



# Tekla Structures 2023

## System components

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# 1 System components

This section contains information on the use of steel and concrete system components that ship with Tekla Structures.

Components are tools that you can use to connect parts in the model. Components automate tasks and group objects so that Tekla Structures treats them as a single unit. You can save the properties of a component and use them in other projects. Tekla Structures contains a wide range of predefined system components by default.

Components adapt to changes in the model, which means that Tekla Structures automatically modifies a component if you modify the parts it connects.

All components are stored in the **Applications & components** catalog. Click the **Applications & components** button in the side pane to open the **Applications & components** catalog.

## See also

[Steel components \(page 34\)](#)

[Concrete components \(page 2765\)](#)

# 2 Steel components

This section contains information on the use of steel components that ship with Tekla Structures.

If you know which component you need, you can press F1 in the component dialog box to quickly access the correct help page. Some components use locally installed help files in a legacy format, which you can only access by pressing F1 in the component dialog box.

More components are available in [Tekla Warehouse](#) for you to download and install.

You can also modify many of the existing components and create your own custom components, see .

## 2.1 Shear tab connections

This section introduces components that can be used in shear tab connections.

- [Shear plate \(34\) \(page 35\)](#)
- [Welded shear plate \(43\) \(page 39\)](#)
- [Shear tab plate connection \(80\) \(page 55\)](#)
- [Shear plate \(103\) \(page 60\)](#)
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- [Full depth \(184\) \(page 258\)](#)
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- [JP Full depth special \(185\) \(page 316\)](#)
- [Shear plate tube column \(189\) \(page 331\)](#)

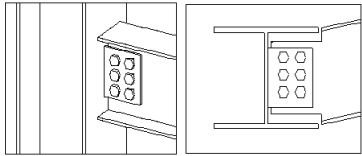
## Shear plate (34)

**Shear plate (34)** connects a beam to a column or to another beam with a shear tab that is welded to the main part and bolted to the web of the secondary beam.

### Objects created

- Shear tab
- Bolts
- Welds

### Use for

Situation	Description
	Beam connected to a column with a shear tab that is welded to the main part and bolted to the secondary part.

### Selection order

1. Select the main part (beam or column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key

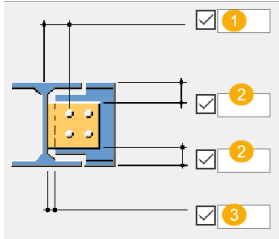


	Description
1	Shear tab

### Picture tab

Use the **Picture** tab to define the connection dimensions.

#### Dimensions



	Description	Default
1	Horizontal distance from the bolt group to the main part	
2	Shear tab edge distance from the secondary part top and bottom	
3	Gap between the main part and the secondary part	10 mm

### Parts tab

Use the **Parts** tab to define the part properties.

#### Parts

Option	Description	Default
<b>Plate</b>	Thickness of the shear tab	Half the bolt thickness rounded up to: 8, 10, 12, 16, 20, 25, 30, 35, 40, 45, and so on.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in

Option	Description	Default
		<b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tab**

Use the **Parameters** tab to define the shear tab position.

#### **Position**

Option	Description
<b>Placing</b>	Select whether the shear tab is placed on the left side or on the right side.

### **Bolts**

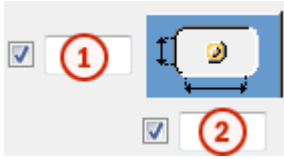
Define the bolt properties.

#### **Bolt basic properties**

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

#### **Slotted holes**

You can define slotted, oversized, or tapped holes.

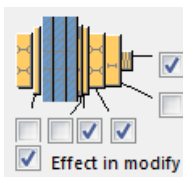


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<p><b>Slotted</b> creates slotted holes.</p> <p><b>Oversized</b> creates oversized or tapped holes.</p> <p><b>No hole</b> does not create holes.</p>	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### General tab

Click the link below to find out more:

General tab

### ***Design tab***

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

Create welds

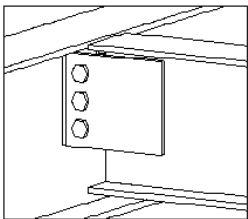
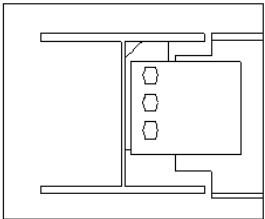
## **Welded shear plate (43)**

**Welded shear plate (43)** connects two beams using a shear tab welded to the secondary beam web and bolted to a stiffener plate welded to the main part web.

### **Objects created**

- Shear tab
- Stiffener
- Shim plate
- Bolts
- Welds

### **Use for**

<b>Situation</b>		<b>Description</b>
		Shear tab welded to the secondary beam and bolted to a stiffener welded to the main part.

### **Limitations**

This connection cannot be used for connections between beams and columns.

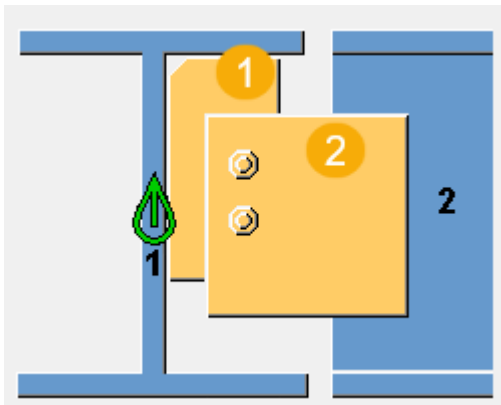
### **Selection order**

1. Select the main part (beam).

- Select the secondary part (beam).

The connection is created automatically when the secondary beam is selected.

### Part identification key

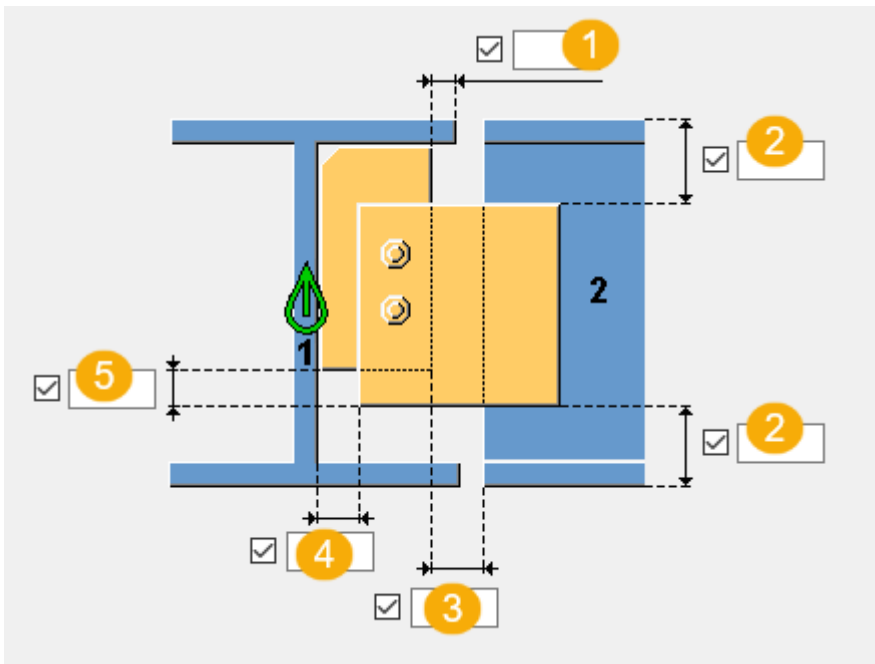


	Description
1	Stiffener
2	Shear tab

### Picture tab

Use the **Picture** tab to define the plate positions.

### Dimensions





	<b>Description</b>	<b>Default</b>
<b>1</b>	Edge distance between the stiffener and the main part flange.	0
<b>2</b>	Shear tab top and bottom edge distance.	By default, the shear tab position and dimensions are defined by the bolt group edge distances. The default position for the shear tab top and bottom edges can be overwritten with the top and bottom edge distances.
<b>3</b>	Distance between the stiffener edge and secondary part end.	
<b>4</b>	Gap between the main part web and the shear tab.	10 mm Changing the value moves the bolt group correspondingly.
<b>5</b>	Edge distance between the shear tab and stiffener bottom.	

### ***Parts tab***

Use the **Parts** tab to define the part properties.

### **Parts**

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Stiffener</b>	Thickness, width and height of the stiffener.	By default, the height is defined by the bolt group vertical edge distances.  If you do not enter a width, the stiffener width will be defined based on the flange width. The default value for the stiffener thickness is the web thickness.



Option	Description	Default
<b>Plate</b>	Thickness and width of the shear tab.  The height is defined by the bolt group edge distances. You can also modify the height with shear tab top and bottom distances on the <b>Picture</b> tab.	The default value for the end plate thickness is half of the screw diameter.
<b>Filler</b>	Thickness of the shim plate.	




Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tab**


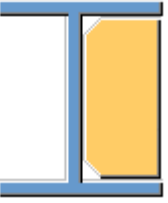

Use the **Parameters** tab to define the shear tab position, stiffener type and chamfers, and shim plate assembly.

### **Sheart tab position**

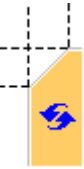
Option	Description
	Default Near side  AutoDefaults can change this option.
	Automatic Near side


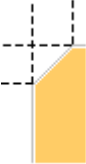


Option	Description
	Near side
	Both sides
	Far side

### Stiffener creation

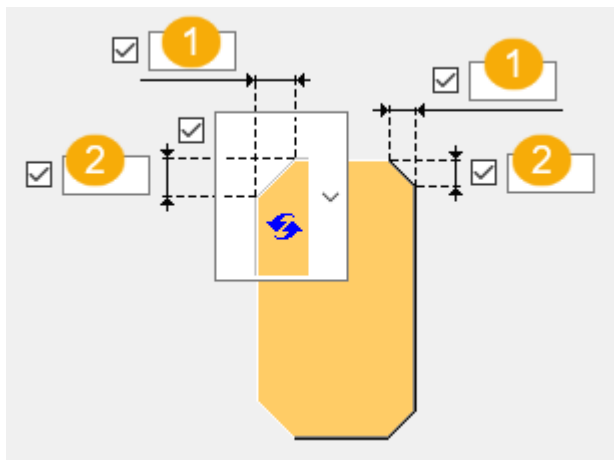
Option	Description
	Default Determined by shear tab AutoDefaults can change this option.
	Full
	Determined by shear tab Tekla Structures determines the size of the stiffener based on the shear tab size. Tekla Structures attempts to keep the bottom edges of the stiffener plate and shear tab level, if possible.

### Chamfer type

Option	Description
	Default. Line chamfer AutoDefaults can change this option.

Option	Description
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### Chamfer dimensions

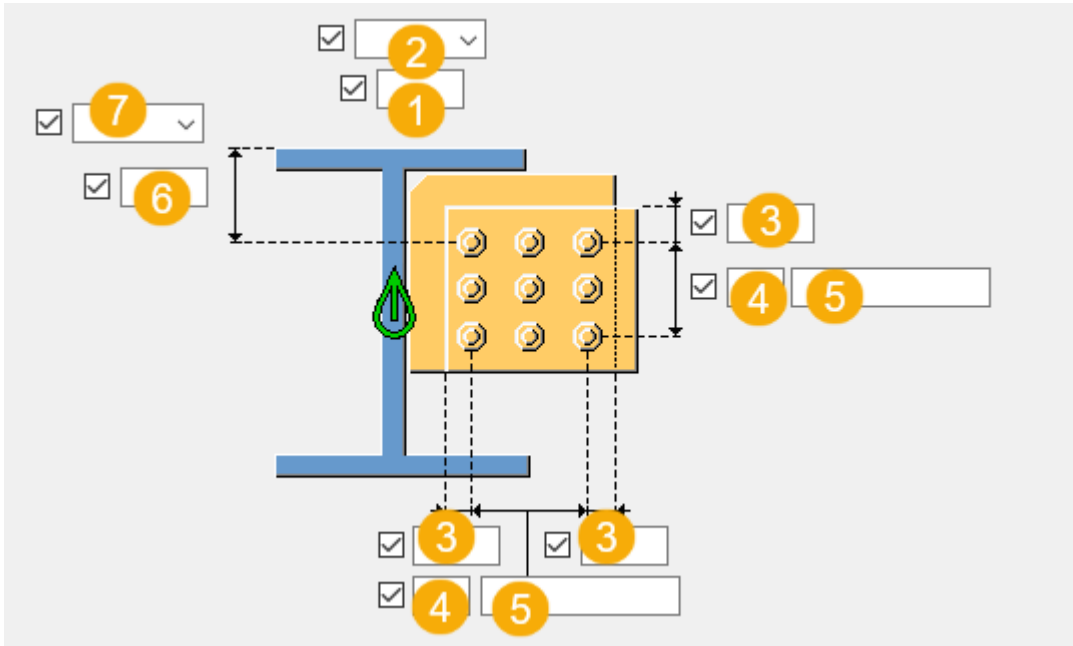


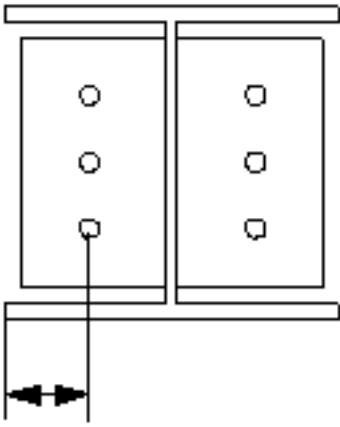
1	Horizontal chamfer dimension
2	Vertical chamfer dimension

### **Bolts tab**

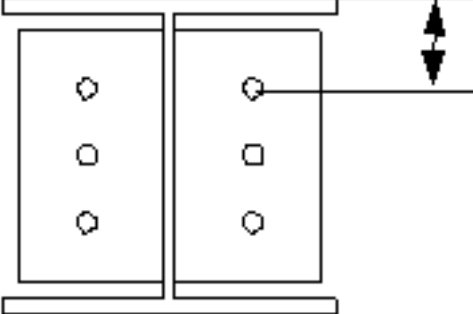
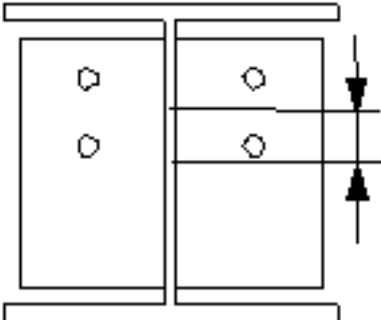
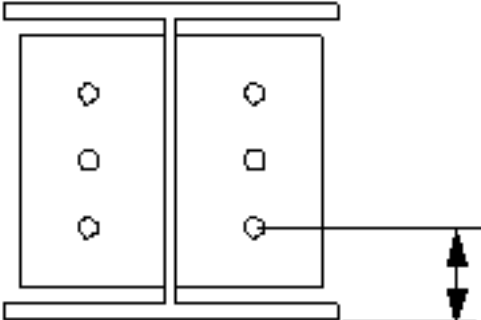
Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

## Bolt group dimensions



	Description
1	Dimension for horizontal bolt group position.
2	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li><b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li> </ul>  <p>The diagram shows two vertical plates with three bolts each. A horizontal dimension line with arrows at both ends is shown below the plates, indicating the measurement from the left edge of the left plate to the leftmost bolt.</p>

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> <div style="text-align: center;"> </div>
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>6</b>	Dimension for vertical bolt group position.

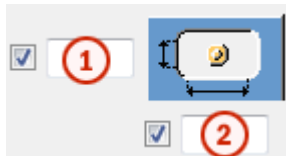
	Description
7	<ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul>  <p>Select how to measure the dimensions for vertical bolt group position.</p>

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

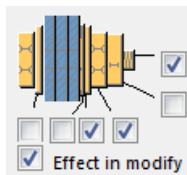


Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### **Bolt assembly**

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

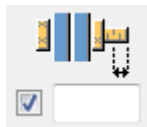
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### **Notch tab**


Use the **Notch** tab to automatically create notches for the secondary beams and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.





#### **Automatic notching**

Automatic notching options affect both the top and the bottom flange.


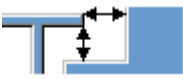
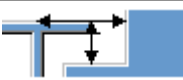
#### **Notch shape**

Automatic notching is switched on when you select a notch shape.

Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.

Option	Description
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.
	Turns off automatic notching.

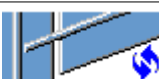

### Notch size


Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.





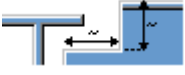
### Flange cut shape

Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.

Option	Description
	Secondary beam flange is cut square.

### Notch dimension rounding




Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.





The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



### Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

## Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.






 

## Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.



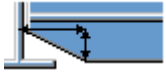



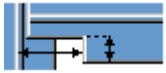
## Side of flange notch

The side of flange notch defines on which side of the beam the notches are created.




Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

## Flange notch shape

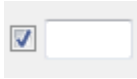
The flange notch shape defines the notch shape in the beam flange.

Option	Description
	<p>Default</p> <p>The entire flange of the secondary beam is cut as far back as you define.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.</p>
	<p>Creates chamfers in the flange.</p> <p>If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.</p>
	<p>Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b>.</p>
	<p>The flange is not cut.</p>
	<p>Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.</p>
	<p>Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b>.</p>

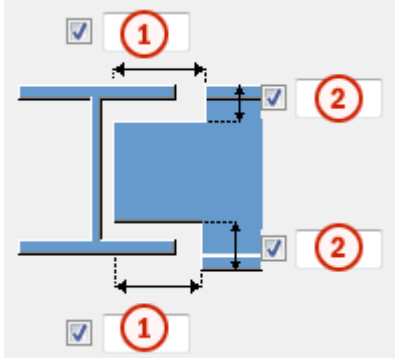
## Flange notch depth

Option	Description
	<p>Default</p> <p>Flange notch depth.</p> <p>AutoDefaults can change this option.</p>
	<p>Flange notch depth.</p>
	<p>Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.</p>

Enter the value for flange notch depth.



### Cut dimensions



	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

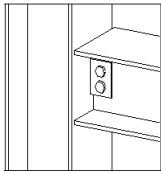
## Shear tab plate connection (80)

**Shear tab plate connection (80)** connects a beam to a column, or a beam to a beam, with a shear tab that is bolted to the secondary part and welded to the main part. It is also possible to create flange stiffeners for beam to column connections and web stiffeners for beam to beam connections.

### Objects created

- Shear tab
- Stiffeners
- Bolts
- Welds

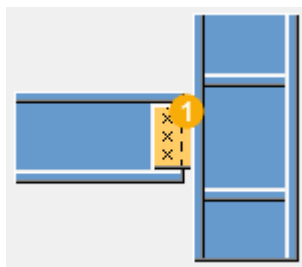
### Use for

Situation	Description
	Beam connected to a column with a shear tab

### Selection order

1. Select the main part (column or beam).
2. Select the secondary part (beam).  
The connection is created automatically when the secondary part is selected.

### Part identification key

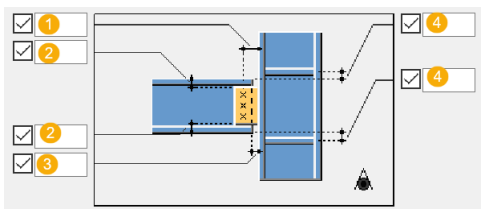


	Description
1	Shear tab

### Picture tab

Use the **Picture** tab to define the connection dimensions.

### Dimensions



	Description
1	Horizontal distance from the main part to the first bolt
2	Vertical distance from the secondary part upper edge and lower edge to the shear tab upper and lower edge
3	Gap between the main part and secondary part By default, the gap value is zero.
4	Distance from the secondary part upper and lower edge to the upper and lower flange of the stiffener By default, this distance is zero and the stiffener is created at secondary part upper and lower edge level.

### Parts tab

Use the **Parts** tab to define the part properties.

### Parts

Option	Description	Default
Tab plate	Thickness of the shear tab	10 mm
Upper fl. stiffener	Thickness, width, and height of the stiffener	
Lower fl. stiffener	Thickness, width, and height of the stiffener	
Web stiffener	Thickness, width, and height of the stiffener	

Option	Description	Default
Pos_No	Prefix and start number for the part position number. Some components have a second row of fields	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .



Option	Description	Default
	where you can enter the assembly position number.	
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tab**

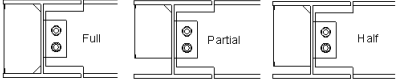
Use the **Parameters** tab to define the beam cut, and the stiffener types and dimensions.

#### **Beam cut and shear tab location**

Option	Description
<b>Beam cut</b>	<ul style="list-style-type: none"> <li>• <b>Beveled:</b> Perpendicular to the beam axis. This is the default value.</li> <li>• <b>Square:</b> Square to the main part.</li> </ul>
<b>Tab location</b>	<p>Tab location in relation to the secondary beam web.</p> <p><b>Both</b> creates two tab plates, one to the left and another to the right side of the web.</p> <p>The default is <b>Left</b>.</p>

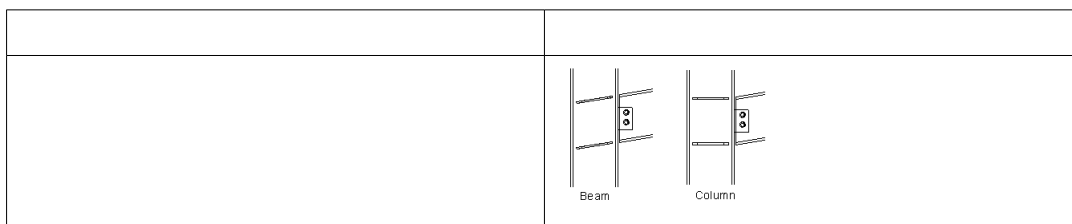
#### **Opposite web stiffener**

Option	Description
<b>Height</b>	<ul style="list-style-type: none"> <li>• <b>Full:</b> Stiffener height is equal to the distance between the main part flanges. This is the default value.</li> <li>• <b>Partial:</b> Stiffener is cut at the lower level edge of the shear tab.</li> <li>• <b>Half:</b> Stiffener height is equal to <b>Partial + 0.5*(Full - Partial)</b>.</li> </ul>

Option	Description
	
<b>Tolerance</b>	Vertical distance between the web stiffener and the main part flanges By default, the tolerance is zero.
<b>Angle</b>	Define the angle. By default, the angle is zero.
<b>Chamfer type</b>	Select the chamfer type. No chamfer usually causes a clash between the stiffener and the I profile rounding.
<b>Chamfer X</b>	Horizontal chamfer dimension For arc chamfers, the horizontal dimension is the radius of the arc.
<b>Chamfer Y</b>	Vertical chamfer dimension

### Flange stiffeners

<b>Tolerance</b>	Distance between the flange stiffeners and the main part flanges By default, the tolerance is zero.
<b>Chamfer type</b>	Select the chamfer type. No chamfer usually causes a clash between the stiffener and the I profile rounding. By default, a line chamfer is created.
<b>Chamfer X</b>	Horizontal chamfer dimension For arc chamfers, the horizontal dimension is the radius of the arc.
<b>Chamfer Y</b>	Vertical chamfer dimension
<b>Direction</b>	<ul style="list-style-type: none"> <li>• <b>Column:</b> Stiffeners are perpendicular to the main part.</li> <li>• <b>Beam:</b> Stiffeners are parallel to the secondary part flange.</li> </ul>



### ***General tab***

Click the link below to find out more:

General tab

### ***Design tab***

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Bolt properties***

Define the bolt properties and bolt group dimensions.

Click the link below to find out more:

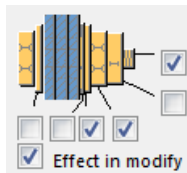
<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### **Bolt assembly**

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### **Welds**

Click the link below to find out more:

Create welds

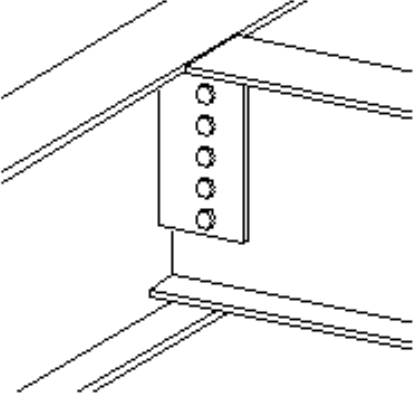
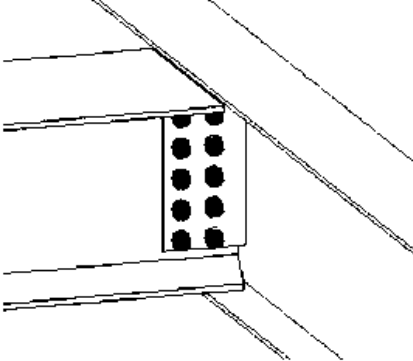

### **Shear plate (103)**

**Shear plate (103)** connects a beam to a beam or to a column with a shear tab. The shear tab is welded to the main part and bolted to the secondary beam.

#### **Objects created**

- Shear tab
- Bolts
- Welds
- Cuts

## Use for

Situation	Description
 A technical drawing showing a shear tab connected to a beam. The tab is a vertical rectangular plate with four circular bolt holes. It is attached to the top flange of a horizontal beam. A secondary beam is shown extending from the top flange of the main beam, perpendicular to the shear tab.	Shear tab connected to a beam.
 A technical drawing showing a shear tab connected to a beam. The tab is a rectangular plate with a grid of circular bolt holes. It is attached to the top flange of a horizontal beam. A secondary beam is shown extending from the top flange of the main beam, but it is skewed relative to the shear tab.	Shear tab connected to a beam. The secondary beam is skewed.
 A technical drawing showing a shear tab connected to a beam. The tab is a rectangular plate with a grid of circular bolt holes. It is attached to the top flange of a horizontal beam. A secondary beam is shown extending from the top flange of the main beam, but it is both sloped and skewed relative to the shear tab.	Shear tab connected to a beam. The secondary beam is sloped and skewed.

## Selection order

1. Select the main part (beam or column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary beam is selected.

## Part identification key

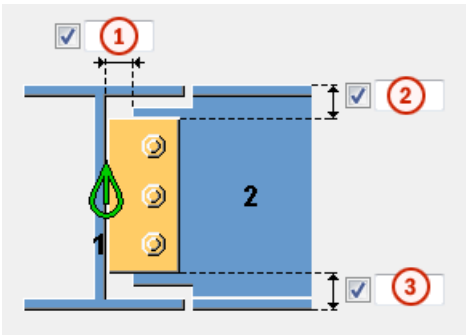


	Part
1	Shear tab

## Picture tab




Use the **Picture** tab to control the position of the shear tab.

## Shear tab dimensions






	Description
1	<p>Cut of the secondary part.</p> <p>Cutting the secondary part creates a gap between the main part and the secondary part.</p> <p>The cut is defined from the main part web.</p>
2	Distance from the top edge of the secondary beam to the top edge of the shear plate.
3	Distance from the bottom edge of the secondary beam to the bottom edge of the shear tab.

### Shear tab position

Option	Description
	Default The shear tab is on the left side of the secondary beam web. AutoDefaults can change this option.
	The shear tab is on the left side of the secondary beam web.
	The shear tab is on the right side of the secondary beam web.

### Beam flange cut

Option	Description
	Default Square AutoDefaults can change this option.
	Cuts the end of the flange bevel.
	Cuts the end of the flange square.

### **Parts tab**

Use the **Parts** tab to control the shear tab properties.

### Shear plate

Part	Description
<b>Plate</b>	Shear tab thickness and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

### **Notch tab**





Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

### **Automatic notching**


Automatic notching options affect both the top and the bottom flange.

### **Notch shape**

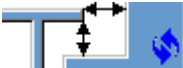

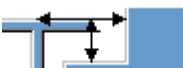
Automatic notching is switched on when you select a notch shape.

Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.



Option	Description
	Turns off automatic notching.




### Notch size

Option	Description
	<p>Default</p> <p>The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.</p> <p>AutoDefaults can change this option.</p>
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.



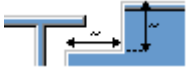


### Flange cut shape

Option	Description
	<p>Default</p> <p>Secondary beam flange is cut parallel to the main beam.</p> <p>AutoDefaults can change this option.</p>
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

### Notch dimension rounding



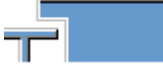
Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.





The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



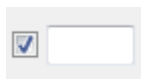
### Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

### Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.








### Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.



### Side of flange notch

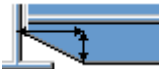



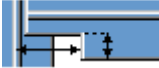
The side of flange notch defines on which side of the beam the notches are created.

Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

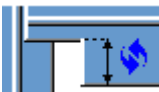
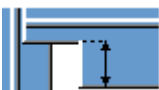

### Flange notch shape

The flange notch shape defines the notch shape in the beam flange.

Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.

Option	Description
	Creates chamfers in the flange. If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.
	Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b> .
	The flange is not cut.
	Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.
	Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b> .

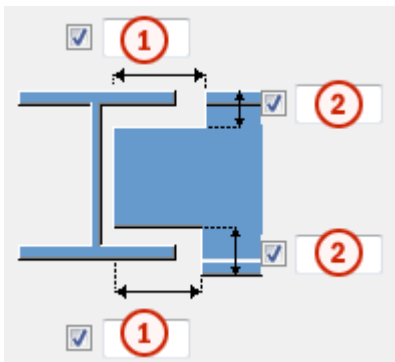
### Flange notch depth

Option	Description
	Default Flange notch depth. AutoDefaults can change this option.
	Flange notch depth.
	Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.

Enter the value for flange notch depth.

### Cut dimensions



	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### BCSA notch definition

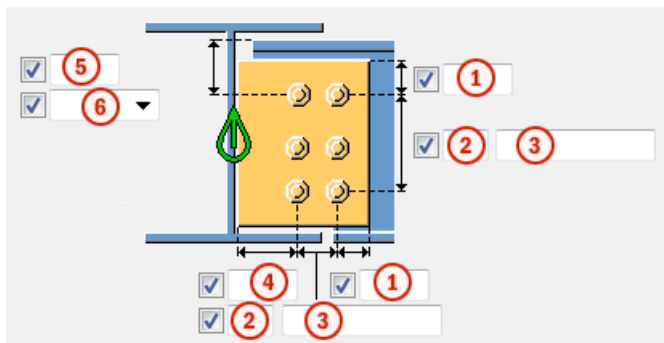
Define whether the notch is created according to British Constructional Steelwork Association (BCSA) specifications.

Option	Description
Default	Notch dimensions.
Yes	Creates a 50 mm notch for simple beam-to-beam connections.
No	Use the options on this <b>Notch</b> tab to define the notch dimensions.

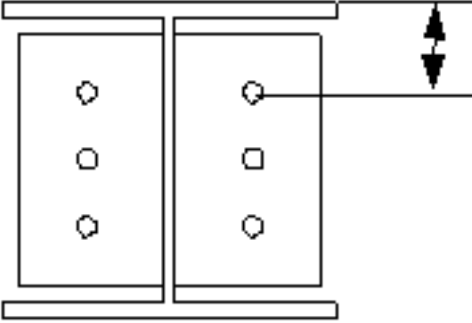
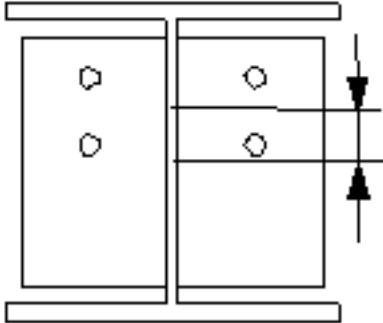
### Bolts tab

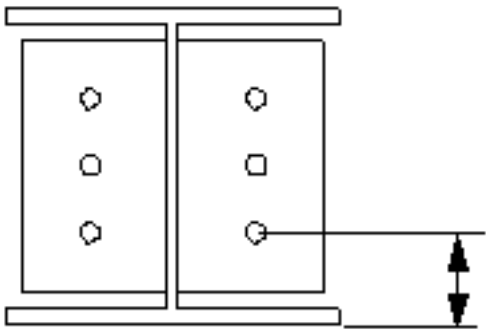
Use the **Bolts** tab to control the bolt properties.

### Bolt group dimensions






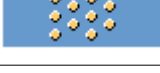


	Description
1	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Number of bolts.

	<b>Description</b>
<b>3</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>4</b>	Dimension for horizontal bolt group position.
<b>5</b>	Dimension for vertical bolt group position.
<b>6</b>	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> <div style="text-align: center; margin: 10px 0;">  </div> <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul> <div style="text-align: center; margin: 10px 0;">  </div>

	Description
	<ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

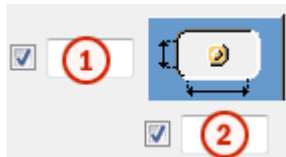
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	

Option	Description	Default
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



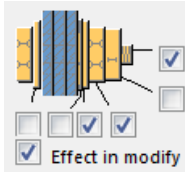
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.

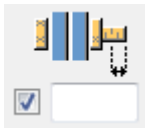







To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Bolting direction

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

### ***General tab***

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

## **Welds**

Click the link below to find out more:

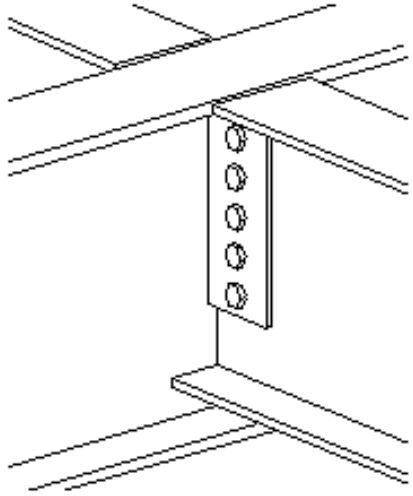
## **Two sided shear plate (118)**

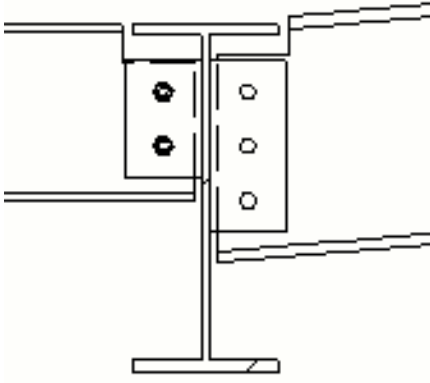
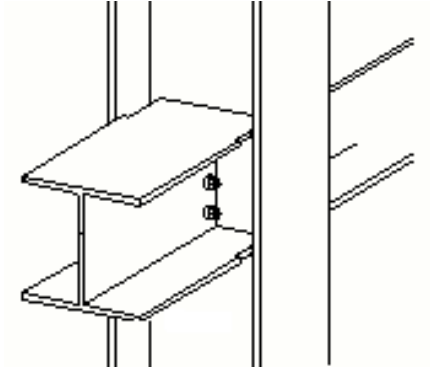
**Two sided shear plate (118)** connects two beams to a beam or a column with shear tabs. The shear tabs are welded to the main beam or column, and bolted to the secondary beams.

### **Objects created**

- Shear tabs (2)
- Bolts
- Welds
- Cuts

### **Use for**

<b>Situation</b>	<b>Description</b>
	Simple shear tabs connected to a beam.

Situation	Description
	<p>Simple shear tabs connected to a beam. The other secondary beam is sloped.</p>
	<p>Simple shear tabs connected to a column web.</p>

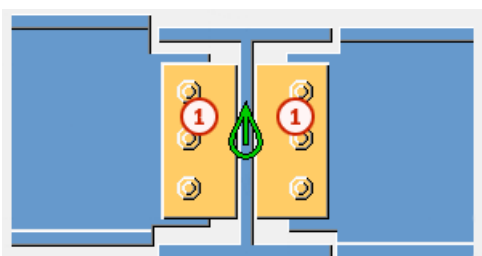
### Limitations

The upper edges on the shear tabs should be on the same level.

### Selection order

1. Select the main part (beam or column).
2. Select the first secondary part (beam).
3. Select the second secondary part (beam).
4. Click the middle mouse button to create the connection.

### Part identification key

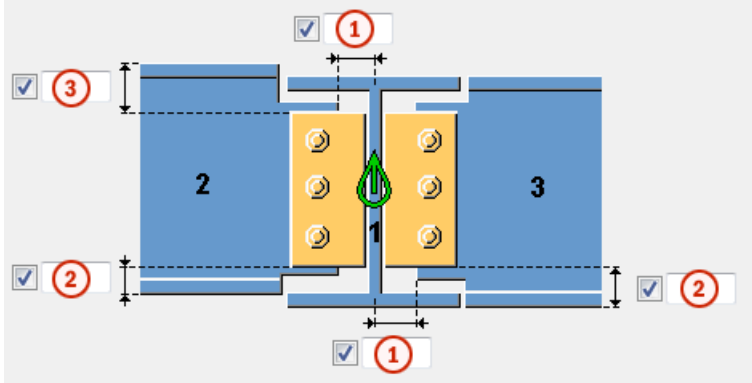


	Part
1	Shear tab

### Picture tab



Use the **Picture** tab to control the position of the shear tabs.


### Shear tab dimensions






	Description	Default
1	Cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part. The cut is defined from the main part web.	
2	Distance from the bottom edge of the secondary beam to the bottom edge of the shear tab.	
3	Distance from the top edge of the first secondary beam to the top edge of the shear plate. The top edges of the shear tabs are aligned to the same level.	50 mm

### Shear tab position

Option	Description
	Default The shear tab is on the left side of the secondary beam web. AutoDefaults can change this option.
	The shear tab is on the right side of the secondary beam web.

Option	Description
	The shear tab is on the right side of the secondary beam web.

### Beam flange cut

Option	Description
	Default Square AutoDefaults can change this option.
	Bevel Cuts the end of the flange bevel.
	Square Cuts the end of the flange square.

### Parts tab

Use the **Parts** tab to control the shear tab properties.

Part	Description
<b>Plate</b>	Shear tab thickness and height.

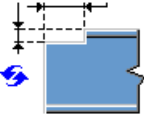
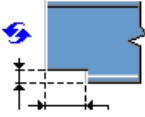


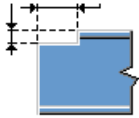
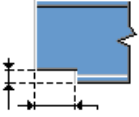
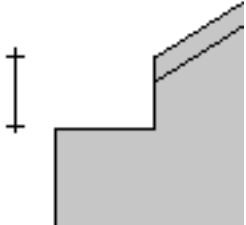
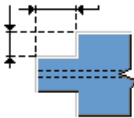
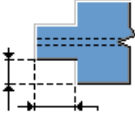
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

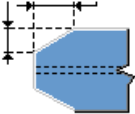
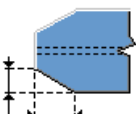
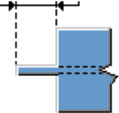
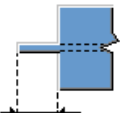


### Notch tab

Use the **Notch** tab to create notches for the secondary beams and to control the notch properties. Define the notches for both secondary beams.

### Notch shape

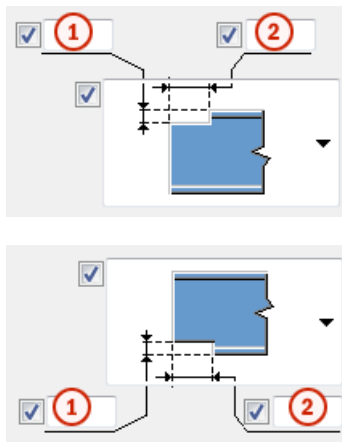
Define the notch shape for the top and the bottom of the secondary beam.

Option	Option	Description
		<p>Default</p> <p>Creates a square notch on the top side or on the bottom side of the secondary beam.</p> <p>AutoDefaults can change this option.</p>
		<p>No notch</p>
		<p>Creates a square notch on the top side or on the bottom side of the secondary beam.</p> <p>Define the notch dimensions. In beam-to-beam connections with a sloped secondary beam, the depth is measured as shown in the picture.</p> 
		<p>Creates a notch on both sides of the secondary part.</p> <p>Define the notch dimensions.</p>

Option	Option	Description
		Creates a chamfered notch on both sides of the secondary beam. Define the chamfer dimensions.
		Creates a strip. Define the length of the strip. The flanges are cut completely.
		Creates a special type of square notch. Define the notch dimensions. The notch is square to the secondary beam. There are no default values for the length or the depth.

### Notch dimensions





Define the top and the bottom dimensions of the notch if you have set the **BCSA notch def** option to **No**.



	Description
1	Vertical notch dimension.
2	Horizontal notch dimension.

### Notching side

Define on which side of the secondary beam the notch is created. You can define the side for both the top and the bottom of the secondary beam.

Option	Description
	Default Creates notches on both sides. AutoDefaults can change this option.
	Creates notches on both sides.
	Creates a notch on the left side.
	Creates a notch on the right side.

### BCSA notch definition

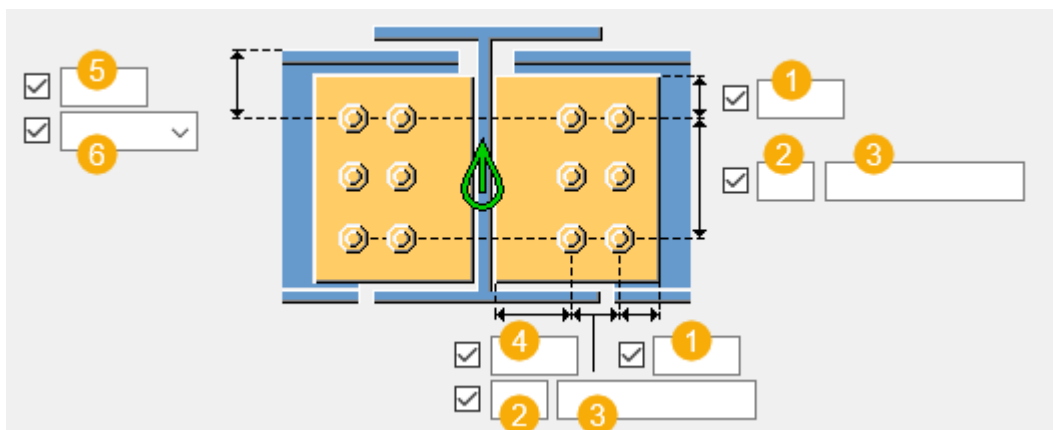
Define whether the notch is created according to British Constructional Steelwork Association (BCSA) specifications.

Option	Description
<b>Default</b>	Notch dimensions.
<b>Yes</b>	Creates a 50 mm notch for simple beam-to-beam connections.
<b>No</b>	Use the options on this <b>Notch</b> tab to define the notch dimensions.

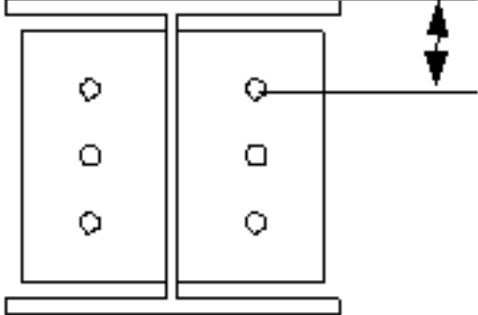
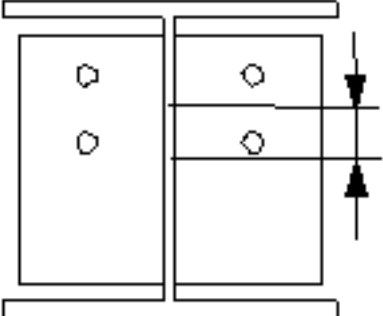
### Bolts tab

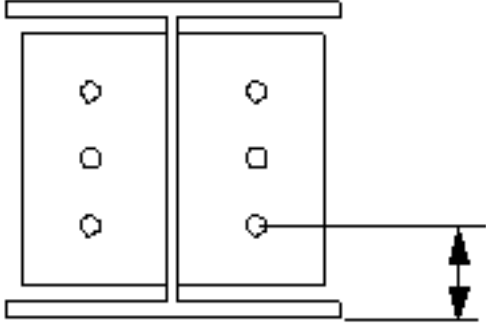
Use the **Bolts** tab to control the bolt properties.

### Bolt group dimensions











	<b>Description</b>
<b>1</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>2</b>	Number of bolts.
<b>3</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>4</b>	Define the horizontal bolt edge distance.
<b>5</b>	Dimension for vertical bolt group position.
<b>6</b>	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> <div style="text-align: center; margin: 10px 0;">  </div> <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul> <div style="text-align: center; margin: 10px 0;">  </div>

	Description
	<ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

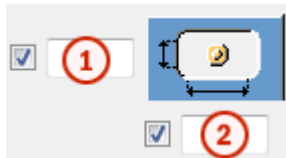
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.

Option	Description	Default
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

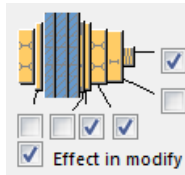


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

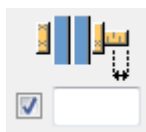
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

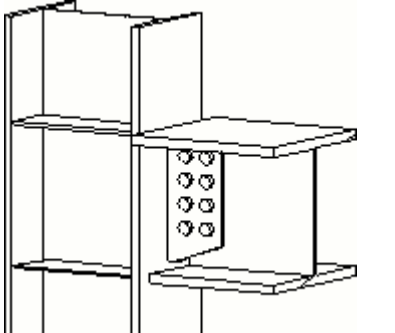
## **Column with shear plate (131)**

**Column with shear plate (131)** connects a beam to a column with a single shear tab or double shear tabs. The shear tab is welded to the main part web and stiffeners, and bolted to the secondary part web. The secondary beam can be leveled or sloped.

### Objects created

- Shear tabs (1 or 2)
- Stiffeners (optional)
- Welds
- Bolts
- Cuts

### Use for

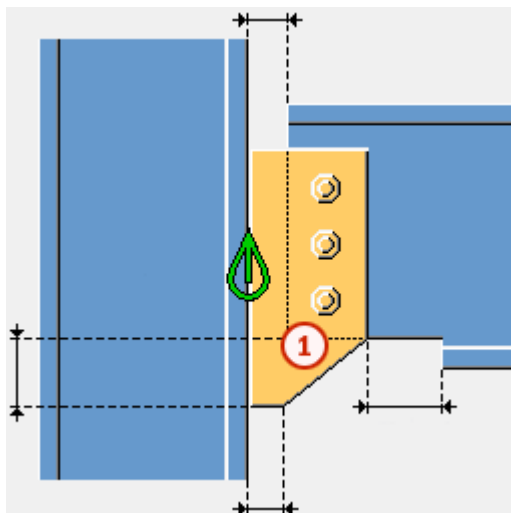
Option	Description
	Two shear tabs and four stiffeners.

### Selection order

1. Select the main part (column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key



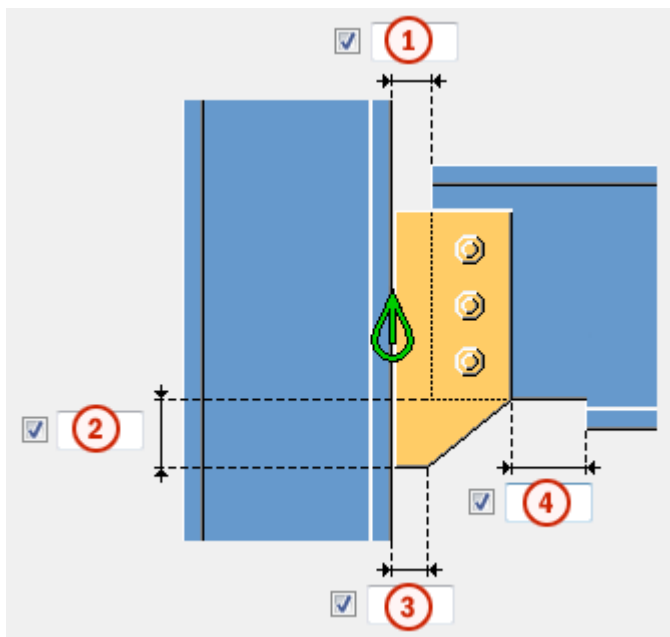
	Part
1	Shear tab

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

### Picture tab

Use the **Picture** tab to control the position of the shear tab, and the beam flange and the web cuts.





### Dimensions



	Description	Default
1	Cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	10 mm
2	Height of the chamfered part of the shear tab.	50 mm
3	Distance from the edge of the main part to the corner of the shear tab.	20 mm
4	Size of the strip made to the secondary part flange. The cut of the flange is defined from the shear tab edge.	20 mm




### Beam end cut

Define how the secondary beam end is cut. The beam is viewed from the side.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.
	Square Cuts the end of the secondary beam square.
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.




### Beam web cut

Define how the secondary beam web end is cut. The beam is viewed from the top.




Option	Description
	Default Bevel AutoDefaults can change this option.
	Bevel Cuts the end of the web bevel when the end of the secondary beam is cut bevel.
	Square Cuts the end of the web square even if the end of the secondary beam is cut bevel.

### Beam flange cut

Define how the secondary beam flange end is cut. The beam is viewed from the top.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Bevel Cuts the end of the flange bevel.
	Square Cuts a part of the flange square and leaves a part of it bevel.

### Beam bottom flange cut

Option	Description
	Default Notch Define the notch dimensions. AutoDefaults can change this option.
	Notch Define the notch dimensions. The bottom of the secondary beam is notched if the shear tab crosses the flange.
	Flange cut The secondary beam flange is cut on the same side as the shear tab if the shear tab crosses the flange.

### **Plates tab**

Use the **Plates** tab to control the size, position, number, orientation and shape of the shear tab.





### Shear tab plate

Option	Description
<b>Tab plate</b>	Shear tab plate thickness, width and height.

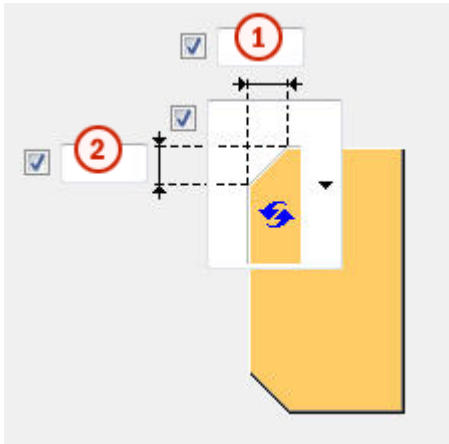


Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Shear tab shape

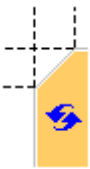

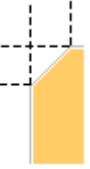

Option	Description
	Default Shear tab corner is chamfered. AutoDefaults can change this option.
	Automatic Shear tab corner is chamfered.
	Shear tab corner is chamfered.
	Shear tab corner is not chamfered.


## Shear tab chamfers



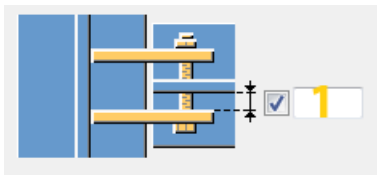
	Description
1	Horizontal dimension of the shear tab chamfer.
2	Vertical dimension of the shear tab chamfer.

## Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer

Option	Description
	Concave arc chamfer




### Gap between shear tabs





	Description	Default
1	Gap between the secondary part web and shear tab. This only affects connections with two shear tabs.	0






### Shear tab position

Define the number and the side of shear tabs in single shear tab connections.

Option	Description
	Default Far side shear tab AutoDefaults can change this option.
	Automatic The component automatically selects either the near side or the far side shear tab. The tab is created to the side of the secondary part when the angle between the main part and the secondary part is less than 90 degrees.
	Far side shear tab

Option	Description
	Near side and far side shear tab
	Near side shear tab

### Shear tab orientation

Option	Description
	Default Sloped AutoDefaults can change this option.
	Automatic The shear tab is sloped in the direction of the secondary beam. Both vertical edges of the shear tab are cut parallel to the end of the secondary beam.
	Sloped The shear tab is sloped in the direction of the secondary beam. Both vertical edges of the shear tab are cut parallel to the end of the secondary beam.
	Square
	Modified sloped Same as the <b>Sloped</b> option, but the vertical edge of the shear tab connected to the secondary beam is cut perpendicular to the secondary beam flange.

### **Stiffeners tab**

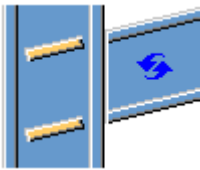
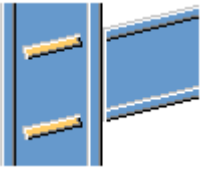
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type.

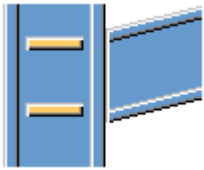
## Stiffener plate dimensions

Option	Description
<b>Top NS</b>	Top near side stiffener thickness, width and height.
<b>Top FS</b>	Top far side stiffener thickness, width and height.
<b>Bottom NS</b>	Bottom near side stiffener thickness, width and height.
<b>Bottom FS</b>	Bottom far side stiffener thickness, width and height.





Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

## Stiffener orientation



Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are parallel to the secondary part.



Option	Description
	Stiffeners are perpendicular to the main part.

### Stiffener creation

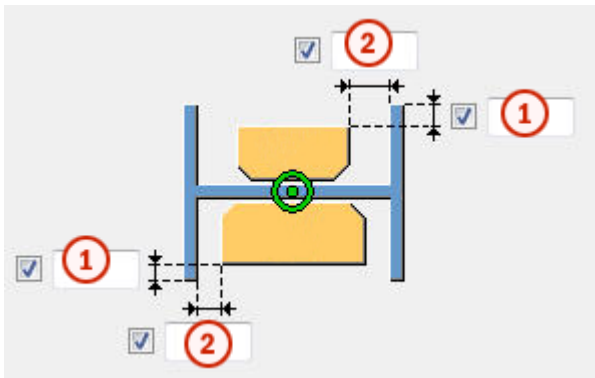
Option	Description
	Default Stiffeners are created. AutoDefaults can change this option.
	Automatic Stiffeners are created when necessary.
	No stiffeners are created.
	Stiffeners are created.

### Stiffener shape

Option	Description
	Default Line chamfered stiffener plates AutoDefaults can change this option.
	Automatic Line chamfered stiffener plates

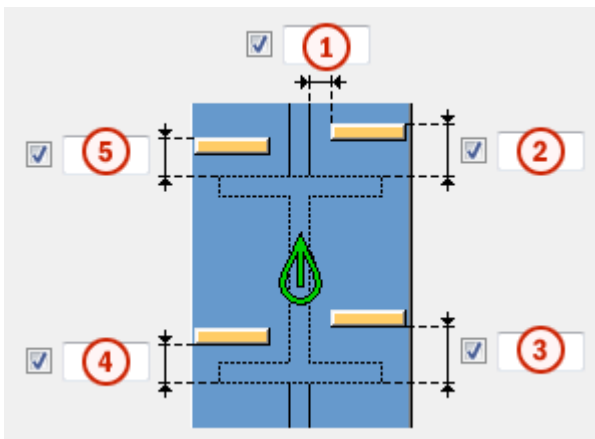
Option	Description
	Square stiffener plates Stiffener plates with a gap for the main part web rounding
	Line chamfered stiffener plates

### Stiffener gap



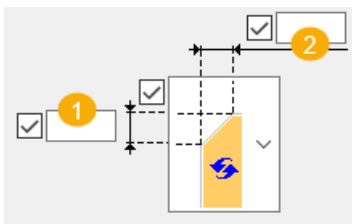
	Description
1	Distance from the edge of the flange to the edge of the stiffener.
2	Size of the gap between the flanges and the stiffener.

### Stiffener positions



	Description
1	Size of the gap between the stiffener and the beam web edge.
2	Size of the gap between the top near side stiffener and the beam flange edge.
3	Size of the gap between the bottom near side stiffener and the beam flange edge.
4	Size of the gap between the bottom far side stiffener and the beam flange edge.
5	Size of the gap between the top far side stiffener and the beam flange edge.

### Chamfer dimensions





	Description	Default
1	Vertical dimension of the chamfer.	10 mm
2	Horizontal dimension of the chamfer.	10 mm

### Chamfer type

Option	Description
	Default. Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer



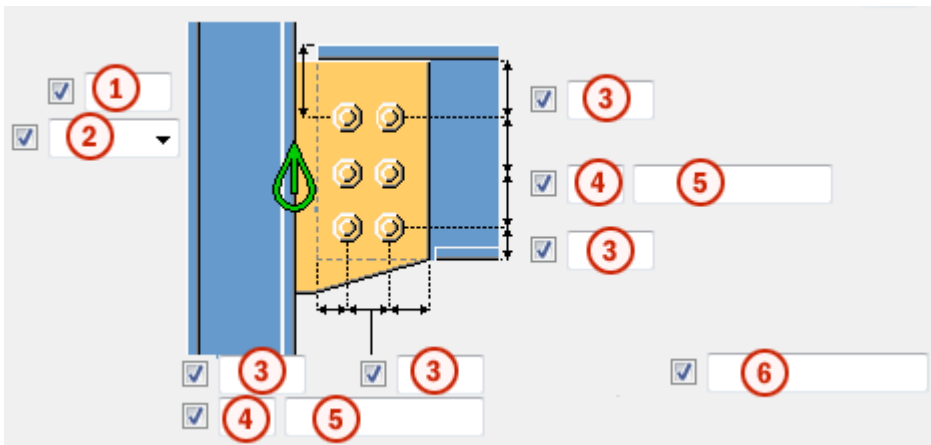
Option	Description
	Convex arc chamfer
	Concave arc chamfer

### ***Bolts tab***

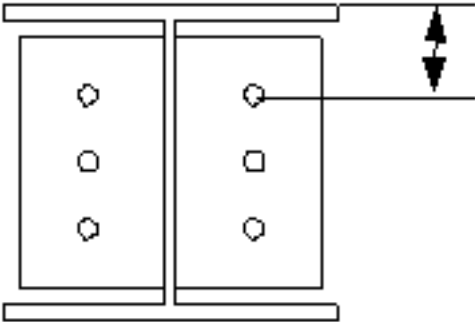
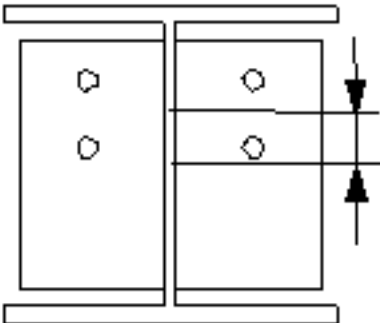
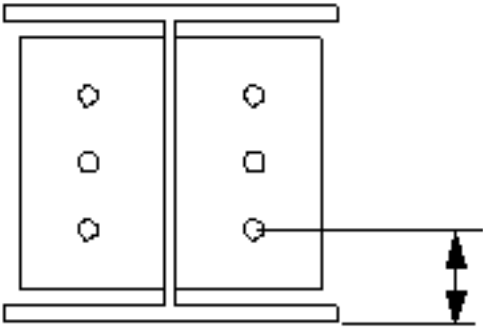
Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part.

### **Bolt group dimensions**

Bolt group dimensions affect the size and shape of the shear tab.









	Description
1	Dimension for vertical bolt group position.



	<b>Description</b>
<b>2</b>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt. </li> </ul>  <ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part. </li> </ul>  <ul style="list-style-type: none"> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt. </li> </ul> 


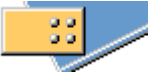

	Description
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>6</b>	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt group orientation

Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square

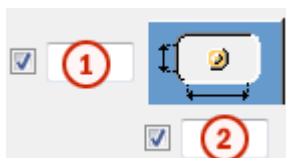
Option	Description
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



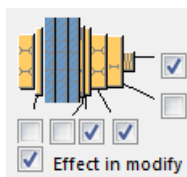
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.

Option	Description	Default
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
Rotate Slots	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
Slots in	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Notch tab






Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

## Automatic notching

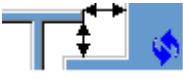
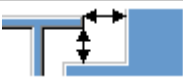
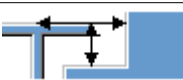
Automatic notching options affect both the top and the bottom flange.

### Notch shape

Automatic notching is switched on when you select a notch shape.

Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.
	Turns off automatic notching.




### Notch size

Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.



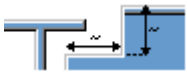


## Flange cut shape

Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

## Notch dimension rounding


Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.



Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.

The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.







## Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.

Option	Description
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

### Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.



 

### Manual notching




Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.

### Side of flange notch

The side of flange notch defines on which side of the beam the notches are created.



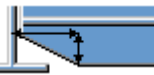


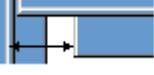
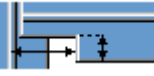
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.




Option	Description
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

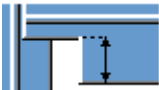

### Flange notch shape

The flange notch shape defines the notch shape in the beam flange.

Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.
	Creates chamfers in the flange. If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.
	Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b> .
	The flange is not cut.
	Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.
	Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b> .

### Flange notch depth

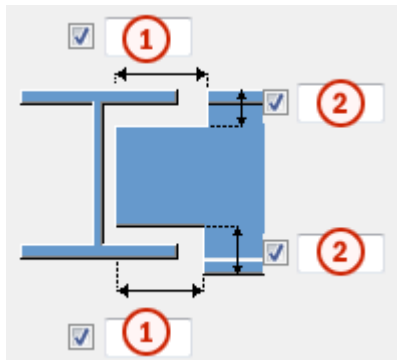
Option	Description
	Default Flange notch depth. AutoDefaults can change this option.

Option	Description
	Flange notch depth.
	Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.

Enter the value for flange notch depth.

### Cut dimensions



	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

[Design type tab](#)

## ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

## ***Welds***

Click the link below to find out more:

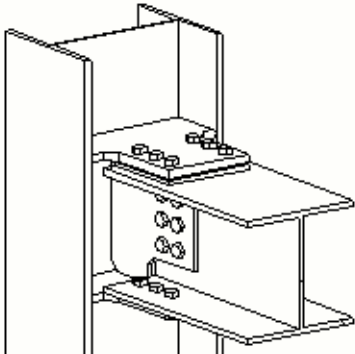
## **Bolted moment connection (134)**

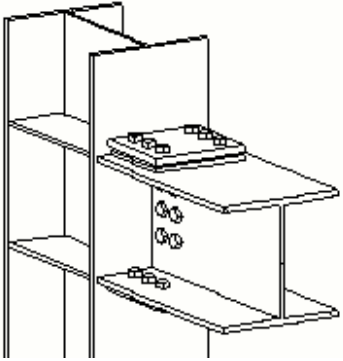
**Bolted moment connection (134)** connects a beam to a column web or flange. The shear tab is welded to the main part web or flange, and bolted to the secondary part web. The secondary part can be leveled or sloped and/or skewed.

### **Objects created**

- Shear tab (1 or 2)
- Flange plates (2)
- Shim plates
- Stiffeners (optional)
- Web doubler plate (optional)
- Bolts
- Welds
- Cuts

### **Use for**

<b>Situation</b>	<b>Description</b>
	Beam connected to column web.

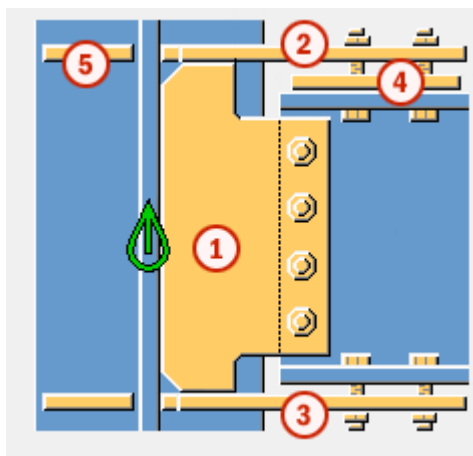
Situation	Description
	<p>Beam connected to column flange.</p>

### Selection order

1. Select the main part (column ).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key



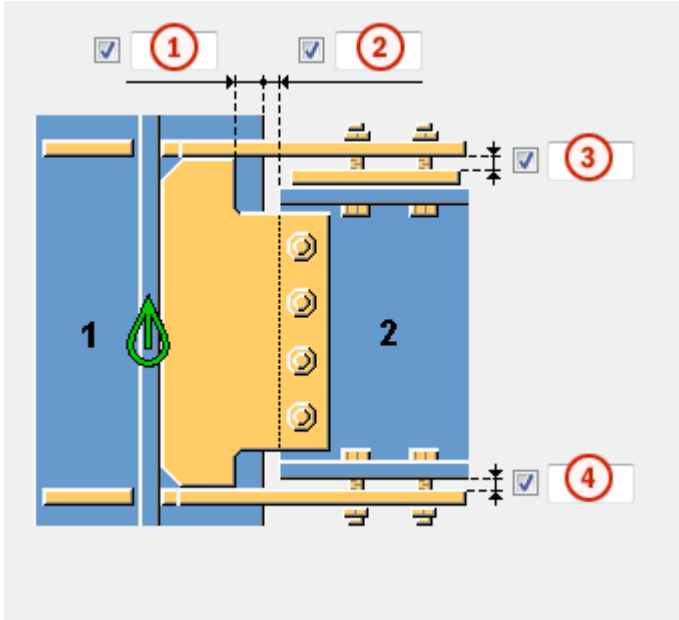
	Part
1	Shear tab
2	Upper flange plate
3	Lower flange plate
4	Shim plate
4	Stiffener

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

### Picture tab

Use the **Picture** tab to control the position of the shear tab, and the beam flange and web cuts.



### Dimensions


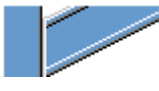
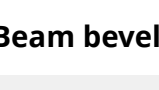


	Description
1	Shear tab edge distance from the main part flange edge.
2	Cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.
3	Distance from the shim plate edge to the flange plate edge.
4	Distance from the edge of the secondary part to the edge of the flange plate.

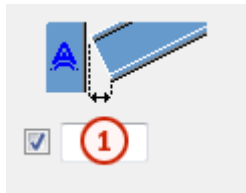
### Beam end cut

Define how the secondary beam end is cut. The beam is viewed from the side.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut

Option	Description
	square. Otherwise, the beam end is cut bevel.
	Square Cuts the end of the secondary beam square.
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.




### Beam bevel cut



	Description
1	Bevel of the beam end cut.

### Beam flange cut

Define how the secondary beam flange end is cut. The beam is viewed from the top.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Bevel Cuts the end of the flange bevel.
	Square Cuts a part of the flange square and leaves a part of it bevel.

### Shear plate tab

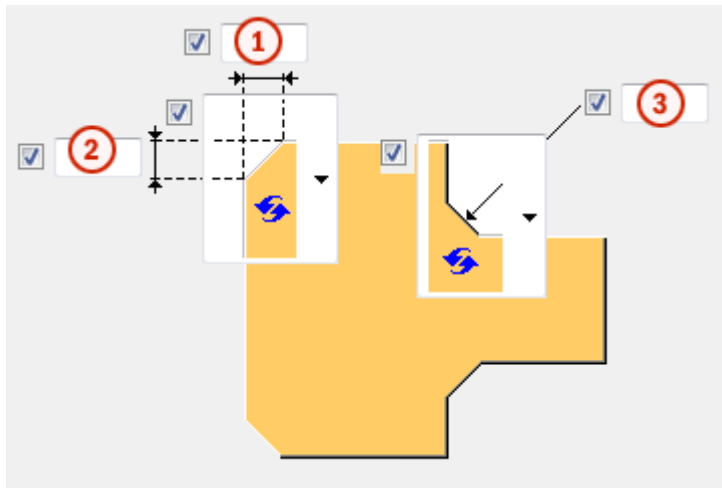
Use the **Shear plate** tab to control the size, position, number, orientation and shape of the shear tab.

## Shear tab

Option	Description
Tab plate	Shear tab plate thickness, width and height.



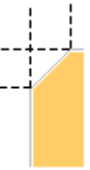


Option	Description	Default
Pos_No	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
Material	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
Name	Name that is shown in drawings and reports.	

## Shear tab chamfers





	Description
1	Horizontal dimension of the shear tab chamfer.
2	Vertical dimension of the shear tab chamfer.
3	Vertical and the horizontal dimension of the shear tab chamfer.



### Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer





### Chamfer type dimensions

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer





Option	Description
	Line chamfer
	Concave arc chamfer




### Shear tab orientation

Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Sloped The shear tab is sloped in the direction of the secondary beam. Both vertical edges of the shear tab are cut parallel to the end of the secondary beam.
	Square

### Shear tab position

Define the number and the side of shear tabs in single shear tab connections.

Option	Description
	Default Far side shear tab AutoDefaults can change this option.
	Automatic The component automatically selects either the near side or the far side shear tab. The tab is created to the side of the secondary part when the

Option	Description
	angle between the main part and the secondary part is less than 90 degrees.
	Far side shear tab
	Near side and far side shear tab
	Near side shear tab

### ***Flange plate tab***

Use the **Flange plate** tab to control the size, position, number, orientation and shape of the flange plates and shim plates.

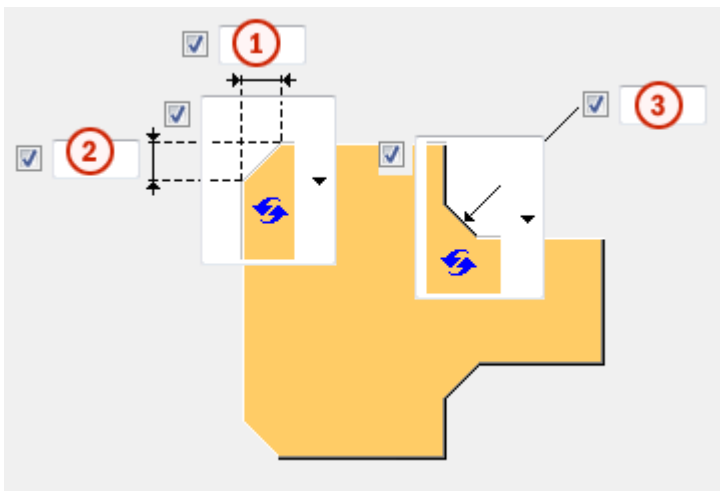
### **Plates**

Part	Description	Default
<b>Upper flange plate</b>	Upper flange plate thickness.	20 mm
<b>Lower flange plate</b>	Lower flange plate thickness.	20 mm
<b>Upper deck fill</b>	Upper deck shim plate thickness and width.	10 mm
<b>Lower deck fill</b>	Lower deck shim plate thickness and width.	0
<b>Upper loose fill</b>	Upper shim plate thickness.	
<b>Lower loose fill</b>	Lower shim plate thickness.	

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

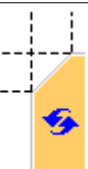
Option	Description	Default
	assembly position number.	
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	





### Flange plate chamfers






	Description
<b>1</b>	Horizontal dimension of the flange plate chamfer.
<b>2</b>	Vertical dimension of the flange plate chamfer.
<b>3</b>	Vertical and horizontal dimension of the flange plate chamfer.


### Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.

Option	Description
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### Chamfer type dimensions

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer

Option	Description
	Concave arc chamfer

### **Stiffeners tab**

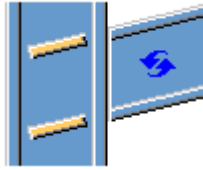
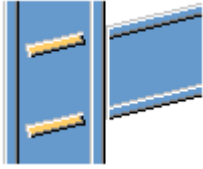
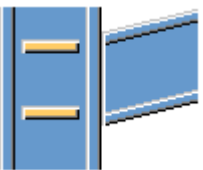
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position, and type.

#### **Stiffener plate dimensions**



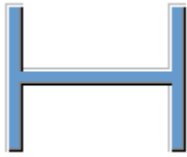
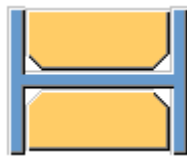
Option	Description
<b>Top NS</b>	Top near side stiffener thickness, width and height.
<b>Top FS</b>	Top far side stiffener thickness, width and height.
<b>Bottom NS</b>	Bottom near side stiffener thickness, width and height.
<b>Bottom FS</b>	Bottom far side stiffener thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	



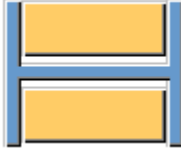

### Stiffener orientation

Option	Description
	<p>Default</p> <p>Stiffeners are parallel to the secondary part.</p> <p>AutoDefaults can change this option.</p>
	<p>Stiffeners are parallel to the secondary part.</p>
	<p>Stiffeners are perpendicular to the main part.</p>

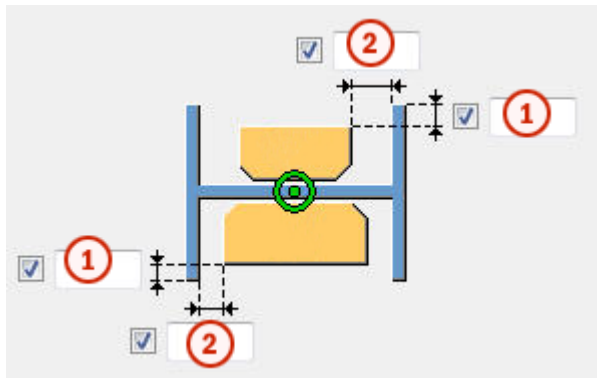
### Stiffener creation

Option	Description
	<p>Default</p> <p>Stiffeners are created.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>Stiffeners are created when necessary.</p>
	<p>No stiffeners are created.</p>
	<p>Stiffeners are created.</p>

## Stiffener shape

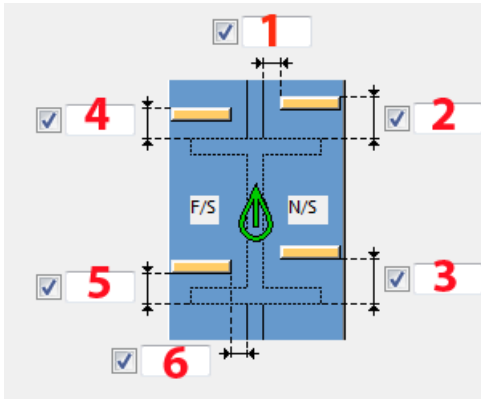
Option	Description
	Default Line chamfered stiffener plates AutoDefaults can change this option.
	Automatic Line chamfered stiffener plates
	Square stiffener plates Stiffener plates with a gap for the main part web rounding
	Line chamfered stiffener plates

## Stiffener gap



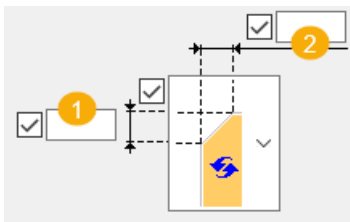
	Description
1	Distance from the edge of the flange to the edge of the stiffener.
2	Size of the gap between the flanges and the stiffener.

## Stiffener positions



	Description
<b>1</b>	Size of the gap between the near side stiffener and the beam web edge.
<b>2</b>	Size of the gap between the top near side stiffener and the beam flange edge.
<b>3</b>	Size of the gap between the bottom near side stiffener and the beam flange edge.
<b>4</b>	Size of the gap between the top far side stiffener and the beam flange edge.
<b>5</b>	Size of the gap between the bottom far side stiffener and the beam flange edge.
<b>6</b>	Size of the gap between the far side stiffener and the beam web edge.



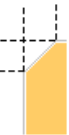


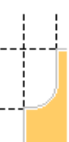
## Chamfer dimensions



	Description	Default
<b>1</b>	Vertical dimension of the chamfer.	10 mm
<b>2</b>	Horizontal dimension of the chamfer.	10 mm



## Chamfer type

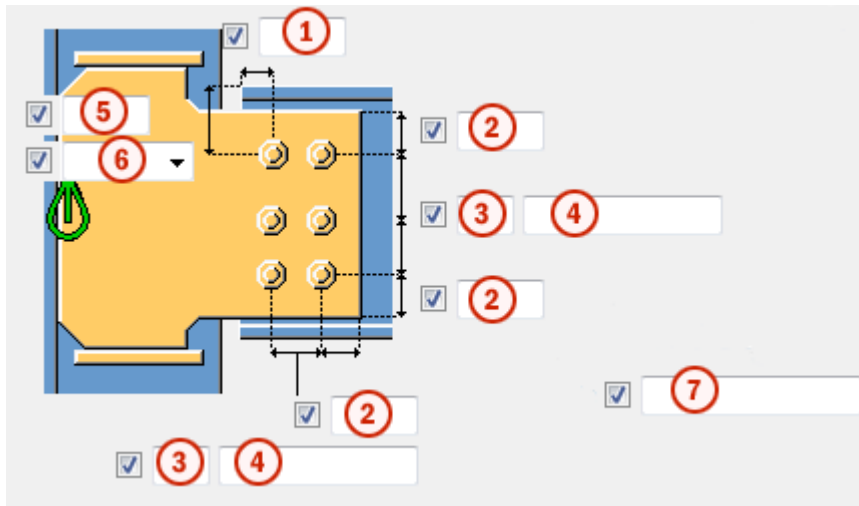
Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer
	Line and arc chamfer

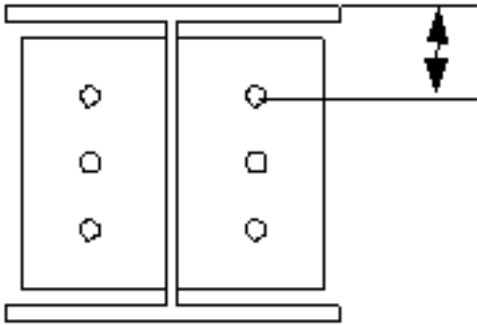
### ***Shear bolts tab***

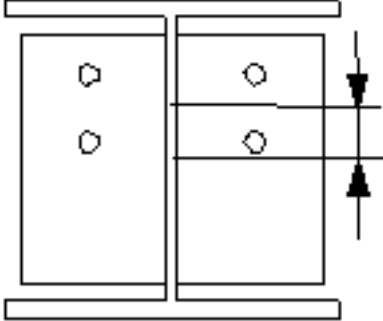
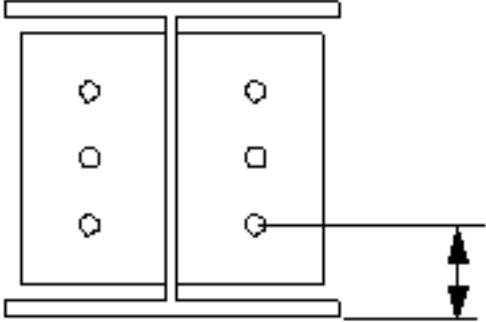
Use the **Shear bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part.

### **Bolt group dimensions**




Bolt group dimensions affect the size and shape of the shear tab.






	Description
1	Dimension for horizontal bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Dimension for vertical bolt group position.
6	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li><b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
<b>7</b>	<p>Define which bolts are deleted from the bolt group.</p> <p>Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.</p>

### Staggering of bolts

<b>Option</b>	<b>Description</b>
	<p>Default</p> <p>Not staggered</p> <p>AutoDefaults can change this option.</p>
	<p>Not staggered</p>
	<p>Staggered type 1</p>

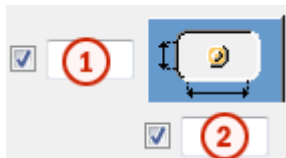
Option	Description
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



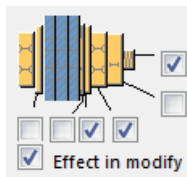
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.

Option	Description	Default
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
Rotate Slots	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
Slots in	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.

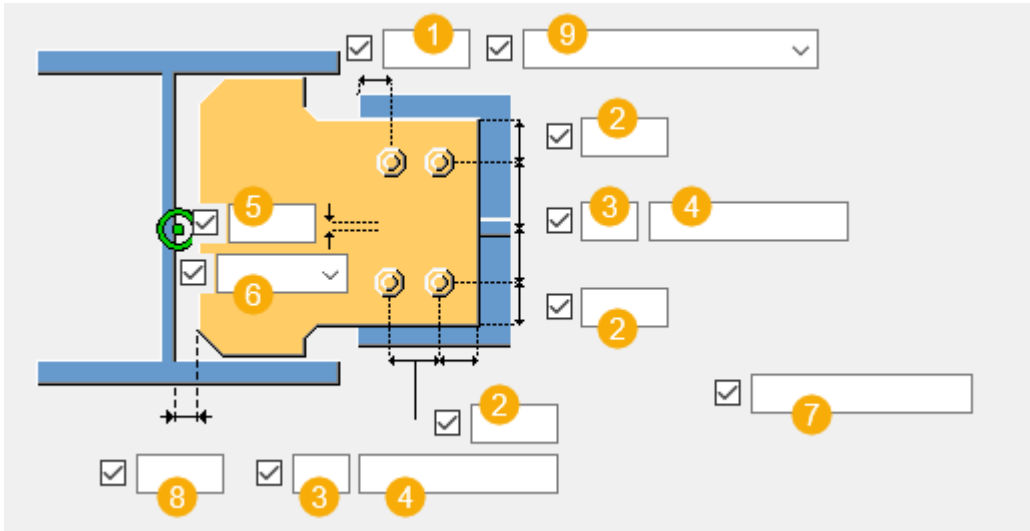


### Flange bolts tab

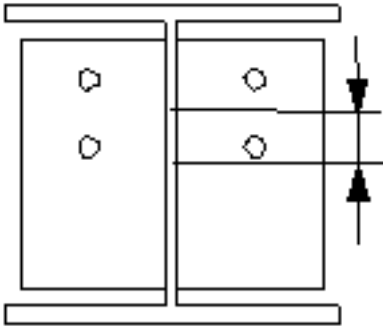
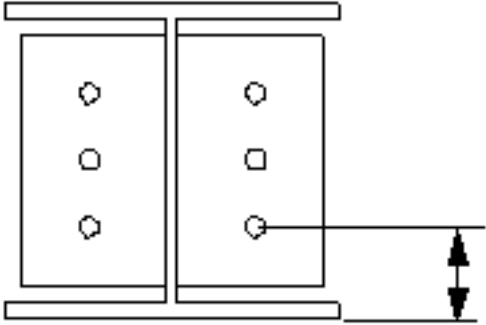
Use the **Flange bolts** tab to control the properties of the bolts that connect the flange plate to the secondary part.

### Bolt group dimensions



Bolt group dimensions affect the size and shape of the flange plate.







<b>Description</b>	
<b>1</b>	Dimension for horizontal bolt group position.
<b>2</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>3</b>	Number of bolts.
<b>4</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>5</b>	Dimension for vertical bolt group position.
<b>6</b>	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> <div style="text-align: center;"> </div>

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
<b>7</b>	<p>Define which bolts are deleted from the bolt group.</p> <p>Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.</p>
<b>8</b>	Flange plate edge distance from the main part web.
<b>9</b>	Select the offset origin part for the bolt group.

### Staggering of bolts

<b>Option</b>	<b>Description</b>
	<p>Default</p> <p>Not staggered</p> <p>AutoDefaults can change this option.</p>
	<p>Not staggered</p>

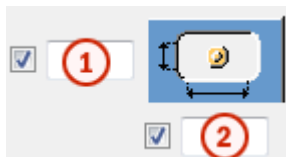
Option	Description
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.



Option	Description	Default
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

#### Slots in deck fill plates and loose fill plates

Option	Description
<b>Slots in deck fill plates, Slots in loose fill plates</b>	Select whether slotted holes are created in deck fill and loose fill plates.

#### ***Doubler plate tab***

Use the **Doubler plate** tab to create doubler plates to strengthen the web of the main part.






#### **Web plate**

Option	Description
<b>Web plate</b>	Web plate thickness and height.

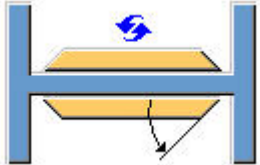
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in



Option	Description	Default
		<b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	

### Doubler plates

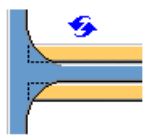
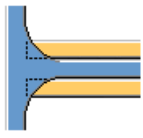

Option	Description
	Default Doubler plates are not created. AutoDefaults can change this option.
	Doubler plates are not created.
	Doubler plate is created on the far side.
	Doubler plate is created on the near side.
	Doubler plates are created on both sides.

### Doubler plate edge shape

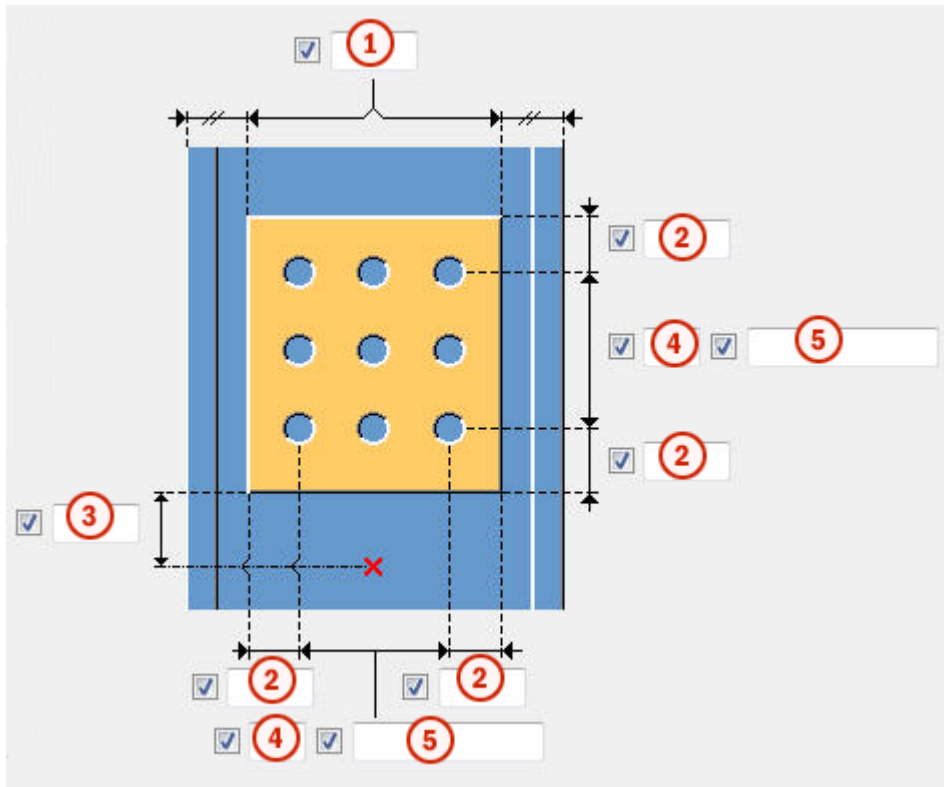
Option	Description
	Default Bevel doubler plates AutoDefaults can change this option.

Option	Description
	Bevel doubler plates Enter the angle in <input checked="" type="checkbox"/> <input type="text"/> (0 - 90)
	Square doubler plates

### Doubler plate cuts

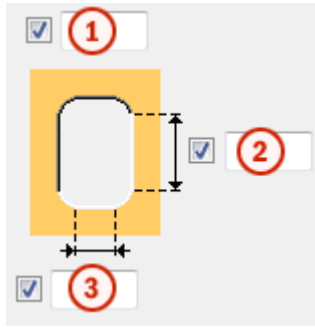
Option	Description
	Default Doubler plates are not cut. AutoDefaults can change this option.
	Doubler plates are not cut.
	Doubler plates are cut in the area that connects the main part web and flange.

## General settings



	Description
1	Edge distance from the column flange.
2	Doubler plate edge distance. Edge distance is the distance from the center of a hole to the edge of the part.
3	Edge distance of the doubler plate in relation to the bottom of the secondary part.
4	Number of holes.
5	Hole spacing. Use a space to separate hole spacing values. Enter a value for each space between holes. For example, if there are 3 holes, enter 2 values.

## Weld hole size



	Description
1	Hole diameter.
2	Slot length.
3	Slot width.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design type tab**

Click the link below to find out more:

[Design type tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

## **Shear plate simple (146)**

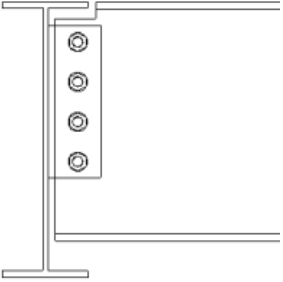
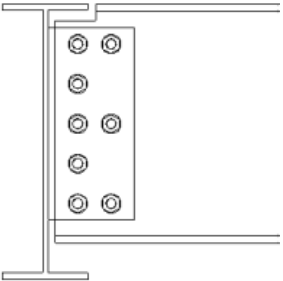
**Shear plate simple (146)** connects a beam to a beam, or a beam to a column with a single square shear tab or double shear tabs. The shear tab is welded to the main part web and flanges, and bolted to the secondary beam web. The

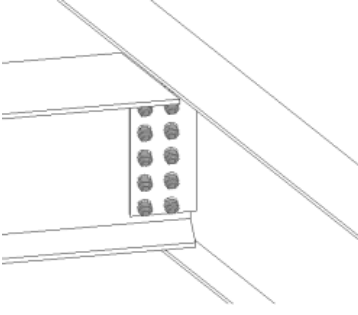
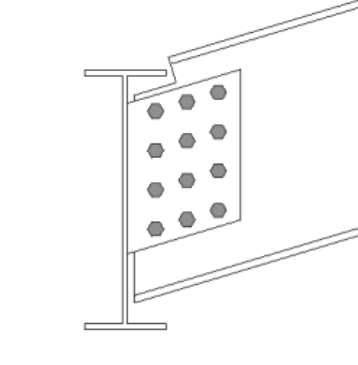
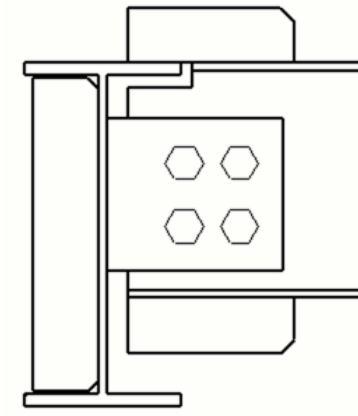
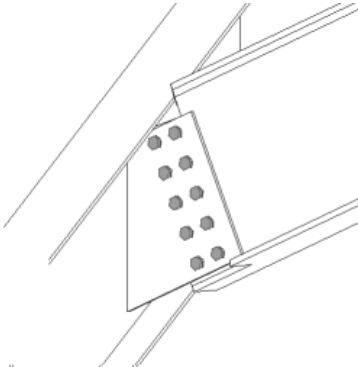
secondary beam can be leveled or sloped and/or skewed. A stiffener plate on the opposite side of the main beam web is optional.

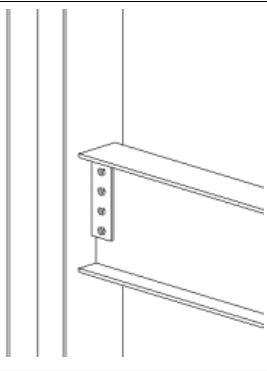
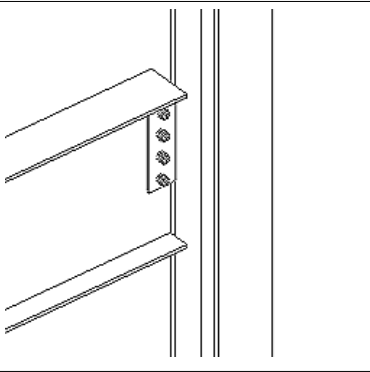
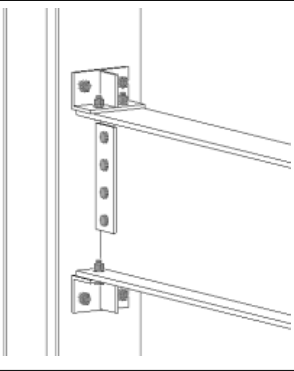
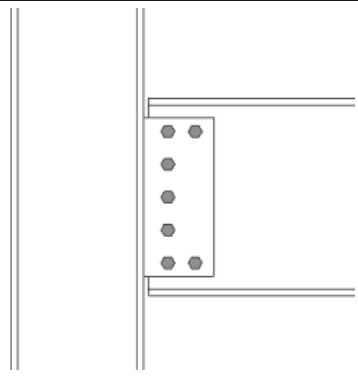
**Objects created**

- Shear tab (1 or 2)
- Stiffener (optional)
- Haunch plates (optional)
- Weld backing bars (optional)
- Seat angles
- Welds
- Bolts
- Cuts

**Use for**

Situation	Description
	Simple shear tab connected to a beam.
	Simple shear tab connected to a beam. Some bolts have been deleted.

Situation	Description
	<p>Simple shear tab connected to a beam. The secondary part is skewed.</p>
	<p>Simple shear tab connected to a beam. The secondary part is sloped and skewed. The bolts and shear tab are parallel with the secondary part.</p>
	<p>Simple shear tab connected to a beam with haunches and a stiffener plate.</p>
	<p>Simple shear tab connected to a beam. The secondary part is sloped and skewed.</p>

Situation	Description
	Simple shear tab connected to a column flange.
	Simple shear tab connected to a column flange/edge.
	Simple shear tab connected to a column flange with seat angle options.
	Simple shear tab connected to a column flange. Some bolts have been deleted.

### Selection order

1. Select the main part (column or beam).



- Select the secondary part (beam).

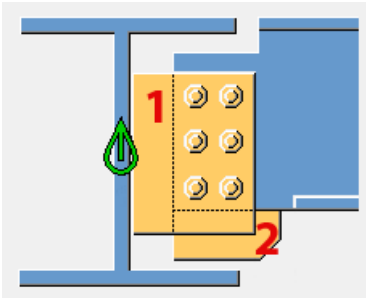
The connection is created automatically when the secondary part is selected.

---

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

---

### Part identification key

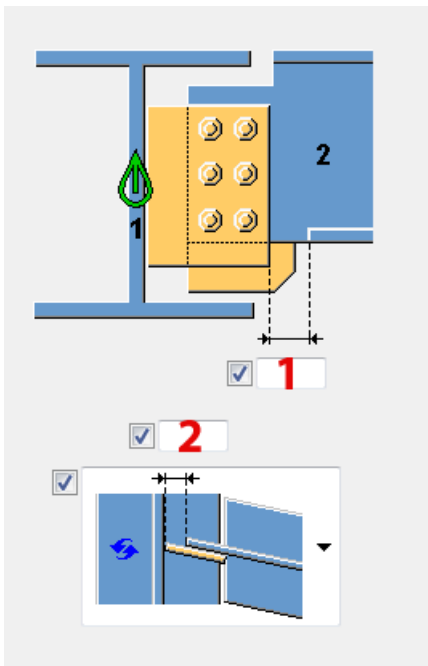


	Part
1	Shear tab
2	Haunch plate

### Picture tab

Use the **Picture** tab to control the beam end, flange, and web cuts.

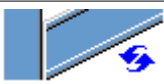
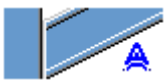



### Dimensions




	Description	Default
1	<p>Size of the strip made to the secondary part flange.</p> <p>The cut of the flange is defined from the shear tab edge.</p>	<p>The flange is automatically stripped when the shear tab crosses the flange.</p> <p>20 mm</p>
2	<p>The beam gap dimension adjusts the gap between the main part web and the secondary beam web.</p> <p>The dimension is measured either square to the main part or in the same direction as the secondary part. This option applies in square and skewed framing conditions.</p> <p>The dimension is only used when the <b>Beam end cut</b> option is set to <b>default</b> or <b>automatic</b>.</p>	<p>20 mm</p> <p>Square to the main part</p>

### Beam end cut




Define how the secondary beam end is cut. The beam is viewed from the side.

Option	Description
	<p>Default</p> <p>Bevel</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.</p>
	<p>Square</p> <p>Cuts the end of the secondary beam square.</p>
	<p>Bevel</p> <p>Cuts the end of the secondary beam parallel to the edge of the main part.</p>
	<p>Square cut closer to the main part web</p> <p>Cuts the end of the secondary beam square and places the beam closer to the main part web.</p>

Option	Description
	<p>Clipped flange</p> <p>Cuts the corner of the flange at the end of the secondary beam.</p>




### Beam web cut

Define how the secondary beam web end is cut. The beam is viewed from the top.




Option	Description
	<p>Default</p> <p>Bevel</p> <p>AutoDefaults can change this option.</p>
	<p>Bevel</p> <p>Cuts the end of the web bevel when the end of the secondary beam is cut bevel.</p>
	<p>Square</p> <p>Cuts the end of the web square even if the end of the secondary beam is cut bevel.</p>

### Beam flange cut

Define how the secondary beam flange end is cut. The beam is viewed from the top.

Option	Description
	<p>Default</p> <p>Bevel</p> <p>AutoDefaults can change this option.</p>
	<p>Bevel</p> <p>Cuts the end of the flange bevel.</p>
	<p>Square</p> <p>Cuts a part of the flange square and leaves a part of it bevel.</p>

## Beam bottom flange cut

Option	Description
	Default Flange cut AutoDefaults can change this option.
	Notch The bottom of the secondary beam is notched if the shear tab crosses the flange. Enter the notch radius and height.
	Flange cut The secondary beam flange is cut on the same side as the shear tab if the shear tab crosses the flange.

## Plates tab

Use the **Plates** tab to control the size, position, number, orientation and shape of the shear tab.

## Parts






Option	Description
<b>Tab plate</b>	Shear tab plate thickness, width and height.
<b>Plate washer</b>	Plate washer thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

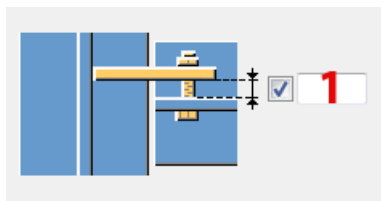
Option	Description	Default
<b>Finish</b>	Describes how the part surface has been treated.	

### Shear tab position

Define the number and the side of shear tabs in single shear tab connections.

Option	Description
	Default Far side shear tab AutoDefaults can change this option.
	Automatic The component automatically selects either the near side or the far side shear tab. The tab is created to the side of the secondary part when the angle between the main part and the secondary part is less than 90 degrees.
	Far side shear tab
	Near side and far side shear tab
	Near side shear tab

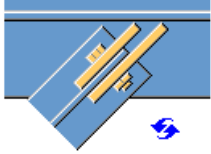


### Gap between shear tab and secondary part



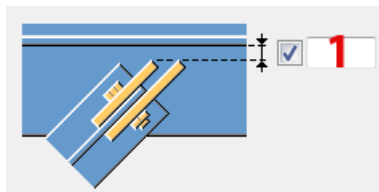
<b>1</b>	Gap between the secondary part web and the shear tab.	0
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### Shear tab position (sloped)

Define the position of shear tabs. The secondary part is sloped.

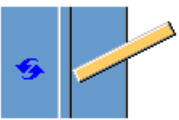
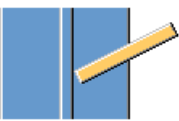

Option	Description
	Default Shear tab edges reach the same level in the main part. AutoDefaults can change this option.
	Shear tab edges reach the same level in the main part.
	Shear tabs have the same length.

### Shear tab edge distance

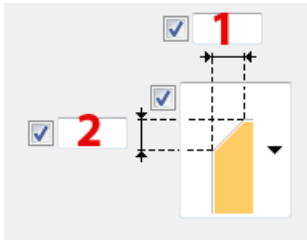


	Description
1	Distance between the main part web and the edge of the shear tabs.

### Shear tab end cut






Option	Description
	Default The shear tab end is not cut. AutoDefaults can change this option.
	Square The shear tab end is not cut.
	Bevel The shear tab end is cut parallel to the main part web.

## Shear tab chamfers








	Description
1	Horizontal dimension of the shear tab chamfer.
2	Vertical dimension of the shear tab chamfer.

## Chamfer type

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

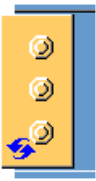

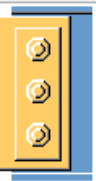
## Shear tab orientation

Option	Description
	Default Sloped AutoDefaults can change this option.



Option	Description
	<p>Automatic</p> <p>The shear tab is sloped in the direction of the secondary beam. Both vertical edges of the shear tab are cut parallel to the end of the secondary beam.</p>
	<p>Sloped</p> <p>The shear tab is sloped in the direction of the secondary beam. Both vertical edges of the shear tab are cut parallel to the end of the secondary beam.</p>
	<p>Square</p>
	<p>Modified sloped</p> <p>Same as the <b>Sloped</b> option, but the vertical edge of the shear tab connected to the secondary beam is cut perpendicular to the secondary beam flange.</p>

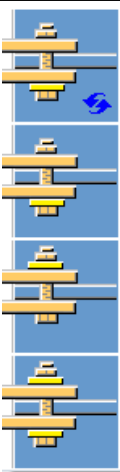
### Plate washer

Define plate washers for bolts and select the plate washer side.

Option	Description
	<p>Default</p> <p>No plate washer</p> <p>AutoDefaults can change this option.</p>
	<p>No plate washer</p>
	<p>One plate washer</p>



Option	Description
	Individual square plate washers for each bolt
	Individual round plate washers for each bolt

Option	Description
	Select whether the plate washer is created for one shear tab or both shear tabs.

### ***Stiffeners tab***

Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type.

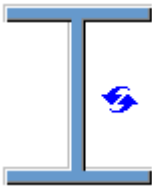

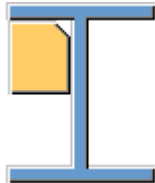

#### **Opposite web stiffener plate dimensions**


Option	Description
<b>Opposite web stiffener</b>	Opposite web stiffener plate thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

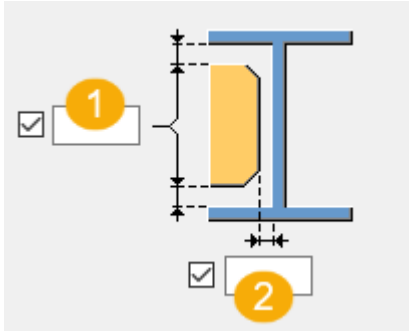
Option	Description	Default
	assembly position number.	
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Stiffener creation

Option	Description
	Default No stiffeners are created. AutoDefaults can change this option.
	Full Creates a full stiffener of the same height as the web of the main part.
	Determined by shear tab Tekla Structures determines the size of the stiffener based on the shear tab size. Tekla Structures attempts to keep the bottom edges of the stiffener plate and shear tab level, if possible.
	Partial Leaves a gap between the stiffener plate and the bottom flange of the main part.

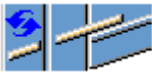


Option	Description
	No stiffeners are created.

### Stiffener gap

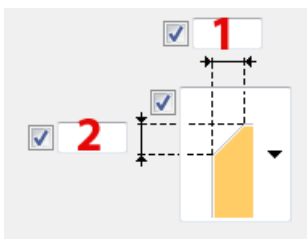


	Description
1	Size of the gap between the main part flanges and the stiffener.
2	Size of the gap between the main part web and the stiffener.

### Stiffener orientation

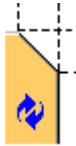




Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are perpendicular to the main part.
	Stiffeners are parallel to the secondary part.

### Stiffener chamfers



	Description
1	Horizontal dimension of the chamfer.
2	Vertical dimension of the chamfer.

### Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### ***Haunch tab***

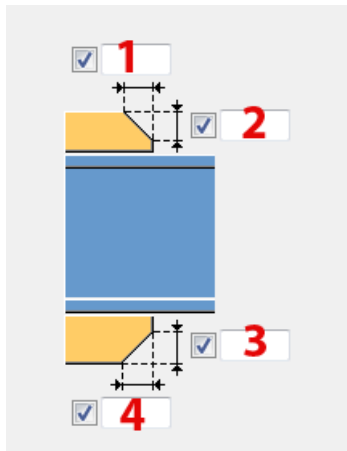
Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges.

### **Haunch plates**

Option	Description
<b>Top plate</b>	Top haunch plate thickness, width and height.
<b>Bottom plate</b>	Bottom haunch plate thickness, width and height.

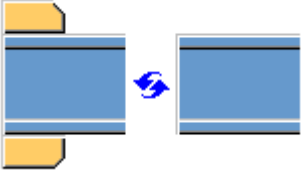
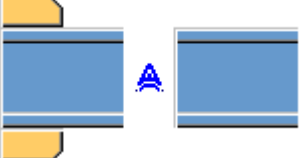


Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Haunch plate chamfers



	Description
<b>1</b>	Width of the top haunch plate chamfer.
<b>2</b>	Height of the top haunch plate chamfer.
<b>3</b>	Height of the bottom haunch plate chamfer.
<b>4</b>	Width of the bottom haunch plate chamfer.

## Haunch plate creation

Option	Description
	<p>Default</p> <p>Top and bottom haunch plates are created, if needed.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>Top or bottom haunch plate or both are created, if needed.</p>
	<p>Top and bottom haunch plates are created.</p> <p>To create a single plate, enter 0 in the thickness (<b>t</b>) field for the plate you do not need (top or bottom plate).</p>
	<p>Haunch plates are not created.</p>

### **Notch tab**


Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.






### **Automatic notching**

Automatic notching options affect both the top and the bottom flange.

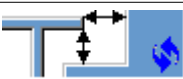
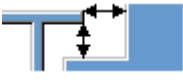
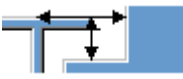

### **Notch shape**

Automatic notching is switched on when you select a notch shape.

Option	Description
	<p>Default</p> <p>Creates notches to the secondary beam.</p> <p>AutoDefaults can change this option.</p>

Option	Description
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.
	Turns off automatic notching.
	Creates notches on both sides of the secondary beam. The cuts are square to the secondary beam.

### Notch size

Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.
	The notch size is measured from the edge of the main beam flange and from the outer edge of the top flange of the main beam.




Enter the horizontal and vertical values for the cuts.



Horizontal measurement:



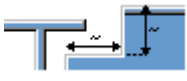
Vertical measurement:

## Flange cut shape

Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

## Notch dimension rounding


Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.



The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.







## Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.



Option	Description
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

### Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.



 




### Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.

### Side of flange notch






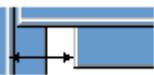
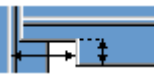
The side of flange notch defines on which side of the beam the notches are created.

Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.


Option	Description
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

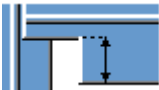

### Flange notch shape

The flange notch shape defines the notch shape in the beam flange.

Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.
	Creates chamfers in the flange. If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.
	Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b> .
	The flange is not cut.
	Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.
	Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b> .

### Flange notch depth

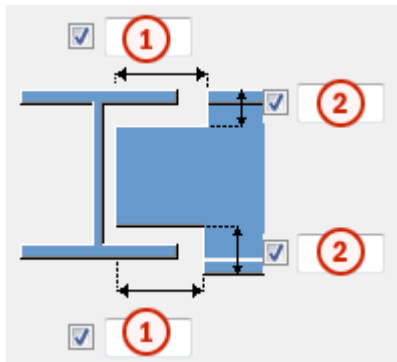
Option	Description
	Default Flange notch depth. AutoDefaults can change this option.

Option	Description
	Flange notch depth.
	Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.

Enter the value for flange notch depth.

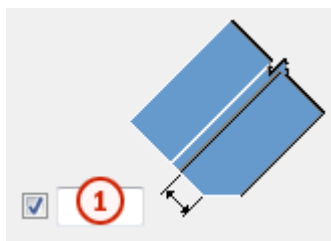
 

### Cut dimensions



	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### Dimension from web to flange cut



	Description
1	Define the distance between the web and the flange cut.

### BCSA notch definition

Define whether the notch is created according to British Constructional Steelwork Association (BCSA) specifications.

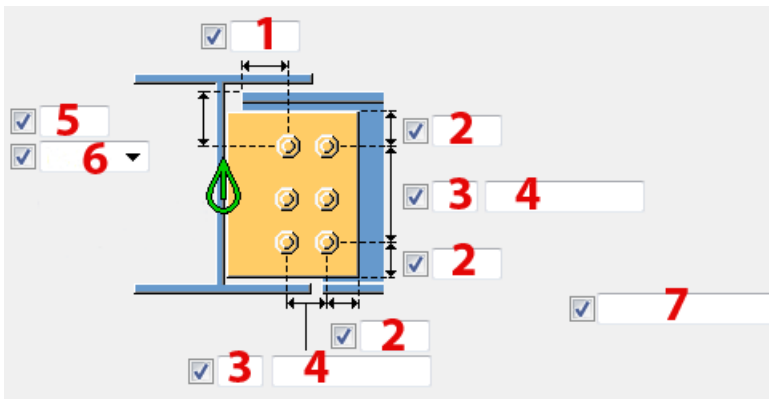
Option	Description
Default	Notch dimensions.
Yes	Creates a 50 mm notch for simple beam-to-beam connections.
No	Use the options on this <b>Notch</b> tab to define the notch dimensions.

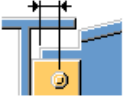
### Bolts tab

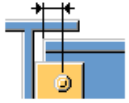

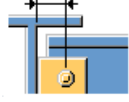

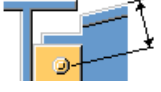
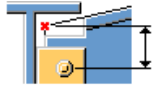
Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part.


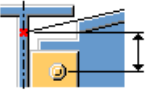

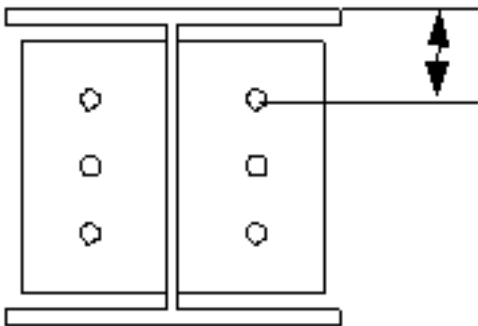
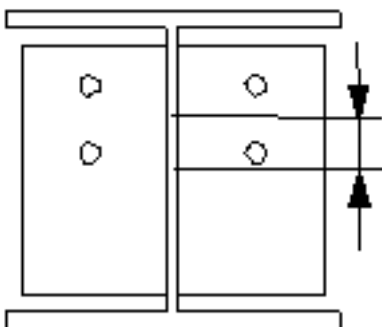
### Bolt group dimensions

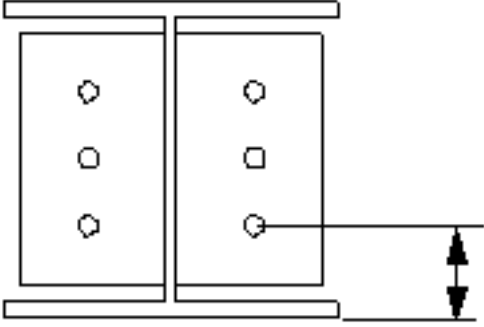
Bolt group dimensions affect the size and shape of the shear tab.









	Description
1	<p>Dimension for horizontal bolt group position.</p> <p>When the secondary beam is sloped or skewed, define whether the horizontal dimension is measured from the bolt group to the edge of the secondary part, or from the bolt group to the main part web.</p> <ul style="list-style-type: none"> <li>Sloped, to the secondary part</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• Skewed, to the secondary part  </li> <li>• Sloped, to the main part  </li> <li>• Skewed, to the main part  </li> </ul> <p>The default is that the horizontal dimension is measured from the bolt group to the edge of the secondary part.</p> <p>Ensure that the <b>Beam end cut</b> on the <b>Picture</b> tab is set to square  </p>
<b>2</b>	<p>Bolt edge distance.</p> <p>Edge distance is the distance from the center of a bolt to the edge of the part.</p>
<b>3</b>	<p>Number of bolts.</p>
<b>4</b>	<p>Bolt spacing.</p> <p>Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.</p>
<b>5</b>	<p>Dimension for vertical bolt group position.</p> <p>When the secondary beam is sloped, define whether the vertical dimension is measured from the bolt group to the edge of the secondary part, or from the bolt group to the edge of the main part.</p> <ul style="list-style-type: none"> <li>• Vertical sloped dimension, to the secondary part  </li> <li>• Vertical dimension, to the secondary part  </li> </ul>






	<b>Description</b>
	<ul style="list-style-type: none"> <li>Vertical dimension, to the main part  </li> <li>Vertical dimension, to the center line of the main part  </li> </ul> <p>The default is that the vertical dimension is measured from the bolt group the edge of the secondary part (sloped dimension).  Ensure that the <b>Beam end cut</b> on the <b>Picture</b> tab is set to square  </p>
<b>6</b>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li><b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.  </li> <li><b>Middle:</b> From the center line of the bolts to the center line of the secondary part.  </li> </ul>

	Description
	<ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
7	<p>Define which bolts are deleted from the bolt group.</p> <p>Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.</p>




### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

## Bolt group orientation

Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

## Bolting direction

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	



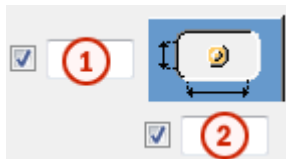
Option	Description	Default
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Cut length

Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

### Slotted holes

You can define slotted, oversized, or tapped holes.

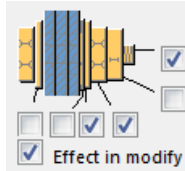


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

## Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## Beam cut tab

Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts.

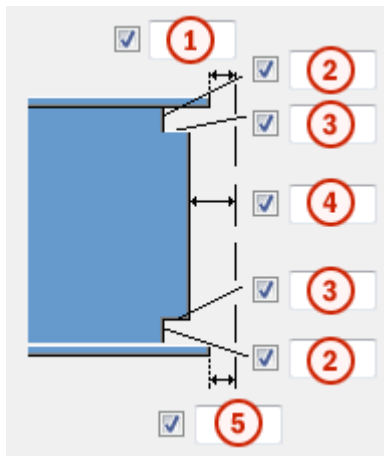
## Weld backing bar

Option	Description
<b>Weld backing bar</b>	Weld backing bar thickness and width.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in


Option	Description	Default
		<b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	







### Weld access hole dimensions




	Description
<b>1</b>	Gap between the secondary part top flange and the main part.
<b>2</b>	Vertical dimensions for the top and the bottom weld access holes.
<b>3</b>	Horizontal dimensions for the top and the bottom weld access holes.
<b>4</b>	Gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.
<b>5</b>	Gap between the secondary part bottom flange and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.






### Weld access hole types

Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	







Option	Description	Default
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	
	Round weld access hole with a radius that you can define in r <input checked="" type="checkbox"/> <input type="text"/>	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and Top Prep x <input checked="" type="checkbox"/> <input type="text"/> Bottom Prep x <input checked="" type="checkbox"/> <input type="text"/>	
	Cone-shaped weld access hole with radiuses that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and r <input checked="" type="checkbox"/> <input type="text"/> Capital <b>R</b> defines the large radius (height). Small <b>r</b> defines the small radius.	R = 35 r = 10

### Beam end preparation




Option	Description
	Default Top and bottom flange are prepared. AutoDefaults can change this option.


Option	Description
	Automatic Top and bottom flange are prepared.
	Beam end is not prepared.
	Top and bottom flange are prepared.
	Top flange is prepared.
	Bottom flange is prepared.

### Flange cut

Option for top flange	Option for bottom flange	Description
		Default Flange is not cut. AutoDefaults can change this option.
		Flange is not cut.
		Flange is cut.




### Weld backing bar creation

Option for bottom backing bar	Description
	Default Backing bars are created inside the flanges. AutoDefaults can change this option.
	No backing bars are created.
	Backing bars are created inside the flanges.

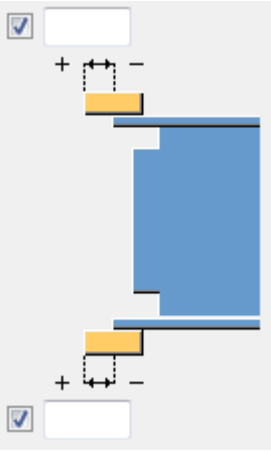
Option for bottom backing bar	Description
	Backing bars are created outside the flanges.

### Weld backing bar length

Enter the length of the weld backing bar in the box below the options.

Option	Description
	Default Absolute length of the backing bar AutoDefaults can change this option.
	Absolute length of the backing bar
	Extension beyond the edge of the flange

### Weld backing bar position

Option	Description
	Enter a positive or a negative value to move the front end of the backing bar relative to the end of the flange.

### Assembly type

Define the location where the weld backing bar welds are made. When you select the **Workshop** option, Tekla Structures includes the backing bars in the assembly.

### Angle box tab

Use the **Angle box** tab to add a seat angle.

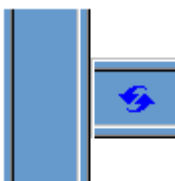
## Seat angle

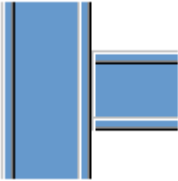



The purpose of seat angles is to carry loads from the secondary part. Seat angles can be positioned to top, bottom or both flanges of the secondary part. The seat angle can be stiffened, and bolted or welded to the main and secondary parts.

Option	Description
<b>Stiffeners</b>	Stiffener thickness, width and height.
<b>Profile</b>	Seat angle profile by selecting it from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	





## Seat angle position

Option	Description
	Default No seat angle is created. AutoDefaults can change this option.


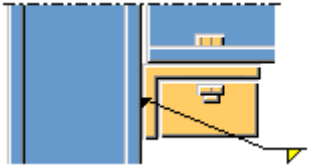
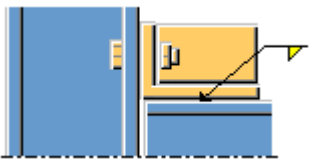

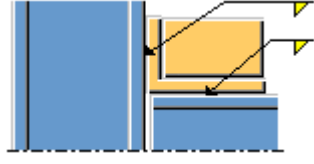
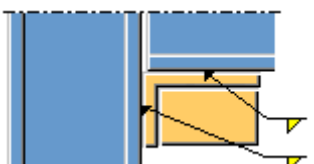
Option	Description
	No seat angle is created.
	Seat angle is created at the top of the flange.
	Seat angle is created at the bottom of the flange.
	Seat angles are created on both sides of the flange.

### Seat angle attachment





Seat angle is positioned at the top or at the bottom of the secondary part.

Option for top seat angle	Option for bottom seat angle	Description
		Default Bolted Seat angle is bolted to the main part and to the secondary part. AutoDefaults can change this option.
		Bolted Seat angle is bolted to the main part and to the secondary part.



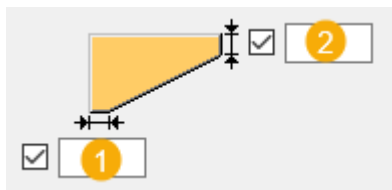
Option for top seat angle	Option for bottom seat angle	Description
		Welded-bolted Seat angle is welded to the main part and bolted to the secondary part.
		Bolted-welded Seat angle is bolted to the main part and welded to the secondary part.
		Welded Seat angle is welded to the main part and to the secondary part.

### Seat angle stiffener type

Option	Description
	Default Rectangular stiffener plate AutoDefaults can change this option.
	Rectangular stiffener plate
	Triangular stiffener plate
	The line connecting the ends of the seat angle legs defines the stiffener plate shape.




### Stiffener offset dimension

Define the offset of bevel cuts for triangular stiffeners.







	Description
1	Horizontal offset dimension
2	Vertical offset dimension






### Seat angle rotation

Option	Description
	Default Seat angle is not rotated. AutoDefaults can change this option.
	Seat angle is not rotated.
	Seat angle is rotated horizontally 90 degrees. To stiffen the rotated seat angle, select the <b>Middle stiffeners</b> option in the <b>Middle stiffener position</b> list.

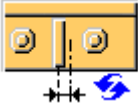


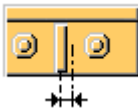
### Seat angle orientation

Option	Description
	Default The longer leg of the seat angle is connected to the secondary part. AutoDefaults can change this option.
	The longer leg of the seat angle is connected to the secondary part.
	The longer leg of the seat angle is connected to the main part.
	Automatic The longer leg of the seat angle is connected to the part where bolts reach furthest from the seat angle corner.

### Seat angle side stiffener position

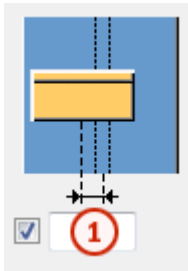
Option	Description
	Default No side stiffeners are created. AutoDefaults can change this option.
	No side stiffeners are created.
	Near side stiffeners are created.
	Far side stiffeners are created.
	Near side and far side stiffeners are created.

### Seat angle middle stiffener position

Option	Description
	Default According to bolts AutoDefaults can change this option.
	No middle stiffener plate is created.
	Middle stiffeners The stiffener plate is positioned in the middle of the seat angle. Enter the number of middle stiffeners in the <b>Number of middle stiffeners</b> box. Multiple stiffeners are centered and equally spaced.
	According to bolts The stiffener plate is positioned between the bolts in the middle of the bolt spacing.

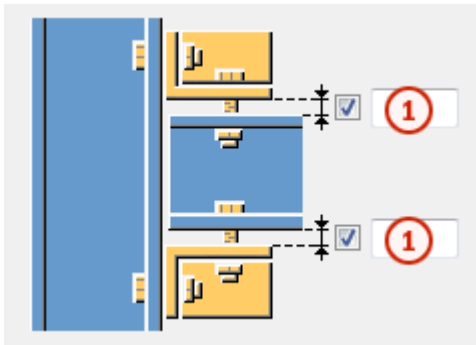
Option	Description
	By default, stiffener is created between every two bolts.  Enter the number of middle stiffeners in the box below the <b>According to bolts</b> option.

### Seat angle offset



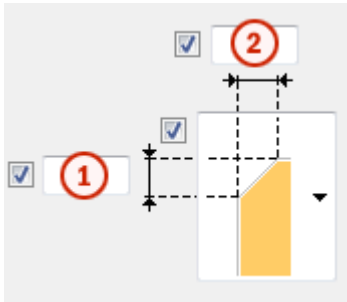
	Description
1	Seat angle horizontal offset from the center line of the main part.

### Seat angle gap





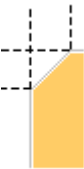


	Description
1	Top gap and bottom gap between the seat angle and the secondary part.

## Seat angle chamfers



	Description
1	Vertical dimension of the chamfer.
2	Horizontal dimension of the chamfer.

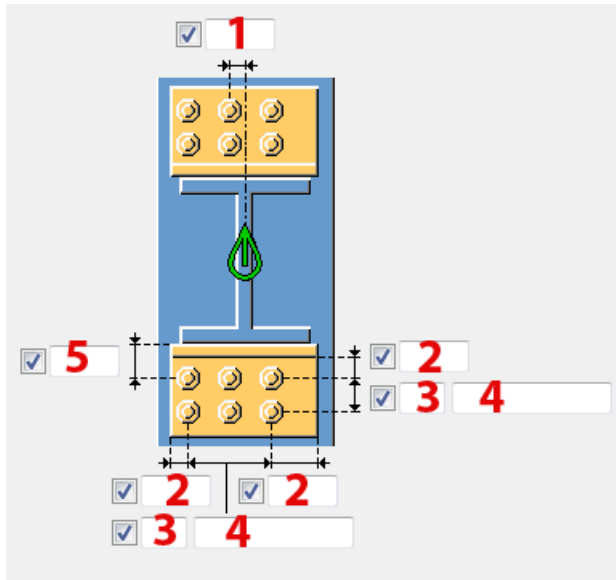
## Chamfer type

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### BoxPBolts tab

Use the **BoxPBolts** tab to control properties of the bolts that connect the seat angle to the main part.

### Seat angle bolt group dimensions



	Description
1	Dimension for horizontal bolt group position. The dimension is defined from the middle line of the secondary beam.
2	Edge distance is the distance from the center of a bolt to the edge of the part. Bolt edge distance.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Dimension for vertical bolt group position. The dimension is defined from the bottom of the secondary beam.

### Bolt basic properties

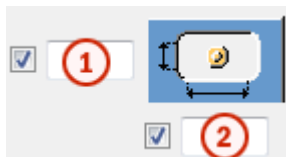
Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.

Option	Description	Default
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

- **Top** refers to the bolt group that connects the top seat angle to the main part.
- **Bottom** refers to the bolt group that connects the bottom seat angle to the main part.

### Slotted holes

You can define slotted, oversized, or tapped holes.



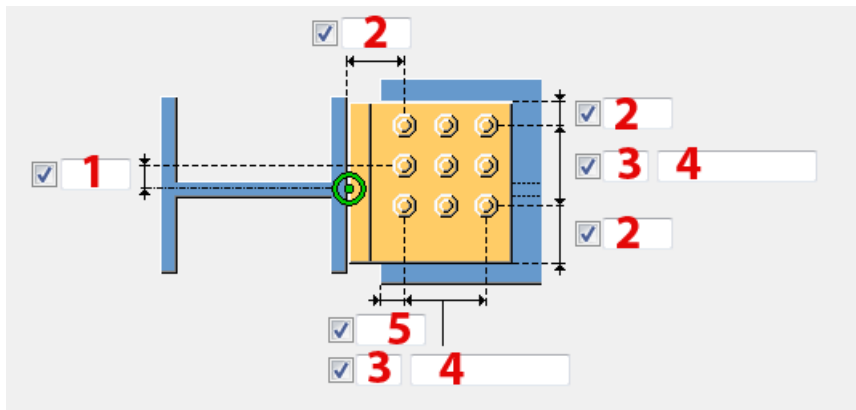
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### BoxSBolts tab

Use the **BoxSBolts** tab to control the properties of the bolts that connect the seat angle to the secondary part.

### Seat angle bolt group dimensions



	Description
<b>1</b>	Dimension for vertical bolt group position. The dimension is defined from the middle line of the secondary beam.
<b>2</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>3</b>	Number of bolts.
<b>4</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>5</b>	Dimension for horizontal bolt group position. The dimension is defined from the bottom of the secondary beam.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.

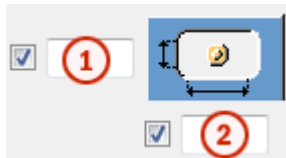


Option	Description	Default
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

- **Top** refers to the bolt group that connects the top seat angle to the secondary part.
- **Bottom** refers to the bolt group that connects the bottom seat angle to the secondary part.

### Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### ***General tab***

Click the link below to find out more:

General tab

### ***Design type tab***

Click the link below to find out more:

Design type tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

## **Welded to top flange (147)**

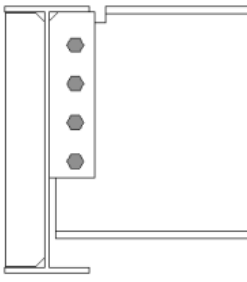
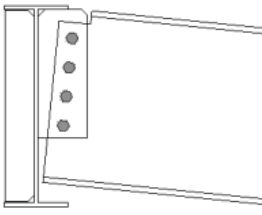
**Welded to top flange (147)** connects two beams with a single shear tab or double shear tabs. The shear tabs are welded to the main beam web and the top flange, and bolted to secondary beam web. The secondary beam can be leveled or sloped.

### **Objects created**

- Shear tab (1 or 2)
- Stiffeners (optional)
- Haunch plates (optional)
- Weld backing bars (optional)
- Seat angles (optional)
- Bolts
- Welds

- Cuts

### Use for

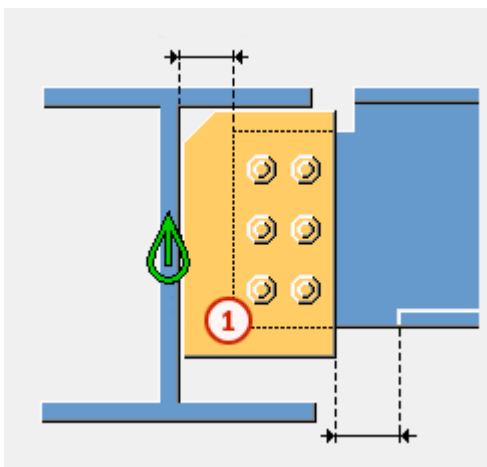
Situation	Description
	<p>Partial depth shear tab connected to the top flange of a beam. Stiffener is created.</p>
	<p>Partial depth shear tab connected to the top flange of a beam. The secondary part is sloped. Stiffener is created.</p>

### Selection order

1. Select the main part (beam).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key

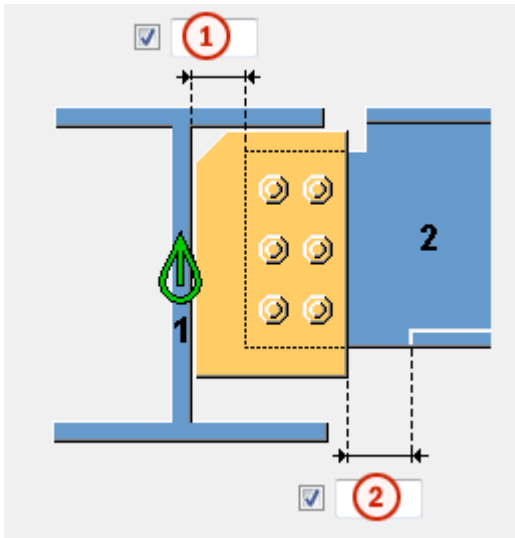


	Part
1	Shear tab

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

### Picture tab

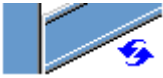





Use the **Picture** tab to control the position of the shear tab, and the beam flange and the web cuts.



	Description	Default
1	Cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	20
2	Size of the strip made to the secondary part flange. The cut of the flange is defined from the shear tab edge.	The flange is automatically stripped when the shear tab crosses the flange. 20




### Beam end cut

Define how the secondary beam end is cut. The beam is viewed from the side.

Option	Description
	<p>Default Bevel AutoDefaults can change this option.</p>
	<p>Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.</p>
	<p>Square Cuts the end of the secondary beam square.</p>
	<p>Bevel Cuts the end of the secondary beam parallel to the edge of the main part.</p>
	<p>Square cut closer to the main part web Cuts the end of the secondary beam square and places the beam closer to the main part web.</p>
	<p>Clipped flange Cuts the corner of the flange at the end of the secondary beam.</p>




### Beam web cut

Define how the secondary beam web end is cut. The beam is viewed from the top.




Option	Description
	<p>Default Bevel AutoDefaults can change this option.</p>
	<p>Bevel Cuts the end of the web bevel when the end of the secondary beam is cut bevel.</p>
	<p>Square Cuts the end of the web square even if the end of the secondary beam is cut bevel.</p>

### Beam flange cut

Define how the secondary beam flange end is cut. The beam is viewed from the top.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Bevel Cuts the end of the flange bevel.
	Square Cuts a part of the flange square and leaves a part of it bevel.

### Beam bottom flange cut

Option	Description
	Default Flange cut AutoDefaults can change this option.
	Notch The bottom of the secondary beam is notched if the shear tab crosses the flange. Enter the notch radius and height.
	Flange cut The secondary beam flange is cut on the same side as the shear tab if the shear tab crosses the flange.

### Plates tab

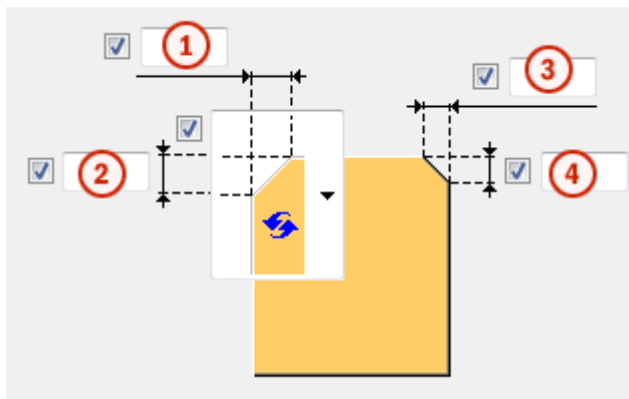
Use the **Plates** tab to control the size, position, number, orientation and shape of the shear tab.

### Shear tab plate

Option	Description
<b>Tab plate</b>	Shear tab plate thickness, width and height.

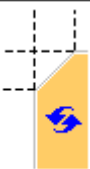
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	


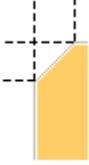


### Shear tab chamfers



	Description
<b>1</b>	Horizontal dimension of the shear tab chamfer.
<b>2</b>	Vertical dimension of the shear tab chamfer.
<b>3</b>	Horizontal dimension of the shear tab exterior chamfer.
<b>4</b>	Vertical dimension of the shear tab exterior chamfer.




### Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.



Option	Description
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### Shear tab position

Define the number and the side of shear tabs in single shear tab connections.

Option	Description
	Default Far side shear tab AutoDefaults can change this option.
	Automatic The component automatically selects either the near side or the far side shear tab. The tab is created to the side of the secondary part when the angle between the main part and the secondary part is less than 90 degrees.
	Far side shear tab



Option	Description
	Near side and far side shear tab
	Near side shear tab

### **Stiffeners tab**

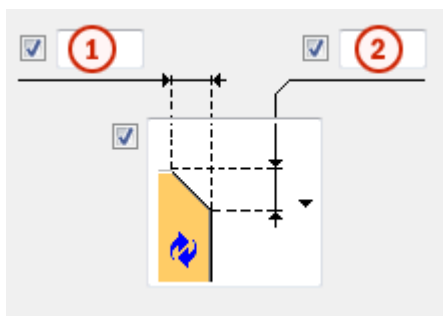
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type.

#### **Opposite web stiffener plate dimensions**

Option	Description
<b>Opposite web stiffener</b>	Opposite web stiffener plate thickness, width and height.

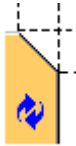




Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

#### **Chamfer dimensions**








	Description
1	Horizontal dimension of the chamfer.
2	Vertical dimension of the chamfer.

### Chamfer type

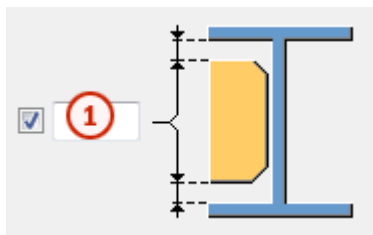
Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### Stiffener creation

Option	Description
	Default No stiffeners are created. AutoDefaults can change this option.
	Full Creates a full stiffener of the same height as the web of the main part.

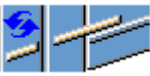


Option	Description
	<p>Determined by shear tab</p> <p>Tekla Structures determines the size of the stiffener based on the shear tab size. Tekla Structures attempts to keep the bottom edges of the stiffener plate and shear tab level, if possible.</p>
	<p>Partial</p> <p>Leaves a gap between the stiffener plate and the bottom flange of the main part.</p>
	<p>No stiffeners are created.</p>

### Stiffener gap



	Description
1	Size of the gap between the main part flanges and the stiffener.

### Stiffener orientation

Option	Description
	<p>Default</p> <p>Stiffeners are parallel to the secondary part.</p> <p>AutoDefaults can change this option.</p>
	<p>Stiffeners are perpendicular to the main part.</p>
	<p>Stiffeners are parallel to the secondary part.</p>

### Haunch tab

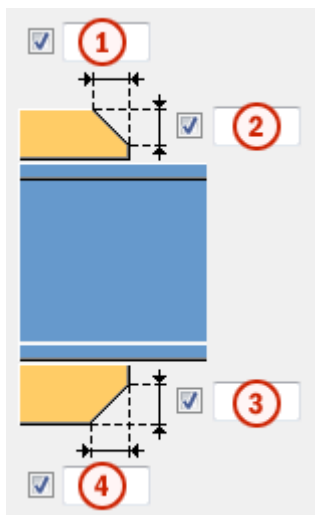
Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges.

### Haunch plates

Option	Description
Top plate	Top haunch plate thickness, width and height.
Bottom plate	Bottom haunch plate thickness, width and height.

Option	Description	Default
Pos_No	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
Material	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
Name	Name that is shown in drawings and reports.	

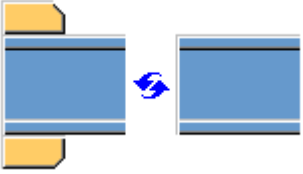
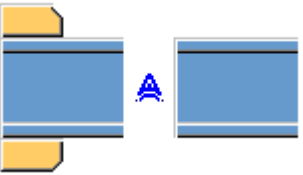


### Haunch plate chamfers



	Description
1	Width of the top haunch plate chamfer.
2	Height of the top haunch plate chamfer.
3	Height of the bottom haunch plate chamfer.

	Description
4	Width of the bottom haunch plate chamfer.

### Haunch plate creation

Option	Description
	<p>Default</p> <p>Top and bottom haunch plates are created, if needed.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>Top or bottom haunch plate or both are created, if needed.</p>
	<p>Top and bottom haunch plates are created.</p> <p>To create a single plate, enter 0 in the thickness (<b>t</b>) field for the plate you do not need (top or bottom plate).</p>
	<p>Haunch plates are not created.</p>

### Notch tab






Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

### Automatic notching

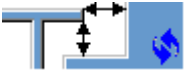
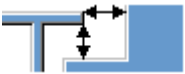
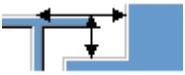
Automatic notching options affect both the top and the bottom flange.

### Notch shape

Automatic notching is switched on when you select a notch shape.

Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.
	Turns off automatic notching.


### Notch size



Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.





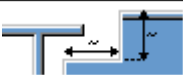
### Flange cut shape

Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.

Option	Description
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

### Notch dimension rounding

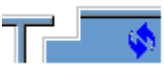


Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.





The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



### Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

## Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.






 

## Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.

## Side of flange notch



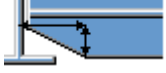



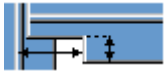
The side of flange notch defines on which side of the beam the notches are created.

Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.


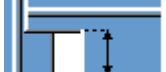



## Flange notch shape

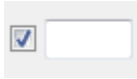
The flange notch shape defines the notch shape in the beam flange.

Option	Description
	<p>Default</p> <p>The entire flange of the secondary beam is cut as far back as you define.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.</p>
	<p>Creates chamfers in the flange.</p> <p>If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.</p>
	<p>Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b>.</p>
	<p>The flange is not cut.</p>
	<p>Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.</p>
	<p>Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b>.</p>

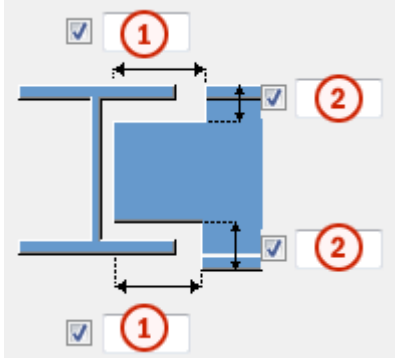
## Flange notch depth

Option	Description
	<p>Default</p> <p>Flange notch depth.</p> <p>AutoDefaults can change this option.</p>
	<p>Flange notch depth.</p>
	<p>Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.</p>

Enter the value for flange notch depth.

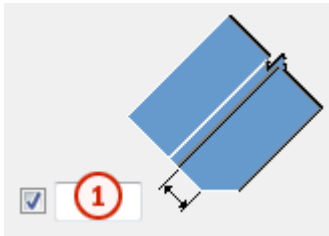


### Cut dimensions



	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### Dimension from web to flange cut

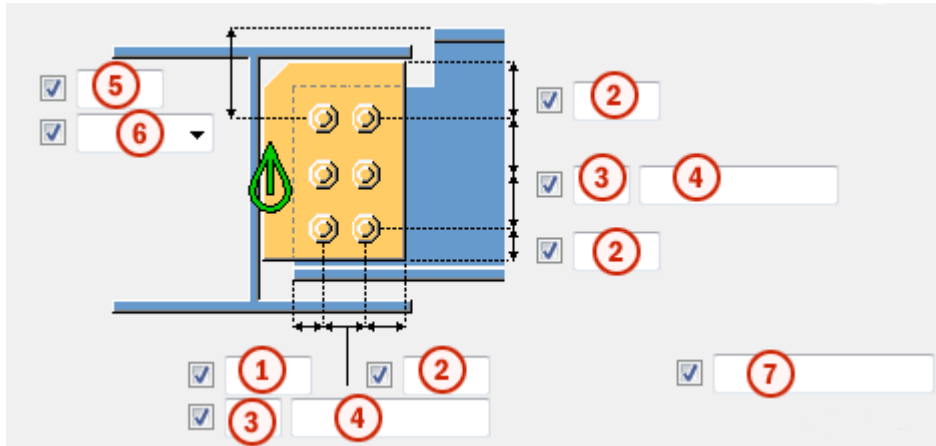


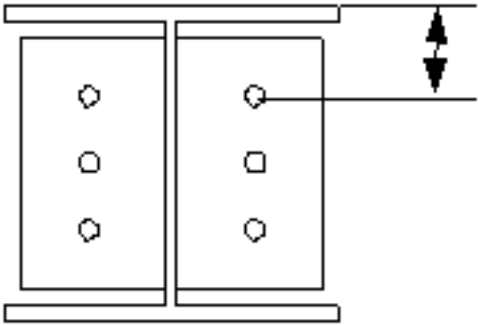
	Description
1	Define the distance between the web and the flange cut.

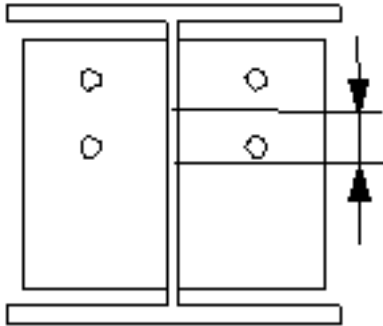
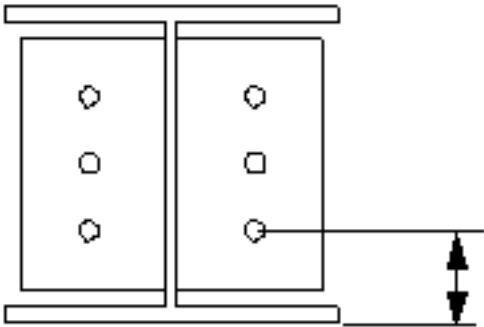
### **Bolts tab**

Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the main part.

## Bolt group dimensions



	Description
1	Dimension for horizontal bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
4	Dimension for vertical bolt group position.
5	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li><b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	Description
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
<b>6</b>	<p>Define which bolts are deleted from the bolt group.</p> <p>Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.</p>

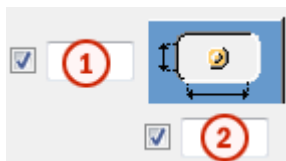
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within	Yes

Option	Description	Default
	the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

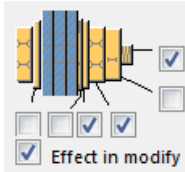


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

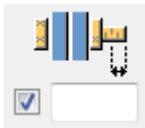
If you want to create a hole only, clear all the check boxes.









To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase



Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.


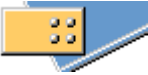



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt group orientation

Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square

Option	Description
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

### **Beam cut tab**

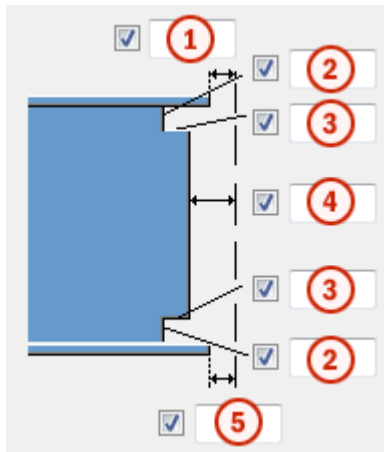
Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts.

### **Weld backing bar**

Option	Description
<b>Weld backing bar</b>	Weld backing bar thickness and width.





Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

## Weld access hole dimensions






	Description
1	Gap between the secondary part top flange and the main part.
2	Vertical dimensions for the top and the bottom weld access holes.
3	Horizontal dimensions for the top and the bottom weld access holes.
4	Gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.
5	Gap between the secondary part bottom flange and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.





## Weld access holes



Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	









Option	Description	Default
	Round weld access hole with a radius that you can define in r <input checked="" type="checkbox"/> <input type="text"/>	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and Top Prep x <input checked="" type="checkbox"/> <input type="text"/> Bottom Prep x <input checked="" type="checkbox"/> <input type="text"/>	
	Cone-shaped weld access hole with radiuses that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and r <input checked="" type="checkbox"/> <input type="text"/> Capital <b>R</b> defines the large radius (height). Small <b>r</b> defines the small radius.	R = 35 r = 10

### Beam end preparation





Option	Description
	Default Top and bottom flange are prepared. AutoDefaults can change this option.
	Automatic Top and bottom flange are prepared.
	Beam end is not prepared.
	Top and bottom flange are prepared.

Option	Description
	Top flange is prepared.
	Bottom flange is prepared.

### Flange cut




Option for top flange	Option for bottom flange	Description
		Default Flange is not cut. AutoDefaults can change this option.
		Flange is not cut.
		Flange is cut.

### Weld backing bars

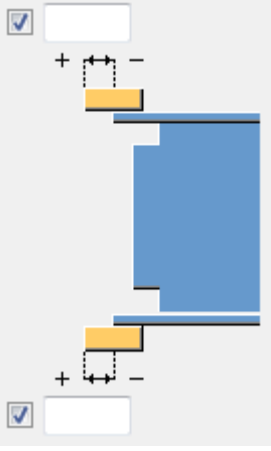
Option for bottom backing bar	Description
	Default Backing bars are created inside the flanges. AutoDefaults can change this option.
	No backing bars are created.
	Backing bars are created inside the flanges.
	Backing bars are created outside the flanges.

### Weld backing bar length

Enter the length of the weld backing bar in the box below the options.

Option	Description
	Default Absolute length of the backing bar AutoDefaults can change this option.
	Absolute length of the backing bar
	Extension beyond the edge of the flange

### Weld backing bar position

Option	Description
	Enter a positive or a negative value to move the front end of the backing bar relative to the end of the flange.

### Assembly type

Define the location where the weld backing bar welds are made. When you select the **Workshop** option, Tekla Structures includes the backing bars in the assembly.

### General tab

Click the link below to find out more:

[General tab](#)

### Design tab

Click the link below to find out more:

## ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

## ***Welds***

Click the link below to find out more:

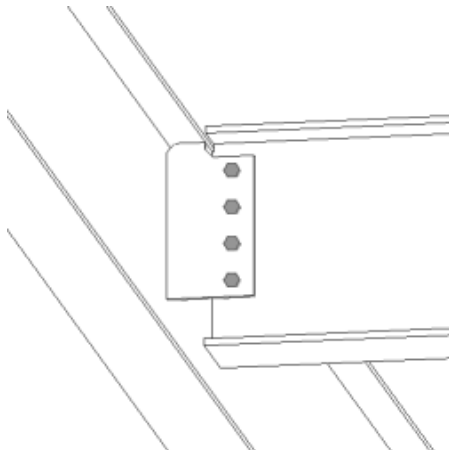
## **Welded to top flange S (149)**

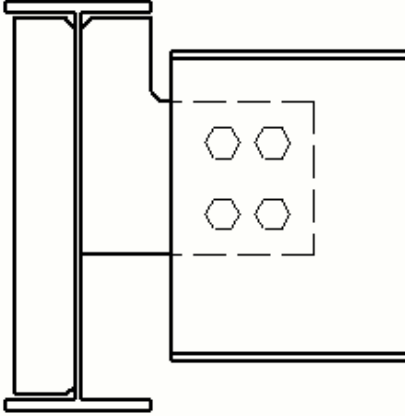
**Welded to top flange S (149)** connects two beams with a single shear tab or double shear tab. The shear tabs are welded to the main beam web and the top flange, and bolted to secondary beam web. The secondary beam can be leveled or sloped.

### **Objects created**

- Shear tab (1 or 2)
- Stiffener (optional)
- Haunch plates (optional)
- Weld backing bars (optional)
- Bolts
- Welds
- Cuts

### **Use for**

<b>Situation</b>	<b>Description</b>
	Partial depth shear tab connected to the top flange of a beam.

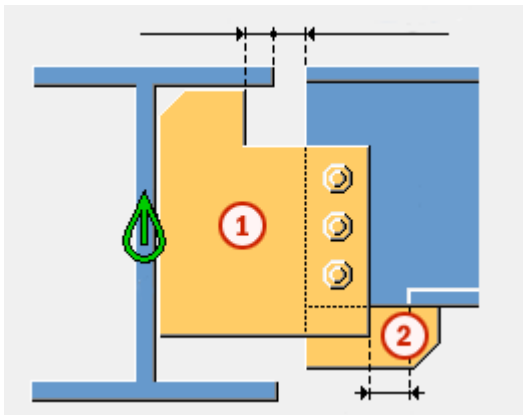
Situation	Description
	<p>Partial depth shear tab connected to the top flange of a beam. Stiffener is created.</p>

### Selection order

1. Select the main part (beam).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key



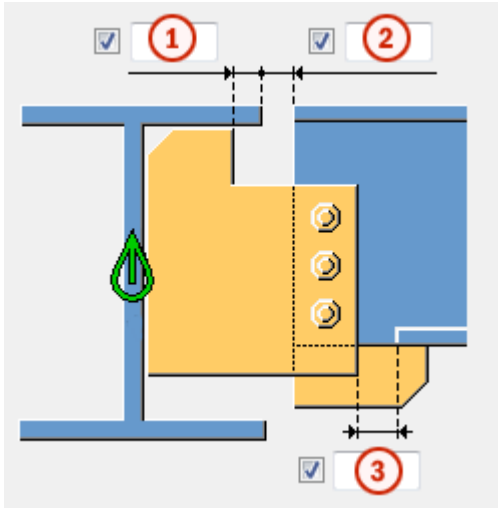
	Part
1	Shear tab
2	Haunch plate

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

### Picture tab

Use the **Picture** tab to control the position of the shear tab, and the beam flange and the web cuts.

### Dimensions








	Description	Default
<b>1</b>	Shear tab edge distance from the main part flange edge.	0
<b>2</b>	Cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	20
<b>3</b>	Size of the strip made to the secondary part flange. The cut of the flange is defined from the shear tab edge.	The flange is automatically stripped when the shear tab crosses the flange. 20

### Beam end cut




Define how the secondary beam end is cut. The beam is viewed from the side.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut

Option	Description
	square. Otherwise, the beam end is cut bevel.
	Square Cuts the end of the secondary beam square.
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.
	Square cut closer to the main part web Cuts the end of the secondary beam square and places the beam closer to the main part web.
	Clipped flange Cuts the corner of the flange at the end of the secondary beam.




### Beam web cut

Define how the secondary beam web end is cut. The beam is viewed from the top.


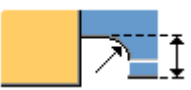

Option	Description
	Default Bevel AutoDefaults can change this option.
	Bevel Cuts the end of the web bevel when the end of the secondary beam is cut bevel.
	Square Cuts the end of the web square even if the end of the secondary beam is cut bevel.

### Beam flange cut

Define how the secondary beam flange end is cut. The beam is viewed from the top.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Bevel Cuts the end of the flange bevel.
	Square Cuts a part of the flange square and leaves a part of it bevel.

### Beam bottom flange cut

Option	Description
	Default Flange cut AutoDefaults can change this option.
	Notch The bottom of the secondary beam is notched if the shear tab crosses the flange. Enter the notch radius and height.
	Flange cut The secondary beam flange is cut on the same side as the shear tab if the shear tab crosses the flange.

### **Plates tab**

Use the **Plates** tab to control the size, position, number, orientation and shape of the shear tab.

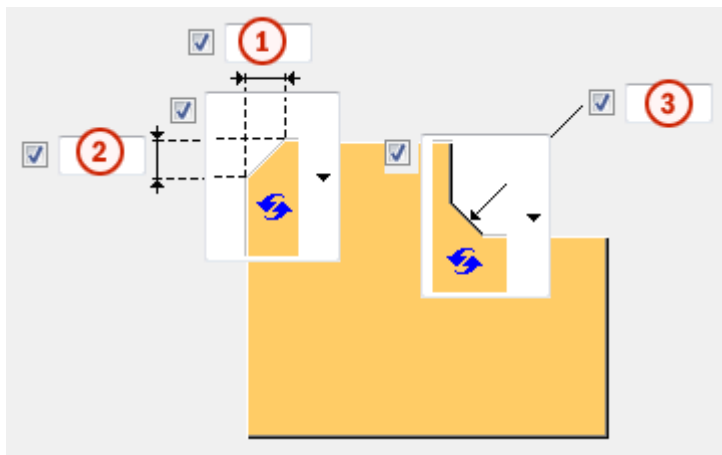
### Shear tab plate

Option	Description
<b>Tab plate</b>	Shear tab plate thickness, width and height.



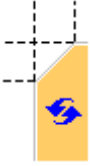

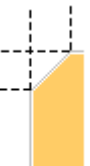


Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Shear tab chamfers







	Description
<b>1</b>	Horizontal dimension of the shear tab chamfer.
<b>2</b>	Vertical dimension of the shear tab chamfer.
<b>3</b>	Vertical and the horizontal dimension of the shear tab chamfer.

### Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer






### Chamfer type dimensions

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer

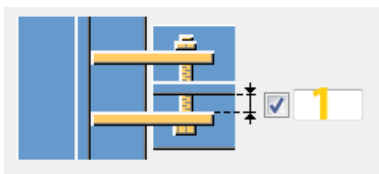
Option	Description
	Line chamfer
	Concave arc chamfer

### Shear tab position

Define the number and the side of shear tabs in single shear tab connections.

Option	Description
	Default Far side shear tab AutoDefaults can change this option.
	Automatic The component automatically selects either the near side or the far side shear tab. The tab is created to the side of the secondary part when the angle between the main part and the secondary part is less than 90 degrees.
	Far side shear tab
	Near side and far side shear tab
	Near side shear tab

## Gap between shear tabs



	Description	Default
1	Gap between the secondary part web and shear tab. This only affects connections with two shear tabs.	0

## Stiffeners tab

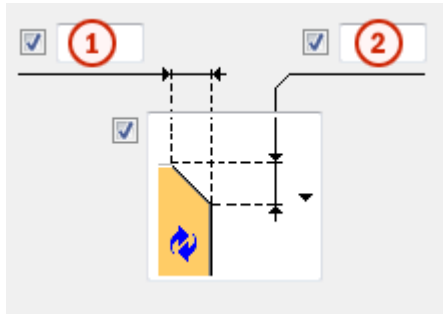
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type.

### Opposite web stiffener plate dimensions

Option	Description
Opposite web stiffener	Opposite web stiffener plate thickness, width and height.

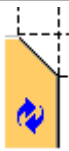




Option	Description	Default
Pos_No	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
Material	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
Name	Name that is shown in drawings and reports.	

## Chamfer dimensions



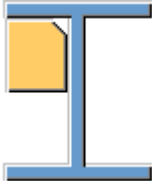




	Description
1	Horizontal dimension of the chamfer.
2	Vertical dimension of the chamfer.

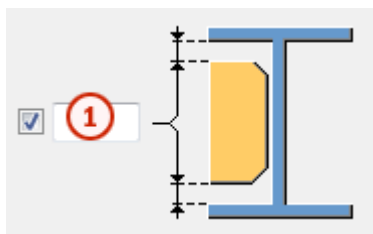
## Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

## Stiffener creation

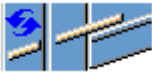


Option	Description
	<p>Default</p> <p>No stiffeners are created.</p> <p>AutoDefaults can change this option.</p>
	<p>Full</p> <p>Creates a full stiffener of the same height as the web of the main part.</p>
	<p>Determined by shear tab</p> <p>Tekla Structures determines the size of the stiffener based on the shear tab size. Tekla Structures attempts to keep the bottom edges of the stiffener plate and shear tab level, if possible.</p>
	<p>Partial</p> <p>Leaves a gap between the stiffener plate and the bottom flange of the main part.</p>
	<p>No stiffeners are created.</p>

## Stiffener gap



	Description
1	Size of the gap between the main part flanges and the stiffener.

## Stiffener orientation

Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are perpendicular to the main part.
	Stiffeners are parallel to the secondary part.

## *Haunch tab*

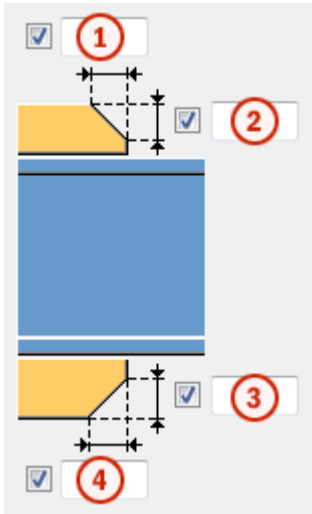
Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges.

## Haunch plates

Option	Description
<b>Top plate</b>	Top haunch plate thickness, width and height.
<b>Bottom plate</b>	Bottom haunch plate thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

## Haunch plate chamfers




	Description
1	Width of the top haunch plate chamfer.
2	Height of the top haunch plate chamfer.
3	Height of the bottom haunch plate chamfer.
4	Width of the bottom haunch plate chamfer.

## Haunch plate creation

Option	Description
	<p>Default</p> <p>Top and bottom haunch plates are created, if needed.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>Top or bottom haunch plate or both are created, if needed.</p>
	<p>Top and bottom haunch plates are created.</p> <p>To create a single plate, enter 0 in the thickness (<b>t</b>) field for the plate you do not need (top or bottom plate).</p>



Option	Description
	Haunch plates are not created.

### Notch tab






Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

### Automatic notching


Automatic notching options affect both the top and the bottom flange.

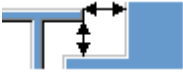
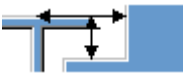
### Notch shape

Automatic notching is switched on when you select a notch shape.

Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.
	Turns off automatic notching.

### Notch size



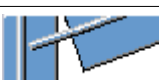
Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.

Option	Description
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.



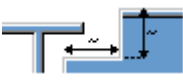


### Flange cut shape

Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

### Notch dimension rounding

Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.

The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



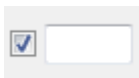
### Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

### Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.








### Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.

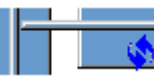
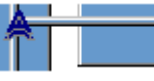
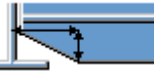
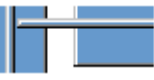

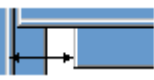
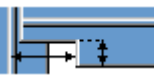
### Side of flange notch

The side of flange notch defines on which side of the beam the notches are created.

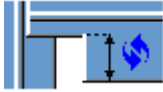
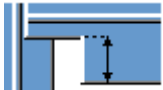
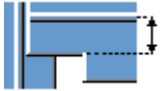
Option	Description
	<p>Default</p> <p>Creates notches on both sides of the flange.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>Creates notches on both sides of the flange.</p>
	<p>Creates notches on both sides of the flange.</p>
	<p>Creates notches on the near side of the flange.</p>
	<p>Creates notches on the far side of the flange.</p>

### Flange notch shape

The flange notch shape defines the notch shape in the beam flange.

Option	Description
	<p>Default</p> <p>The entire flange of the secondary beam is cut as far back as you define.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.</p>
	<p>Creates chamfers in the flange.</p> <p>If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.</p>
	<p>Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b>.</p>
	<p>The flange is not cut.</p>
	<p>Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.</p>
	<p>Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b>.</p>

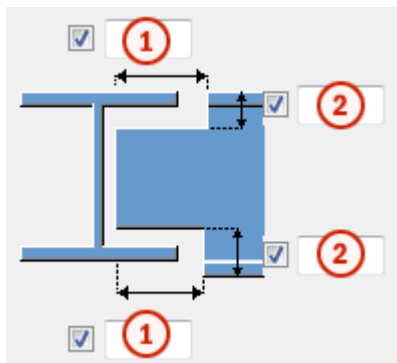
## Flange notch depth

Option	Description
	Default Flange notch depth. AutoDefaults can change this option.
	Flange notch depth.
	Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.

Enter the value for flange notch depth.

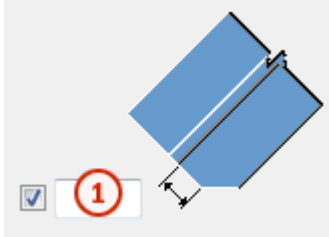
 

## Cut dimensions



	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### Dimension from web to flange cut

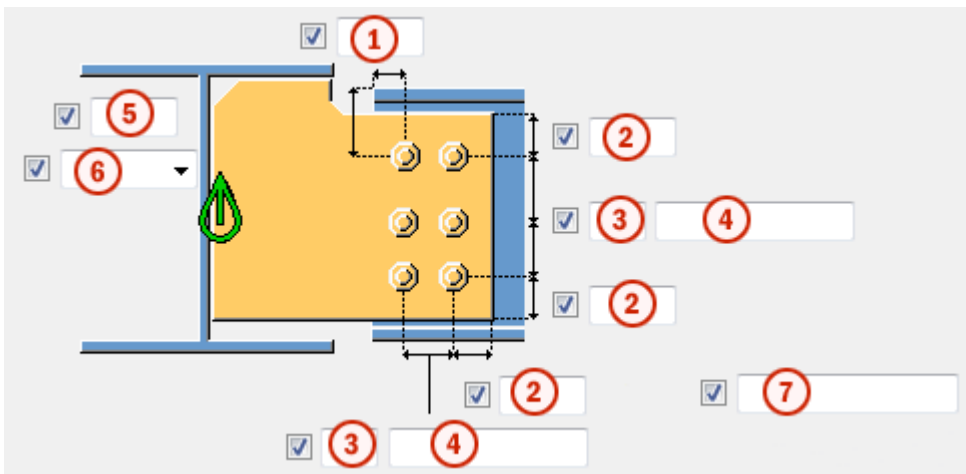


	Description
1	Define the distance between the web and the flange cut.

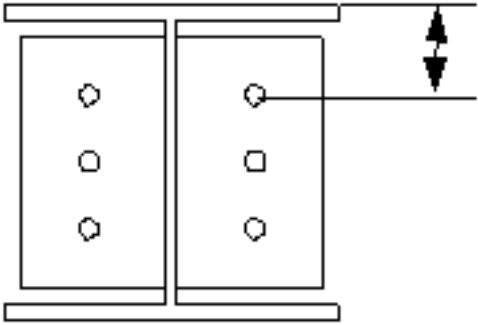
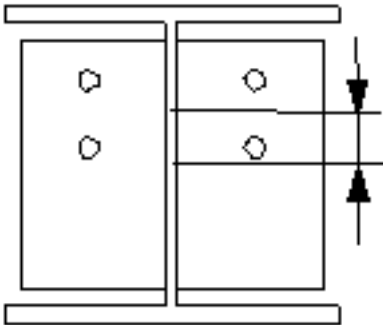
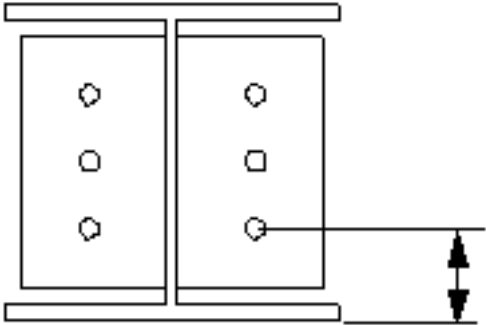
### Bolts tab

Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the main part.

### Bolt group dimensions



	Description
1	Dimension for horizontal bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Dimension for vertical bolt group position.

	<b>Description</b>
<b>6</b>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 

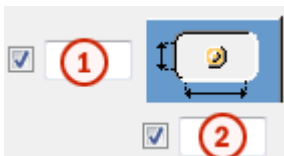
	Description
7	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.

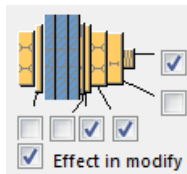


Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.





To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.





### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.








### Staggering of bolts




Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered

Option	Description
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt group orientation

Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

### Bolting direction

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

### Beam cut tab

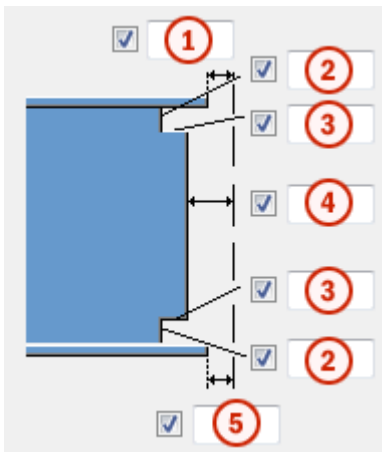
Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts.

### Weld backing bar

Option	Description
Weld backing bar	Weld backing bar thickness and width.

Option	Description	Default
Pos_No	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
Material	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
Name	Name that is shown in drawings and reports.	







### Weld access hole dimensions

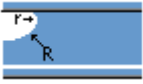


	Description
1	Gap between the secondary part top flange and the main part.







	Description
2	Vertical dimensions for the top and the bottom weld access holes.
3	Horizontal dimensions for the top and the bottom weld access holes.
4	Gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.
5	Gap between the secondary part bottom flange and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.

### Weld access holes



Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	
	Round weld access hole with a radius that you can define in r <input checked="" type="checkbox"/> <input type="text"/>	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and Top Prep x <input checked="" type="checkbox"/> <input type="text"/> Bottom Prep x <input checked="" type="checkbox"/> <input type="text"/>	





Option	Description	Default
	<p>Cone-shaped weld access hole with radiuses that you can define in <input type="checkbox"/> <b>R</b> <input type="checkbox"/> <input type="text"/></p> <p>and <input type="checkbox"/> <b>r</b> <input type="checkbox"/> <input type="text"/></p> <p>Capital <b>R</b> defines the large radius (height). Small <b>r</b> defines the small radius.</p>	<p>R = 35 r = 10</p>

### Beam end preparation





Option	Description
	<p>Default Top and bottom flange are prepared. AutoDefaults can change this option.</p>
	<p>Automatic Top and bottom flange are prepared.</p>
	<p>Beam end is not prepared.</p>
	<p>Top and bottom flange are prepared.</p>
	<p>Top flange is prepared.</p>
	<p>Bottom flange is prepared.</p>

### Flange cut

Option for top flange	Option for bottom flange	Description
		<p>Default Flange is not cut. AutoDefaults can change this option.</p>


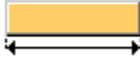

Option for top flange	Option for bottom flange	Description
		Flange is not cut.
		Flange is cut.

### Weld backing bars

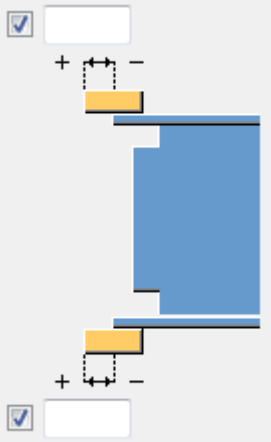
Option for bottom backing bar	Description
	Default Backing bars are created inside the flanges. AutoDefaults can change this option.
	No backing bars are created.
	Backing bars are created inside the flanges.
	Backing bars are created outside the flanges.

### Weld backing bar length

Enter the length of the weld backing bar in the box below the options.

Option	Description
	Default Absolute length of the backing bar AutoDefaults can change this option.
	Absolute length of the backing bar
	Extension beyond the edge of the flange

## Weld backing bar position

Option	Description
	Enter a positive or a negative value to move the front end of the backing bar relative to the end of the flange.

### Assembly type

Define the location where the weld backing bar welds are made. When you select the **Workshop** option, Tekla Structures includes the backing bars in the assembly.

### General tab

Click the links below to find out more:

[General tab](#)

### Design tab

Click the links below to find out more:

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

### Welds

Click the link below to find out more:

## Moment connection (181)

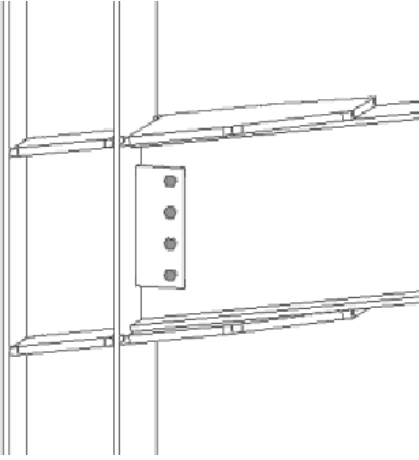
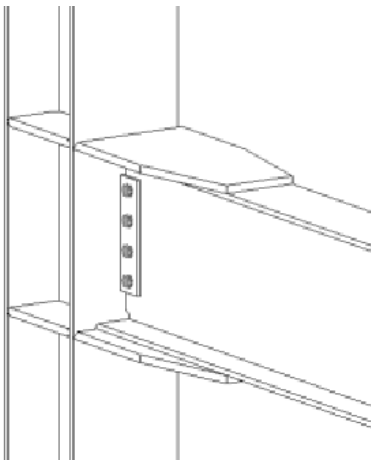
**Moment connection (181)** connects a beam to a column or to a beam with a single shear tab or double shear tabs. The shear tab is welded to the main part

and bolted to the secondary part web. The secondary beam can be leveled or sloped. Top and bottom flange plates may be welded to the secondary beam and site-welded to the main column.

**Objects created**

- Shear tab (1 or 2)
- Top flange plate
- Bottom flange plate
- Stiffeners (4) (optional)
- Web doubler plate (optional)
- Bolts
- Welds
- Cuts

**Use for**

Situation	Description
	<p>Moment connection welded to a column flange. The secondary part is sloped.</p>
	<p>Moment connection welded to a column flange. Beam weld preparation and weld access hole options.</p>

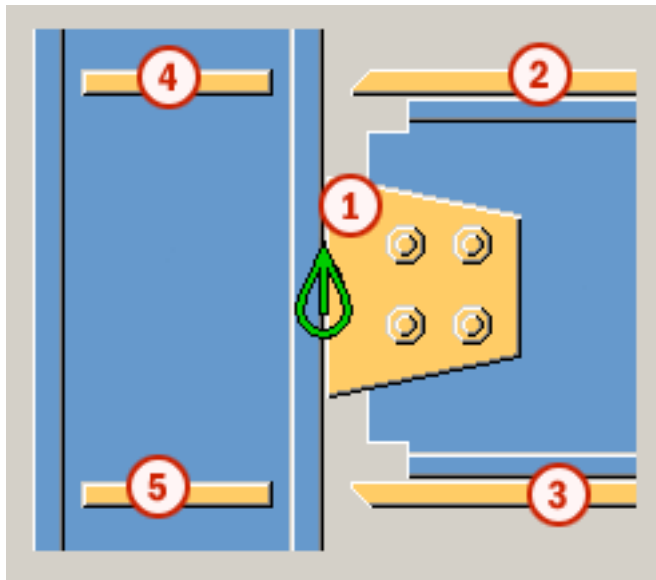


### Selection order

1. Select the main part (column or beam).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key



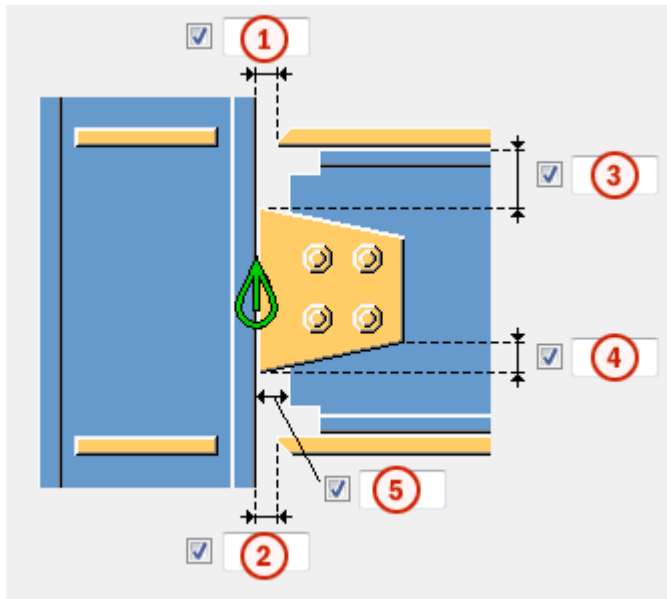
	Part
1	Shear tab
2	Top flange plate
3	Bottom flange plate
4	Top stiffener plate
5	Bottom stiffener plate

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

### Picture tab

Use the **Picture** tab to control the position of the shear tab, and the beam flange and the web cuts.

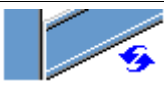
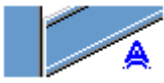
## Dimensions





	Description
1	Site welding distance from the edge of the top flange plate to the main part flange.
2	Site welding distance from the edge of the bottom flange plate to the main part web.
3	Distance from the edge of the shear tab to the top edge of the secondary part.
4	Chamfer dimension of the shear tab.
5	Distance from the main part flange to the edge of the secondary part.

## Beam end cut




Define how the secondary beam end is cut. The beam is viewed from the side.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.

Option	Description
	Square Cuts the end of the secondary beam square.
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.

### Beam flange cut

Define how the secondary beam flange end is cut. The beam is viewed from the top.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Bevel Cuts the end of the flange bevel.
	Square Cuts a part of the flange square and leaves a part of it bevel.

### Plates tab

Use the **Plates** tab to control the size, position, number, and shape of the shear tab.

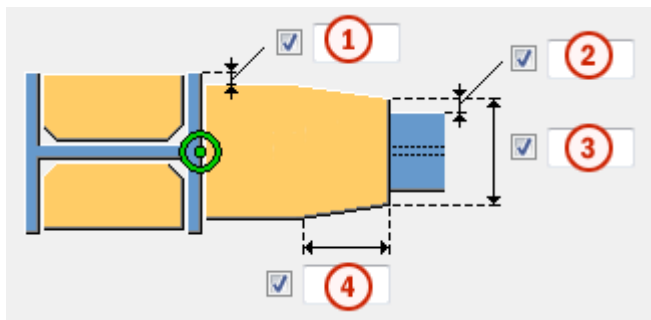
### Plates

Option	Description
<b>Tab plate</b>	Shear tab plate thickness, width and height.

Option	Description
<b>Top plate</b>	Top plate thickness, width and height.
<b>Bottom plate</b>	Bottom plate thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	






### Shear tab dimensions



	Description
<b>1</b>	Distance from the edge of the main part flange to the edge of the top and bottom plate.
<b>2</b>	Distance from the flange of the secondary part to the edge of the top and bottom plate.
<b>3</b>	Width of the chamfered end of the top and bottom plate.
<b>4</b>	Chamfering dimension of the top and bottom plate.

### Shear tab position

Define the number and the side of shear tabs in single shear tab connections.

Option	Description
	<p>Default Far side shear tab AutoDefaults can change this option.</p>
	<p>Automatic The component automatically selects either the near side or the far side shear tab. The tab is created to the side of the secondary part when the angle between the main part and the secondary part is less than 90 degrees.</p>
	<p>Far side shear tab</p>
	<p>Near side and far side shear tab</p>
	<p>Near side shear tab</p>

### ***Stiffeners tab***

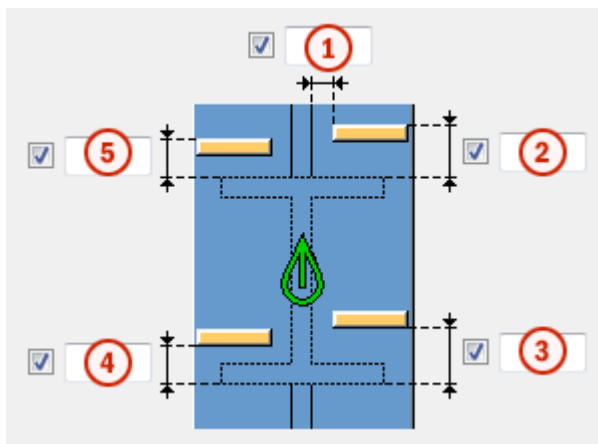
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type.

#### **Stiffener plate dimensions**

Option	Description
<b>Top NS</b>	Top near side stiffener thickness, width and height.
<b>Top FS</b>	Top far side stiffener thickness, width and height.
<b>Bottom NS</b>	Bottom near side stiffener thickness, width and height.
<b>Bottom FS</b>	Bottom far side stiffener thickness, width and height.

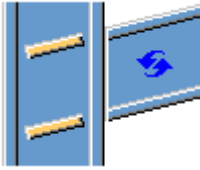
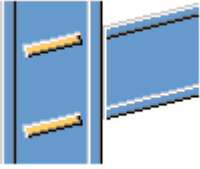
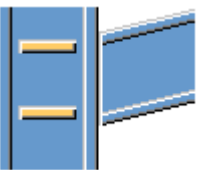
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Stiffener positions







	Description
<b>1</b>	Size of the gap between the stiffener and the beam web edge.
<b>2</b>	Size of the gap between the top near side stiffener and the beam flange edge.
<b>3</b>	Size of the gap between the bottom near side stiffener and the beam flange edge.
<b>4</b>	Size of the gap between the bottom far side stiffener and the beam flange edge.
<b>5</b>	Size of the gap between the top far side stiffener and the beam flange edge.



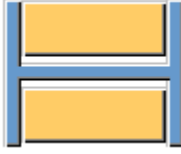

### Stiffener orientation

Option	Description
	<p>Default</p> <p>Stiffeners are parallel to the secondary part.</p> <p>AutoDefaults can change this option.</p>
	<p>Stiffeners are parallel to the secondary part.</p>
	<p>Stiffeners are perpendicular to the main part.</p>

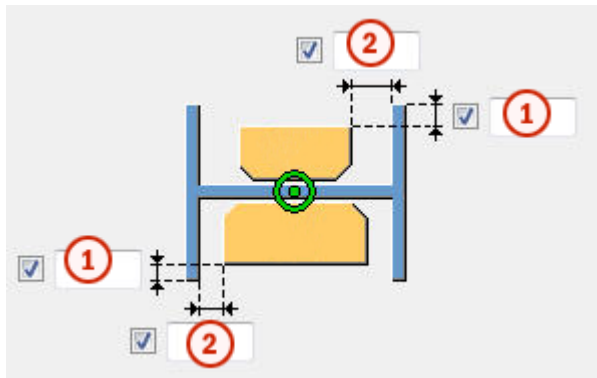
### Stiffener creation

Option	Description
	<p>Default</p> <p>Stiffeners are created.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>Stiffeners are created when necessary.</p>
	<p>No stiffeners are created.</p>
	<p>Stiffeners are created.</p>

## Stiffener shape

Option	Description
	Default Line chamfered stiffener plates AutoDefaults can change this option.
	Automatic Line chamfered stiffener plates
	Square stiffener plates Stiffener plates with a gap for the main part web rounding
	Line chamfered stiffener plates

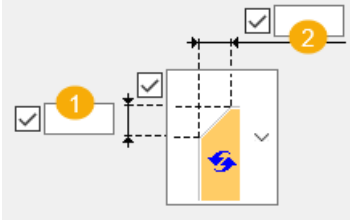
## Stiffener gap



	Description
1	Distance from the edge of the flange to the edge of the stiffener.
2	Size of the gap between the flanges and the stiffener.

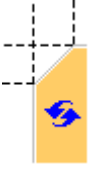






## Chamfer dimensions



	Description	Default
1	Vertical dimension of the chamfer.	10 mm
2	Horizontal dimension of the chamfer.	10 mm

## Chamfer type

Option	Description
	Default. Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

## Notch tab

Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties. The **Notch** tab has two sections:






automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

### Automatic notching

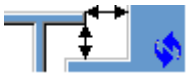
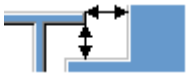
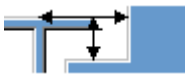
Automatic notching options affect both the top and the bottom flange.

### Notch shape

Automatic notching is switched on when you select a notch shape.

Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.
	Turns off automatic notching.


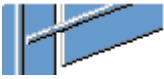

### Notch size

Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.



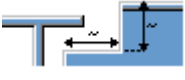


### Flange cut shape

Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

### Notch dimension rounding




Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.





The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



## Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

## Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.






 

## Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.



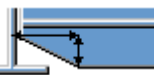



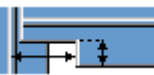
## Side of flange notch

The side of flange notch defines on which side of the beam the notches are created.

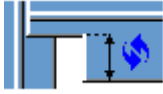
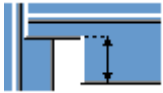
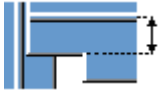
Option	Description
	<p>Default</p> <p>Creates notches on both sides of the flange.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>Creates notches on both sides of the flange.</p>
	<p>Creates notches on both sides of the flange.</p>
	<p>Creates notches on the near side of the flange.</p>
	<p>Creates notches on the far side of the flange.</p>

### Flange notch shape

The flange notch shape defines the notch shape in the beam flange.

Option	Description
	<p>Default</p> <p>The entire flange of the secondary beam is cut as far back as you define.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.</p>
	<p>Creates chamfers in the flange.</p> <p>If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.</p>
	<p>Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b>.</p>
	<p>The flange is not cut.</p>
	<p>Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.</p>
	<p>Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b>.</p>

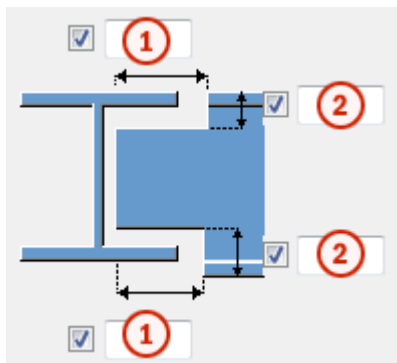
## Flange notch depth

Option	Description
	Default Flange notch depth. AutoDefaults can change this option.
	Flange notch depth.
	Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.

Enter the value for flange notch depth.

## Cut dimensions



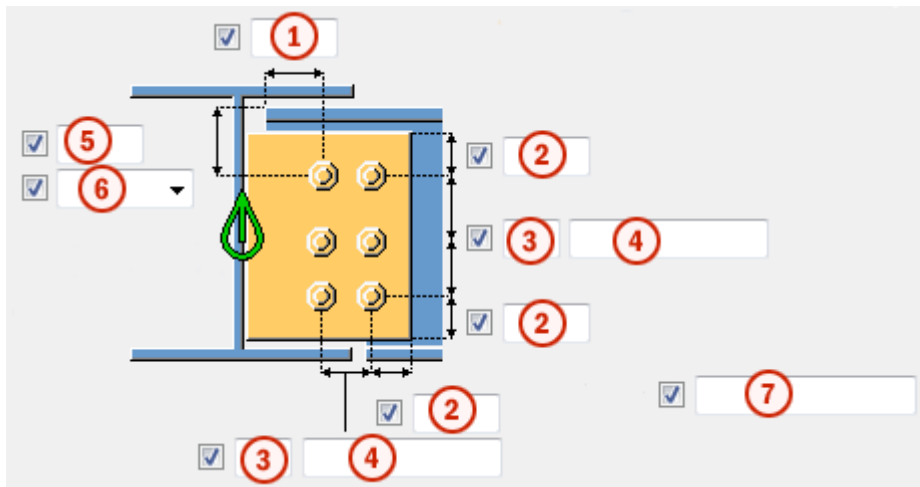
	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

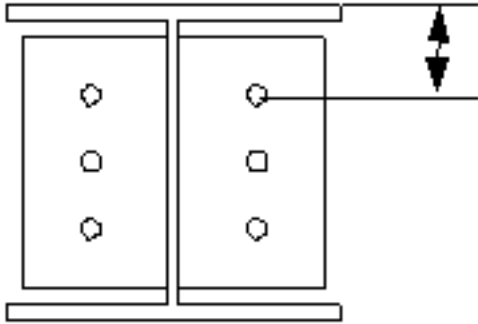
## **Bolts tab**

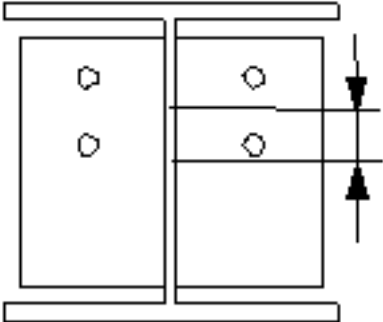
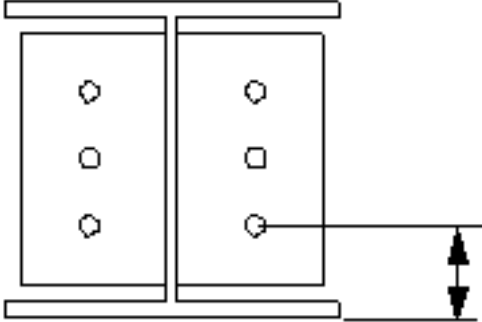
Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part.

## Bolt group dimensions




Bolt group dimensions affect the size and shape of the shear tab.






	Description
1	Dimension for horizontal bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Dimension for vertical bolt group position.
6	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>
<b>7</b>	<p>Define which bolts are deleted from the bolt group.</p> <p>Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.</p>






### Staggering of bolts

<b>Option</b>	<b>Description</b>
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1



Option	Description
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt group orientation

Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

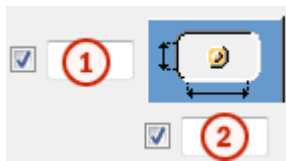
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

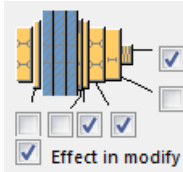


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

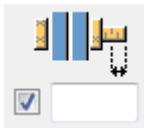
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

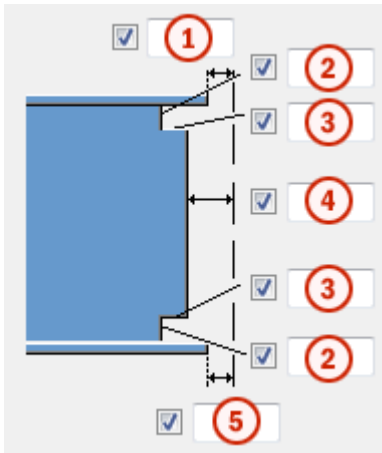
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Beam cut tab

Use the **Beam cut** tab to control the weld access holes, beam end preparations, and flange cuts.












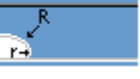
### Weld access hole dimensions







	Description
1	Gap between the secondary part top flange and the main part.
2	Vertical dimensions for the top and the bottom weld access holes.
3	Horizontal dimensions for the top and the bottom weld access holes.
4	Gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.

	Description
5	Gap between the secondary part bottom flange and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.




### Weld access holes

Option	Option	Description
		Default Round weld access hole AutoDefaults can change this option.
		Round weld access hole
		Square weld access hole
		Round weld access hole with a radius that you can define in R <input checked="" type="checkbox"/> <input type="text"/>
		Extended cone-shaped weld access hole with a radius and dimensions that you can define in R <input checked="" type="checkbox"/> <input type="text"/>
		Cone-shaped weld access hole with radiuses that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and r <input checked="" type="checkbox"/> <input type="text"/> Capital <b>R</b> defines the large radius (height). Small <b>r</b> defines the small radius.





### Beam end preparation



Option	Description
	Default Top and bottom flange are prepared. AutoDefaults can change this option.
	Automatic Top and bottom flange are prepared.
	Beam end is not prepared.
	Top and bottom flange are prepared.

### Beam end alignment

Option	Description
	Default Beam end is not aligned. Secondary part flange is not aligned with the top and bottom plates. AutoDefaults can change this option.
	Beam end is not aligned.
	Beam end is aligned.

### Flange cut

Option for top flange	Option for bottom flange	Description
		Default Flange is not cut. AutoDefaults can change this option.
		Flange is not cut.

Option for top flange	Option for bottom flange	Description
		Flange is cut.

### ***Doubler plates tab***


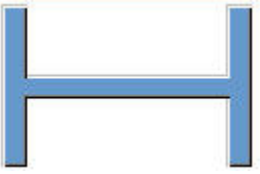
Use the **Doubler plate** tab to create doubler plates to strengthen the web of the main part.

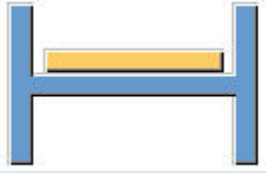


### **Web plate**

Option	Description
<b>Web plate</b>	Web plate thickness and height.




Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Doubler plates**

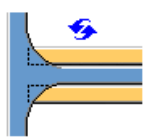
Option	Description
	Default Doubler plates are not created. AutoDefaults can change this option.
	Doubler plates are not created.

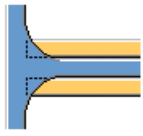

Option	Description
	Doubler plate is created on the far side.
	Doubler plate is created on the near side.
	Doubler plates are created on both sides.

### Doubler plate edge shape

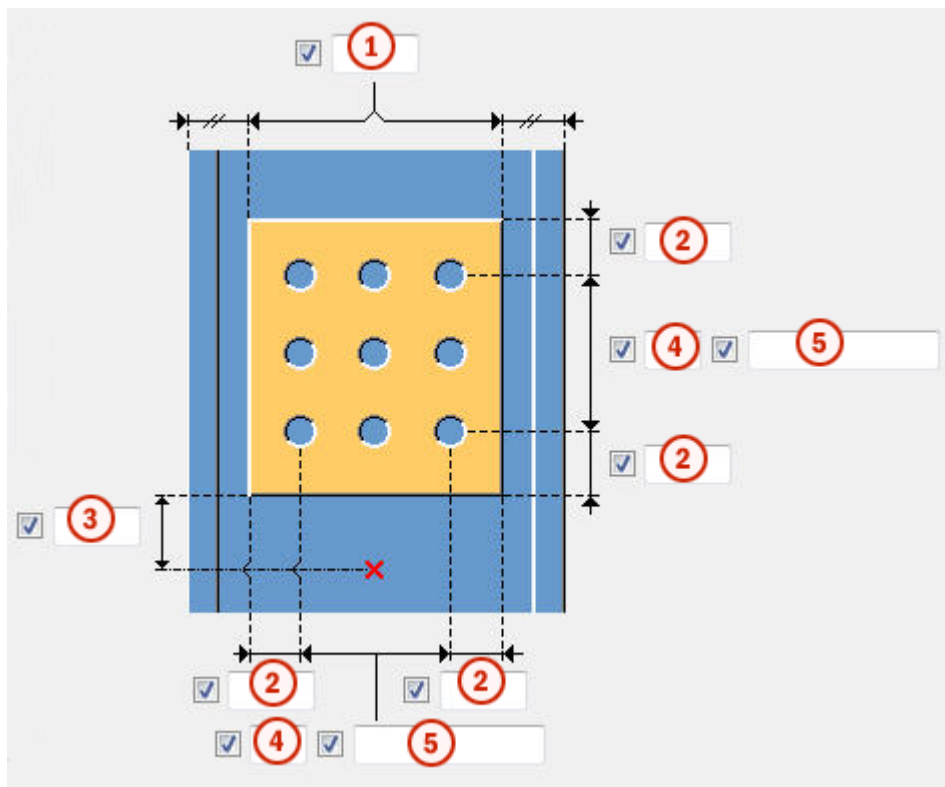
Option	Description
	Default Bevel doubler plates AutoDefaults can change this option.
	Bevel doubler plates Enter the angle in <input checked="" type="checkbox"/> <input type="text"/> (0 - 90)
	Square doubler plates

### Doubler plate cuts

Option	Description
	Default Doubler plates are not cut. AutoDefaults can change this option.

Option	Description
	Doubler plates are not cut.
	Doubler plates are cut in the area that connects the main part web and flange.

### General settings

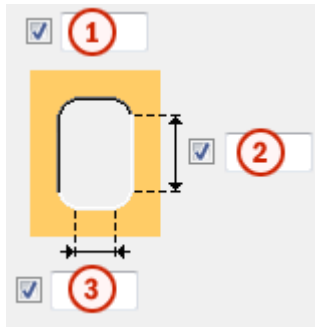


	Description
1	Edge distance from the column flange.
2	Doubler plate edge distance. Edge distance is the distance from the center of a hole to the edge of the part.
3	Edge distance of the doubler plate in relation to the bottom of the secondary part.
4	Number of holes.



	Description
5	Hole spacing. Use a space to separate hole spacing values. Enter a value for each space between holes. For example, if there are 3 holes, enter 2 values.

### Weld hole size



	Description
1	Hole diameter.
2	Slot length.
3	Slot width.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design type tab**

Click the link below to find out more:

[Design type tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

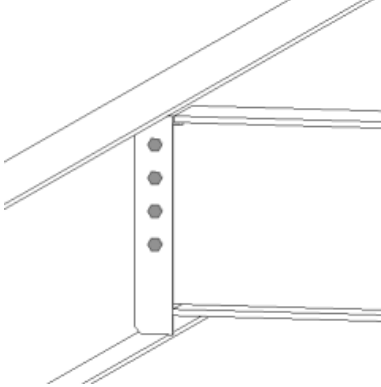
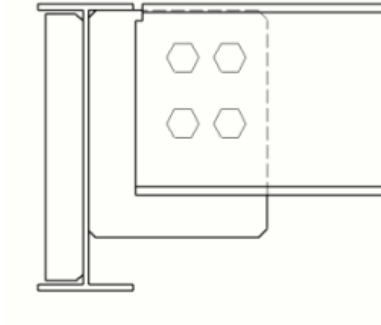
## Full depth (184)

**Full depth (184)** connects two beams with a full depth shear tab. The shear tab is welded to the main beam web and flanges, and bolted to the secondary beam web. The secondary beam can be leveled or sloped. A stiffener plate on the opposite side of the main beam web and the haunch plates welded to the secondary beam flanges are optional.

### Objects created

- Shear tab (1 or 2)
- Stiffener (optional)
- Haunch plates (optional)
- Weld backing bars (optional)
- Bolts
- Welds
- Cuts

### Use for

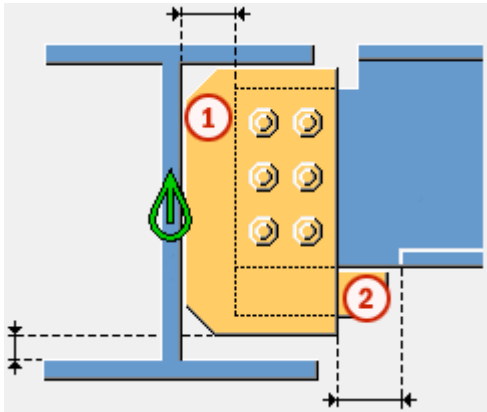
Situation	Description
	Full depth shear tab.
	Full depth connection with a stiffener plate.

### Selection order

1. Select the main part (beam).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key



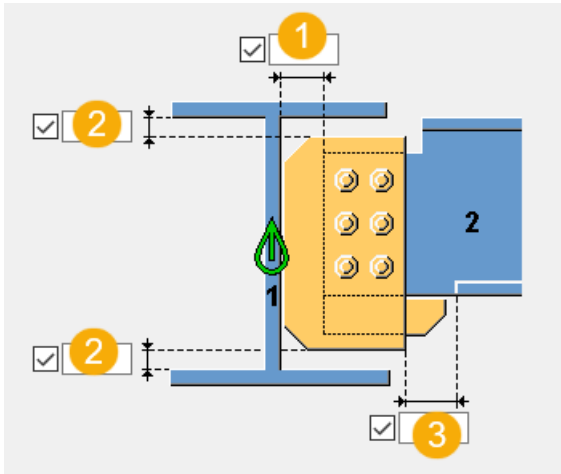
	Part
1	Shear tab
2	Haunch plate

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

### Picture tab

Use the **Picture** tab to control the position of the shear tab, and the beam flange and the web cuts.

## Dimensions






	Description	Default
<b>1</b>	Cut of the secondary part. The cut is defined from the main part web.	20 mm
<b>2</b>	Shear tab edge distance from the main part flange edge.	
<b>3</b>	Size of the strip made to the secondary part flange. The cut of the flange is defined from the shear tab edge.	The flange is automatically stripped when the shear tab crosses the flange. 10 mm

## Beam end cut




Define how the secondary beam end is cut. The beam is viewed from the side.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.
	Square Cuts the end of the secondary beam square.

Option	Description
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.
	Square cut closer to the main part web Cuts the end of the secondary beam square and places the beam closer to the main part web.
	Clipped flange Cuts the corner of the flange at the end of the secondary beam.



### Beam web cut


Define how the secondary beam web end is cut. The beam is viewed from the top.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Bevel Cuts the end of the web bevel when the end of the secondary beam is cut bevel.
	Square Cuts the end of the web square even if the end of the secondary beam is cut bevel.




### Beam flange cut

Define how the secondary beam flange end is cut. The beam is viewed from the top.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Bevel Cuts the end of the flange bevel.

Option	Description
	Square Cuts a part of the flange square and leaves a part of it bevel.

### Beam bottom flange cut

Option	Description
	Default Flange cut AutoDefaults can change this option.
	Notch The bottom of the secondary beam is notched if the shear tab crosses the flange. Enter the notch radius and height.
	Flange cut The secondary beam flange is cut on the same side as the shear tab if the shear tab crosses the flange.

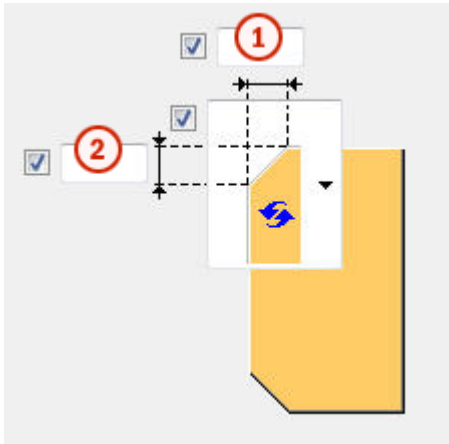
### **Plates tab**

Use the **Plates** tab to control the size, position, number, and shape of the shear tab.

### **Shear tab plate**

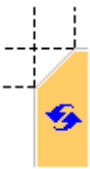

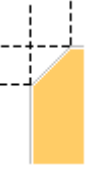

Option	Description
<b>Tab plate</b>	Shear tab thickness and width.


## Shear tab chamfers



	Description
1	Horizontal dimension of the shear tab chamfer.
2	Vertical dimension of the shear tab chamfer.






## Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer

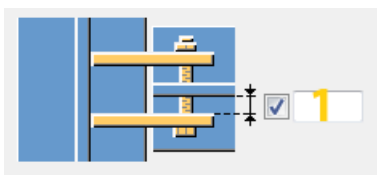
Option	Description
	Concave arc chamfer

### Shear tab position

Define the number and the side of shear tabs in single shear tab connections.

Option	Description
	Default Far side shear tab AutoDefaults can change this option.
	Automatic The component automatically selects either the near side or the far side shear tab. The tab is created to the side of the secondary part when the angle between the main part and the secondary part is less than 90 degrees.
	Far side shear tab
	Near side and far side shear tab
	Near side shear tab

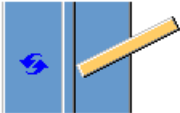


### Gap between shear tabs





	Description	Default
1	Gap between the secondary part web and shear tab.  This only affects connections with two shear tabs.	0

### Shear tab end cut

Option	Description
	Default The shear tab end is not cut. AutoDefaults can change this option.
	Square The shear tab end is not cut.
	Bevel The shear tab end is cut parallel to the main part web.

### Stiffeners tab

Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type.



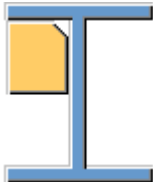


### Opposite web stiffener plate dimensions

Option	Description
<b>Opposite web stiffener</b>	Opposite web stiffener plate thickness, width and height.

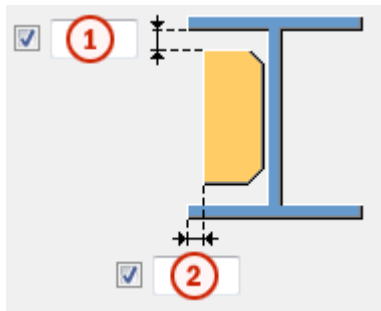
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in

Option	Description	Default
		<b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Stiffener creation

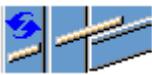


Option	Description
	Default No stiffeners are created. AutoDefaults can change this option.
	Full Creates a full stiffener of the same height as the web of the main part.
	Determined by shear tab Tekla Structures determines the size of the stiffener based on the shear tab size. Tekla Structures attempts to keep the bottom edges of the stiffener plate and shear tab level, if possible.
	Partial Leaves a gap between the stiffener plate and the bottom flange of the main part.
	No stiffeners are created.

### Stiffener gap

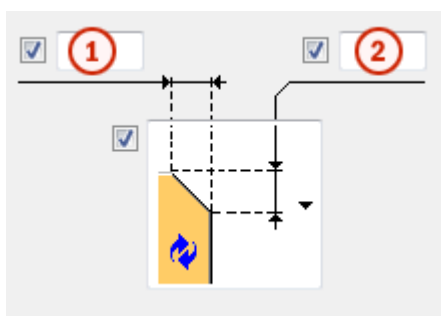


	Description
1	Size of the gap between the main part flange and the stiffener.
2	Distance from the edge of the main part flange to the edge of the stiffener.

### Stiffener orientation

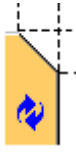




Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are perpendicular to the main part.
	Stiffeners are parallel to the secondary part.

### Chamfer dimensions



	Description
1	Horizontal dimension of the chamfer.
2	Vertical dimension of the chamfer.

## Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

## ***Haunch tab***

Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges.

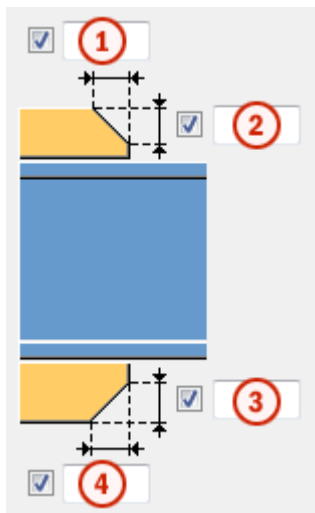
## Haunch plates

Option	Description
<b>Top plate</b>	Top haunch plate thickness, width and height.
<b>Bottom plate</b>	Bottom haunch plate thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

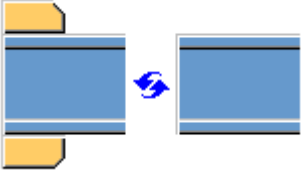
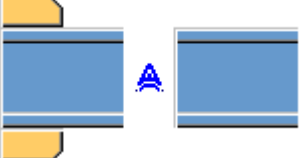


Option	Description	Default
	assembly position number.	
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Haunch plate chamfers



	Description
<b>1</b>	Width of the top haunch plate chamfer.
<b>2</b>	Height of the top haunch plate chamfer.
<b>3</b>	Height of the bottom haunch plate chamfer.
<b>4</b>	Width of the bottom haunch plate chamfer.

## Haunch plate creation

Option	Description
	<p>Default</p> <p>Top and bottom haunch plates are created, if needed.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>Top or bottom haunch plate or both are created, if needed.</p>
	<p>Top and bottom haunch plates are created.</p> <p>To create a single plate, enter 0 in the thickness (<b>t</b>) field for the plate you do not need (top or bottom plate).</p>
	<p>Haunch plates are not created.</p>

### **Notch tab**


Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.





### **Automatic notching**

Automatic notching options affect both the top and the bottom flange.


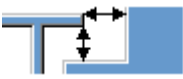
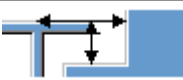
### **Notch shape**

Automatic notching is switched on when you select a notch shape.

Option	Description
	<p>Default</p> <p>Creates notches to the secondary beam.</p> <p>AutoDefaults can change this option.</p>

Option	Description
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.
	Turns off automatic notching.

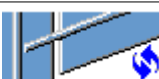

### Notch size


Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.





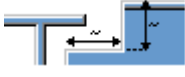
### Flange cut shape

Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.

Option	Description
	Secondary beam flange is cut square.

### Notch dimension rounding




Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.

The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.







### Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.



## Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.






 

## Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.



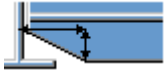




## Side of flange notch

The side of flange notch defines on which side of the beam the notches are created.




Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

## Flange notch shape

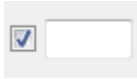
The flange notch shape defines the notch shape in the beam flange.

Option	Description
	<p>Default</p> <p>The entire flange of the secondary beam is cut as far back as you define.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.</p>
	<p>Creates chamfers in the flange.</p> <p>If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.</p>
	<p>Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b>.</p>
	<p>The flange is not cut.</p>
	<p>Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.</p>
	<p>Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b>.</p>

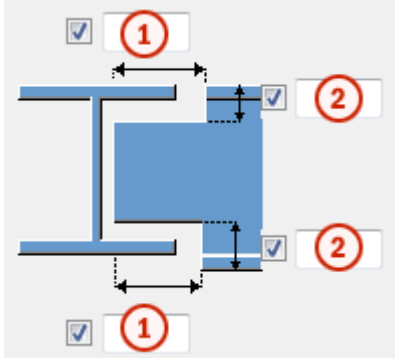
## Flange notch depth

Option	Description
	<p>Default</p> <p>Flange notch depth.</p> <p>AutoDefaults can change this option.</p>
	<p>Flange notch depth.</p>
	<p>Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.</p>

Enter the value for flange notch depth.

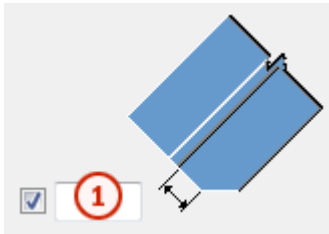


### Cut dimensions



	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### Dimension from web to flange cut



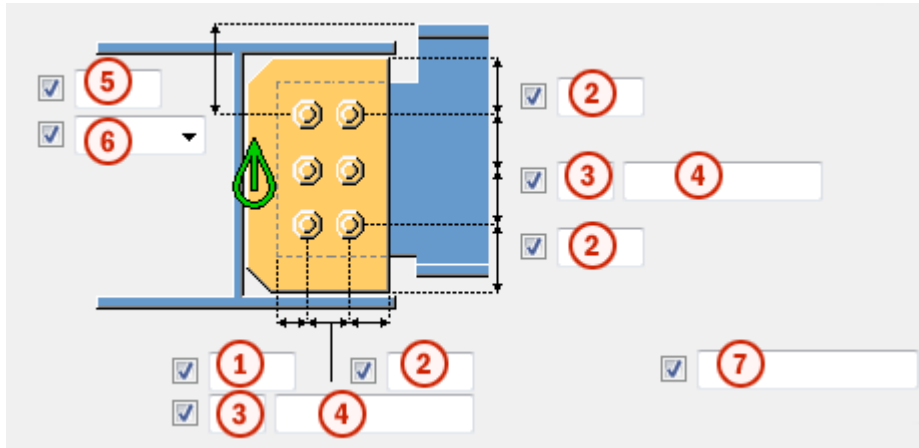
	Description
1	Define the distance between the web and the flange cut.

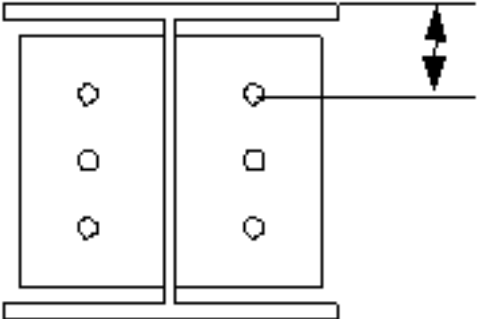
### **Bolts tab**

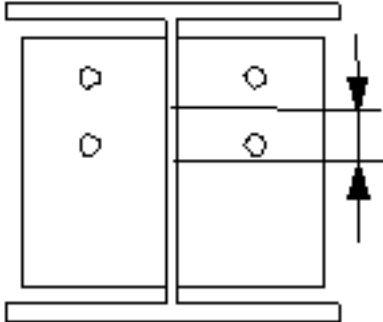
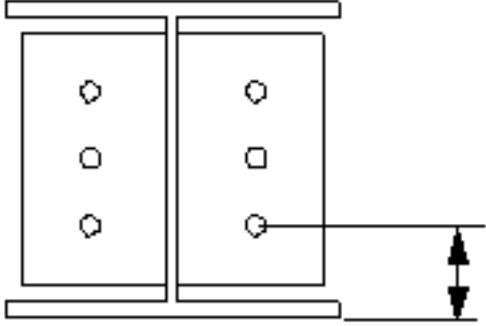
Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part.

### **Bolt group dimensions**




Bolt group dimensions affect the size and shape of the shear tab.






	Description
1	Dimension for horizontal bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Dimension for vertical bolt group position.
6	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 






	Description
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
7	<p>Define which bolts are deleted from the bolt group.</p> <p>Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.</p>

### Staggering of bolts

Option	Description
	<p>Default</p> <p>Not staggered</p> <p>AutoDefaults can change this option.</p>
	<p>Not staggered</p>
	<p>Staggered type 1</p>

Option	Description
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt group orientation

Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

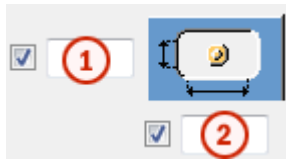
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

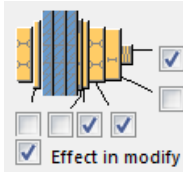


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

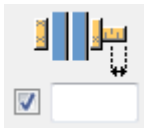
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Beam cut tab

Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts.

### Weld backing bar

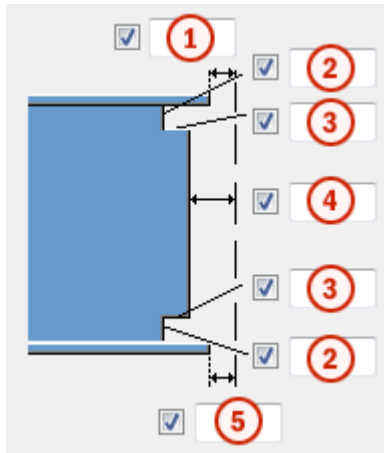
Option	Description
<b>Weld backing bar</b>	Weld backing bar thickness and width.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	





Option	Description	Default
<b>Finish</b>	Describes how the part surface has been treated.	





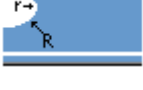
### Weld access hole dimensions





	Description
<b>1</b>	Gap between the secondary part top flange and the main part.
<b>2</b>	Vertical dimensions for the top and the bottom weld access holes.
<b>3</b>	Horizontal dimensions for the top and the bottom weld access holes.
<b>4</b>	Gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.
<b>5</b>	Gap between the secondary part bottom flange and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.





### Weld access holes

Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	
	Round weld access hole	







Option	Description	Default
	Square weld access hole	
	Diagonal weld access hole	
	Round weld access hole with a radius that you can define in r <input checked="" type="checkbox"/> <input type="text"/>	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and Top Prep x <input checked="" type="checkbox"/> <input type="text"/> Bottom Prep x <input checked="" type="checkbox"/> <input type="text"/>	
	Cone-shaped weld access hole with radiuses that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and r <input checked="" type="checkbox"/> <input type="text"/> Capital <b>R</b> defines the large radius (height). Small <b>r</b> defines the small radius.	R = 35 r = 10

### Beam end preparation







Option	Description
	Default Top and bottom flange are prepared. AutoDefaults can change this option.
	Automatic Top and bottom flange are prepared.



Option	Description
	Beam end is not prepared.
	Top and bottom flange are prepared.
	Top flange is prepared.
	Bottom flange is prepared.

### Flange cut

Option for top flange	Option for bottom flange	Description
		Default Flange is not cut. AutoDefaults can change this option.
		Flange is not cut.
		Flange is cut.


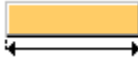

### Weld backing bars

Option for top backing bar	Option for bottom backing bar	Description
		Default Backing bars are created inside the flanges. AutoDefaults can change this option.
		No backing bars are created.
		Backing bars are created inside the flanges.

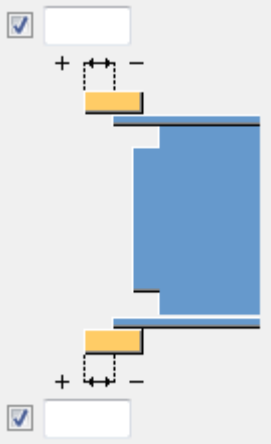
Option for top backing bar	Option for bottom backing bar	Description
		Backing bars are created outside the flanges.

### Weld backing bar length

Enter the length of the weld backing bar in the box below the options.

Option	Description
	Default Absolute length of the backing bar AutoDefaults can change this option.
	Absolute length of the backing bar
	Extension beyond the edge of the flange

### Weld backing bar position

Option	Description
	Enter a positive or a negative value to move the front end of the backing bar relative to the end of the flange.

### Assembly type

Define the location where the weld backing bar welds are made. When you select the **Workshop** option, Tekla Structures includes the backing bars in the assembly.

### General tab

Click the links below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds tab***

Click the link below to find out more:

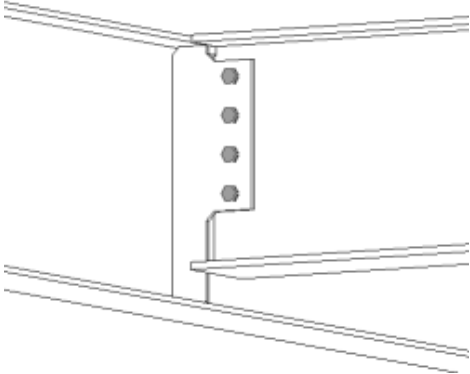
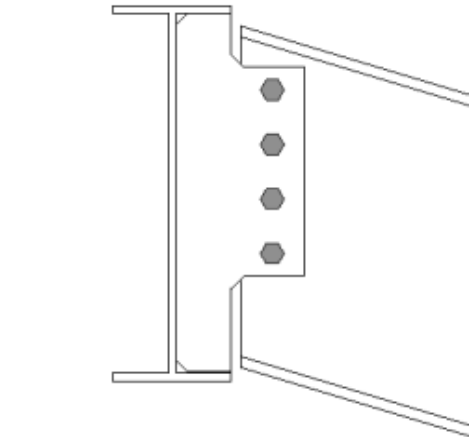
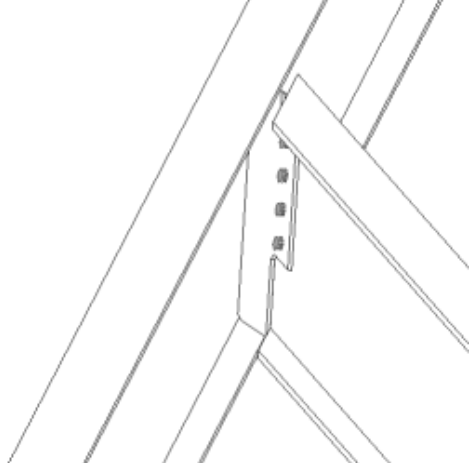
## **Full depth S (185)**

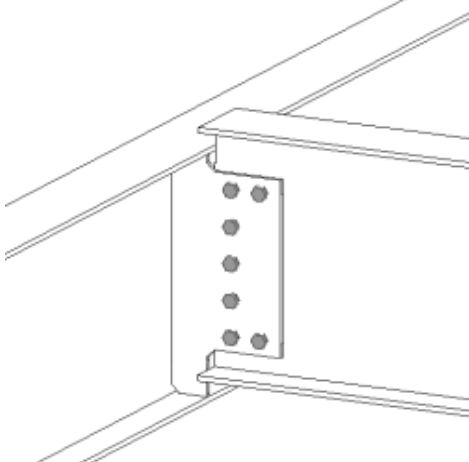
**Full depth S (185)** connects two beams with a full depth shear tab. The shear tab is welded to the main beam web and flanges, and bolted to the secondary beam web. The secondary beam can be leveled or sloped. A stiffener plate on the opposite side of the main beam web and the haunch plates welded to the secondary beam flanges are optional.

### **Objects created**

- Shear tabs (1 or 2)
- Stiffener (optional)
- Haunch plates (optional)
- Weld backing bars (optional)
- Bolts
- Welds
- Cuts

**Use for**

<b>Situation</b>	<b>Description</b>
	Full depth shear tab.
	Full depth shear tab. The secondary part is sloped.
	Full depth shear tab. The secondary part is sloped and skewed.

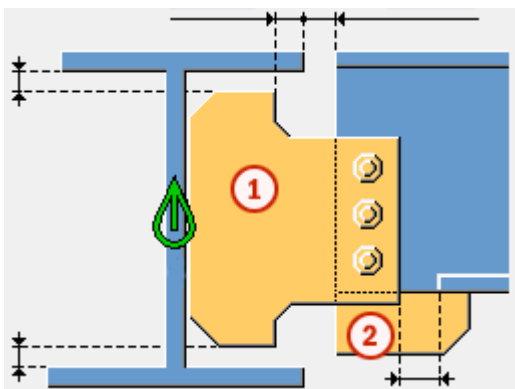
Situation	Description
	<p>Full depth shear tab.</p> <p>The secondary part is offset. Some bolts have been deleted.</p>

### Selection order

1. Select the main part (beam).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key



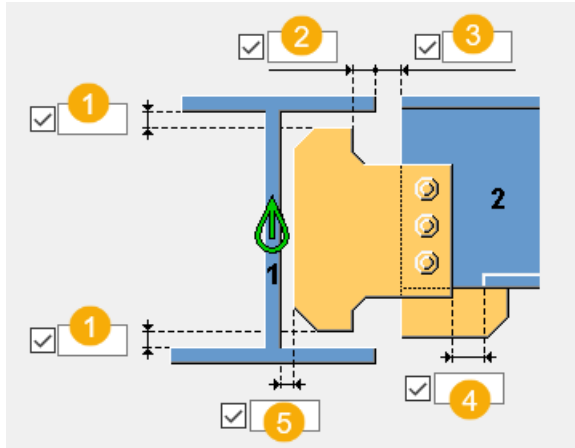
<b>Part</b>	
<b>1</b>	Shear tab
<b>2</b>	Haunch plate

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

### Picture tab

Use the **Picture** tab to control the position of the shear tab, and the beam flange and web cuts.

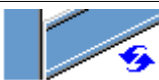
### Dimensions








	Description	Default
1	Shear tab edge distance from the main part flange edge.	0
2	Shear tab edge distance from the main part flange edge.	0
3	Cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	20 mm
4	Size of the strip made to the secondary part flange. The cut of the flange is defined from the shear tab edge.	The flange is automatically stripped when the shear tab crosses the flange. 20 mm
5	Gap between the shear tab and the main part web.	

### Beam end cut

Define how the secondary beam end is cut. The beam is viewed from the side.




Option	Description
	Default Bevel AutoDefaults can change this option.



Option	Description
	<p>Automatic</p> <p>If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.</p>
	<p>Square</p> <p>Cuts the end of the secondary beam square.</p>
	<p>Bevel</p> <p>Cuts the end of the secondary beam parallel to the edge of the main part.</p>
	<p>Square cut closer to the main part web</p> <p>Cuts the end of the secondary beam square and places the beam closer to the main part web.</p>
	<p>Clipped flange</p> <p>Cuts the corner of the flange at the end of the secondary beam.</p>




### Beam web cut

Define how the secondary beam web end is cut. The beam is viewed from the top.




Option	Description
	<p>Default</p> <p>Bevel</p> <p>AutoDefaults can change this option.</p>
	<p>Bevel</p> <p>Cuts the end of the web bevel when the end of the secondary beam is cut bevel.</p>
	<p>Square</p> <p>Cuts the end of the web square even if the end of the secondary beam is cut bevel.</p>

### Beam flange cut

Define how the secondary beam flange end is cut. The beam is viewed from the top.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Bevel Cuts the end of the flange bevel.
	Square Cuts a part of the flange square and leaves a part of it bevel.

### Beam bottom flange cut

Option	Description
	Default Flange cut AutoDefaults can change this option.
	Notch The bottom of the secondary beam is notched if the shear tab crosses the flange. Enter the notch radius and height.
	Flange cut The secondary beam flange is cut on the same side as the shear tab if the shear tab crosses the flange.

### **Plates tab**

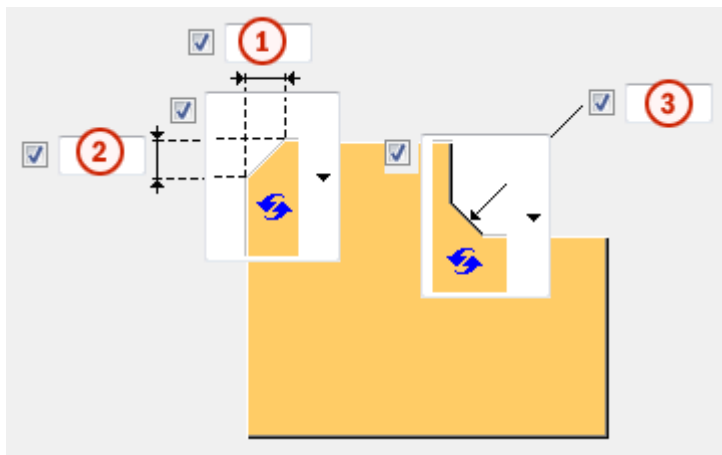
Use the **Plates** tab to control the size, position, number, and shape of the shear tab.

### Shear tab plate

Option	Description
<b>Tab plate</b>	Shear tab plate thickness, width and height.






Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Shear tab chamfers







	Description
<b>1</b>	Horizontal dimension of the shear tab chamfer.
<b>2</b>	Vertical dimension of the shear tab chamfer.
<b>3</b>	Vertical and the horizontal dimension of the shear tab chamfer.

### Chamfer type

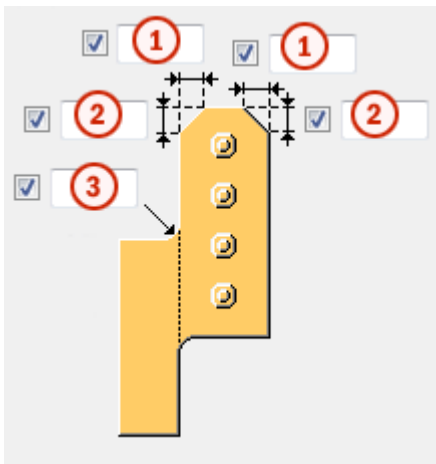
Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### Chamfer type dimensions

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer







Option	Description
	Line chamfer
	Concave arc chamfer




### Inner shear tab chamfers








	Description
1	Horizontal dimension of the shear tab chamfer.
2	Vertical dimension of the shear tab chamfer.
3	Radius and the vertical dimensions of the shear tab inner chamfer.

### Chamfer type

Option	Option	Description
		Default No chamfer AutoDefaults can change this option.
		No chamfer
		Line chamfer



Option	Option	Description
		Convex arc chamfer
		Concave arc chamfer




### Inner chamfer type

Option	Description
	Default Concave arc chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Concave arc chamfer
	Convex arc chamfer

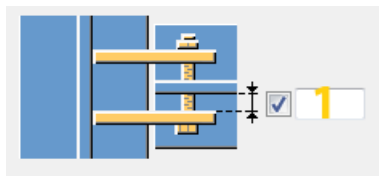
### Shear tab position

Define the number and the side of shear tabs in single shear tab connections.

Option	Description
	Default Far side shear tab AutoDefaults can change this option.
	Automatic The component automatically selects either the near side or the far side shear tab. The tab is created to the side of the secondary part when the angle between the main part and the secondary part is less than 90 degrees.

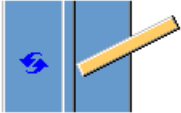


Option	Description
	Far side shear tab
	Near side and far side shear tab
	Near side shear tab

### Gap between shear tabs







	Description	Default
1	Gap between the secondary part web and shear tab.	0

### Shear tab end cut

Option	Description
	Default The shear tab end is not cut. AutoDefaults can change this option.
	Square The shear tab end is not cut.
	Bevel The shear tab end is cut parallel to the main part web.

## Shear tab orientation

Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Sloped The shear tab is sloped in the direction of the secondary beam. Both vertical edges of the shear tab are cut parallel to the end of the secondary beam.
	Square

## Stiffeners tab

Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type.



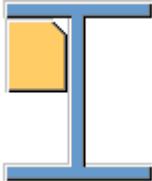


### Opposite web stiffener plate dimensions

Option	Description
<b>Opposite web stiffener</b>	Opposite web stiffener plate thickness, width and height.

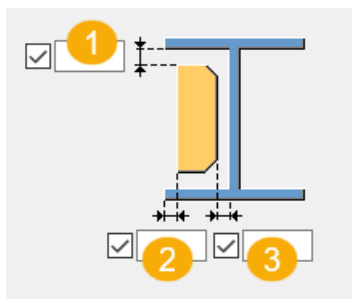
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	



## Stiffener creation

Option	Description
	<p>Default</p> <p>No stiffeners are created.</p> <p>AutoDefaults can change this option.</p>
	<p>Full</p> <p>Creates a full stiffener of the same height as the web of the main part.</p>
	<p>Determined by shear tab</p> <p>Tekla Structures determines the size of the stiffener based on the shear tab size. Tekla Structures attempts to keep the bottom edges of the stiffener plate and shear tab level, if possible.</p>
	<p>Partial</p> <p>Leaves a gap between the stiffener plate and the bottom flange of the main part.</p>
	<p>No stiffeners are created.</p>




## Stiffener gap



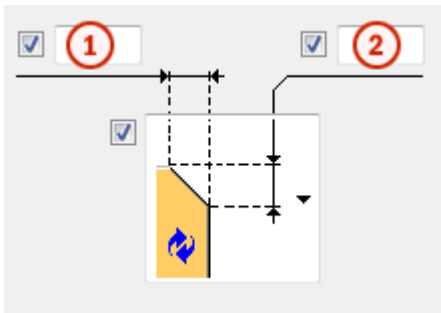
	Description
1	Size of the gap between the main part flange and the stiffener.

	Description
2	Distance from the edge of the main part flange to the edge of the stiffener.
3	Gap between the opposite web stiffener and main part web.

### Stiffener orientation



Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are perpendicular to the main part.
	Stiffeners are parallel to the secondary part.




### Chamfer dimensions



	Description
1	Horizontal dimension of the chamfer.
2	Vertical dimension of the chamfer.

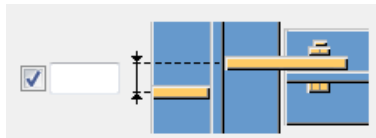
### Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer

Option	Description
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### Opposite web stiffener offset

Define the opposite web stiffener offset from the shear tab center line.



### Haunch tab

Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges.

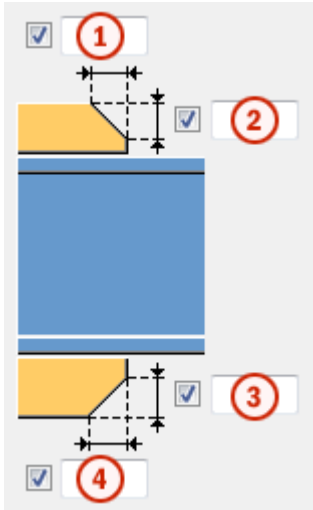
### Haunch plates

Option	Description
<b>Top plate</b>	Top haunch plate thickness, width and height.
<b>Bottom plate</b>	Bottom haunch plate thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
<b>Name</b>	Name that is shown in drawings and reports.	



### Haunch plate chamfers



	Description
<b>1</b>	Width of the top haunch plate chamfer.
<b>2</b>	Height of the top haunch plate chamfer.
<b>3</b>	Height of the bottom haunch plate chamfer.
<b>4</b>	Width of the bottom haunch plate chamfer.

### Haunch plate creation

Option	Description
	<p>Default</p> <p>Top and bottom haunch plates are created, if needed.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>Top or bottom haunch plate or both are created, if needed.</p>

Option	Description
	<p>Top and bottom haunch plates are created.</p> <p>To create a single plate, enter 0 in the thickness (<b>t</b>) field for the plate you do not need (top or bottom plate).</p>
	<p>Haunch plates are not created.</p>

### **Notch tab**






Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

### **Automatic notching**

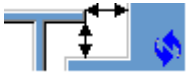

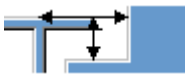
Automatic notching options affect both the top and the bottom flange.

### **Notch shape**

Automatic notching is switched on when you select a notch shape.

Option	Description
	<p>Default</p> <p>Creates notches to the secondary beam.</p> <p>AutoDefaults can change this option.</p>
	<p>Creates notches to the secondary beam. The cuts are square to the main beam web.</p>
	<p>Creates notches to the secondary beam. The cuts are square to the secondary beam web.</p>
	<p>Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.</p>
	<p>Turns off automatic notching.</p>




## Notch size

Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.






## Flange cut shape

Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

## Notch dimension rounding

Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

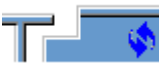


Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.

Option	Description
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.


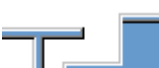


The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



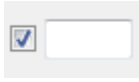
### Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

### Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.








### Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.



### Side of flange notch

The side of flange notch defines on which side of the beam the notches are created.

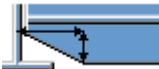



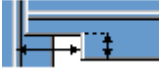
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

### Flange notch shape

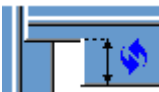
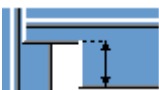

The flange notch shape defines the notch shape in the beam flange.

Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.



Option	Description
	Creates chamfers in the flange. If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.
	Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b> .
	The flange is not cut.
	Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.
	Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b> .

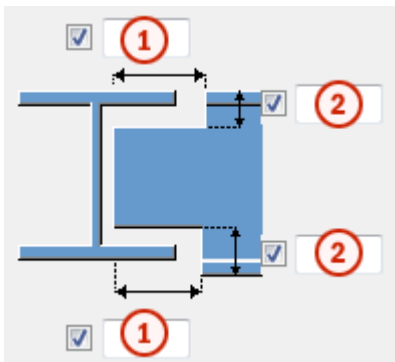
### Flange notch depth

Option	Description
	Default Flange notch depth. AutoDefaults can change this option.
	Flange notch depth.
	Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.

Enter the value for flange notch depth.

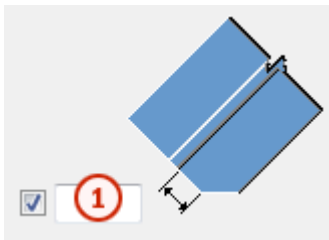
 

### Cut dimensions



	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### Dimension from web to flange cut



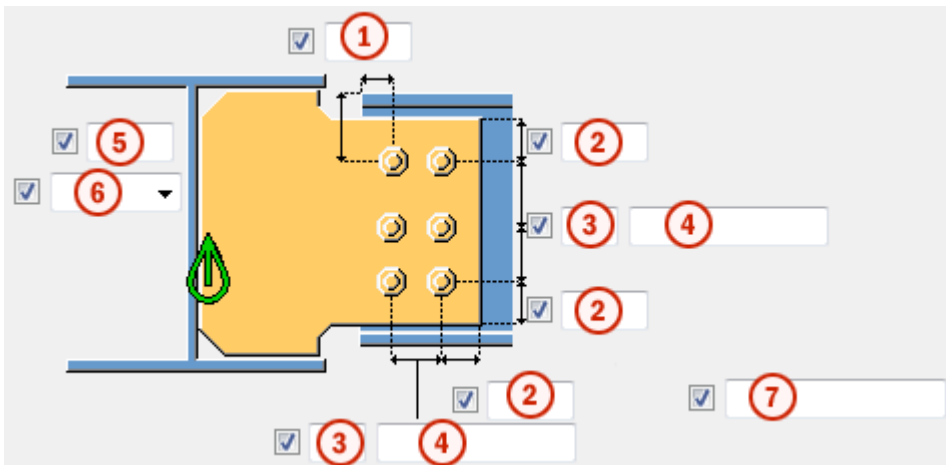
	Description
1	Define the distance between the web and the flange cut.

### Bolts tab

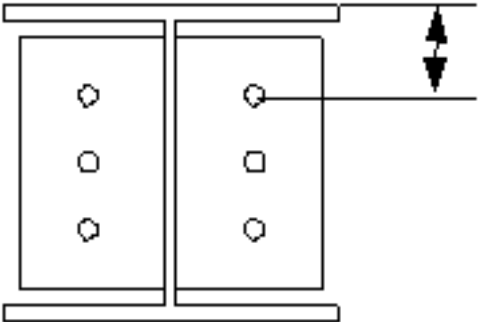
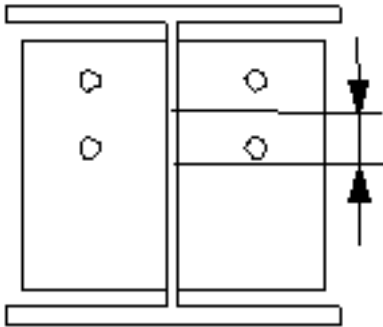
Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part.

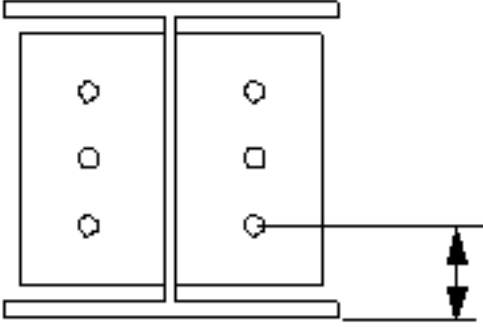
### Bolt group dimensions

Bolt group dimensions affect the size and shape of the shear tab.









	Description
1	Dimension for horizontal bolt group position.






	<b>Description</b>
<b>2</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>3</b>	Number of bolts.
<b>4</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>5</b>	Dimension for vertical bolt group position.
<b>6</b>	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> <div style="text-align: center; margin: 10px 0;">  </div> <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul> <div style="text-align: center; margin: 10px 0;">  </div>

	Description
	<ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
7	<p>Define which bolts are deleted from the bolt group.</p> <p>Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.</p>

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

## Bolt group orientation

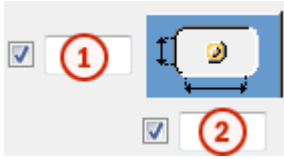
Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.

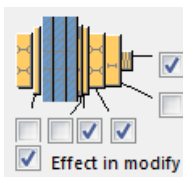


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<p><b>Slotted</b> creates slotted holes.</p> <p><b>Oversized</b> creates oversized or tapped holes.</p> <p><b>No hole</b> does not create holes.</p>	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.






To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## Bolting direction

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

## Beam cut tab

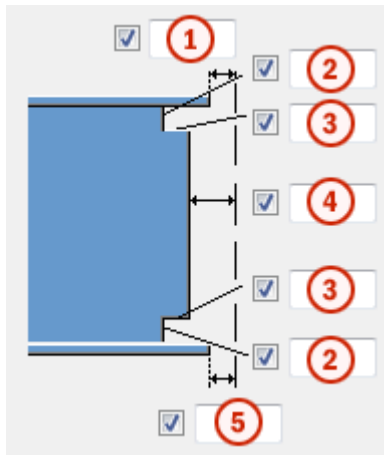
Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts.

### Weld backing bar

Option	Description
<b>Weld backing bar</b>	Weld backing bar thickness and width.





Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

## Weld access hole dimensions






	Description
1	Gap between the secondary part top flange and the main part.
2	Vertical dimensions for the top and the bottom weld access holes.
3	Horizontal dimensions for the top and the bottom weld access holes.
4	Gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.
5	Gap between the secondary part bottom flange and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.





## Weld access holes



Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	









Option	Description	Default
	Round weld access hole with a radius that you can define in r <input checked="" type="checkbox"/> <input type="text"/>	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and Top Prep x <input checked="" type="checkbox"/> <input type="text"/> Bottom Prep x <input checked="" type="checkbox"/> <input type="text"/>	
	Cone-shaped weld access hole with radiuses that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and r <input checked="" type="checkbox"/> <input type="text"/> Capital <b>R</b> defines the large radius (height). Small <b>r</b> defines the small radius.	R = 35 r = 10

### Beam end preparation









Option	Description
	Default Top and bottom flange are prepared. AutoDefaults can change this option.
	Automatic Top and bottom flange are prepared.
	Beam end is not prepared.
	Top and bottom flange are prepared.

Option	Description
	Top flange is prepared.
	Bottom flange is prepared.

### Flange cut




Option for top flange	Option for bottom flange	Description
		Default Flange is not cut. AutoDefaults can change this option.
		Flange is not cut.
		Flange is cut.

### Weld backing bars

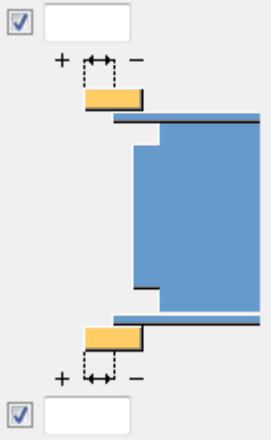
Option for top backing bar	Option for bottom backing bar	Description
		Default Backing bars are created inside the flanges. AutoDefaults can change this option.
		No backing bars are created.
		Backing bars are created inside the flanges.
		Backing bars are created outside the flanges.

### Weld backing bar length

Enter the length of the weld backing bar in the box below the options.

Option	Description
	Default Absolute length of the backing bar AutoDefaults can change this option.
	Absolute length of the backing bar
	Extension beyond the edge of the flange

### Weld backing bar position

Option	Description
	Enter a positive or a negative value to move the front end of the backing bar relative to the end of the flange.

### Assembly type

Define the location where the weld backing bar welds are made. When you select the **Workshop** option, Tekla Structures includes the backing bars in the assembly.

#### **General tab**

Click the link below to find out more:

[General tab](#)

#### **Design tab**

Click the link below to find out more:

[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

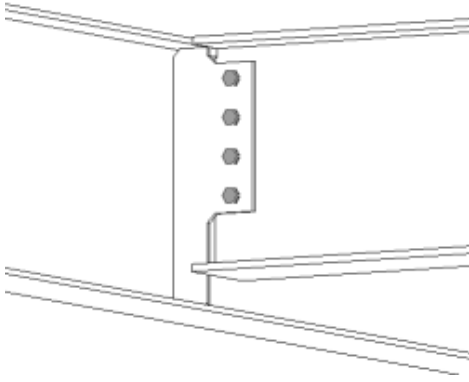
## **JP Full depth special (185)**

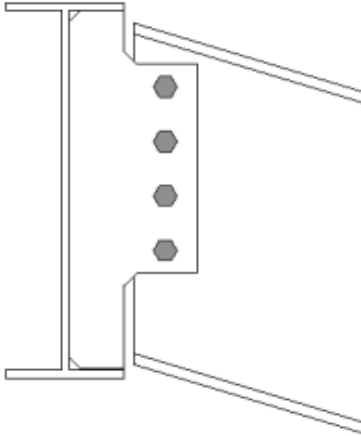
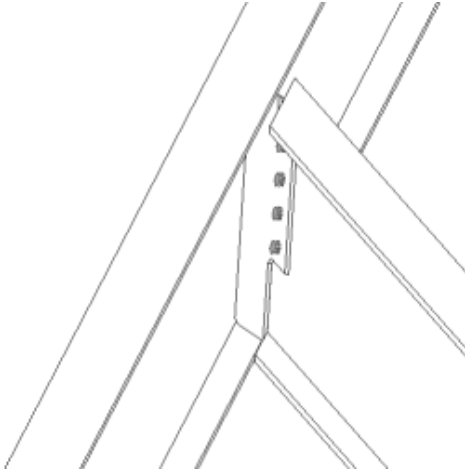
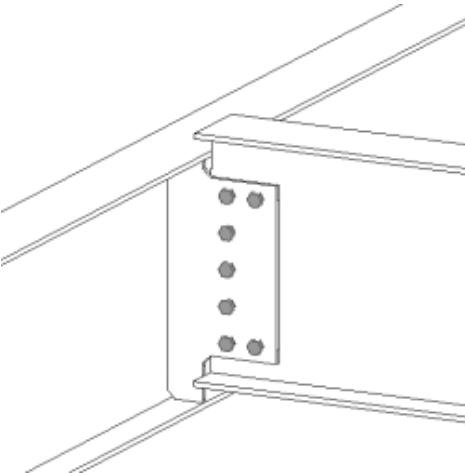
**JP Full depth special (185)** connects two beams with a full depth shear tab. The shear tab is welded to the main beam web and flanges, and bolted to the secondary beam web. The secondary beam can be leveled or sloped. A stiffener plate can be created on the opposite side of the main beam web.

### **Objects created**

- Shear tabs (1 or 2)
- Stiffener (optional)
- Bolts
- Welds

### **Use for**

<b>Situation</b>	<b>Description</b>
	Full depth shear tab.

Situation	Description
	<p>Full depth shear tab. The secondary part is sloped.</p>
	<p>Full depth shear tab. The secondary part is sloped and skewed.</p>
	<p>Full depth shear tab. The secondary part is offset. Some bolts have been deleted.</p>

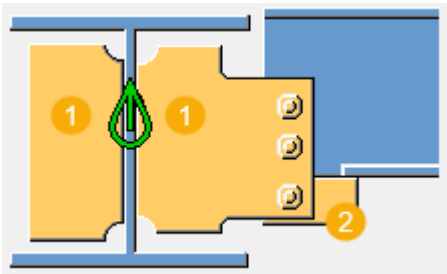
**Selection order**

1. Select the main part (beam).

- Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key

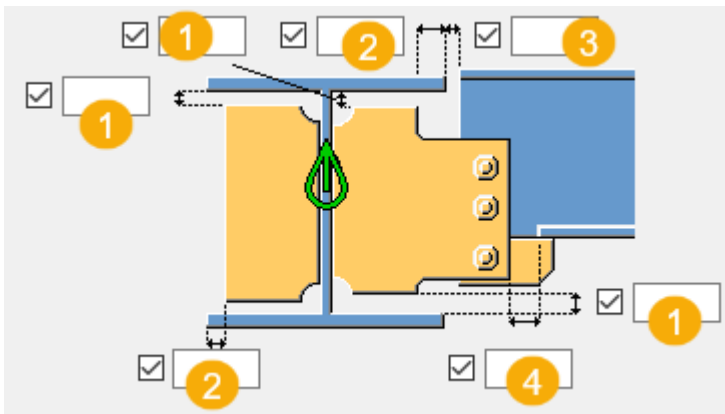


	Description
1	Shear tab
2	Stiffener

### Picture tab

Use the **Picture** tab to control the position of the shear tab, and the beam flange and web cuts.

### Dimensions









1	Shear tab edge distance from the main part flange edge.
2	Shear tab edge distance from the main part flange edge.
3	Cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.

<b>4</b>	Size of the strip made to the secondary part flange. The cut of the flange is defined from the shear tab edge.
----------	---


### Beam end cut



Define how the secondary beam end is cut. The beam is viewed from the side.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.
	Square Cuts the end of the secondary beam square.
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.
	Square cut closer to the main part web Cuts the end of the secondary beam square and places the beam closer to the main part web.
	Clipped flange Cuts the corner of the flange at the end of the secondary beam.

### Beam web cut




Define how the secondary beam web end is cut. The beam is viewed from the top.

Option	Description
	Default Bevel AutoDefaults can change this option.




Option	Description
	Bevel Cuts the end of the web bevel when the end of the secondary beam is cut bevel.
	Square Cuts the end of the web square even if the end of the secondary beam is cut bevel.

### Beam flange cut

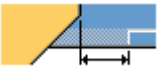
Define how the secondary beam flange end is cut. The beam is viewed from the top.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Bevel Cuts the end of the flange bevel.
	Square Cuts a part of the flange square and leaves a part of it bevel.




### Beam bottom flange cut

Option	Description
	Default Flange cut AutoDefaults can change this option.
	Notch The bottom of the secondary beam is notched if the shear tab crosses the flange. Enter the notch radius and height.
	Flange cut The secondary beam flange is cut on the same side as the shear tab if the shear tab crosses the flange.



Option	Description
	Shear tab cut Enter the dimension to the secondary part flange cut.

### Shear tab shape

Option	Description
	Default Square cut AutoDefaults can change this option.
	Square cut
	Bevel cut

### Plates tab

Use the **Plates** tab to control the size, position, number, and shape of the shear tab.






### Shear tab plate

Option	Description
<b>Tab plate</b>	Shear tab plate thickness, width and height.





Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
<b>Name</b>	Name that is shown in drawings and reports.	

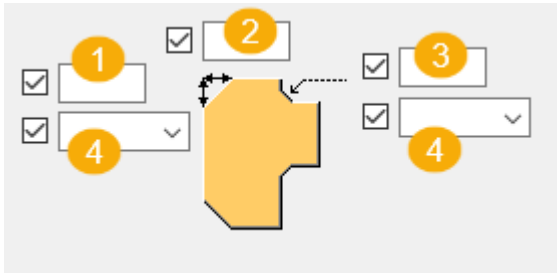
### Shear tab position

Option	Description
	Default Near side shear tab AutoDefaults can change this option.
	Automatic The component automatically selects either the near side or the far side shear tab. The tab is created to the side of the secondary part when the angle between the main part and the secondary part is less than 90 degrees.
	Near side shear tab
	Near side and far side shear tab
	Far side shear tab

### Shear tab orientation

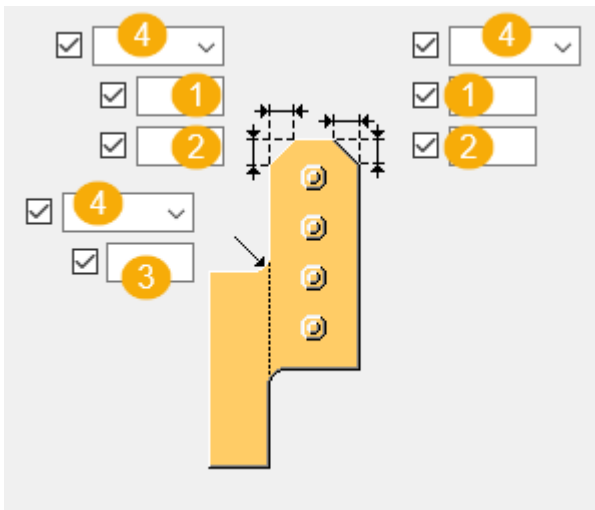
Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Sloped The shear tab is sloped in the direction of the secondary beam. Both vertical edges of the shear tab are cut parallel to the end of the secondary beam.
	Square

### Shear tab chamfers



	Description
1	Vertical dimension of the shear tab chamfer.
2	Horizontal dimension of the shear tab chamfer.
3	Shear tab chamfer radius.
4	Select the chamfer type.

### Inner shear tab chamfers



	Description
1	Horizontal dimension of the shear tab chamfer.
2	Vertical dimension of the shear tab chamfer.
3	Shear tab chamfer radius.
4	Select the chamfer type.

### **Stiffeners tab**




Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type.



## Opposite web stiffener plate dimensions

Option	Description
<b>Opposite web stiffener</b>	Opposite web stiffener plate thickness, width and height.

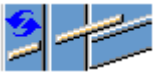


Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

## Stiffener creation

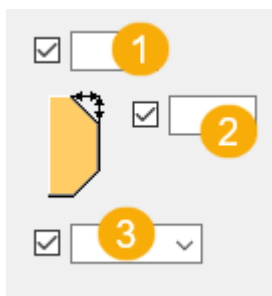
Option	Description
	Default No stiffeners are created. AutoDefaults can change this option.
	Full Creates a full stiffener of the same height as the web of the main part.
	Determined by shear tab Tekla Structures determines the size of the stiffener based on the shear tab size. Tekla Structures attempts to keep the bottom edges of the stiffener plate and shear tab level, if possible.

Option	Description
	Partial Leaves a gap between the stiffener plate and the bottom flange of the main part.
	No stiffeners are created.

### Stiffener orientation

Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are perpendicular to the main part.
	Stiffeners are parallel to the secondary part.

### Chamfer dimensions

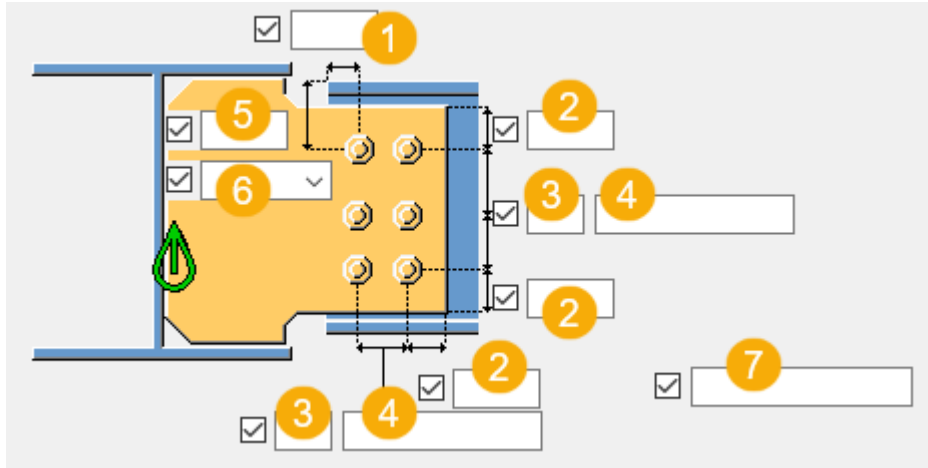


	Description
1	Horizontal dimension of the chamfer.
2	Vertical dimension of the chamfer.
3	Select the chamfer type.

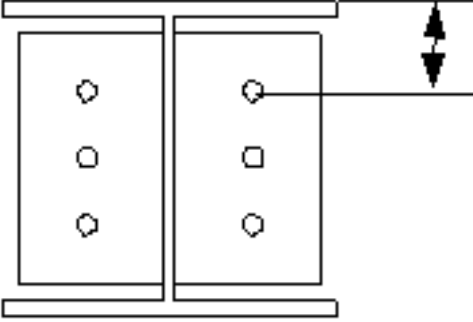
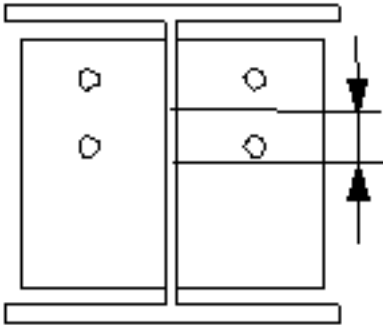
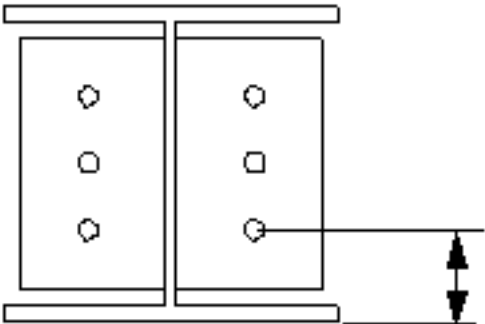
### **Bolts tab**

Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part.

### **Bolt group dimensions**









	<b>Description</b>
<b>1</b>	Dimension for horizontal bolt group position.
<b>2</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>3</b>	Number of bolts.
<b>4</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>5</b>	Dimension for vertical bolt group position.






	Description
6	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.              </li> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>

	Description
7	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt group orientation

Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.



## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



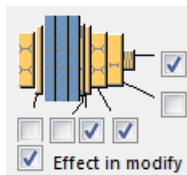
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### **Bolt assembly**

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

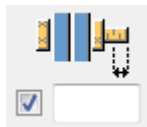
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### ***General tab***

Click the link below to find out more:

General tab

### ***Design tab***

Click the link below to find out more:

Design tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

## Welds

Click the link below to find out more:

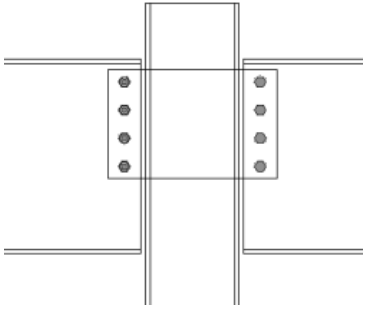
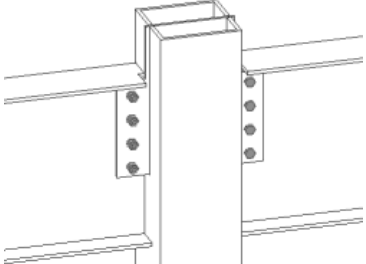
### Shear plate tube column (189)

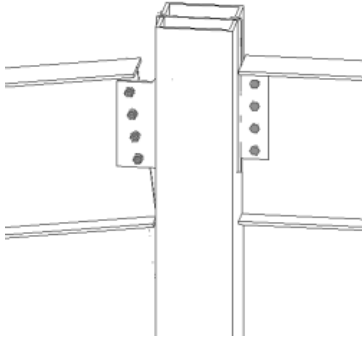
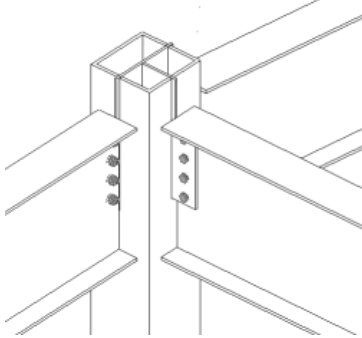
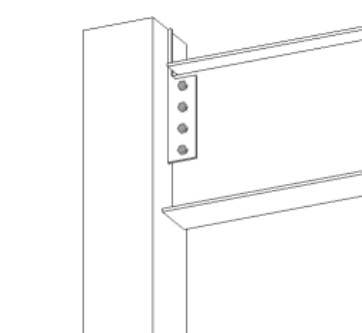
**Shear plate tube column (189)** connects a beam to a tube column with a shear tab. The shear tab goes through the tube column.

#### Objects created

- Shear tab (1 or 2)
- Bolts
- Welds
- Cuts

#### Use for

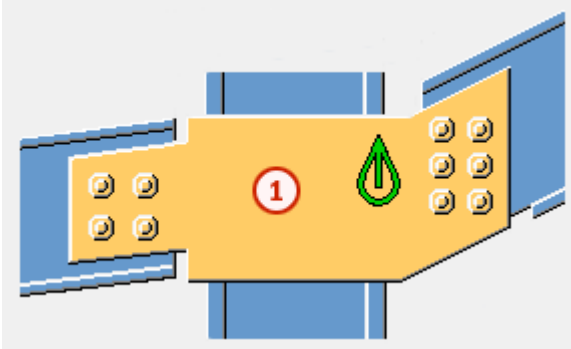
Situation	Description
 A technical drawing showing a cross-section of a vertical tube column. Two horizontal beams are attached to the column. A vertical shear tab is positioned between the two beams, passing through the tube column. The shear tab is secured with four bolts on each side of the column.	Shear tab through a tube column with two secondary parts.
 A technical drawing showing a cross-section of a vertical tube column. Two horizontal beams are attached to the column. A vertical shear tab is positioned between the two beams, passing through the tube column. The shear tab extends to the top of the column and is secured with four bolts on each side of the column.	Shear tab through a tube column with two secondary parts. Shear tab extends to the top of the column.

Situation	Description
	<p>Shear tab through a tube column with two secondary parts and bolt alignment options.</p> <p>The secondary parts can be leveled and/or sloped.</p>
	<p>Shear tab through a tube column with two secondary parts.</p> <p>A third secondary part has been added after the connection was created.</p>
	<p>Shear tab through a tube column with one secondary part.</p>

### Selection order

1. Select the main part (column).
2. Select the first secondary part (beam).
3. Select the second secondary part (beam).
4. Click the middle mouse button to create the component.

## Part identification key



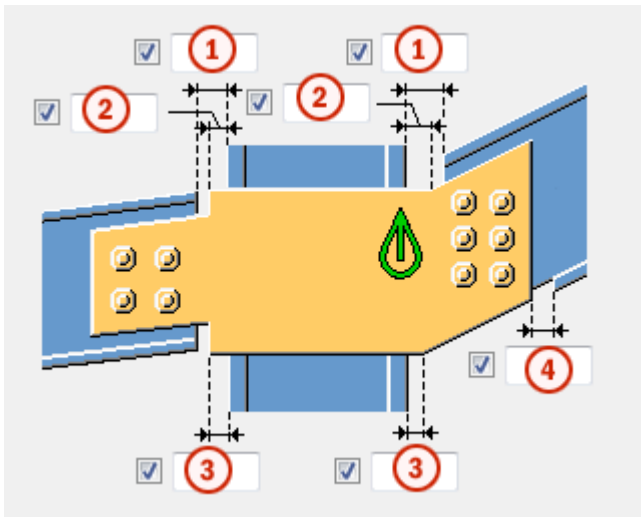
	Part
1	Shear tab

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

## Picture tab

Use the **Picture** tab to control the position of the shear tab and to define how the beam ends are cut.

## Dimensions

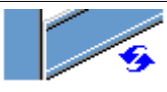
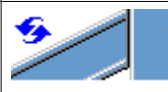
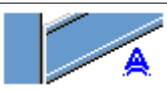
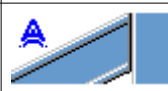

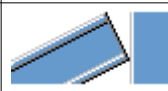
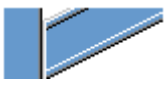



	Description	Default
1	Cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	20 mm

	Description	Default
2	Distance from the edge of the main part to the top corner of the shear tab.	5 mm
3	Distance from the edge of the main part to the bottom corner of the shear tab.	5 mm
4	Size of the strip made to the secondary part flange. The cut of the flange is defined from the shear tab edge.	The flange is automatically stripped when the shear tab crosses the flange. 20 mm

### Beam end cut

Define how the secondary beam end is cut. The beam is viewed from the side.

Option	Option	Description
		Default Bevel AutoDefaults can change this option.
		Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.
		Square Cuts the end of the secondary beam square.
		Bevel Cuts the end of the secondary beam parallel to the edge of the main part.

### Plates tab

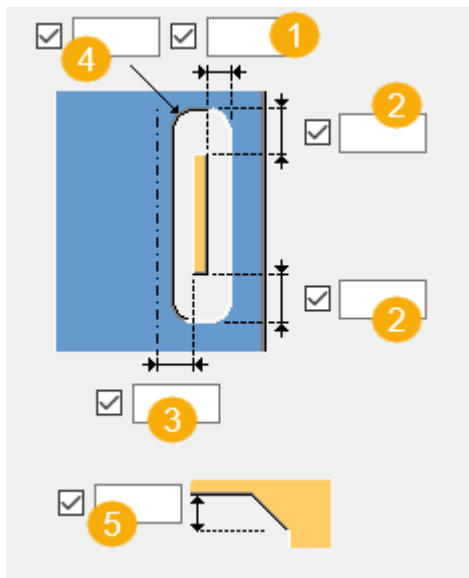
Use the **Plates** tab to control the size, position, number, orientation and shape of the shear tab.

## Shear tab plate

Option	Description
Shear plate	Plate thickness.

Option	Description	Default
Pos_No	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
Material	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
Name	Name that is shown in drawings and reports.	





## Shear tab dimensions



	Description
1	Horizontal size of the cut created for the shear tab.  Equal size is created on both sides of the shear tab.




	Description
2	Vertical size of the cut created for the shear tab. Equal size is created at the top and bottom of the shear tab.
3	Distance from the center line of the shear tab to the center line of the main part. Default value 0 places the shear tab at the center line of the main part.
4	Corner radius of the cut created for the shear tab.
5	Vertical dimension of the shear tab chamfer.

### Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Concave arc chamfer








### Shear tab cut

When the component is created near the column top, the upper edge of the shear tab can be extended to the top of the column.

Option	Description
	Default Line AutoDefaults can change this option.
	Line
	Column top The upper edge of the shear tab is extended to the top of the main part.













## Shear tab shape

Option	Description
	Default Perpendicular to the main part AutoDefaults can change this option.
	Perpendicular to the main part
	Automatic
	Shear tab edges are aligned in the direction of the right secondary part.
	Shear tab edges are aligned in the direction of the left secondary part.
	The edges of the shear tab are connected at the intersection of the secondary part edges.
	Defined by both edges

## Shear tab orientation



Define the shear tab orientation for both secondary parts.

Option	Option	Description
		Default Sloped AutoDefaults can change this option.
		Automatic Sloped or square If the secondary part is sloped less than 10 degrees, a square shear tab is created. Otherwise, the shear tab is sloped in the direction of the secondary part.
		Sloped
		Square

Option	Option	Description
		Sloped with square end cut







### Shear tab top corner shape

Define the shape of the shear tab top corner for both secondary parts.



Option	Option	Description
		Default Bevel AutoDefaults can change this option.
		Bevel
		Square




### Shear tab bottom corner shape

Define the shape of the shear tab bottom corner for both secondary parts.

Option	Option	Description
		Default Bevel AutoDefaults can change this option.
		Bevel
		Square

### Shear tab position

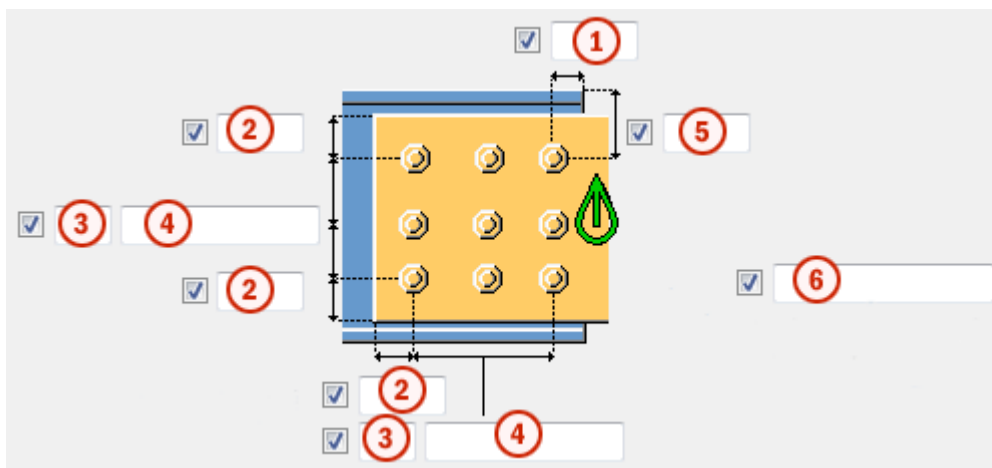
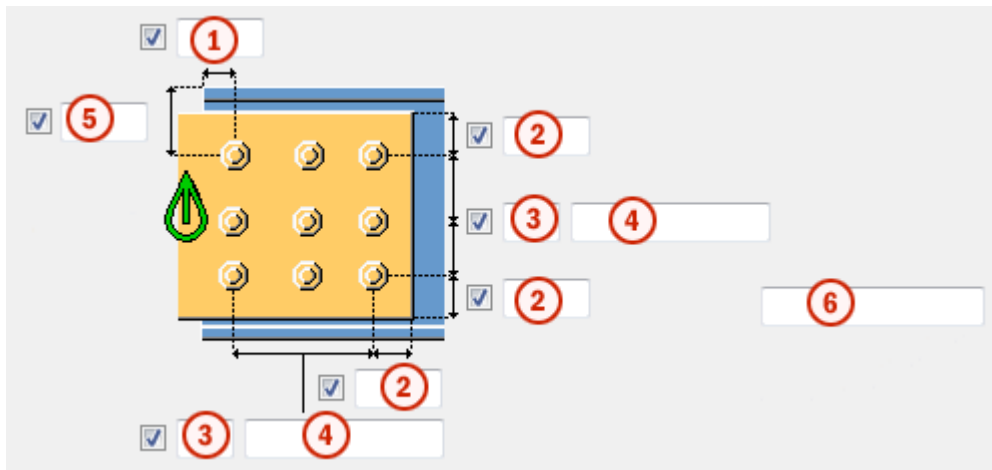
Option	Description
	Default Near side AutoDefaults can change this option.
	Automatic The shear tab is created to the near side when the angle between the main part and the secondary part is less than 90 degrees.

Option	Description
	Near side
	Both sides
	Far side

### 1stSecBolts and 2ndSecBolts tabs

Use the **1stSecBolts** tab and the **2ndSecBolts** tab to control the properties of the bolts that connect the shear tab to the first and the second secondary part.






### Bolt group dimensions





	Description
1	Dimension for horizontal bolt group position.





	Description
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Dimension for vertical bolt group position.
6	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

### Bolt group orientation

Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered

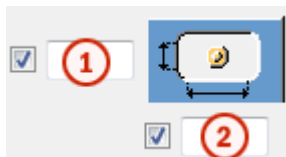
Option	Description
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



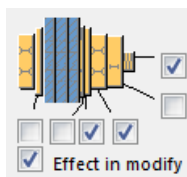
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.

Option	Description	Default
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
Rotate Slots	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
Slots in	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### General tab

Click the link below to find out more:

General tab

### ***Design tab***

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

## **2.2 Clip angle connections**

This section introduces clip angle connection components available in Tekla Structures.

Click the links below to find out more:

- [Angle cleat \(3\) \(page 343\)](#)
- [Two sided angle cleat \(25\) \(page 347\)](#)
- [Clip angle \(116\) \(page 351\)](#)
- [Two sided clip angle \(117\) \(page 361\)](#)
- [Clip angle \(141\) \(page 373\)](#)
- [Two sided clip angle \(143\) \(page 420\)](#)

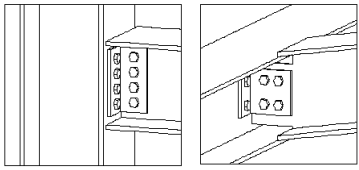
### **Angle cleat (3)**

**Angle cleat (3)** connects two beams or a beam to a column using one or two bolted clip angles.

#### **Objects created**

- Clip angle (L profile)
- Bolts
- Welds

## Use for

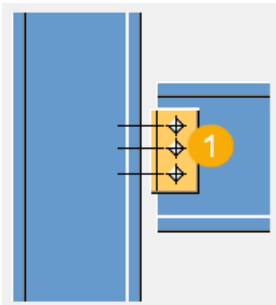
Situation	Description
	Clip angle bolted between the parts. The secondary part can be sloped.

## Selection order

1. Select the main part.
2. Select the secondary part.

The connection is created automatically when the secondary part is selected.

## Part identification key

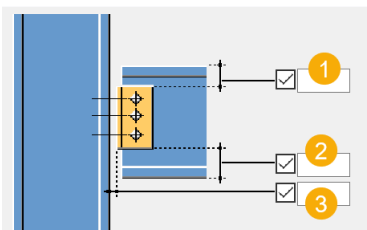


	Description
1	Clip angle

## Picture tab

Use the **Picture** tab to define the clip angle length, and the gap between the main part and the clip angle.

## Dimensions





	<b>Description</b>
<b>1</b>	Clip angle edge distance from the secondary part upper edge. You can control the clip angle length by defining the distance from the secondary part upper and lower edge.
<b>2</b>	Clip angle edge distance from the secondary part lower edge.
<b>3</b>	Gap between the main part and the clip angle. By default, the value is 0.

### **Parts tab**

Use the **Parts** tab to define the clip angle properties.

#### **Parts**

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>L profile</b>	Select the profile from the profile catalog.	L150-100-10

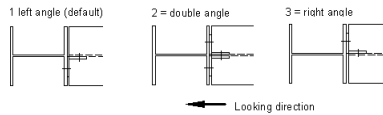
<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tab**

Use the **Parameters** tab to define the location of the clip angles.

## Placing

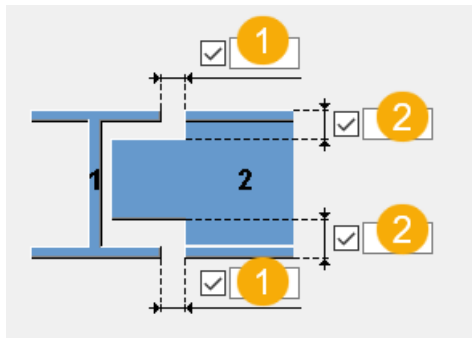
Option	Description
<b>Placing</b>	By default, the clip angle is created on the left side. <b>Middle</b> creates two clip angles.



## Notch tab

Use the **Notch** tab to define the secondary part notch dimensions.

## Cut dimensions



	Description	
<b>1</b>	Dimension for the horizontal flange cut.	10 mm
<b>2</b>	Dimension for the vertical flange cut.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

## General tab

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Bolts***

Click the link below to find out more:

### ***Welds***

Click the link below to find out more:

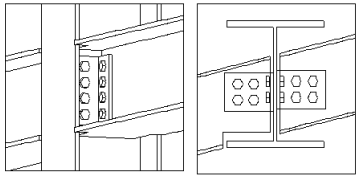
## **Two sided angle cleat (25)**

**Two sided angle cleat (25)** connects two beams to a beam or to a column with one or two bolted clip angles.

### **Objects created**

- Clip angles
- Bolts

### **Use for**

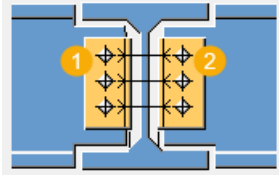
<b>Option</b>	<b>Description</b>
	Two beams connected to a column or a beam with bolted clip angles.

### **Selection order**

1. Select the main part (column or beam).
2. Select the first secondary part (beam).
3. Select the second secondary part (beam).

Click the middle mouse button to create the component.

## Part identification key

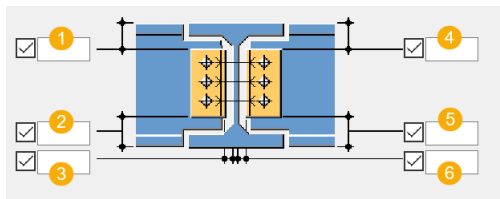


	Description
1	L profile
2	L profile 2

## Picture tab

Use the **Picture** tab to define the L profile length and the gap between the main part and the angle profiles. You can control the L profile length with the L profile edge distance.

## Dimensions



	Description
1	L profile edge distance from the first secondary part upper edge.
2	L profile edge distance from the first secondary part lower edge.
3	Gap between the main part and the angle profile in the first secondary part. By default, the value is zero.
4	L profile 2 edge distance from the second secondary part upper edge.
5	L profile 2 edge distance from the second secondary part lower edge.
6	Gap between the main part and the angle profile in the second secondary part. By default, the value is zero.

## Parts tab

Use the **Parts** tab to define the angle profile properties.

## Parts

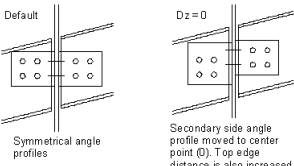
Option	Description	Default
<b>L profile</b>	Select the profile from the profile catalog.	L150-100-10
<b>L profile 2</b>	Select the profile from the profile catalog.	L150-100-10

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tab**

Use the **Parameters** tab to define the position of the angle profiles.

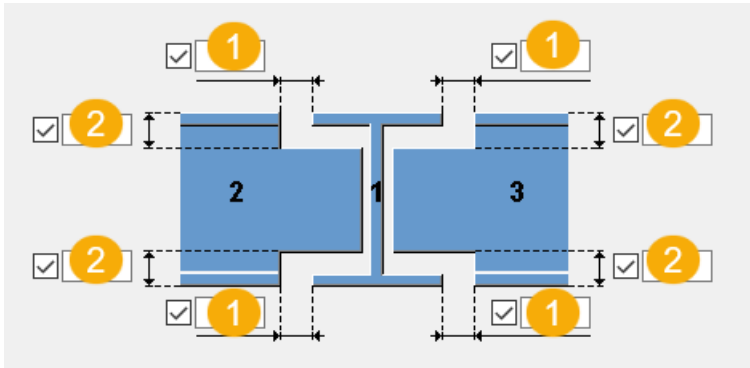
### **Angle profile positions**

Option	Description
<b>Placing, Placing 2</b>	Define the number and side of angles in single angle connections separately for both sides.
<b>Move L-prof. 2 in z direction, Move L-prof. 2 in y direction</b>  	Move the position of angle profiles on the secondary part side.  By default, the angle profiles are symmetrical. For example, when connecting skewed secondary beams, the offsets can be used for placing the angle profiles.

### **Notch tab**

Use the **Notch** tab to define the secondary part notch dimensions.

#### **Cut dimensions**



	<b>Description</b>	<b>Default</b>
<b>1</b>	Dimensions for the horizontal flange cuts.	10 mm
<b>2</b>	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### **Bolts**

Click the link below to find out more:

### **General tab**

Click the link below to find out more:

General tab

### **Analysis tab**

Click the link below to find out more:

Analysis tab

## ***Design tab***

Click the link below to find out more:

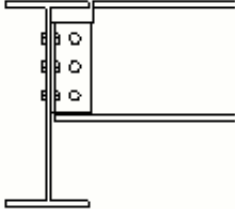
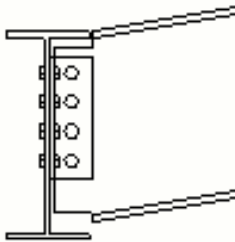
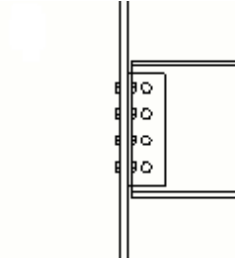
### **Clip angle (116)**

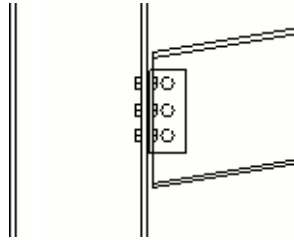
**Clip angle (116)** connects a beam to a beam or a column with a clip angle.

#### **Objects created**

- Clip angle (1 or 2)
- Bolts
- Cuts

#### **Use for**

<b>Situation</b>	<b>Description</b>
	Clip angle connection to a beam web.
	Clip angle connection to a beam web. The secondary beam is sloped.
	Clip angle connection to a column flange.

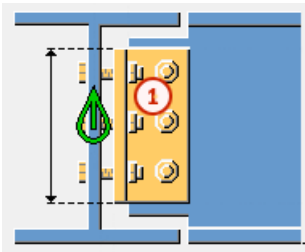
Situation	Description
	<p>Clip angle connection to a column flange. The secondary beam is sloped.</p>

### Selection order

1. Select the main part (beam or column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key

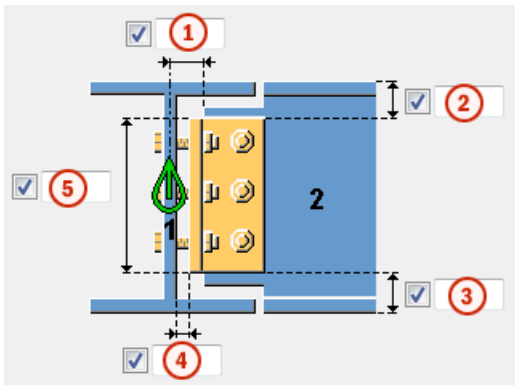


	Part
1	Clip angle

### Picture tab

Use the **Picture** tab to control the clip angle dimensions and the clip angle position.





### Dimensions





	Description	Default
1	Cut length for the secondary part.	
2	Clip angle upper edge distance from the top of the secondary beam.  The upper edge position of the angle modifies the clip angle height.  Positive value moves the top position closer to the beam center and thus decreases the clip angle size. Negative values increase the clip angle size.	If no value is entered, bolts and bolt edge distances define the size of the clip angle.
3	Clip angle lower edge distance from the bottom of the secondary beam.  The lower edge position of the angle modifies the clip angle height.  Positive value moves the top position closer to the beam center and thus decreases the clip angle size. Negative values increase the clip angle size.	If no value is entered, bolts and bolt edge distances define the size of the clip angle.
4	Gap between the main part and the clip angle.	
5	Height of the clip angle.	

### Clip angle position

Option	Description
	Default Near and far side clip angles are created. AutoDefaults can change this option.
	Near side clip angle is created.
	Near side and far side clip angles are created.
	Far side clip angle is created.

### Parts tab

Use the **Parts** tab to control the properties of the clip angle.

## Clip angle

Part	Description
<b>L profile</b>	Define the clip angle profile by selecting it from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### **Notch tab**

Use the **Notch** tab to create notches for the secondary beam and to control the notch properties.

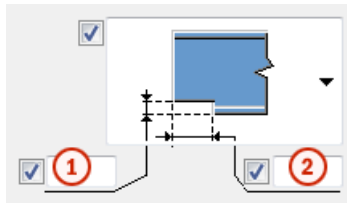
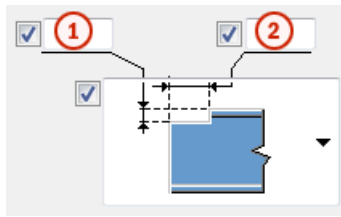
### **BCSA notch definition**

Define whether the notch is created according to British Constructional Steelwork Association (BCSA) specifications.

Option	Description
<b>Default</b>	Notch dimensions.
<b>Yes</b>	Creates a 50 mm notch for simple beam-to-beam connections.
<b>No</b>	Use the options on this <b>Notch</b> tab to define the notch dimensions.

## Notch dimensions

Define the top and the bottom dimensions of the notch if you have set the **BCSA notch def** option to **No**.

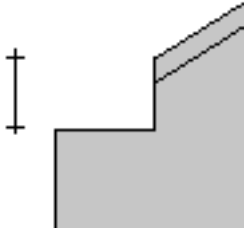
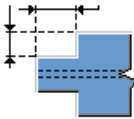
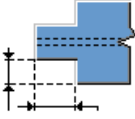
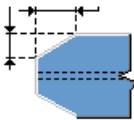
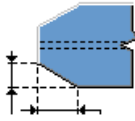
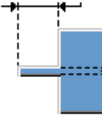
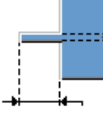
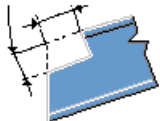
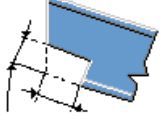


	Description
1	Vertical notch dimension.
2	Horizontal notch dimension.

## Notch shape


Define the notch shape for the top and the bottom of the secondary beam.




Option	Option	Description
		Default Creates a square notch on the top side or on the bottom side of the secondary beam. AutoDefaults can change this option.
		No notch
		Creates a square notch on the top side or on the bottom side of the secondary beam. Define the notch dimensions. In beam-to-beam connections with a sloped secondary beam,

Option	Option	Description
		<p>the depth is measured as shown in the picture.</p> 
		<p>Creates a notch on both sides of the secondary part.</p> <p>Define the notch dimensions.</p>
		<p>Creates a chamfered notch on both sides of the secondary beam.</p> <p>Define the chamfer dimensions.</p>
		<p>Creates a strip.</p> <p>Define the length of the strip. The flanges are cut completely.</p>
		<p>Creates a special type of square notch.</p> <p>Define the notch dimensions. The notch is square to the secondary beam. There are no default values for the length or the depth.</p>

### Notching side

Define on which side of the secondary beam the notch is created. You can define the side for both the top and the bottom of the secondary beam.

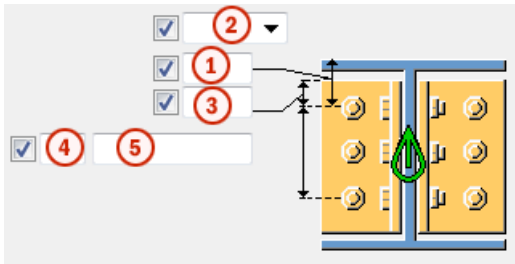
Option	Description
	<p>Default</p> <p>Creates notches on both sides.</p> <p>AutoDefaults can change this option.</p>

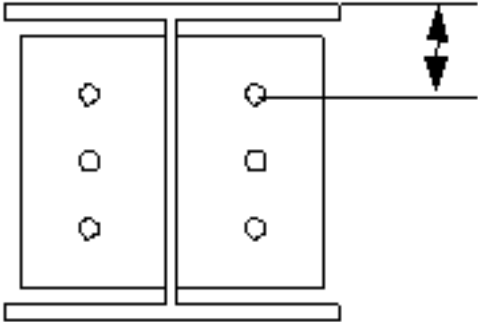
Option	Description
	Creates notches on both sides.
	Creates a notch on the left side.
	Creates a notch on the right side.

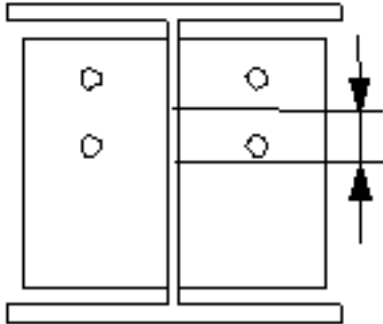
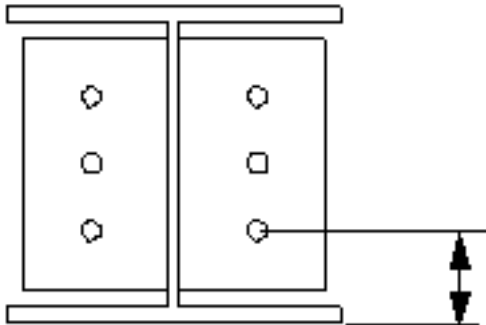
### **Bolts tab**

Use the **Bolts** tab to control the bolt properties. The vertical position of bolts in the main part must be aligned with the vertical position of bolts in the secondary part. Vertical bolts cannot be staggered.



### **Bolt group dimensions**







	Description
1	Dimension for vertical bolt group position.
2	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

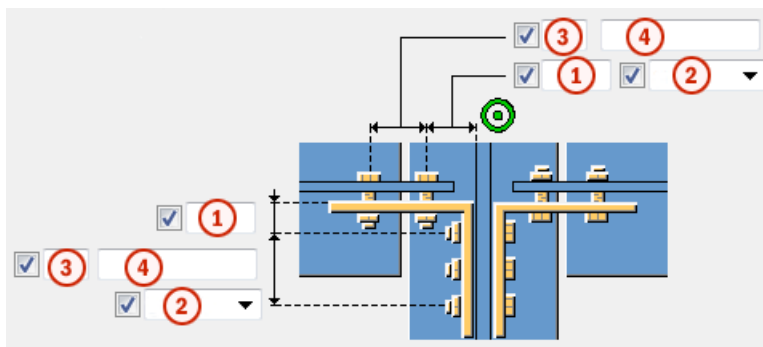
	Description
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered

Option	Description
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt group dimensions



	Description
1	Bolt edge distance.
2	Location where the bolts should be attached.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	

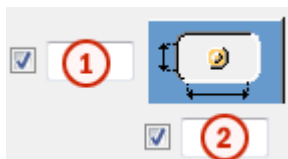
Option	Description	Default
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Cut length

Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

### Slotted holes

You can define slotted, oversized, or tapped holes.



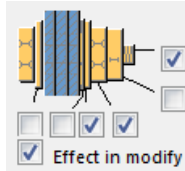
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	



## **Bolt assembly**

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## **General tab**

Click the link below to find out more:

[General tab](#)

## **Design tab**

Click the link below to find out more:

[Design tab](#)

## **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

## **Welds**

Click the link below to find out more:

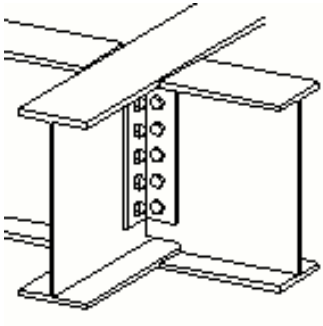
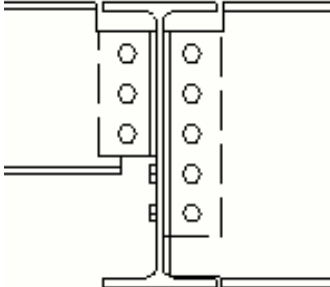
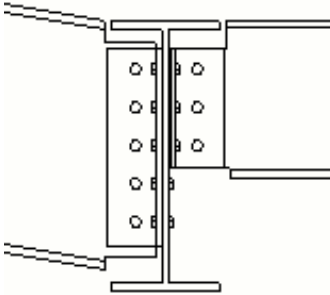
## Two sided clip angle (117)

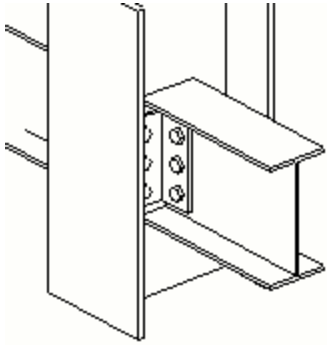
**Two sided clip angle (117)** connects two beams to a beam or a column using clip angles. The clip angles are bolted to the secondary beams and to the main part.

### Objects created

- Clip angles (2 or 4)
- Bolts
- Cuts

### Use for

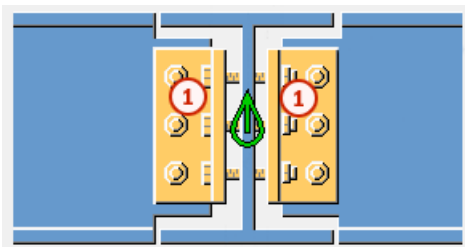
Situation	Description
 A 3D perspective drawing showing a clip angle bolted to the web of a main beam. Two secondary beams are attached to the clip angle, one above and one below the main beam's web.	Clip angle connection to a beam web.
 A 2D cross-sectional diagram of a clip angle connection. The clip angle is bolted to the web of a main beam. Two secondary beams are attached to the clip angle, one above and one below. The secondary beams have different heights, with the top one being taller than the bottom one.	Clip angle connection to a beam web. Two secondary beams with different heights.
 A 2D cross-sectional diagram of a clip angle connection. The clip angle is bolted to the web of a main beam. One secondary beam is attached to the clip angle above the main beam, and another secondary beam is attached below. The secondary beam above is sloped downwards.	Clip angle connection to a beam web. The other secondary beam is sloped.

Situation	Description
	Clip angle connection to a column web.

### Selection order

1. Select the main part (beam or column).
2. Select the first secondary part (beam).
3. Select the second secondary part (beam).
4. Click the middle mouse button to create the connection.

### Part identification key

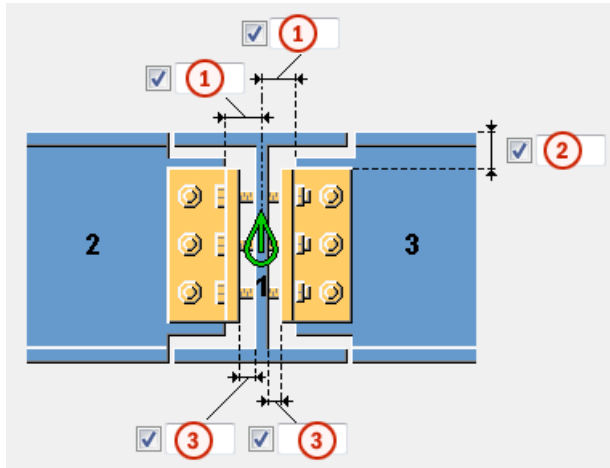


	Part
1	Clip angle

### Picture tab





Use the **Picture** tab to control the dimensions and the position of the clip angle.

## Dimensions



	Description	Default
1	Cut length for the secondary part.	2.25 mm
2	Clip angle upper edge distance from the top of the secondary beam.  The upper edge position of the angle modifies the clip angle height.  Positive value moves the top position closer to the beam center and thus decreases the clip angle size. Negative values increase the clip angle size.	If no value is entered, bolts and bolt edge distances define the size of the clip angle.
3	Gap between the main part and the clip angle.	

## Clip angle position

Option	Description
	Default Near side and far side clip angles are created. AutoDefaults can change this option.
	Near side clip angles are created.
	Near side and far side clip angles are created.
	Far side clip angles are created.

### **Parts tab**

Use the **Parts** tab to control the clip angle properties.

### **Clip angle**

<b>Part</b>	<b>Description</b>
<b>L profile, L profile 2</b>	Define the clip angle profile by selecting it from the profile catalog.
<b>Angle 1 length, Angle 2 length</b>	Define the length of the clip angle both on the first secondary part and the second secondary part side.

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### **Move cleats to smaller web**

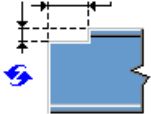
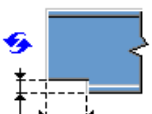


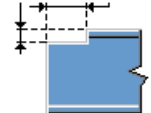
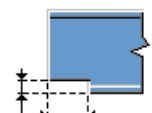
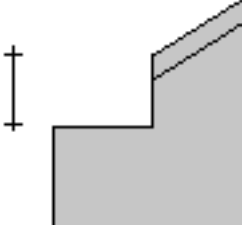
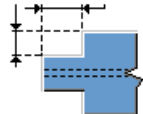
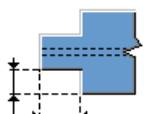
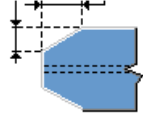
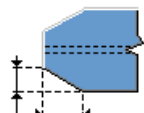
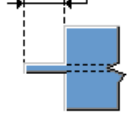
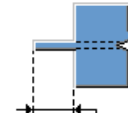
Define the position of the cleats.


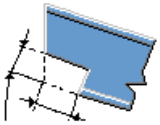
### **Notch tab**

Use the **Notch** tab to create notches for the secondary beams and to control the notch properties. Define the notches for both secondary beams.

### **Notch shape**





Define the notch shape for the top and the bottom of the secondary beam.

Option	Option	Description
		<p>Default</p> <p>Creates a square notch on the top side or on the bottom side of the secondary beam.</p> <p>AutoDefaults can change this option.</p>
		<p>No notch</p>
		<p>Creates a square notch on the top side or on the bottom side of the secondary beam.</p> <p>Define the notch dimensions. In beam-to-beam connections with a sloped secondary beam, the depth is measured as shown in the picture.</p> 
		<p>Creates a notch on both sides of the secondary part.</p> <p>Define the notch dimensions.</p>
		<p>Creates a chamfered notch on both sides of the secondary beam.</p> <p>Define the chamfer dimensions.</p>
		<p>Creates a strip.</p> <p>Define the length of the strip. The flanges are cut completely.</p>

Option	Option	Description
		<p>Creates a special type of square notch.</p> <p>Define the notch dimensions. The notch is square to the secondary beam. There are no default values for the length or the depth.</p>

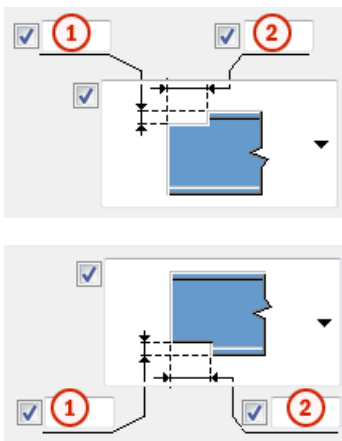
### Notching side

Define on which side of the secondary beam the notch is created. You can define the side for both the top and the bottom of the secondary beam.

Option	Description
	<p>Default</p> <p>Creates notches on both sides.</p> <p>AutoDefaults can change this option.</p>
	<p>Creates notches on both sides.</p>
	<p>Creates a notch on the left side.</p>
	<p>Creates a notch on the right side.</p>

### Notch dimensions

Define the top and the bottom dimensions of the notch if you have set the **BCSA notch def** option to **No**.



	Description
1	Vertical notch dimension.
2	Horizontal notch dimension.

### BCSA notch definition

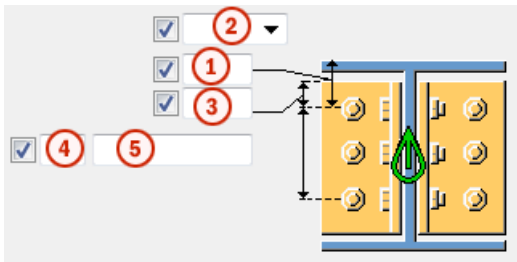
Define whether the notch is created according to British Constructional Steelwork Association (BCSA) specifications.

Option	Description
<b>Default</b>	Notch dimensions.
<b>Yes</b>	Creates a 50 mm notch for simple beam-to-beam connections.
<b>No</b>	Use the options on this <b>Notch</b> tab to define the notch dimensions.

### Bolts tab

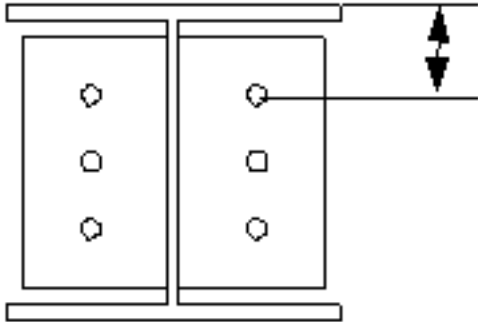
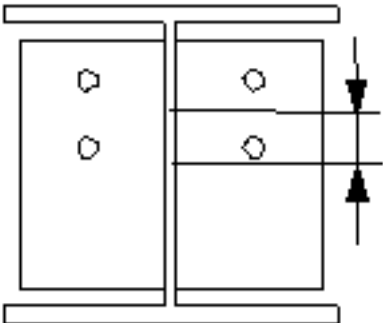
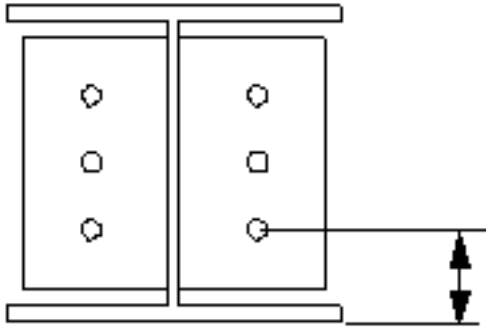
Use the **Bolts** tab to control the bolt properties.

#### Bolt group dimensions









	Description
1	Dimension for vertical bolt group position.



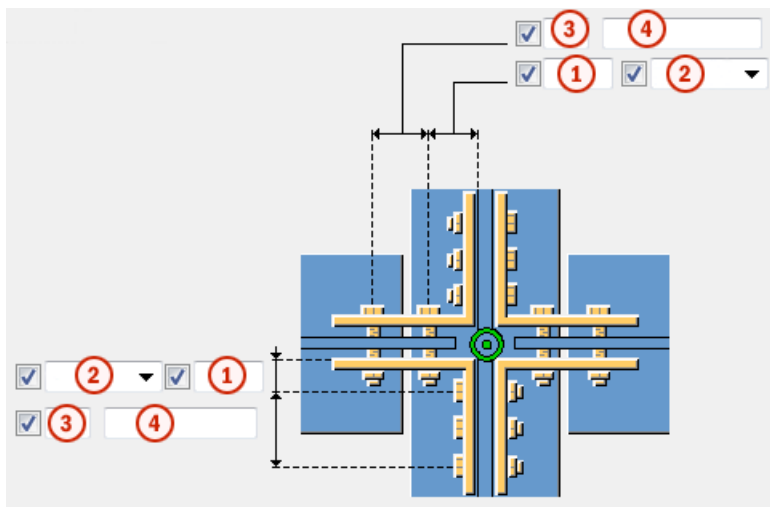
	<b>Description</b>
<b>2</b>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 

	Description
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Number of bolts.
5	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt group dimensions



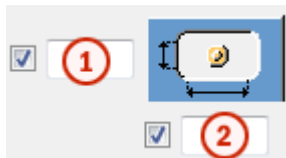
	Description
1	Bolt edge distance.
2	Location where the bolts should be attached.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



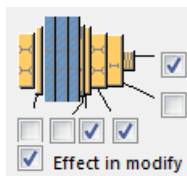
Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.

Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### **Bolt assembly**

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

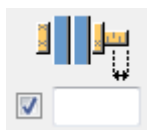
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

## **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

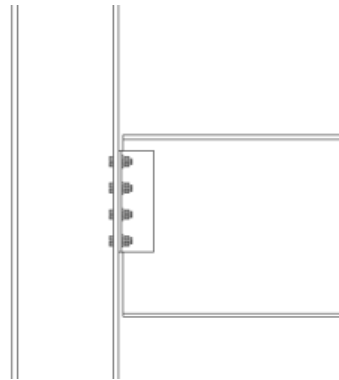
## **Clip angle (141)**

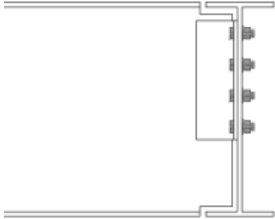
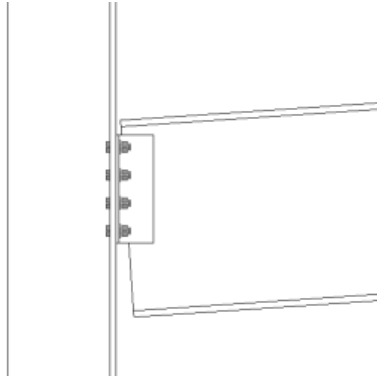
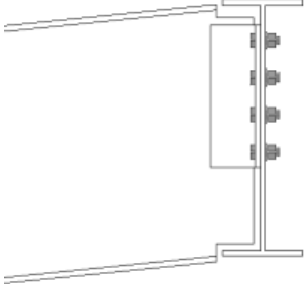
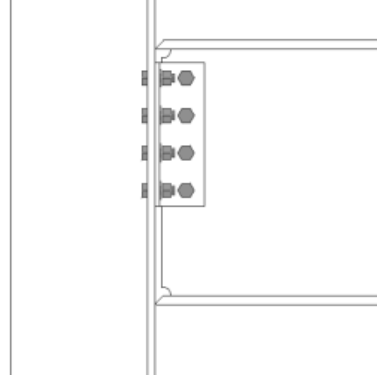
**Clip angle (141)** connects two beams, or a beam to a column, using bolted or welded clip angles. The secondary beam can be leveled or sloped. Welded haunch plates and seat angles are optional.

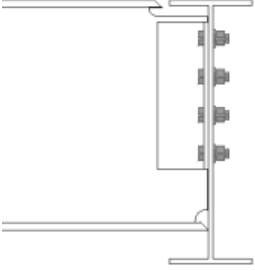
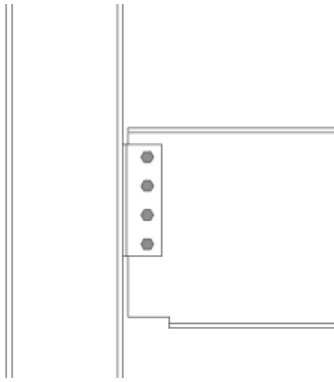
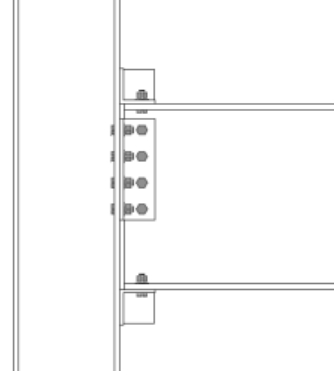
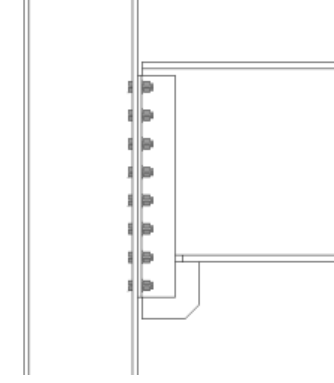
### **Objects created**

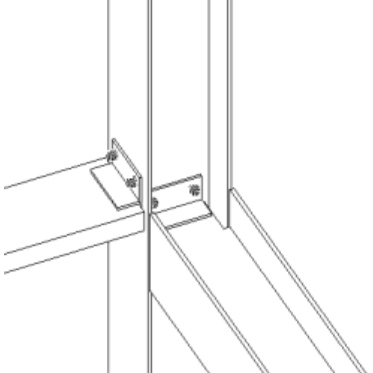
- Clip angles (1 or 2)
- Stiffeners (optional)
- Top and bottom haunch plate (optional)
- Seat angle (optional)
- Seat stiffeners (optional)
- Bolts
- Plate washers (optional)
- Welds
- Cuts

### **Use for**

<b>Situation</b>	<b>Description</b>
	Clip angle connection to column flange or web. Single-sided/double-sided clip. Welded/bolted, bolted/bolted, welded/welded options.

Situation	Description
	<p>Clip angle connection to beam web. Single-sided/double-sided clip.</p>
	<p>Clip angle connection to column flange or web. Single-sided/double-sided clip. The secondary part is sloped. The secondary part end can be cut square or bevel.</p>
	<p>Clip angle connection to beam web. Single-sided/double-sided clip. The secondary part is sloped. There are several notching options.</p>
	<p>Clip angle connection to column flange or web. Single-sided/double-sided clip. Weld preparation and weld access holes for moment connection.</p>

Situation	Description
	<p>Clip angle connection to beam web. Single-sided/double sided clip. Option for weld preparation.</p>
	<p>Clip angle connection to column flange. Bottom flange is blocked or stripped for erection.</p>
	<p>Clip angle connection to column. Seat angle option. Top/Bottom/Both.</p>
	<p>Clip angle connection to column flange or web. Single-sided/double-sided clip. Haunch option. Top/Bottom/Both.</p>

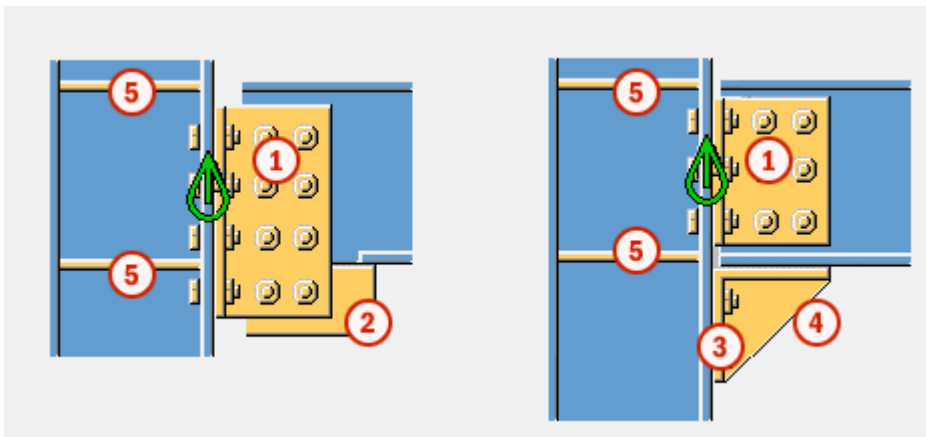
Situation	Description
	<p>Clip angle connection to column flange or web. Single-sided/double-sided clip. Secondary part is rotated.</p>

### Selection order

1. Select the main part (beam or column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key



	Part
1	Clip angles
2	Haunch plate
3	Seat angle
4	Seat stiffener
5	Web stiffeners

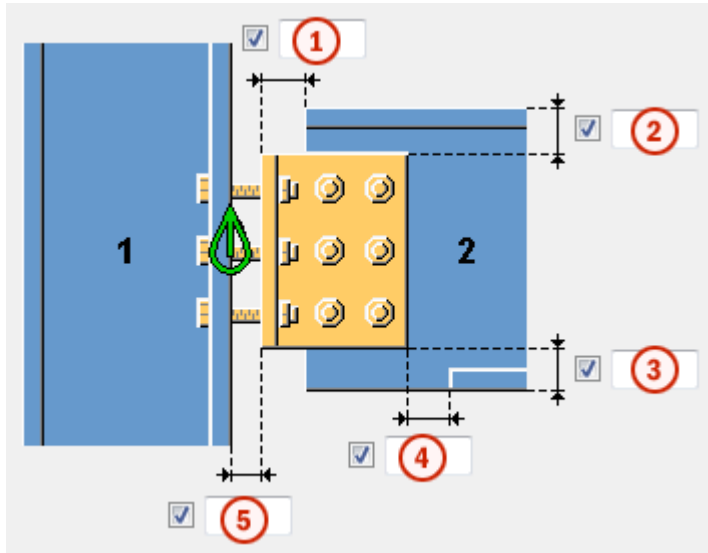
**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.



### Picture tab

Use the **Picture** tab to control the clip angle dimensions and to define how the beam end is cut.




### Dimensions



	Description	Default
<b>1</b>	Cut length for the secondary part. The cut is defined from the clip angle edge.	20 mm
<b>2</b>	Clip angle upper edge distance from the top of the secondary beam. The upper edge position of the angle modifies the clip angle height. Positive value moves the top position closer to the beam center and thus decreases the clip angle size. Negative values increase the clip angle size.	If no value is entered, bolts and bolt edge distances define the size of the clip angle.
<b>3</b>	Clip angle lower edge distance from the bottom of the secondary beam. The lower edge position of the angle modifies the clip angle height. Positive value moves the top position closer to the beam center and thus decreases the clip angle size. Negative values increase the clip angle size.	If no value is entered, bolts and bolt edge distances define the size of the clip angle.

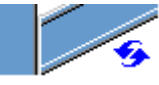
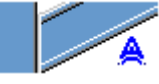

	Description	Default
4	Size of the strip made to the secondary part flange. The cutting point of the flange is defined from the clip angle edge.	The flange is automatically stripped when the clip angle crosses the flange. 10 mm
5	Define the gap between the main part and the clip angle.	0


### Beam bottom flange cut

Option	Description
	Default Flange cut AutoDefaults can change this option.
	Notch The bottom of the secondary beam is notched if the clip angle crosses the flange. Enter the notch radius and height.
	Flange cut The secondary beam flange is cut on the same side as the clip angle if the clip angle crosses the flange.

### Beam end cut

Define how the secondary beam end is cut. The beam is viewed from the side.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.
	Square Cuts the end of the secondary beam square.

Option	Description
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.

### **Parts tab**

Use the **Parts** tab to control the size, position and orientation of the clip angles.

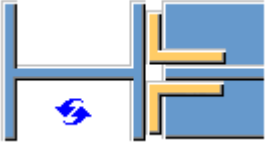






### **Profile NS/FS**

Option	Description	Default
<b>Profile NS</b>	Near side clip angle profile by selecting it from the profile catalog.	Angle size is defined by the bolt diameter. The default name is ANGLE.
<b>Profile FS</b>	Far side clip angle profile by selecting it from the profile catalog.	Angle size determined by the bolt diameter. The default name is ANGLE.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	







### Clip angle position

Define the number of clip angles and the side of the clip angle in single clip angle connections.

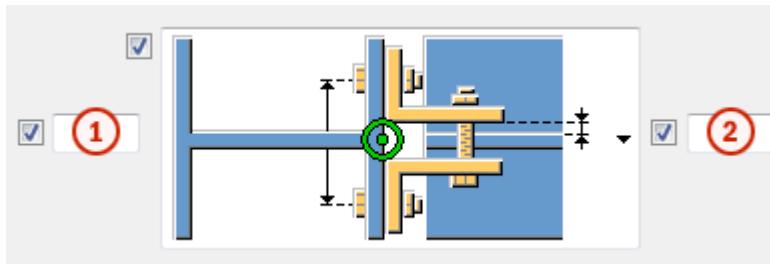
Option	Description
	<p>Default</p> <p>Near side and far side clip angles are created.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>If the main part is a tube profile, two clip angles are created. Otherwise a near side clip angle is created.</p>
	<p>Near side clip angle is created.</p>
	<p>Near side and far side clip angles are created.</p>
	<p>Far side clip angle is created.</p>
	<p>Wrapped angle. Far side clip angle is created.</p>
	<p>Wrapped angle. Near side clip angle is created.</p>

### Clip angle orientation

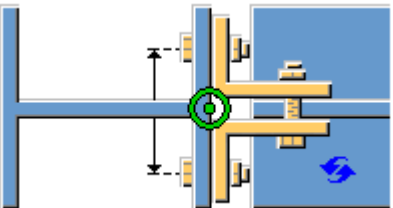
These options switch the unequal legs of the far side and the near side clip angles.

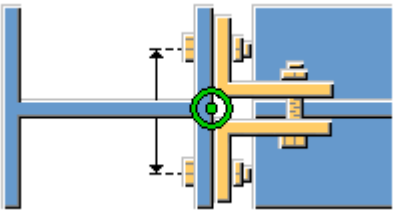
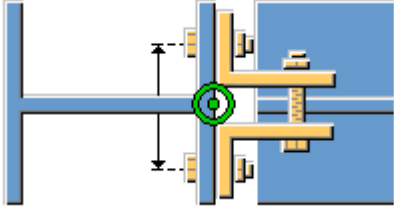
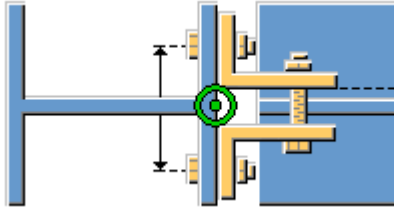
Option for near side	Option for far side	Description
		Default Not switched AutoDefaults can change this option.
		Not switched The clip angle is placed on a connection so that the longer leg is connected to the secondary part.
		Switched The clip angle legs are switched so that the longer leg is connected to the main part.

### Bolt spacing and weld gap



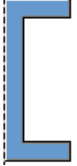


Option	Description
1	Bolt spacing.
2	Weld gap.

Option	Description
	Default Bolt spacing without weld gap AutoDefaults can change this option.

Option	Description
	Bolt spacing without weld gap
	Bolt spacing with weld gap
	Bolt spacing with weld gap that you can define

### Center of the bolt gage line

Option	Description
	Default Center of the bolt gage line from the center line of the secondary part. AutoDefaults can change this option.
	Center of the bolt gage line from the center line of the secondary part.
	Center of the bolt gage line from the back of the secondary part web. You can use this option when the secondary part has a C or U profile.

### **Stiffeners tab**

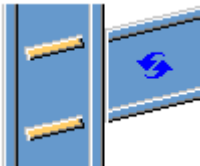
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position, and type.

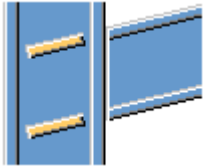
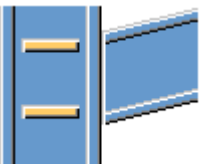
## Stiffener plate dimensions

Option	Description
<b>Top NS</b>	Top near side stiffener thickness, width and height.
<b>Top FS</b>	Top far side stiffener thickness, width and height.
<b>Bottom NS</b>	Bottom near side stiffener thickness, width and height.
<b>Bottom FS</b>	Bottom far side stiffener thickness, width and height.





Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

## Stiffener orientation


Option	Description
	<p>Default</p> <p>Stiffeners are parallel to the secondary part.</p> <p>AutoDefaults can change this option.</p>

Option	Description
	Stiffeners are parallel to the secondary part.
	Stiffeners are perpendicular to the main part.


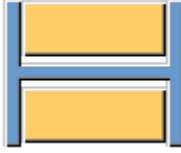

### Stiffener creation

Option	Description
	Default Stiffeners are created. AutoDefaults can change this option.
	Automatic Stiffeners are created when necessary.
	No stiffeners are created.
	Stiffeners are created.

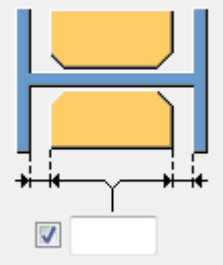
### Stiffener shape

Option	Description
	Default Line chamfered stiffener plates AutoDefaults can change this option.

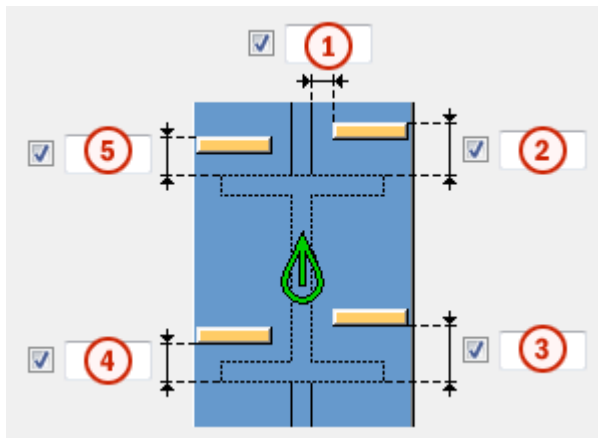


Option	Description
	Automatic Line chamfered stiffener plates
	Square stiffener plates Stiffener plates with a gap for the main part web rounding
	Line chamfered stiffener plates

### Stiffener gap

Option	Description
	Size of the gap between the flanges and the stiffener.

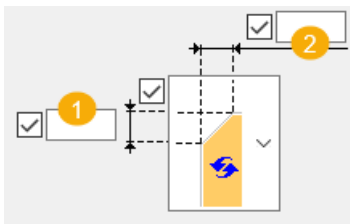
### Stiffener positions



	Description
1	Size of the gap between the stiffener and the beam web edge.

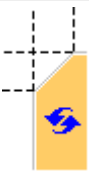

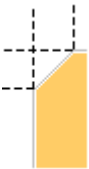
	Description
2	Size of the gap between the top near side stiffener and the beam flange edge.
3	Size of the gap between the bottom near side stiffener and the beam flange edge.
4	Size of the gap between the bottom far side stiffener and the beam flange edge.
5	Size of the gap between the top far side stiffener and the beam flange edge.



### Chamfer dimensions



	Description	Default
1	Vertical dimension of the chamfer.	10 mm
2	Horizontal dimension of the chamfer.	10 mm

### Chamfer type

Option	Description
	Default. Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer

Option	Description
	Convex arc chamfer
	Concave arc chamfer

### ***Haunch tab***

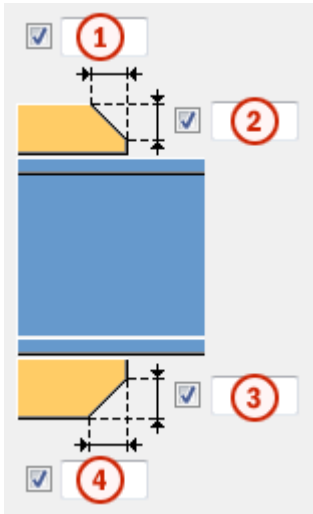
Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges.

### **Haunch plates**

Option	Description
<b>Top plate</b>	Top haunch plate thickness, width and height.
<b>Bottom plate</b>	Bottom haunch plate thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	


## Haunch plate chamfers



	Description
1	Width of the top haunch plate chamfer.
2	Height of the top haunch plate chamfer.
3	Height of the bottom haunch plate chamfer.
4	Width of the bottom haunch plate chamfer.

## Haunch plate creation

Option	Description
	<p>Default</p> <p>Top and bottom haunch plates are created, if needed.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>Top or bottom haunch plate or both are created, if needed.</p>
	<p>Top and bottom haunch plates are created.</p> <p>To create a single plate, enter 0 in the thickness (<b>t</b>) field for the plate you do not need (top or bottom plate).</p>

Option	Description
	Haunch plates are not created.

### **Notch tab**






Use the **Notch** tab to automatically create notches for the secondary beams and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

### **Automatic notching**

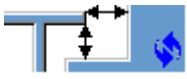
Automatic notching options affect both the top and the bottom flange.

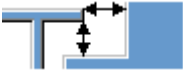
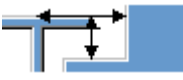
### **Notch shape**

Automatic notching is switched on when you select a notch shape.

Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.
	Turns off automatic notching.

### **Notch size**



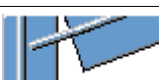
Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.

Option	Description
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.



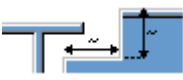


### Flange cut shape

Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

### Notch dimension rounding

Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.

The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



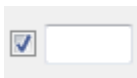
### Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

### Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.








### Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.



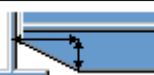



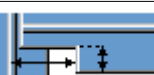
### Side of flange notch

The side of flange notch defines on which side of the beam the notches are created.

Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

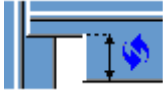
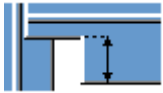
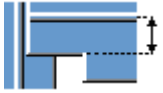
### Flange notch shape

The flange notch shape defines the notch shape in the beam flange.

Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.
	Creates chamfers in the flange. If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.
	Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b> .
	The flange is not cut.
	Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.
	Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b> .



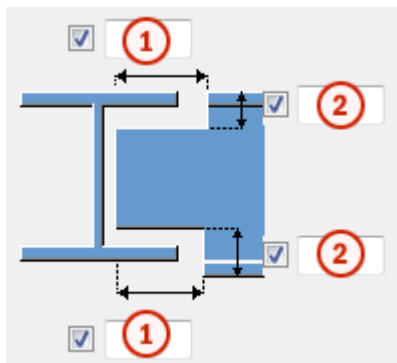
## Flange notch depth

Option	Description
	Default Flange notch depth. AutoDefaults can change this option.
	Flange notch depth.
	Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.

Enter the value for flange notch depth.

## Cut dimensions

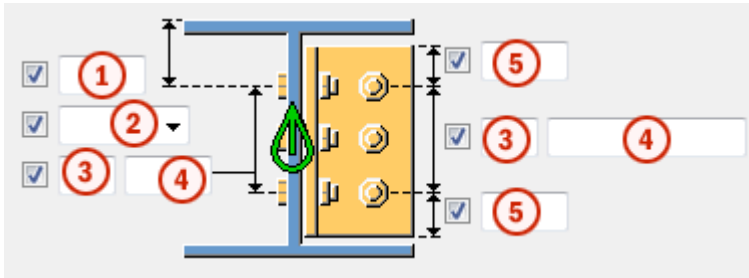


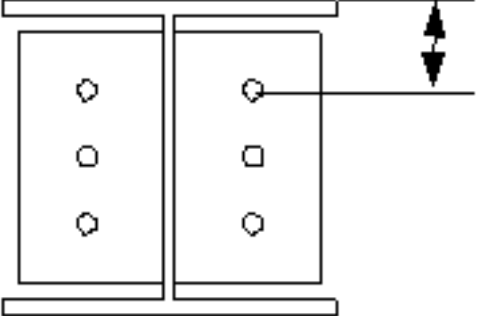
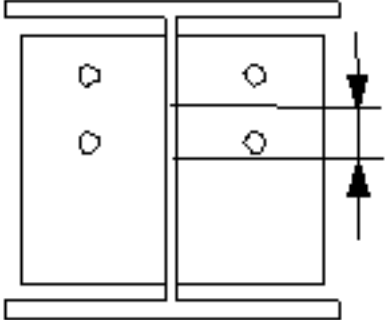
	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

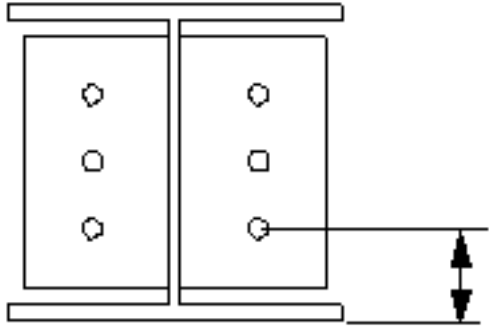
## **Bolts tab**

Use the **Bolts** tab to control bolts and welds that connect the clip angle to the main part and to the secondary part.






## Bolt group dimensions



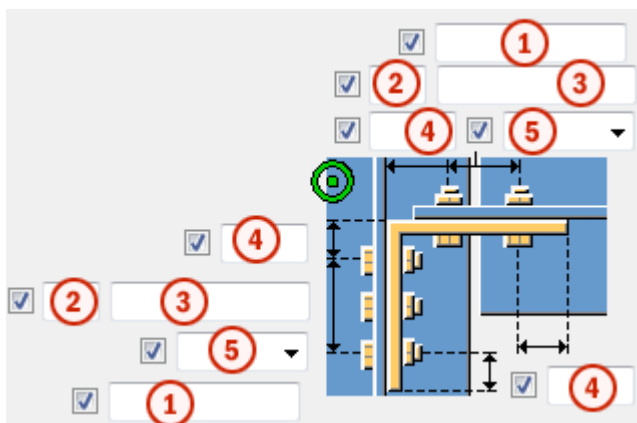
	Description
1	Dimension for vertical bolt group position.
2	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt. </li> </ul>  <ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part. </li> </ul> 

	Description
	<ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.

### Staggering of bolts on clip angle

Option	Description
	Default Bolts are not staggered. AutoDefaults can change this option.
	Bolts are not staggered. The bolts that connect the clip angle to the secondary part are on the same horizontal level as the bolts that connect the clip angle to the main part.
	Bolts on the main part are staggered. The bolts that connect the clip angle to the main part are moved downwards by half the bolt vertical spacing value.
	Bolts on the secondary part are staggered. The bolts that connect the clip angle to the secondary part are moved downwards by half the bolt vertical spacing value.
	Bolts on the secondary part are staggered. The bolts that connect the clip angle to the sloped secondary part are parallel to the secondary part.


## Bolt group dimensions








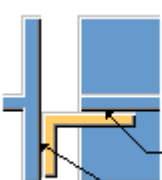
	Description
1	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.
2	Number of bolts.
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
4	Bolt edge distance.
5	Location where the bolts should be attached.

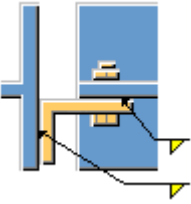

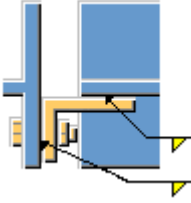

## Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3

Option	Description
	Staggered type 4

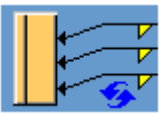
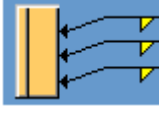
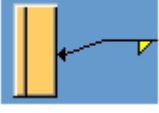
### Attachment type

Option	Description
	<p>Default</p> <p>Both parts are bolted.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>When the main part is a tube profile, the clip angles are welded to the main part and bolted to the secondary part. Otherwise the clip angles are bolted to both parts.</p>
	Both parts are bolted.
	Main part is welded and secondary is part bolted.
	Main part is bolted and secondary part is welded.
	Both parts are welded.

Option	Description
	Main part is not bolted.
	Secondary part is not welded.
	Secondary part is not bolted.
	Both parts are bolted and welded.

### Number of clip angle welds

Define the number of welds that connect the clip angle to the main part and/or the secondary part.

Option	Description
	Default Three welds are created to the clip angle. AutoDefaults can change this option.
	Three welds are created to the clip angle.
	One weld is created to the clip angle.

## Bolt basic properties

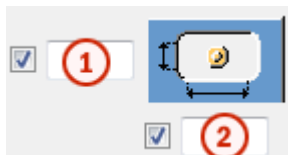
Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Cut length

Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

## Slotted holes

You can define slotted, oversized, or tapped holes.



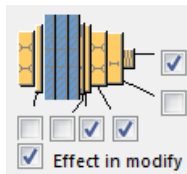
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.

Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.





To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase


Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Bolting direction

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1



Option	Description
	Bolting direction 2

### ***Plate washers tab***

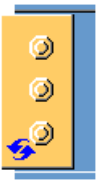
Use the **Plate washers** tab to define the plate washer properties to the main part and to the secondary parts.





Option	Description
<b>Plate washer</b>	Plate washer thickness, width and height.


Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

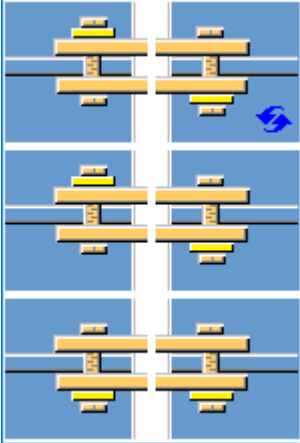
### **Plate washer**

Define plate washers for bolts and select the plate washer side.

Option	Description
	Default No plate washer AutoDefaults can change this option.

Option	Description
	No plate washer
	One plate washer
	Individual square plate washers for each bolt
	Individual round plate washers for each bolt

Option	Description
	Select whether the plate washer is created for one clip angle or both clip angles.

Option	Description
	<p>Select whether the plate washers are placed symmetrically or asymmetrically.</p>

**Beam cut tab**

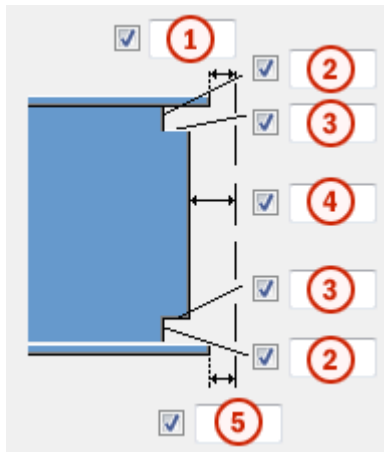
Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts.

**Weld backing bar**

Option	Description
<p><b>Weld backing bar</b></p>	<p>Weld backing bar thickness and width.</p>





Option	Description	Default
<p><b>Pos_No</b></p>	<p>Prefix and start number for the part position number.</p> <p>Some components have a second row of fields where you can enter the assembly position number.</p>	<p>The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b>.</p>
<p><b>Material</b></p>	<p>Material grade.</p>	<p>The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b>.</p>
<p><b>Name</b></p>	<p>Name that is shown in drawings and reports.</p>	
<p><b>Finish</b></p>	<p>Describes how the part surface has been treated.</p>	




## Weld access hole dimensions







	Description
1	Gap between the secondary part top flange and the main part.
2	Vertical dimensions for the top and the bottom weld access holes.
3	Horizontal dimensions for the top and the bottom weld access holes.
4	Gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.
5	Gap between the secondary part bottom flange and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.



## Weld access holes

Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	







Option	Description	Default
	Round weld access hole with a radius that you can define in r <input checked="" type="checkbox"/> <input type="text"/>	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and Top Prep x <input checked="" type="checkbox"/> <input type="text"/> Bottom Prep x <input checked="" type="checkbox"/> <input type="text"/>	
	Cone-shaped weld access hole with radiuses that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and r <input checked="" type="checkbox"/> <input type="text"/> Capital <b>R</b> defines the large radius (height). Small <b>r</b> defines the small radius.	R = 35 r = 10

### Beam end preparation









Option	Description
	Default Top and bottom flange are prepared. AutoDefaults can change this option.
	Automatic Top and bottom flange are prepared.
	Beam end is not prepared.
	Top and bottom flange are prepared.

Option	Description
	Top flange is prepared.
	Bottom flange is prepared.

### Flange cut



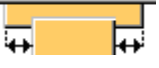
Option for top flange	Option for bottom flange	Description
		Default Flange is not cut. AutoDefaults can change this option.
		Flange is not cut.
		Flange is cut.

### Weld backing bars

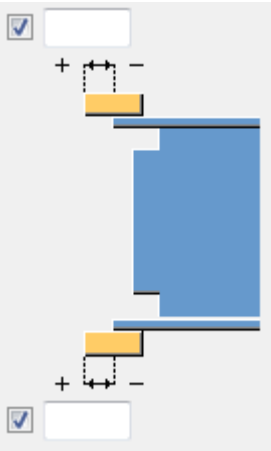
Option for top backing bar	Option for bottom backing bar	Description
		Default Backing bars are created inside the flanges. AutoDefaults can change this option.
		No backing bars are created.
		Backing bars are created inside the flanges.
		Backing bars are created outside the flanges.

### Weld backing bar length

Enter the length of the weld backing bar in the box below the options.

Option	Description
	Default Absolute length of the backing bar AutoDefaults can change this option.
	Absolute length of the backing bar
	Extension beyond the edge of the flange

### Weld backing bar position

Option	Description
	Enter a positive or a negative value to move the front end of the backing bar relative to the end of the flange.

### Assembly type

Define the location where the weld backing bar welds are made. When you select the **Workshop** option, Tekla Structures includes the backing bars in the assembly.

### Angle box tab

Use the **Angle box** tab to add a seat angle.

### Seat angle

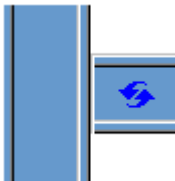


The purpose of seat angles is to carry loads from the secondary part. Seat angles can be positioned to top, bottom or both flanges of the secondary part. The seat angle can be stiffened, and bolted or welded to the main and secondary parts.

Option	Description
<b>Stiffeners</b>	Stiffener thickness, width and height.



Option	Description
<b>Top angle, Bottom angle</b>	Select the seat angle profile by selecting it from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Seat angle position

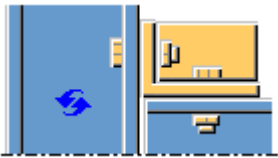





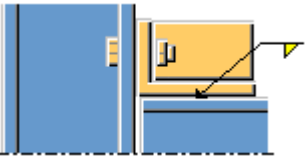

Option	Description
	Default No seat angle is created. AutoDefaults can change this option.
	No seat angle is created.
	Seat angle is created at the top of the flange.

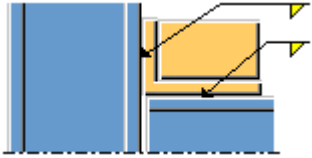
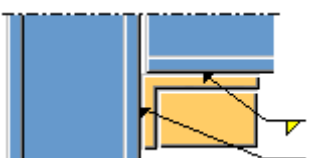


Option	Description
	Seat angle is created at the bottom of the flange.
	Seat angles are created on both sides of the flange.





### Seat angle attachment

Seat angle is positioned at the top or at the bottom of the secondary part.

Option for top seat angle	Option for bottom seat angle	Description
		Default Bolted Seat angle is bolted to the main part and to the secondary part. AutoDefaults can change this option.
		Bolted Seat angle is bolted to the main part and to the secondary part.
		Welded-bolted Seat angle is welded to the main part and bolted to the secondary part.
		Bolted-welded Seat angle is bolted to the main part and welded to the secondary part.

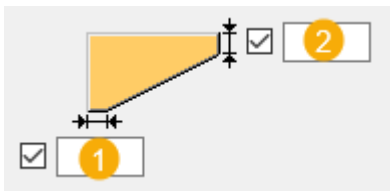
Option for top seat angle	Option for bottom seat angle	Description
		Welded Seat angle is welded to the main part and to the secondary part.

### Stiffener type

Option	Description
	Default Rectangular stiffener plate AutoDefaults can change this option.
	Rectangular stiffener plate
	Triangular stiffener plate
	The line connecting the ends of the seat angle legs defines the stiffener plate shape.


### Stiffener offset dimension



Define the offset of bevel cuts for triangular stiffeners.







	Description
1	Horizontal offset dimension
2	Vertical offset dimension

### Seat angle rotation




Option	Description
	Default Seat angle is not rotated. AutoDefaults can change this option.



Option	Description
	Seat angle is not rotated.
	Seat angle is rotated horizontally 90 degrees. To stiffen the rotated seat angle, select the <b>Middle stiffeners</b> option in the <b>Middle stiffener position</b> list.

### Seat angle orientation

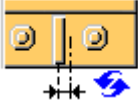
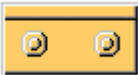
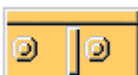
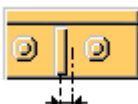
Option	Description
	Default The longer leg of the seat angle is connected to the secondary part. AutoDefaults can change this option.
	The longer leg of the seat angle is connected to the secondary part.
	The longer leg of the seat angle is connected to the main part.
	Automatic The longer leg of the seat angle is connected to the part where bolts reach furthest from the seat angle corner.

### Side stiffener position

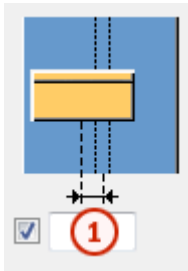
Option	Description
	Default No side stiffeners are created. AutoDefaults can change this option.
	No side stiffeners are created.
	Near side stiffeners are created.

Option	Description
	Far side stiffeners are created.
	Near side and far side stiffeners are created.

### Middle stiffener position

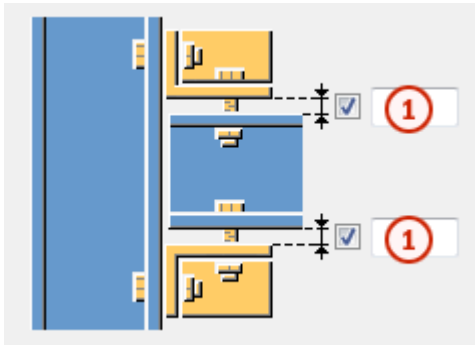
Option	Description
	<p>Default</p> <p>According to bolts</p> <p>AutoDefaults can change this option.</p>
	No middle stiffener plate is created.
	<p>Middle stiffeners</p> <p>The stiffener plate is positioned in the middle of the seat angle.</p> <p>Enter the number of middle stiffeners in the <b>Number of middle stiffeners</b> box.</p> <p>Multiple stiffeners are centered and equally spaced.</p>
	<p>According to bolts</p> <p>The stiffener plate is positioned between the bolts in the middle of the bolt spacing.</p> <p>By default, stiffener is created between every two bolts.</p> <p>Enter the number of middle stiffeners in the box below the <b>According to bolts</b> option.</p>

### Seat angle offset



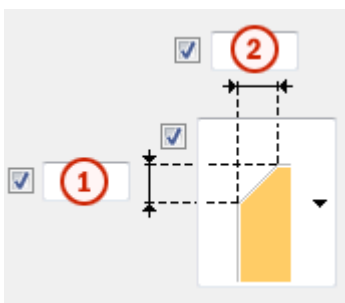
	Description
1	Seat angle horizontal offset from the center line of the main part.

### Gap








	Description
1	Top gap and bottom gap between the seat angle and the secondary part.

### Chamfer dimensions



	Description
1	Vertical dimension of the chamfer.
2	Horizontal dimension of the chamfer.

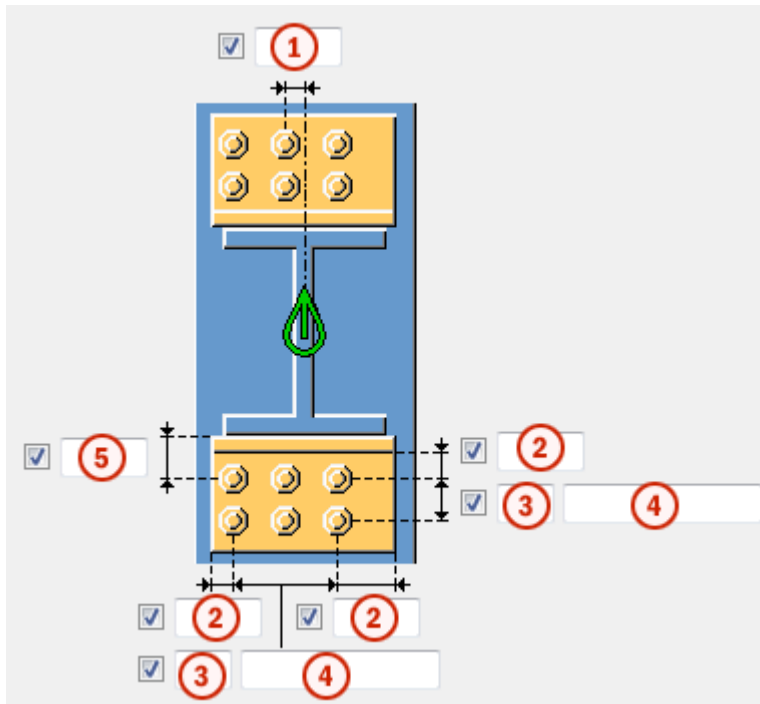
## Chamfer type

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### ***BoxPBolts tab***

Use the **BoxPBolts** tab to control properties of the bolts that connect the seat angle to the main part.

## Bolt group dimensions



	Description
<b>1</b>	Dimension for horizontal bolt group position. The dimension is defined from the middle line of the secondary beam.
<b>2</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>3</b>	Number of bolts.
<b>4</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>5</b>	Dimension for vertical bolt group position. The dimension is defined from the bottom of the secondary beam.

### Top

**Top** refers to the bolt group that connects the top seat angle to the main part.

### Bottom

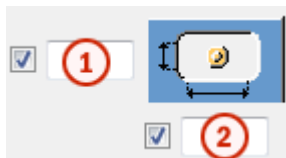
**Bottom** refers to the bolt group that connects the bottom seat angle to the main part.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



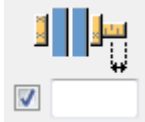
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	



Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt length increase

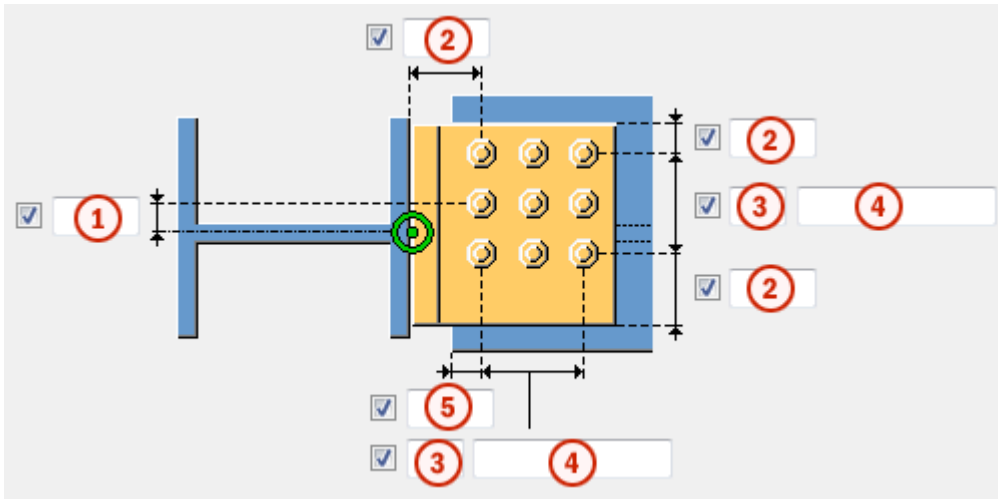
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### BoxSBolts tab

Use the **BoxSBolts** tab to control properties of the bolts that connect the seat angle to the secondary part.

### Bolt group dimensions



	Description
<b>1</b>	Dimension for vertical bolt group position. The dimension is defined from the middle line of the secondary beam.
<b>2</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>3</b>	Number of bolts.

	Description
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Dimension for horizontal bolt group position. The dimension is defined from the bottom of the secondary beam.

### Top

**Top** refers to the bolt group that connects the top seat angle to the secondary part.

### Bottom

**Bottom** refers to the bolt group that connects the bottom seat angle to the secondary part.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### ***General tab***

Click the link below to find out more:

General tab

### ***Design type tab***

Click the link below to find out more:

Design type tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

## Welds

Click the link below to find out more:

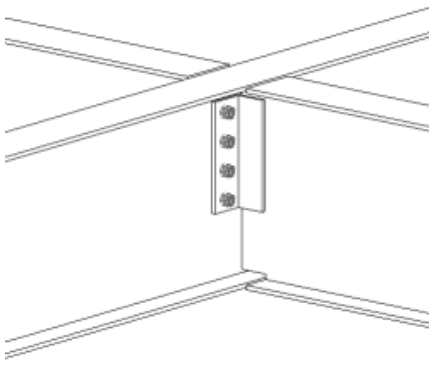
### Two sided clip angle (143)

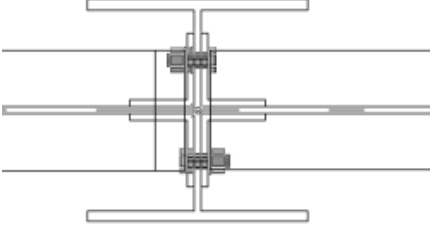
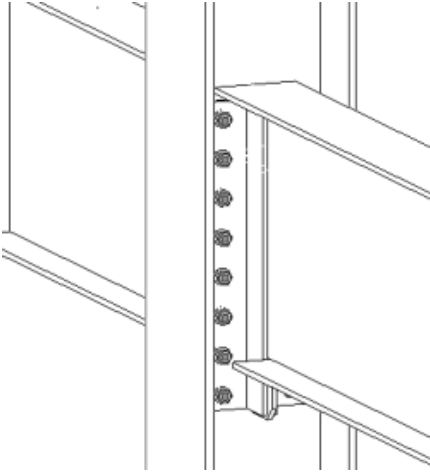
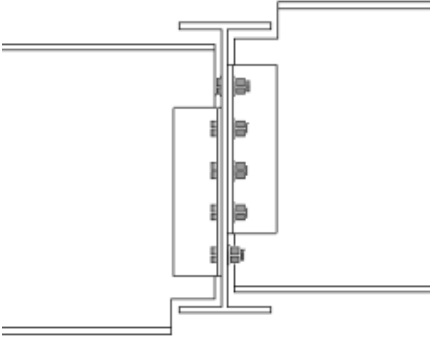
**Two sided clip angle (143)** connects two beams, or a beam to a column, using single or double clip angles. The secondary beam can be leveled or sloped. Welded haunch plates and a seat angle are optional.

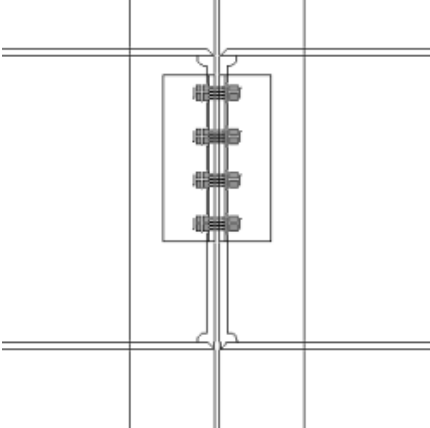
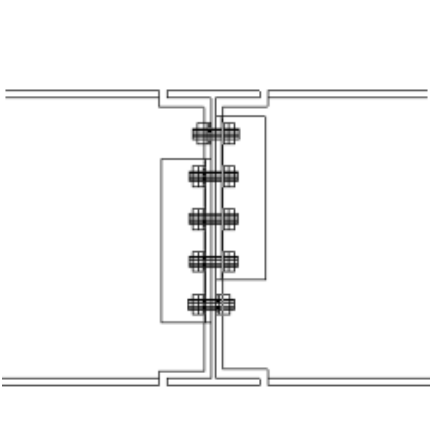
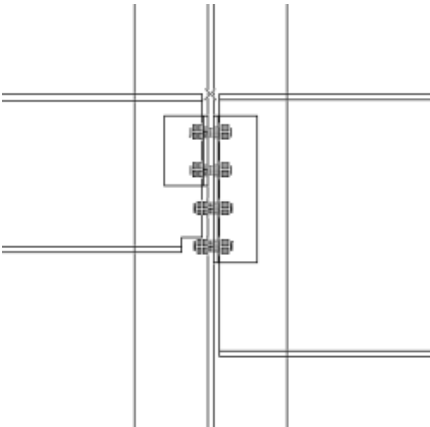
#### Objects created

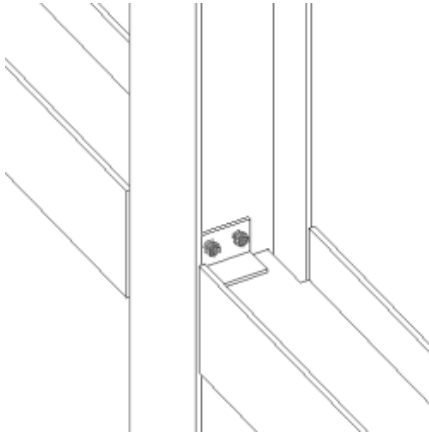
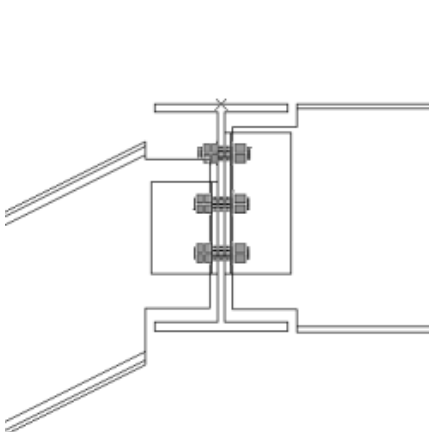
- Clip angles (2)
- Haunch plates (optional)
- Seat angle (optional)
- Weld backing bars (optional)
- Bolts
- Plate washers (optional)
- Welds
- Cuts

#### Use for

Situation	Description
 A technical line drawing showing a clip angle connection. Two beams are shown intersecting. A vertical clip angle is bolted to the top flange of the upper beam and the top flange of the lower beam. The clip angle has four bolts. The lower beam is sloped downwards.	Clip angle connection. Single-sided/double-sided clip. Two secondary parts. Bolted/bolted, welded/ bolted, welded/welded options.

Situation	Description
	<p>Clip angle connection.            Single-sided/double-sided clip.            Two secondary parts. Bolted/bolted, welded/            bolted, welded/welded options.</p>
	<p>Clip angle connection.            Single-sided/double-sided clip.            Two secondary parts.            Haunch option. Top/Bottom/Both</p>
	<p>Clip angle connection.            Single-sided/double-sided clip.            Two secondary parts at different heights.</p>

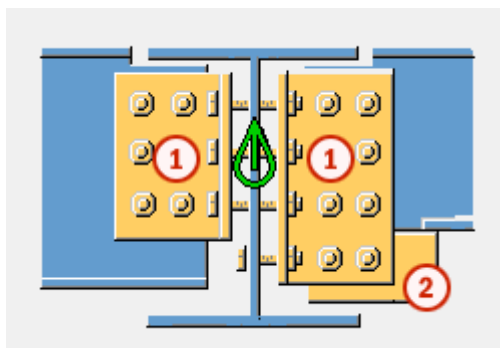
Situation	Description
	<p>Clip angle connection.</p> <p>Single-sided/double-sided clip.</p> <p>Two secondary parts.</p> <p>Weld preparation and weld access holes for moment connection.</p>
	<p>Clip angle connection.</p> <p>Single-sided/double-sided clip.</p> <p>Two secondary parts.</p> <p>Safety connection.</p>
	<p>Clip angle connection.</p> <p>Automatic notching of secondary part to provide bolt clearance.</p>

Situation	Description
	<p>Clip angle connection. Single-sided/double-sided clip. Two secondary parts rotated.</p>
	<p>Clip angle connection. Single-sided/double-sided clip. Two secondary parts, one sloped.</p>

### Selection order

1. Select the main part (column or beam).
2. Select the first secondary part (beam).
3. Select the second secondary part (beam).
4. Click the middle mouse button to create the connection.

### Part identification key



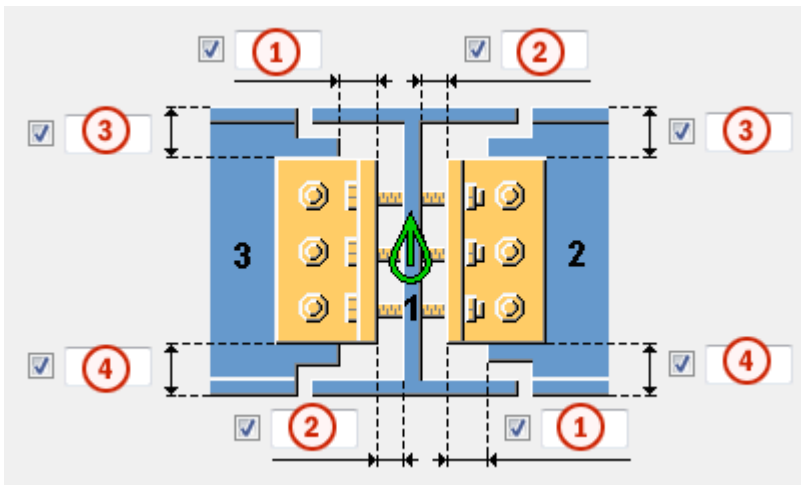
	Part
1	Clip angles
2	Haunch plate

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

### Picture tab

Use the **Picture** tab to control the clip angle dimensions and to define how the beam end is cut.

### Dimensions

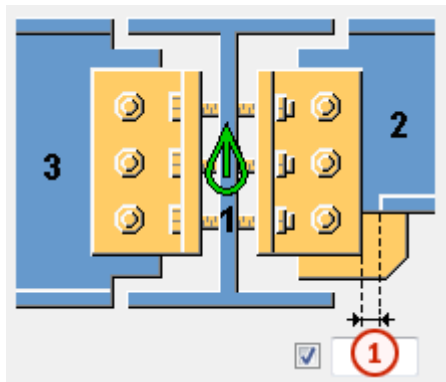


	Description	Default
1	Cut length for the secondary part. The cut is defined from the clip angle edge.	
2	Define the gap between the main part and the clip angle.	0
3	Clip angle upper edge distance from the top of the secondary beam. The upper edge position of the angle modifies the clip angle height. Positive value moves the top position closer to the beam center and thus decreases the clip angle size. Negative values increase the clip angle size.	If no value is entered, bolts and bolt edge distances define the size of the clip angle.



	Description	Default
4	<p>Clip angle lower edge distance from the bottom of the secondary beam.</p> <p>The lower edge position of the angle modifies the clip angle height.</p> <p>Positive value moves the top position closer to the beam center and thus decreases the clip angle size. Negative values increase the clip angle size.</p>	If no value is entered, bolts and bolt edge distances define the size of the clip angle.

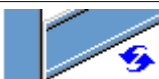

Option	Description
<b>Sort secondaries by profile height</b>	<p>Select whether the secondary parts are sorted by their profile height.</p> <p>When set to <b>Yes</b>, the highest secondary part is always regarded as the first secondary part, regardless of the selection order.</p>









	Description	Default
1	<p>Size of the strip made to the secondary part flange.</p> <p>The cutting point of the flange is defined from the clip angle edge.</p>	The flange is automatically stripped when the clip angle crosses the flange.




### Beam end cut

Define how the secondary beam end is cut. The beam is viewed from the side.

Option	Option	Description
		<p>Default</p> <p>Bevel</p> <p>AutoDefaults can change this option.</p>

Option	Option	Description
		Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.
		Square Cuts the end of the secondary beam square.
		Bevel Cuts the end of the secondary beam parallel to the edge of the main part.

#### Beam bottom flange cut

Option	Description
	Default Flange cut AutoDefaults can change this option.
	Notch The bottom of the secondary beam is notched if the clip angle crosses the flange. Enter the notch radius and height.
	Flange cut The secondary beam flange is cut on the same side as the clip angle if the clip angle crosses the flange.

#### **Parts tab**



Use the **Parts** tab to control the size, position and orientation of the clip angles.









## Profile NS/FS

Option	Description	Default
<b>Profile NS</b> <b>Profile 2 NS</b>	Near side clip angle profile for the first and the second secondary parts by selecting it from the profile catalog.	Angle size is defined by the bolt diameter. The default name is ANGLE.
<b>Profile FS</b> <b>Profile 2 FS</b>	Far side clip angle profile for the first and the second secondary parts by selecting it from the profile catalog.	Angle size is determined by the bolt diameter. The default name is ANGLE.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	





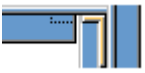

## Clip angle position

Option for the second secondary part	Option for the first secondary part	Description
		Default Near side and far side clip angles are created. AutoDefaults can change this option.

Option for the second secondary part	Option for the first secondary part	Description
		Automatic If the main part is a tube profile, two clip angles are created. Otherwise a near side clip angle is created.
		Near side clip angle is created.
		Near side and far side clip angles are created.
		Far side clip angle is created.





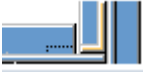

### Near side clip angle orientation

These options switch the unequal legs of the near side clip angles.

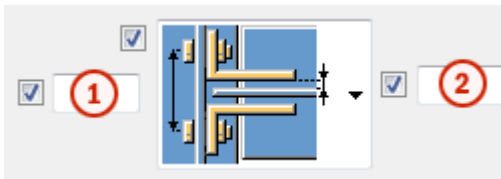
Option for the second secondary part	Option for the first secondary part	Description
		Default Not switched AutoDefaults can change this option.
		Not switched The clip angle is placed on a connection so that the longer leg is connected to the secondary part.
		Switched The clip angle legs are switched so that the longer leg is connected to the main part.

### Far side clip angle orientation

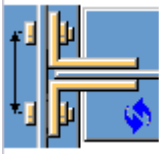

These options switch the unequal legs of the far side clip angles.

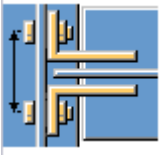
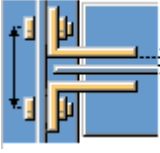
Option for the second secondary part	Option for the first secondary part	Description
		Default Not switched AutoDefaults can change this option.
		Not switched The clip angle is placed on a connection so that the longer leg is connected to the secondary part.
		Switched The clip angle legs are switched so that the longer leg is connected to the main part.

### Bolt spacing and weld gap

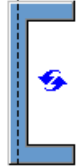
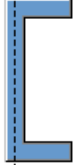
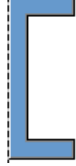


Option	Description
1	Bolt spacing.
2	Weld gap.

Option	Description
	Default Bolt spacing without weld gap AutoDefaults can change this option.
	Bolt spacing without weld gap

Option	Description
	Bolt spacing with weld gap
	Bolt spacing with weld gap that you can define.

### Center of the bolt gage line


Option	Description
	Default Center of the bolt gage line from the center line of the secondary part. AutoDefaults can change this option.
	Center of the bolt gage line from the center line of the secondary part.
	Center of the bolt gage line from the back of the secondary part web. You can use this option when the secondary part has a C or U profile.




### Safety connections

In **Side 2 horizontal offset**, enter a value to the field to move the clip angles in horizontal direction on the side of the second secondary beam. Enter the **Vertical cut/offset** and **Horizontal cut** dimensions.

### Safety connection type








Define whether the created connection is a standard connection or a safety connection.



Option	Description
	Default No safety connection is created. AutoDefaults can change this option.

Option	Description
	No safety connection is created.
	<p>Clip angles are moved down to create safety connection.</p> <p>Enter the dimension in the <b>Vertical cut/offset</b> field.</p>
	<p>Clip angles are notched to create safety connection.</p> <p>Enter the notch dimensions in the <b>Vertical cut/offset</b> and <b>Horizontal cut</b> fields.</p>

### Safety connection location




Define the location of the safety connection.

Option	Description
	<p>Default</p> <p>On the first secondary beam</p> <p>AutoDefaults can change this option.</p>
	On the first secondary beam
	On the first secondary beam
	On the second secondary beam
	On the second secondary beam
	On the first secondary beam
	On the second secondary beam

Option	Description
	On the first secondary beam and the second secondary
	On the second secondary beam and the first secondary beam

### Safety connection staggering

Define how the clip angles are staggered.

Option	Description
	Default Staggered AutoDefaults can change this option.
	Staggered Clip angle height is not modified, but the clip angles are moved to create safety connection.
	Flush Clip angle height is modified to create safety connection, but the bottoms of the angles are flush with each other.

### Haunch tab

Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges.

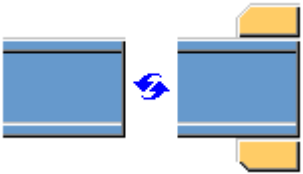
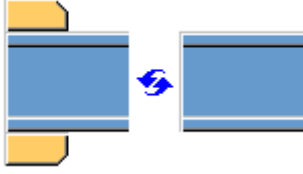
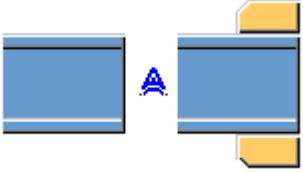
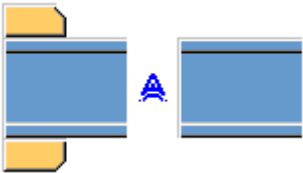

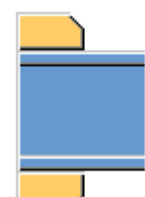
### Haunch plates



Option	Description
<b>Top plate</b>	Top haunch plate thickness, width and height.
<b>Bottom plate</b>	Bottom haunch plate thickness, width and height.



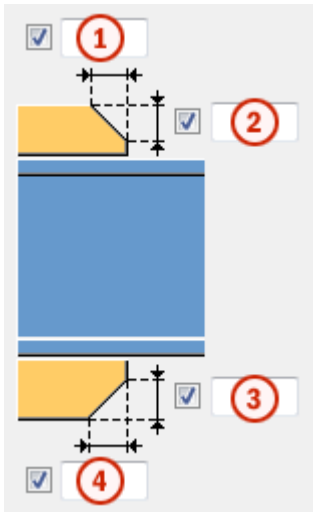
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Haunch plate creation

Option for the second secondary beam	Option for the first secondary beam	Description
		Default Top and bottom haunch plates are created, if needed.  AutoDefaults can change this option.
		Automatic Top or bottom haunch plate or both are created, if needed.
		Top and bottom haunch plates are always created.  To create a single plate, enter 0 in the thickness ( <b>t</b> ) field for the haunch plate you do not need (top or bottom plate).

Option for the second secondary beam	Option for the first secondary beam	Description
		Haunch plates are not created.

### Haunch plate chamfers



	Description
1	Width of the top haunch plate chamfer.
2	Height of the top haunch plate chamfer.
3	Height of the bottom haunch plate chamfer.
4	Width of the bottom haunch plate chamfer.

### Notch tab






Use the **Notch** tab to automatically create notches for the secondary beams and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

#### Automatic notching

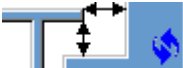


Automatic notching options affect both the top and the bottom flange.

#### Notch shape

Automatic notching is switched on when you select a notch shape.

Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.
	Turns off automatic notching.


### Notch size



Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.





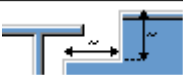
### Flange cut shape

Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.

Option	Description
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

### Notch dimension rounding

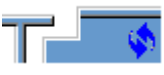


Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.





The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



### Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

## Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.






 

## Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.



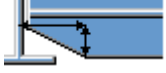



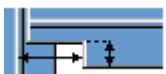
## Side of flange notch

The side of flange notch defines on which side of the beam the notches are created.




Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

## Flange notch shape

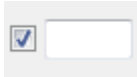
The flange notch shape defines the notch shape in the beam flange.

Option	Description
	<p>Default</p> <p>The entire flange of the secondary beam is cut as far back as you define.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.</p>
	<p>Creates chamfers in the flange.</p> <p>If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.</p>
	<p>Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b>.</p>
	<p>The flange is not cut.</p>
	<p>Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.</p>
	<p>Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b>.</p>

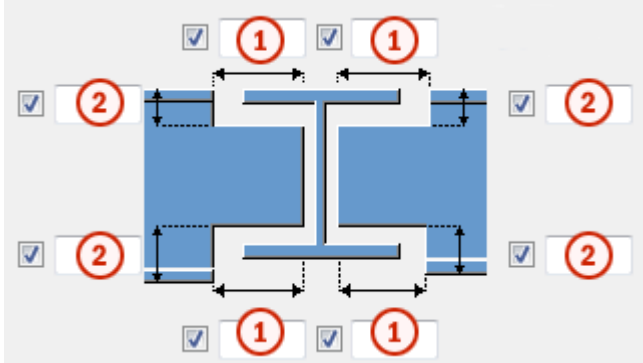
## Flange notch depth

Option	Description
	<p>Default</p> <p>Flange notch depth.</p> <p>AutoDefaults can change this option.</p>
	<p>Flange notch depth.</p>
	<p>Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.</p>

Enter the value for flange notch depth.



### Cut dimensions

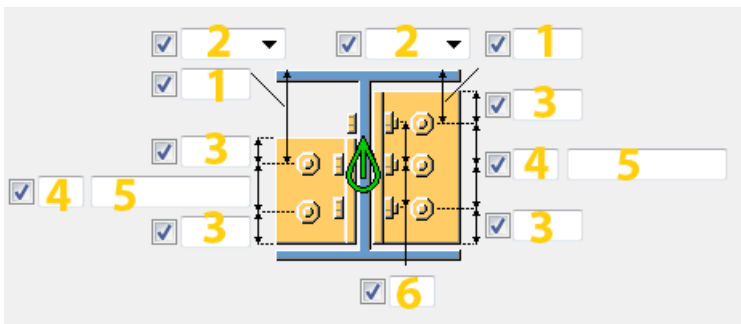


	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

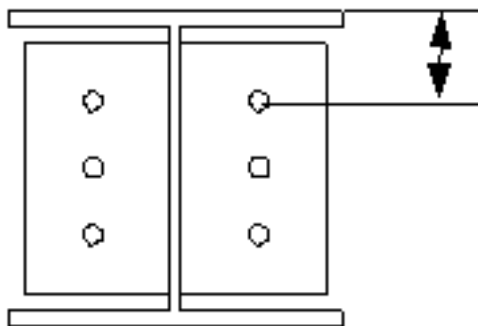
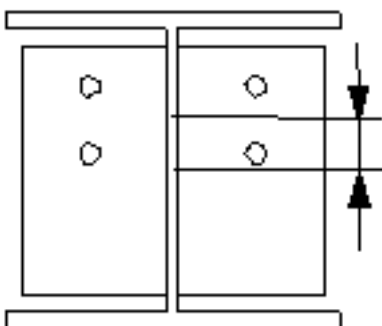
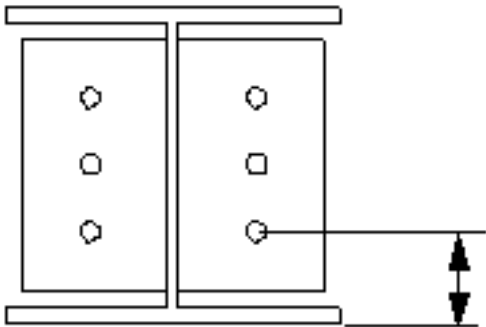
### Bolts tab

Use the **Bolts** tab to control the bolt group dimensions.

### Bolt group dimensions













	Description
1	Dimension for vertical bolt group position.

	<b>Description</b>
<b>2</b>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 













	Description
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Number of bolts.
5	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
6	Number of rows of bolts through the main part.

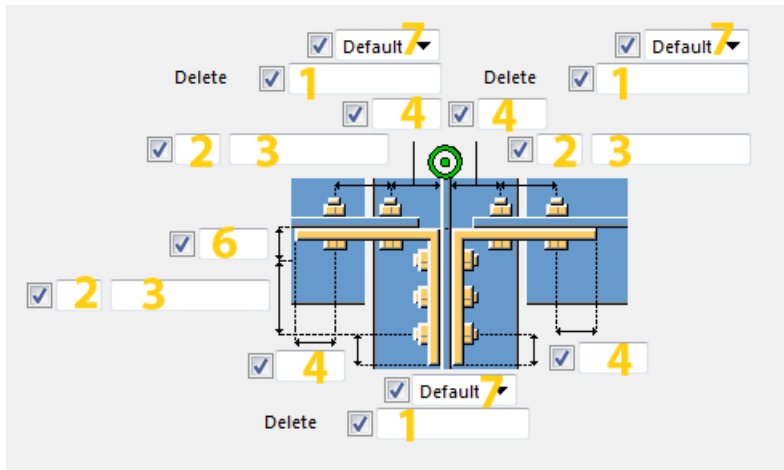
### Staggering of bolts on clip angle

Option for second secondary	Option for first secondary	Description
		Default Bolts are not staggered. AutoDefaults can change this option.
		Bolts are not staggered. The bolts that connect the clip angle to the secondary part are on the same horizontal level as the bolts that connect the clip angle to the main part.
		Bolts on the main part are staggered. The bolts that connect the clip angle to the main part are moved downwards by half the bolt vertical spacing value.
		Bolts on the secondary part are staggered. The bolts that connect the clip angle to the secondary part are moved downwards by half the bolt vertical spacing value.
		Bolts on the secondary part are staggered. The bolts that connect the clip angle to the sloped secondary part are parallel to the secondary part.

## Attachment type

Option	Description
	<p>Default</p> <p>Both parts are bolted.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>When the main part is a tube profile, the clip angles are welded to the main part and bolted to the secondary part. Otherwise the clip angles are bolted to both parts.</p>
	<p>Both parts are bolted.</p>
	<p>Main part is welded and secondary part is bolted.</p>
	<p>Main part is bolted and secondary part is welded.</p>
	<p>Both parts are welded.</p>
	<p>Main part is not bolted.</p>
	<p>Secondary part is not welded.</p>
	<p>Secondary part is not bolted.</p>
	<p>Both parts are bolted and welded.</p>

## Bolt group dimensions



	Description
1	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.
2	Number of bolts.
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
4	Bolt edge distance.
5	Location where the bolts should be attached.
6	Angle leg length.
7	Location where the bolts should be attached: <b>Site / Workshop</b> .

### ***Bolt settings tab***

Use the **Bolt settings** tab to control the bolts and welds that connect the clip angle to the main part and to the secondary part.

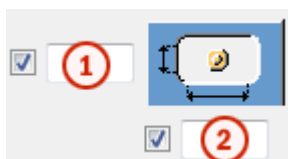
### **Bolt basic properties**

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.

Option	Description	Default
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

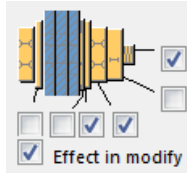
### Cut length

Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

## Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## Same bolt length for all

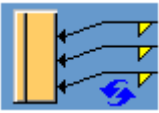
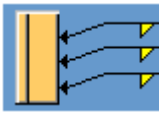
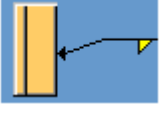
Set this option to **Yes** to have the same bolt length for all bolts. The longest bolt defines how long the shorter bolts are with extra length.

## Use different settings for secondary parts




Set to **Yes** to define different settings for the second secondary part. The default is that the same settings are used for both secondary parts.

## Number of clip angle welds

Define the number of welds that connect the clip angle to the main part and/or the secondary part.

Option	Description
	Default Three welds are created to the clip angle. AutoDefaults can change this option.
	Three welds are created to the clip angle.
	One weld is created to the clip angle.

## Bolting direction

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

## Plate washers tab

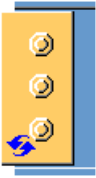




Use the **Plate washers** tab to define the plate washer properties to the main part and to the secondary parts.


Option	Description
<b>Plate washer</b>	Plate washer thickness, width and height.

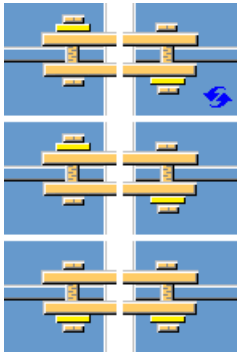
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

## Plate washer

Define plate washers for bolts and select the plate washer side.

Option	Description
	Default No plate washer AutoDefaults can change this option.
	No plate washer
	One plate washer
	Individual square plate washers for each bolt
	Individual round plate washers for each bolt

Option	Description
	Select whether the plate washer is created for one clip angle or both clip angles.

Option	Description
	Select whether the plate washers are placed symmetrically or asymmetrically.

### **Angle box tab**

Use the **Angle box** tab to add a seat angle.

### **Seat angle**

The purpose of seat angles is to carry loads from the secondary part. Seat angles can be positioned to top, bottom or both flanges of the secondary part. The seat angle can be stiffened, and bolted or welded to the main and secondary parts.






Option	Description
<b>Stiffeners</b>	Stiffener thickness, width and height.
<b>Top angle NS, Bottom angle NS, Top angle FS, Bottom angle FS</b>	Select the seat angle profile by selecting it from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	








Option	Description	Default
<b>Finish</b>	Describes how the part surface has been treated.	

### Top seat angle position


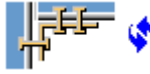








Option	Description
	Default No seat angle is created. AutoDefaults can change this option.
	No seat angle is created.
	Seat angle is created at the top of the second secondary part flange.
	Seat angle is created at the top of the first secondary part flange.
	Seat angles are created at the top of both flanges.

### Bottom seat angle position




Option	Description
	Default No seat angle is created. AutoDefaults can change this option.
	No seat angle is created.
	Seat angle is created at the bottom of the second secondary part flange
	Seat angle is created at the bottom of the first secondary part flange.
	Seat angles are created at the bottom of both flanges.


### Seat angle attachment

Seat angle is positioned at the top or at the bottom of the secondary part.

Option for top seat angle	Option for bottom seat angle	Description
		Default Bolted Seat angle is bolted to the main part and to the secondary part. AutoDefaults can change this option.
		Bolted Seat angle is bolted to the main part and to the secondary part.
		Welded-bolted Seat angle is welded to the main part and bolted to the secondary part.
		Bolted-welded Seat angle is bolted to the main part and welded to the secondary part.
		Welded Seat angle is welded to the main part and to the secondary part.

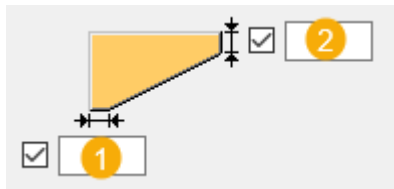
### Stiffener type

Option	Description
	Default Rectangular stiffener plate AutoDefaults can change this option.
	Rectangular stiffener plate
	Triangular stiffener plate

Option	Description
	The line connecting the ends of the seat angle legs defines the stiffener plate shape.





**Stiffener offset dimension**

Define the offset of bevel cuts for triangular stiffeners.






	Description
1	Horizontal offset dimension
2	Vertical offset dimension

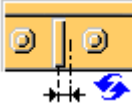


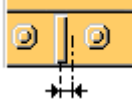
**Seat angle orientation**

Option	Description
	Default The longer leg of the seat angle is connected to the secondary part. AutoDefaults can change this option.
	The longer leg of the seat angle is connected to the secondary part.
	The longer leg of the seat angle is connected to the main part.
	Automatic The longer leg of the seat angle is connected to the part where bolts reach furthest from the seat angle corner.






### Seat angle rotation

Option	Description
	Default Seat angle is not rotated. AutoDefaults can change this option.
	Seat angle is not rotated.
	Seat angle is rotated horizontally 90 degrees. To stiffen the rotated seat angle, select the <b>Middle stiffeners</b> option in the <b>Middle stiffener position</b> list.

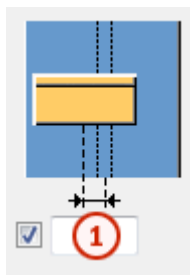
### Middle stiffener position

Option	Description
	Default According to bolts AutoDefaults can change this option.
	No middle stiffener plate is created.
	Middle stiffeners The stiffener plate is positioned in the middle of the seat angle. Enter the number of middle stiffeners in the <b>Number of middle stiffeners</b> box. Multiple stiffeners are centered and equally spaced.
	According to bolts The stiffener plate is positioned between the bolts in the middle of the bolt spacing. By default, stiffener is created between every two bolts. Enter the number of middle stiffeners in the box below the <b>According to bolts</b> option.

### Side stiffener position

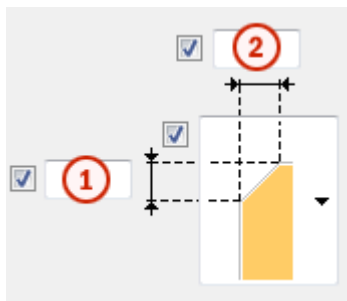
Option	Description
	Default No side stiffeners are created. AutoDefaults can change this option.
	No side stiffeners are created.
	Near side stiffeners are created.
	Far side stiffeners are created.
	Near side and far side stiffeners are created.

### Seat angle offset



	Description
1	Seat angle horizontal offset from the center line of the main part.



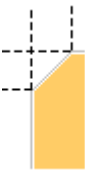


### Chamfer dimensions



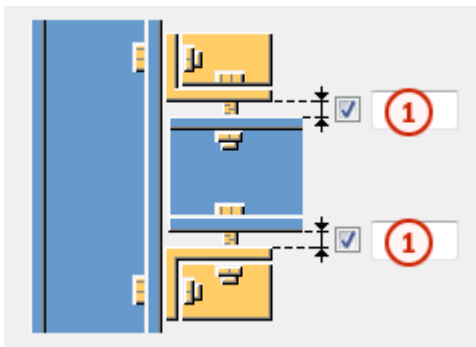
	Description
1	Vertical dimension of the chamfer.

	Description
2	Horizontal dimension of the chamfer.

### Chamfer type

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### Gap

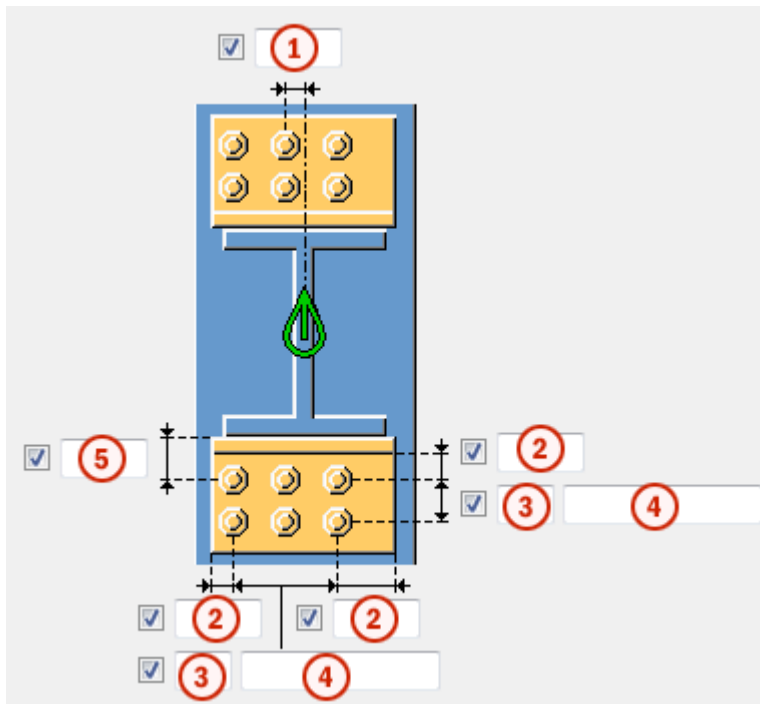


	Description
1	Top gap and bottom gap between the seat angle and the secondary part.

### BoxPBolts tab

Use the **BoxPBolts** tab to control properties of the bolts that connect the seat angle to the main part.

### Bolt group dimensions



	Description
1	Dimension for horizontal bolt group position. The dimension is defined from the middle line of the secondary beam.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Dimension for vertical bolt group position. The dimension is defined from the bottom of the secondary beam.

## Top

**Top** refers to the bolt group that connects the top seat angle to the main part.

## Bottom

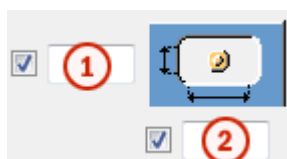
**Bottom** refers to the bolt group that connects the bottom seat angle to the main part.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



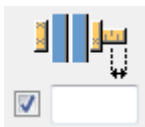
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.



Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt length increase

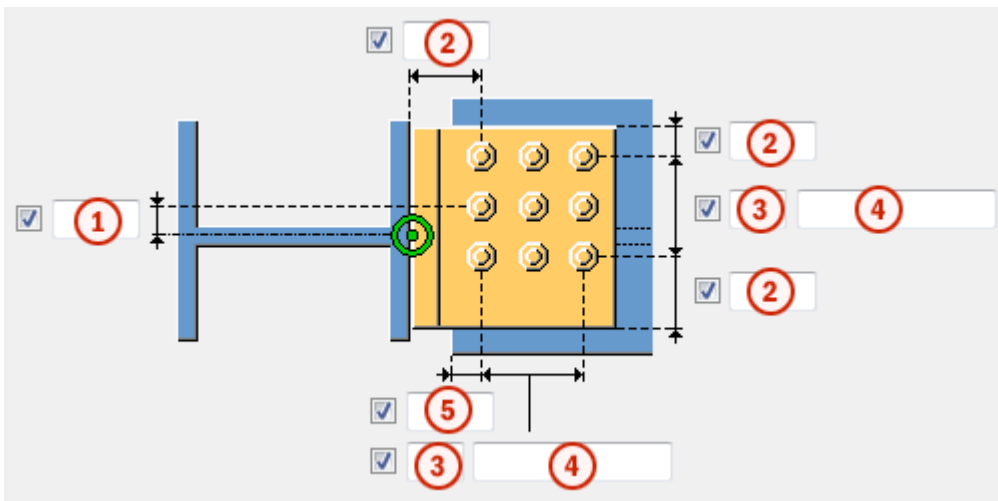
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### BoxBolts tab

Use the **BoxBolts** tab to control properties of the bolts that connect the seat angle to the secondary part.

### Bolt group dimension



	Description
<b>1</b>	Dimension for vertical bolt group position. The dimension is defined from the middle line of the secondary beam.
<b>2</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>3</b>	Number of bolts.
<b>4</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>5</b>	Dimension for horizontal bolt group position. The dimension is defined from the bottom of the secondary beam.

### Top

**Top** refers to the bolt group that connects the top seat angle to the secondary part.

### Bottom

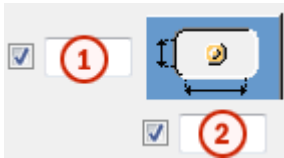
**Bottom** refers to the bolt group that connects the bottom seat angle to the secondary part.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

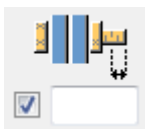
You can define slotted, oversized, or tapped holes.



Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

## Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## Beam cut tab

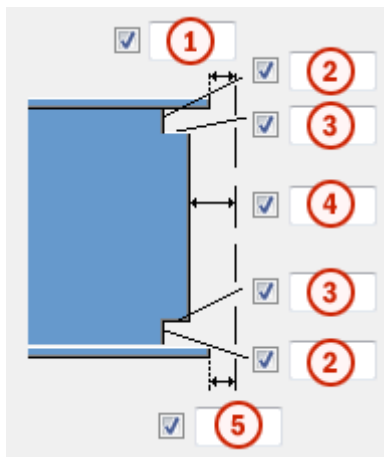
Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts.

## Weld backing bar

Option	Description
<b>Weld backing bar</b>	Weld backing bar thickness and width.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	







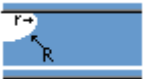
#### Weld access hole dimensions



	Description
<b>1</b>	Gap between the secondary part top flange and the main part.
<b>2</b>	Vertical dimensions for the top and the bottom weld access holes.
<b>3</b>	Horizontal dimensions for the top and the bottom weld access holes.
<b>4</b>	Gap between the secondary part web and the main part.  Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.







	Description
5	Gap between the secondary part bottom flange and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.

### Weld access holes







Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	
	Round weld access hole with a radius that you can define in r <input checked="" type="checkbox"/> <input type="text"/>	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and Top Prep x <input checked="" type="checkbox"/> <input type="text"/> Bottom Prep x <input checked="" type="checkbox"/> <input type="text"/>	
	Cone-shaped weld access hole with radiuses that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and r <input checked="" type="checkbox"/> <input type="text"/>	R = 35 r = 10

Option	Description	Default
	Capital <b>R</b> defines the large radius (height). Small <b>r</b> defines the small radius.	

### Beam end preparation

Option	Description
	Default Top and bottom flange are prepared. AutoDefaults can change this option.
	Automatic Top and bottom flange are prepared.
	Beam end is not prepared.
	Top and bottom flange are prepared.
	Top flange is prepared.
	Bottom flange is prepared.

### Flange cut

Option for top flange	Option for bottom flange	Description
		Default Flange is not cut. AutoDefaults can change this option.
		Flange is not cut.
		Flange is cut.

## Weld backing bars

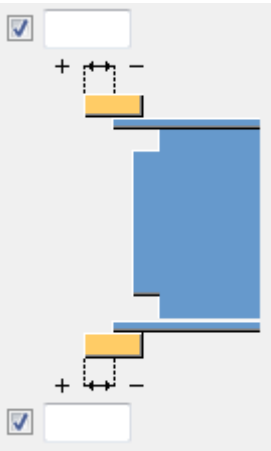
Option for top backing bar	Option for bottom backing bar	Description
		Default Backing bars are created inside the flanges. AutoDefaults can change this option.
		No backing bars are created.
		Backing bars are created inside the flanges.
		Backing bars are created outside the flanges.

## Weld backing bar length

Enter the length of the weld backing bar in the box below the options.

Option	Description
	Default Absolute length of the backing bar AutoDefaults can change this option.
	Absolute length of the backing bar
	Extension beyond the edge of the flange

## Weld backing bar position

Option	Description
	Enter a positive or a negative value to move the front end of the backing bar relative to the end of the flange.

### Assembly type

Define the location where the weld backing bar welds are made. When you select the **Workshop** option, Tekla Structures includes the backing bars in the assembly.

### General tab

Click the links below to find out more:

[General tab](#)

### Design type tab

Click the links below to find out more:

[Design type tab](#)

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

### Welds

Click the link below to find out more:



## 2.3 Bent plate connections

This section introduces bent plate connection components available in Tekla Structures.

Click the links below to find out more:

- [Bent plate \(151\) \(page 465\)](#)
- [Bent plate \(190\) \(page 490\)](#)

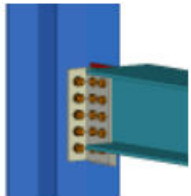
### Bent plate (151)

**Bent plate (151)** connects a beam to a column or a beam using one or two bolted or welded bent plates. The end of the beam can be cut square or bevel to accommodate a sloping secondary beam. By default, notches are created to the secondary beam flanges when needed. You can define on which side of the secondary beam web the bent plate is placed in single plate connections. Double plate connections can also be created. Haunch plates are created welded to the secondary beam flanges when required.

#### Objects created

- Bent plates
- Haunch plates
- Stiffeners
- Bolts
- Cuts
- Welds

#### Use for

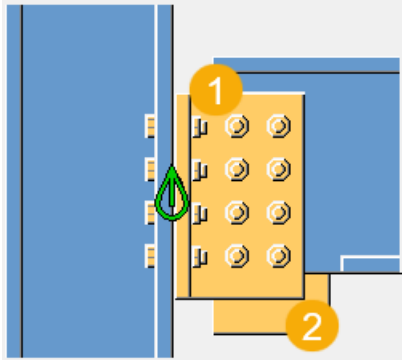
Situation	Description
	Beam connected to a column using a bent plate.

#### Selection order

1. Select the main part (column or beam).
2. Select the secondary part.

The connection is created automatically when the secondary part is selected.

## Part identification key

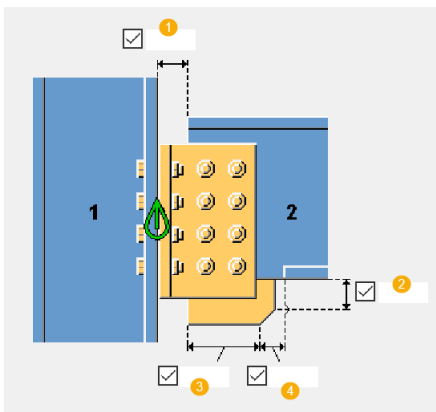


	Description
1	Bent plate
2	Haunch plate

## Picture tab

Use the **Picture** tab to define the connection dimensions.





## Dimensions



	Description
1	Distance between the main part and the secondary part (beam). By default, the distance is 20 mm.
2	Haunch plate height to the beginning of the chamfer.
3	Haunch plate width to the beginning of the chamfer.
4	Distance from the bent plate edge to the lower flange notch. You can define this dimension if the plate extends below the bottom of the secondary beam.




### Beam end cut

Define how the secondary beam end is cut. The beam is viewed from the side.


Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.
	Square Cuts the end of the secondary beam square.
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.





### Beam flange cut

Define how the secondary beam flange end is cut. The beam is viewed from the top.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Bevel Cuts the end of the flange bevel.
	Square Cuts a part of the flange square and leaves a part of it bevel.

### Haunch plate creation

Options	Description
	Default Haunch plates are not created. AutoDefaults can change this option.

Options	Description
	Haunch plates are not created.
	Top and bottom haunch plates are created.
	Top haunch plate is created.
	Bottom haunch plate is created.

### **Parts tab**

Use the **Parts** tab to define the bent plate properties and positions.

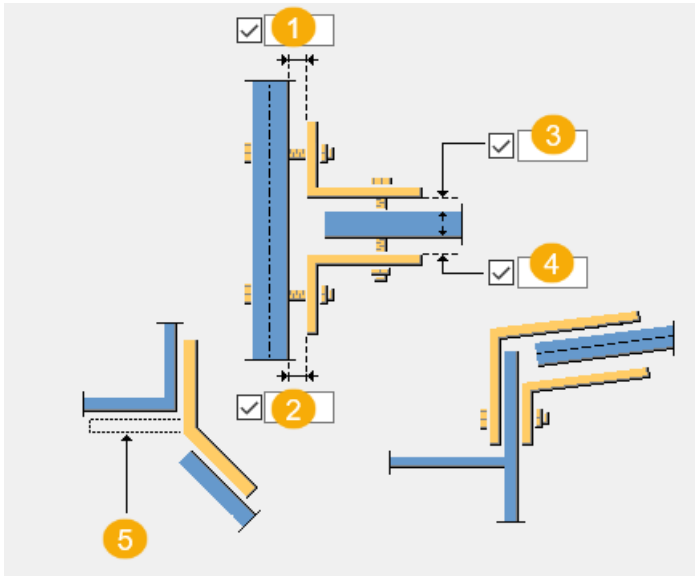
#### **Parts**

Option	Description
<b>Bent plate NS</b>	Thickness of the near side bent plate.
<b>Bent plate FS</b>	Thickness of the far side bent plate.
<b>Top Web Ext</b>	Thickness, width and height of the top web extension.
<b>Btm Web Ext</b>	Thickness, width and height of the bottom web extension.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .




Option	Description	Default
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	





### Dimensions








	Description
1	Gap between the right bent plate and the main part.
2	Gap between the left bent plate and the main part.
3	Gap between the right bent plate and the secondary part.
4	Gap between the left bent plate and the secondary part.
5	Collision plane change.

### Bent plate position




	Default Creates two bent plates, near side and far side. AutoDefaults can change this option.
	Automatic Near side and far side bent plates are selected automatically.
	Near side bent plate



	Far side bent plate
	Far side switched Creates a far side bent plate with a leg pointing to the near side.
	Near side switched Creates a far side bent plate with a leg pointing to the far side.
	Creates two bent plates, near side and far side.

### Attachment to the main part





Option	Description
	Default The bent plate is bolted to the main part. AutoDefaults can change this option.
	Automatic The bent plate is bolted to the main part.
	The bent plate is bolted to the main part.
	The bent plate is welded to the main part.
	The bent plate is bolted and welded to the main part.

### Attachment to the secondary part

Option	Description
	Default The bent plate is bolted to the secondary part. AutoDefaults can change this option.
	Automatic The bent plate is bolted to the secondary part.
	The bent plate is bolted to the secondary part.

Option	Description
	The bent plate is welded to the secondary part.
	The bent plate is bolted and welded to the secondary part.

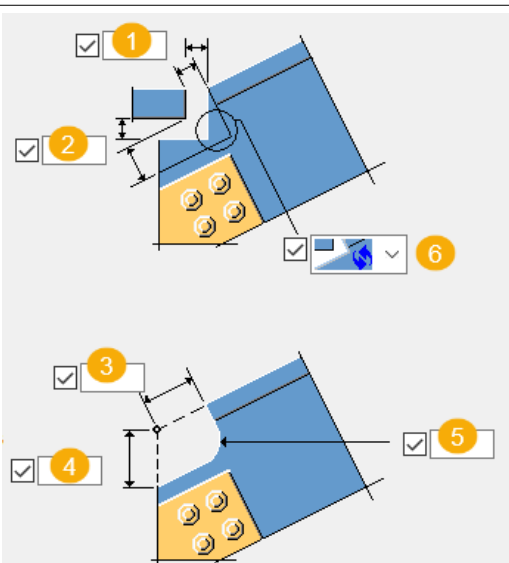
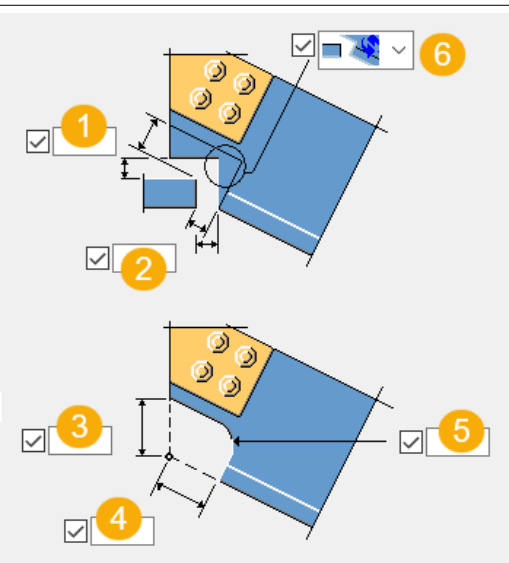
### Attachment point control

Option	Description
	Default The collision plane is not changed from the default position. AutoDefaults can change this option.
	The collision plane is not changed from the default position.
	The collision plane is changed to the nearest surface.
	The collision plane is changed to the farthest surface.

### Top notch / Btm notch tab

Use the **Top notch** and **Btm notch** tabs to define the notch settings and dimensions.

### Notch dimensions

Option	Option
	

	<b>Description</b>
<b>1</b>	Horizontal dimension for the notch clearing. The distance is measured from the intersection point of three planes: top or bottom of the flange plane, end of the flange plane, and the inner web or side surface, depending on the type of clearance selected.
<b>2</b>	Vertical dimension for the notch clearing. The distance is measured from the intersection point of three planes: bottom of the flange plane, end of the flange plane, and the inner web or side surface, depending on the type of clearance selected.
<b>3</b>	Horizontal dimension for the notch override. The distance is measured from the intersection point of three planes: top of the flange plane, fitting plane, and the inner web or side surface, depending on the type of clearance selected.
<b>4</b>	Vertical dimension for the notch override. The distance is measured from the intersection point of three planes: top of the flange plane, fitting plane, and the inner web or side surface, depending on the type of clearance selected.
<b>5</b>	Radius of the notch cut.
<b>6</b>	Vertical notch orientation.

### Notch settings

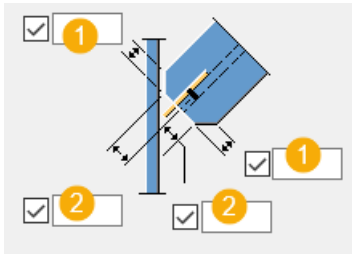
<b>Do notch</b>	<ul style="list-style-type: none"> <li>• <b>Yes</b> enables notching.</li> <li>• <b>No</b> disables notching, but does not disable stripping and flange coping.</li> </ul> <p>Use the <b>Strip / Cope</b> options for disabling stripping and flange coping.</p>
<b>Type of clearance</b>	<ul style="list-style-type: none"> <li>• <b>Side with flange</b> Use the main part flange and the inner side plane of the secondary part as a reference for the clearing.</li> <li>• <b>Web with plate</b> Use the inner shear tab plane and the inner web plane of the secondary part as a reference for the clearing.</li> </ul>



	<ul style="list-style-type: none"> <li>• <b>Web with flange</b> Use the flange of the main part and the inner web plane of the secondary part as a reference for the clearing.</li> </ul>
<b>Strip/Cope option</b>	<ul style="list-style-type: none"> <li>• <b>Automatic strip</b> Based on the shear tab shape and edges, the connection strips the secondary part flanges as necessary.</li> <li>• <b>Never strip or cope</b> Stripping or coping is not done.</li> <li>• <b>Force strip</b> Connection always strips, even when the shear tab edges are not clashing or close to the secondary part flanges. Set the notch cut length in <b>Forcing Dist</b> and the depth in <b>Force Depth</b>.</li> <li>• <b>Automatic flange cope</b> Based on the shear tab shape and edges, the connection copes the secondary part flanges as necessary.</li> <li>• <b>Force flange cope</b> The connection always copes, even when the shear tab edges are not clashing or close to the secondary part flanges. Set the notch cut length in <b>Forcing Dist</b> and the depth in <b>Force Depth</b>.</li> <li>• <b>Strip also other side</b> Both secondary part flanges are stripped.</li> </ul>

### Flange cut options

Define the flange cut dimensions and the cut thickness.






	Description
1	Dimension for additional flange cut. The dimension is measured from the end of the beam if not fitted, or from the fitting surface if fitted.
2	Dimension for additional flange cut. The dimension is measured from the center line of the beam.

### Vertical notch orientation

	Bottom	
		Default Square to the secondary part. AutoDefaults can change this option.
		Automatic Square to the secondary part.
		Square to the secondary part. The notch is cut vertically square relative to the secondary part.
		Square to main part The notch is cut vertically square relative to the main part.

### Notch orientation

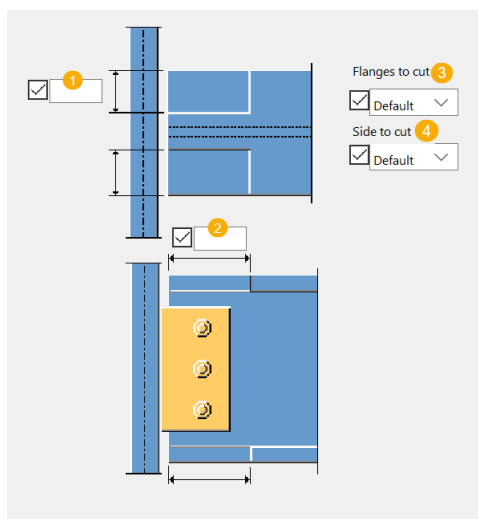
Option	Description
	Default Square to the main part. AutoDefaults can change this option.

Option	Description
	Automatic Square to the main part.
	Square to the secondary part. The notch is cut horizontally square relative to the secondary part.
	Square to the main part. The notch is cut horizontally square relative to the main part.

### **Flange cuts tab**

Use the **Flange cuts** tab to define how the flanges are cut.

### **Dimensions**



	Description
<b>1</b>	Transversal dimension
<b>2</b>	Longitudinal dimension
<b>3</b>	<ul style="list-style-type: none"> <li>• <b>Top:</b> Top flange is cut.</li> <li>• <b>Bottom:</b> Bottom flange is cut.</li> <li>• <b>Both:</b> Both the top and the bottom flange are cut.</li> </ul>
<b>4</b>	<ul style="list-style-type: none"> <li>• <b>Near:</b> Near side is cut.</li> <li>• <b>Far:</b> Far side is cut.</li> <li>• <b>Both:</b> Both the near and far side are cut.</li> </ul>

### **Stiffeners tab**

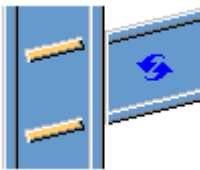
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position, and type.

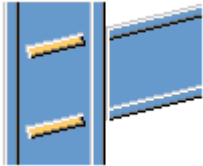
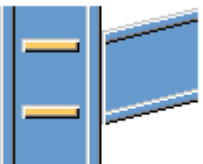
#### **Stiffener plate dimensions**

<b>Option</b>	<b>Description</b>
<b>Top NS</b>	Thickness, width, and height of the top near side stiffener.
<b>Top FS</b>	Thickness, width, and height of the top far side stiffener.
<b>Bottom NS</b>	Thickness, width, and height of the bottom near side stiffener.
<b>Bottom FS</b>	Thickness, width, and height of the bottom far side stiffener.





<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

#### **Stiffener orientation**


<b>Option</b>	<b>Description</b>
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.


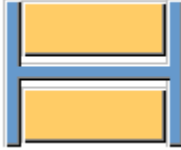

Option	Description
	Stiffeners are parallel to the secondary part.
	Stiffeners are perpendicular to the main part.

### Stiffener creation

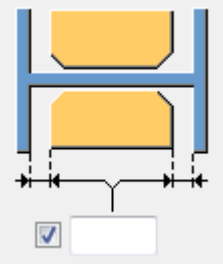
Option	Description
	Default Stiffeners are created. AutoDefaults can change this option.
	Automatic Stiffeners are created when necessary.
	No stiffeners are created.
	Stiffeners are created.

### Stiffener shape

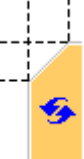

Option	Description
	Default Line chamfered stiffener plates AutoDefaults can change this option.




Option	Description
	Automatic Line chamfered stiffener plates
	Square stiffener plates Stiffener plates with a gap for the main part web rounding
	Line chamfered stiffener plates

### Stiffener gap

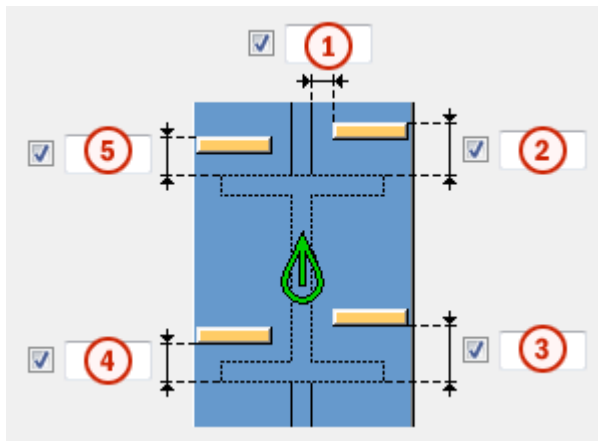
Option	Description
	Size of the gap between the flanges and the stiffener.

### Chamfer type

Option	Description
	Default. Line chamfer AutoDefaults can change this option.
	No chamfer

Option	Description
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### Stiffener positions

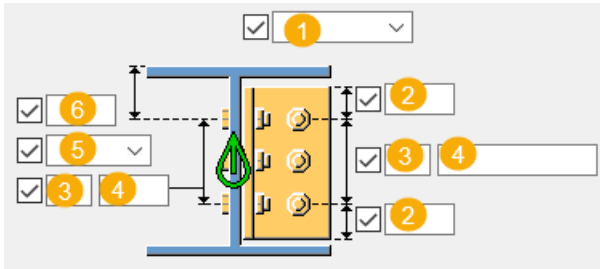


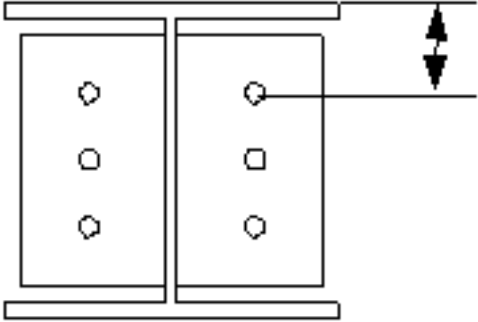
	Description
<b>1</b>	Size of the gap between the stiffener and the beam web edge.
<b>2</b>	Size of the gap between the top near side stiffener and the beam flange edge.
<b>3</b>	Size of the gap between the bottom near side stiffener and the beam flange edge.
<b>4</b>	Size of the gap between the bottom far side stiffener and the beam flange edge.
<b>5</b>	Size of the gap between the top far side stiffener and the beam flange edge.

### **Bolts tab**

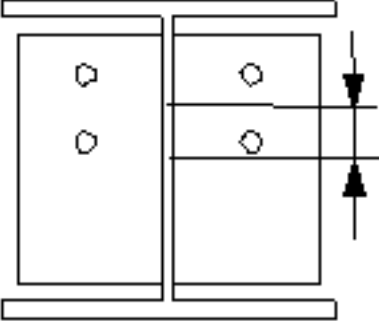
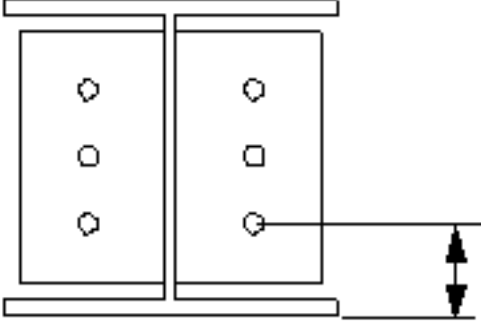
Use the **Bolts** tab to control the bolt group dimensions and bolt properties.

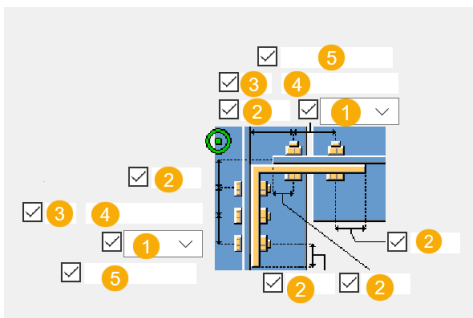
## Bolt group dimensions



	Description
1	Select main bolted part: beam or bent plate.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li><b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 















	<b>Description</b>
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.             </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.             </li> </ul>
<b>6</b>	<p>Bolt edge distance.</p> <p>Edge distance from the center of the bolt to the top of the beam.</p>



	<b>Description</b>
<b>1</b>	Select the location where the bolts should be attached.

	Description
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

### Bolt alignment

Main bolt alignment	Secondary bolt alignment	Description
		Default Square to the secondary part. AutoDefaults can change this option.
		Automatic Square to the secondary part.
		Square to the secondary part.
		Square to the main part.
		Vertically staggered.
		Horizontally staggered.

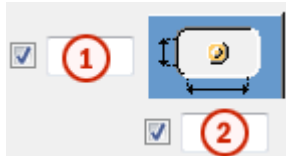
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.

Option	Description	Default
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### Slotted holes

You can define slotted, oversized, or tapped holes.

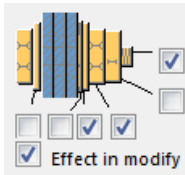


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.







### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Staggering of bolts on clip angle

Option	Description
	Default Bolts are not staggered. AutoDefaults can change this option.

Option	Description
	Bolts are not staggered. The bolts that connect the clip angle to the secondary part are on the same horizontal level as the bolts that connect the clip angle to the main part.
	Bolts on the main part are staggered. The bolts that connect the clip angle to the main part are moved downwards by half the bolt vertical spacing value.
	Bolts on the secondary part are staggered. The bolts that connect the clip angle to the secondary part are moved downwards by half the bolt vertical spacing value.
	Bolts on the secondary part are staggered. The bolts that connect the clip angle to the sloped secondary part are parallel to the secondary part.

### **Beam cut tab**

Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts.

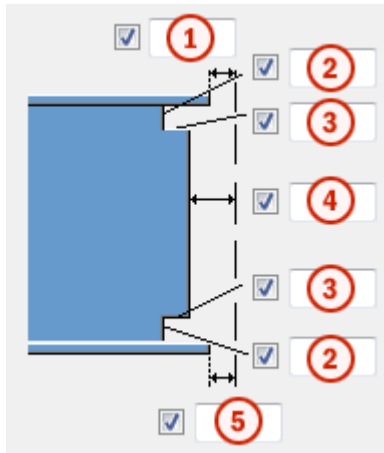
### **Weld backing bar**

Option	Description
<b>Backing bar</b>	Thickness and width of the weld backing bar.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	



Option	Description	Default
<b>Finish</b>	Describes how the part surface has been treated.	





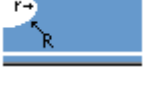
### Weld access hole dimensions





	Description
<b>1</b>	Gap between the secondary part top flange and the main part.
<b>2</b>	Vertical dimensions for the top and the bottom weld access holes.
<b>3</b>	Horizontal dimensions for the top and the bottom weld access holes.
<b>4</b>	Gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.
<b>5</b>	Gap between the secondary part bottom flange and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.





### Weld access holes

Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	
	Round weld access hole	







Option	Description	Default
	Square weld access hole	
	Diagonal weld access hole	
	Round weld access hole with a radius that you can define in r <input checked="" type="checkbox"/> <input type="text"/>	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and Top Prep x <input checked="" type="checkbox"/> <input type="text"/> Bottom Prep x <input checked="" type="checkbox"/> <input type="text"/>	
	Cone-shaped weld access hole with radiuses that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and r <input checked="" type="checkbox"/> <input type="text"/> Capital <b>R</b> defines the large radius (height). Small <b>r</b> defines the small radius.	R = 35 r = 10

### Beam end preparation







Option	Description
	Default Top and bottom flange are prepared. AutoDefaults can change this option.
	Automatic Top and bottom flange are prepared.

Option	Description
	Beam end is not prepared.
	Top and bottom flange are prepared.
	Top flange is prepared.
	Bottom flange is prepared.



### Flange cut

Option for top flange	Option for bottom flange	Description
		Default Flange is not cut. AutoDefaults can change this option.
		Flange is not cut.
		Flange is cut.

### Weld backing bars


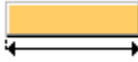

Option for top backing bar	Option for bottom backing bar	Description
		Default Backing bars are created inside the flanges. AutoDefaults can change this option.
		No backing bars are created.
		Backing bars are created inside the flanges.



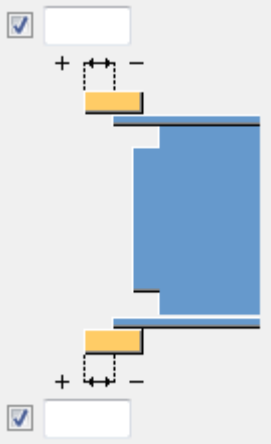
Option for top backing bar	Option for bottom backing bar	Description
		Backing bars are created outside the flanges.

### Weld backing bar length

Enter the length of the weld backing bar in the box below the options.

Option	Description
	Default Absolute length of the backing bar AutoDefaults can change this option.
	Absolute length of the backing bar
	Extension beyond the edge of the flange

### Weld backing bar position

Option	Description
	Enter a positive or a negative value to move the front end of the backing bar relative to the end of the flange.

### Assembly type

Define the location where the weld backing bar welds are made. When you select the **Workshop** option, Tekla Structures includes the backing bars in the assembly.

### General tab

Click the link below to find out more:

General tab

### ***Design type tab***

Click the link below to find out more:  
Design type tab

### ***Analysis tab***

Click the link below to find out more:  
Analysis tab

### ***Welds***

Click the link below to find out more:

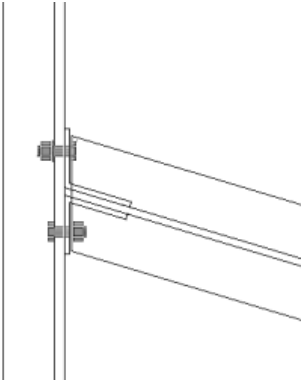
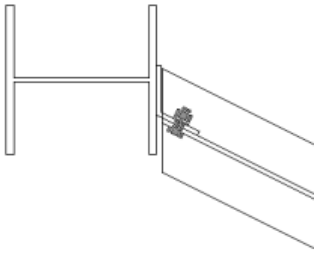
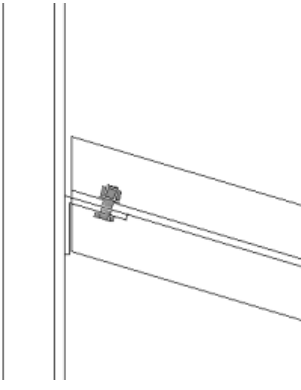
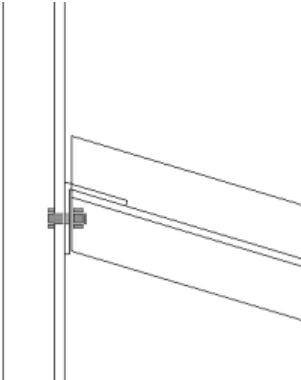
## **Bent plate (190)**

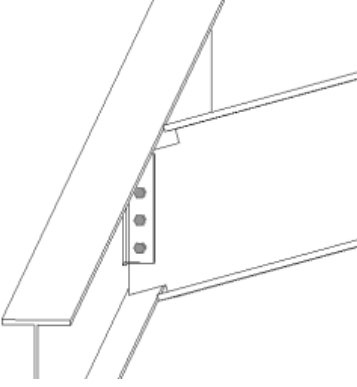
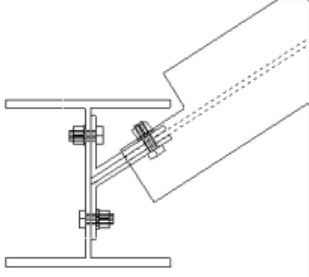
**Bent plate (190)** connects two beams or a beam and a column using one or two bolted or welded bent plates. The secondary beam can be leveled or sloped and/or skewed. Welded haunch plates are optional.

### **Objects created**

- Bent plate (1 or 2)
- Stiffeners (optional)
- Top and bottom haunch plate (optional)
- Weld backing bars (optional)
- Bolts
- Welds
- Cuts

**Use for**

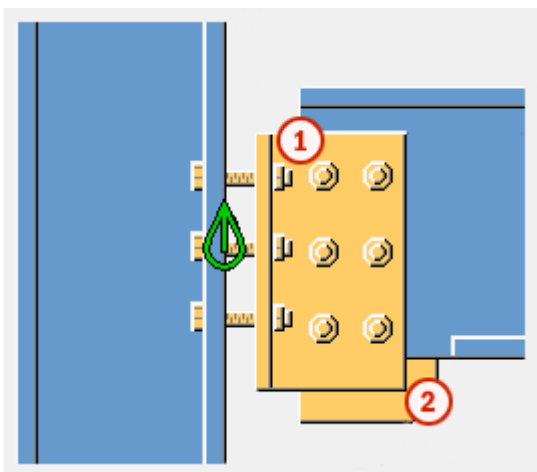
Situation	Description
	<p>Bent plate connecting two beams. The secondary part is skewed.</p>
	<p>Bent plate connected to a column flange. The secondary part is skewed.</p>
	<p>Bent plate connecting two beams. The secondary part is skewed.</p>
	<p>Bent plate connecting two beams. The secondary part is skewed. The plate can be placed to various locations.</p>

Situation	Description
	<p>Bent plate connecting two beams. The secondary part is skewed and sloped.</p>
	<p>Bent plate connected to a column web. The secondary part is skewed.</p>

### Selection order

1. Select the main part (beam or column).
2. Select the secondary part (beam). The connection is created automatically when the secondary part is selected.

### Part identification key



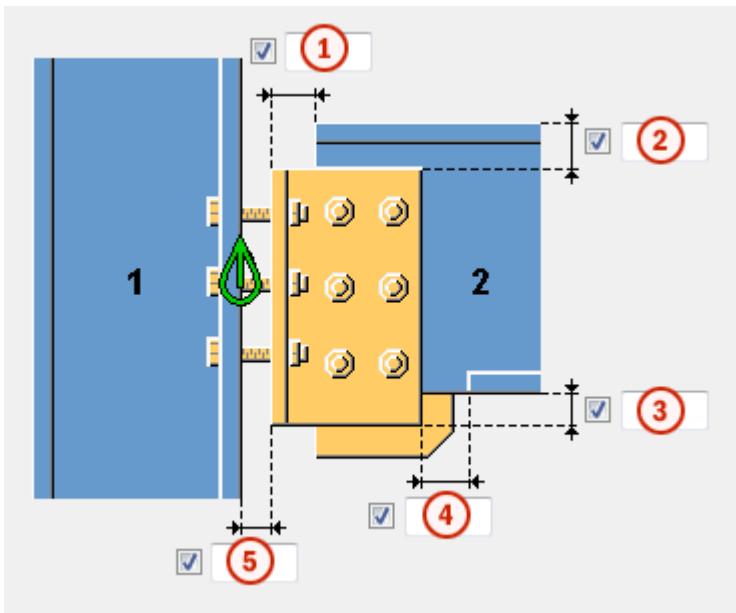
	Part
1	Bent plate
2	Haunch plate

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

### Picture tab

Use the **Picture** tab to control the position of the bent plate and to define how the beam end is cut.

### Dimensions

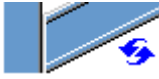
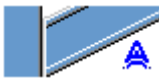




	Description	Default
1	<p>Cut length for the secondary part.</p> <p>The cutting point is defined from the bent plate edge.</p>	20 mm
2	<p>Bent plate upper edge distance from the top of the secondary part.</p> <p>The upper edge position of the plate modifies the bent plate height.</p> <p>Positive value moves the top position closer to the beam center and thus decreases the bent plate size. Negative value increases the bent plate size.</p>	If no value is entered, bolts and bolt edge distances define the size of the plate.

	Description	Default
3	Bent plate lower edge distance from the bottom of the secondary part. The lower edge position of the plate modifies the bent plate height. Positive value moves the bottom position closer to the beam center and thus decreases the plate size. Negative values increase the plate size.	If no value is entered, bolts and bolt edge distances define the size of the plate.
4	Size of the strip made to the secondary part flange. The cutting point of the flange is defined from the bent plate edge.	The flange is automatically stripped when the bent plate crosses the flange.  10 mm
5	Gap between the main part and the bent plate.	0

### Beam end cut

Define how the beam end is cut. The secondary part is viewed from the side.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary part slopes less than 10 degrees, a square cut is created. Otherwise, a bevel cut is made to the end of the secondary part.
	Square Creates a square cut to the end of the secondary part.
	Bevel Cuts the end of the secondary part parallel to the edge of the main part.

### Plates tab




Use the **Plates** tab to control the thickness, position and attachment of the bent plate. The dimensions on the **Picture** tab and the **Bolts** tab also affect the size of the bent plate.





## Bent plate NS/FS

Option	Description
<b>Bent plate</b>	Bent plate thickness.

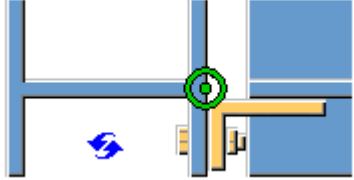

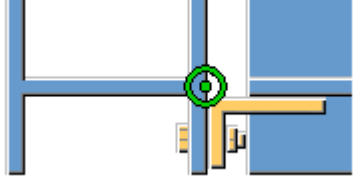
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

## Bent plate position

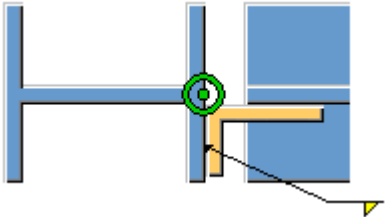
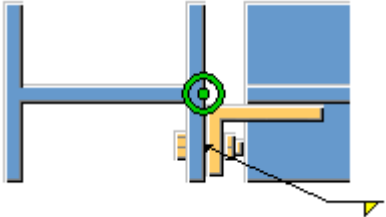
Option	Description
	Default Near side and far side bent plate AutoDefaults can change this option.
	Automatic Near side and far side bent plates are created automatically.
	Near side switched Creates a near side bent plate with a leg pointing to the far side.

Option	Description
	<p>Far side switched</p> <p>Creates a far side bent plate with a leg pointing to the near side.</p>
	<p>Far side</p>
	<p>Near side</p>
	<p>Near side and far side</p>

### Main and secondary part attachment type

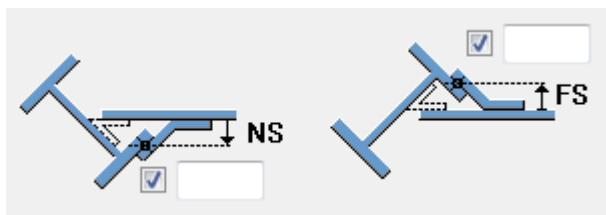
Option	Description
	<p>Default</p> <p>Bent plate is bolted to the main part.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic Bolted</p>
	<p>Bolted</p>



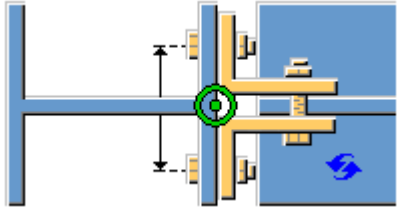
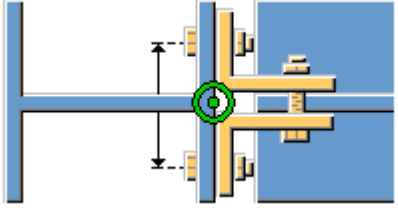
Option	Description
	Welded
	Bolted and welded

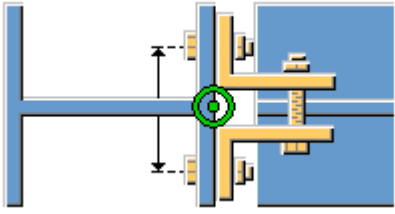
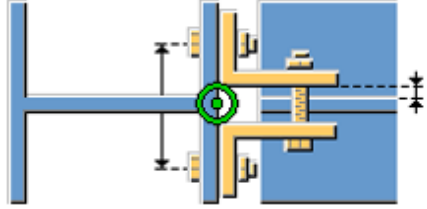
### Attachment point control

Define whether the bent plate is attached to the web or to the flange of the main part.



### Bolt spacing and weld gap

Option	Description
	<p>Default</p> <p>Define the bolt spacing. Weld gap is not created.</p> <p>AutoDefaults can change this option.</p>
	<p>Define the bolt spacing. Weld gap is not created.</p>

Option	Description
	Define the bolt spacing. Weld gap is created.
	Define the bolt spacing and the weld gap.

### **Stiffeners tab**

Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position, and type.

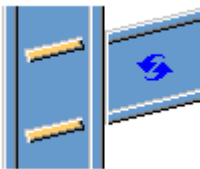
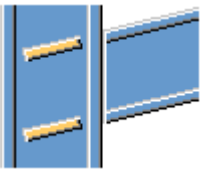
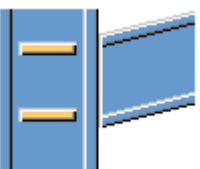
#### **Stiffener plate dimensions**

Option	Description
<b>Top NS</b>	Top near side stiffener thickness, width and height.
<b>Top FS</b>	Top far side stiffener thickness, width and height.
<b>Bottom NS</b>	Bottom near side stiffener thickness, width and height.
<b>Bottom FS</b>	Bottom far side stiffener thickness, width and height.



Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in

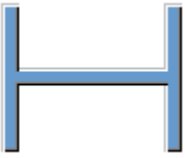

Option	Description	Default
		<b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Stiffener orientation





Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are parallel to the secondary part.
	Stiffeners are perpendicular to the main part.

### Stiffener creation

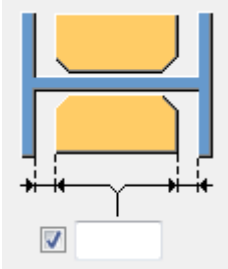
Option	Description
	Default Stiffeners are created. AutoDefaults can change this option.
	Automatic Stiffeners are created when necessary.

Option	Description
	No stiffeners are created.
	Stiffeners are created.

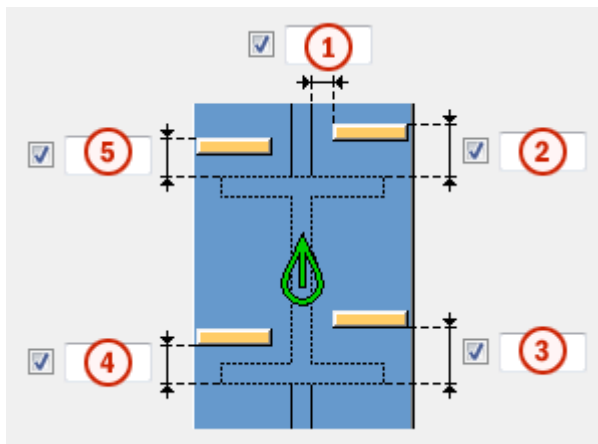
### Stiffener shape

Option	Description
	Default Line chamfered stiffener plates AutoDefaults can change this option.
	Automatic Line chamfered stiffener plates
	Square stiffener plates Stiffener plates with a gap for the main part web rounding
	Line chamfered stiffener plates

### Stiffener gap

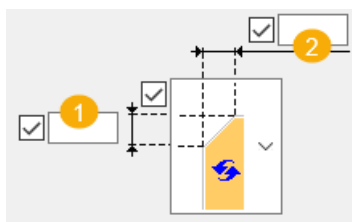
Option	Description
	<p>Size of the gap between the flanges and the stiffener.</p>

### Stiffener positions



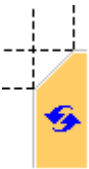




	Description
1	Size of the gap between the stiffener and the beam web edge.
2	Size of the gap between the top near side stiffener and the beam flange edge.
3	Size of the gap between the bottom near side stiffener and the beam flange edge.
4	Size of the gap between the bottom far side stiffener and the beam flange edge.
5	Size of the gap between the top far side stiffener and the beam flange edge.

### Chamfer dimensions



	Description	Default
1	Vertical dimension of the chamfer.	10 mm
2	Horizontal dimension of the chamfer.	10 mm

### Chamfer type

Option	Description
	Default. Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### ***Haunch tab***

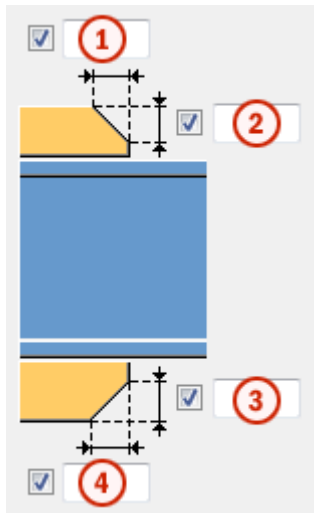
Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges.

### **Haunch plates**

Option	Description
<b>Top plate</b>	Top haunch plate thickness, width and height.
<b>Bottom plate</b>	Bottom haunch plate thickness, width and height.

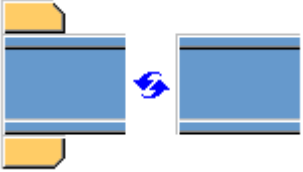
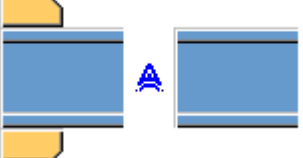


Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Haunch plate chamfers



	Description
<b>1</b>	Width of the top haunch plate chamfer.
<b>2</b>	Height of the top haunch plate chamfer.
<b>3</b>	Height of the bottom haunch plate chamfer.
<b>4</b>	Width of the bottom haunch plate chamfer.

## Haunch plate creation

Option	Description
	<p>Default</p> <p>Top and bottom haunch plates are created, if needed.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>Top or bottom haunch plate or both are created, if needed.</p>
	<p>Top and bottom haunch plates are created.</p> <p>To create a single plate, enter 0 in the thickness (<b>t</b>) field for the plate you do not need (top or bottom plate).</p>
	<p>Haunch plates are not created.</p>

### **Notch tab**


Use the **Notch** tab to automatically create notches for the secondary beams and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

### **Automatic notching**





Automatic notching options affect both the top and the bottom flange.

### **Notch shape**


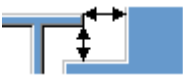
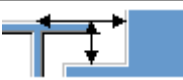
Automatic notching is switched on when you select a notch shape.

Option	Description
	<p>Default</p> <p>Creates notches to the secondary beam.</p> <p>AutoDefaults can change this option.</p>



Option	Description
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.
	Turns off automatic notching.

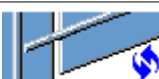

### Notch size


Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.





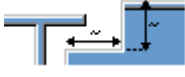
### Flange cut shape

Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.

Option	Description
	Secondary beam flange is cut square.

### Notch dimension rounding




Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.





The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



### Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

## Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.






 

## Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.



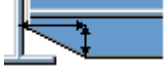



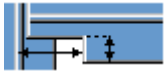
## Side of flange notch

The side of flange notch defines on which side of the beam the notches are created.


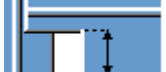

Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

## Flange notch shape

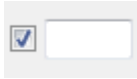
The flange notch shape defines the notch shape in the beam flange.

Option	Description
	<p>Default</p> <p>The entire flange of the secondary beam is cut as far back as you define.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.</p>
	<p>Creates chamfers in the flange.</p> <p>If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.</p>
	<p>Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b>.</p>
	<p>The flange is not cut.</p>
	<p>Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.</p>
	<p>Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b>.</p>

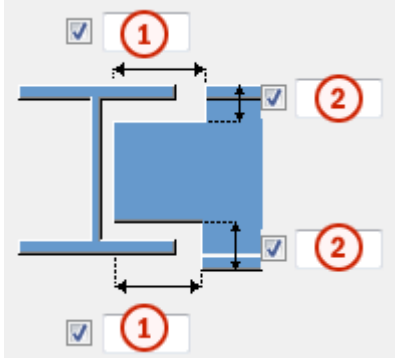
## Flange notch depth

Option	Description
	<p>Default</p> <p>Flange notch depth.</p> <p>AutoDefaults can change this option.</p>
	<p>Flange notch depth.</p>
	<p>Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.</p>

Enter the value for flange notch depth.



### Cut dimensions

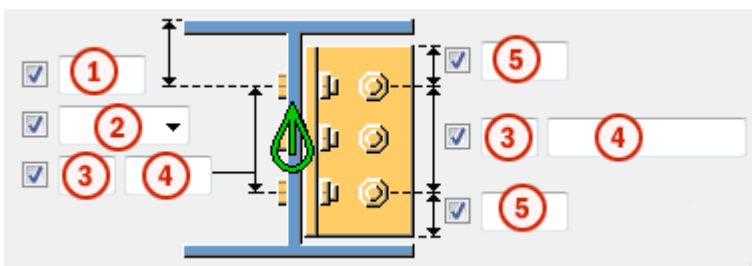


	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

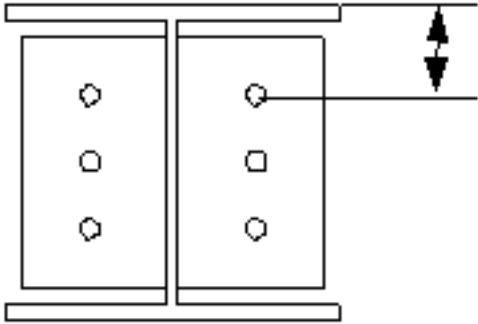
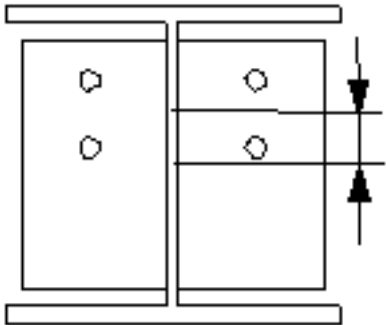
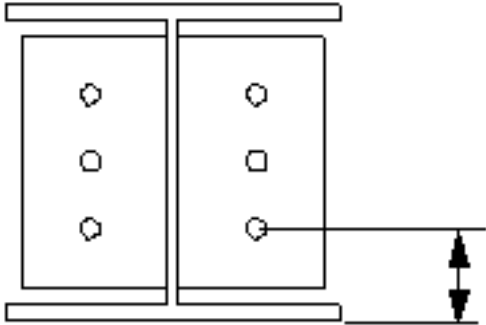
### Bolts tab

Use the **Bolts** tab to control the properties of the bolts that connect the bent plate to the main part and to the secondary part.

### Bolt group dimensions








	Description
1	Dimension for vertical bolt group position.

	<b>Description</b>
<p><b>2</b></p>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
<p><b>3</b></p>	<p>Number of bolts.</p>

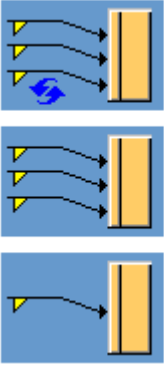
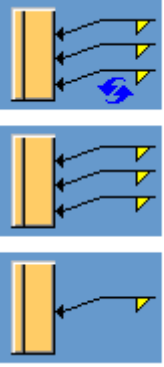
	Description
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.

### Staggering of bolts on bent plate

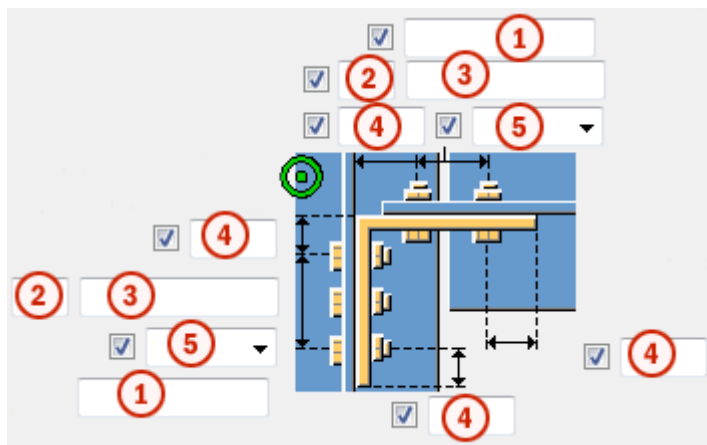
Option	Description
	Default Bolts are not staggered. AutoDefaults can change this option.
	Bolts are not staggered. The bolts that connect the bent plate to the secondary part are on the same horizontal level as the bolts that connect the bent plate to the main part.
	Bolts on the main part are staggered. The bolts that connect the bent plate to the main part are moved downwards by half the bolt vertical spacing value.
	Bolts on the secondary part are staggered. The bolts that connect the bent plate to the secondary part are moved downwards by half the bolt vertical spacing value.
	Bolts on the secondary part are staggered. The bolts that connect the bent plate to the sloped secondary part are parallel to the secondary part.

### Welds between parts

Define the number of welds created between the bent plate and secondary part, and the bent plate and main part.

Option	Description
	Welds between the bent plate and the secondary part
	Welds between the bent plate and the main part

### Bolt group dimensions









	Description
1	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.
2	Number of bolts.



	Description
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
4	Bolt edge distance.
5	Location where the bolts should be attached.

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

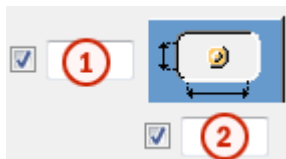
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

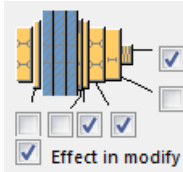


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

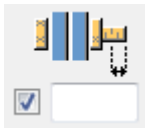
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Beam cut tab

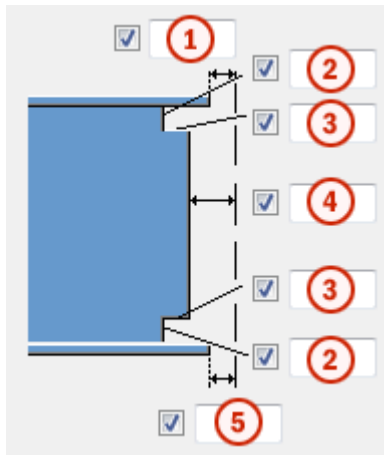
Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts.

### Weld backing bar

Option	Description
<b>Weld backing bar</b>	Weld backing bar thickness and width.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	




## Weld access hole dimensions







	Description
1	Gap between the secondary part top flange and the main part.
2	Vertical dimensions for the top and the bottom weld access holes.
3	Horizontal dimensions for the top and the bottom weld access holes.
4	Gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.
5	Gap between the secondary part bottom flange and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.



## Weld access holes

Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	







Option	Description	Default
	Round weld access hole with a radius that you can define in r <input checked="" type="checkbox"/> <input type="text"/>	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and Top Prep x <input checked="" type="checkbox"/> <input type="text"/> Bottom Prep x <input checked="" type="checkbox"/> <input type="text"/>	
	Cone-shaped weld access hole with radiuses that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and r <input checked="" type="checkbox"/> <input type="text"/> Capital <b>R</b> defines the large radius (height). Small <b>r</b> defines the small radius.	R = 35 r = 10

### Beam end preparation









Option	Description
	Default Top and bottom flange are prepared. AutoDefaults can change this option.
	Automatic Top and bottom flange are prepared.
	Beam end is not prepared.
	Top and bottom flange are prepared.

Option	Description
	Top flange is prepared.
	Bottom flange is prepared.

### Flange cut




Option for top flange	Option for bottom flange	Description
		Default Flange is not cut. AutoDefaults can change this option.
		Flange is not cut.
		Flange is cut.

### Weld backing bars

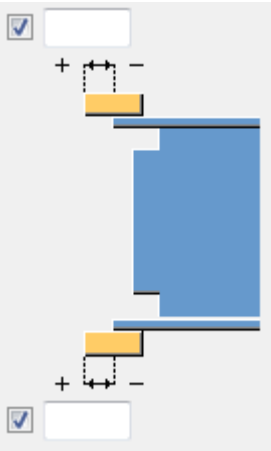
Option for top backing bar	Option for bottom backing bar	Description
		Default Backing bars are created inside the flanges. AutoDefaults can change this option.
		No backing bars are created.
		Backing bars are created inside the flanges.
		Backing bars are created outside the flanges.

### Weld backing bar length

Enter the length of the weld backing bar in the box below the options.

Option	Description
	Default Absolute length of the backing bar AutoDefaults can change this option.
	Absolute length of the backing bar
	Extension beyond the edge of the flange

### Weld backing bar position

Option	Description
	Enter a positive or a negative value to move the front end of the backing bar relative to the end of the flange.

### Assembly type

Define the location where the weld backing bar welds are made. When you select the **Workshop** option, Tekla Structures includes the backing bars in the assembly.

### General tab

Click the link below to find out more:

[General tab](#)

### Design tab

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

## **2.4 End plate connections and details**

This section introduces components that can be used in end plate connection and details.

- [Seating cap plate \(2\) \(page 521\)](#)
- [Bearing plate \(7\) \(page 530\)](#)
- [Column - 2 beams \(14\) \(page 538\)](#)
- [Joining plates \(14\) \(page 555\)](#)
- [Wooden purlin shoe \(15\) \(page 581\)](#)
- [Two sided end plate \(24\) \(page 569\)](#)
- [Stiffened end plate \(27\) \(page 591\)](#)
- [Stub \(28\) \(page 608\)](#)
- [End plate \(29\) \(page 621\)](#)
- [Seating cap \(37\) \(page 635\)](#)
- [Haunch \(40\) \(page 651\)](#)
- [Cranked beam \(41\) \(page 676\)](#)
- [HqI connection \(46\) \(page 689\)](#)
- [Plate with nail \(47\) \(page 695\)](#)
- [Spacer plate \(48\) \(page 698\)](#)
- [Double plate \(50\) \(page 707\)](#)
- [Partial stiff end plate \(65\) \(page 729\)](#)
- [End plate \(101\) \(page 748\)](#)
- [End plate with compensating flange plates \(111\) \(page 758\)](#)
- [Two-sided end plate with compensating flange plates \(112\) \(page 769\)](#)
- [Two sided end plate \(115\) \(page 781\)](#)
- [Stub connection \(119\) \(page 793\)](#)



- [Two sided end plate \(142\) \(page 804\)](#)
- [End plate \(144\) \(page 834\)](#)
- [End plate detail \(1002\) \(page 866\)](#)
- [Angle cut \(1057\) \(page 868\)](#)
- [Cast-in plate \(1069\) \(page 871\)](#)

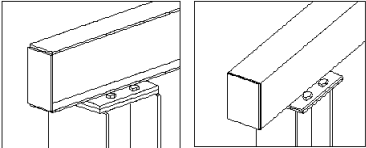
## Seating cap plate (2)

**Seating cap plate (2)** connects a beam to the column head. The connection creates two plates, one welded to the bottom of the beam and one to the column head. The plates are bolted together.

### Objects created

- Cap plates
- End plate
- Bolts
- Welds

### Use for

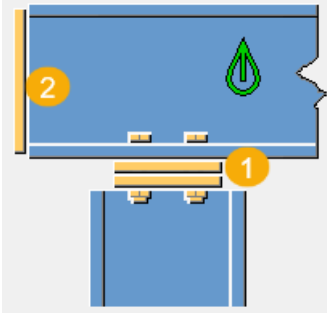
Situation	Description
	<p>Beam and column connected with two cap plates that are bolted together. The end plate is created to the beam end.</p>

### Selection order

1. Select the main part (beam or column).
2. Select the secondary part (beam or column).

The connection is created automatically when the secondary part is selected.

## Part identification key

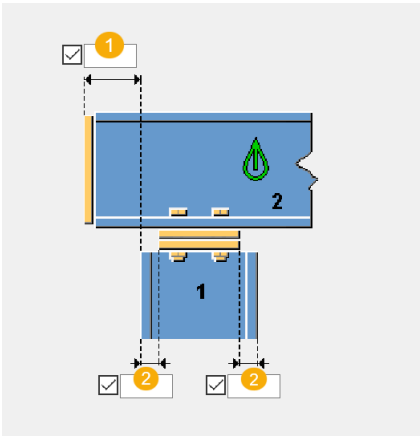


	Description
1	Upper cap plate Lower cap plate
2	End plate

## Picture tab

Use the **Picture** tab to define the connection dimensions.

## Dimensions



	Description	Default
1	Cut distance of the secondary beam end from the main part edge.	
2	End plate edge distance from the main part edge.	-10 mm Positive values move the end plate edge towards the column centre.

### **Parts tab**

Use the **Parts** tab to define the part properties.

#### **Parts**

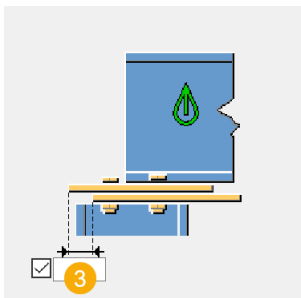
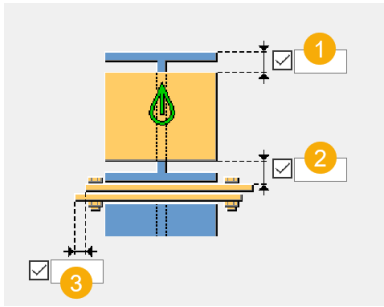
<b>Option</b>	<b>Description</b>
<b>Lower cap plate</b>	Thickness, width and height of the cap plate.
<b>Upper cap plate</b>	Thickness, width and height of the cap plate.
<b>End plate</b>	Thickness, width and height of the end plate.  If you leave the plate thickness empty, the end plate is not created.

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tab**

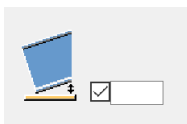
Use the **Parameters** tab to define the plate dimensions.

## Plate dimensions



	Description
1	End plate edge distance to the secondary part flange. This distance affects the size of the end plate welded to the secondary part end.
2	End plate edge distance to the upper cap plate. This distance affects the size of the end plate welded to the secondary part end.
3	Cap plate edge dimension.

## Gap size



Define the limit value for the gap between the end plate and the secondary beam. Use this when the beam is slightly curved or sloped to decide if the end angle is so small that the beam end can be straight.

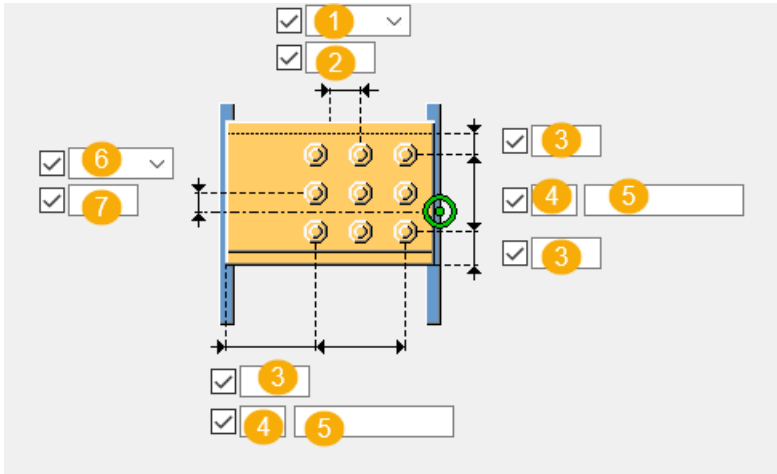
If the actual gap is smaller than this value, the end of the beam is left straight.

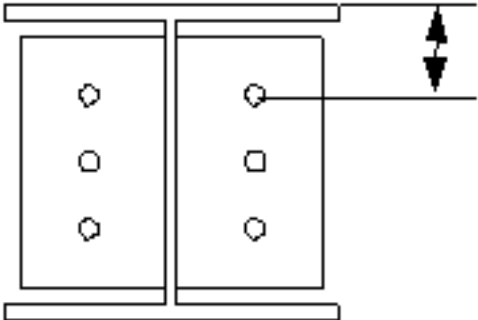
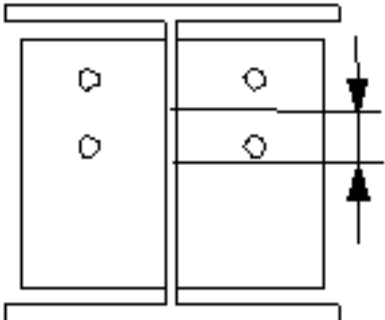
If the actual gap is larger than this value, the end of the beam is fitted to the end plate.

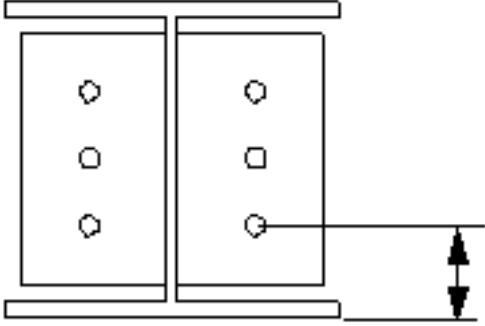
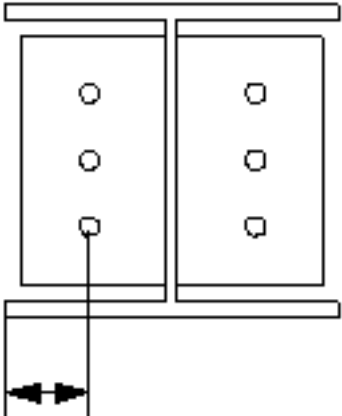
## **Bolts tab**

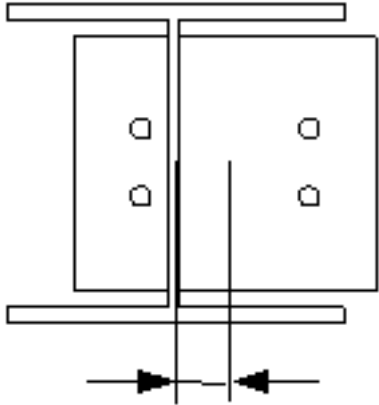
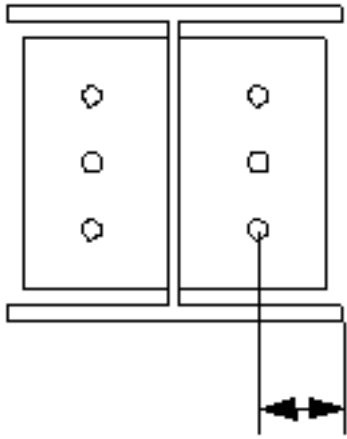
Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

## Bolt group dimensions



	Description
1	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.              </li> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> </ul>

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
2	Dimension for vertical bolt group position.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Number of bolts.
5	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
6	Select how to measure the dimensions for horizontal bolt group position. <ul style="list-style-type: none"> <li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li> </ul> 

	Description
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.              </li> <li> <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.              </li> </ul>
7	Dimension for horizontal bolt group position.

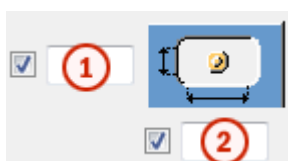
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within	Yes

Option	Description	Default
	the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



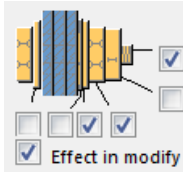
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.

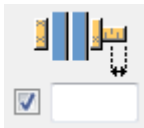









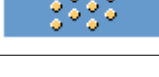
To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### General tab

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

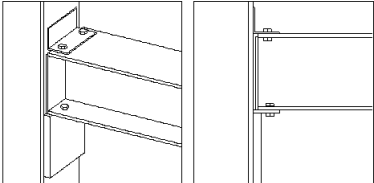
## **Bearing plate (7)**

**Bearing plate (7)** connects a beam to a column. A console seat plate welded to the column carries the shear forces. The beam upper flange is bolted to an L profile. The lower flange is bolted to a shim plate.

### **Objects created**

- Console seat plate
- End plate
- Shim plate
- Clip angle (L profile)
- Bolts
- Welds

### **Use for**

<b>Option</b>	<b>Description</b>
	Beam is connected to a column. The clip angle, shim plate, and console are created.

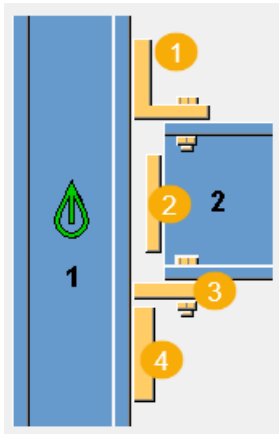
### **Selection order**

1. Select the main part (column).

- Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key

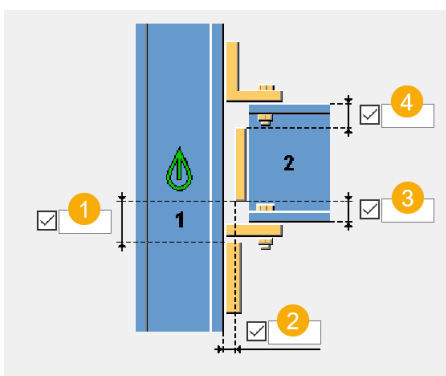


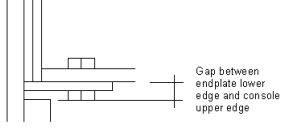
	Description
1	Clip angle (L profile)
2	End plate
3	Shim plate
	Console seat plate

### Picture tab

Use the **Picture** tab to define the connection dimensions.

### Dimensions



	Description	Default
1	<p>Console seat edge distance from the end plate lower edge.</p> 	
2	Gap between the end plate and the column.	10 mm
3	<p>End plate edge distance from the beam lower edge.</p> <p>Positive values move the end plate lower edge upward and negative values downward.</p>	End plate lower edge is set to the same position as the beam lower edge.
4	<p>End plate edge distance from the beam upper edge.</p> <p>Positive values move the end plate upper edge downward and negative values upward.</p>	10 mm

### Parts tab

Use the **Parts** tab to define the part properties.

### Parts

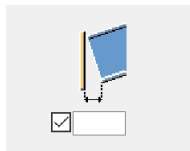
Option	Description	
<b>Seat</b>	Thickness, width, and height of the console seat.	<p>Thickness: 30 mm</p> <p>If the width is left empty, the secondary beam width is used.</p> <p>If the height is left empty, the secondary beam height is used.</p>
<b>End plate</b>	Thickness and width of the end plate.	<p>Thickness: Equal to the secondary part web thickness (rounded up to thickness 8, 10, 12, 16, 20, 25, 30, 35, 40, 45, and so on).</p> <p>If the width is left empty, the secondary beam width is used.</p>

Option	Description	
<b>Fitting plate</b>	Thickness of the shim plate.	10 mm
<b>L profile</b>	Select the profile from the profile catalog.	L100-6
<b>L seat</b>	Select the profile from the profile catalog.  An angle console can be created under the end plate. When an L console is used, the shim plate and the console seat plate are not created.	

### **Parameters tab**

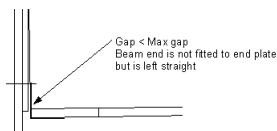
Use the **Parameters** to control the end plate gap size.

#### **Gap size**



Define the limit value for the gap between the end plate and the secondary beam. Use this when the beam is slightly curved or sloped to decide if the end angle is so small that the beam end can be straight.

If the actual gap is smaller than this value, the end of the beam is left straight.

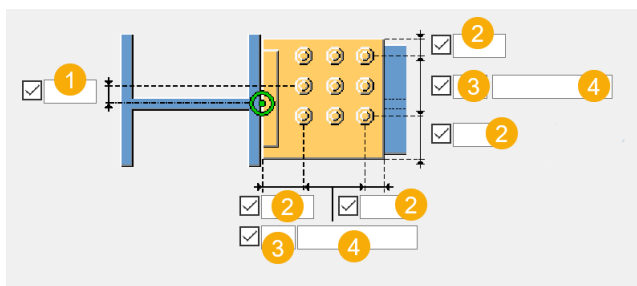


If the actual gap is larger than this value, the end of the beam is fitted to the end plate.

### **Console Blt tab**

Use the **Console Blt** tab to define the bolt group dimensions and bolt properties of the console seat plate.

## Bolt group dimensions



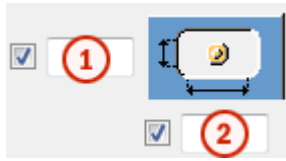
	Description
1	Dimension for horizontal bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.

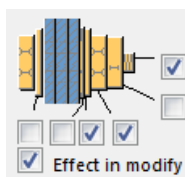


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

## Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



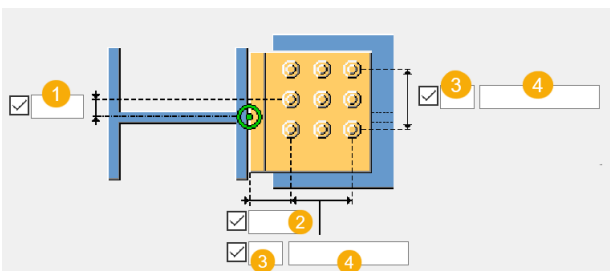
### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### L-profile Bolt tab

Use the **L-profile Bolt** tab to define the bolt group dimensions and bolt properties of the L profile bolts.

#### Bolt group dimensions



	Description
<b>1</b>	Dimension for horizontal bolt group position.
<b>2</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.









	Description
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2

Option	Description
	Staggered type 3
	Staggered type 4

### ***General tab***

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

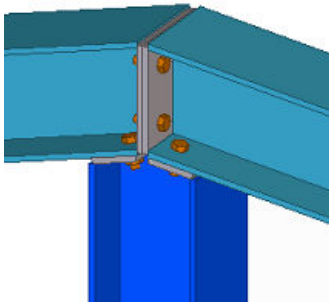
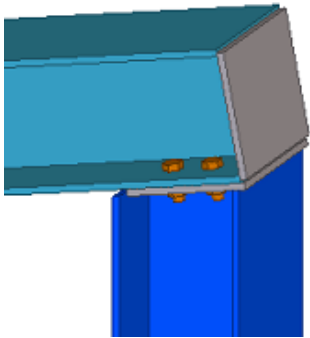
## **Column - 2 beams (14)**

**Column - 2 beams (14)** connects two beams to a column. The beam ends rest on the column. The secondary beams can be horizontal or sloped.

### **Objects created**

- End plates
- Cap plates
- Bolts
- Welds

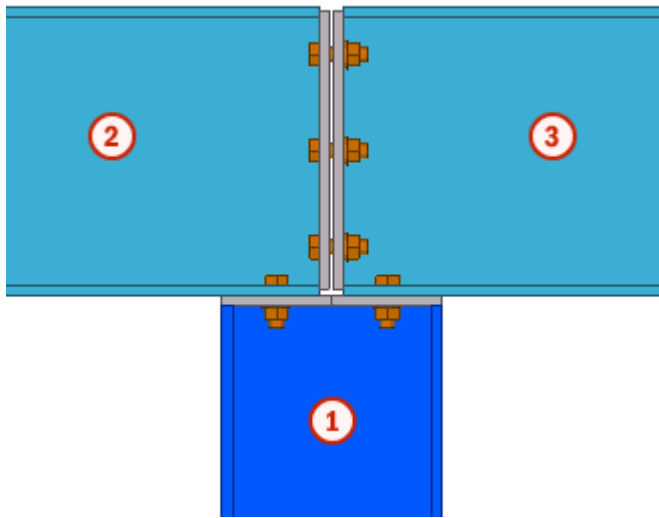
## Use for

Situation	Description
 A 3D perspective view of a steel connection. A vertical blue column is connected to two horizontal blue beams. The connection is made using a central vertical end plate with four bolts (two on each side) connecting it to the beams. The beams are positioned on top of the column.	Connection between a column and two beams.
 A 3D perspective view of a steel connection. A vertical blue column is connected to a single horizontal blue beam. The connection is made using a central vertical end plate with four bolts (two on each side) connecting it to the beam. The beam is positioned on top of the column.	<p>Connection between a column and a beam.</p> <p>You can use the component with only one secondary beam but then the settings are more difficult to define, and there are fewer situations where the component can be used.</p> <p>If you use the component with only one secondary beam, enter a negative value for the gap between end plates.</p>

## Selection order

1. Select the main part (column).
2. Select the first secondary part (beam).
3. Select the second secondary part (beam).
4. Click the middle mouse button to create the connection.

## Part identification key



	Part
1	Column
2	Beam
3	Beam

### Picture tab

Use the **Picture** tab to control the plate sizes.

### Plate 1, 2, 3, 4

Plates 1 and 2 are the end plates on the beams. Plates 3 and 4 are the cap plates between the columns and the beams.

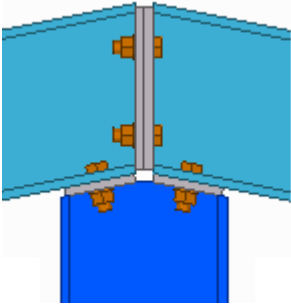
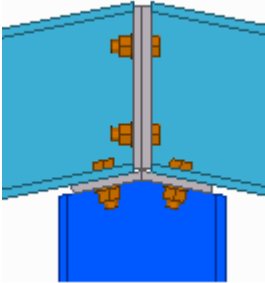
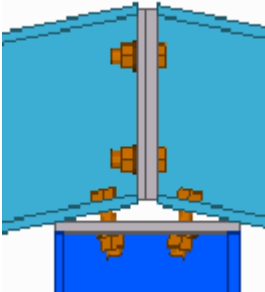
Option	Description
Plate 1, 2, 3, 4	Plate thickness, width and height.

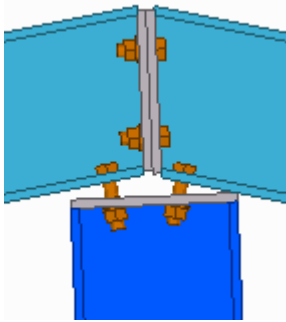
Option	Description	Default
Pos_No	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

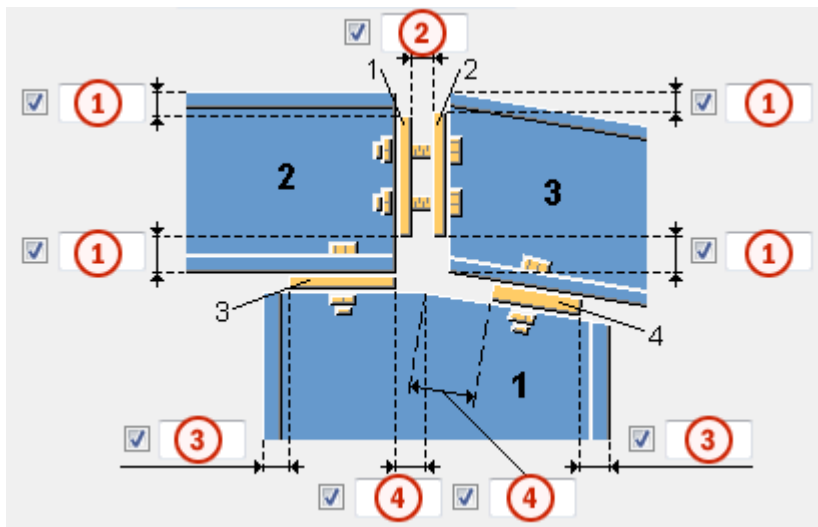
### Plate 3 + 4

Define the type of the connection between the column and beams.

Option	Description	Example
<b>2 plates</b>	Two plates are created. The column is chamfered twice.	
<b>Folded plate</b>	A folded plate is created. The plate can be unfolded on a workshop drawing. The column is chamfered twice.	
<b>1 plate</b>	One plate is created. The plate is always oriented horizontally. The column is fitted perpendicularly.	

Option	Description	Example
<b>Plate perp to column</b>	One plate is created. The column is fitted perpendicularly, even if the column is positioned in a skewed direction.	

### Plate distances



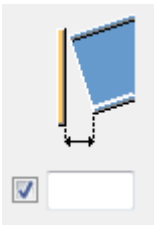
	Description	Default
<b>1</b>	Plate distance from the beam edge.	5 mm
<b>2</b>	Gap between the end plates. If you use the component with only one secondary beam, enter a negative value.	
<b>3</b>	Plate distance from the column edges.	
<b>4</b>	Plate distance from the column center.	

### End plates

Select how the end plates are positioned.



### Gap size



Define the limit value for the gap between the end plate and the beam, or for the gap between the cap plate and the column. Use this when the beam or the column is slightly curved or sloped to decide if the end angle is so small that the end can be straight.

If the actual gap is smaller than this value, the end of the beam is left straight.

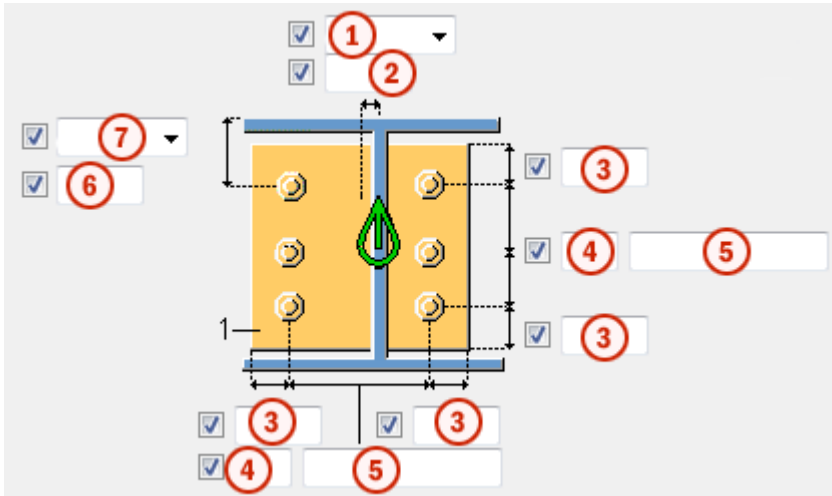
If the actual gap is larger than this value, the end is fitted to the end plate or to the cap plate.

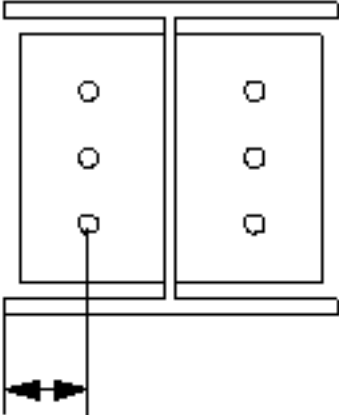
The default value is 5 mm.

### **Bolts 1 - 2 tab**

Use the **Bolts 1 - 2** tab to control the bolts that connect the end plates.

## Bolt group dimensions



	Description
1	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li> </ul> 

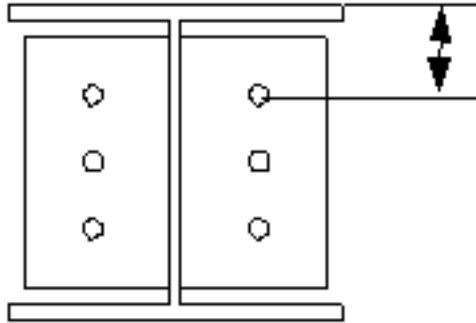


	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> <div style="text-align: center;"> </div>
<b>2</b>	Dimension for horizontal bolt group position.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>6</b>	Dimension for vertical bolt group position.

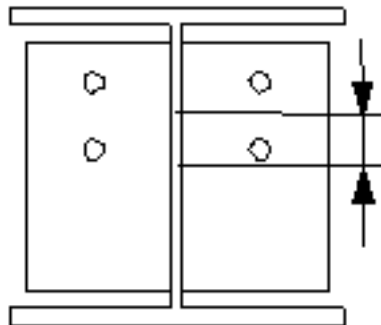
## Description

7 Select how to measure the dimensions for vertical bolt group position.

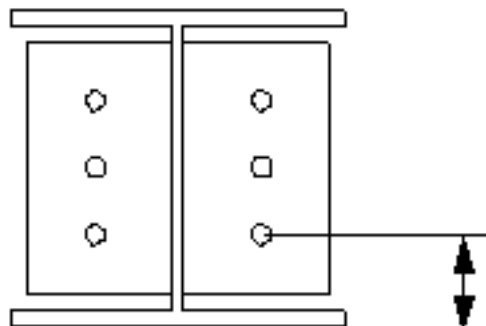
- **Top:** From the upper edge of the secondary part to the uppermost bolt.



- **Middle:** From the center line of the bolts to the center line of the secondary part.



- **Below:** From the lower edge of the secondary part to the lowest bolt.

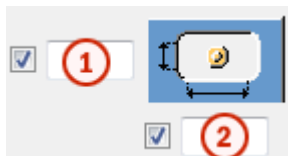


## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



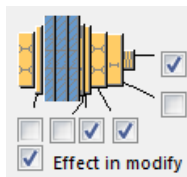
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### **Bolt assembly**

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

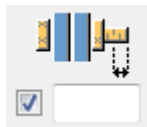
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### **Bolt length increase**

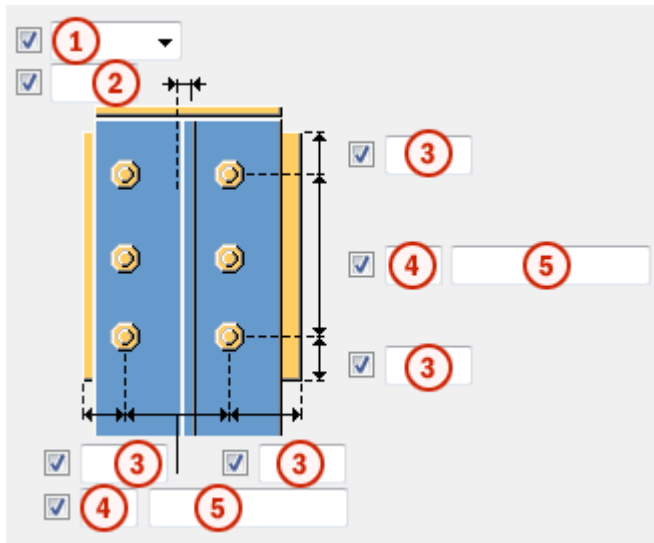
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.

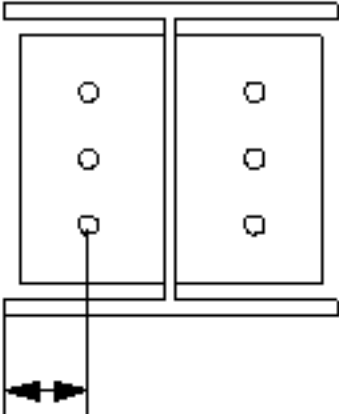


### **Bolts 3/Bolts 4 tabs**

Use the **Bolts 3** and **Bolts 4** tabs to control the bolts that connect the first secondary beam or the second secondary beam to the column.

## Bolt group dimensions



Description	
1	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li> </ul> 

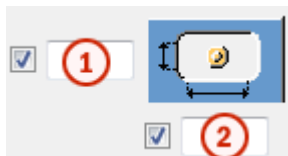
	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> <div style="text-align: center;"> </div>
<b>2</b>	Dimension for horizontal bolt group position.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



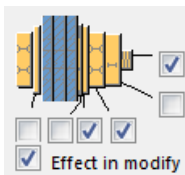
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

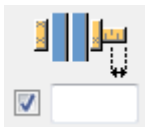
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Holes - Plate 1/Holes - Plate 2/Holes - Plates 3 and 4 tabs

Use the **Holes** tabs to control the galvanizing holes in the end plates.


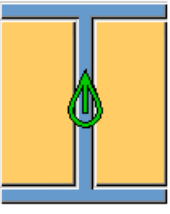
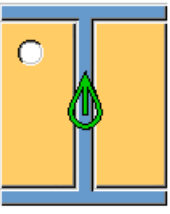
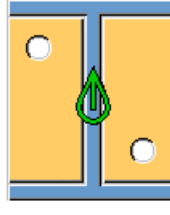
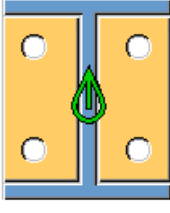
Option	Description
<b>Bolt standard</b>	Select the bolt standard.
<b>Bolt type</b>	Select the bolt type to define the location where the bolts should be attached.
<b>Read data from</b>	<p>You can select to use the <code>sinkholes.dat</code> definition file to specify the default values for horizontal and vertical offsets, and the diameters for upper and lower holes.</p> <p>The file is searched in the following order: Environment common system steel folder (<code>..\Environments</code></p>



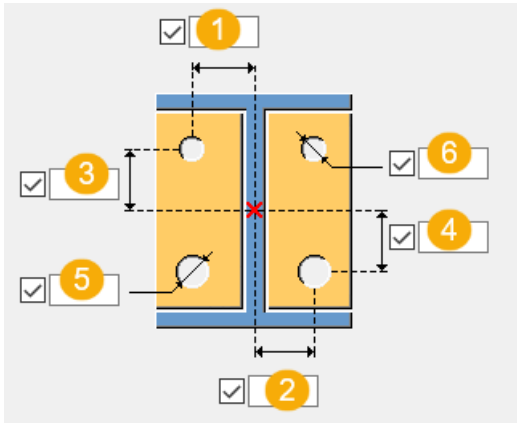
Option	Description
	\common\system\Steel), model folder, XS_FIRM, XS_PROJECT and XS_SYSTEM folder.  You can also select to define the holes in the component dialog box.

### Number of holes

The center of a hole group is the middle point of the beam and the middle point of the haunch, if the haunch exists. The hole groups are composed of 0, 1, 2 or 4 holes.

Option	Description
	Default No holes AutoDefaults can change this option.
	No holes
	1 hole
	2 holes
	4 holes

## Hole positions



	Description
<b>1</b>	Plates 1 and 2: Horizontal distance between the secondary beam center and the upper hole. Plates 3 and 4: Horizontal distance between the main part center and the upper hole.
<b>2</b>	Plates 1 and 2: Horizontal distance between the secondary beam center and the lower hole. Plates 3 and 4: Horizontal distance between the main part center and the lower hole.
<b>3</b>	Plates 1 and 2: Vertical distance between the secondary beam center and the upper hole. Plates 3 and 4: Vertical distance between the main part center and the upper hole.
<b>4</b>	Plates 1 and 2: Vertical distance between the secondary beam center and the lower hole. Plates 3 and 4: Vertical distance between the main part center and the lower hole.
<b>5</b>	Diameter of the lower hole.
<b>6</b>	Diameter of the upper hole.

### **General tab**

Click the link below to find out more:

[General tab](#)

## ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

## ***Welds***

Click the link below to find out more:

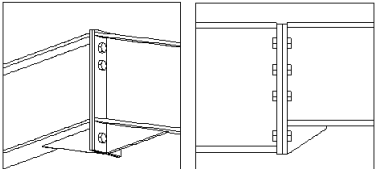
## **Joining plates (14)**

**Joining plates (14)** connects two beam ends using an end plate welded to both beams. End plates are connected with bolts. Stiffeners and ear plates can also be created.

### **Objects created**

- End plates
- Shim plates
- Ear plates
- Stiffeners
- Bolts
- Welds

### **Use for**

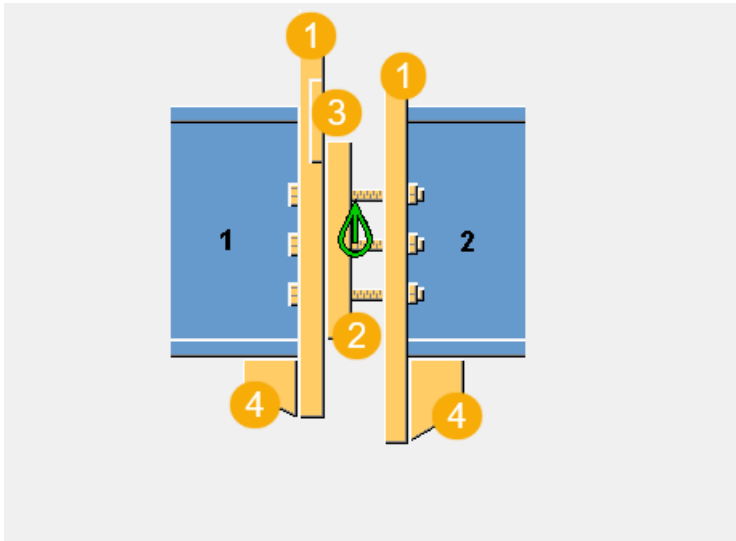
<b>Situation</b>	<b>Description</b>
	Beam ends connected with bolted end plates. Stiffener is created.

### **Selection order**

1. Select the main part (beam).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key

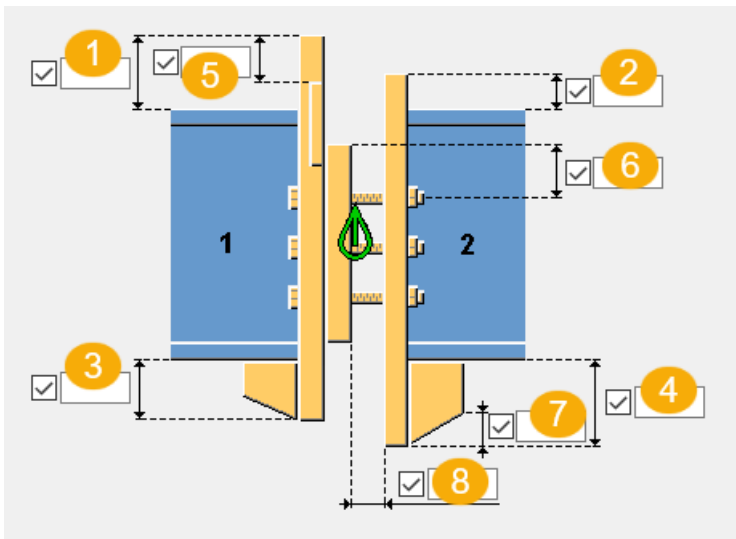


	Description
1	End plate
2	Shim plate
3	Ear plate
4	Stiffener

### Picture tab

Use the **Picture** tab to define the geometry of the connection.

### Dimensions



	<b>Description</b>	<b>Default</b>
<b>1</b>	End plate edge distance from the main part upper edge.  If you do not enter a value for the end plate edge distance on the main part side, the secondary part side value is used on the main part side as well.	10 mm
<b>2</b>	End plate edge distance from the secondary part upper edge.	10 mm
<b>3</b>	End plate edge distance from the main part lower edge.  If you do not enter a value for the end plate edge distance on the main part side, the secondary part side value is used on the main part side as well.	10 mm
<b>4</b>	End plate edge distance from the secondary part lower edge.	10 mm
<b>5</b>	Ear plate edge distance from the end plate upper edge.	38 mm
<b>6</b>	Shim plate vertical bolt edge distance.	1.5*bolt diameter
<b>7</b>	Stiffener edge inclination.  To get a rectangular stiffener, set the value to 0.  To get a triangular stiffener, enter the same value here as for the stiffener width on the <b>Parts</b> tab.	25 mm
<b>8</b>	Shim plate horizontal distance from the secondary part end plate.	

### **Parts tab**

Use the **Parts** tab to define the part properties, and the shim plate shape and bolt edge distance.

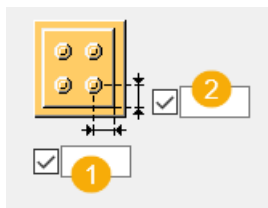
### **Parts**

<b>Option</b>	<b>Description</b>
<b>Sec end plate</b>	Thickness, width, and height of the secondary part end plate.
<b>Prim end plate</b>	Thickness, width, and height of the main part end plate.
<b>Fitting plate 1, Fitting plate 2, Fitting plate 3</b>	Thickness of the shim plate.

Option	Description
<b>Number of fitting pl. 1, Number of fitting pl. 2, Number of fitting pl. 3</b>	Number of shim plates.
<b>Ear plates</b>	Thickness, width, and height of the ear plates.  When you enter the ear plate thickness, two ear plates are by default created.
<b>Stiffeners</b>	Thickness and width of the stiffeners.

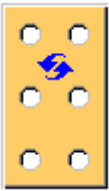





Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Shim plate bolt edge distance



	Description
<b>1</b>	Horizontal bolt edge distance in the shim plate.
<b>2</b>	Vertical bolt edge distance in the shim plate.

## Shim plate shape

Option	Description
	<p>Default</p> <p>Holes are based on the bolt group of the connection.</p> <p>AutoDefaults can change this option.</p>
	<p>Holes are based on the bolt group of the connection.</p>
	<p>Finger shim plate with horizontal slots.</p> <p>The plate can be installed from the right or the left side of the connection.</p>
	<p>Finger shim plate with vertical slots.</p> <p>The plate can be installed from the top of the connection.</p>
	<p>Two separate finger shim plates with horizontal slots.</p>
	<p>Two separate finger shim plates with vertical slots.</p>

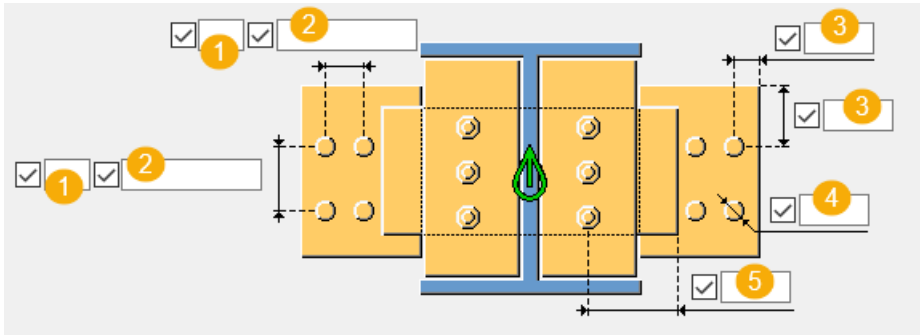
## Tolerance

Define the tolerance for the slots in finger shim plates. The width of the slot is the bolt diameter + the tolerance. For two separate shim plates, also define the tolerance between the plates.

### Parameters tab

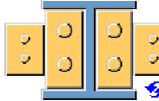
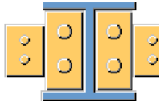
Use the **Parameters** tab to define ear plate creation and dimensions.

### Dimensions

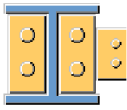
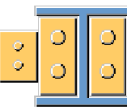


	Description	Default
<b>1</b>	Number of ear bolts You can define the number of the holes in the horizontal and vertical direction.	Horizontal: 1 Vertical: 2
<b>2</b>	Ear bolt spacing	3*hole diameter If there are more than two bolts in the bolt group in one direction, give the distances separated by a space (for example, 40 50).
<b>3</b>	Ear bolt edge distance Edge distance is calculated from the top and outside edges.	2.5*hole diameter
<b>4</b>	Ear bolt hole diameter	
<b>5</b>	Bolt edge distance to the edge of the shim plate	

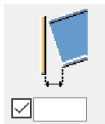
### Ear plate creation

Option	Description
	Default Both ear plates are created. AutoDefaults can change this option.
	Both ear plates are created.



Option	Description
	Ear plate 1 is created.
	Ear plate 2 is created.

### Gap size



Define the limit value for the gap between the end plate and the secondary beam. Use this when the beam is slightly curved or sloped to decide if the end angle is so small that the beam end can be straight.

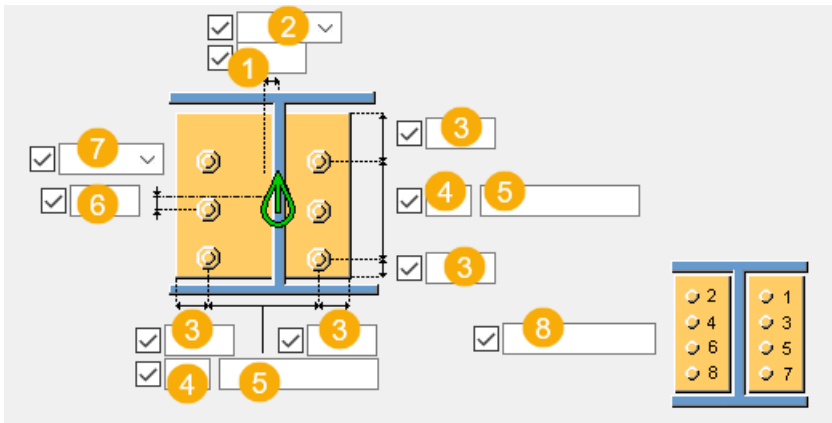
If the actual gap is smaller than this value, the end of the beam is left straight.

If the actual gap is larger than this value, the end of the beam is fitted to the end plate.

### Bolts tab

Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

### Bolt group dimensions

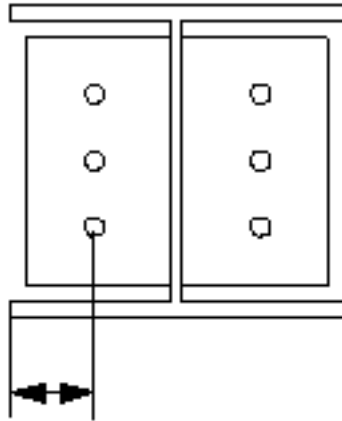


1	Dimension for horizontal bolt group position.

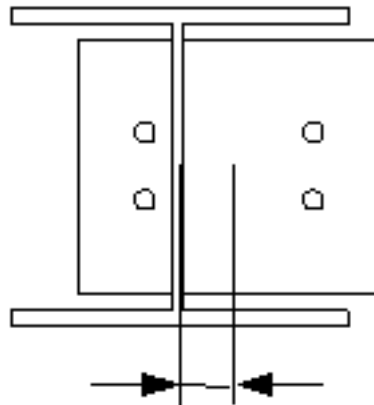
2

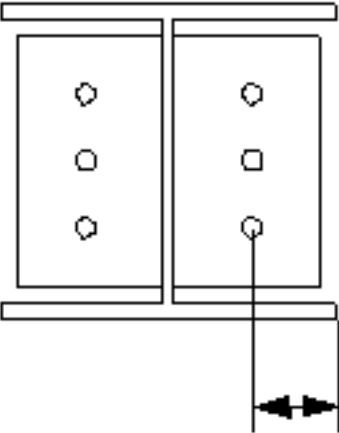
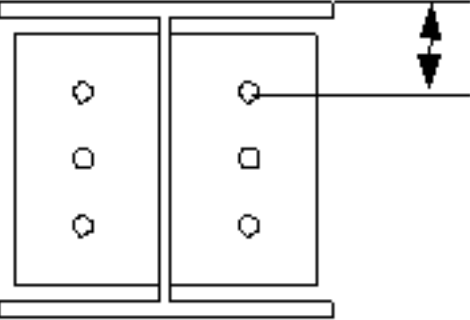
Select how to measure the dimensions for horizontal bolt group position.

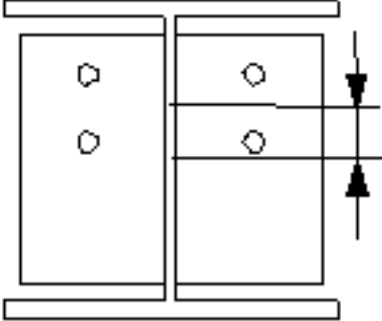
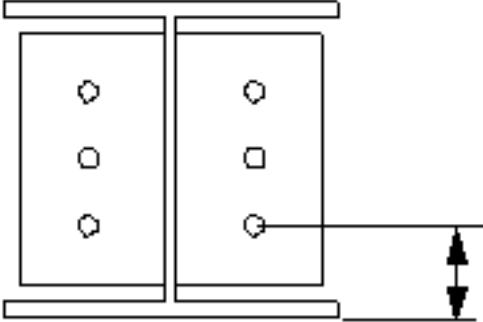
- **Left:** From the left edge of the secondary part to the leftmost bolt.



- **Middle:** From the center line of the secondary part to the center line of the bolts.



	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
3	<p>Bolt edge distance.</p> <p>Edge distance is the distance from the center of a bolt to the edge of the part.</p>
4	Number of bolts.
5	<p>Bolt spacing.</p> <p>Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.</p>
6	Dimension for vertical bolt group position.
7	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
<b>8</b>	Define which bolts are deleted from the bolt group.

**Bolt basic properties**

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

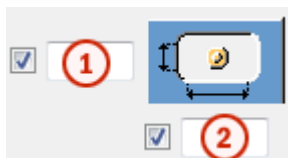
Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Bolt comment

You can define a bolt comment.

### Slotted holes

You can define slotted, oversized, or tapped holes.

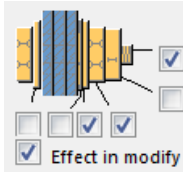


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

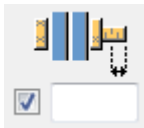
If you want to create a hole only, clear all the check boxes.









To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Holes tab


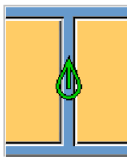
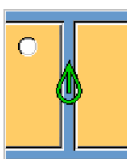
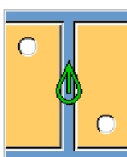
Use the **Holes** tab to control the galvanizing holes in the end plates.

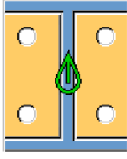
Option	Description
<b>Bolt standard</b>	Select the bolt standard.
<b>Bolt type</b>	Select the bolt type to define the location where the bolts should be attached.

Option	Description
<p><b>Read data from</b></p>	<p>You can select to use the <code>sinkholes.dat</code> definition file to specify the default values for horizontal and vertical offsets, and the diameters for upper and lower holes.</p> <p>The file is searched in the following order: Environment common system steel folder (<code>..\Environments\common\system\Steel</code>), model folder, <code>XS_FIRM</code>, <code>XS_PROJECT</code> and <code>XS_SYSTEM</code> folder.</p> <p>You can also select to define the holes in the component dialog box.</p>

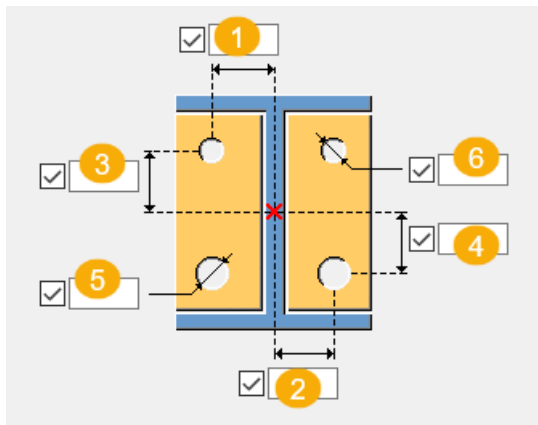
### Number of holes

The center of a hole group is the middle point of the beam and the middle point of the haunch, if the haunch exists. The hole groups are composed of 0, 1, 2, or 4 holes.

Option	Description
	<p>Default No holes AutoDefaults can change this option.</p>
	<p>No holes</p>
	<p>1 hole</p>
	<p>2 holes</p>

Option	Description
	4 holes

### Hole positions



<b>1</b>	Horizontal distance between the end plate center and the upper hole.
<b>2</b>	Horizontal distance between the end plate center and the lower hole.
<b>3</b>	Vertical distance between the end plate center and the upper hole.
<b>4</b>	Vertical distance between the end plate center and the lower hole.
<b>5</b>	Diameter of the lower hole.
<b>6</b>	Diameter of the upper hole.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

[Design tab](#)



### ***Analysis tab***

Click the link below to find out more:  
[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

### ***Dstv connection properties***

Click the link below to find out more:

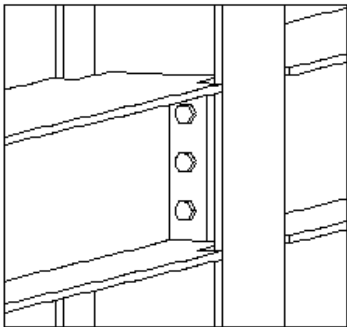
## **Two-sided end plate (24)**

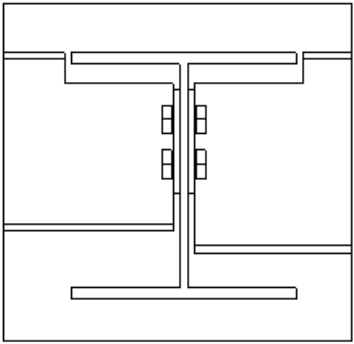
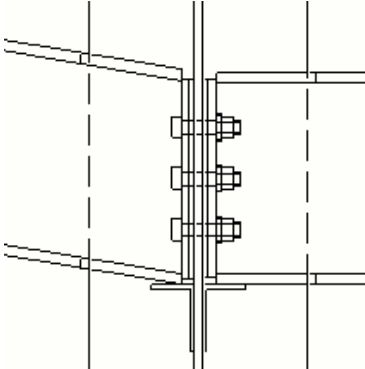
**Two-sided end plate (24)** connects two beams to a column or to a beam using a bolted end plate. One bolt group goes through all the three parts. This connection is created and used in the same way as **End plate (29)** connection.

### **Objects created**

- End plate
- Seat (plate or angle)
- Shim plates
- Stiffeners
- Welds
- Bolts
- Cuts

### **Use for**

<b>Situation</b>	<b>Description</b>
	Beam-to-column end plate connection.

Situation	Description
	Beam-to-beam end plate connection.
	End plate connection with shim plates and a seat angle.

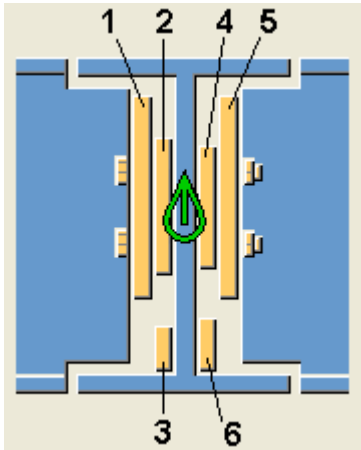
### Limitations

Do not use this connection when connecting a beam to a column flange.

### Selection order

1. Select the main part (column or beam).
2. Select the first secondary part (beam).
3. Select the second secondary part (beam).
4. Click the middle mouse button to create the connection.

### Part identification key

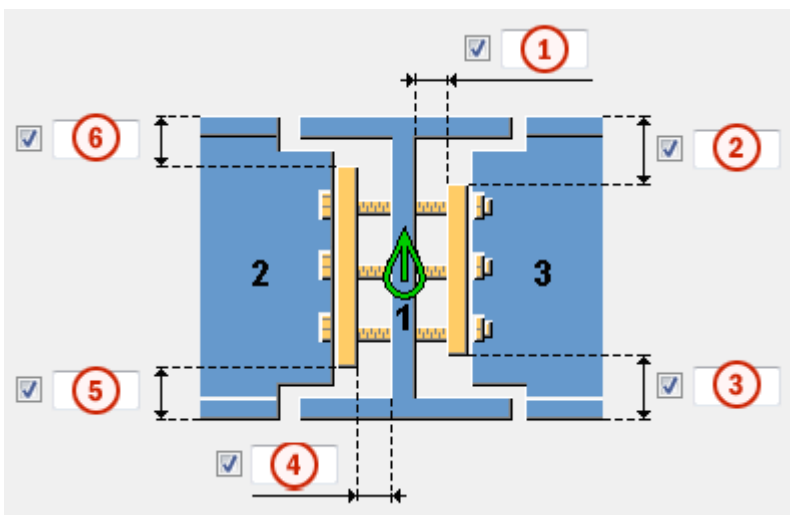


	Part
1	End plate for the first secondary beam
2	Shim plate for the first secondary beam
3	Seat (plate or angle) for the first secondary beam
4	Shim plate for the second secondary beam
5	End plate for the second secondary beam
6	Seat (plate or angle) for the second secondary beam

### Picture tab

Use the **Picture** tab to control the position of the end plate.

### End plate position



	<b>Description</b>
<b>1</b>	Gap between the main part and the end plate or the shim plate of the second secondary beam.
<b>2</b> <b>3</b>	End plate edge distance from the top or bottom of the second secondary beam.
<b>4</b>	Gap between the main part and the end plate or the shim plate of the first secondary beam.
<b>5</b> <b>6</b>	End plate edge distance from the top or the bottom of the first secondary beam.

### **Parts tab**

Use the **Parts** tab to define the properties of the parts created.

### **Plate**

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>End plate</b>	End plate thickness, width and height.  The width and height are defined by the bolt group edge distances. The height can also be entered as a plate edge distance from the upper and lower edge of the secondary beam.	half of the bolt diameter
<b>Seat</b>	Define whether a seat is created under the end plate.  The seat is created only if the seat thickness is entered.  Adding a seat plate moves the end plate by default 20 mm below the secondary beam bottom.	<code>width = end plate width</code> <code>height = secondary beam height</code>
<b>L seat</b>	Define whether a seat angle is created under the end plate. The length	<code>width = end plate width</code>

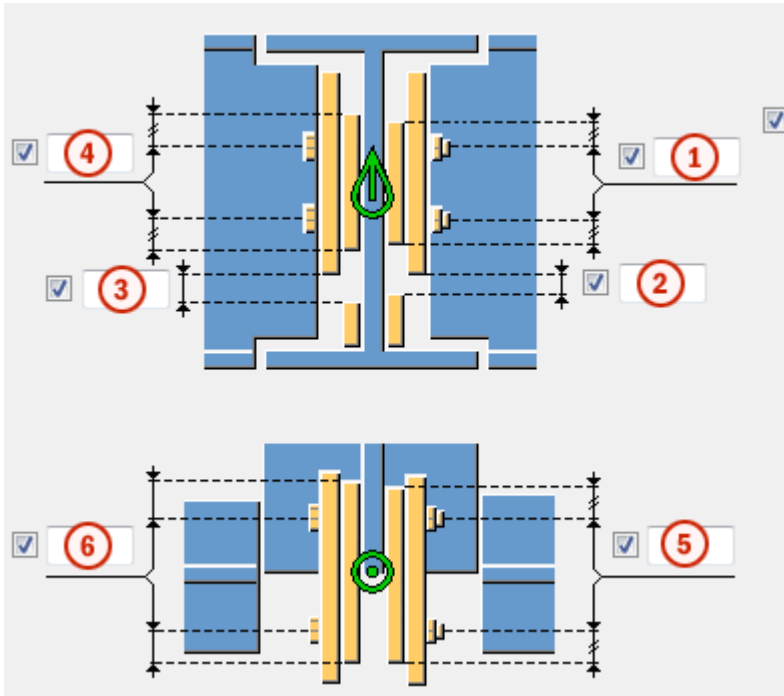
Option	Description	Default
	<p>of the angle is defined by the seat width.</p> <p>If you enter a seat angle profile, the seat will be an angle instead of a plate even if you have entered the plate thickness.</p> <p>Adding a seat angle does not move the end plate in the same way as the seat plate. To avoid collision between the angle and the secondary beam, modify the end plate or enter a gap between the end plate and the seat angle.</p>	
<b>Fitting plate</b>	<p>Shim plate thickness.</p> <p>The plate is created only if the plate thickness is entered.</p>	width and height = defined by the bolt group and the shim plate edge distances
<b>Number or fitting pl.</b>	Define how many shim plates are created.	

Option	Description	Default
<b>Pos_No</b>	<p>Prefix and start number for the part position number.</p> <p>Some components have a second row of fields where you can enter the assembly position number.</p>	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Parameters tab

Use the **Parameters** tab to control the shim plate and end plate positions.

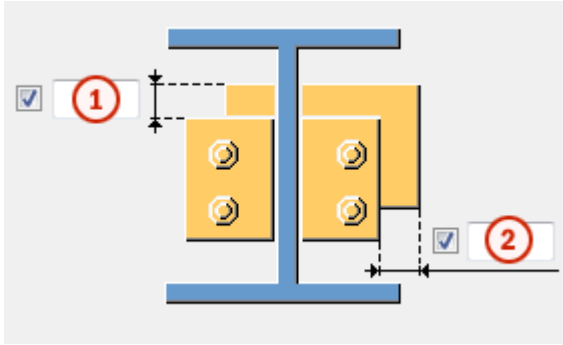
### End plate dimensions



	Description	Default
1	Vertical bolt edge distance for the shim plates.	1.5*bolt diameter
4	The number and spacing of bolts affect the size of the shim plates.	
2	Gap between the end plate and the seat (plate or angle).	0 mm
3		
5	Horizontal bolt edge distance for the shim plates.	
6		

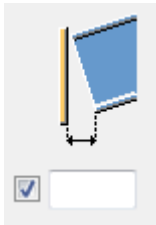
### Shim plate and end plate positions

Define the position of the shim plates and the end plate in the second secondary beam. The plates move in relation to the plates in the first secondary beam. By default, the plates in the second secondary beam are positioned so that holes are placed symmetrically. You may need to move the plates, for example, when connecting skew or curved secondary beams.



<b>Description</b>	
<b>1</b>	Define how much the plates are moved in vertical direction.
<b>2</b>	Define how much the plates are moved in horizontal direction.

### Gap size



Define the limit value for the gap between the end plate and the secondary or main beam. Use this gap when the beam is slightly curved or sloped to decide if the end angle is so small that the beam end can be straight.

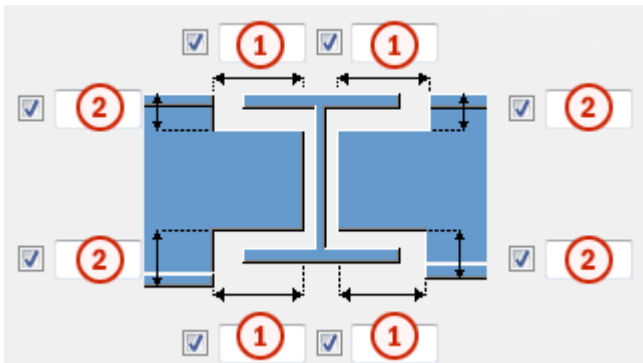
If the actual gap is smaller than this value, the beam end is left straight.

If the actual gap is larger than this value, the beam end is fitted to the end plate.

### Notch tab

Use the **Notch** tab to modify the horizontal and vertical cuts.

### Cut dimensions

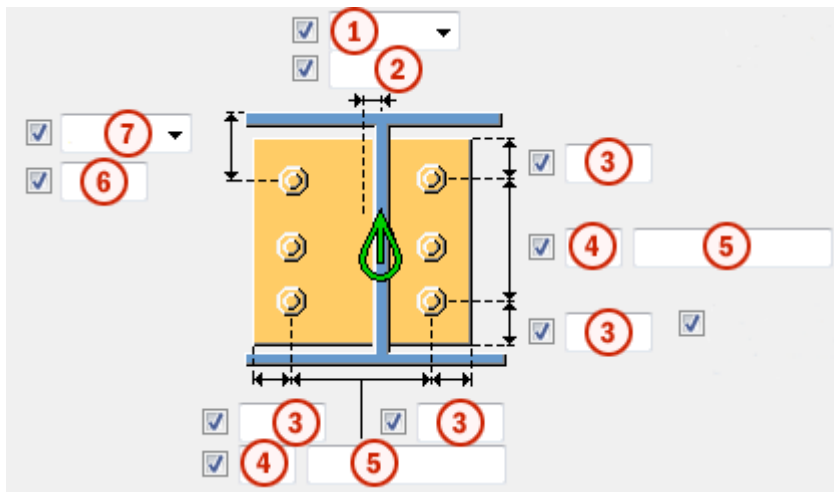


	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### **Bolts tab**

Use the **Bolts** tab to control the properties of the bolts used.

### **Bolt group dimensions**



	Description
1	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li> </ul>

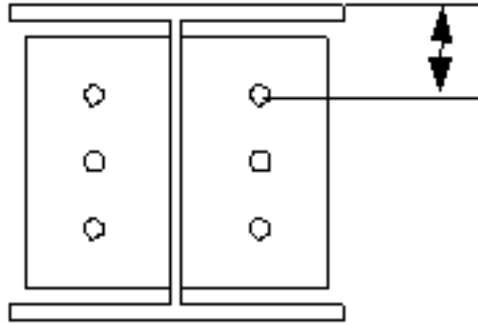


	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> <div style="text-align: center;"> </div>
<b>2</b>	Dimension for horizontal bolt group position.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>6</b>	Dimension for vertical bolt group position.

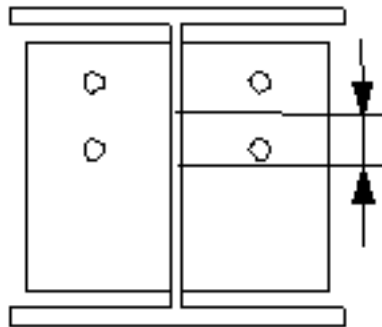
## Description

7 Select how to measure the dimensions for vertical bolt group position.

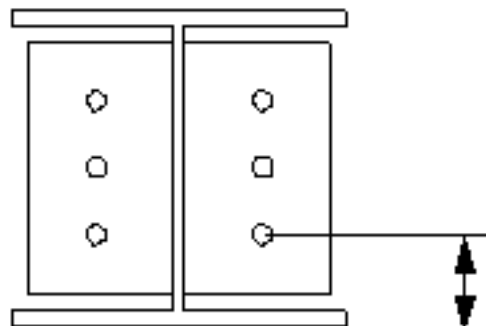
- **Top:** From the upper edge of the secondary part to the uppermost bolt.









- **Middle:** From the center line of the bolts to the center line of the secondary part.



- **Below:** From the lower edge of the secondary part to the lowest bolt.



## Staggering of bolts

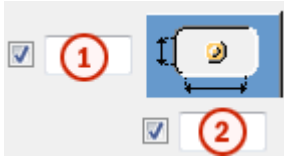
Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.

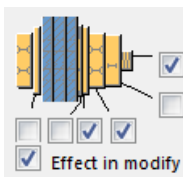


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<p><b>Slotted</b> creates slotted holes.</p> <p><b>Oversized</b> creates oversized or tapped holes.</p> <p><b>No hole</b> does not create holes.</p>	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### ***General tab***

Click the link below to find out more:  
General tab

### ***Design tab***

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:  
Analysis tab

### ***Welds***

Click the link below to find out more:

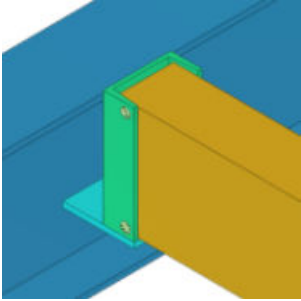
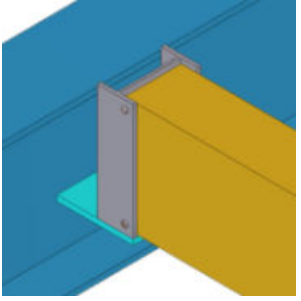
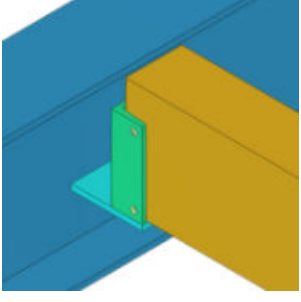
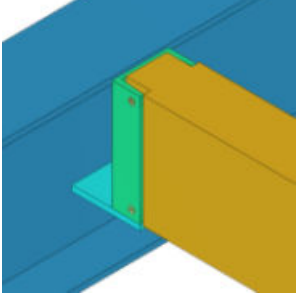
## **Wooden purlin shoe (15)**

**Wooden purlin shoe (15)** creates a connection between a steel beam and a wooden purlin. A purlin shoe is welded to the steel beam, in which a wooden purlin is fitted. You can use various profiles to create the purlin shoe, for example, U-shaped and L-shaped profiles. The purlin shoe has holes so the wooden purlin can be connected using hexagon head wood screws.

### **Objects created**

- Purlin shoe
- Bolts
- Welds

## Use for

Situation	Description
	Wooden purlin shoe, U profile.
	Wooden purlin shoe, I profile.
	Wooden purlin shoe.
	Wooden purlin shoe, purlin is notched.

### Before you start

Create a steel beam and a purlin.

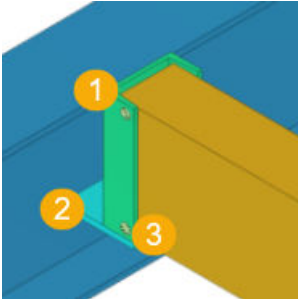
### Selection order

1. Select the beam (main part).

2. Select the wooden purlin (secondary part).

The connection is created automatically when the secondary part is selected.

### Part identification key

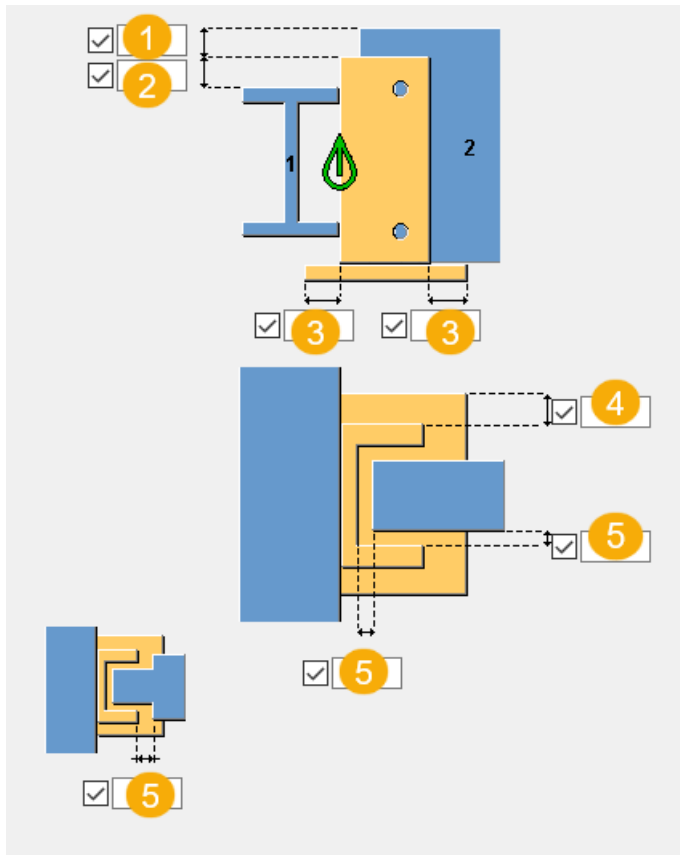


	Description
1	Purlin shoe profile
2	Bottom plate
3	Bolt group

### **Picture tab**

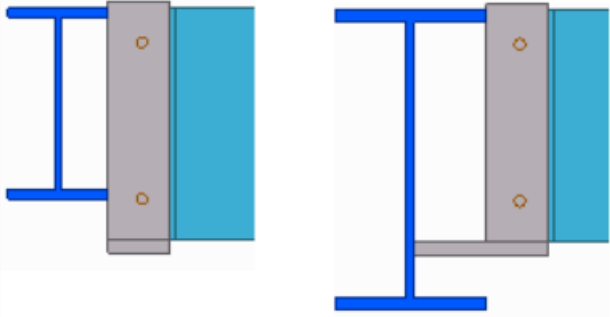
Use the **Picture** tab to define the offset dimensions of the shoe profile, base plate, and notch.

## Offset dimensions



	Description	Default
<b>1</b>	Shoe profile offset from the purlin top.	
<b>2</b>	Shoe profile offset from the steel beam top. This dimension takes priority over the shoe profile offset.	5 mm
<b>3</b>	Bottom plate offset in the direction of the wooden purlin. If you do not enter a value and the steel beam bottom is further down than the wooden purlin bottom, the bottom plate extends automatically to the main part web. For example:	0



	Description	Default
		
4	Bottom plate offset in the direction of the main part.	0
5	Notch offset. When the shoe profile width is insufficient, the wooden purlin is notched.	

### Parts tab

Use the **Parts** tab to define the shoe profile and bottom plate properties.

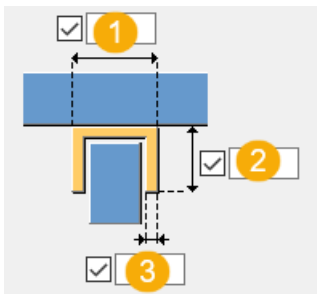
#### Parts

Option	Description
<b>Bottom plate</b>	Thickness of the bottom plate.
<b>Profile</b>	Select the shoe section profile from the profile catalog.  If you do not select any profile, the shoe profile shape selected in <b>Section type</b> is used.
<b>Section type</b>	Select the shoe profile section type.  Section type is used when a profile is not defined in <b>Profile</b> .  Which profile is used depends on the wooden purlin width. The shoe profile has to be chosen so that the wooden purlin fits the shoe without needing to notch the wooden purlin.  Catalog profiles are used, except for the last two options: U-shaped bent plate and L-shaped bent plate. When you use either of these, you can select in <b>Create shoe as</b> whether the U-

Option	Description
	shaped or L-shaped profile is created as a folded plate or a polybeam. If you create a polybeam, you can create an unfolded bent plate drawing with bent lines.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Section dimensions



	Description
<b>1</b>	Shoe profile width. If you have selected a catalog section (UNP, UPE, INP, IPE, L) in <b>Section type</b> you have to define a width that corresponds with the catalog profiles.

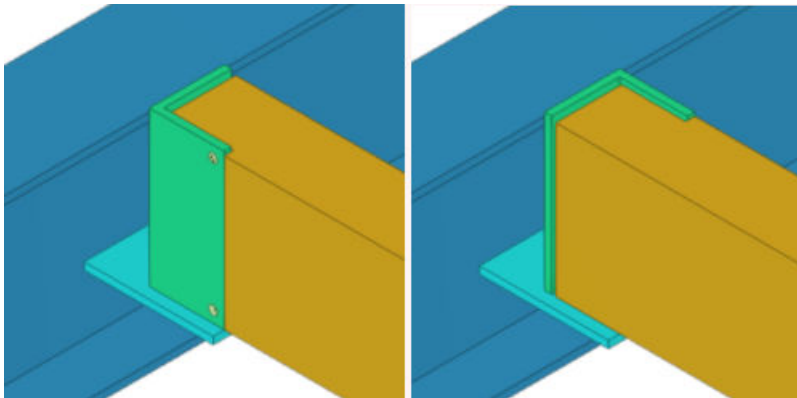
	Description
	<p>For example, if you have selected the UNP section, you can set the width to 80 because this profile exists in the catalog. You cannot use value 90 because the catalog does not contain a UNP90 profile.</p> <p>If you use a value that is not valid, the shoe profile will disappear.</p>
2	<p>Shoe profile flange height.</p> <p>You can define the flange height for U-shaped bent plates and L-shaped bent plates.</p>
3	<p>Shoe profile flange thickness.</p> <p>You can define the flange thickness for U-shaped bent plates and L-shaped bent plates.</p>

### Shoe reference line

Define the position of the shoe profile reference line.

### L position

Select the shoe profile position if the profile is L shaped. The options are left or right:



### Create shoe as

If you have selected a U-shaped bent plate or an L-shaped bent plate in **Section type**, you can select whether the plate is created as a folded plate or a polybeam.

---

**NOTE** Select **Polybeam** to create an unfolded bent plate drawing with bent lines.

If you select **Folded plate**, you cannot create an unfolded bent plate drawing with bent lines.

---

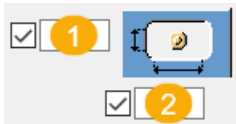
### Holes tab

Use the **Holes** tab to define the hole properties and the pattern in the shoe profile.

#### Basic properties

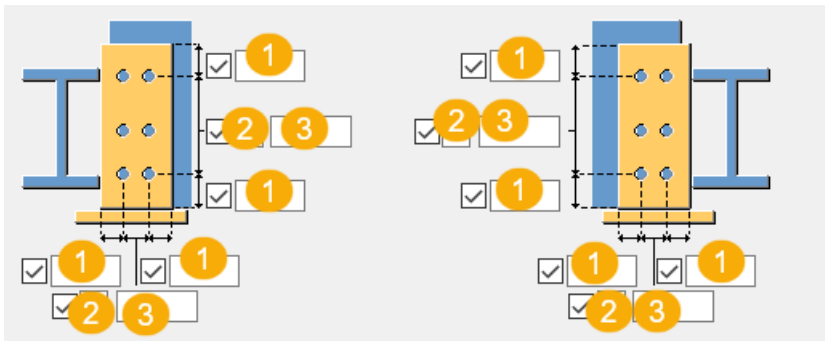
Option	Description	Default
<b>Bolt standard</b>	Bolt assembly standard to be used inside the component.  The available standards are defined in the bolt assembly catalog.	The default value is 4014-8.8.
<b>Bolt size</b>	Hole diameter.	18 mm
<b>Assembly type</b>	Location where the bolts should be attached.	<b>Site</b>

#### Slotted holes



	Description	Default
<b>1</b>	Vertical dimension of the slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of the slotted hole, or allowance for oversized holes.	0, which results in a round hole.

#### Dimensions

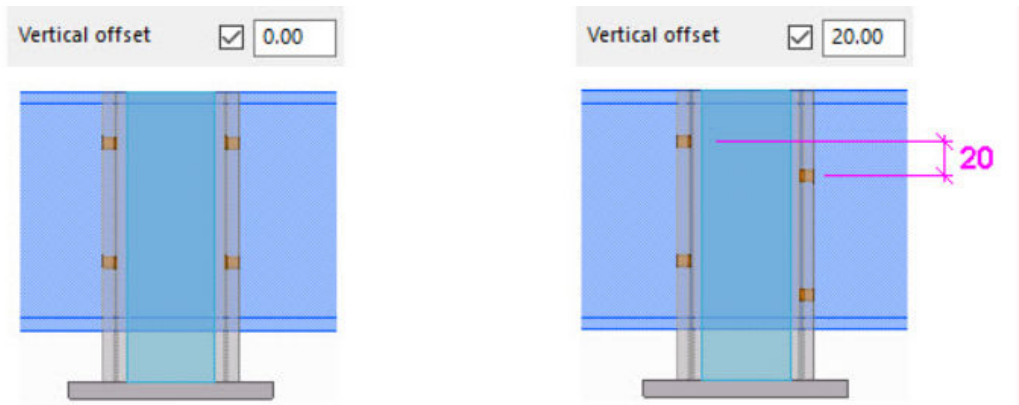


	Description
1	Hole edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Number of holes.
3	Hole spacing. Use a space to separate the spacing values. Enter a value for each space between holes. For example, if there are 3 holes, enter 2 values.

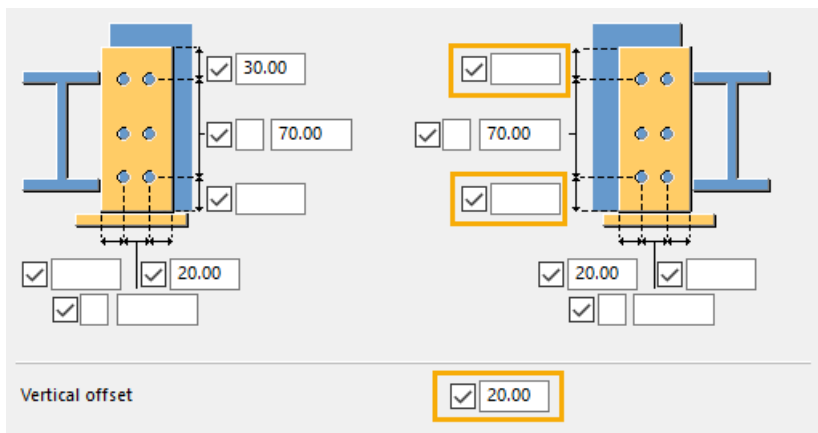
### Vertical offset

Define the vertical shift between the bolt groups.

If the purlin is screwed at the same height on both sides of the shoe profile, the screws may hit each other. To prevent this, one hole pattern can be vertically shifted. In this way, the screws cannot hit each other. The default value is 0. For example:



Note that the vertical offset can only be used when you do not enter a vertical edge distance for the bolt group to be shifted. If you enter a value for these edge distances, the edge distance is applied and the hole pattern is not shifted vertically.



### ***Extra weld parameters tab***

Use the **Extra weld parameters** tab to define how the shoe profile is connected to the main part.

#### **Connect parts as**

**NOTE** Set the desired connection type before adding the component in the model.

If you have to change the connection type after you have added the component in the model, you have to delete the component and recreate it with the changed connection type.

<b>Option</b>	<b>Description</b>
<b>Secondary part of welding</b>	The shoe profile is dimensioned and labeled as a welded part in the assembly drawing. It is not possible to create a separate assembly drawing of the shoe profile.
<b>Sub-assembly</b>	<p>The shoe profile is added as a sub-assembly. It is possible to create a separate assembly drawing of the shoe profile.</p> <p>In the assembly drawing of the main part, the position of the sub-assembly is dimensioned but the dimensions of the sub-assembly parts are not. This is because this sub-assembly is already fabricated when it is welded to the main part. This results in better readable assembly drawings.</p>

### ***General tab***

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:

### ***Welds***

Click the link below to find out more:

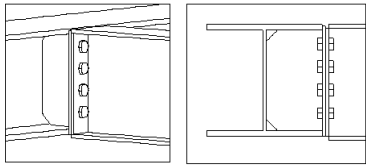
## Stiffened end plate (27)

**Stiffened end plate (27)** connects two beams, or a beam to a column, using an end plate at the secondary beam end and a T-shaped plate construction consisting of a stiffener and a shear tab. The plates are connected with bolts.

### Objects created

- End plate
- Shear tabs
- Stiffeners
- Shim plates
- Bolts
- Welds

### Use for

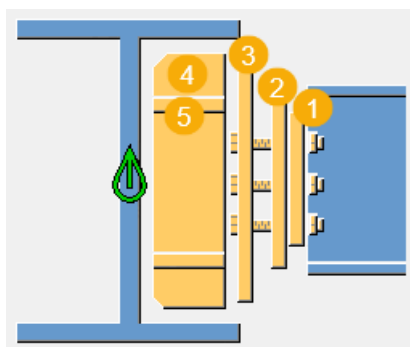
Situation	Description
	<p>Two beams connected with a bolted end plate. Shear tab is created.</p>

### Selection order

1. Select the main part (beam or column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key



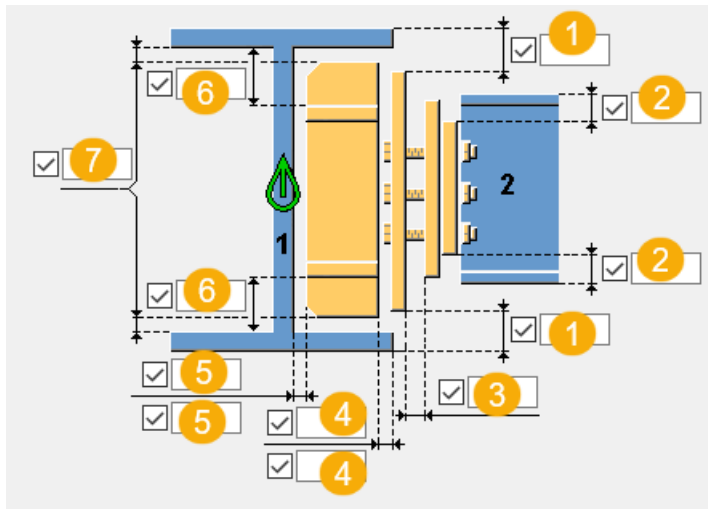
	Description
1	End plate

	Description
2	Shim plate
3	Front plate
4	Shear tab
5	Stiffener

### Picture tab

Use the **Picture** tab to define the part positions.

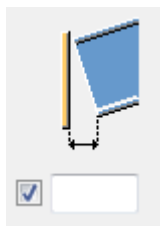
### Dimensions



	Description
1	Front plate edge distance from the main part flange.
2	End plate edge distance from the secondary part flange.
3	Gap between the front plate and the shim plate.
4	Shear tab edge distance from the main part flange. This dimension has an effect on the shear tab size. The lower box is for controlling the shear tab on the other side of the main part.
5	Shear tab edge distance from the main part web. The lower box is for controlling the shear tab on the other side of the main part.
6	Stiffener edge distance from the shear tab edge.
7	Shear tab edge distance from the main part flange. This dimension has an effect on the shear tab size.



## Gap size



Define the limit value for the gap between the end plate and the secondary beam. Use this when the beam is slightly curved or sloped to decide if the end angle is so small that the beam end can be straight.

If the actual gap is smaller than this value, the end of the beam is left straight.

If the actual gap is larger than this value, the end of the beam is fitted to the end plate.

## Parts tab

Use the **Parts** tab to define the part properties.

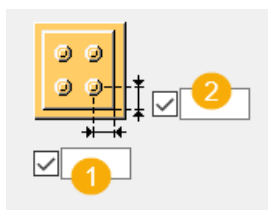
### Parts

Option	Description	Default
<b>End plate</b>	Thickness of the end plate.	10 mm
<b>Front plate</b>	Thickness and width of the front plate.	Thickness: 10 mm Width: Same as the width of the end plate
<b>Move front plate (column-beam connection)</b>	Select whether the front plate is moved in column-to-beam connections.	
<b>Shear plate</b>	Thickness, width and height of the shear tab.	
<b>Fill shear plate width</b>	Select whether to use the XS_STANDARD_STIFFENER_WIDTH_TOLERANCE advanced option for the width.	
<b>Stiffener</b>	Thickness and width of the stiffener.	
<b>Bottom stiffener as one plate</b>	Select whether the bottom stiffener is created as one plate.	
<b>Fitting plate 1, Fitting plate 2, Fitting plate 3</b>	Thickness of the shim plate.	

Option	Description	Default
<b>Number of fitting pl. 1, Number of fitting pl. 2, Number of fitting pl. 3</b>	Define the number of shim plates.	

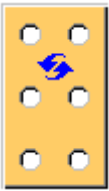





Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Shim plate bolt edge distance



	Description
<b>1</b>	Horizontal bolt edge distance in the shim plate.
<b>2</b>	Vertical bolt edge distance in the shim plate.

## Shim plate shape

Option	Description
	<p>Default</p> <p>Holes are based on the bolt group of the connection.</p> <p>AutoDefaults can change this option.</p>
	<p>Holes are based on the bolt group of the connection.</p>
	<p>Finger shim plate with horizontal slots.</p> <p>The plate can be installed from the right or the left side of the connection.</p>
	<p>Finger shim plate with vertical slots.</p> <p>The plate can be installed from the top of the connection.</p>
	<p>Two separate finger shim plates with horizontal slots.</p>
	<p>Two separate finger shim plates with vertical slots.</p>

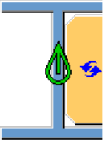


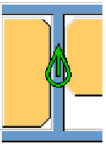
## Tolerance

Define the tolerance for the slots in finger shim plates. The width of the slot is the bolt diameter + the tolerance. For two separate shim plates, also define the tolerance between the plates.

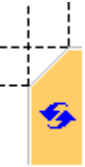

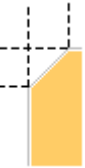
### Parameters tab



Use the **Parameters** tab to define the chamfers of the shear tab and stiffeners.

### Shear tab shape

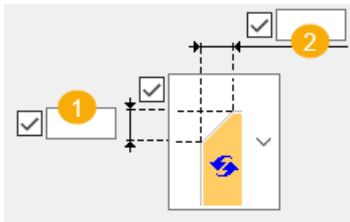
	Default Full Creates a full shear tab of the same height as the web of the main part. AutoDefaults can change this option.
	Full
	Shear tabs are created on both sides of the main part web.
	Partial shear tab is created on the other side of the main part web.

### Chamfer type

Option	Description
	Default. Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer

Option	Description
	Convex arc chamfer
	Concave arc chamfer

### Chamfer dimensions

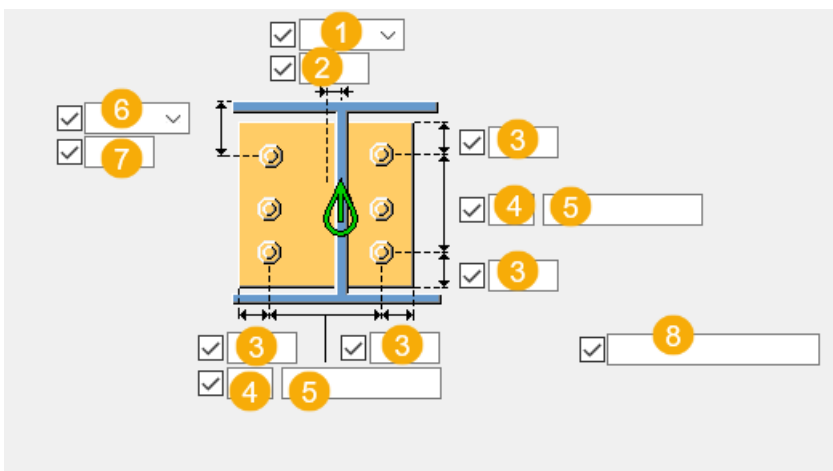


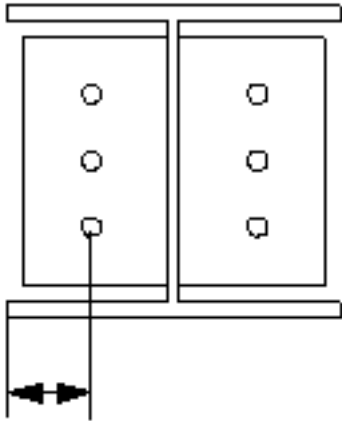
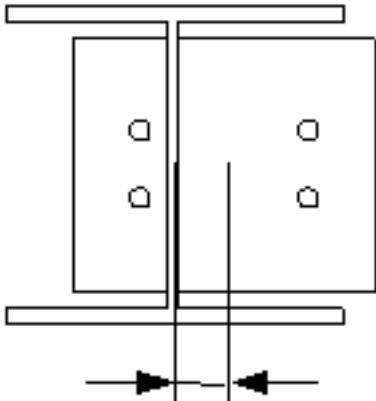
	Description	Default
1	Vertical dimension of the chamfer.	10 mm
2	Horizontal dimension of the chamfer.	10 mm

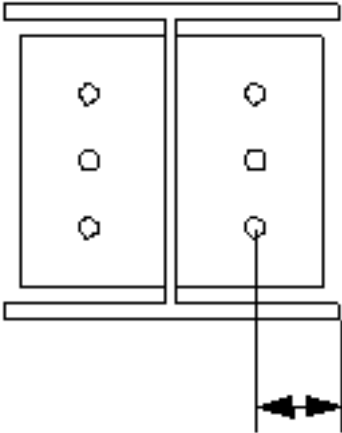
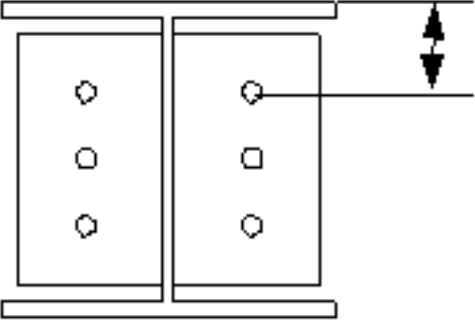
### Bolts tab

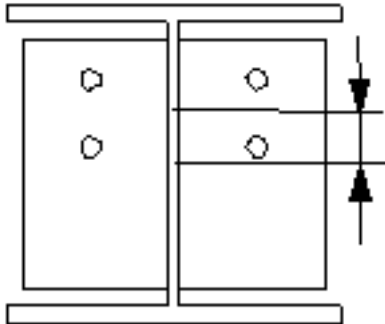
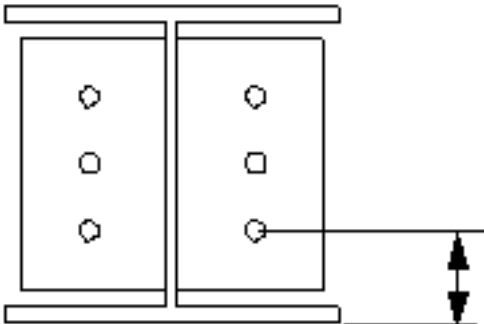
Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

### Bolt group dimensions



	Description
1	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.           </li> </ul>  <ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.           </li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
<b>2</b>	Dimension for horizontal bolt group position.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>6</b>	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
<b>7</b>	Dimension for vertical bolt group position.
<b>8</b>	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

### Bolt basic properties

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	



Option	Description	Default
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### Bolt type

Select the bolt type to define the location where the bolts should be attached.

### Bolt comment

You can define a bolt comment.

### Slotted holes

You can define slotted, oversized, or tapped holes.

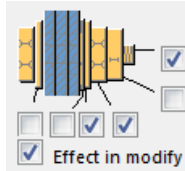


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

## Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

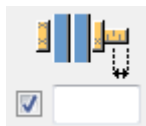
If you want to create a hole only, clear all the check boxes.






To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## Bolt length increase



Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.







## Bolting direction

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

## Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered

Option	Description
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

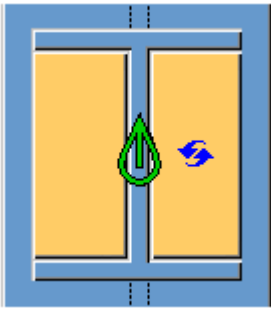
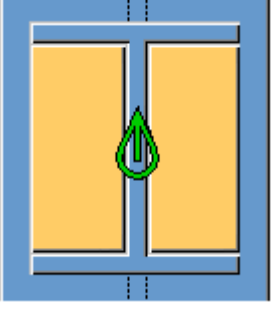
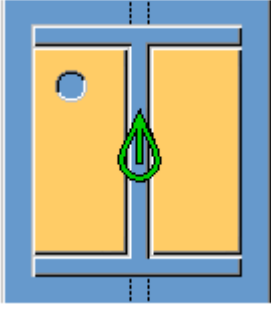
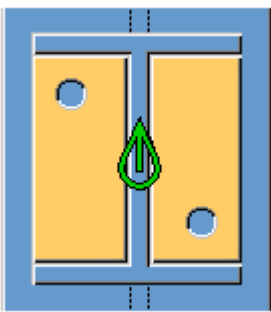
### ***Holes - end plate tab***

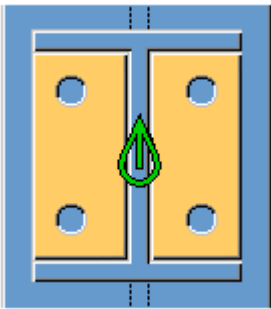
Use the **Holes - end plate** tab to control the galvanizing holes in the end plate.

Option	Description
<b>Bolt standard</b>	Select the bolt standard.
<b>Bolt type</b>	Select the bolt type to define the location where the bolts should be attached.
<b>Read data from</b>	<p>You can select to use the <code>sinkholes.dat</code> definition file to specify the default values for horizontal and vertical offsets, and the diameters for upper and lower holes.</p> <p>The file is searched in the following order: Environment common system steel folder (<code>..\Environments\common\system\Steel</code>), model folder, <code>XS_FIRM</code>, <code>XS_PROJECT</code> and <code>XS_SYSTEM</code> folder.</p> <p>You can also select to define the holes in the component dialog box.</p>

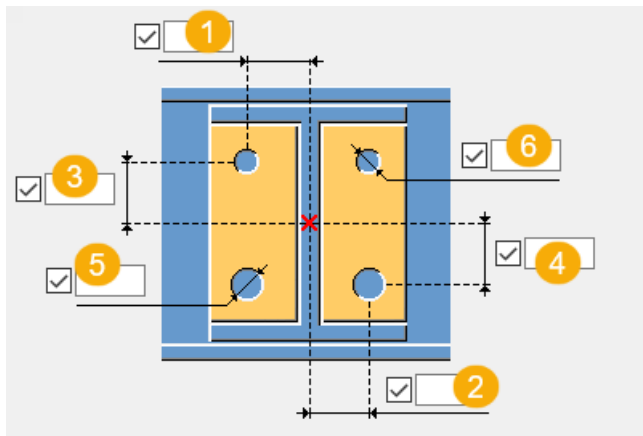
### **Number of holes**

The center of a hole group is the middle point of the beam and the middle point of the haunch, if the haunch exists. The hole groups are composed of 0, 1, 2 or 4 holes.

Option	Description
	<p>Default No holes AutoDefaults can change this option.</p>
	<p>No holes</p>
	<p>1 hole</p>
	<p>2 holes</p>

Option	Description
	4 holes

**Hole positions**



	Description
1	Horizontal distance between the secondary beam center and the upper hole.
2	Horizontal distance between the secondary beam center and the lower hole.
3	Vertical distance between the secondary beam center and the upper hole.
4	Vertical distance between the secondary beam center and the lower hole.
5	Diameter of the lower hole.
6	Diameter of the upper hole.

**Holes - front plate tab**

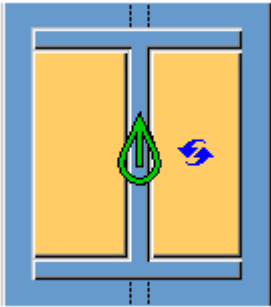
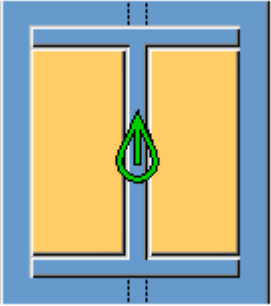
Use the **Holes - front plate** tab to control the galvanizing holes in the front plate.

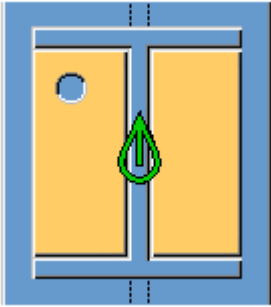
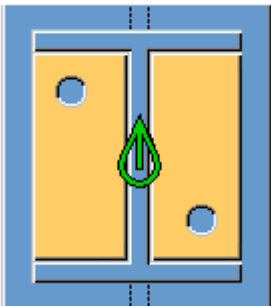
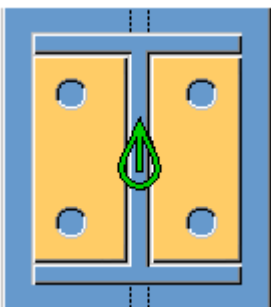
Option	Description
<b>Bolt standard</b>	Select the bolt standard.

Option	Description
<b>Bolt type</b>	Select the bolt type to define the location where the bolts should be attached.
<b>Read data from</b>	<p>You can select to use the <code>sinkholes.dat</code> definition file to specify the default values for horizontal and vertical offsets, and the diameters for upper and lower holes.</p> <p>The file is searched in the following order: Environment common system steel folder (<code>..\Environments\common\system\Steel</code>), model folder, <code>XS_FIRM</code>, <code>XS_PROJECT</code> and <code>XS_SYSTEM</code> folder.</p> <p>You can also select to define the holes in the component dialog box.</p>

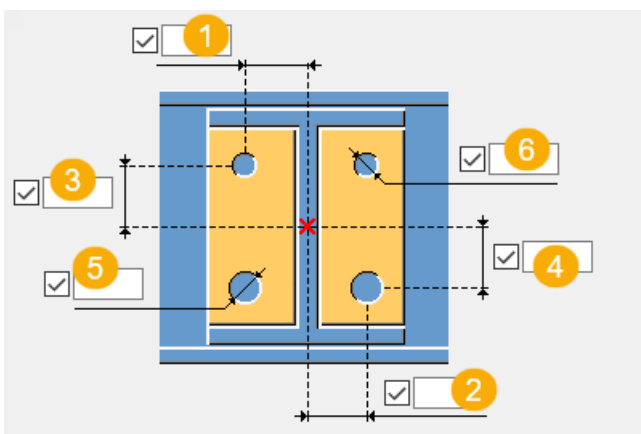
### Number of holes

The center of a hole group is the middle point of the beam and the middle point of the haunch, if the haunch exists. The hole groups are composed of 0, 1, 2 or 4 holes.

Option	Description
	<p>Default</p> <p>No holes</p> <p>AutoDefaults can change this option.</p>
	<p>No holes</p>

Option	Description
	1 hole
	2 holes
	4 holes

### Hole positions



	<b>Description</b>
<b>1</b>	Horizontal distance between the main beam center and the upper hole.
<b>2</b>	Horizontal distance between the main beam center and the lower hole.
<b>3</b>	Vertical distance between the main beam center and the upper hole.
<b>4</b>	Vertical distance between the main beam center and the lower hole.
<b>5</b>	Diameter of the lower hole.
<b>6</b>	Diameter of the upper hole.

### ***General tab***

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

### ***Dstv connection properties***

Click the link below to find out more:

## **Stub (28)**

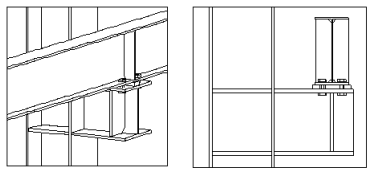
**Stub (28)** connects a crane beam to a column using a stub. The connection also creates stiffeners to the column, beam, and stub, as well as a bearing plate between the crane beam and the stub.



### Objects created

- Bearing plate
- Stiffeners
- Seat
- Bolts
- Rods
- Welds

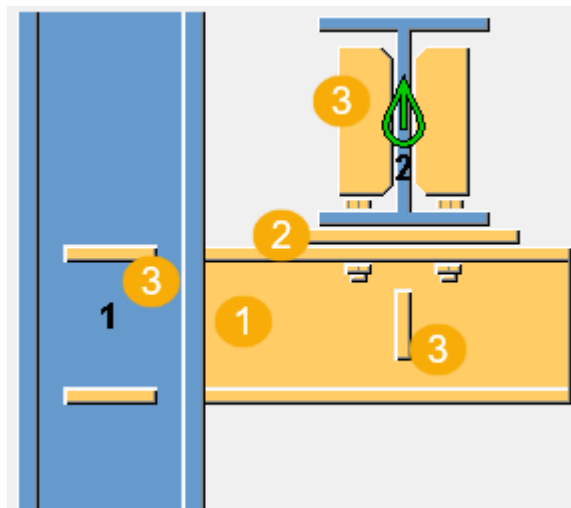
### Use for

Situation	Description
	Beam connected to a column with a stub

### Selection order

1. Select the main part (column).
2. Select the first secondary part (beam).
3. Select the second secondary part (beam).
4. Click the middle mouse button to create the connection.

### Part identification key



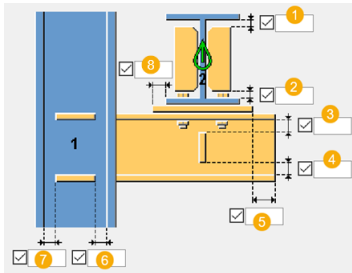
	Description
1	Stub
2	Bearing plate

	Description
3	Stiffener

### Picture tab

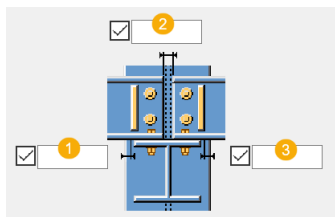
Use the **Picture** tab to define the connection dimensions and stiffener tolerances.

### Dimensions



	Description	Default
1	Gap between the stiffener plate and secondary beam upper flange	0
2	Gap between the stiffener plate and secondary beam lower flange	0
3	Gap between the stiffener plate and stub upper flange	0
4	Gap between the stiffener plate and stub lower flange	0
5	Bearing plate edge distance to the stub end Changing the value automatically changes the length of the stub profile.	10 mm
6	Stiffener plate edge dimension to the column flange	0
7	Stiffener plate edge dimension to the column flange	0
8	Edge distance from the secondary part flange to the bearing plate end Changing the value automatically changes the length of the stub profile.	10 mm

## Dimensions



	Description
1	Stiffener edge distance from the stub flange
2	Gap dimension between the secondary parts
3	Stiffener edge distance from the stub flange

## Parts tab

Use the **Parts** tab to define the part properties.

### Parts

Option	Description	Default
<b>Bearing plate</b>	Thickness and height of the bearing plate	Thickness = 20 mm Width = 50 mm
<b>Sec stiffeners</b>	Thickness, width, and height of the secondary part stiffeners	1.5*(secondary part web thickness)
<b>Prim. stiffeners</b>	Thickness, width, and height of the main part stiffeners	1.5*(main part web thickness)
<b>Cons stiffeners</b>	Thickness, width, and height of the console stiffeners	1.5*(console web thickness)
<b>Seat</b>	Select the profile from the profile catalog.	HE300A






Option	Description	Default
<b>Pos_no</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	
<b>Comment</b>	Add a comment about the part.	

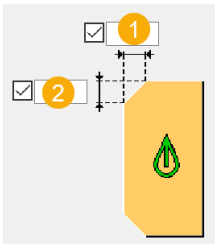
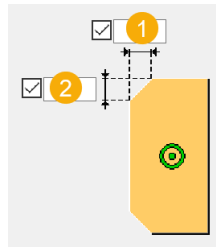
### **Parameters tab**

Use the **Parameters** tab to define the stiffener chamfers and dimensions.

### **Chamfer shape**

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer This shape may cause a clash between the stiffener and I profile rounding.
	Line chamfer
	Convex chamfer
	Concave chamfer

## Chamfer dimensions

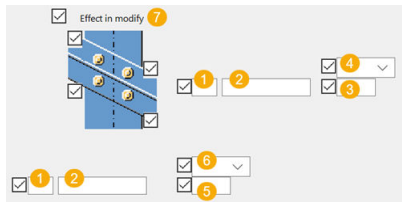
Main part stiffener	Secondary part stiffener
	

Description	
1	Horizontal chamfer dimension for the main part stiffener and the secondary part stiffener
2	Vertical chamfer dimension for the main part stiffener and the secondary part stiffener

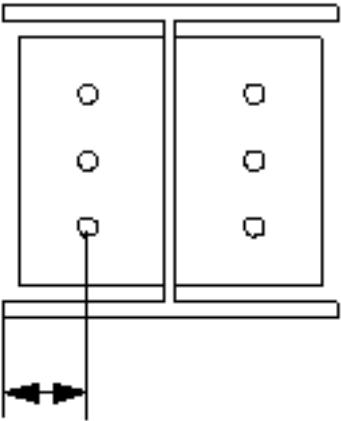
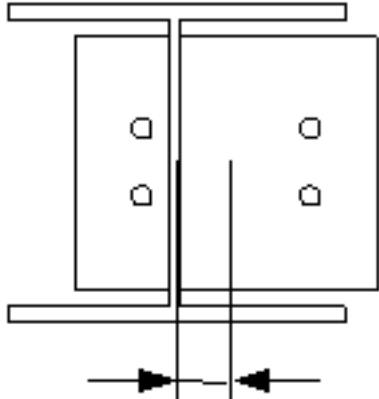
## Bolts tab

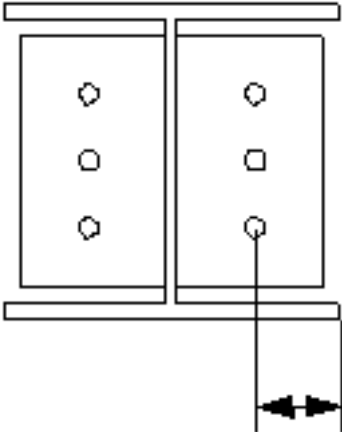
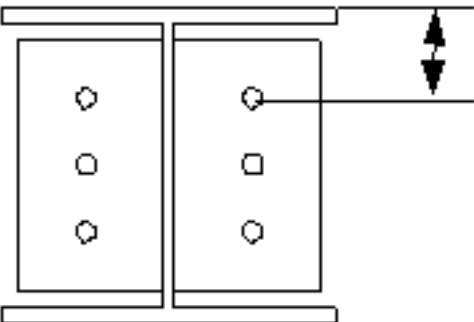
Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

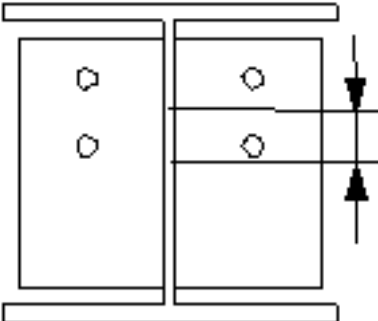
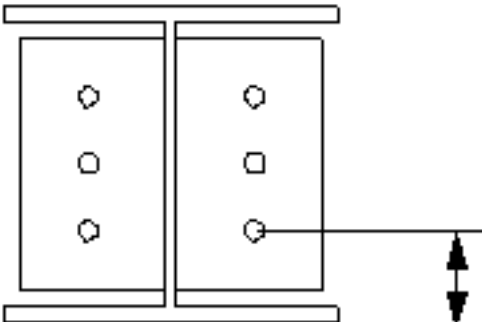
### Dimensions



Description	
1	Number of bolts.
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Dimension for horizontal bolt group position.

	Description
4	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.              </li> <li> <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.              </li> </ul>

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
<b>5</b>	Dimension for vertical bolt group position.
<b>6</b>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	Description
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>
7	To modify the bolt assembly, select the <b>Effect in modify</b> check box and click <b>Modify</b> .

### Bolt basic properties

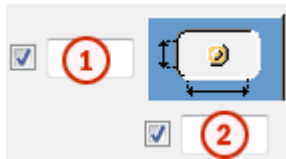
Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes



Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

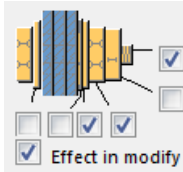


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Rods tab

Use the **Rods** tab to define the rod, nut, and washer properties and dimensions.

### Parts

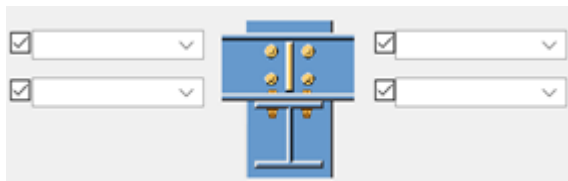
Option	Description
<b>Rod profile</b>	Select the profile from the profile catalog.
<b>Nut profile</b>	Select the profile from the profile catalog.
<b>Nut 2 profile</b>	Select the profile from the profile catalog.
<b>Washer profile</b>	Select the profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the

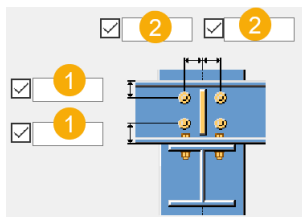
Option	Description	Default
		<b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Comment</b>	Add a comment about the part.	

### Hole creation

Select where the holes are created and define the hole tolerance.



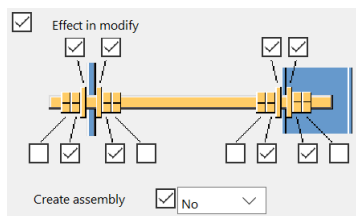
### Dimensions



	Description
<b>1</b>	Vertical edge dimension
<b>2</b>	Horizontal edge dimension

### Assembly creation

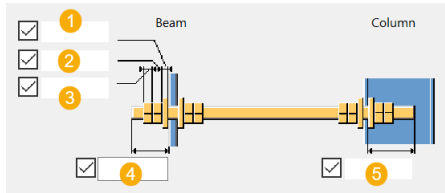
Select whether to create an assembly.



The selected check boxes define which component objects (bolt, washers, and nuts) are used in the assembly. If you want to create a hole only, clear all the check boxes.

To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## Assembly dimensions



	Description
1	Width of the washer plate
2	Width of the nut profile
3	Width of the nut profile
4	Rod length to the beam flange
5	Rod length to the column flange

## Hole tolerance

Option	Description
<b>Washer hole tolerance</b>	If you select <b>Washer hole tolerance</b> , define the tolerance value.
<b>Nut hole tolerance</b>	If you select <b>Nut hole tolerance</b> , define the tolerance value.

## **General tab**

Click the link below to find out more:

[General tab](#)

## **Design tab**

Click the link below to find out more:

[Design tab](#)

## **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

## **Welds**

Click the link below to find out more:

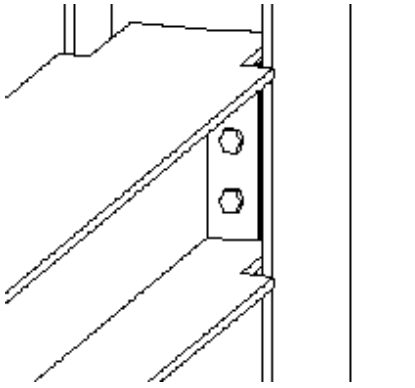
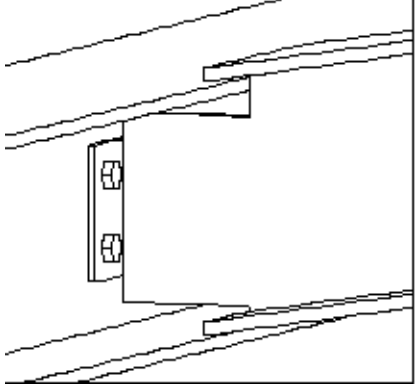
## End plate (29)

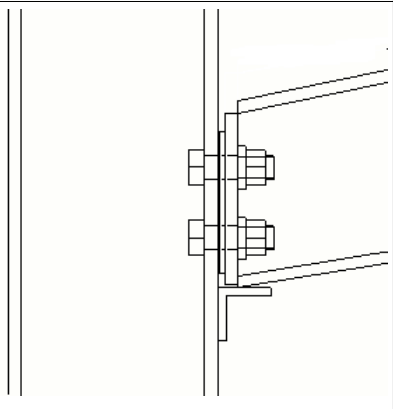
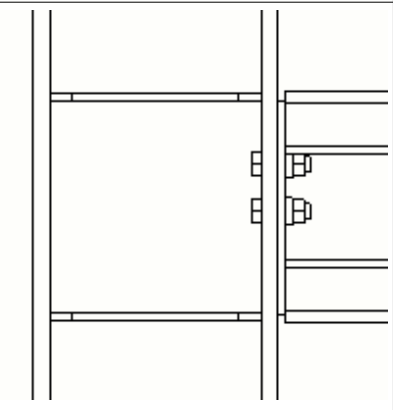
**End plate (29)** connects a beam to a column or two beams to each other using a bolted end plate. Stiffeners, seats and shim plates are optional.

### Objects created

- End plate
- Seat angle or seat plate (optional)
- Shim plates (optional)
- Stiffeners (optional)
- Bent plate (optional)
- Welds
- Bolts
- Cuts

### Use for

Situation	Description
	Beam-to-column end plate connection.
	Beam-to-beam end plate connection.

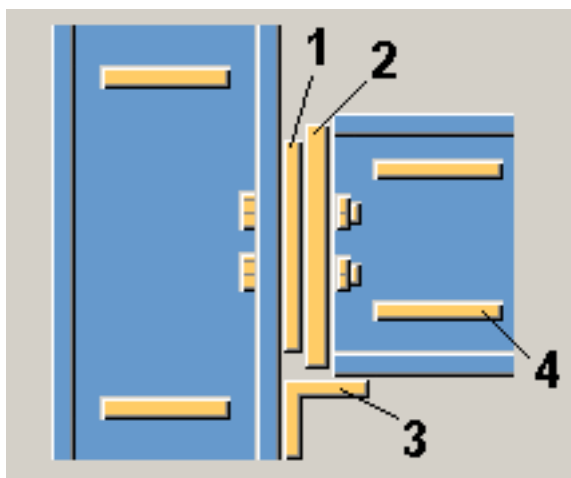
Situation	Description
	<p>End plate connection with a shim plate and a seat angle.</p>
	<p>End plate connection with stiffeners.</p>

### Selection order

1. Select the main part (column or beam).
2. Select the secondary part (beam).

The connection is created automatically when the secondary beam is selected.

### Part identification key

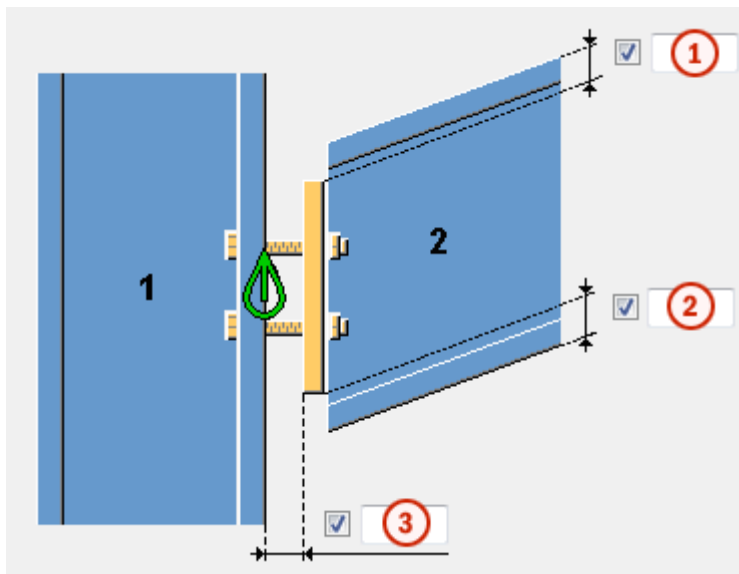


	Part
1	Shim plate
2	End plate
3	Seat (plate or angle)
4	Stiffener

### Picture tab

Use the **Picture** tab to control the position of the end plate.

### End plate position

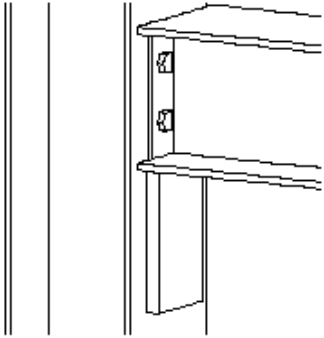


	Description	Default
1	End plate top position from the top of the secondary beam.  If no value is entered, bolts and bolt edge distances define the size of the end plate. If you give both values, the position distance override the bolt edge distance values.	10 mm
2	End plate bottom position from the bottom of the secondary beam.	
3	Gap between the shim plate and the main part.  If the shim plate does not exist, the defined gap is created between the end plate and the main part.	0 mm

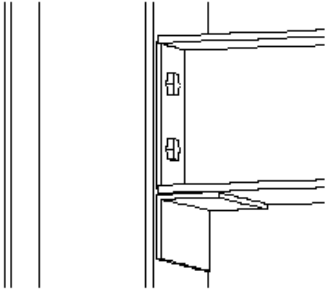
### Parts tab

Use the **Parts** tab to define the properties of the parts.

### Plate

Part	Description	Default
<b>End plate</b>	<p>End plate thickness, width and height.</p> <p>The width and height are defined by the bolt group edge distances. The height can also be entered as a plate edge distance from the upper and lower edge of the secondary beam.</p>	half of the bolt diameter
<b>Seat</b>	<p>Define whether a seat is created under the end plate.</p> <p>The seat is created only if the seat thickness is entered.</p>  <p>Adding a seat plate moves the end plate by default 20 mm below the secondary beam bottom.</p>	<p>width = end plate width</p> <p>height = secondary beam height</p>
<b>L seat</b>	<p>Define whether a seat angle is created under the end plate. The length</p>	width = end plate width



Part	Description	Default
	<p>of the angle is defined by the seat width.</p>  <p>If you enter a seat angle profile, the seat will be an angle instead of a plate even if you have entered the plate thickness.</p> <p>Adding a seat angle does not drag the end plate in the same way as the seat plate. To avoid collision between the angle and the secondary beam, modify the end plate or enter a gap between the end plate and the seat angle.</p>	
<b>Fitting Plate</b>	<p>Shim plate thickness.</p> <p>The plate is created only if the plate thickness is entered.</p>	<p>width = defined by the bolt group and the shim plate edge distances</p>
<b>Number of fitting pl. (DEF=1)</b>	<p>Define how many shim plates are created.</p>	
<b>Folded Plate</b>	<p>Bent plate thickness, width and height.</p> <p>The plate is created only if the plate thickness is entered.</p> <p>Bent plate can also be used with ordinary shim plates.</p>	<p>width = determined from the bolt group inner bolts</p>

<b>Part</b>	<b>Description</b>	<b>Default</b>
<b>Stiffeners</b>	Define whether stiffeners are created to the column when a beam is connected to the column flange.  If you enter one of the dimensions, stiffeners are created.	thickness = 20 mm  width = width of the column flange  height = height of the column web
<b>Upper horiz stiff</b> <b>Lower horiz stiff</b>	Define whether horizontal stiffeners are created to the beam.  If you enter one of the dimensions, stiffeners are created.	thickness = 20 mm  width = width of the beam flange  height = 300 mm

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

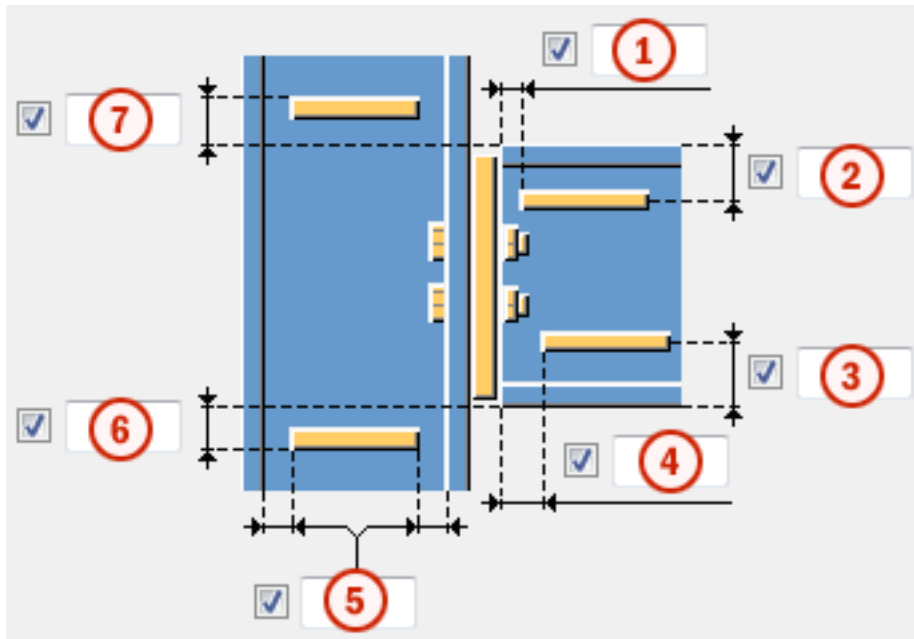
### ***Parameters tab***

Use the **Parameters** tab to control the stiffener position and orientation.

### **Material of folded plate**

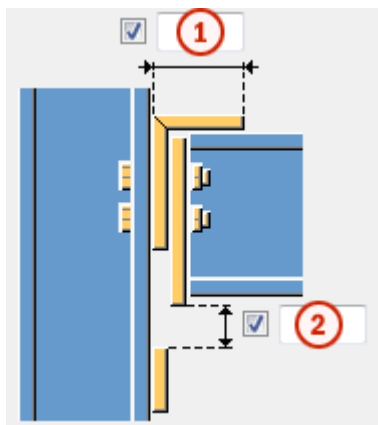
Select the material of the bent plate. The default material is defined in the **Folded plate** box on the **Components** tab in **File menu --> Settings --> Options**.

## Stiffener positions



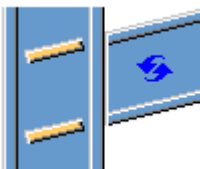
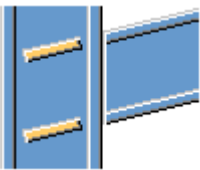
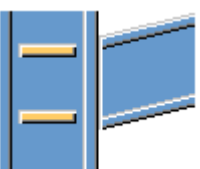
	Description	Default
1 4	Distance between the beam horizontal stiffener and the beam end.	
2 3	Distance between the beam horizontal stiffener and the beam flange.	0.25*beam height
5	Distance between the stiffener and the main part flange.	
6 7	Distance between the main part stiffener and the beam flange.	

## Bent shim plate and seat length

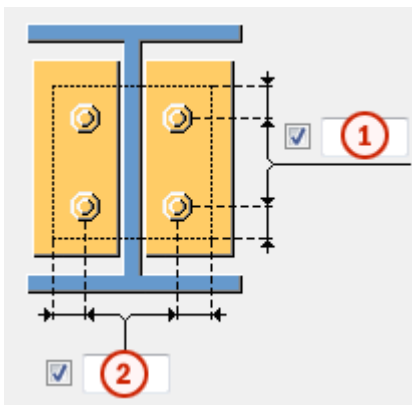


	Description	Default
1	Length of the horizontal part of the bent shim plate.	
2	Distance between the end plate and the seat.  When using seat angles, change either this value or the size of the end plate to avoid collision between the secondary beam and the angle.	20 mm

### Stiffener orientation

Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are parallel to the secondary part.
	Stiffeners are perpendicular to the main part.

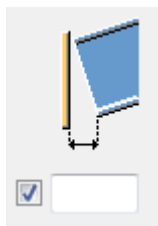
### Bolt edge distances in shim plate



Define the bolt edge distances for shim plates. When these fields are empty, shim plates are of the same size as the end plate.

	Description
1	Vertical bolt edge distance in the shim plate. The size of the shim plate is defined by the bolt group and the edge distances. Vertical and horizontal edge distance define the distance symmetrically. Positive dimension increases the shim plate size.
2	Horizontal bolt edge distance in the shim plate. The size of the shim plate is defined by the bolt group and the edge distances. Vertical and horizontal edge distance define the distance symmetrically. Positive dimension increases the shim plate size.

### Gap size to end plate



Define the limit value for the gap between the end plate and the secondary or main part. Use this gap when the beam is slightly curved or sloped to decide if the end angle is so small that the beam end can be straight.

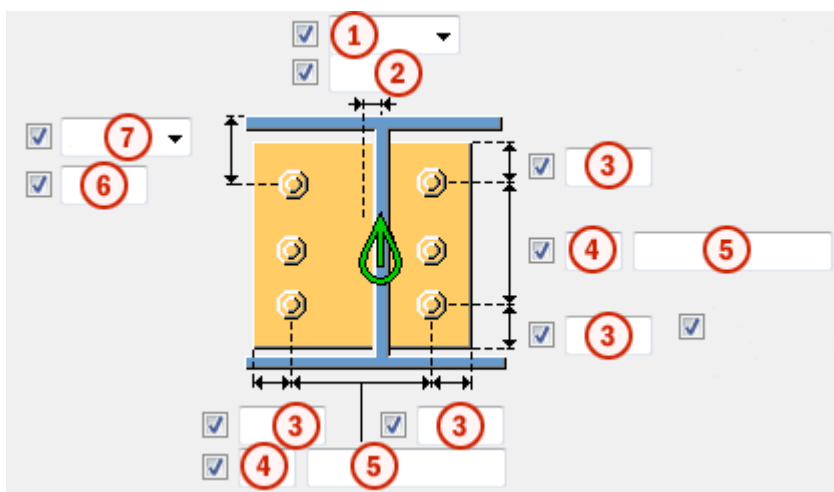
If the actual gap is smaller than this value, the beam end is left straight.

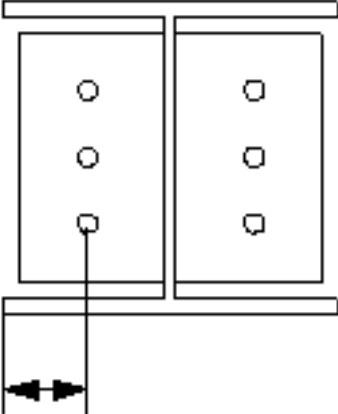
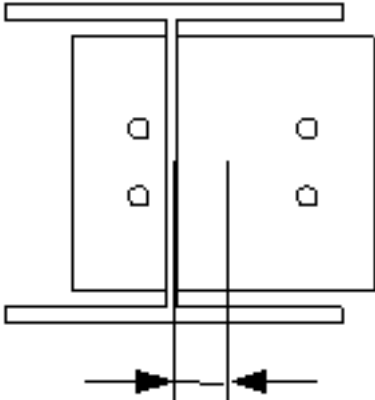
If the actual gap is larger than this value, the beam end is fitted to the end plate.

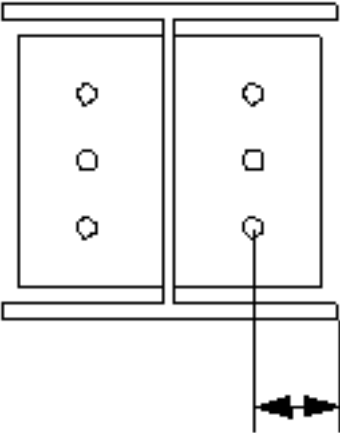
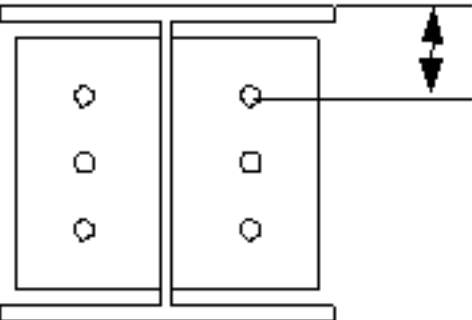
### Bolts tab

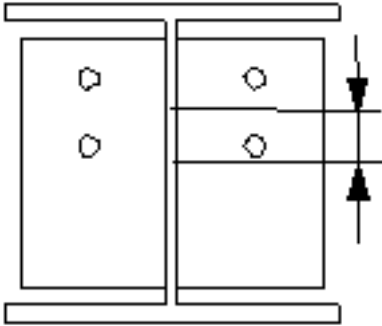
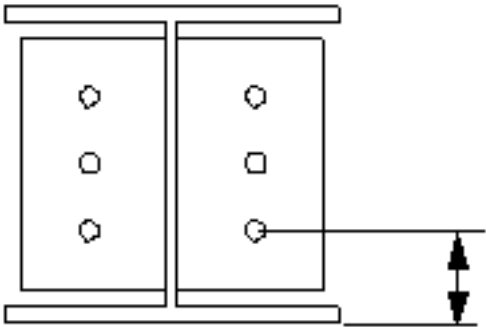
Use the **Bolts** tab to control the properties of the bolts.

### Bolt group dimensions








	Description
1	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.              </li> <li> <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.              </li> </ul>


	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
<b>2</b>	Dimension for horizontal bolt group position.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>6</b>	Dimension for vertical bolt group position.
<b>7</b>	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	Description
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part. </li> </ul> 
	<ul style="list-style-type: none"> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt. </li> </ul> 

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3



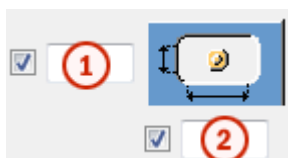
Option	Description
	Staggered type 4

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



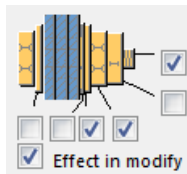
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.

Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### **Bolt assembly**

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

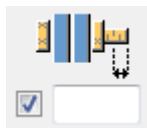
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### **Bolt length increase**

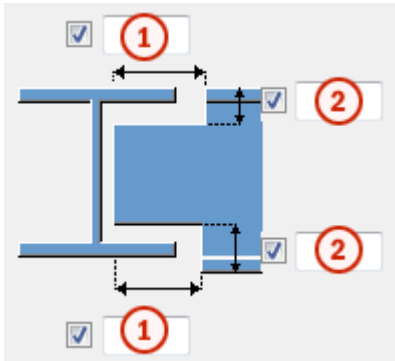
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### **Notch tab**

Use the **Notch** tab to modify the horizontal and vertical cuts.

## Cut dimensions



	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

[Design tab](#)

### **Analysis tab**

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

## **Seating cap (37)**

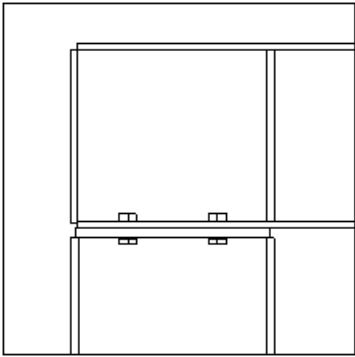
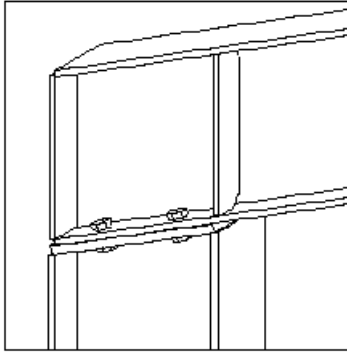
**Seating cap (37)** connects a beam to a column head with an end plate welded to the column head and bolted to the lower flange of the secondary beam. The

connection also creates stiffeners to the secondary part web, and optionally rectangular washer plates.

### Objects created

- End plates
- Stiffeners
- Washer plates
- Bolts
- Welds

### Use for

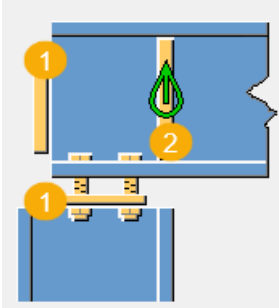
Option	Description
	Square beam connected to a column with a bolted end plate.
	Sloped beam connected to a column with a bolted end plate.

### Selection order

1. Select the main part (column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

## Part identification key

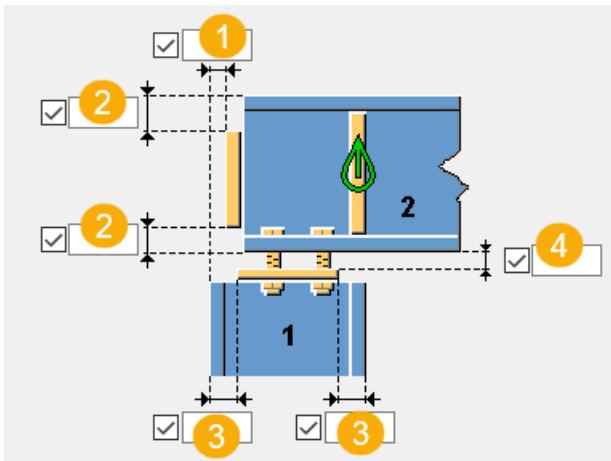


1	End plate
2	Stiffener

## Picture tab

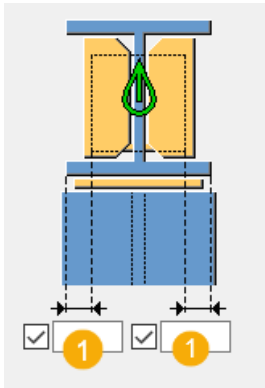
Use the **Picture** tab to define the geometry of the connection.

## End plate positions



	Description	Default
1	End plate edge distance to the main part flange.	
2	End plate edge distance from the secondary part flange. You can control the column end plate size in the secondary part axis direction. Positive values move the end plate edge towards the centre.	-10 mm
3	End plate edge distance to the main part flange.	
4	Distance between the end plate and the secondary part.	

## Stiffener positions



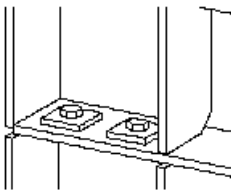
	Description	Default
1	Distance between the stiffener plate and the secondary beam flange.	0

### Parts tab

Use the **Parts** tab to define the part properties.

### Plates

Option	Description	Default
<b>Prim end plate</b>	Thickness of the main part end plate.	Half of the screw diameter  The width is defined by the bolt group horizontal edge distances.  The height is defined by the plate edge distances from the left and right edge of the column.
<b>Sec stiffeners</b>	Thickness, width and height of the stiffeners.	The default value for the stiffener thickness is 1.5*secondary beam web thickness rounded upwards to: 8, 10, 12, 16, 20, 25, 30, 35, 40, 45, and so on.  If you do not define the width, stiffener width is based on the flange width.  The height is equal to the distance between

Option	Description	Default
		the secondary beam flanges.
<b>Sec end plate</b>	Thickness of the secondary part end plate.	The size of the plate is based on the dimensions of the secondary part. You can control the dimensions on the <b>Picture</b> tab.  1.5* secondary beam web thickness rounded upwards to: 8, 10, 12, 16, 20, 25, 30, 35, 40, 45, and so on.
<b>Washer plates</b>	Thickness, width and height of the washer plates.   <p>Washer plates are small rectangular plates used as washers between the bolt head and secondary beam flange.</p>	If you do not enter a value for the thickness, the plates are not created.

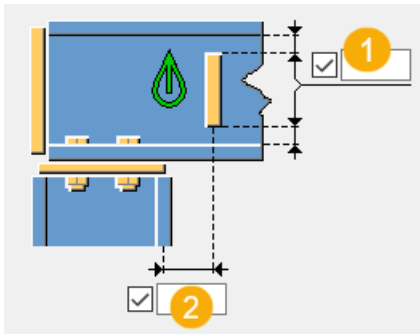
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
<b>Name</b>	Name that is shown in drawings and reports.	

### Parameters tab

Use the **Parameters** tab to define the chamfer dimensions and stiffener position.

### Stiffener position

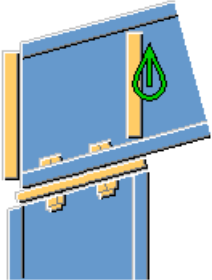
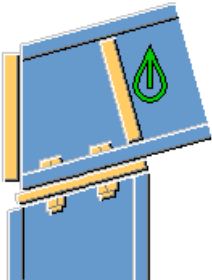


	Description
<b>1</b>	Define the stiffener offset from the secondary part web.
<b>2</b>	Define the stiffener offset from the main part flange. By default, stiffeners are placed to the same plane as the column flange. Positive offset values move stiffeners to the right and negative to the left.

### Stiffener angle

Option	Description
	<p>Default</p> <p>Stiffeners are created parallel to the column flange.</p> <p>AutoDefaults can change this option.</p>



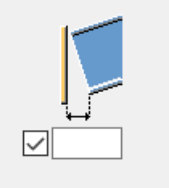
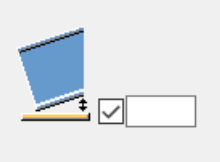
Option	Description
	Stiffeners are created parallel to the column flange.
	Stiffeners are created perpendicular to the secondary beam flange.

### Gap size

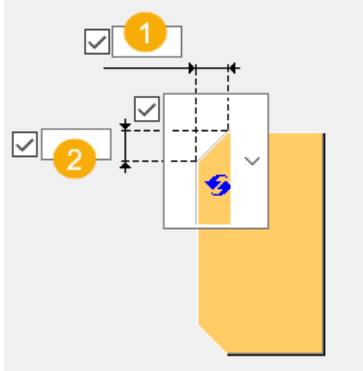
Define the limit value for the gap between the end plate and the secondary beam. Use this when the beam is slightly curved or sloped to decide if the end angle is so small that the beam end can be straight.

If the actual gap is smaller than this value, the end of the beam is left straight.

If the actual gap is larger than this value, the end of the beam is fitted to the end plate.

Option	Description
	Horizontal gap dimension
	Vertical gap dimension

## Chamfer size



	Description
1	Horizontal chamfer dimension
2	Vertical chamfer dimension

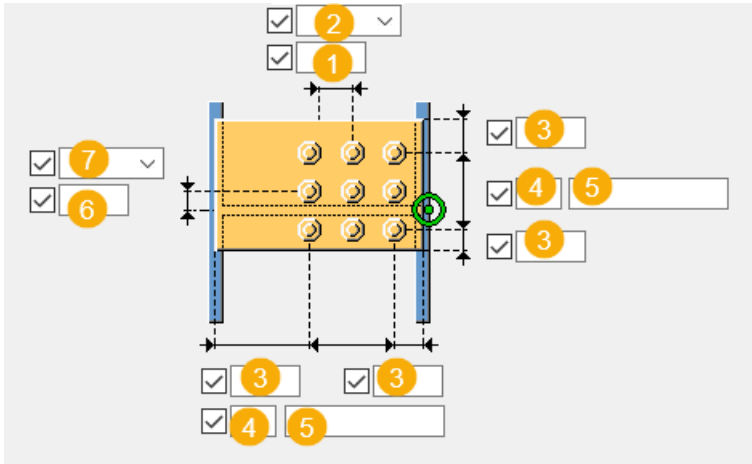
## Chamfer type

Option	Description
	Default. Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

## Bolts tab

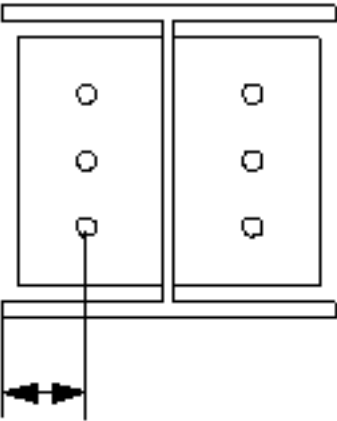
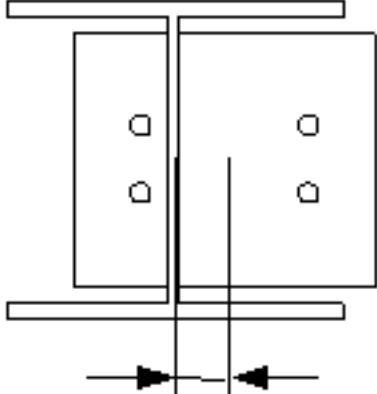
Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

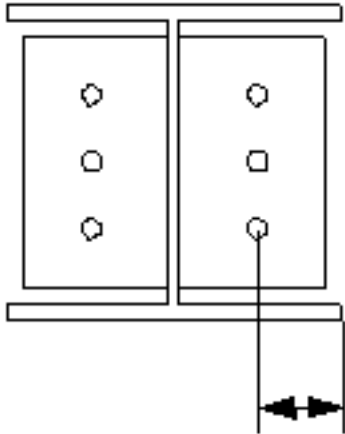
### Bolt group dimensions



	Description
1	Dimension for vertical bolt group position.
2	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"><li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li></ul> <p>The diagram shows two vertical plates with three bolts each. A horizontal line is drawn from the top edge of the right plate to the top bolt. A vertical double-headed arrow indicates the distance from this line to the top edge of the left plate.</p>

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> <div style="text-align: center;"> </div>
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>6</b>	Dimension for horizontal bolt group position.

	Description
7	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.            </li> <li> <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.            </li> </ul>

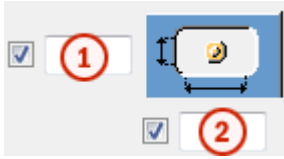
	Description
	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

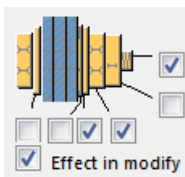


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<p><b>Slotted</b> creates slotted holes.</p> <p><b>Oversized</b> creates oversized or tapped holes.</p> <p><b>No hole</b> does not create holes.</p>	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.









To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

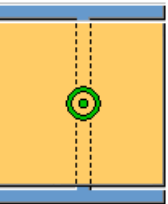
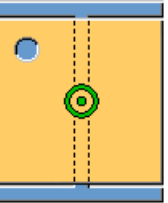
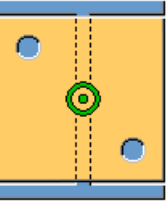
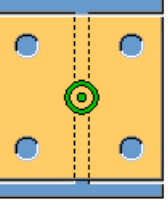
## Holes tab

Use the **Holes** tab to define the holes created in the end plates.

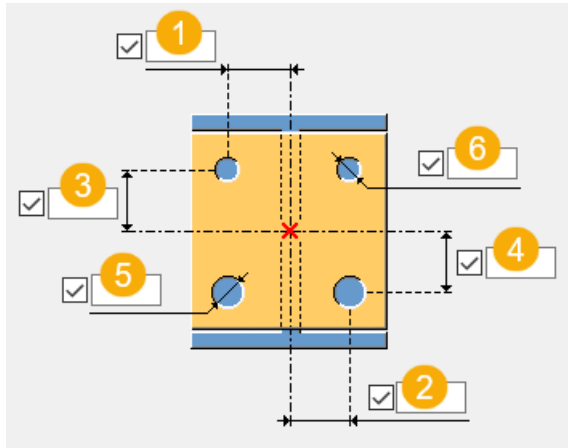
Option	Description
<b>Bolt standard</b>	Select the bolt standard.
<b>Bolt type</b>	Select the bolt type to define the location where the bolts should be attached.
<b>Read data from</b>	<p>You can select to use the <code>sinkholes.dat</code> definition file to specify the default values for horizontal and vertical offsets, and the diameters for upper and lower holes.</p> <p>The file is searched in the following order: Environment common system steel folder (<code>..\Environments\common\system\Steel</code>), model folder, <code>XS_FIRM</code>, <code>XS_PROJECT</code> and <code>XS_SYSTEM</code> folder.</p> <p>You can also select to define the holes in the component dialog box.</p>



## Number of holes

Option	Description
	Default No holes AutoDefaults can change this option.
	No holes
	1 hole
	2 holes
	4 holes

## Hole positions



	Description
1	Horizontal distance between the end plate center and the upper hole.
2	Horizontal distance between the end plate center and the lower hole.
3	Vertical distance between the end plate center and the upper hole.
4	Vertical distance between the end plate center and the lower hole.
5	Diameter of the lower hole.
6	Diameter of the upper hole.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

[Design tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

## **Welds**

Click the link below to find out more:

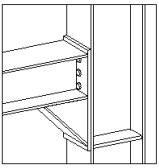
### **Haunch (40)**

**Haunch (40)** connects a beam to a column using a welded haunch, or a profile haunch and a bolted end plate.

#### **Objects created**

- End plate
- Top plate
- Stiffeners
- Cap plate
- Web plate
- Haunch plates
- Compression flange plates
- Bolts
- Welds

#### **Use for**

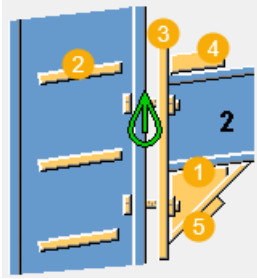
<b>Situation</b>	<b>Description</b>
	Beam connected to a column using a profile haunch and a bolted end plate.

#### **Selection order**

1. Select the main part (column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

## Part identification key

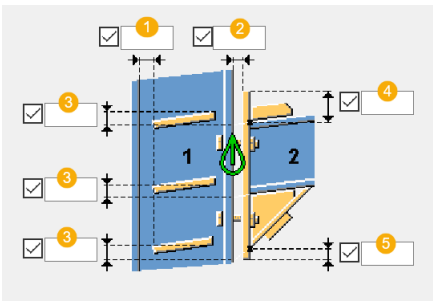


	Description
1	Haunch plate
2	Stiffener
3	End plate
4	Top plate
5	Compression flange plate

## Picture tab

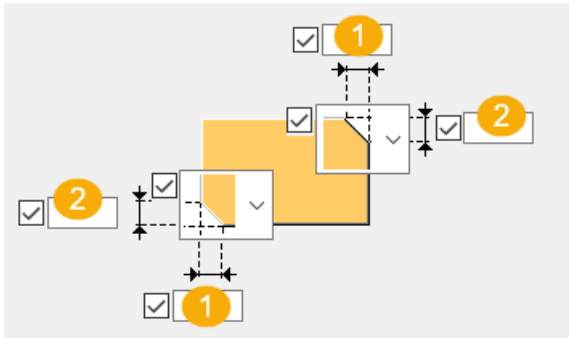
Use the **Picture** tab to define the connection dimensions, chamfers, double haunches, and rotation point.

## Dimensions



	Description
1	Tolerance dimension from the stiffener edge to the column web.
2	Gap dimension between the column and the end plate.
3	Vertical stiffener dimension from the creation point.
4	End plate top position from the top of the secondary beam.
5	End plate bottom position from the haunch plate lower edge.

## Top plate chamfers



	Description
1	Horizontal chamfer dimension.
2	Vertical chamfer dimension.

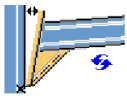
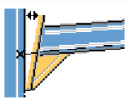
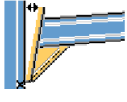
Option	Option	Description
		No chamfer
		Line chamfer
		Convex chamfer
		Concave chamfer

## Horizontal rafter double haunch

You can select to create a double haunch if the beam is horizontal. All the plates welded to the lower haunch are mirrored on the upper haunch and the end plate is extended.

Option	Description
	Default Lower haunch is created. AutoDefaults can change this option.
	Lower haunch is created.
	Double haunch is created.
	Double haunch with column stiffeners is created.

## Select rotation point

Option	Description
	Default Rotation point is in the middle of the beam lower flange. AutoDefaults can change this option.
	Rotation point is in the middle of the haunch flange.
	Rotation point is in the middle of the beam lower flange.



	Description
<b>1</b>	Define the tolerance value between the column and the end plate. The maximum width is at the top of the end plate. There is no tolerance at the lowest point of the end plate.
<b>2</b>	Select whether the tolerance is defined as a distance or as a rotation angle (in degrees).

## Parameters tab

Use the **Parameters** tab to define the part properties and to control stiffener creation.

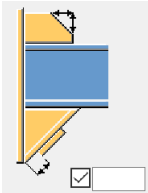
## Parts

Option	Description
<b>End plate</b>	Thickness, width, and height of the end plate.
<b>Add. stiffener</b>	Thickness, width, and height of the additional stiffener.
<b>Rafter bottom stiffener</b>	Thickness, width, and height of the beam bottom stiffener.
<b>Compr. stiffener</b>	Thickness, width, and height of the compression stiffener.
<b>Top plate</b>	Thickness, width, and height of the top plate.
<b>Cap plate</b>	Thickness, width, and height of the cap plate.

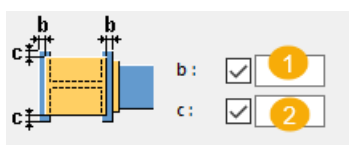
Option	Description
<b>Diagonal stiffener</b>	Thickness and width of the diagonal stiffener.
<b>Beam stiffener</b>	Thickness, width, and height of the beam stiffener.
<b>Morris stiffener</b>	Thickness and width of the Morris stiffener.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	




### Compression flange plate position

Option	Description
	<p>Compression flange plate edge distance to the end plate bottom edge.</p> <p>If the haunch is not created, the plate is positioned on the beam flange.</p>



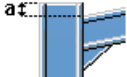


### Cap plate position




	Description	Default
1	Cap plate edge distance from the column flange.	5 mm The cap plate is by default 5 mm smaller than the profile.
2	Cap plate edge distance from the column flange. Define this dimension when the cap plate width has not been defined.	5 mm

Option	Description
	Default Cap plate is created parallel with the beam. AutoDefaults can change this option.
	Cap plate is created parallel with the beam.
	Cap plate is horizontal.





### Additional stiffener

Option	Description
	Default Cap plate or stiffener is not created. AutoDefaults can change this option.
	Cap plate or stiffener is not created.
	Cap plate or stiffener is not created. Define the vertical dimension for moving the column end fitting plane.
	Cap plate and stiffener are created. Define the vertical dimension for moving the cap plate or the column end fitting plane.
	Horizontal stiffener is created.







Option	Description
	Stiffener is created parallel with the skewed beam.

### Bottom flange stiffener


Option	Description
	Default Stiffener is not created. AutoDefaults can change this option.
	Horizontal stiffener is created.
	Stiffener is not created.
	Skewed stiffener is created.




### Morris stiffener

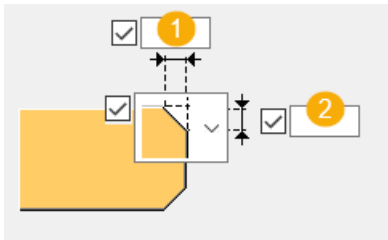
If a haunch is not created, the Morris stiffener is not created either.

Option	Description
	Default Horizontal stiffener is created. Define the upper stiffener dimension from the column web. AutoDefaults can change this option.
	Horizontal stiffener is created. Define the upper stiffener dimension from the column web.
	Stiffener is not created.
	Skewed stiffener is created. Define the upper stiffener dimension from the column web.

### Stiffener chamfer shape and dimensions




Option	Description
	No chamfer

Option	Description
	Line chamfer
	Convex chamfer
	Concave chamfer




	Description
1	Horizontal chamfer dimension.
2	Vertical chamfer dimension.

### Beam stiffener

Option	Description
	Default Vertical stiffener in the direction of the column. AutoDefaults can change this option.
	Vertical stiffener in the direction of the column.
	Stiffener is created perpendicular to the beam axis.

### Beam stiffener offset

Option	Description
	Beam stiffener offset from the default position where the beam stiffener is created. The default position is in the place where the haunch profile flange touches the secondary beam.

### Extra length for haunch flange plate

Define the distance that extends the flange plate of a welded haunch.

### Parameter to avoid solid error

Define the distance value to avoid solid errors. If a haunch profile is selected, and a chamfer is created in the profile, the haunch profile may disappear. You can solve this issue by increasing this value. The default value is 0.5 mm.

### ***Haunch tab***

Use the **Haunch** tab to define the haunch plate properties, type, and geometry.

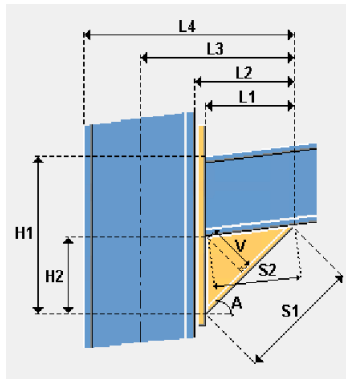
### Parts

Option	Description
<b>Haunch prof</b>	In <b>Haunch type</b> , select <b>Profile</b> or <b>Default</b> . Select the haunch profile from the profile catalog.
<b>Vert haunch pl</b>	In <b>Haunch type</b> , select <b>Welded plates</b> . Thickness of the haunch plate.
<b>Horiz haunch pl</b>	In <b>Haunch type</b> , select <b>Welded plates</b> . Thickness and width of the haunch plate.
<b>Closure plate</b>	Thickness and height of the closure plate.
<b>Comp. flange pl</b>	Thickness, width, and height of the flange plate.
<b>Haunch prolongation</b>	If the connection is created with an open beam, the beam bottom flange can be extended to reach the end plate. Select to extend the beam bottom flange on the <b>Open beam</b> tab.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Haunch parameters



Haunch parameters:

**1**

**2**

	Description	Default
<b>1</b>	Select the first dimension for the haunch geometry. If the selected dimension cannot be used for the geometry, a red component symbol is displayed. For profile haunches: If only one dimension is selected (first or second), a symmetrical haunch is created using the symmetrical cut for profile haunch options.	<b>A, L1</b> dimension where $L1 = 1/5$ from the beam length. Profile haunch: a symmetrical haunch using the symmetrical cut for profile haunch options.

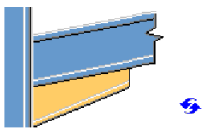
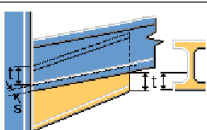
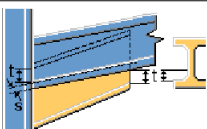
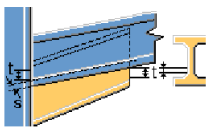
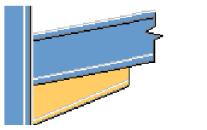
	Description	Default
2	<p>Select the second dimension for the haunch geometry.</p> <p>If you select two dimensions that cannot be used for the geometry, a red component symbol is displayed.</p> <p>For profile haunches: If only one dimension is selected (first or second), a symmetrical haunch is created using the symmetrical cut for profile haunch options.</p>	<p><b>A, L1</b> dimension where <math>L1 = 1/5</math> from the beam length.</p> <p>Profile haunch: a symmetrical haunch using the symmetrical cut for profile haunch options.</p>

### Symmetrical cut for profile haunch

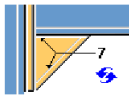
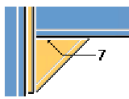
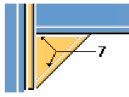
Select the calculation method, and define the tolerance value (**t**) and saw plate thickness (**s**) to create a symmetrical profile haunch. This setting is not used for welded plates.

When measured, the tolerance distance might have an error between 0 mm – 2 mm, resulting from the approximations done during calculation. Check that the result is as intended. Note that if you define the vertical cut distance at the upper end of the hauch, the tolerance value is not used.

With saw plate thickness, you can control how much of the material will be wasted because of the sawing.

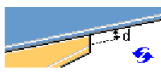

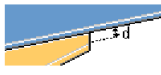

Option	Description
	<p>Default</p> <p>Inner haunch flange to outer beam flange calculation.</p> <p>AutoDefaults can change this option.</p>
	<p>Define the tolerance value from the outer haunch plate flange, and the saw plate thickness.</p>
	<p>Define the tolerance value from the inner haunch plate flange, and the saw plate thickness.</p>
	<p>Define the tolerance value from the haunch plate web, and the saw plate thickness.</p>
	<p>Inner haunch flange to outer beam flange calculation.</p>

## Welds in the vertical haunch plate

Option	Description
	Default Both welds are created. AutoDefaults can change this option.
	Weld is created on the secondary beam.
	Both welds are created.

## Cut at the upper end of the haunch

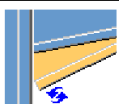
Using this option you can select if the haunch is created as fitted to the secondary beam, or if there should be some material left, as specified with the **d** option.

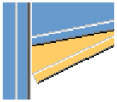
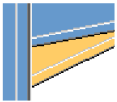
Option	Description
	Default Vertical cut at the upper end of the haunch. Define the cut distance. AutoDefaults can change this option.
	The cut is perpendicular to the beam flange.
	Vertical cut at the upper end of the haunch. Define the cut distance.
	Haunch is not cut.

## Haunch end cuts parallel (only for profiles)

Select **Yes** to create the haunch cut at the upper end and the haunch cut at the lower end parallel to each other.

## Cut at the lower end of the haunch (only for profile haunch)

Option	Description
	Default Vertical cut at the lower end of the haunch. AutoDefaults can change this option.

Option	Description
	Vertical cut at the lower end of the haunch.
	Haunch is not cut.

### **Extra plates**






Use the **Extra plates** tab to define the web plate and bolt plate properties.

### **Parts**

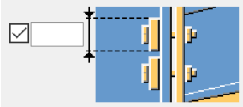
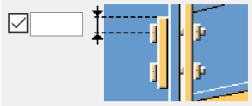
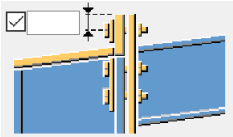
Option	Description
<b>Web plate</b>	Thickness, width, and height of the web plate.
<b>Upper bolt plate</b>	Thickness and width of the upper bolt plate.
<b>Lower bolt plate</b>	Thickness and width of the lower bolt plate.
<b>Plate on column</b>	Thickness and width of the plate on the column.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

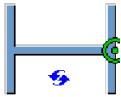
## Bolt plate

Option	Description
	Default One bolt plate for each bolt in the group. AutoDefaults can change this option.
	One bolt plate for each bolt in the group.
	One bolt plate for each column of bolts in the group.
	One bolt plate for all the bolts in the group.
	Bolt plate is not created.



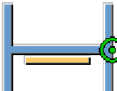

## Bolt plate dimensions

Option	Description
	Define the bolt plate height when creating one bolt plate for each bolt in the group.
	Define the vertical bolt plate edge distance for the first and last bolt in the group when creating one bolt plate for each column of bolts, or one bolt plate for all the bolts in the group.
	Define the thickness of the horizontal bolt plate that continues the column flange.  If the first bolt in the beam bolt group is positioned above the beam – column collision area, a new bolt plate is created for the first bolt row in the group.

## Create web plate

Option	Description
	Default Web plate is not created. AutoDefaults can change this option.

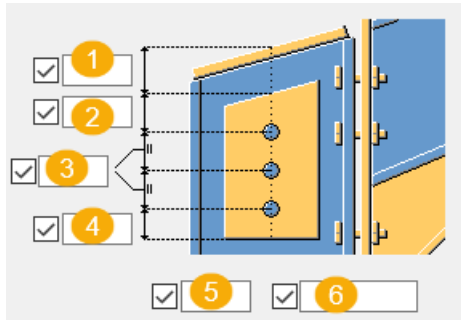


Option	Description
	Web plate is not created.
	One web plate is created on the right side of the column web.
	One web plate is created on the left side of the column web.
	Two web plates are created.

### Web plate settings

Option	Description	Default
<b>Web plate edge type</b>	Select how the web plate is cut at the higher end. <b>Bevel</b> cuts the web plate at the same angle the column cap plate is positioned. If the column cap plate is horizontal or does not exist, the web plate is cut <b>Square</b> .	<b>Square</b>
<b>Number of holes</b>	Define the number of holes in the web plate.	2
<b>Hole diameter</b>	Define the diameter of the holes in the web plate.	20 mm
<b>Horizontal, Vertical</b>	Define the web plate welding size: <ul style="list-style-type: none"> <li>Define the left and right weld between the column and the web plate.</li> <li>Define the lower vertical edge for the web plate.</li> </ul>	5 mm

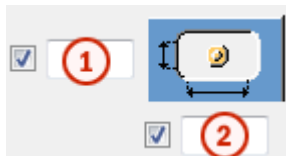
## Web plate dimensions



Option	Description	Default
1	Distance from the edge of the extra plate to the top of the cap plate.	5 mm
2	Hole edge distance of the first hole in the web plate.	30 mm + hole_diameter/2
3	Vertical spacing between the holes.	160 mm
4	Vertical hole edge distance to the lower edge of the web plate.	30 mm + hole_diameter/2
5	Number of holes in the columns.	1
6	Distance between the holes in the columns.	hole_diameter x 2

## Slotted holes

You can define slotted or oversized holes.



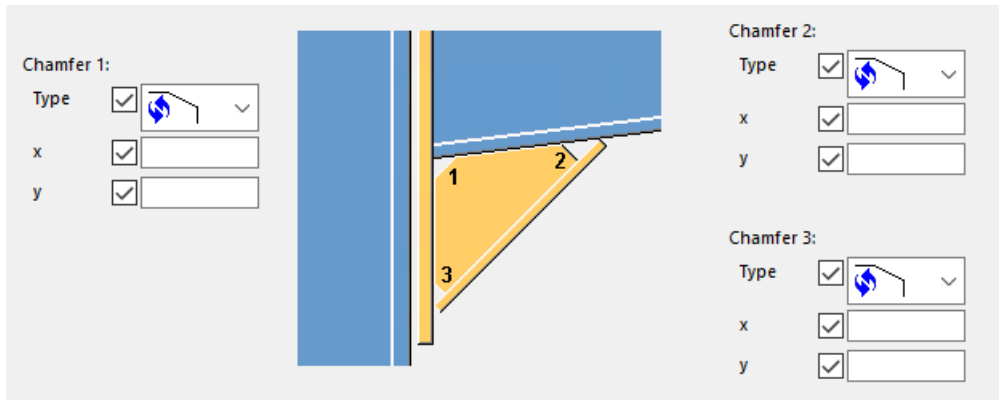
	Description
1	Vertical dimension of the slotted hole.
2	Horizontal dimension of the slotted hole, or allowance for oversized holes.

## Chamfers tab

Use the **Chamfers** tab to define the chamfer type and dimensions.

### Chamfers

Define the chamfer type and dimensions separately for each corner.



Chamfer	Description	Default
<b>Chamfer 1</b>	Select the chamfer type and define the dimensions.  This chamfer is available for both profile and welded plate haunches.	No chamfer
<b>Chamfer 2</b>	Select the chamfer type and define the dimensions.  This chamfer is available for welded plate haunches only.	No chamfer
<b>Chamfer 3</b>	Select the chamfer type and define the dimensions.  This chamfer is available for welded plate haunches only.	No chamfer

### **Holes tab**

Use the **Holes** tab to control the galvanizing holes in the end plate.

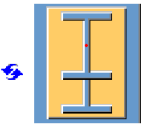
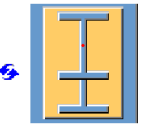

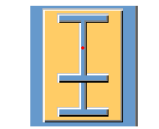


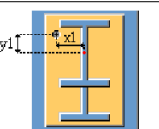
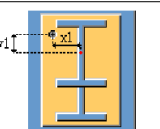
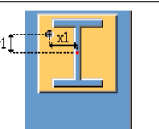
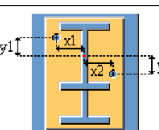
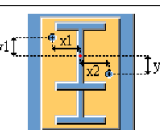
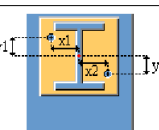
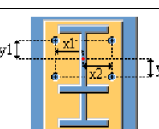
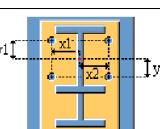
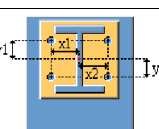
Option	Description
<b>Bolt standard</b>	Select the bolt standard.
<b>Bolt type</b>	Select the bolt type to define the location where the bolts should be attached.
<b>Read data from</b>	You can select to use the <code>sinkholes.dat</code> definition file to specify the default values for horizontal and vertical offsets, and

Option	Description
	<p>the diameters for upper and lower holes.</p> <p>The file is searched in the following order: Environment common system steel folder (<code>..\Environments\common\system\Steel</code>), model folder, <code>XS_FIRM</code>, <code>XS_PROJECT</code> and <code>XS_SYSTEM</code> folder.</p> <p>You can also select to define the holes in the component dialog box.</p>

### Hole positions and number of holes

Define the hole positions and the number of holes in the end plate and the cap plate.

The hole group center in the end plate is the middle point of the rafter and the middle point of the haunch, if the haunch exists. The hole group center in the cap plate is the middle point of the column. The hole groups are composed of 0, 1, 2, or 4 holes.

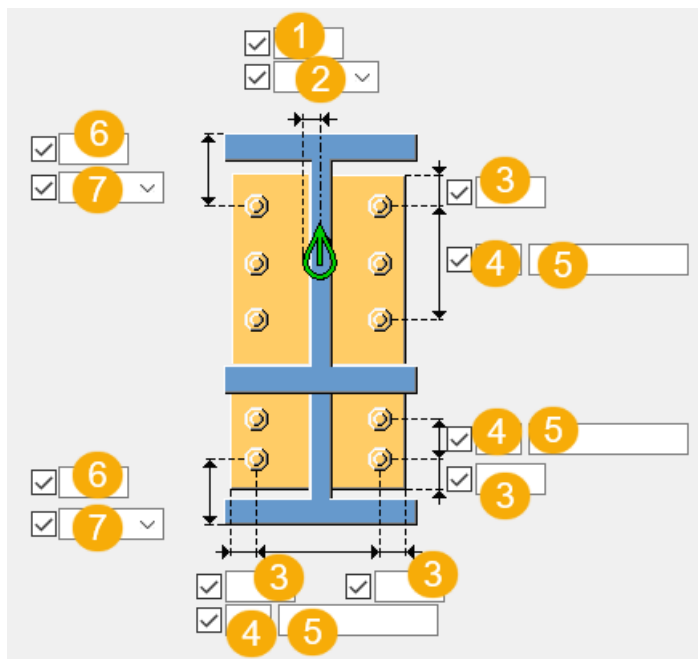
Holes group in rafter	Holes group in haunch	Holes group in cap plate
		
		
		
		
		

	Description	Default
<b>D1</b>	Define the hole diameter for the holes positioned by the x1 and y1 dimensions.	20 mm
<b>D2</b>	Define the hole diameter for the holes positioned by the x2 and y2 dimensions.	20 mm
<b>x1</b>	Define the x1 position of the galvanization holes.	0
<b>y1</b>	Define the y1 position of the galvanization holes.	0
<b>x2</b>	Define the x2 position of the galvanization holes.	0
<b>y2</b>	Define the y2 position of the galvanization holes.	0

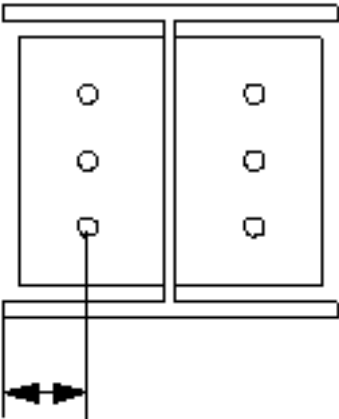
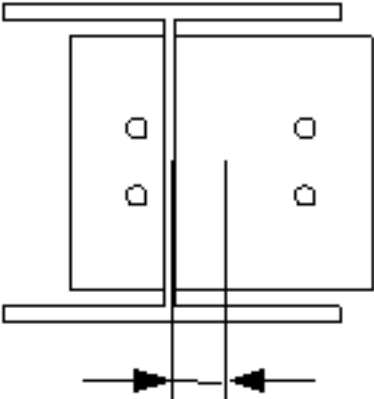
### **Bolts tab**

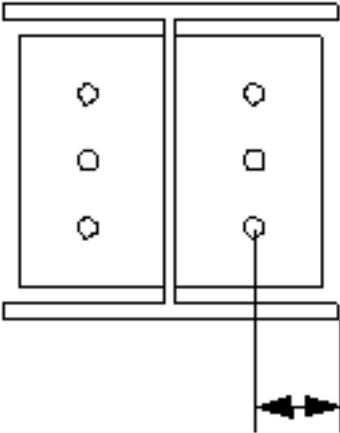
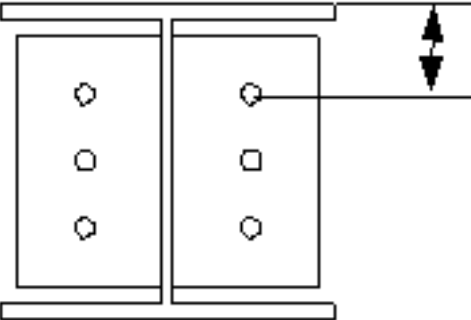
Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

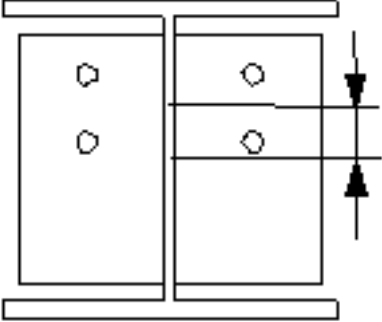
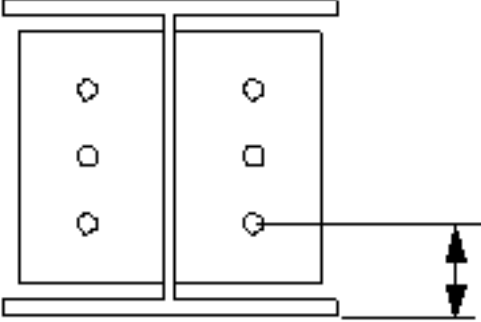
### **Bolt group dimensions**



	Description
<b>1</b>	Dimension for horizontal bolt group position.

	Description
2	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.           </li> </ul>  <ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.           </li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
<b>3</b>	<p>Bolt edge distance.</p> <p>Edge distance is the distance from the center of a bolt to the edge of the part.</p>
<b>4</b>	Number of bolts.
<b>5</b>	<p>Bolt spacing.</p> <p>Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.</p>
<b>6</b>	Dimension for vertical bolt group position.
7	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>

### Bolt basic properties

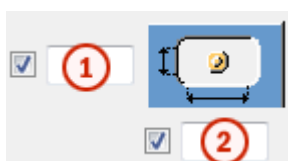
<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes



Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

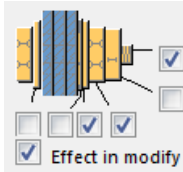


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.






To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.




### Bolting direction


Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

### Open beam tab

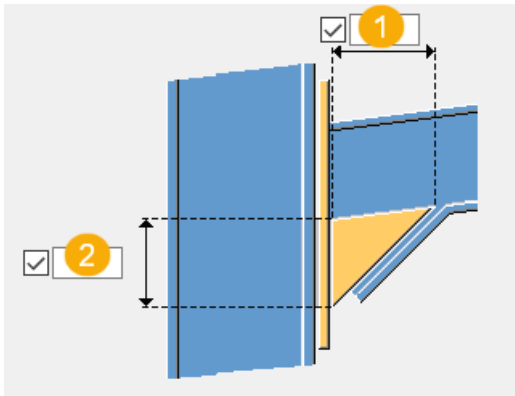
Use the **Open beam** tab to create an open beam haunch. To create the haunch, the beam web is cut and the profile is opened at a desired angle. A welded plate is placed as the haunch web.

### Create open beam

Option	Description
	Open beam is not created. This is the default.



Option	Description
	<p>Open beam is created.</p> <p>If you create an open beam, the options on the <b>Haunch</b> tab are ignored.</p>

### Haunch dimensions





	Description	Default
1	Horizontal haunch dimension	300 mm
2	Vertical haunch dimension	300 mm

### Beam extension

Option	Description
	<p>Beam bottom flange is not extended. This is the default.</p>
	<p>Beam bottom flange is extended to reach the end plate.</p>

### Haunch part to the beam

Option	Description
	<p>The haunch is added to the beam.</p>

Option	Description
	<p>The haunch is an independent part that is welded to the beam. This is the default.</p>

### ***General tab***

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

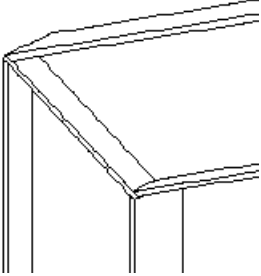
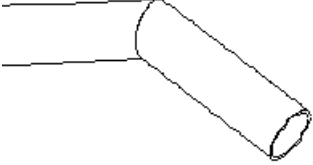
## **Cranked beam (41)**

**Cranked beam (41)** connects two beam ends. The beam ends are fitted to an angle which is an average of the beam end angles. A plate can be created between the connected parts.

### **Objects created**

- End plates
- Haunch plates
- Stiffeners
- Bolts
- Welds

## Use for

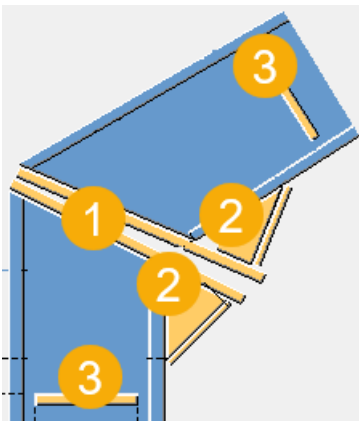
Situation	Description
	Beam ends are fitted.
	Beam ends are fitted. Tubular profiles are used.

## Selection order

1. Select the main part (beam).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

## Part identification key



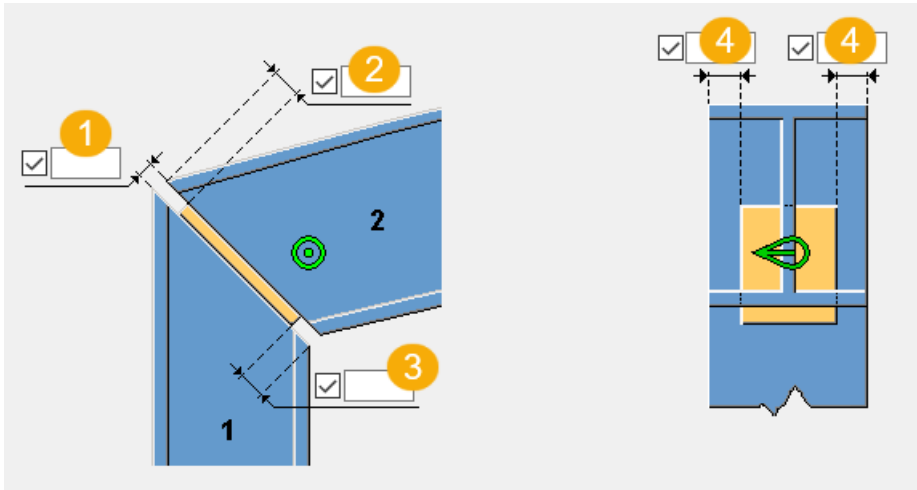
	Description
1	End plate
2	Haunch plate

	Description
3	Stiffener

### Picture tab

Use the **Picture** tab to define the geometry of the connection.

### Dimensions



	Description
1	Define the gap between the parts. The gap is created on both sides of the end plate.
2	Define the end plate edge distance from the top of the secondary part.
3	Define the end plate edge distance from the bottom of the main part.
4	Define the end plate edge distance to the left and right edge of the secondary part.

### Parts tab

Use the **Parts** tab to define the properties of the end plates, haunch plates, and stiffeners.

### Parts

Part	Description
Plate	Thickness, width and height of the end plate.
Sec plate	Thickness, width and height of the secondary end plate.

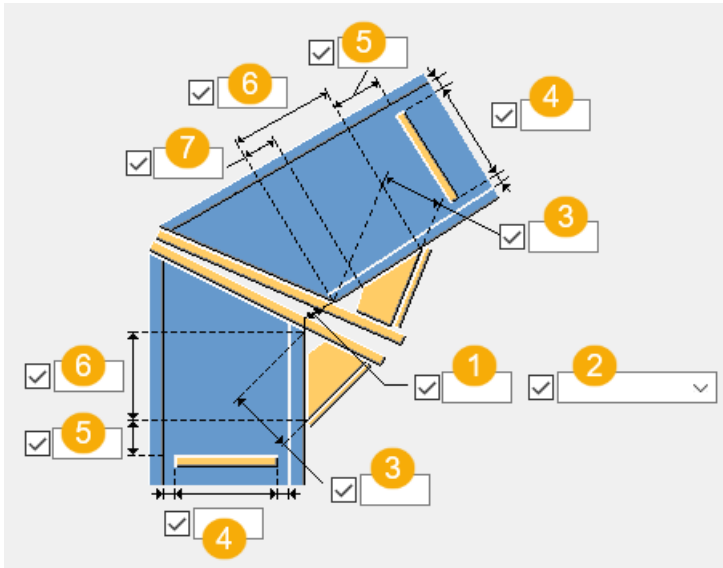
<b>Part</b>	<b>Description</b>
<b>Haunch prof</b>	Select the haunch profile from the profile catalog.
<b>Vert haunch pl</b>	Thickness of the vertical haunch plate.
<b>Horiz haunch pl</b>	Thickness and width of the horizontal haunch plate.
<b>Haunch prof 2</b>	Select the second haunch plate profile from the profile catalog.
<b>Vert haunch pl 2</b>	Thickness of the second vertical haunch plate.
<b>Horiz haunch pl 2</b>	Thickness and width of the second horizontal haunch plate.
<b>Column stiffener</b>	Thickness, width and height of the column stiffener.
<b>Beam stiffener</b>	Thickness, width and height of the column stiffener.

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### ***Parameters tab***

Use the **Parameters** tab to define the plate positions and dimensions.

## Plate positions and dimensions

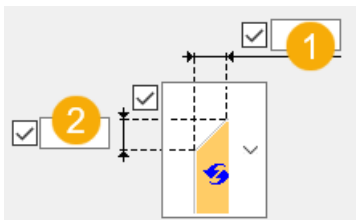


	Description
1	Gap between the end plates. You can define the gap either as a distance or as an angle.
2	Select whether the gap is defined as a distance or as an angle (degrees). By default, the gap is created as a distance.
3	Haunch plate height
4	Gap between the stiffeners and beam flanges
5	Stiffener edge distance to the haunch edge
6	Haunch plate length
7	Haunch plate chamfer size

### Parallel haunch end cuts

If you have selected the haunch profile from the profile catalog, you can select that the haunch ends are cut parallel.



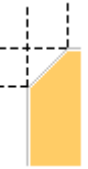


### Chamfer dimensions





<b>1</b>	Horizontal chamfer dimension
<b>2</b>	Vertical chamfer dimension

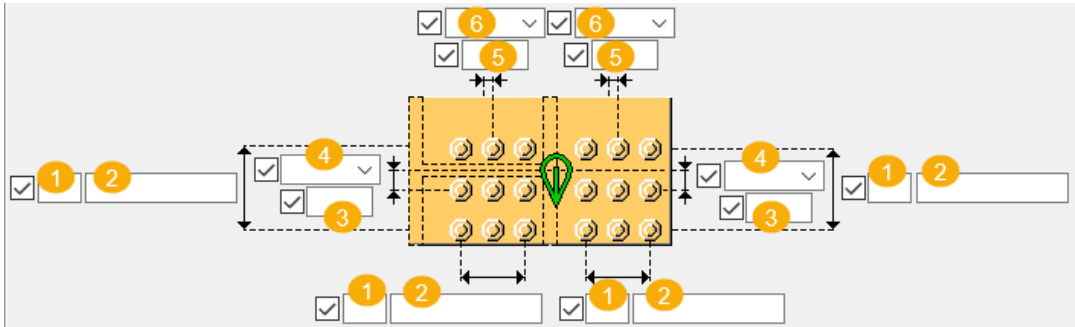
### Chamfer type

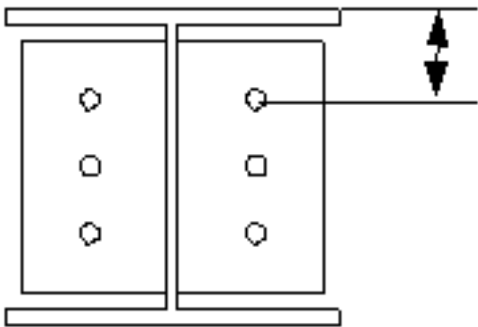
Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

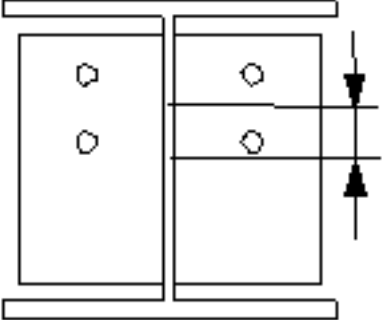
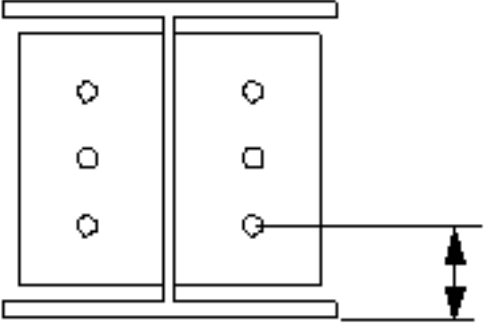
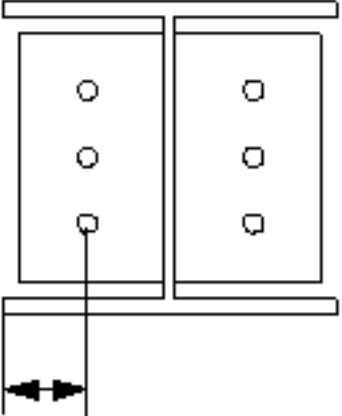
### ***Bolts tab***

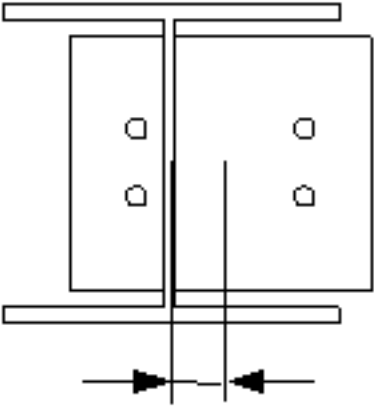
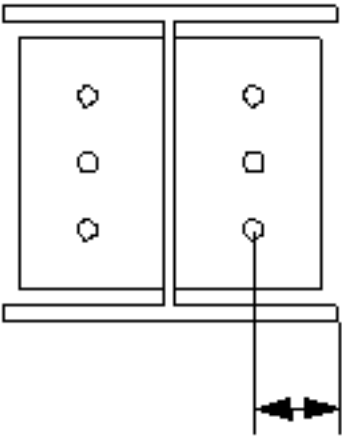
Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

## Bolt group dimensions



	Description
1	Number of bolts.
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Dimension for vertical bolt group position.
4	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li><b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>
<b>5</b>	Dimension for horizontal bolt group position.
<b>6</b>	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.              </li> </ul>

	Description
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the secondary part to the center line of the bolts. </li> </ul>  <ul style="list-style-type: none"> <li> <b>Right:</b> From the right edge of the secondary part to the rightmost bolt. </li> </ul> 

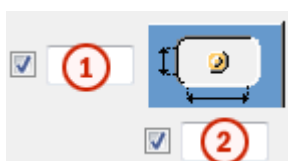
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

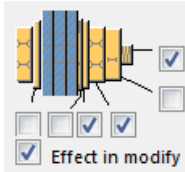


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

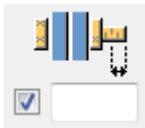
If you want to create a hole only, clear all the check boxes.









To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

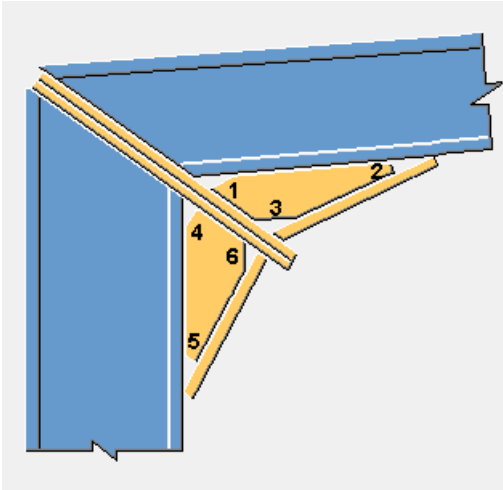
Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### **Chamfers tab**

Use the **Chamfers** tab to define the chamfer types and dimensions for the haunch plate chamfers.

### **Chamfers**

You can define each chamfer separately.



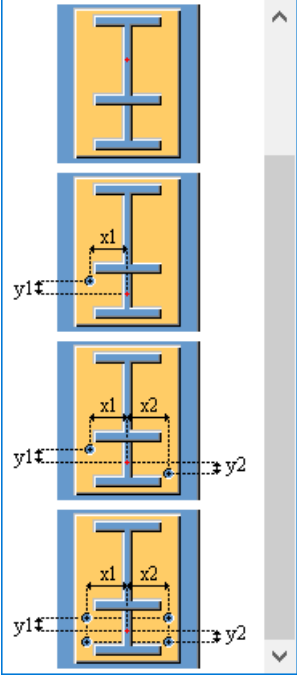
### **Holes tab**

Use the **Holes** tab to define the holes created in the end plates.

### **Hole dimensions**

You can define the holes separately for the main part end plate and the secondary part end plate. The main part end plate values are used as default values for the secondary part end plate.

Option	Description
	<p>Define the hole group dimensions in the rafter.</p>

Option	Description
	<p>Define the hole group dimensions in the haunch.</p>

Option	Description
<b>Bolt standard</b>	Select the bolt standard.
<b>Bolt type</b>	Select the bolt type to define the location where the bolts should be attached.
<b>Read data from</b>	<p>You can select to use the <code>sinkholes.dat</code> definition file to specify the default values for horizontal and vertical offsets, and the diameters for upper and lower holes.</p> <p>The file is searched in the following order: Environment common system steel folder (<code>..\Environments\common\system\Steel</code>), model folder, <code>XS_FIRM</code>, <code>XS_PROJECT</code> and <code>XS_SYSTEM</code> folder.</p> <p>You can also select to define the holes in the component dialog box.</p>



### **General tab**

Click the link below to find out more:

General tab

### **Design tab**

Click the link below to find out more:

Design tab

### **Analysis tab**

Click the link below to find out more:

Analysis tab

### **Welds**

Click the link below to find out more:

Create welds

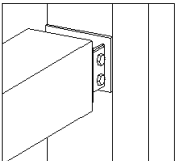
## **Hql connection (46)**

**Hql connection (46)** connects two hollow tube profiles by using end plates and stiffeners.

### **Objects created**

- End plates
- Stiffeners
- Bolts
- Welds

### **Use for**

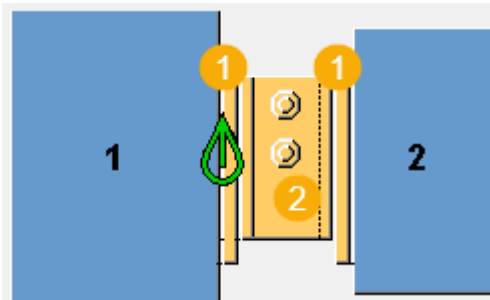
<b>Situation</b>	<b>Description</b>
	Profiles connected with bolted end plate

### Selection order

1. Select the main part.
2. Select the secondary part.

The connection is created automatically when the secondary part is selected.

### Part identification key

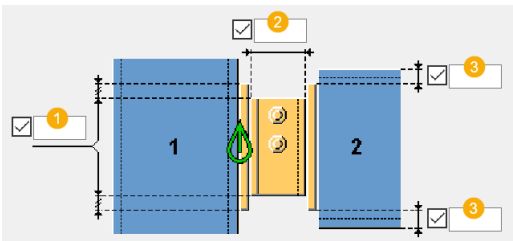


	Description
1	End plate
2	Stiffener

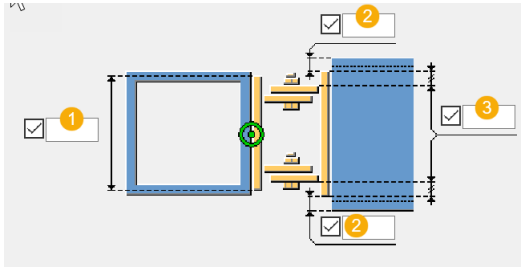
### Picture tab

Use the **Picture** tab to define the connection dimensions.

### Dimensions



	Description	Default
1	Vertical position of the stiffeners Define the distance from the top and bottom edge of the end plate.	10 mm
2	Distance between the end plates	
3	End plate top and bottom distance from the secondary beam edge	



	Description	Default
1	Width of the plate connected to the main part	
2	End plate edge distance from the secondary part edge	0.5*beam web thickness
3	Horizontal position of the stiffeners	10 mm

### Parts tab

Use the **Parts** tab to define the part properties.

#### Parts

Option	Description	Default
<b>Plate to prim</b>	Thickness of the end plate	1.5*main part web thickness
<b>End plate to sec</b>	Thickness of the end plate	1.5*secondary part web thickness
<b>Stiffeners</b>	Thickness of the stiffeners	0.5*bolt diameter

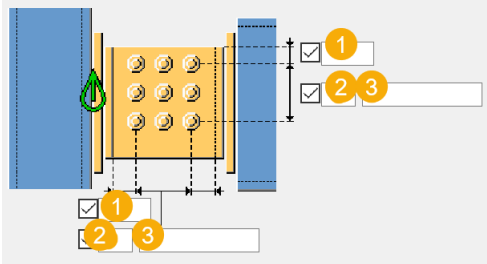
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
<b>Name</b>	Name that is shown in drawings and reports.	

### **Bolts tab**

Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

#### **Bolt group dimensions**



	Description
<b>1</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>2</b>	Number of bolts.
<b>3</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

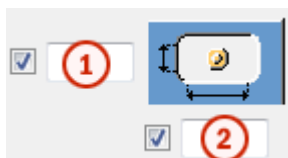
#### **Bolt basic properties**

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

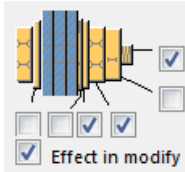


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

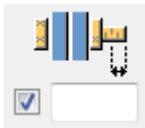
If you want to create a hole only, clear all the check boxes.








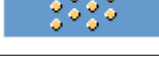
To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### General tab

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

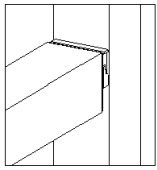
## **Plate with nail (47)**

**Plate with nail (47)** connects two hollow tube profiles with an end plate that is welded to the secondary part, and two fastener plates with nails, one welded to the end plate and the other welded to the main part.

### **Objects created**

- End plate
- Fastener plate
- Welds

### **Use for**

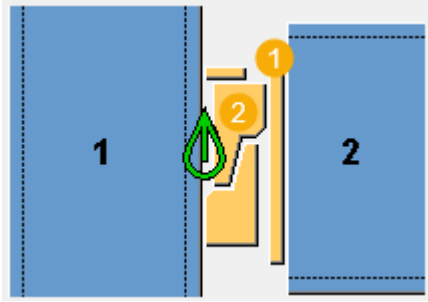
<b>Situation</b>	<b>Description</b>
	Profiles connected with end plate and fastener plates

### **Selection order**

1. Select the main part (column or beam).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

## Part identification key

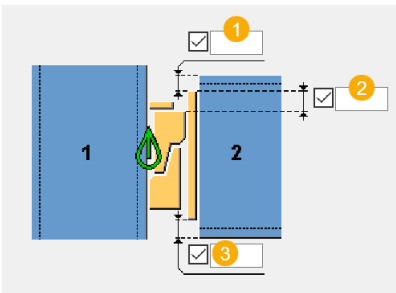


	Description
1	End plate
2	Fastener plates

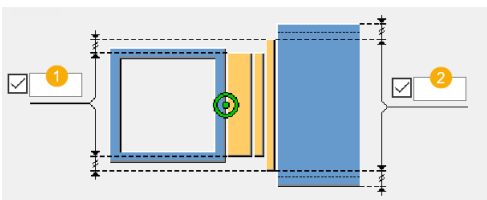
## Picture tab

Use the **Picture** tab to define the connection dimensions.

## Dimensions



	Description	Default
1	End plate edge distance from the upper edge of the secondary beam	0.5*beam flange thickness
2	Vertical position of the nail from the top of the end plate	10 mm
3	End plate edge distance from the lower edge of the secondary beam	





	Description	Default
1	Horizontal position of the nail from the end plate edge	0
2	Horizontal position of the end plate	0.5*beam web thickness

### **Parts tab**

Use the **Parts** tab to define the part properties.

### **Parts**

Option	Description	Default
<b>End plate to beam</b>	Thickness of the end plate	1.5*secondary part web thickness
<b>Fastener plate</b>	Thickness and width of the fastener plate	Thickness = 10 mm Width = 30 mm

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **General tab**

Click the link below to find out more:

General tab

### ***Design tab***

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

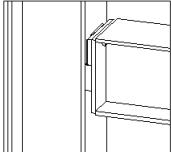
## **Spacer plate (48)**

**Spacer plate (48)** connects a beam to a column with an end plate that is welded to the beam and two bearing plates, one connected to the beam and the other welded to the column. Spacer plates are created to fill the space between the column and the bearing plate that is connected to the beam. The situation occurs when the bearing plate connected to the column is thicker than the bearing plate connected to the beam.

### **Objects created**

- Bearing plate
- End plate
- Spacer plate
- Bolts
- Welds

### **Use for**

<b>Situation</b>	<b>Description</b>
	Beam connected to a column

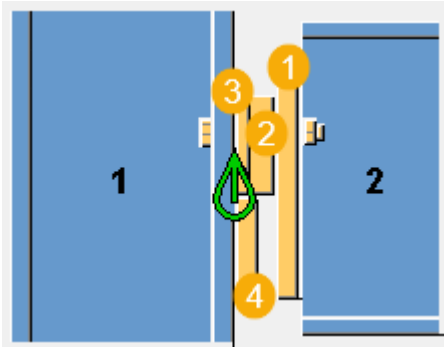
### **Selection order**

1. Select the main part (column).

- Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key

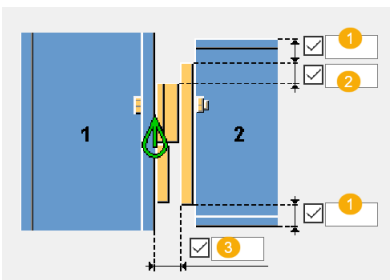


	Description
1	End plate to beam
2	Bearing plate to beam
3	Spacer plate
4	Bearing plate to column

### Picture tab

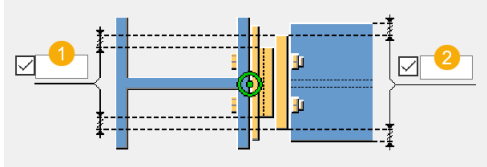
Use the **Picture** tab to define the connection dimensions.

### Dimensions



	Description	Default
1	End plate top and bottom distance from the secondary beam edge	0.5*beam flange thickness
2	Bearing plate edge dimension from the top of the end plate	0
3	End plate edge distance from the main part	Thickness of the

	Description	Default
		thicker bearing plate plus 1.0 mm



	Description	Default
1	Bearing plate horizontal position from the end plate edge	0
2	End plate horizontal position from the secondary part edge	0

### **Parts tab**

Use the **Parts** tab to define the part properties.

### **Parts**

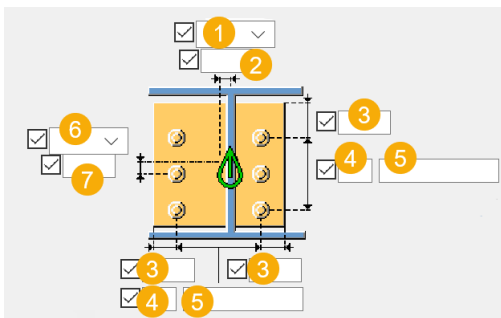
Option	Description	Default
<b>Bearing pl to prim</b>	Thickness and height of the bearing plate connected to the main part	Thickness = 25 mm Height = height of the beam profile divided by three and rounded up to nearest 5 mm
<b>End plate to beam</b>	Thickness of the end plate	15 mm
<b>Bearing pl to beam</b>	Thickness and height of the bearing plate connected to the secondary part	Thickness = 30 mm Height = height of the beam profile divided by three and rounded up to nearest 5 mm
<b>Spacer plates</b>	Thickness of the spacer plates	2 mm

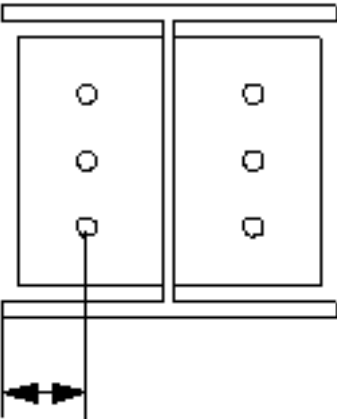
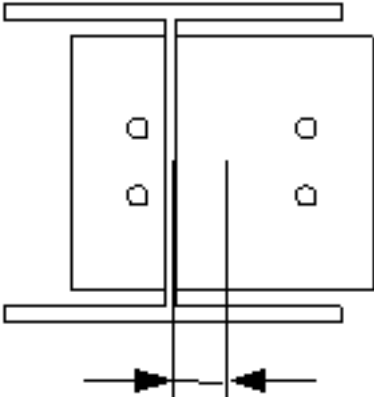
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

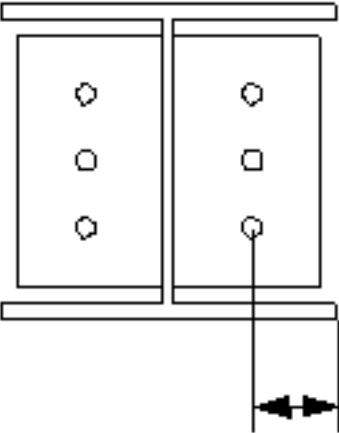
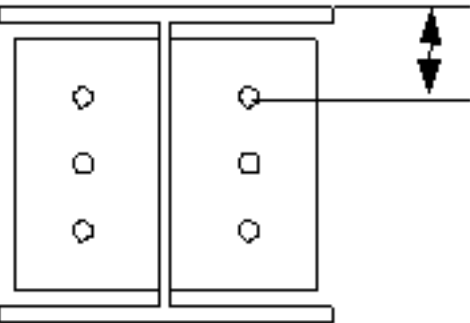
### **Bolts tab**

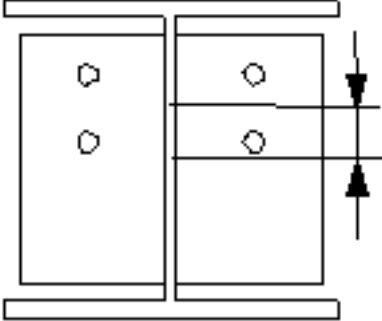
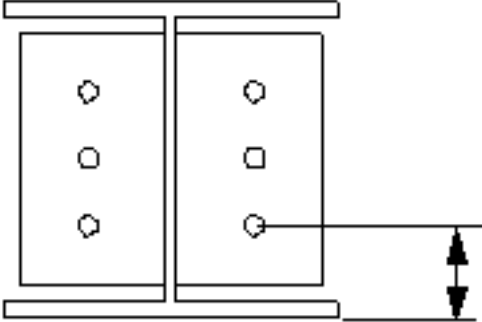
Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

### **Bolt group dimensions**



	<b>Description</b>
<b>1</b>	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
<b>2</b>	Dimension for horizontal bolt group position.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>6</b>	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
<b>7</b>	Dimension for vertical bolt group position.

### Bolt basic properties

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes



Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

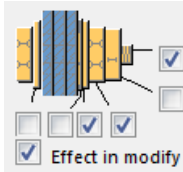


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

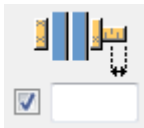
If you want to create a hole only, clear all the check boxes.








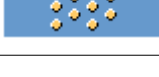
To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### General tab

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

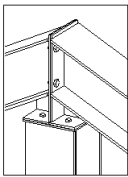
## **Double plate (50)**

**Double plate (50)** connects two beams and a column with double end plates. Ear plates can be connected to the beam end plates.

### **Objects created**

- End plates
- Stiffeners
- Ear plates
- Bolts
- Welds

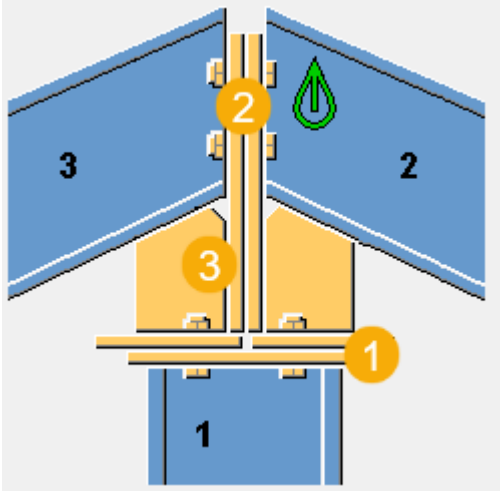
### **Use for**

<b>Situation</b>	<b>Description</b>
	Two beams connected to a column with end plates

### **Selection order**

1. Select the main part (column).
2. Select the first secondary part (beam).
3. Select the second secondary part (beam).
4. Click the middle mouse button to create the connection.

### Part identification key

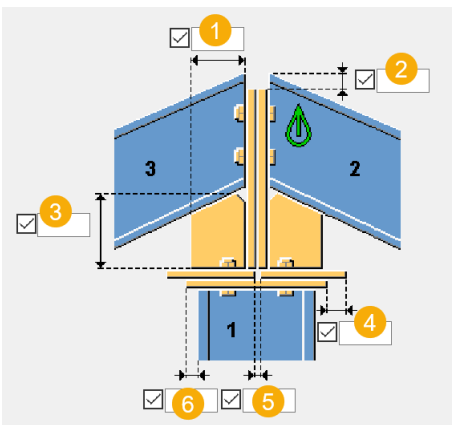


	Description
1	Column end plates, upper and lower
2	Beam end plates
3	Stiffeners

### Picture tab

Use the **Picture** tab to define the connection dimensions.

### Dimensions



	Description	Default
1	Stiffener plate width	Equal to lower column plate width

	Description	Default
2	Distance from the top of the beam end plate to the beam upper edge	-20 mm
3	Stiffener height	-200 mm
4	Distance between the column end plate edges	0
5	Distance between the upper column end plates	0
6	Distance between the lower column end plate and column edge	10 mm

### Parts tab

Use the **Parts** tab to define the part properties.

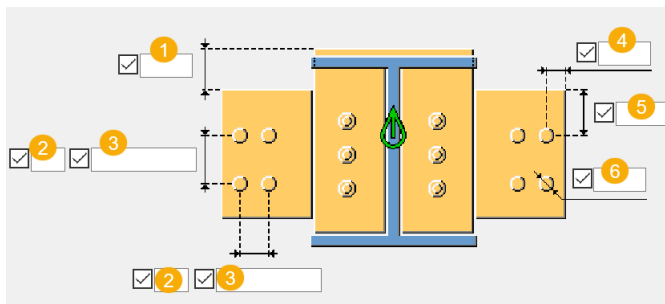
### Parts

Option	Description	Default
<b>Beam end plates</b>	Thickness of the end plates	10 mm
<b>Column end plates</b>	Thickness, width, and height of the end plates	10 mm
<b>Stiffener plates</b>	Thickness of the stiffener plates	10 mm
<b>End plates</b>	Thickness, width, and height of the end plates	By default, ear plates are not created. To create ear plates, enter the thickness.

### Parameters tab

Use the **Parameters** tab to define the ear plate dimensions and position.

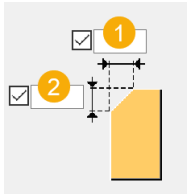
### Dimensions



	Description	Default
1	Distance between the end plate upper edge and ear plate upper edge	

	Description	Default
2	Number of the holes in the ear plate in the vertical and horizontal direction	Vertical = 2 Horizontal = 1
3	Vertical and horizontal distance between the holes in the ear plate	
4	Distance from the center point of the outermost hole in the ear plate to the ear plate outer edge	
5	Distance from the center point of the uppermost hole in the ear plate to the ear plate upper edge	
6	Ear plate hole diameter	

### Stiffener chamfer dimensions



	Description	Default
1	Horizontal chamfer dimension	20 mm
2	Vertical chamfer dimension	20 mm

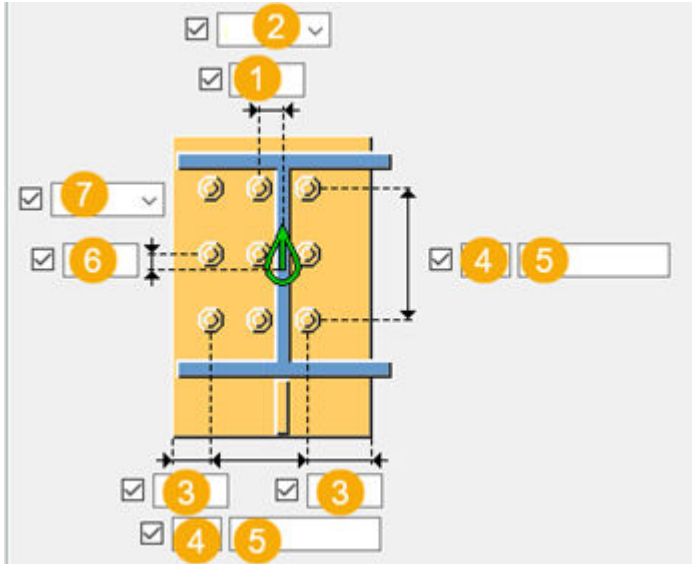
### Ear plate position

Option	Description
	Default Ear plates are created on both sides. AutoDefaults can change this option.
	Ear plates are created on both sides.
	Ear plate is created on the left.
	Ear plate is created on the right.

### Flange Bolt tab

Use the **Flange Bolt** tab to define the bolt group dimensions and bolt properties.

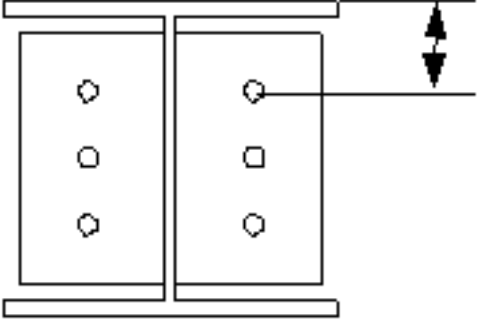
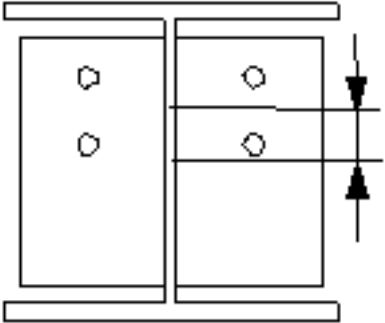
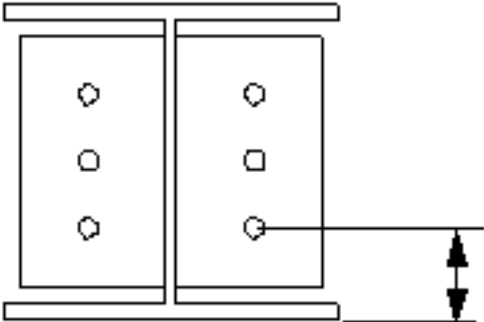
#### Bolt group dimensions



	Description
1	Dimension for horizontal bolt group position.
2	Select how to measure the dimensions for horizontal bolt group position. <ul style="list-style-type: none"><li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li></ul> <p>The diagram shows two vertical rectangular plates with three bolts each, mounted on a horizontal base. A dimension line with arrows at both ends is drawn below the plates, starting from the left edge of the leftmost bolt and extending to the left edge of the secondary part (the base).</p>

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> <div style="text-align: center;"> </div>
<b>3</b>	<p>Bolt edge distance.</p> <p>Edge distance is the distance from the center of a bolt to the edge of the part.</p>
<b>4</b>	<p>Number of bolts.</p>
<b>5</b>	<p>Bolt spacing.</p> <p>Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.</p>
<b>6</b>	<p>Dimension for vertical bolt group position.</p>



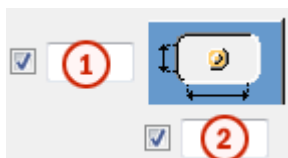
	Description
7	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.              </li> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



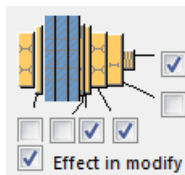
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.








To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.


### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

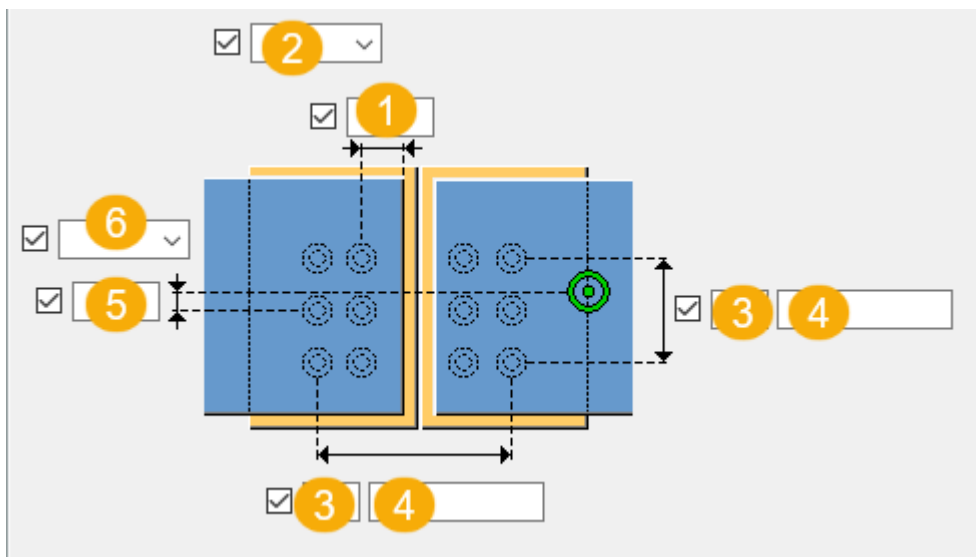
Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3

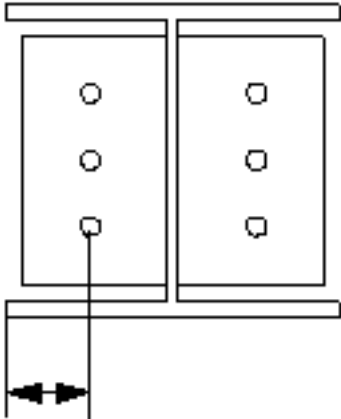
Option	Description
	Staggered type 4

**Web bolts tab**

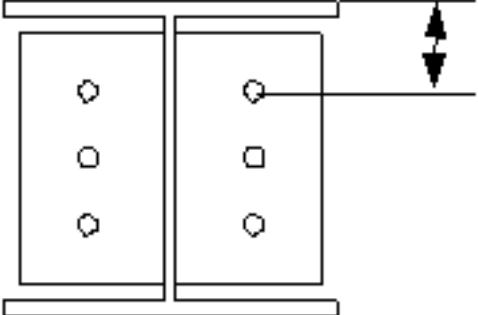
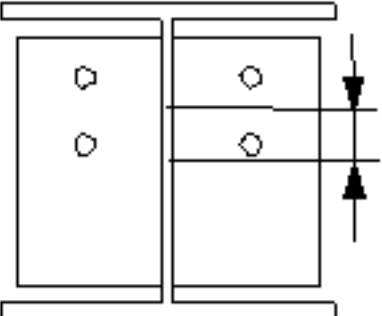
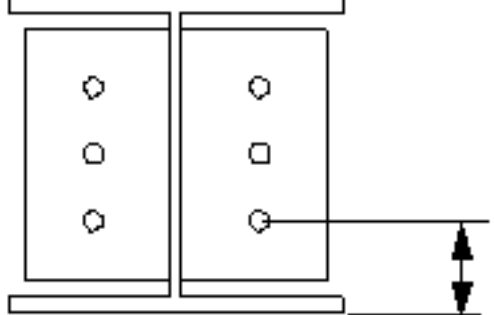
Use the **Web bolts** tab to define the bolt group dimensions and bolt properties.

**Bolt group dimensions**



	Description
1	Dimension for horizontal bolt group position.
2	Select how to measure the dimensions for horizontal bolt group position. <ul style="list-style-type: none"> <li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> <div style="text-align: center;"> </div>
<b>3</b>	Number of bolts.
<b>4</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>5</b>	Dimension for vertical bolt group position.

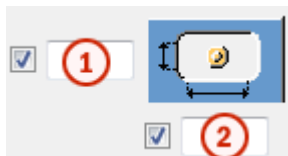
	Description
6	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.              </li> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes







You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
Slots in	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)



## Welds

Click the link below to find out more:

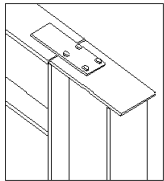
### Fit haunch (51)

**Fit haunch (51)** connects a beam to a column with a connection plate and an end plate that is welded to the column.

#### Objects created

- Column plate (end plate)
- Connection plate
- Triangular plate
- Bolts
- Welds

#### Use for

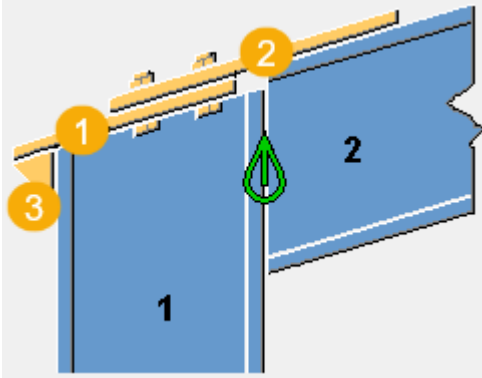
Situation	Description
	Beam connected to a column with a connection plate and an end plate

#### Selection order

1. Select the main part (column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

## Part identification key

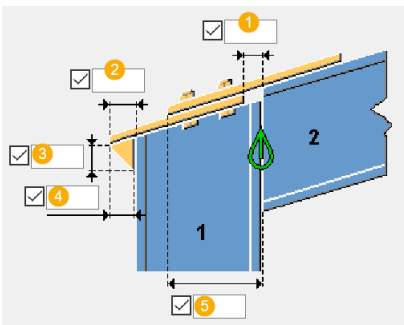


	Description
1	Column end plate
2	Connection plate
3	Triangular plate

## Picture tab

Use the **Picture** tab to define the connection dimensions.

## Dimensions



	Description	Default
1	Column plate edge distance from the secondary part edge	0
2	Column plate edge distance from the column edge	$0.5 \times \text{connection plate width mm}$
3	Height of the triangular plate	$\text{Main part height} / 6 \text{ mm}$

	Description	Default
4	Width of the triangular plate	Main part height/6 mm
5	Connection plate edge distance from the column edge	Main part height/6 mm

### **Parts tab**

Use the **Parts** tab to define the part properties.

### **Parts**

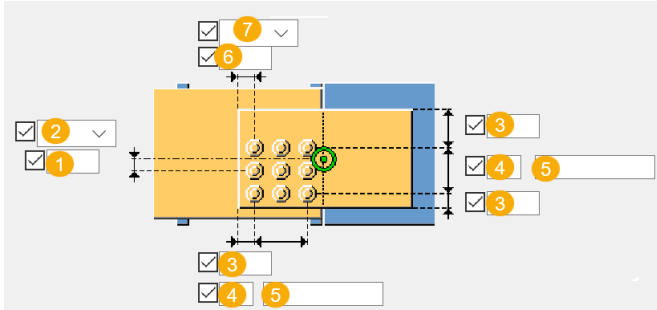
Option	Description	Default
<b>Column plate</b>	Thickness and height of the column plate	Thickness = 10 mm Height = main part height - main part flange thickness mm
<b>Connection plate</b>	Thickness, width, and height of the connection plate	Thickness = 10 mm Width is calculated by the bolt positions. Height is equal to the main part height.
<b>Triangular plate</b>	Thickness of the triangular plate	10 mm

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

## Bolts tab

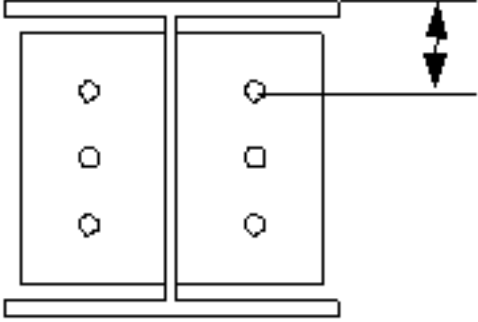
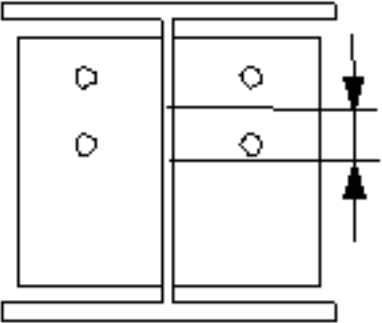
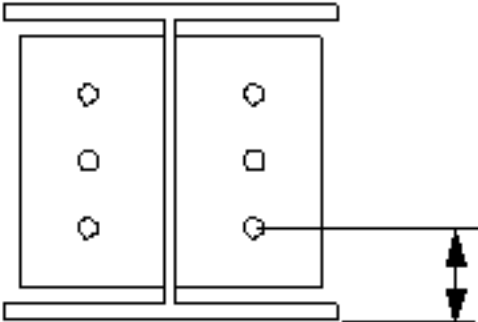
Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

### Bolt group dimensions



	Description
1	Dimension for horizontal bolt group position.
2	Select how to measure the dimensions for horizontal bolt group position. <ul style="list-style-type: none"><li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li></ul> <p>The diagram shows two vertical plates with three bolts each. A horizontal dimension line with arrows at both ends is shown below the plates, indicating the distance from the left edge of the secondary part to the leftmost bolt.</p>

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> <div style="text-align: center;"> </div>
<b>3</b>	<p>Bolt edge distance.</p> <p>Edge distance is the distance from the center of a bolt to the edge of the part.</p>
<b>4</b>	<p>Number of bolts.</p>
<b>5</b>	<p>Bolt spacing.</p> <p>Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.</p>
<b>6</b>	<p>Dimension for vertical bolt group position.</p>

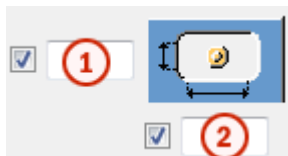
	Description
7	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.              </li> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



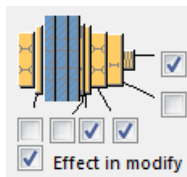
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

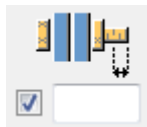
If you want to create a hole only, clear all the check boxes.








To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase


Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3



Option	Description
	Staggered type 4

### ***General tab***

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

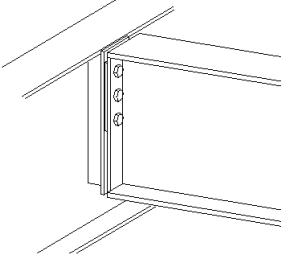
## **Partial stiff end plate (65)**

**Partial stiff end plate (65)** creates a beam-to-beam end plate connection. The connection creates an end plate on the secondary beam, a stiffener plate and a connection front plate at the main beam. In addition, stiffener plates can be added to both sides, a bottom plate can be added to the bottom of the main stiffener plate, and shim plates can be created.

### **Objects created**

- End plate
- Shear tab
- Stiffeners
- Shim plates
- Bolts
- Welds

## Use for

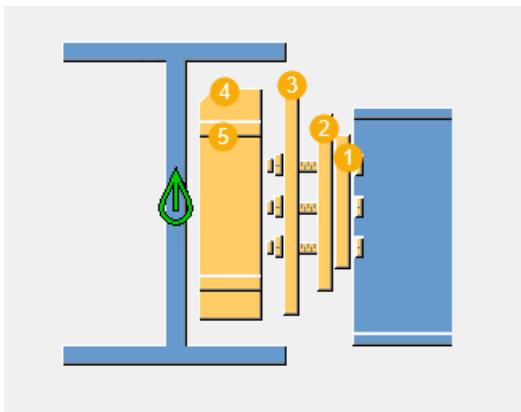
Situation	Description
	Two beams connected with bolted end plates.

## Selection order

1. Select the main part (beam).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

## Part identification key

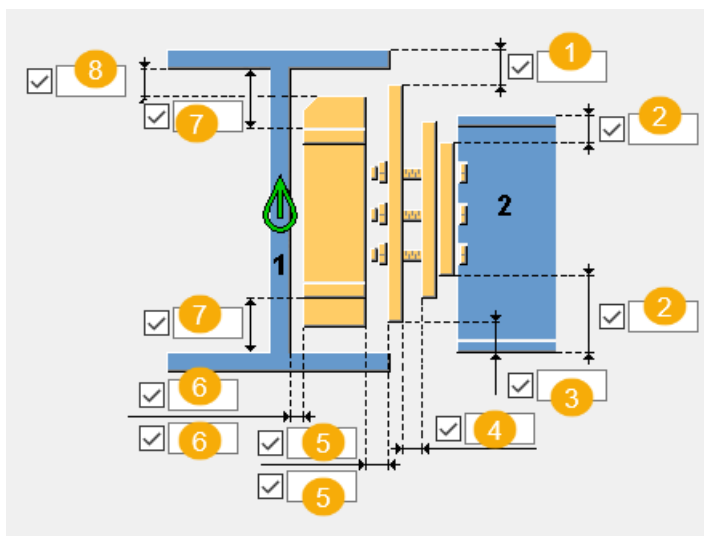


	Description
1	End plate
2	Shim plate
3	Front plate
4	Shear tab
5	Stiffener

## Picture tab

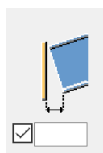
Use the **Picture** tab to define the part positions.

## Dimensions



	Description
1	Front plate edge distance from the main part flange.
2	End plate edge distance from the secondary part flange.
3	Front plate edge distance from the secondary part flange.
4	Gap between the front plate and the shim plate.
5	Gap between the shear tab and the front plate. The lower box is for controlling the shear tab on the other side of the main part.
6	Gap between the shear tab and the main part web. The lower box is for controlling the shear tab on the other side of the main part.
7	Stiffener edge distance from the main part web.
8	Shear tab edge distance from the main part web.

## Gap size



Define the limit value for the gap between the end plate and the secondary beam. Use this when the beam is slightly curved or sloped to decide if the end angle is so small that the beam end can be straight.

If the actual gap is smaller than this value, the end of the beam is left straight.

If the actual gap is larger than this value, the end of the beam is fitted to the end plate.

### **Parts tab**

Use the **Parts** tab to define the part properties.

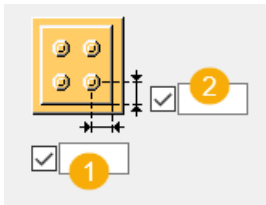
#### **Parts**

<b>Option</b>	<b>Description</b>
<b>End plate</b>	Thickness of the end plate.
<b>Front plate</b>	Thickness and width of the front plate.
<b>Shear plate</b>	Thickness, width and height of the end plate.
<b>Fill shear plate width</b>	Select whether to use the XS_STANDARD_STIFFENER_WIDTH_TOLERANCE advanced option for the width.
<b>Stiffener</b>	Thickness and width of the stiffener.
<b>Bottom stiffener as one plate</b>	Select whether the bottom stiffener is created as one plate.
<b>Fitting plate 1, Fitting plate 2, Fitting plate 3</b>	Thickness of the shim plate.
<b>Bottom plate</b>	Select the bottom plate profile from the profile catalog.
<b>Profile</b>	Select a profile.  When you select a profile, this profile is created instead of the front plate.
<b>Profile rotation</b>	Select whether the profile is rotated horizontally or vertically.

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

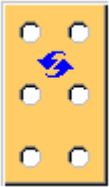
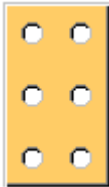


Option	Description	Default
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	


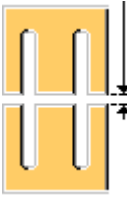
### Shim plate bolt edge distance



	Description
<b>1</b>	Horizontal bolt edge distance in the shim plate.
<b>2</b>	Vertical bolt edge distance in the shim plate.

### Shim plate shape

Option	Description
	Default Holes are based on the bolt group of the connection. AutoDefaults can change this option.
	Holes are based on the bolt group of the connection.
	Finger shim plate with horizontal slots. The plate can be installed from the right or the left side of the connection.
	Finger shim plate with vertical slots. The plate can be installed from the top of the connection.

Option	Description
	Two separate finger shim plates with horizontal slots.
	Two separate finger shim plates with vertical slots.

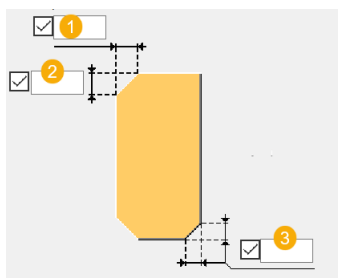
### Tolerance

Define the tolerance for the slots in finger shim plates. The width of the slot is the bolt diameter + the tolerance. For two separate shim plates, also define the tolerance between the plates.


### Parameters tab





Use the **Parameters** tab to define the chamfers of the shear tab and stiffeners.

### Shear tab chamfer dimensions

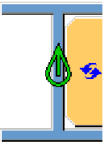


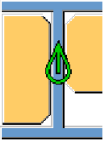


	Description	Default
1	Horizontal chamfer dimension.	30 mm
2	Vertical chamfer dimension.	30 mm
3	Bottom chamfer dimension.	30 mm

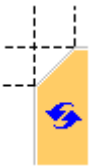
Option	Description
	Default Line chamfer AutoDefaults can change this option.





Option	Description
	No chamfer
	Line chamfer
	Convex chamfer
	Concave chamfer

### Shear tab shape

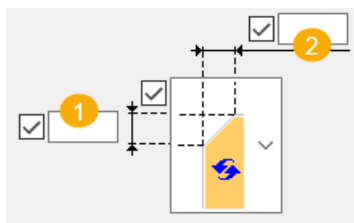
Option	Description
	Default Full Creates a full shear tab of the same height as the web of the main part. AutoDefaults can change this option.
	Full
	Shear tabs are created on both sides of the main part web.
	Partial shear tab is created on the other side of the main part web.

### Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.

Option	Description
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### Chamfer dimensions



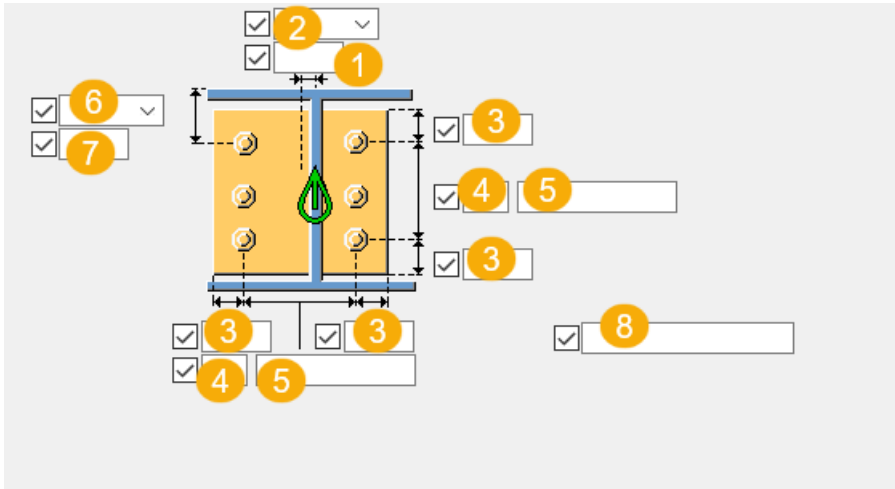
	Description	Default
<b>1</b>	Vertical dimension of the chamfer.	10 mm
<b>2</b>	Horizontal dimension of the chamfer.	10 mm

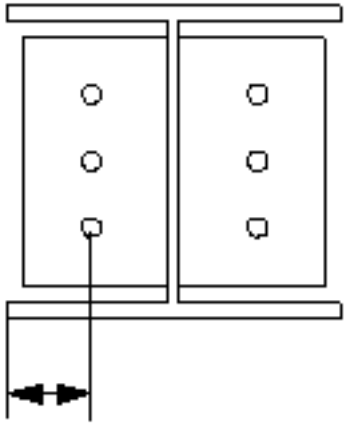
### **Bolts tab**

Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

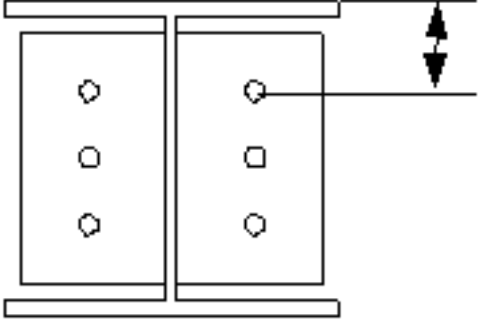
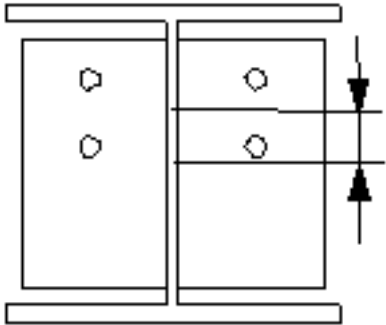
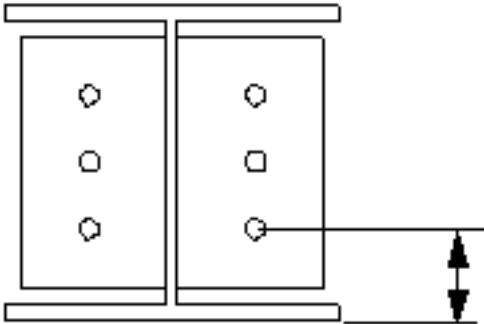


## Bolt group dimensions



	Description
1	Dimension for horizontal bolt group position.
2	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> <div style="text-align: center;"> </div>
<b>3</b>	<p>Bolt edge distance.</p> <p>Edge distance is the distance from the center of a bolt to the edge of the part.</p>
<b>4</b>	<p>Number of bolts.</p>
<b>5</b>	<p>Bolt spacing.</p> <p>Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.</p>

	<b>Description</b>
<p><b>6</b></p>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li> <p><b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</p>  </li> <li> <p><b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</p>  </li> <li> <p><b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</p>  </li> </ul>
<p><b>7</b></p>	<p>Dimension for vertical bolt group position.</p>

	Description
8	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### Bolt type

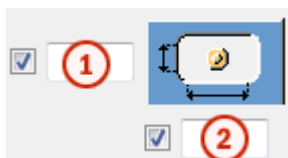
Select the bolt type to define the location where the bolts should be attached.

### Bolt comment

You can define a bolt comment.

### Slotted holes

You can define slotted, oversized, or tapped holes.



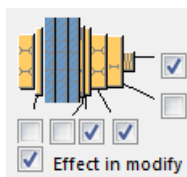
Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.

Option	Description	Default
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
Rotate Slots	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
Slots in	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.




To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.



### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.






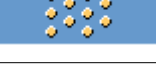


### Bolting direction

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.

Option	Description
	Bolting direction 1
	Bolting direction 2

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Holes - end plate tab

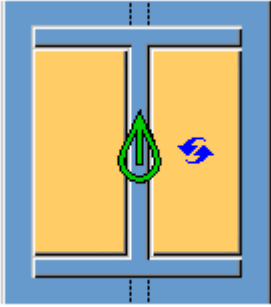
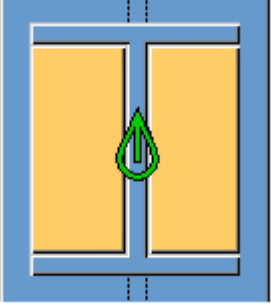
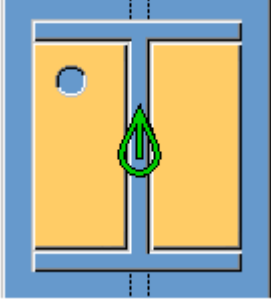
Use the **Holes - end plate** tab to control the galvanizing holes in the end plate.

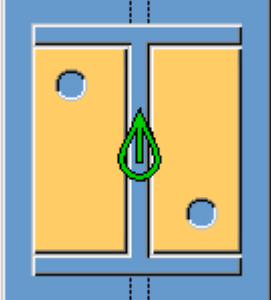
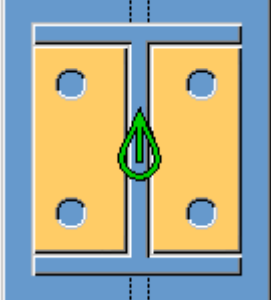
Option	Description
<b>Bolt standard</b>	Select the bolt standard.
<b>Bolt type</b>	Select the bolt type to define the location where the bolts should be attached.
<b>Read data from</b>	You can select to use the <code>sinkholes.dat</code> definition file to specify the default values for horizontal and vertical offsets, and the diameters for upper and lower holes.  The file is searched in the following order: Environment common system

Option	Description
	steel folder (..\Environments\common\system\Steel), model folder, XS_FIRM, XS_PROJECT and XS_SYSTEM folder.  You can also select to define the holes in the component dialog box.

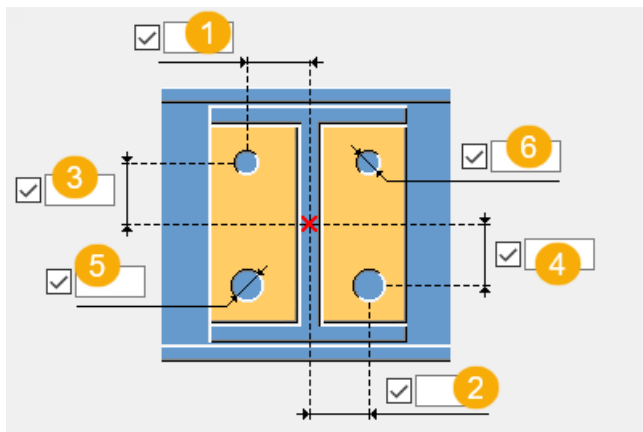
### Number of holes

The center of a hole group is the middle point of the beam and the middle point of the haunch, if the haunch exists. The hole groups are composed of 0, 1, 2 or 4 holes.

Option	Description
	Default No holes AutoDefaults can change this option.
	No holes
	1 hole

Option	Description
	2 holes
	4 holes

### Hole positions



	Description
1	Horizontal distance between the secondary beam center and the upper hole.
2	Horizontal distance between the secondary beam center and the lower hole.
3	Vertical distance between the secondary beam center and the upper hole.
4	Vertical distance between the secondary beam center and the lower hole.
5	Diameter of the lower hole.



	Description
6	Diameter of the upper hole.

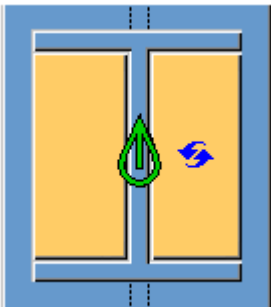
### **Holes - front plate tab**

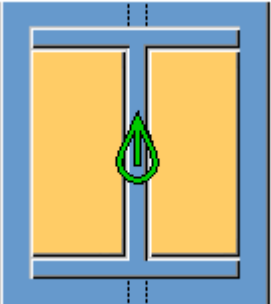
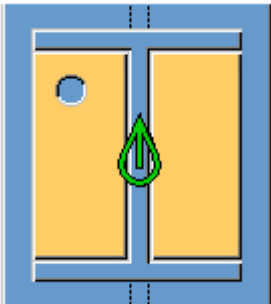
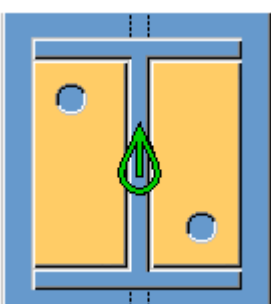
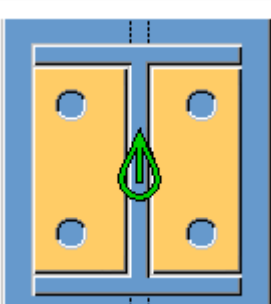
Use the **Holes - front plate** tab to control the galvanizing holes in the front plate.

Option	Description
<b>Bolt standard</b>	Select the bolt standard.
<b>Bolt type</b>	Select the bolt type to define the location where the bolts should be attached.
<b>Read data from</b>	<p>You can select to use the <code>sinkholes.dat</code> definition file to specify the default values for horizontal and vertical offsets, and the diameters for upper and lower holes.</p> <p>The file is searched in the following order: Environment common system steel folder (<code>..\Environments\common\system\Steel</code>), model folder, <code>XS_FIRM</code>, <code>XS_PROJECT</code> and <code>XS_SYSTEM</code> folder.</p> <p>You can also select to define the holes in the component dialog box.</p>

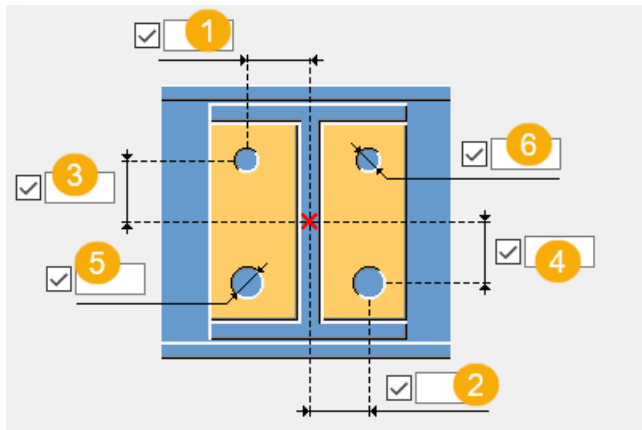
### **Number of holes**

The center of a hole group is the middle point of the beam and the middle point of the haunch, if the haunch exists. The hole groups are composed of 0, 1, 2 or 4 holes.

Option	Description
	<p>Default</p> <p>No holes</p> <p>AutoDefaults can change this option.</p>

Option	Description
	No holes
	1 hole
	2 holes
	4 holes

## Hole positions



	Description
1	Horizontal distance between the secondary beam center and the upper hole.
2	Horizontal distance between the secondary beam center and the lower hole.
3	Vertical distance between the secondary beam center and the upper hole.
4	Vertical distance between the secondary beam center and the lower hole.
5	Diameter of the lower hole.
6	Diameter of the upper hole.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

[Design tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

## **Welds**

Click the link below to find out more:

## ***Dstv connection properties***

Click the link below to find out more:

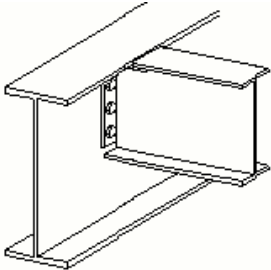
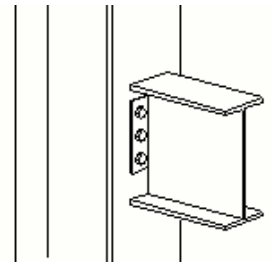
## **End plate (101)**

**End plate (101)** connects a beam to another beam or to a column using an end plate. The end plate is welded to the secondary beam and bolted to the main part (beam or column).

### **Objects created**

- End plate
- Bolts
- Welds
- Cuts

### **Use for**

<b>Situation</b>	<b>Description</b>
	Beam to beam connection with a bolted end plate.
	Beam to column connection with a bolted end plate.

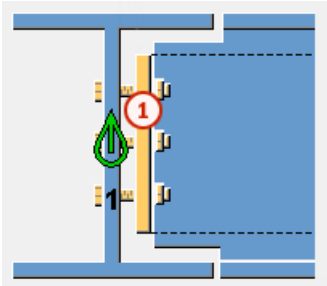
### **Selection order**

1. Select the main part (beam or column).

- Select the secondary part (beam).

The connection is created automatically when the secondary beam is selected.

### Part identification key

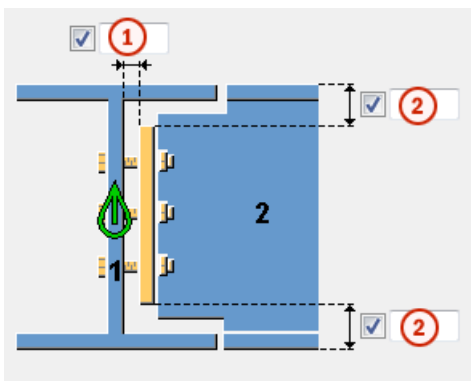


	Part
1	End plate

### Picture tab

Use the **Picture** tab to control the position of the end plate.

### End plate position



	Description	Default
1	Gap between the main part and the end plate.	2 mm
2	End plate edge distance to the secondary part flange.	

### End plate tab

Use the **End plate** tab to control the properties of the end plate.

## Plate

Part	Description
<b>End plate</b>	Define the end plate thickness and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

Option	Description
<b>End plate edge type</b>	Define how the end plate is cut. The default is <b>Rolled/Sawn</b> .
<b>Adapt to secondary part slope</b>	Select whether to align the end plate with the secondary part slope.

### **Notch tab**

Use the **Notch** tab to create notches for the secondary beam and to control the notch properties.

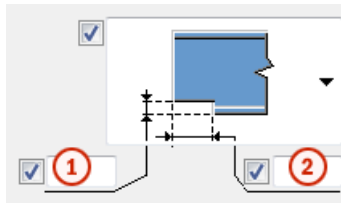
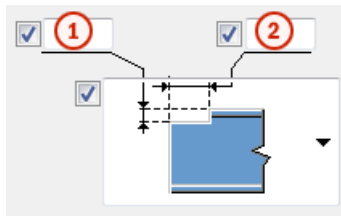
#### **BCSA notch definition**

Define whether the notch is created according to British Constructional Steelwork Association (BCSA) specifications.

Option	Description
<b>Default</b>	Notch dimensions.
<b>Yes</b>	Creates a 50 mm notch for simple beam-to-beam connections.
<b>No</b>	Use the options on this <b>Notch</b> tab to define the notch dimensions.

## Notch dimensions

Define the top and the bottom dimensions of the notch if you have set the **BCSA notch def** option to **No**.

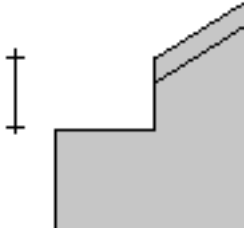
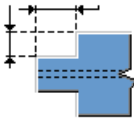
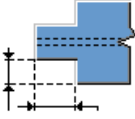
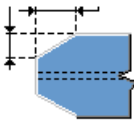
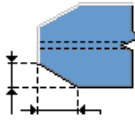
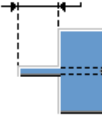
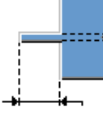
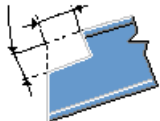
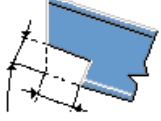


	Description
1	Vertical notch dimension.
2	Horizontal notch dimension.

## Notch shape


Define the notch shape for the top and the bottom of the secondary beam.

Option	Option	Description
		Default Creates a square notch on the top side or on the bottom side of the secondary beam. AutoDefaults can change this option.
		No notch
		Creates a square notch on the top side or on the bottom side of the secondary beam. Define the notch dimensions. In beam-to-beam connections with a sloped secondary beam,




Option	Option	Description
		<p>the depth is measured as shown in the picture.</p> 
		<p>Creates a notch on both sides of the secondary part.</p> <p>Define the notch dimensions.</p>
		<p>Creates a chamfered notch on both sides of the secondary beam.</p> <p>Define the chamfer dimensions.</p>
		<p>Creates a strip.</p> <p>Define the length of the strip. The flanges are cut completely.</p>
		<p>Creates a special type of square notch.</p> <p>Define the notch dimensions. The notch is square to the secondary beam. There are no default values for the length or the depth.</p>

### Notching side

Define on which side of the secondary beam the notch is created. You can define the side for both the top and the bottom of the secondary beam.

Option	Description
	<p>Default</p> <p>Creates notches on both sides.</p> <p>AutoDefaults can change this option.</p>

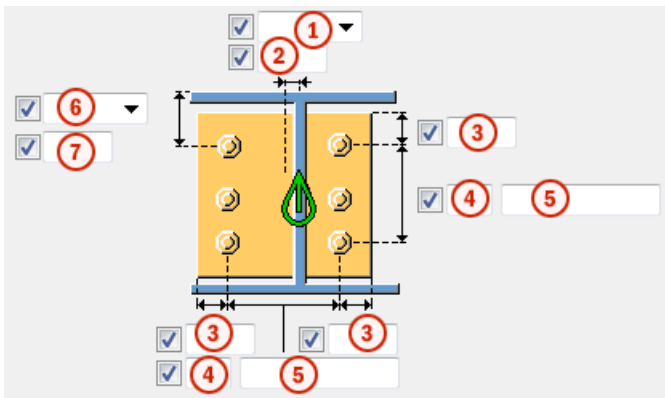


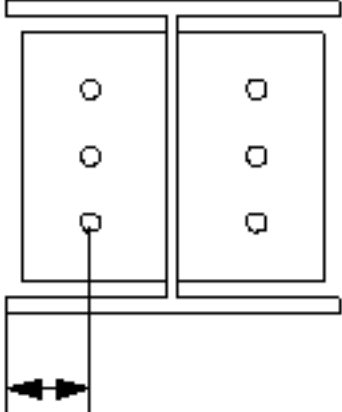
Option	Description
	Creates notches on both sides.
	Creates a notch on the left side.
	Creates a notch on the right side.

### **Bolts tab**

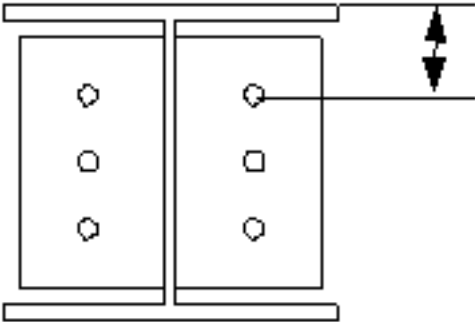
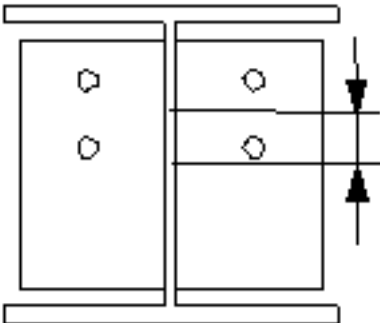
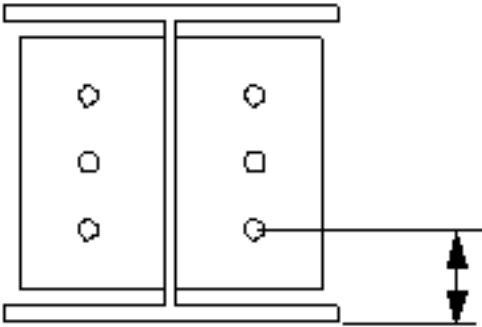
Use the **Bolts** tab to control the bolt properties.

### **Bolt group dimensions**









	Description
<b>1</b>	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> <div style="text-align: center;"> </div>
<b>2</b>	Dimension for horizontal bolt group position.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

	<b>Description</b>
<p><b>6</b></p>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
<p><b>7</b></p>	<p>Dimension for vertical bolt group position.</p>

## Staggering of bolts

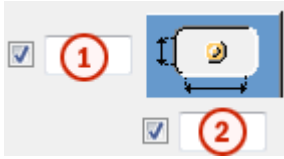
Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.

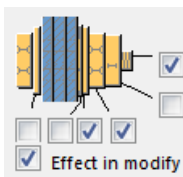


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<p><b>Slotted</b> creates slotted holes.</p> <p><b>Oversized</b> creates oversized or tapped holes.</p> <p><b>No hole</b> does not create holes.</p>	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### ***General tab***

Click the link below to find out more:

General tab

### ***Design tab***

Click the link below to find out more:

Design tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

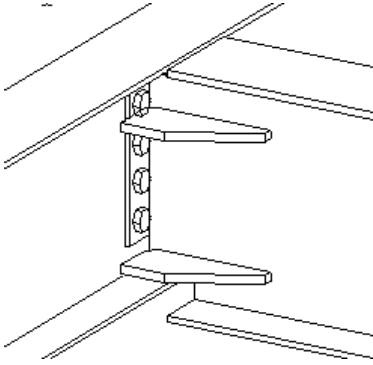
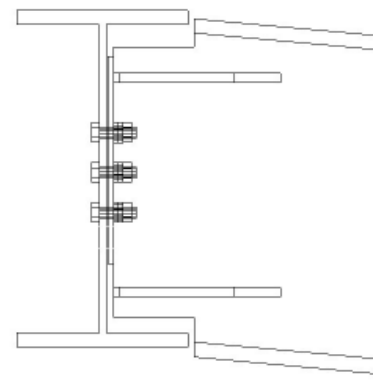
## **End plate with compensating flange plates (111)**

**End plate with compensating flange plates (111)** connects a beam to another beam using an end plate with compensating flange plates. The end plate is welded to the secondary beam and bolted to the main beam.

### **Objects created**

- End plate
- Compensating flange plates
- Bolts
- Welds
- Cuts

**Use for**

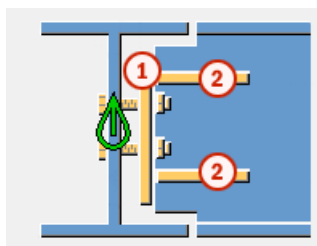
Situation	Description
	<p>Connection with an end plate and compensating flanges.</p>
	<p>Connection with an end plate and compensating flange plates. The secondary beam is sloped.</p>

**Selection order**

1. Select the main part (beam).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

**Part identification key**

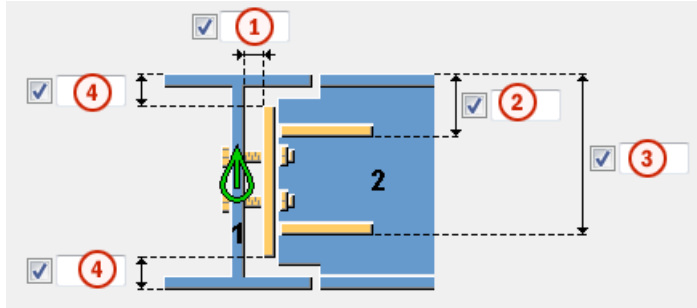


	Part
1	End plate
2	Compensating flange plate

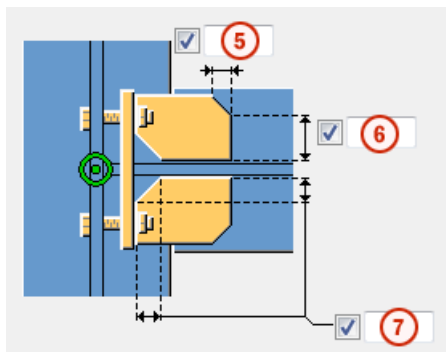
### Picture tab

Use the **Picture** tab to control the position of the plates.

### Dimensions



	Description
1	Gap between the main beam and the end plate.
2	Distance from the inner edge of the flange plate to the secondary beam flange.
3	Distance from the outer edge of the flange plate to the secondary beam flange.
4	End plate edge distance to the main beam flange.



	Description
1	Horizontal chamfer dimension of the flange plate.
2	Flange plate dimension that remains when a chamfer is created.
3	Inner chamfer dimension of the flange plate.

### Parts tab

Use the **Parts** tab to control the plate properties.



## Plate

Part	Description
<b>End plate</b>	Define the end plate thickness and height.
<b>Compensating flange plate</b>	Define the flange plate thickness, width, and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### ***Notch tab***

Use the **Notch** tab to create notches for the secondary beam and to control the notch properties.

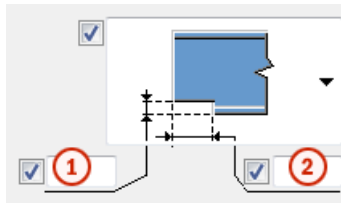
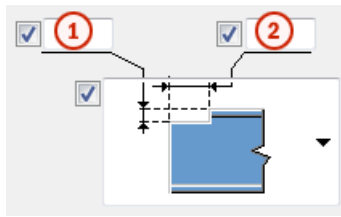
### **BCSA notch definition**

Define whether the notch is created according to British Constructional Steelwork Association (BCSA) specifications.

Option	Description
<b>Default</b>	Notch dimensions.
<b>Yes</b>	Creates a 50 mm notch for simple beam-to-beam connections.
<b>No</b>	Use the options on this <b>Notch</b> tab to define the notch dimensions.

## Notch dimensions

Define the top and the bottom dimensions of the notch if you have set the **BCSA notch def** option to **No**.

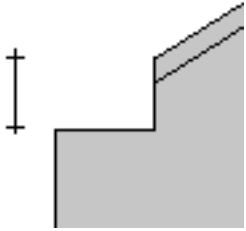
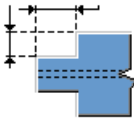
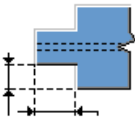
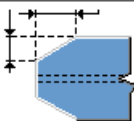
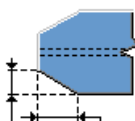
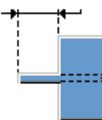
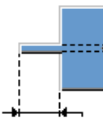
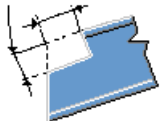
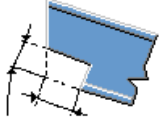


	Description
1	Vertical notch dimension.
2	Horizontal notch dimension.

## Notch shape


Define the notch shape for the top and the bottom of the secondary beam.




Option	Option	Description
		Default Creates a square notch on the top side or on the bottom side of the secondary beam. AutoDefaults can change this option.
		No notch
		Creates a square notch on the top side or on the bottom side of the secondary beam. Define the notch dimensions. In beam-to-beam connections with a sloped secondary beam,

Option	Option	Description
		<p>the depth is measured as shown in the picture.</p> 
		<p>Creates a notch on both sides of the secondary part.</p> <p>Define the notch dimensions.</p>
		<p>Creates a chamfered notch on both sides of the secondary beam.</p> <p>Define the chamfer dimensions.</p>
		<p>Creates a strip.</p> <p>Define the length of the strip. The flanges are cut completely.</p>
		<p>Creates a special type of square notch.</p> <p>Define the notch dimensions. The notch is square to the secondary beam. There are no default values for the length or the depth.</p>

### Notching side

Define on which side of the secondary beam the notch is created. You can define the side for both the top and the bottom of the secondary beam.

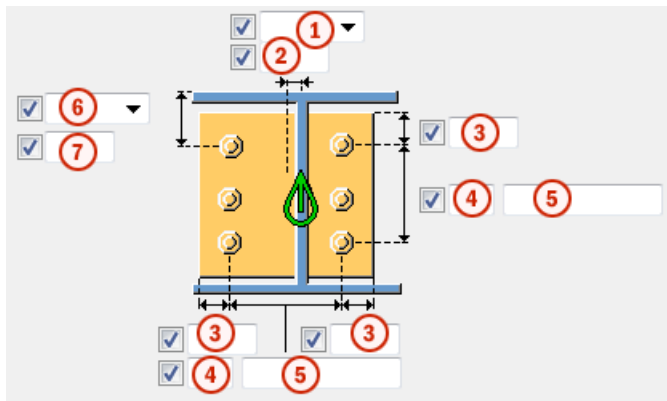
Option	Description
	<p>Default</p> <p>Creates notches on both sides.</p> <p>AutoDefaults can change this option.</p>

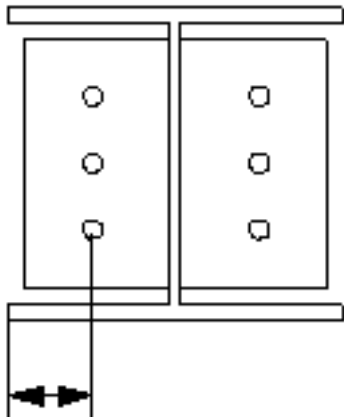
Option	Description
	Creates notches on both sides.
	Creates a notch on the left side.
	Creates a notch on the right side.

### **Bolts tab**

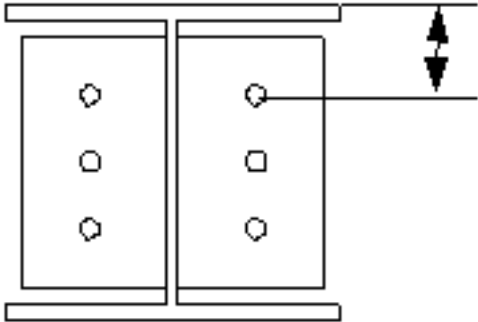
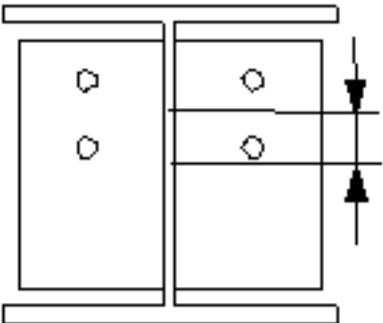
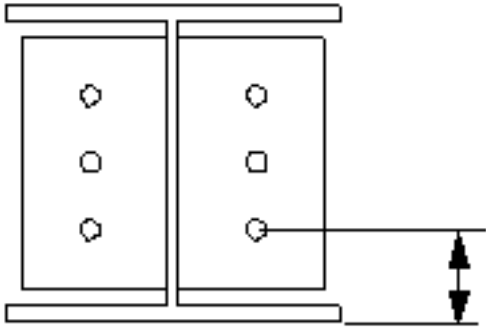
Use the **Bolts** tab to control the bolt properties.

### **Bolt group dimensions**









	Description
<p><b>1</b></p>	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> <div style="text-align: center;"> </div>
<b>2</b>	Dimension for horizontal bolt group position.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

	<b>Description</b>
<p><b>6</b></p>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
<p><b>7</b></p>	<p>Dimension for vertical bolt group position.</p>

## Staggering of bolts

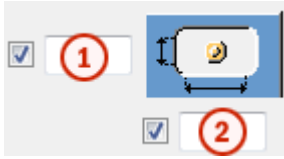
Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.

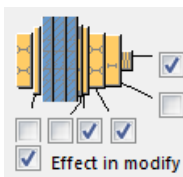


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<p><b>Slotted</b> creates slotted holes.</p> <p><b>Oversized</b> creates oversized or tapped holes.</p> <p><b>No hole</b> does not create holes.</p>	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.





### ***General tab***

Click the link below to find out more:  
General tab

### ***Design tab***

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:  
Analysis tab

### ***Welds***

Click the link below to find out more:

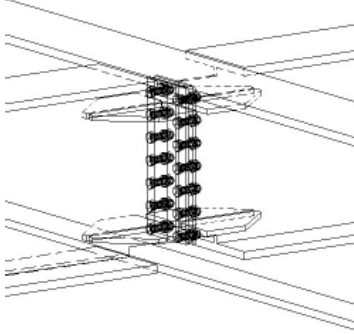
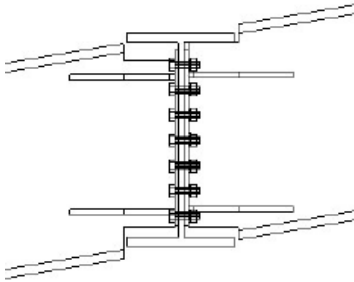
## **Two-sided end plate with compensating flange plates (112)**

**Two-sided end plate with compensating flange plates (112)** connects a beam to two beams using end plates with compensating flange plates. The end plates are welded to the secondary beams and bolted to the main beam.

### **Objects created**

- End plates
- Compensating flange plates
- Bolts
- Welds
- Cuts

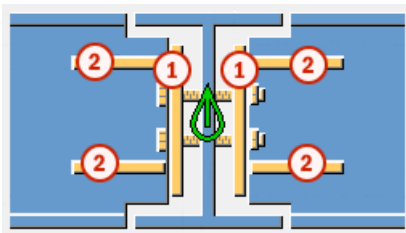
## Use for

Situation	Description
	<p>Connection with end plates and compensating flange plates.</p>
	<p>Connection with end plates and compensating flange plates. Secondary beams are sloped.</p>

## Selection order

1. Select the main part (beam).
2. Select the first secondary part (beam).
3. Select the second secondary part (beam).
4. Click the middle mouse button to create the connection.

## Part identification key

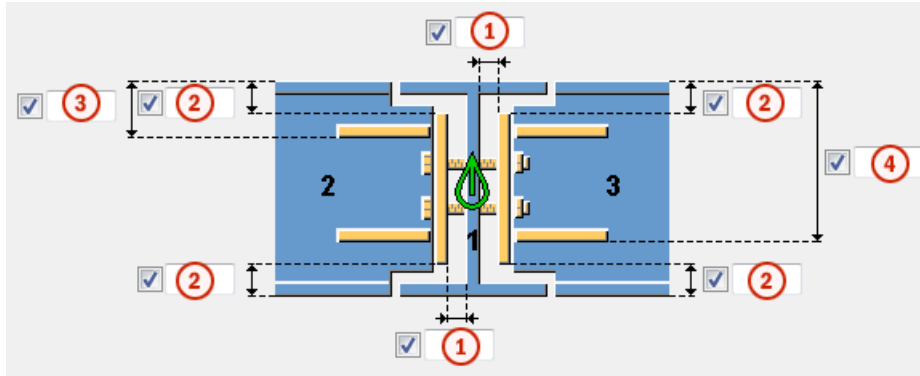


	Part
1	End plate
2	Compensating flange plate

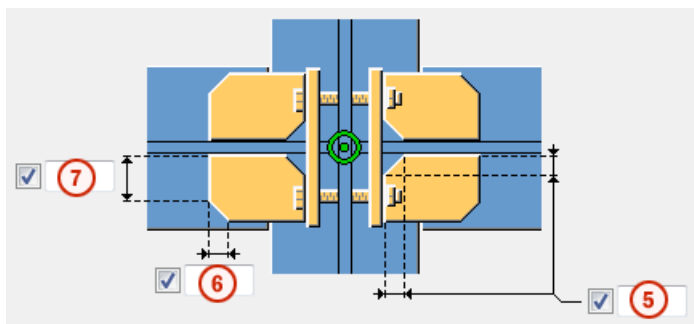
**Picture tab**

Use the **Picture** tab to control the position of the end plates and compensating flange plates.

**Dimensions**



	Description
1	Gap between the main beam and the end plate.
2	End plate edge distance to the secondary beam flange.
3	Distance from the inner edge of the flange plate to the secondary beam flange.
4	Distance from the outer edge of the flange plate to the secondary beam flange.



	Description
1	Inner chamfer dimension of the flange plate.
2	Horizontal chamfer dimension of the flange plate.
3	Flange plate dimension that remains when a chamfer is created.

**Parts tab**

Use the **Parts** tab to control the plate properties.

## Plate

Part	Description	Default
<b>End plate, Second end plate</b>	Define the end plate thickness and height.  If you have defined the gap between the main beam and the end plate on the <b>Picture</b> tab, the length entered on the <b>Parts</b> tab is not taken into account.	If the secondary part width is less than 200mm, the thickness of the end plate is 8mm. Otherwise, it is 10mm.
<b>Compensating flange plate, Second compensating flange plate</b>	Define the flange plate thickness, width, and height.  The same values are used for the top and the bottom plates.	<b>Width</b> = The default value is based on rounding (beam flange width - beam web thickness) / 2.0.  <b>Height</b> = 150mm more than the notch length

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Move plates 2 in y-direction

You can move the flange plates and the end plate on the second secondary beam side in the y-direction. By default, the plates on the second secondary side are positioned so that the holes are symmetric. To use this option, set the horizontal bolt group position to the **Middle** position and define the horizontal bolt group dimension on the **Bolts** tab. Moving the plates is useful especially when the secondary beams are skewed or curved.

### Notch tab

Use the **Notch** tab to create notches for the secondary beams and to control the notch properties. Define the notches for both secondary beams.

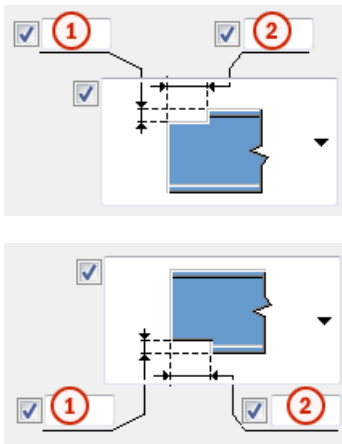
### BCSA notch definition

Define whether the notch is created according to British Constructional Steelwork Association (BCSA) specifications.

Option	Description
<b>Default</b>	Notch dimensions.
<b>Yes</b>	Creates a 50 mm notch for simple beam-to-beam connections.
<b>No</b>	Use the options on this <b>Notch</b> tab to define the notch dimensions.

### Notch dimensions

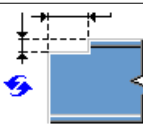
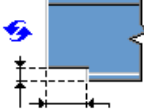
Define the top and the bottom dimensions of the notch if you have set the **BCSA notch def** option to **No**.



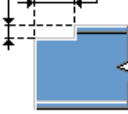
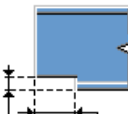
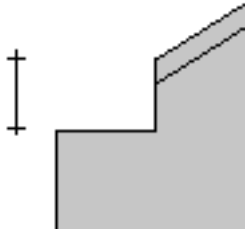
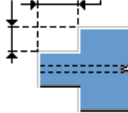
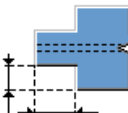
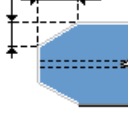
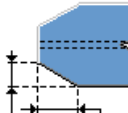
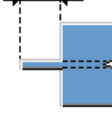
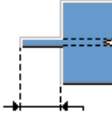
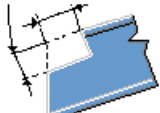



	Description
<b>1</b>	Vertical notch dimension.
<b>2</b>	Horizontal notch dimension.

### Notch shape

Define the notch shape for the top and the bottom of the secondary beam.





Option	Option	Description
		Default Creates a square notch on the top side or on the

Option	Option	Description
		<p>bottom side of the secondary beam.</p> <p>AutoDefaults can change this option.</p>
		<p>No notch</p>
		<p>Creates a square notch on the top side or on the bottom side of the secondary beam.</p> <p>Define the notch dimensions. In beam-to-beam connections with a sloped secondary beam, the depth is measured as shown in the picture.</p> 
		<p>Creates a notch on both sides of the secondary part.</p> <p>Define the notch dimensions.</p>
		<p>Creates a chamfered notch on both sides of the secondary beam.</p> <p>Define the chamfer dimensions.</p>
		<p>Creates a strip.</p> <p>Define the length of the strip. The flanges are cut completely.</p>
		<p>Creates a special type of square notch.</p> <p>Define the notch dimensions. The notch is</p>

Option	Option	Description
		square to the secondary beam. There are no default values for the length or the depth.

### Notching side

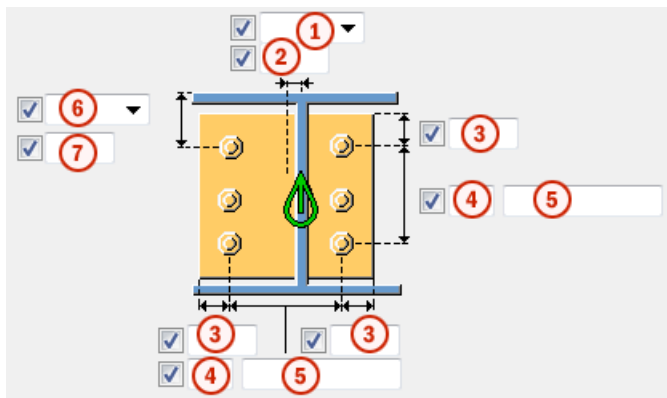
Define on which side of the secondary beam the notch is created. You can define the side for both the top and the bottom of the secondary beam.

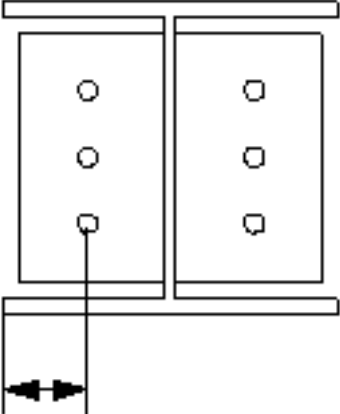
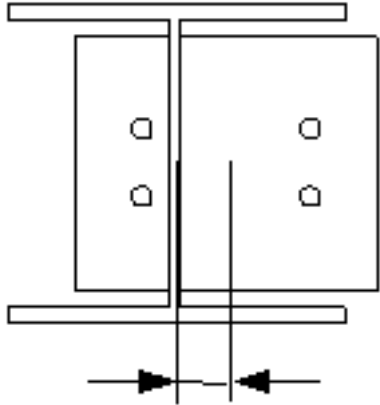
Option	Description
	Default Creates notches on both sides. AutoDefaults can change this option.
	Creates notches on both sides.
	Creates a notch on the left side.
	Creates a notch on the right side.

### Bolts tab

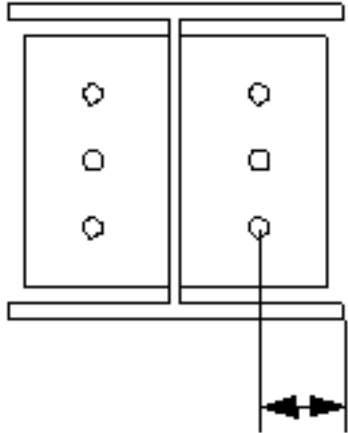
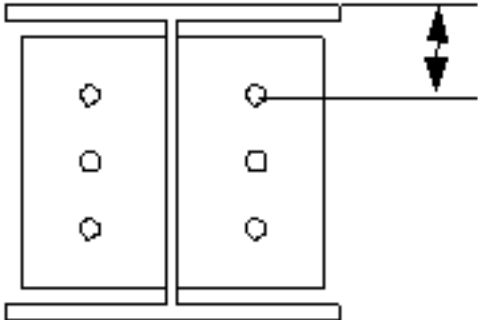
Use the **Bolts** tab to control the bolt properties.

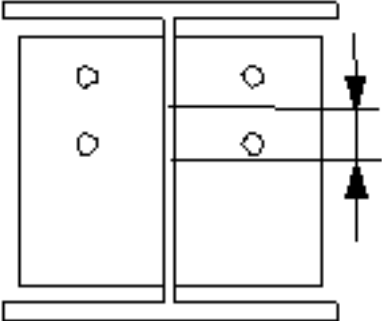
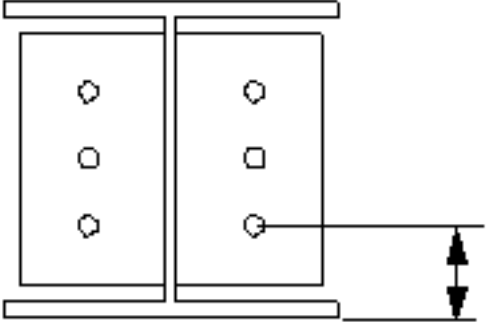
### Bolt group dimensions







	Description
1	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.              </li> <li> <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.              </li> </ul>





	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
<b>2</b>	Dimension for horizontal bolt group position.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>6</b>	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	Description
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>
7	Dimension for vertical bolt group position.

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2

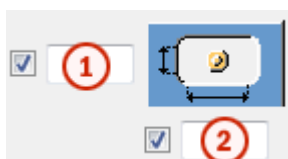
Option	Description
	Staggered type 3
	Staggered type 4

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



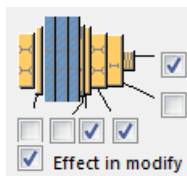
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.

Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### **Bolt assembly**

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

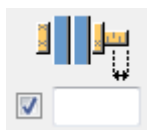
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

## ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

## ***Welds***

Click the link below to find out more:

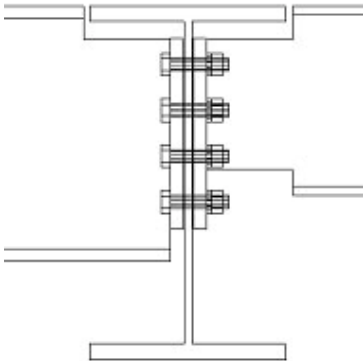
## **Two sided end plate (115)**

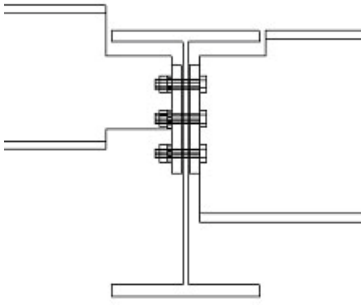
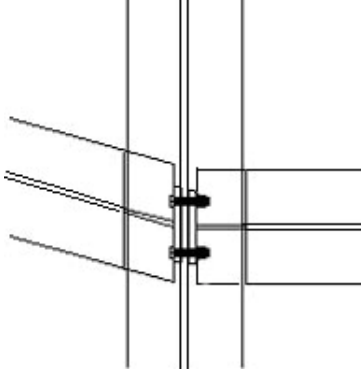
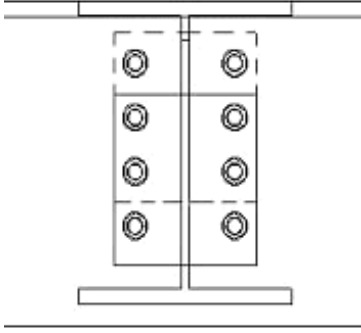
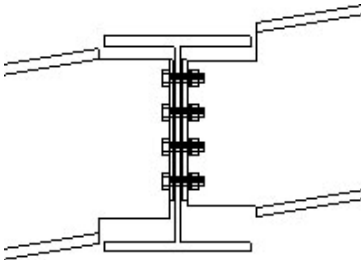
**Two sided end plate (115)** connects two beams to a beam or a column using end plates. The end plates are welded to the secondary beams and bolted to the main part (beam or column).

### **Objects created**

- End plates (2)
- Bolts
- Welds
- Cuts

### **Use for**

<b>Situation</b>	<b>Description</b>
	End plates with two secondary beams. Automatic notching for bolt clearance.

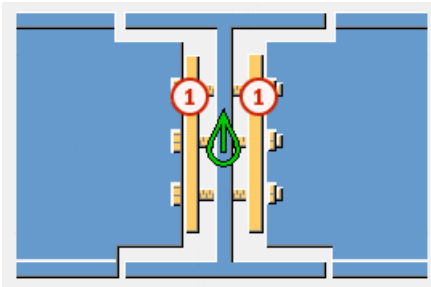
Situation	Description
	<p>End plates with two secondary beams at different heights.</p>
	<p>End plates with two secondary beams. A square and a skewed secondary beam.</p>
	<p>End plates with two secondary beams. Safety connection.</p>
	<p>End plates with two sloped secondary beams. Various notching options.</p>

### Selection order

1. Select the main part (beam or column).
2. Select the first secondary part (beam).
3. Select the second secondary part (beam).

4. Click the middle mouse button to create the connection.

### Part identification key

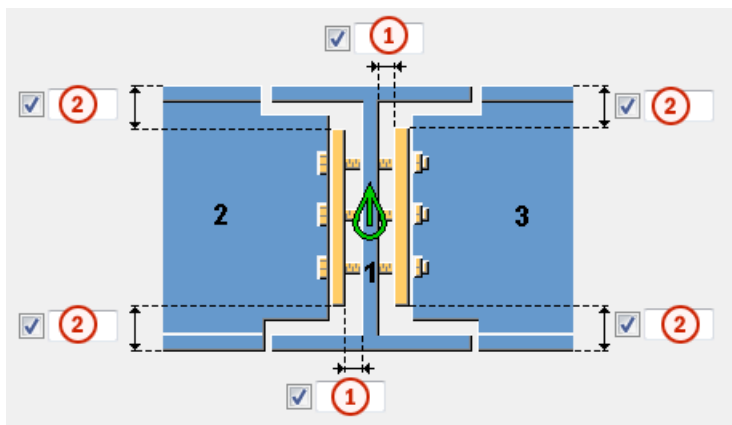


	Part
1	End plate

### Picture tab

Use the **Picture** tab to control the position of the end plates.

### Dimensions



	Description	Default
1	Gap between the main part and the end plate.	2 mm
2	End plate edge distance to the secondary beam flange.	50 mm

### End plates tab

Use the **End plates** tab to control the properties of the end plates.

## Plate

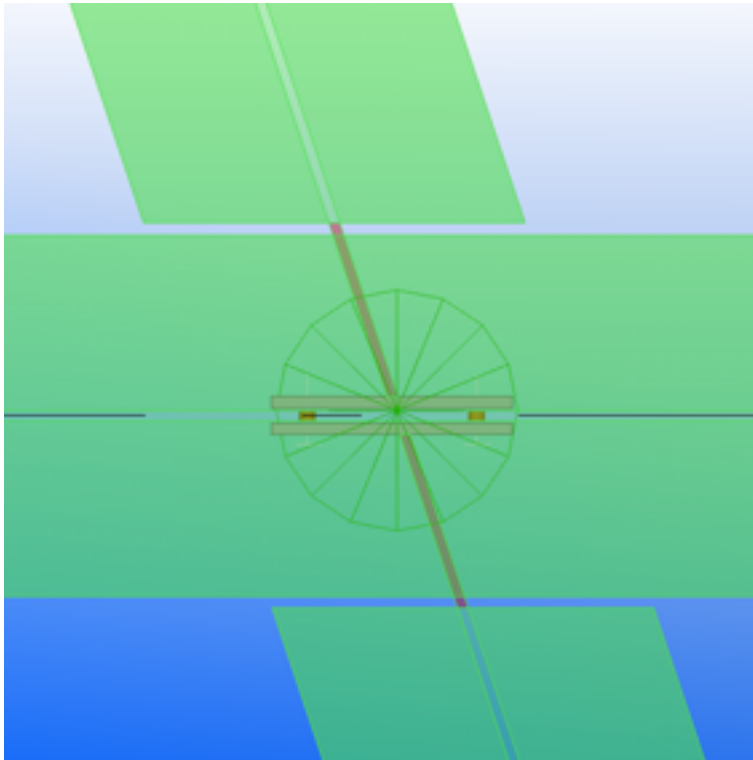
Part	Description
<b>End plate, 2nd End plate</b>	Define the end plate thickness and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Move plates 2 in y-direction

You can move the end plate on the second secondary beam side in the y-direction. By default, the plates on the second secondary side are positioned so that the holes are symmetric. To use this option, set the horizontal bolt group position to the **Middle** position and define the horizontal bolt group dimension on the **Bolts** tab. Moving the plates is useful especially when the secondary beams are skewed or curved.





### End plate Edge Type

Define how the end plate is cut. The default is **Rolled/Sawn**.

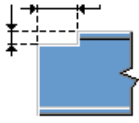
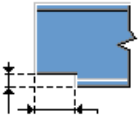
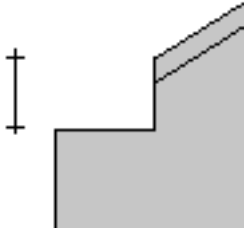
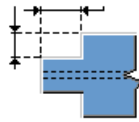
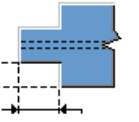
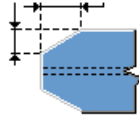
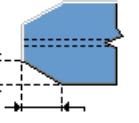
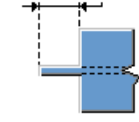
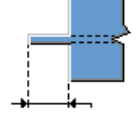
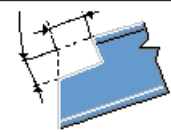
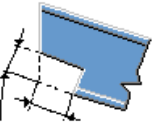
### Notch tab

Use the **Notch** tab to create notches for the secondary beams and to control the notch properties. Define the notches for both secondary beams.

### Notch shape

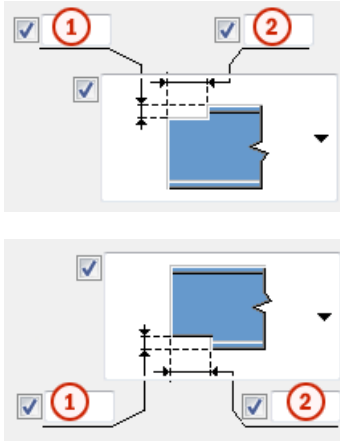
Define the notch shape for the top and the bottom of the secondary beam.

Option	Option	Description
		<p>Default</p> <p>Creates a square notch on the top side or on the bottom side of the secondary beam.</p> <p>AutoDefaults can change this option.</p>
		<p>No notch</p>

Option	Option	Description
		<p>Creates a square notch on the top side or on the bottom side of the secondary beam.</p> <p>Define the notch dimensions. In beam-to-beam connections with a sloped secondary beam, the depth is measured as shown in the picture.</p> 
		<p>Creates a notch on both sides of the secondary part.</p> <p>Define the notch dimensions.</p>
		<p>Creates a chamfered notch on both sides of the secondary beam.</p> <p>Define the chamfer dimensions.</p>
		<p>Creates a strip.</p> <p>Define the length of the strip. The flanges are cut completely.</p>
		<p>Creates a special type of square notch.</p> <p>Define the notch dimensions. The notch is square to the secondary beam. There are no default values for the length or the depth.</p>

### Notch dimensions

Define the top and the bottom dimensions of the notch if you have set the **BCSA notch def** option to **No**.



	Description
1	Vertical notch dimension.
2	Horizontal notch dimension.

### Notching side

Define on which side of the secondary beam the notch is created. You can define the side for both the top and the bottom of the secondary beam.

Option	Description
	Default Creates notches on both sides. AutoDefaults can change this option.
	Creates notches on both sides.
	Creates a notch on the left side.
	Creates a notch on the right side.

### BCSA notch definition

Define whether the notch is created according to British Constructional Steelwork Association (BCSA) specifications.

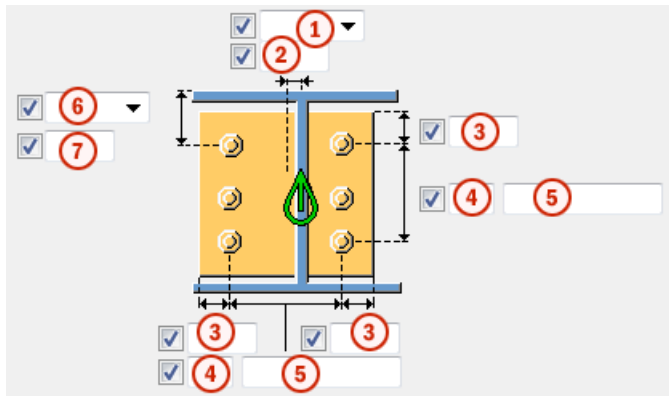
Option	Description
Default	Notch dimensions.
Yes	Creates a 50 mm notch for simple beam-to-beam connections.

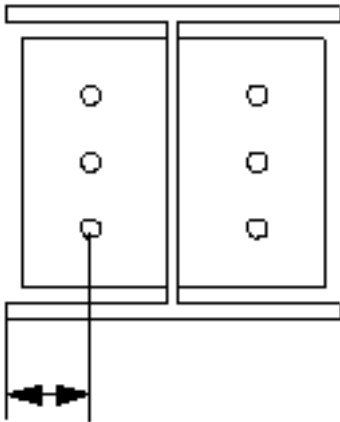
Option	Description
<b>No</b>	Use the options on this <b>Notch</b> tab to define the notch dimensions.

**Bolts tab**

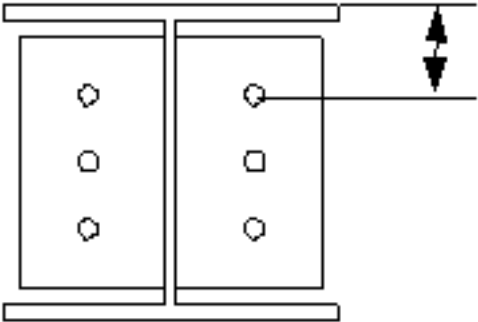
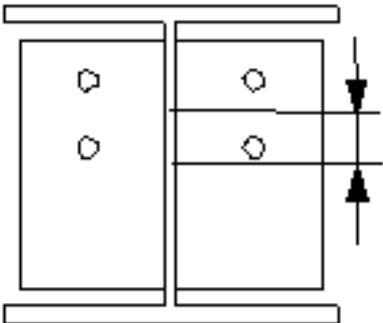
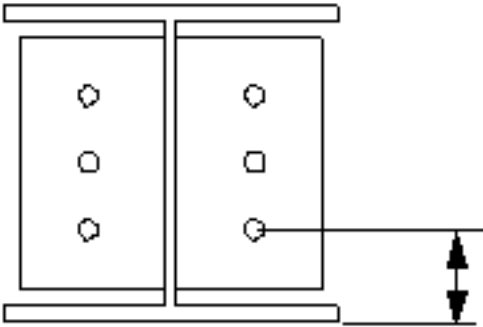
Use the **Bolts** tab to control the bolts properties.

**Bolt group dimensions**









	Description
1	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> <div style="text-align: center;"> </div>
<b>2</b>	Dimension for horizontal bolt group position.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

	<b>Description</b>
<p><b>6</b></p>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li> <p><b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</p>  </li> <li> <p><b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</p>  </li> <li> <p><b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</p>  </li> </ul>
<p><b>7</b></p>	<p>Dimension for vertical bolt group position.</p>

## Staggering of bolts

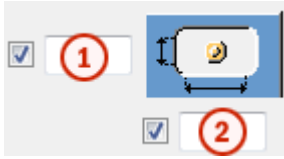
Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.

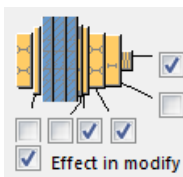


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<p><b>Slotted</b> creates slotted holes.</p> <p><b>Oversized</b> creates oversized or tapped holes.</p> <p><b>No hole</b> does not create holes.</p>	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.





### ***General tab***

Click the link below to find out more:

General tab

### ***Design tab***

Click the link below to find out more:

Design tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

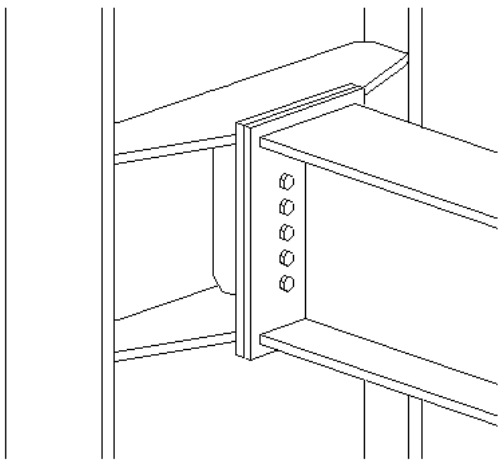
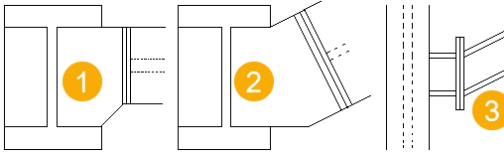
## **Stub connection (119)**

**Stub connection (119)** creates a connection between an H(I) type of column and a beam. The beam can be of any type. The connection can create eight stiffener plates and four haunch plates. The end plates are bolted to each other, and the other plates are welded.

### **Objects created**

- End plates
- Haunch plates
- Stiffeners
- Bolts
- Welds

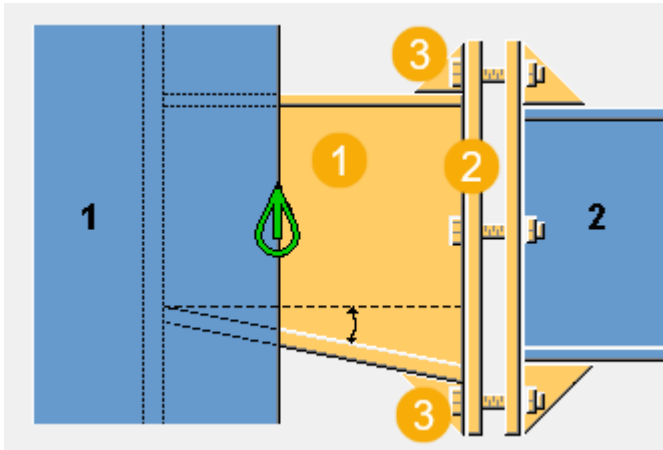
## Use for

Situation	Description
	<p>Stub connection with bolted end plates and haunch plates.</p>
	<p>The secondary part can be skewed or sloped. Top and bottom haunch plates can be created.</p> <p><b>1</b> Secondary part web not directed to the center of the column (top view).</p> <p><b>2</b> Secondary part web not perpendicular to the column horizontally (top view).</p> <p><b>3</b> Secondary part web not perpendicular to the column vertically (side view).</p>

## Selection order

1. Select the main part (column).
2. Select the secondary part (beam).

## Part identification key

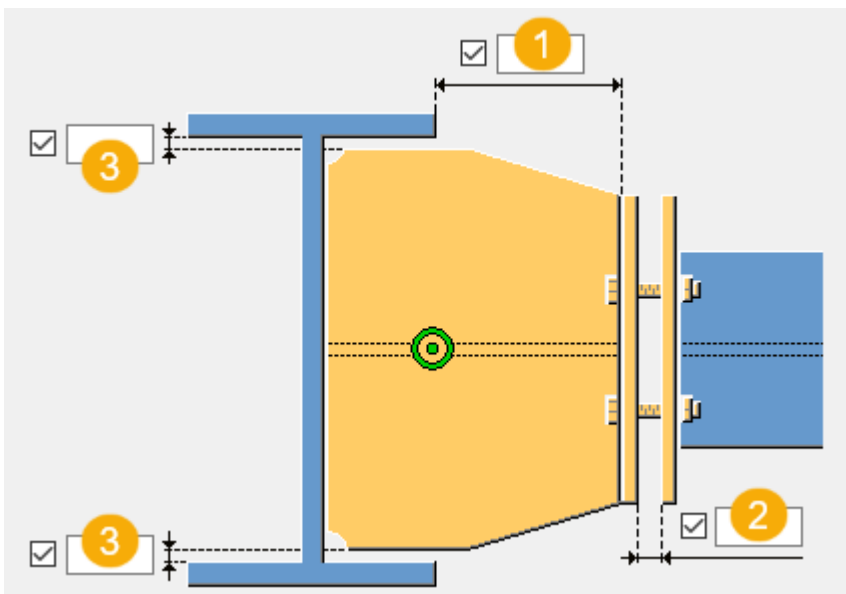


	Description
1	Stiffener plates
2	End plates
3	Haunch plates

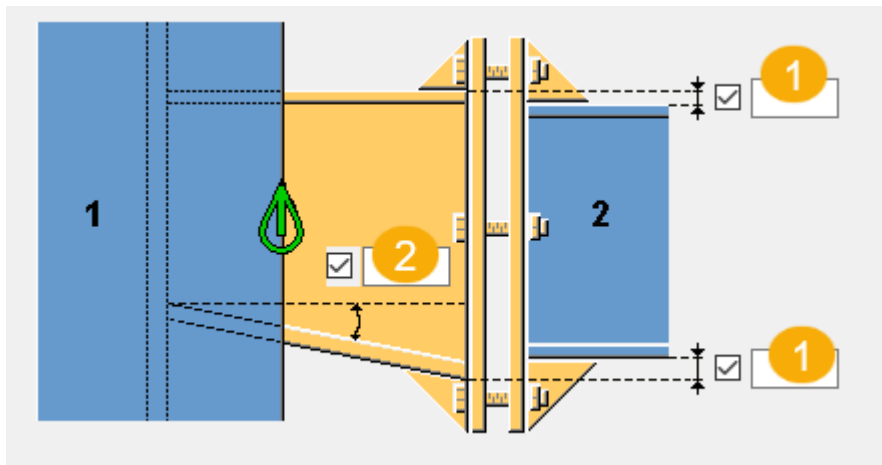
## Picture tab

Use the **Picture** tab to define end plate and stiffener dimensions.

## Dimensions



	Description	Default
1	Distance from the column to the first end plate. If the secondary part web is not perpendicular to the column horizontally, this is the minimum distance from the column to the first end plate.	100 mm
2	Distance between the end plates.	0 mm
3	Gap between the end plate and the beam web.	



	Description	Default
1	Distance between the exterior face of the beam and the exterior face of the front stiffener.	0 mm
2	Angle between the bottom front stiffener and the horizon. (This angle is valid only in the regular case).	0 degrees

### Parts tab

Use the **Parts** tab to define the part properties.

### Parts

Option	Description
<b>Top plate</b> <b>Bottom plate</b> <b>Middle plate</b>	Thickness of the top, bottom and middle plate.
<b>Upper haunches</b> <b>Lower haunches</b>	Thickness of the upper and lower haunches.
<b>End plate 1</b>	Thickness, width and height of the end plate.

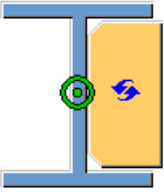
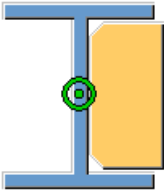
Option	Description
<b>End plate 2</b>	Thickness of the end plate.
<b>Top stiffener</b> <b>Bottom stiffener</b> <b>Middle stiffener</b>	Thickness of the top, bottom and middle stiffener.

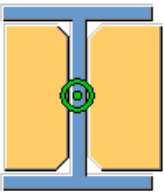
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tab**

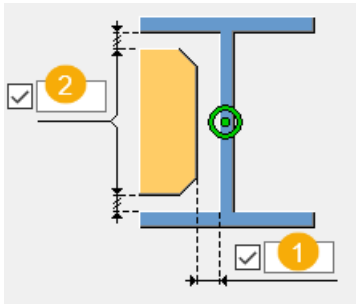
Use the **Parameters** tab to control the stiffener creation, position and chamfers.

### **Stiffener creation**

Option	Description
	Default Full Creates a full stiffener of the same height as the web of the main part. AutoDefaults can change this option.
	Full Creates a full stiffener of the same height as the web of the main part.

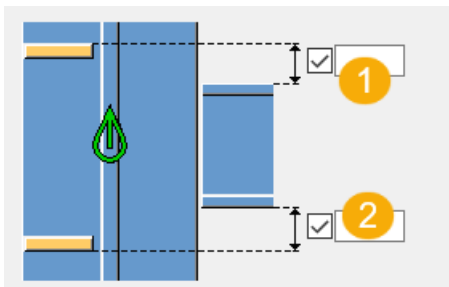
Option	Description
	Full, both sides of the main part Creates a full stiffener of the same height as the web of the main part.

### Stiffener gap



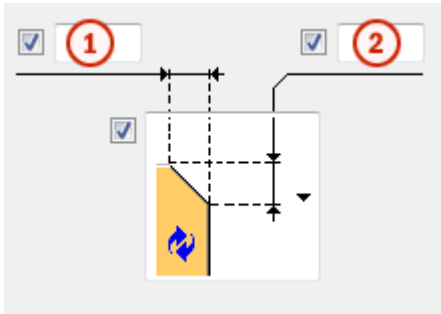
	Description
1	Distance between the stiffener and the column web
2	Distance between the stiffener and the column flange

### Stiffener positions



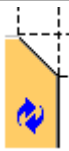




	Description
1	Size of the gap between the top stiffener and the beam flange edge.
2	Size of the gap between the bottom stiffener and the beam flange edge.

## Chamfer dimensions



	Description
1	Horizontal dimension of the chamfer.
2	Vertical dimension of the chamfer.

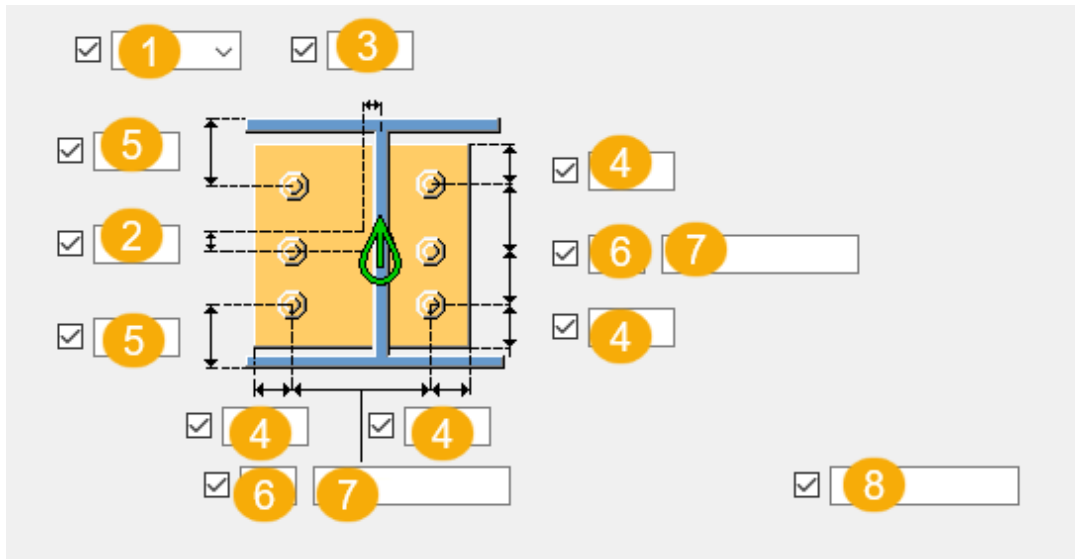
## Chamfer type

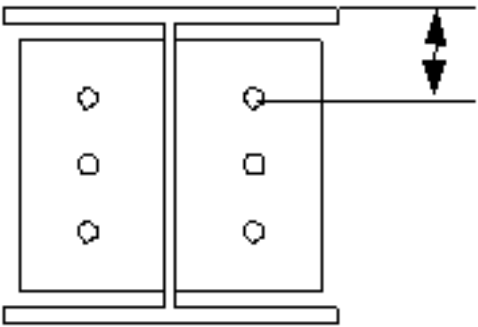
Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

## **Bolts tab**

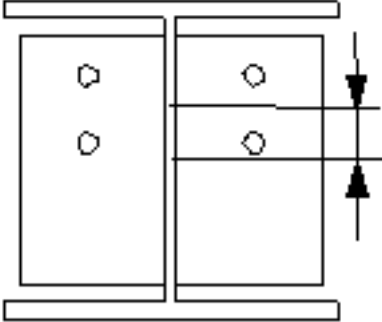
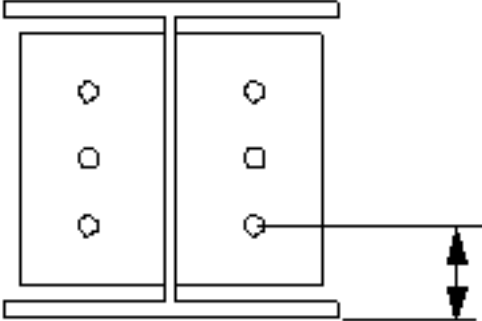
Use the **Bolts** tab to define the bolt properties.

## Bolt group dimensions



	Description
1	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li><b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 



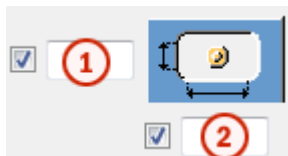
	<b>Description</b>
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>
<b>2</b>	Dimension for vertical bolt group position.
<b>3</b>	Dimension for horizontal bolt group position.
<b>4</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>5</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>6</b>	Number of bolts.
<b>7</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>8</b>	Define which bolts are deleted from the bolt group.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



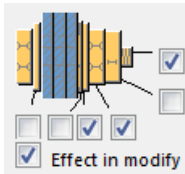
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

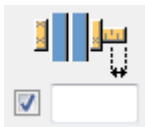
If you want to create a hole only, clear all the check boxes.








To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.


### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3

Option	Description
	Staggered type 4

### ***General tab***

Click the link below to find out more:

General tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

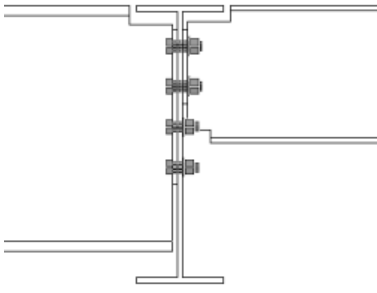
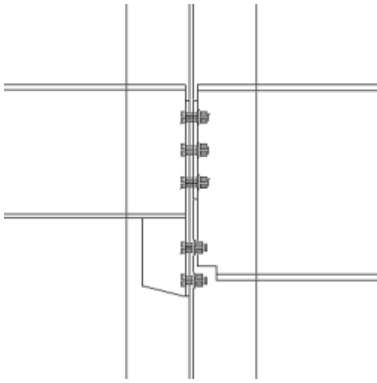
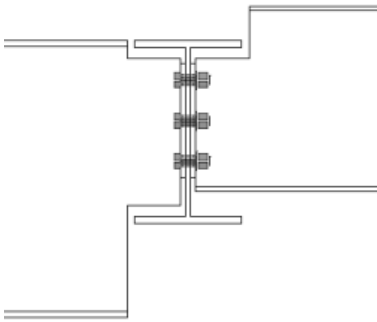
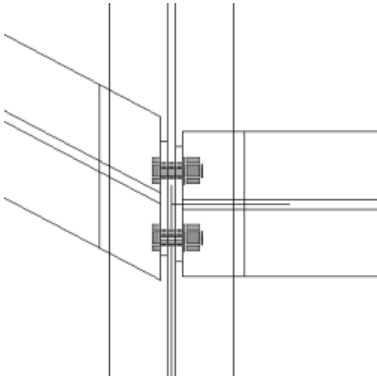
## **Two sided end plate (142)**

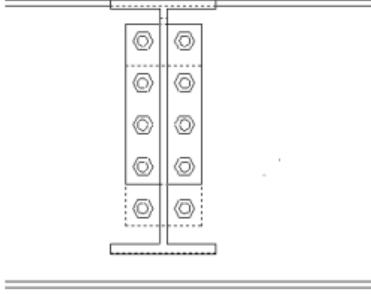
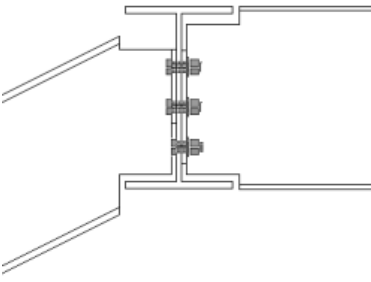
**Two sided end plate (142)** connects two beams to a beam or to a column using bolted end plates. One bolt group goes through all the three parts.

### **Objects created**

- End plates
- Shim plates
- Compensating flange plates (optional)
- Haunch plates (optional)
- Holes
- Bolts
- Welds
- Cuts

**Use for**

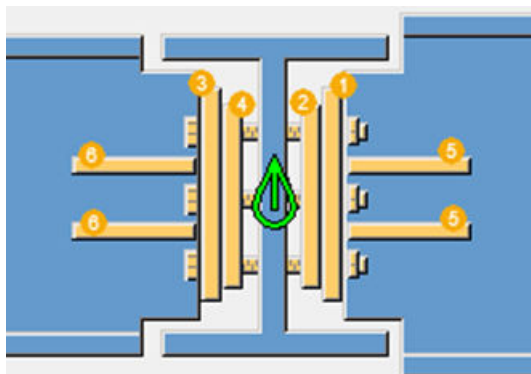
Situation	Description
	<p>End plate connection with two secondary parts. Automatic notching for bolt clearance.</p>
	<p>End plate connection with two secondary parts and with a haunch plate. Automatic notching for bolt clearance.</p>
	<p>End plate connection with two secondary parts at different heights.</p>
	<p>End plate connection with two secondary parts. The secondary parts can be square and/or skewed.</p>

Situation	Description
	<p>End plate connection with two secondary parts. Safety connection.</p>
	<p>End plate connection with two secondary parts. The secondary parts can be leveled and/or sloped.</p>

### Selection order

1. Select the main part (column or beam).
2. Select the first secondary part (beam).
3. Select the second secondary part (beam).
4. Click the middle mouse button to create the connection.

### Part identification key



	Part
1	End plate for the first secondary part

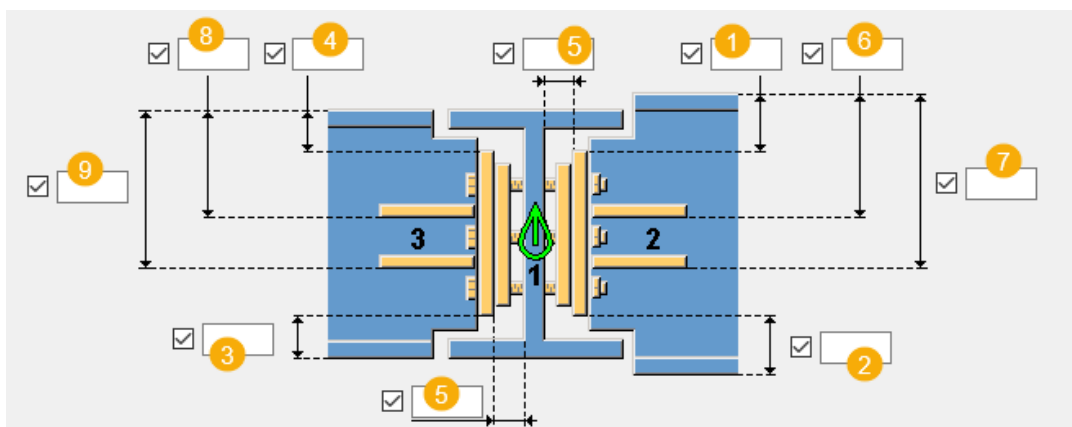
	Part
2	Shim plate for the first secondary part
3	End plate for the second secondary part
4	Shim plate for the second secondary part
5	Compensating flange plate for the first secondary part
6	Compensating flange plate for the second secondary part

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

### Picture tab

Use the **Picture** tab to control the positions of the end plates and compensating flange plates.



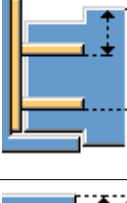
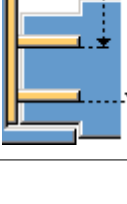
### Plate positions



	Description
1	End plate upper edge distance from the top of the first secondary beam.
2	End plate lower edge distance from the bottom of the first secondary beam.
3	End plate lower edge distance from the bottom of the second secondary beam.
4	End plate upper edge distance from the top of the second secondary beam.
5	Gap between the shim plates and the main part. Gap for each side individually. If the shim plates are not used, the defined gap is created between the end plate and the main part.
6	Upper compensation flange plate edge distance from the top of the first secondary beam.

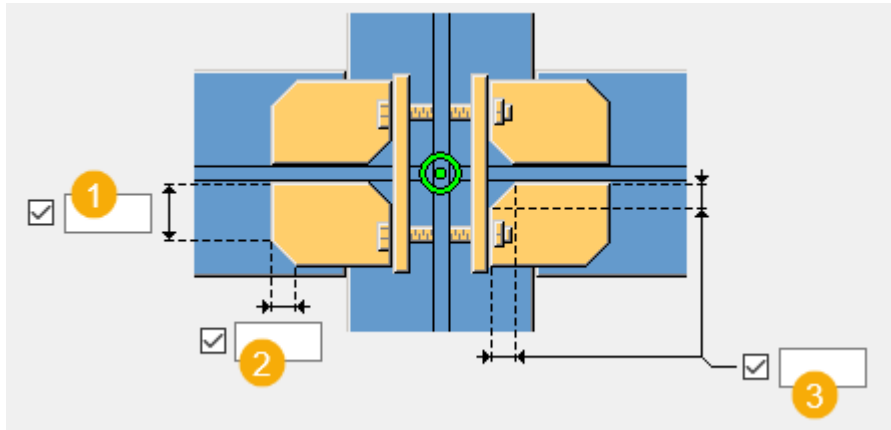
	Description
7	Lower compensation flange plate edge distance from the top of the first secondary beam.
8	Upper compensation flange plate edge distance from the top of the second secondary beam.
9	Lower compensation flange plate edge distance from the top of the first secondary beam.

### Compensation flange plate arrangements

Option	Description
	Default Compensation flange plates are not created. AutoDefaults can change this option.
	Compensation flange plates are not created.
	Compensation flange plates are created. Edge distance from the top of the secondary part.
	Compensation flange plates are created. Edge distance from the top of the main part.



## Compensating flange plate shapes



	Description
<b>1</b>	Compensating flange plate dimension that remains when a chamfer is created.
<b>2</b>	Horizontal chamfer dimension of the compensating flange plate.
<b>3</b>	Inner chamfer dimension of the compensating flange plate.

## Sort secondaries by profile height

When you create a **Two sided end plate (142)** connection, the larger of the two profiles is usually selected as the first secondary beam. If the profile is later changed and the second secondary beam becomes larger than the first secondary beam, the order of secondary beams can be redefined.

- **Yes** switches the secondary beams so that the largest beam automatically becomes the first secondary beam.
- **No** does not change the order of secondary beams if the profile size is changed.

## Plates 1 tab

Use the **Plates 1** tab to control the size of the end plate, shim plates and compensating flange plates for the first secondary beam.

## Plates

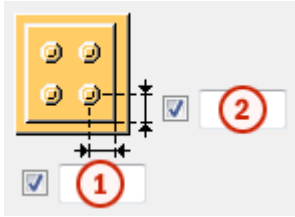
Option	Description	Default
<b>End plate</b>	End plate thickness, width and height.	thickness = 10 mm

Option	Description	Default
<b>Fitting Plate 1</b> <b>Fitting Plate 2</b> <b>Fitting Plate 3</b>	Shim plate thickness.  The plate is created only if the plate thickness is given.  You can define up to three different shim plates.	0
<b>Number of fitting pl. 1 (DEF=1)</b> <b>Number of fitting pl. 2 (DEF=1)</b> <b>Number of fitting pl. 3 (DEF=1)</b>	Number of shim plates for each thickness.	By default, 1 plate is created.
<b>Comp. flange pl</b>	Compensation flange plate thickness, width and height.	

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

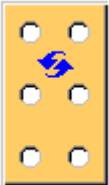
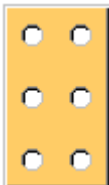


### Bolt edge distances in shim plate


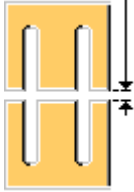
Define the bolt edge distances for shim plates. When these fields are empty, shim plates are of the same size as the end plate.



	Description	Default
1	Horizontal bolt edge distance in the shim plate.	30 mm
2	Vertical bolt edge distance in the shim plate.	30 mm

### Shim plate shape



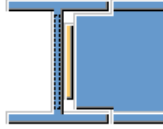
Option	Description
	Default Holes are based on the bolt group of the connection. AutoDefaults can change this option.
	Holes are based on the bolt group of the connection.
	Finger shim plate with horizontal slots. The plate can be installed from the right or the left side of the connection.
	Finger shim plate with vertical slots. The plate can be installed from the top of the connection.

Option	Description
	Two separate finger shim plates with horizontal slots.
	Two separate finger shim plates with vertical slots.

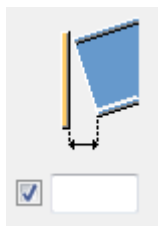
### Tolerance

Define the tolerance for the slots in finger shim plates. The width of the slot is the bolt diameter + the tolerance. For two separate shim plates, also define the tolerance between the plates.

### Shim plate position

Option	Description
	Default Shim plates are outside the main part. AutoDefaults can change this option.
	Shim plates are outside the main part.
	Shim plates are inside the main part.

### Gap size





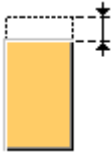

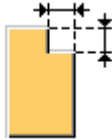
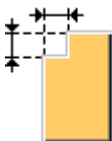
Define the limit value for the gap between the end plate and the secondary beam. Use this when the beam is slightly curved or sloped to decide if the end angle is so small that the beam end can be straight.

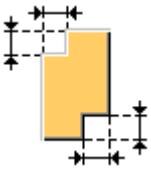
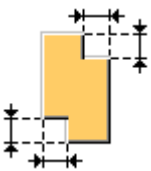
If the actual gap is smaller than this value, the end of the beam is left straight.

If the actual gap is larger than this value, the end of the beam is fitted to the end plate.

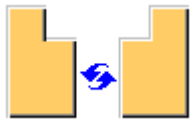



### Safety connections

In two-sided connections the safety connection options improve safety during erection. Safety connection options move the end plate or create different notches so that some of the bolts are in single shear instead of double shear. This allows the first secondary beam to be connected while the crane moves to get the next beam.


Option	Description
	Default End plate with no notches. AutoDefaults can change this option.
	End plate with no notches.
	One end plate is moved up to create a safety connection.
	One end plate is moved down to create a safety connection.
	One opposite upper corner of each end plate is notched to create a safety connection
	One opposite upper corner of each end plate is notched to create a safety connection.




Option	Description
	<p>Diagonal opposite corners of each end plate are notched to create a safety connection.</p>
	<p>Diagonal opposite corners of each end plate are notched to create a safety connection.</p>

### Safety connection location

Option	Description
	<p>Default Affects both the near side and the far side end plates. AutoDefaults can change this option.</p>
	<p>Affects both the near side and the far side end plates.</p>
	<p>Affects only the near side end plate.</p>
	<p>Affects only the far side end plate.</p>

### Safety connection cut type

Option	Description
	<p>Default Square cut. This selection affects only safety connections that are created with cuts. It does not affect safety connections that shorten the plate. AutoDefaults can change this option.</p>

Option	Description
	Square cut
	Line cut
	Concave arc cut

### Safety connection cut dimensions

Option	Description
<b>Vertical cut/offset</b>	Define the height of the notch or the vertical offset of the end plate.
<b>Horizontal cut</b>	Define the width of the notch in the end plate.
<b>Radius</b>	Define the radius of the concave arc cut.

### **Plates 2 tab**

Use the **Plates 2** tab to control the size of the end plate, shim plates and compensating flange plates for the second secondary beam.

### Plates

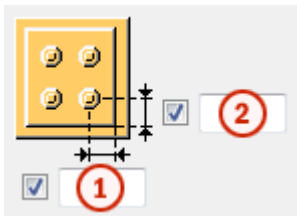
Option	Description	Default
<b>End plate</b>	End plate thickness, width and height.	thickness = 10 mm
<b>Fitting Plate 1</b> <b>Fitting Plate 2</b> <b>Fitting Plate 3</b>	Shim plate thickness. The plate is created only if the plate thickness is given. You can define up to three different shim plates.	0

Option	Description	Default
<b>Number of fitting pl. 1 (DEF=1)</b> <b>Number of fitting pl. 2 (DEF=1)</b> <b>Number of fitting pl. 3 (DEF=1)</b>	Number of shim plates for each thickness.	By default, 1 plate is created.
<b>Comp. flange pl</b>	Compensation flange plate thickness, width and height.	

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Bolt edge distances in shim plate

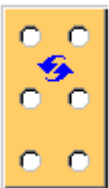
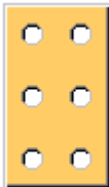




Define the bolt edge distances for shim plates. When these fields are empty, shim plates are of the same size as the end plate.





	Description	Default
1	Horizontal bolt edge distance in the shim plate.	30 mm
2	Vertical bolt edge distance in the shim plate.	30 mm

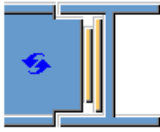

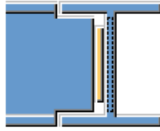
### Shim plate shape

Option	Description
	Default Holes are based on the bolt group of the connection. AutoDefaults can change this option.
	Holes are based on the bolt group of the connection.
	Finger shim plate with horizontal slots. The plate can be installed from the right or the left side of the connection.
	Finger shim plate with vertical slots. The plate can be installed from the top of the connection.
	Two separate finger shim plates with horizontal slots.
	Two separate finger shim plates with vertical slots.

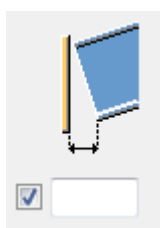
## Tolerance

Define the tolerance for the slots in finger shim plates. The width of the slot is the bolt diameter + the tolerance. For two separate shim plates, also define the tolerance between the plates.

## Shim plate position

Option	Description
	Default Shim plates are outside the main part. AutoDefaults can change this option.
	Shim plates are outside the main part.
	Shim plates are inside the main part.

## Gap size



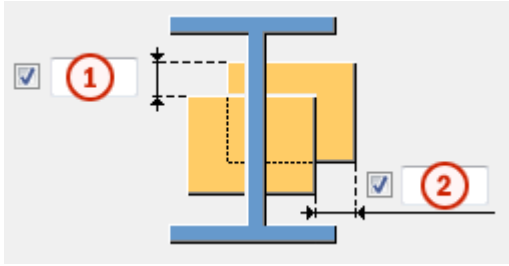
Define the limit value for the gap between the end plate and the secondary beam. Use this when the beam is slightly curved or sloped to decide if the end angle is so small that the beam end can be straight.

If the actual gap is smaller than this value, the end of the beam is left straight.

If the actual gap is larger than this value, the end of the beam is fitted to the end plate.

## Shim plate and end plate positions

Define the position of the shim plates and the end plate in the second secondary beam. The plates move in relation to the plates in the first secondary beam. By default, the plates in the second secondary beam are positioned so that holes are placed symmetrically. You may need to move the plates, for example, when connecting skew or curved secondary beams.



	Description
1	Define how much the plates are moved in vertical direction.
2	Define how much the plates are moved in horizontal direction.

### **Haunch tab**

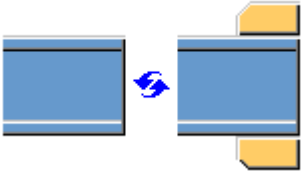
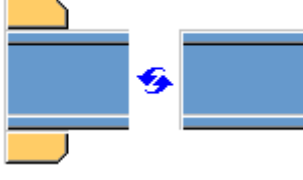
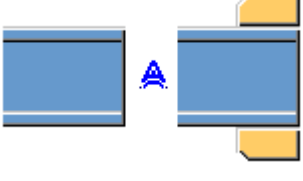
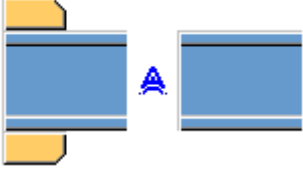




Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges.

### **Haunch plates**

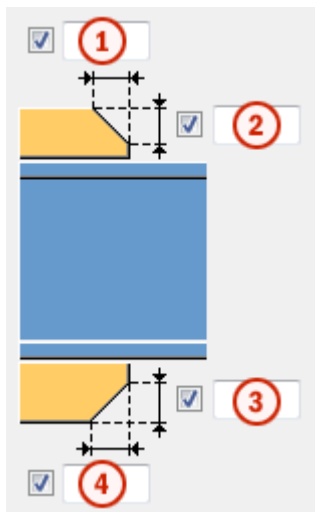
Option	Description
<b>Top plate, Top plate 2</b>	Top haunch plate thickness, width and height.
<b>Bottom plate, Bottom plate 2</b>	Bottom haunch plate thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

## Haunch plate creation

Option for the second secondary beam	Option for the first secondary beam	Description
		Default Top and bottom haunch plates are created, if needed. AutoDefaults can change this option.
		Automatic Top or bottom haunch plate or both are created, if needed.
		Top and bottom haunch plates are always created. To create a single plate, enter 0 in the thickness ( <b>t</b> ) field for the haunch plate you do not need (top or bottom plate).
		Haunch plates are not created.

## Haunch plate chamfers



	Description
1	Width of the top haunch plate chamfer.
2	Height of the top haunch plate chamfer.
3	Height of the bottom haunch plate chamfer.
4	Width of the bottom haunch plate chamfer.

### **Notch tab**






Use the **Notch** tab to automatically create notches for the secondary beams and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

### **Automatic notching**


Automatic notching options affect both the top and the bottom flange.

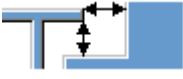
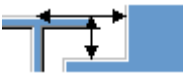
### **Notch shape**

Automatic notching is switched on when you select a notch shape.

Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.
	Turns off automatic notching.

### **Notch size**



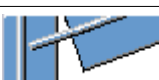
Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.

Option	Description
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.



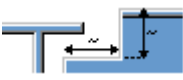


### Flange cut shape

Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

### Notch dimension rounding




Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.





The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



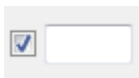
### Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

### Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.








### Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.

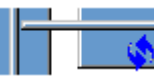

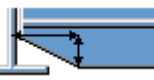
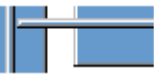


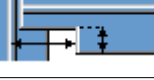
### Side of flange notch

The side of flange notch defines on which side of the beam the notches are created.

Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

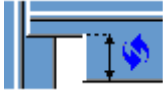
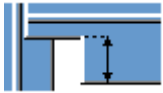
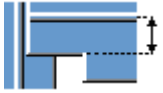
### Flange notch shape

The flange notch shape defines the notch shape in the beam flange.

Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.
	Creates chamfers in the flange. If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.
	Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b> .
	The flange is not cut.
	Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.
	Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b> .



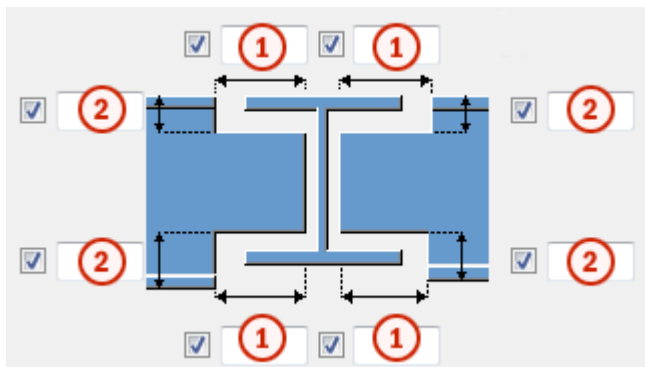
## Flange notch depth

Option	Description
	Default Flange notch depth. AutoDefaults can change this option.
	Flange notch depth.
	Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.

Enter the value for flange notch depth.

## Cut dimensions



	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

## BCSA notch definition

Define whether the notch is created according to British Constructional Steelwork Association (BCSA) specifications.

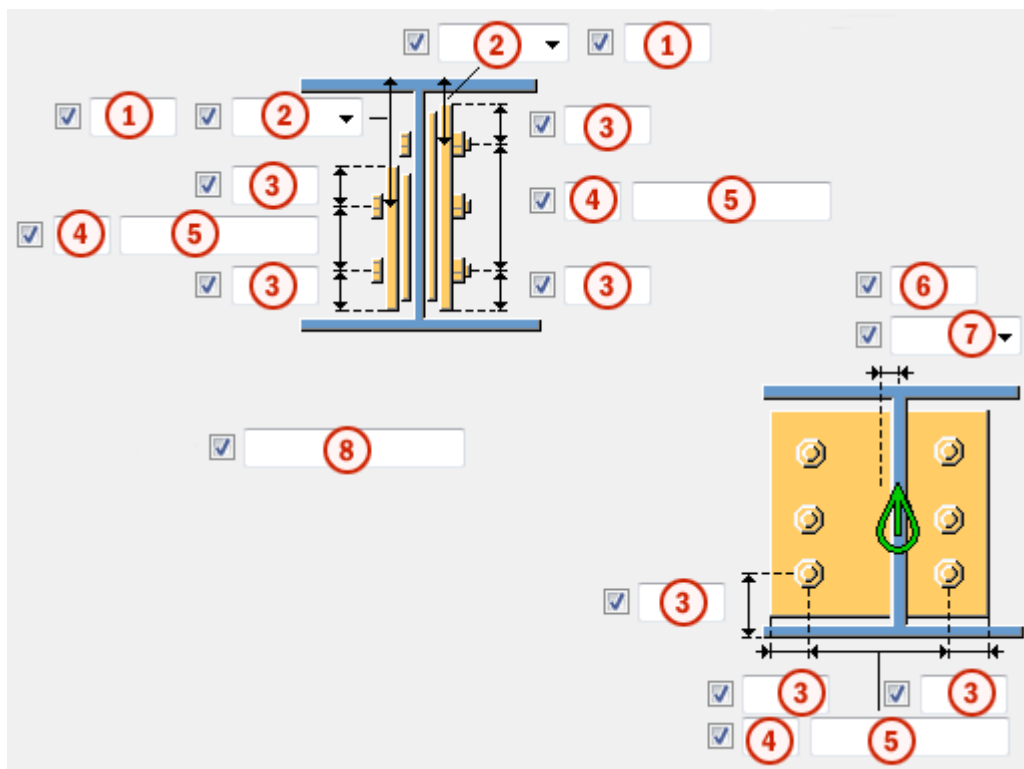
Option	Description
<b>Default</b>	Notch dimensions.
<b>Yes</b>	Creates a 50 mm notch for simple beam-to-beam connections.
<b>No</b>	Use the options on this <b>Notch</b> tab to define the notch dimensions.

### **Bolts tab**

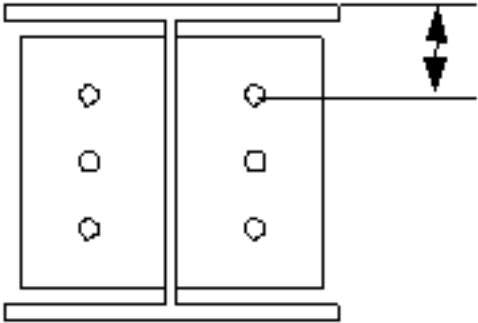
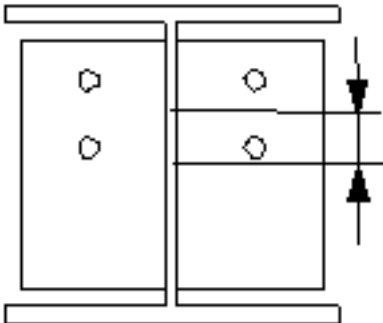
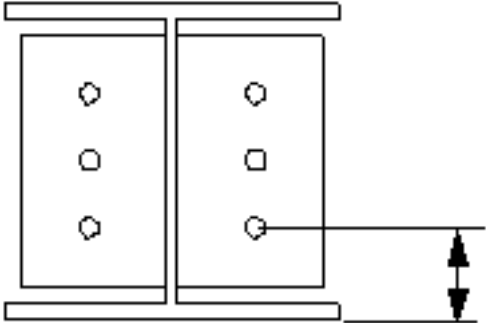
Use the **Bolts** tab to control the properties of bolts that connect the end plates to the main part.

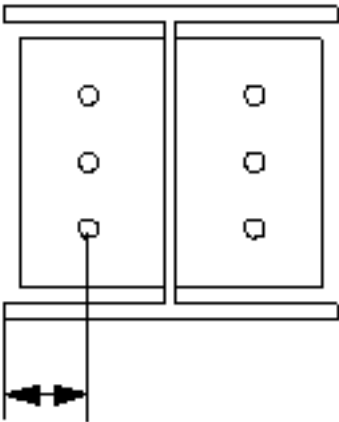
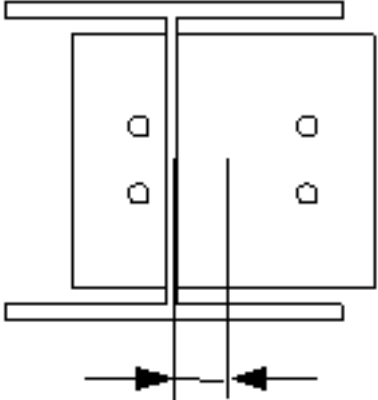
### **Bolt group dimensions**

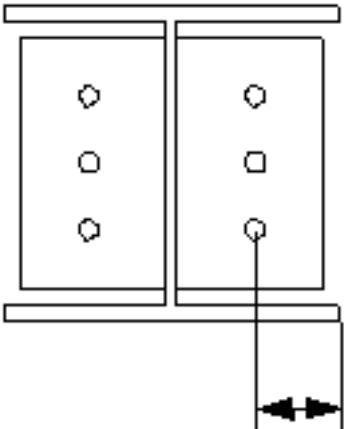
Bolt group dimensions affect the size of the end plates.



	Description
<b>1</b>	Dimension for vertical bolt group position.

	<b>Description</b>
<p><b>2</b></p>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
<p><b>3</b></p>	<p><b>Bolt edge distance.</b></p> <p>Edge distance is the distance from the center of a bolt to the edge of the part.</p>

	<b>Description</b>
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>6</b>	Dimension for horizontal bolt group position.
<b>7</b>	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> 

	Description
	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
8	<p>Define which bolts are deleted from the bolt group.</p> <p>Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.</p>

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	<p>Defines whether the thread may be within the bolted parts when bolts are used with a shaft.</p> <p>This has no effect when full-threaded bolts are used.</p>	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Cut length

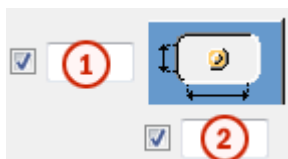
Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

## Bolt comment

You can define a bolt comment.

## Slotted holes

You can define slotted, oversized, or tapped holes.

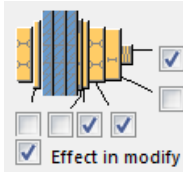


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

## Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



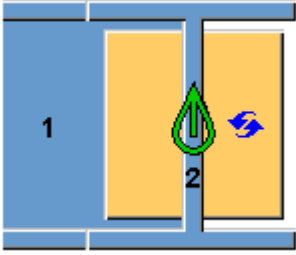
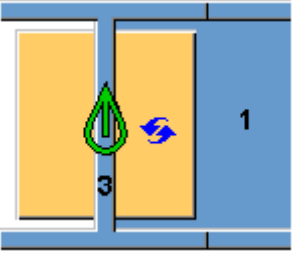
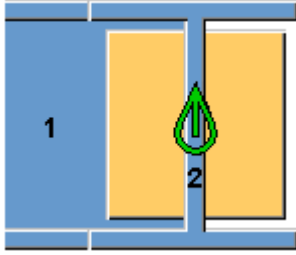
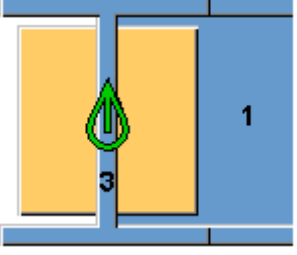
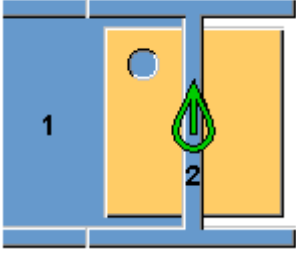
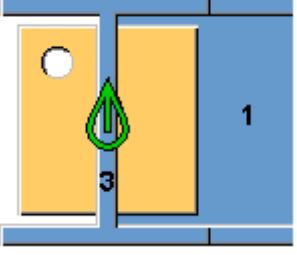
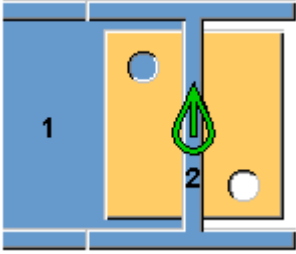
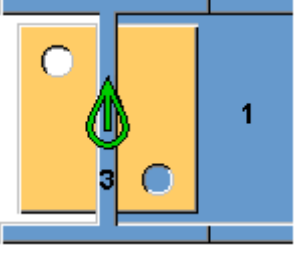
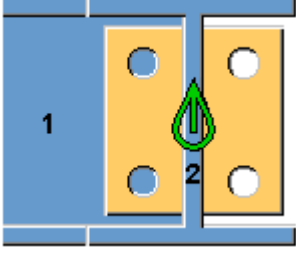
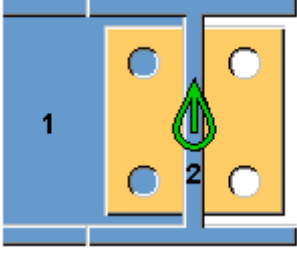
### Holes tab

Use the **Holes** tab to control the galvanizing holes in the end plates.

Option	Description
<b>Bolt standard</b>	Select the bolt standard.
<b>Bolt type</b>	Select the bolt type to define the location where the bolts should be attached.
<b>Read data from</b>	<p>You can select to use the <code>sinkholes.dat</code> definition file to specify the default values for horizontal and vertical offsets, and the diameters for upper and lower holes.</p> <p>The file is searched in the following order: Environment common system steel folder (<code>..\Environments\common\system\Steel</code>), model folder, <code>XS_FIRM</code>, <code>XS_PROJECT</code> and <code>XS_SYSTEM</code> folder.</p> <p>You can also select to define the holes in the component dialog box.</p>

### Number of holes

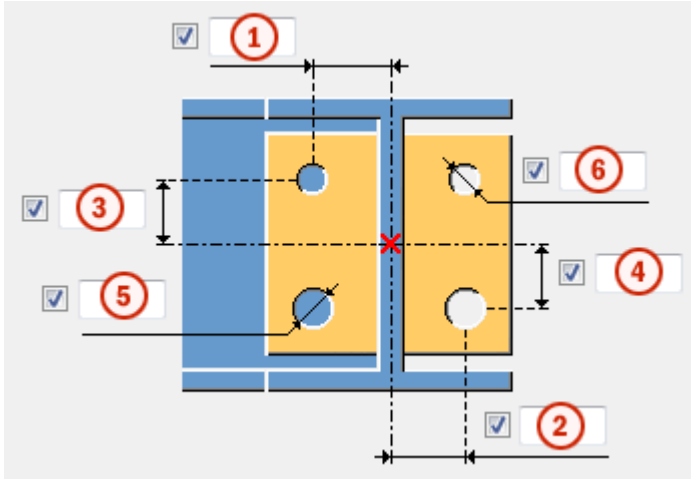
The center of a hole group is the middle point of the beam and the middle point of the haunch, if the haunch exists. The hole groups are composed of 0, 1, 2 or 4 holes.

Option for the first secondary beam	Option for the second secondary beam	Description
		Default No holes AutoDefaults can change this option.
		No holes
		1 hole
		2 holes
		4 holes

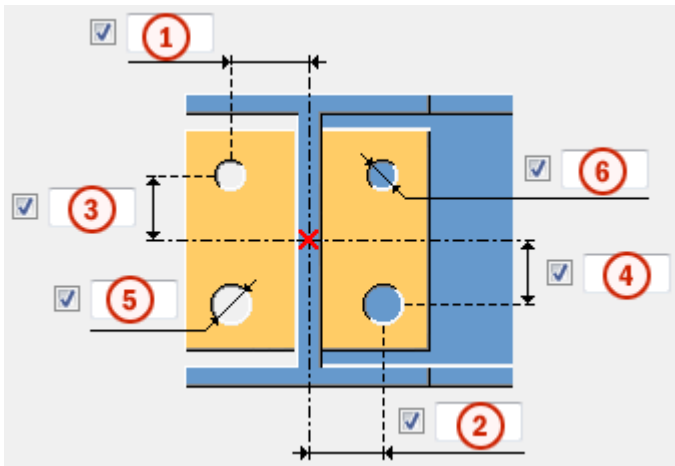
### Hole positions

Hole positions in the end plate of the first secondary beam.





Hole positions in the end plate of the second secondary beam.



	Description
1	Horizontal distance between the secondary beam center and the upper hole.
2	Horizontal distance between the secondary beam center and the lower hole.
3	Vertical distance between the secondary beam center and the upper hole.
4	Vertical distance between the secondary beam center and the lower hole.
5	Diameter of the lower hole.
6	Diameter of the upper hole.

### ***General tab***

Click the link below to find out more:

General tab

### ***Design type tab***

Click the link below to find out more:

Design type tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

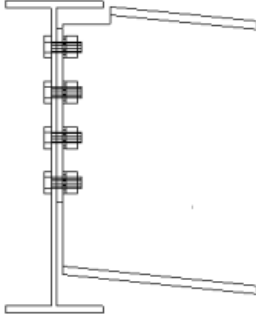
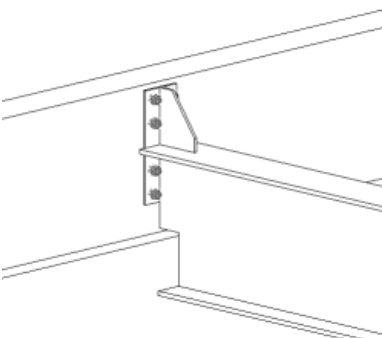
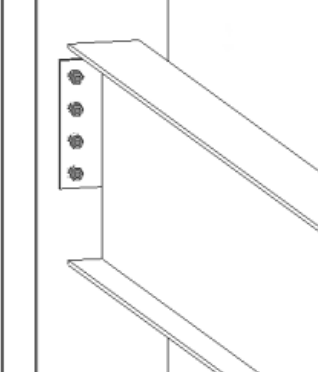
## **End plate (144)**

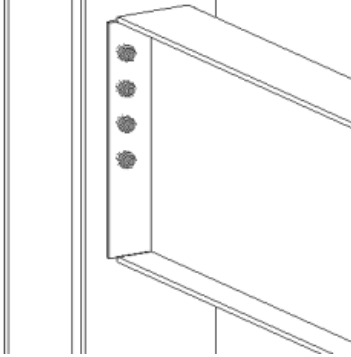
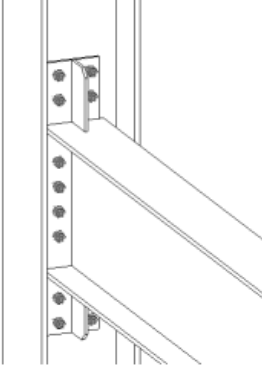
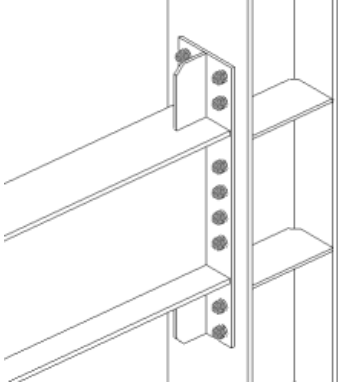
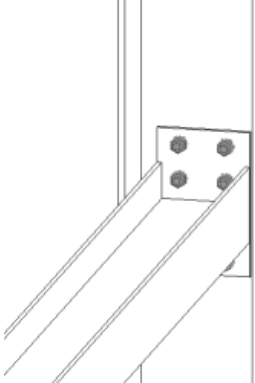
**End plate (144)** connects a beam to a column or two beams to each other using a bolted end plate. The secondary part can be leveled or sloped.

### **Objects created**

- End plate
- Bent plate
- Shim plates (optional)
- Stiffeners (optional)
- Haunch plates (optional)
- Holes
- Bolts
- Seat angles
- Welds
- Cuts

**Use for**

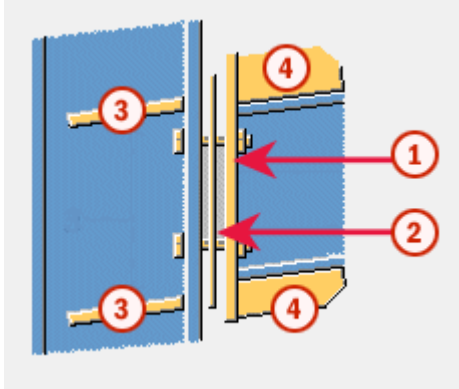
<b>Situation</b>	<b>Description</b>
	<p>Beam-to-beam end plate connection.</p> <p>The secondary part can either be leveled or sloped, or squared or skewed.</p> <p>There are several notching options.</p>
	<p>Beam-to-beam end plate connection.</p> <p>Extended plate with or without haunch plates.</p>
	<p>End plate connection to a column flange or web.</p> <p>The secondary part can either be leveled or sloped, or squared or skewed.</p>

Situation	Description
	<p>Full depth end plate connection to a column flange or web.</p> <p>The secondary part can either be leveled or sloped, or squared or skewed.</p>
	<p>End plate connection to a column web.</p> <p>Extended plate with haunch plates.</p>
	<p>End plate connection to a column flange with column stiffener.</p>
	<p>Column end plate connection.</p> <p>The secondary part is rotated.</p>

### Selection order

1. Select the main part (column or beam).
2. Select the secondary part (beam).  
The connection is created automatically.

### Part identification key




	Part
1	End plate
2	Shim plate
3	Stiffener
4	Haunch plate

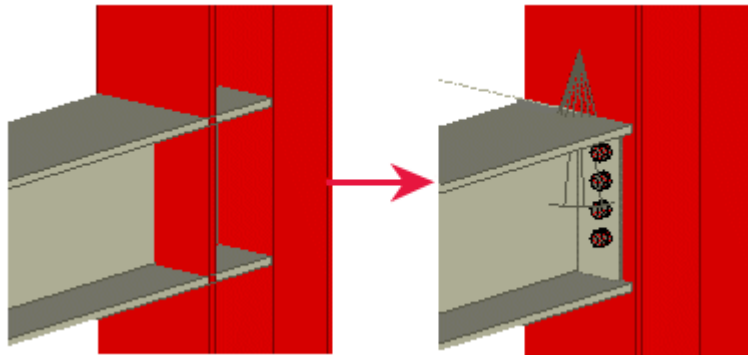
**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

### **Example: Add an end plate using End plate (144)**

In this example, you will connect a beam to a column using an end plate connection. **End plate (144)** connects two beams, or a beam to a column, using a bolted end plate.

1. Click the **Applications & components** button  in the side pane to open the **Applications & components** catalog.
2. Type 144 in the search box.
3. Double-click **End plate (144)** to open the component properties.
4. Click **Apply** to add the component using the default properties.
5. Select the main part (column).
6. Select the secondary part (beam).

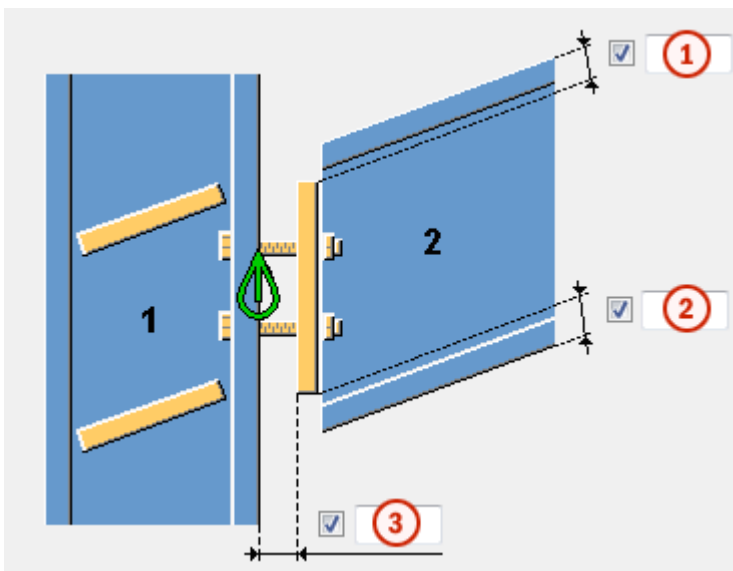
Tekla Structures automatically adds the connection when you select the beam.



**Picture tab**

Use the **Picture** tab to control the position of the end plate.

**End plate position**



	Description	Default
1	End plate upper edge distance from the top of the secondary beam. A positive value moves the top position closer to the beam center and thus decreases the plate size. Negative values increase the plate size.	10 mm
2	End plate lower edge distance from the bottom of the secondary beam.	

	Description	Default
<b>3</b>	Gap between the shim plate and the main part. If the shim plate is not used, the defined gap is created between the end plate and the main part.	0

### **Plates tab**

Use the **Plates** tab to control the size of the end plate, bent plate, and shim plates.

### **Plates**

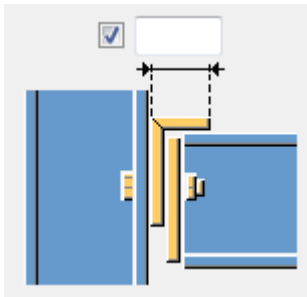
Option	Description	Default
<b>End plate</b>	End plate thickness, width and height. The width and height are defined by the bolt group edge distances.	thickness = 10 mm
<b>Folded Plate</b>	Bent plate thickness, width and height. The plate is created only if the plate thickness is given.	thickness = 0 width = bolt horizontal spacing value - (1.5*the bolt diameter) height = 200 mm
<b>Fitting plate 1, 2, 3</b>	Shim plate thickness. The plate is created only if the plate thickness is given. You can define up to three different shim plates.	0
<b>Number of fitting plates</b>	Number of shim plates for each thickness.	By default, 1 plate is created.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .


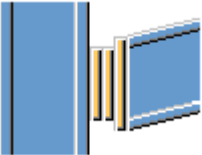
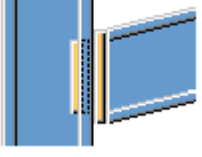
Option	Description	Default
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Bent shim plate length

Define the horizontal length of the bent shim plate. The default is  $10 \times$  bent plate thickness.

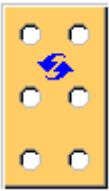







### Shim plate position

Option	Description
	Default Shim plates are created outside the main part. AutoDefaults can change this option.
	Shim plates are created outside the main part.
	Shim plates are created inside the main part.



## Shim plate shape

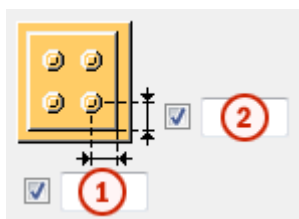
Option	Description
	<p>Default</p> <p>Holes are based on the bolt group of the connection.</p> <p>AutoDefaults can change this option.</p>
	<p>Holes are based on the bolt group of the connection.</p>
	<p>Finger shim plate with horizontal slots.</p> <p>The plate can be installed from the right or the left side of the connection.</p>
	<p>Finger shim plate with vertical slots.</p> <p>The plate can be installed from the top of the connection.</p>
	<p>Two separate finger shim plates with horizontal slots.</p>
	<p>Two separate finger shim plates with vertical slots.</p>

## Tolerance

Define the tolerance for the slots in finger shim plates. The width of the slot is the bolt diameter + the tolerance. For two separate shim plates, also define the tolerance between the plates.

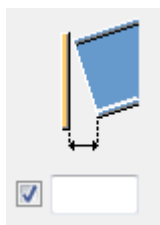
### Bolt edge distances in shim plate

Define the bolt edge distances for shim plates. When these fields are empty, shim plates are of the same size as the end plate.



	Description	Default
1	Horizontal bolt edge distance in the shim plate.	30 mm
2	Vertical bolt edge distance in the shim plate.	30 mm

### Gap size



Define the limit value for the gap between the end plate and the secondary beam. Use this when the beam is slightly curved or sloped to decide if the end angle is so small that the beam end can be straight.

If the actual gap is smaller than this value, the end of the beam is left straight.

If the actual gap is larger than this value, the end of the beam is fitted to the end plate.

### Stiffeners tab

Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position, and type.

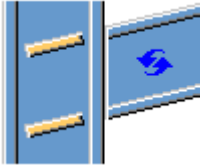
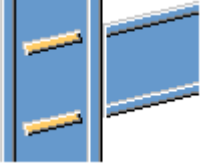
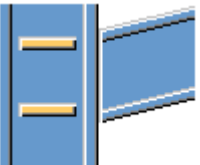
#### Stiffener plate dimensions

Option	Description
Top NS	Top near side stiffener thickness, width and height.
Top FS	Top far side stiffener thickness, width and height.
Bottom NS	Bottom near side stiffener thickness, width and height.



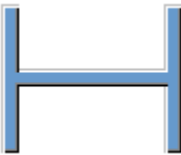

Option	Description
<b>Bottom FS</b>	Bottom far side stiffener thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	



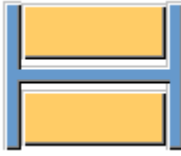
### Stiffener orientation


Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are parallel to the secondary part.
	Stiffeners are perpendicular to the main part.

### Stiffener creation

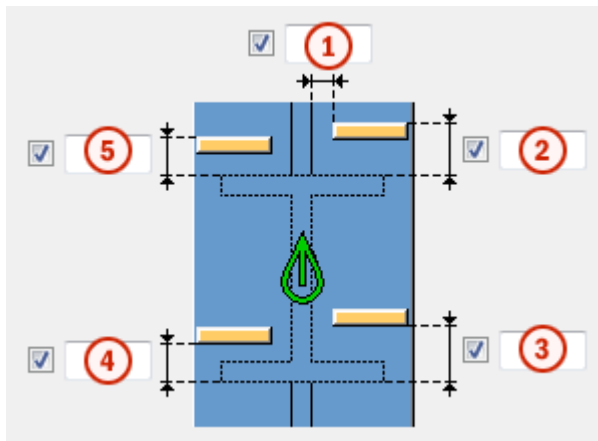
Option	Description
	Default Stiffeners are created. AutoDefaults can change this option.
	Automatic Stiffeners are created when necessary.
	No stiffeners are created.
	Stiffeners are created.

### Stiffener shape

Option	Description
	Default Line chamfered stiffener plates AutoDefaults can change this option.
	Automatic Line chamfered stiffener plates
	Square stiffener plates Stiffener plates with a gap for the main part web rounding

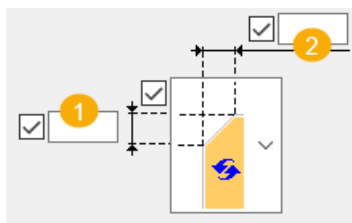
Option	Description
	Line chamfered stiffener plates

### Stiffener positions



	Description
1	Size of the gap between the stiffener and the beam web edge.
2	Size of the gap between the top near side stiffener and the beam flange edge.
3	Size of the gap between the bottom near side stiffener and the beam flange edge.
4	Size of the gap between the bottom far side stiffener and the beam flange edge.
5	Size of the gap between the top far side stiffener and the beam flange edge.

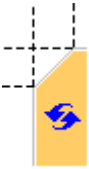

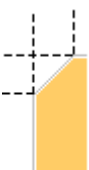


### Chamfer dimensions



	Description	Default
1	Vertical dimension of the chamfer.	10 mm

	Description	Default
2	Horizontal dimension of the chamfer.	10 mm

### Chamfer type

Option	Description
	Default. Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### ***Haunch tab***

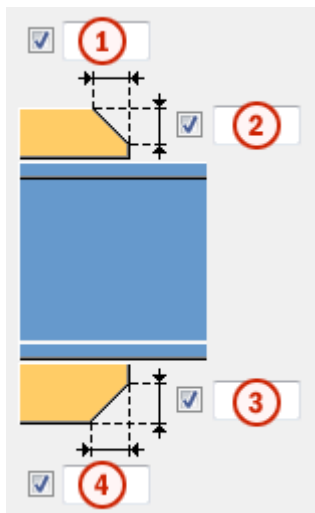
Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges.

### Haunch plates

Option	Description
<b>Top plate</b>	Top haunch plate thickness, width and height.
<b>Bottom plate</b>	Bottom haunch plate thickness, width and height.

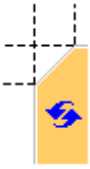

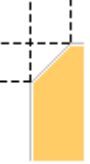


Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Haunch plate chamfers

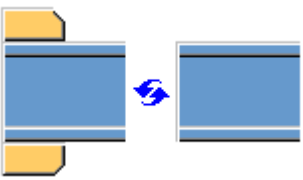
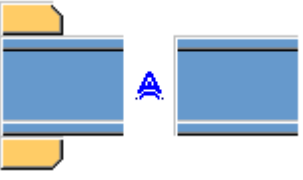


	Description
<b>1</b>	Width of the top haunch plate chamfer.
<b>2</b>	Height of the top haunch plate chamfer.
<b>3</b>	Height of the bottom haunch plate chamfer.
<b>4</b>	Width of the bottom haunch plate chamfer.



### Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### Haunch plate creation

Option	Description
	Default Top and bottom haunch plates are created, if needed. AutoDefaults can change this option.
	Automatic Top or bottom haunch plate or both are created, if needed.



Option	Description
	<p>Top and bottom haunch plates are created.</p> <p>To create a single plate, enter 0 in the thickness (<b>t</b>) field for the plate you do not need (top or bottom plate).</p>
	<p>Haunch plates are not created.</p>

### **Notch tab**






Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

### **Automatic notching**

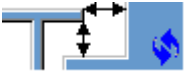
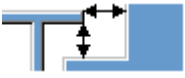
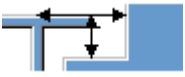
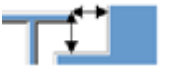
Automatic notching options affect both the top and the bottom flange.

### **Notch shape**

Automatic notching is switched on when you select a notch shape.

Option	Description
	<p>Default</p> <p>Creates notches to the secondary beam.</p> <p>AutoDefaults can change this option.</p>
	<p>Creates notches to the secondary beam. The cuts are square to the main beam web.</p>
	<p>Creates notches to the secondary beam. The cuts are square to the secondary beam web.</p>
	<p>Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.</p>
	<p>Turns off automatic notching.</p>




## Notch size

Option	Description
	<p>Default</p> <p>The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.</p> <p>AutoDefaults can change this option.</p>
	<p>The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.</p>
	<p>The notch size is measured from the center line of the main beam and from the top flange of the main beam.</p>
	<p>The notch size is measured from the edge of the main beam flange and from the outer edge of the top flange of the main beam.</p>

Enter the horizontal and vertical values for the cuts.






## Flange cut shape

Option	Description
	<p>Default</p> <p>Secondary beam flange is cut parallel to the main beam.</p> <p>AutoDefaults can change this option.</p>
	<p>Secondary beam flange is cut parallel to the main beam.</p>
	<p>Secondary beam flange is cut square.</p>

## Notch dimension rounding


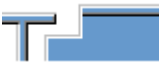

Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.



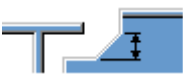

The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



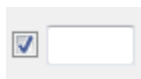
### Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

### Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.








### Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.



### Side of flange notch

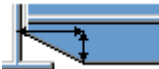



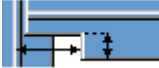
The side of flange notch defines on which side of the beam the notches are created.

Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

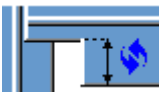
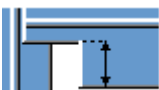

### Flange notch shape

The flange notch shape defines the notch shape in the beam flange.

Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.

Option	Description
	Creates chamfers in the flange. If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.
	Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b> .
	The flange is not cut.
	Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.
	Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b> .

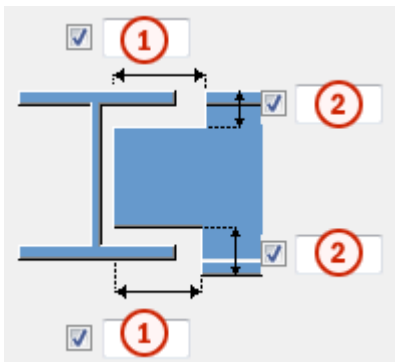
### Flange notch depth

Option	Description
	Default Flange notch depth. AutoDefaults can change this option.
	Flange notch depth.
	Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.

Enter the value for flange notch depth.

### Cut dimensions



	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### BCSA notch definition

Define whether the notch is created according to British Constructional Steelwork Association (BCSA) specifications.

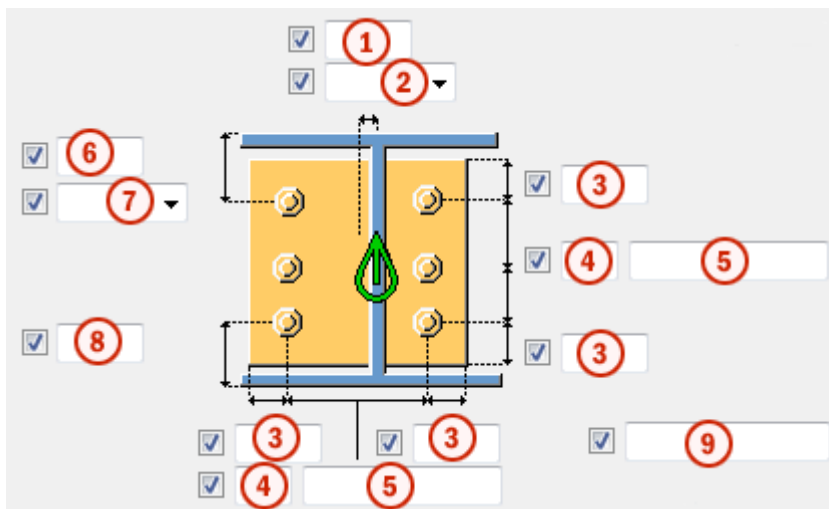
Option	Description
Default	Notch dimensions.
Yes	Creates a 50 mm notch for simple beam-to-beam connections.
No	Use the options on this <b>Notch</b> tab to define the notch dimensions.

### Bolts tab

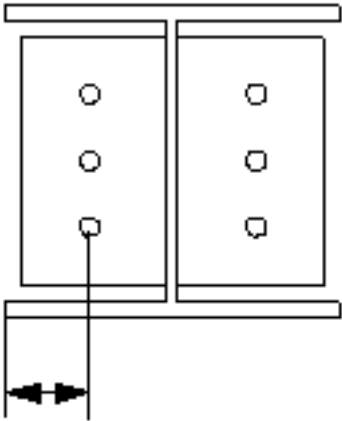
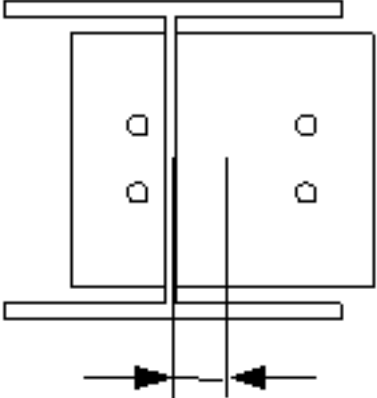
Use the **Bolts** tab to control the properties of the bolts that connect the end plate to the main part.

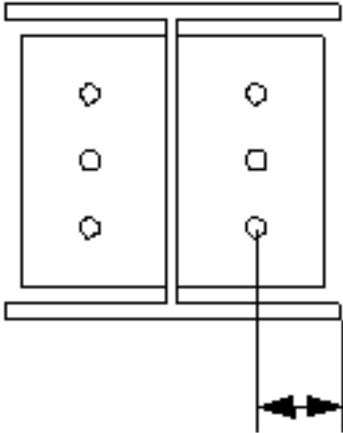
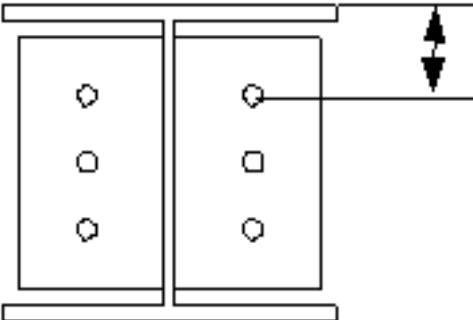
### Bolt group dimensions

Bolt group dimensions affect the size of the end plate.

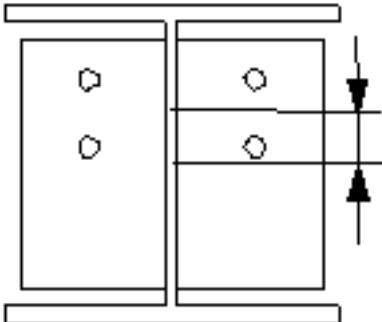
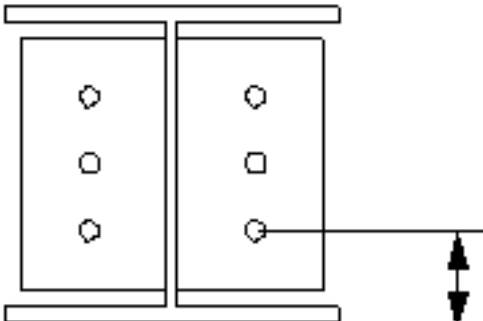


	Description
1	Dimension for horizontal bolt group position.

	<b>Description</b>
<p><b>2</b></p>	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <p><b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</p>  </li> <li> <p><b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</p>  </li> </ul>

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
<b>3</b>	<p>Bolt edge distance.</p> <p>Edge distance is the distance from the center of a bolt to the edge of the part.</p>
<b>4</b>	Number of bolts.
<b>5</b>	<p>Bolt spacing.</p> <p>Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.</p>
<b>6</b>	Dimension for vertical bolt group position.
<b>7</b>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 



	Description
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
<b>8</b>	Distance from the bottom of the beam to the lowest bolt.
<b>9</b>	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	

Option	Description	Default
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Cut length

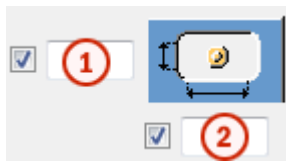
Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

### Bolt comment

You can define a bolt comment.

### Slotted holes

You can define slotted, oversized, or tapped holes.



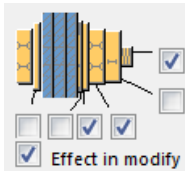
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options	

Option	Description	Default
	depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

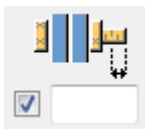
If you want to create a hole only, clear all the check boxes.






To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase


Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.








### Bolting direction

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.

Option	Description
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

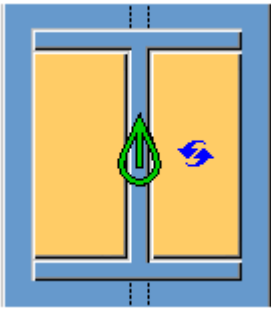
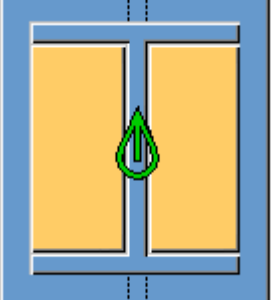
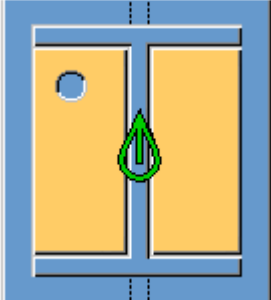
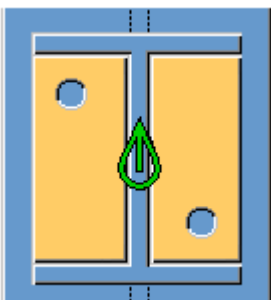
### **Holes tab**

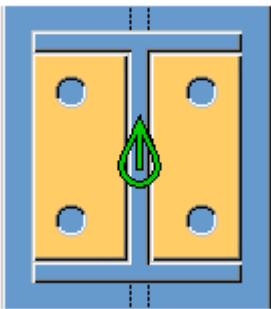
Use the **Holes** tab to control the galvanizing holes in the end plate.

Option	Description
<b>Bolt standard</b>	Select the bolt standard.
<b>Bolt type</b>	Select the bolt type to define the location where the bolts should be attached.
<b>Read data from</b>	<p>You can select to use the <code>sinkholes.dat</code> definition file to specify the default values for horizontal and vertical offsets, and the diameters for upper and lower holes.</p> <p>The file is searched in the following order: Environment common system steel folder (<code>..\Environments\common\system\Steel</code>), model folder, <code>XS_FIRM</code>, <code>XS_PROJECT</code> and <code>XS_SYSTEM</code> folder.</p> <p>You can also select to define the holes in the component dialog box.</p>

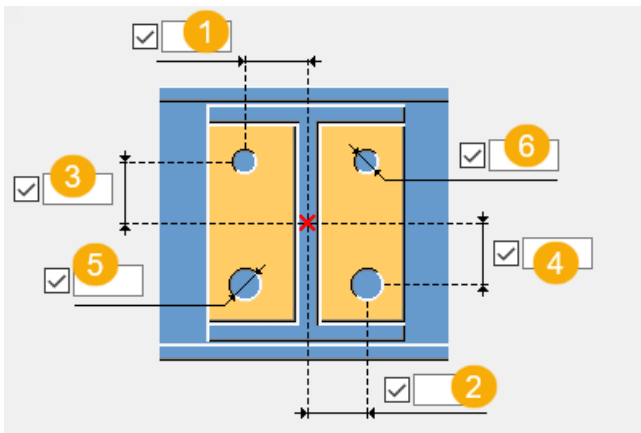
### **Number of holes**

The center of a hole group is the middle point of the beam and the middle point of the haunch, if the haunch exists. The hole groups are composed of 0, 1, 2 or 4 holes.

Option	Description
	<p>Default No holes AutoDefaults can change this option.</p>
	<p>No holes</p>
	<p>1 hole</p>
	<p>2 holes</p>

Option	Description
	4 holes

### Hole positions



	Description
<b>1</b>	Horizontal distance between the secondary beam center and the upper hole.
<b>2</b>	Horizontal distance between the secondary beam center and the lower hole.
<b>3</b>	Vertical distance between the secondary beam center and the upper hole.
<b>4</b>	Vertical distance between the secondary beam center and the lower hole.
<b>5</b>	Diameter of the lower hole.
<b>6</b>	Diameter of the upper hole.

### **Angle box tab**

Use the **Angle box** tab to add a seat angle. The purpose of seat angles is to carry loads from the secondary beam.

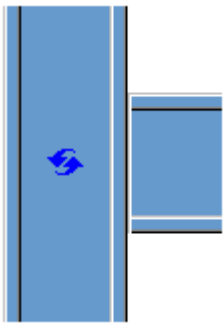
## Seat angle

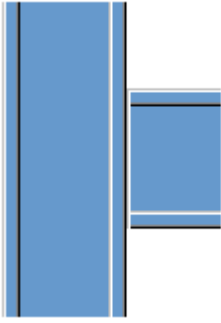
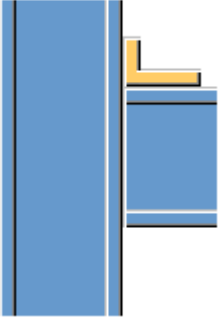
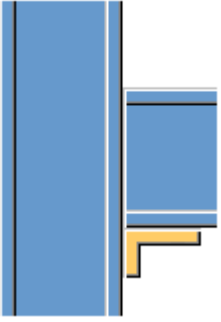
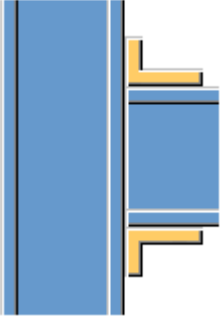
Option	Description
<b>Top angle, Bottom angle</b>	Seat angle thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

## Seat angle position

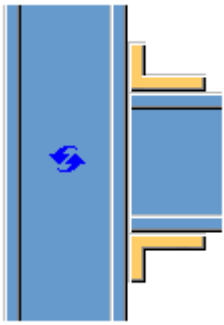
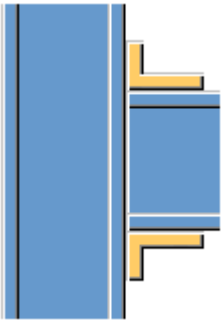
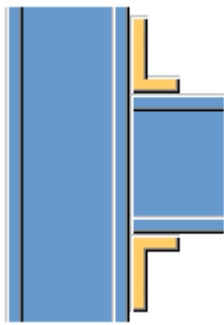
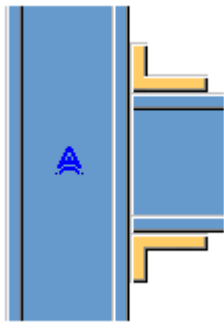
Seat angles can be located on the top, bottom or both flanges of the secondary part.

Option	Description
	<p>Default</p> <p>No seat angle is created.</p> <p>AutoDefaults can change this option.</p>

Option	Description
	<p>No seat angle is created.</p>
	<p>A seat angle is created at the top of the flange of the beam.</p>
	<p>A seat angle is created at the bottom of the flange of the beam.</p>
	<p>Seat angles are created on both sides of the flange of the beam.</p>



## Seat angle orientation

Option	Description
	<p>Default</p> <p>The longer leg of the seat angle is connected to the secondary beam.</p> <p>AutoDefaults can change this option.</p>
	<p>The longer leg of the seat angle is connected to the secondary beam.</p>
	<p>The longer leg of the seat angle is connected to the main part.</p>
	<p>Automatic</p> <p>The longer leg of the seat angle is connected to the part where bolts reach furthest from the angle seat corner.</p>

### **General tab**

Click the link below to find out more:

[General tab](#)

### ***Design type tab***

Click the link below to find out more:

[Design type tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

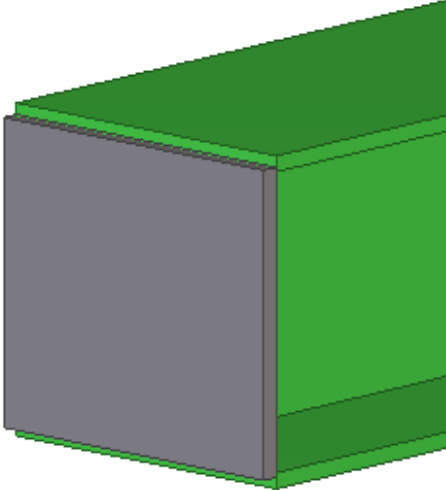
## **End plate detail (1002)**

**End plate detail (1002)** creates an end plate that is welded to a beam end.

### **Objects created**

- End plate

### **Use for**

<b>Situation</b>	<b>Description</b>
	End plate at a beam end.

### **Selection order**

1. Select the main part (beam).

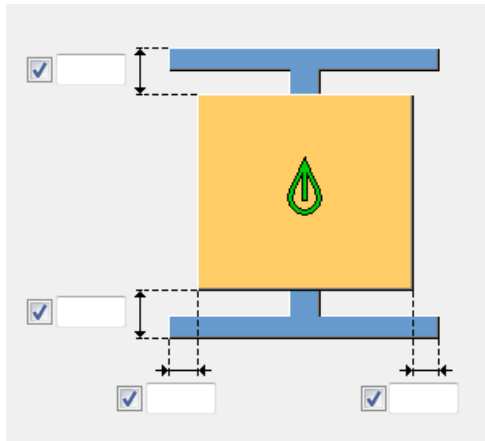
- Pick a position.

The detail is created automatically when the point is picked.

### **Picture tab**

Use the **Picture** tab to control the end plate distances from the beam edges.

Positive values move the end plate closer to the beam axis and thus decrease the plate size. Negative values increase the plate size.



The default distances from the upper and the lower edge are 10 mm.

The default distances from the right and the left edge are 0mm.

For rectangular tube profiles all the distances are 3 mm by default.

### **Parts tab**

Use the **Parts** tab to control the end plate properties.

Option	Description
<b>End plate</b>	Define the end plate thickness, width and height. By default, the thickness is $1.5 \times \text{beam web thickness}$ rounded up to the next plate thickness.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### ***General tab***

Click the link below to find out more:

General tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

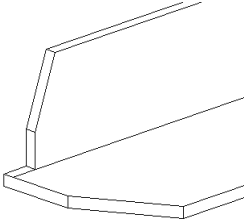
## **Angle cut (1057)**

**Angle cut (1057)** creates fittings at the end of a profile that is of the angle type. The fittings are created at the end that is closer to the picked point. Two types of fittings are possible: one that chamfers the angle, or one that creates a polygon cut. The type is automatically decided according to the properties on the **Parameters** tab.

### **Objects created**

- Fittings

## Use for

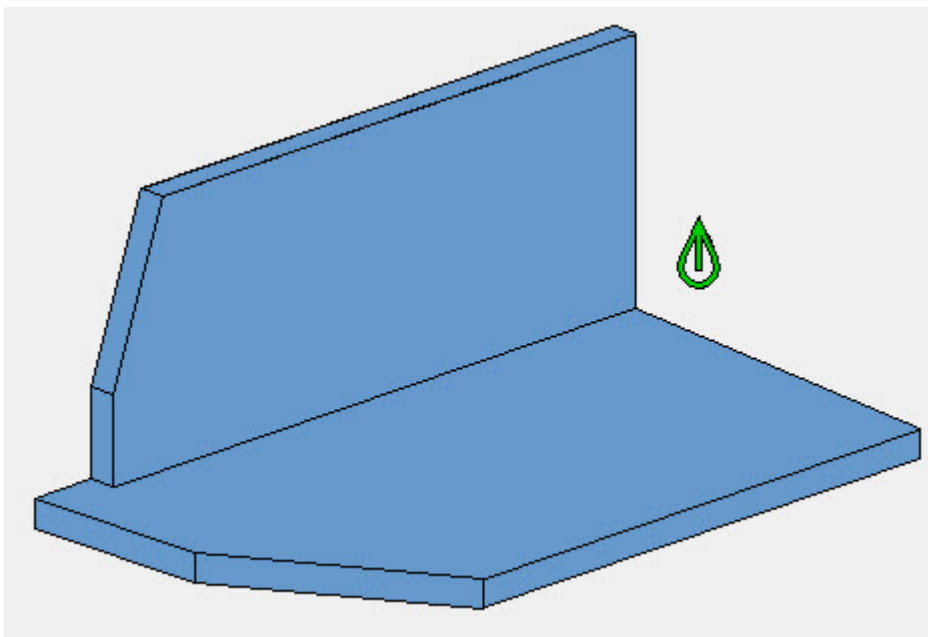
Situation	Description
	Fittings at the end of a profile.

## Selection order

1. Select the main part (angle profile).
2. Pick a position.  
The detail is created automatically when the point is picked.

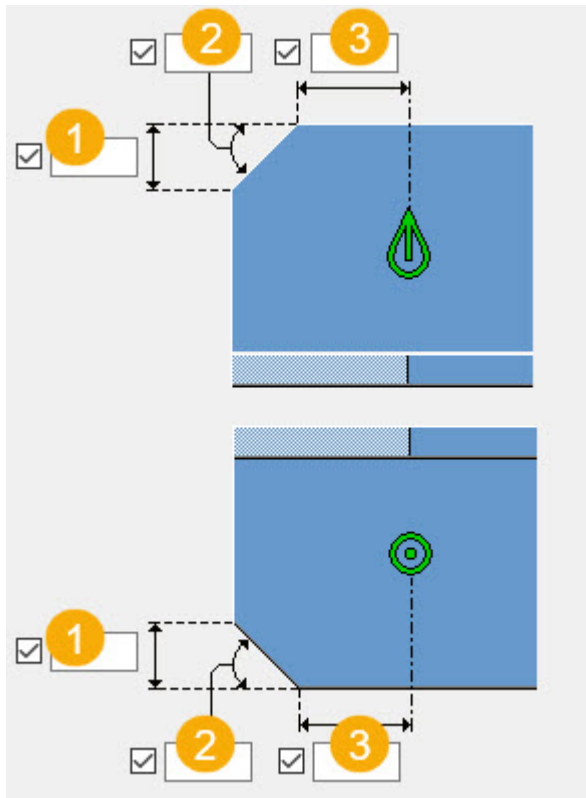
## Picture tab

The **Picture** tab shows the angle cut.



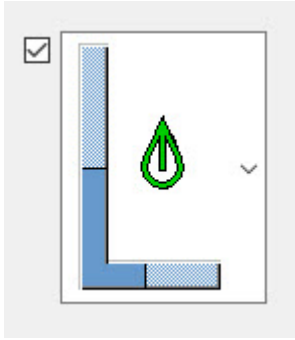
## Parameters tab

Use the **Parameters** tab to define the fitting properties.



	Description	Default
<b>1</b>	Height of the flange cut. Defines the height of the cut. If the distance between the reference point and the profile end is so short that height of the cut cannot be achieved, then the profile is chamfered only.	The default value is half of the distance of the shorter edge.
<b>2</b>	Angle of the flange cut.	0 degrees
<b>3</b>	Offset distance for the flange. Defines the distance between the reference point and the start edge of the cut. It can have negative values as well.	0 mm

Select how the flange is cut. The options are to have a cut on both flanges, or to select which flange to cut.



### ***General tab***

Click the link below to find out more:

General tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

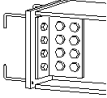
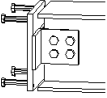
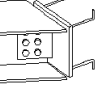
## **Cast-in plate (1069)**

**Cast-in plate (1069)** creates a cast plate at the selected end of a beam. Studs, bolts, bent anchor bolts, or nail holes can be added to the plate.

### **Objects created**

- Cast-in plate
- Shear tab
- Clip angle
- Bolts
- Studs
- Anchors
- Washer plates
- Welds

## Use for

Situation	Description
	Bolted clip angle at the near and far side of the beam. The clip angle is anchored to the concrete using bent anchor bolts.
	Anchoring with four studs.
	Shear tab is bolted to a skewed beam.

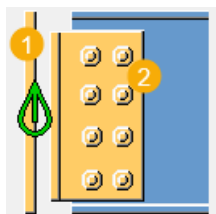
## Selection order

1. Select the main part (beam).
2. Pick a position near the end of the beam.

Note that the point you pick determines from which end of the beam the plate will be positioned, it does not locate the plate itself.

The connection is created automatically when you pick the position.

## Part identification key




	Description
1	Cast-in plate
2	Clip angle or shear tab


## Picture tab

Use the **Picture** tab to define the connection type and dimensions.

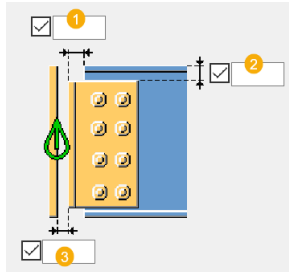
## Beam connection type

Option	Description
	Clip angle profile is used to connect the beam and the cast-in plate.



Option	Description
	Shear tab is used to connect the beam and the cast-in plate.

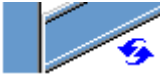



### Dimensions






	Description	Default
<b>1</b>	Edge distance from the beam end to the shear tab or clip angle profile end.	1-2"
<b>2</b>	Edge distance from the beam top to the clip angle profile top. This option is only valid for clip angle profiles, not for shear tabs.	1-3/4"
<b>3</b>	Distance between the cast-in plate and the shear tab or clip angle profile.	0

### Beam end cut

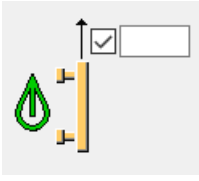
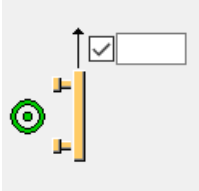
Define how the secondary beam end is cut. The beam is viewed from the side.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.
	Square Cuts the end of the secondary beam square.
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.

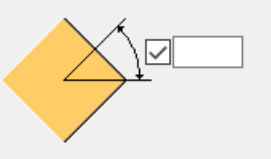
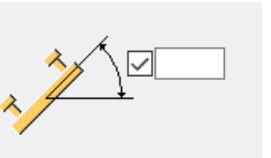
### Cast-in plate alignment

Option	Description
	Default Cast-in plate is aligned and created on the beam plane. AutoDefaults can change this option.
	Cast-in plate is aligned and created on the beam plane.
	Cast-in plate is created in the global coordinate system.

### Cast-in plate offset

Option	Description
	Cast-in plate height offset, measured in the plane of the plate.
	Cast-in plate out-of-plane offset, measured in the plane of the plate.

### Cast-in plate rotation

Option	Description
	Cast-in plate rotation in degrees, measured in the plane of the plate.
	Cast-in plate out-of-plane rotation, in degrees, measured in the plane of the plate.

### **Parts tab**

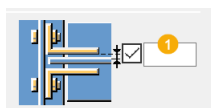
Use the **Parts** tab to define the part properties.

## Parts

Option	Description
<b>Cast-in plate</b>	Thickness, width, and height of the cast-in plate.
<b>Profile NS</b>	Select the profile from the profile catalog.
<b>Profile FS</b>	Select the profile from the profile catalog.
<b>Tab plate</b>	Thickness, width, and height of the shear tab.
<b>Plate washer</b>	Thickness, width, and height of the washer plate.






Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Gap between clip angles









	Description
<b>1</b>	Gap between the secondary part web and clip angles. This only affects connections with two clip angles.

### Clip angle position

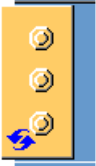




Option	Description
	Default One near side clip angle or shear tab is created. AutoDefaults can change this option.
	Automatic One near side clip angle or shear tab is created.
	Far side One far side clip angle or shear tab is created.
	Both sides Two clip angles or shear tabs are created on the near and far side.
	Near side One near side clip angle or shear tab is created.


### Clip angle leg direction

Far side	Near side	Description
		Default Not switched The long leg of the clip angle is connected to the secondary part. AutoDefaults can change this option.
		Not switched The long leg of the clip angle is connected to the secondary part.
		Switched The long leg of the clip angle is connected to the cast plate.

### Plate washer

Define plate washers for bolts and select the plate washer side.

Option	Description
	<p>Default No plate washer AutoDefaults can change this option.</p>
	<p>No plate washer</p>
	<p>One plate washer</p>
	<p>Individual square plate washers for each bolt</p>
	<p>Individual round plate washers for each bolt</p>

Option	Description
	<p>Select whether the plate washer is created for one shear tab or both shear tabs.</p>

### **Studs/Anchors tab**

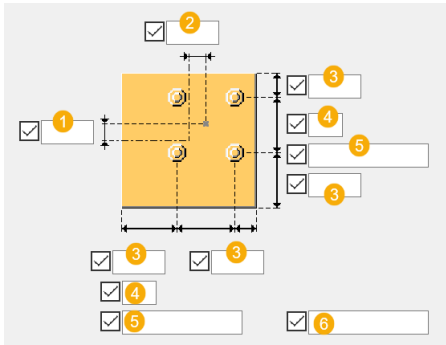
Use the **Studs/Anchors** tab to define whether studs or anchors are created, and their properties.

#### **Properties**

<b>Option</b>	<b>Description</b>
<b>Stud size</b>	Diameter of the stud.
<b>Stud standard</b>	Name of the stud.
<b>Stud length</b>	Length of the stud.
<b>Site / Workshop</b>	Location where the bolts should be attached.
<b>Std/Anc</b>	Select whether to create studs, anchors, or none of these.
<b>Stud/Anc profile</b>	Select the profile from the profile catalog.

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

## Bolt group dimensions

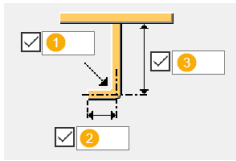


	Description
1	Vertical bolt group dimension from the center line of the plate.
2	Horizontal bolt group dimension from the center line of the plate.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Number of bolts.
5	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
6	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

## Anchor bend direction

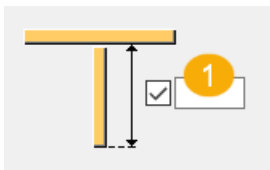
Option	Description
	Default Anchors are bent in. AutoDefaults can change this option.
	Anchors are bent in.
	Anchors are bent out.
	Anchors are not bent. Studs are created.

### Bent anchor bolt length



	Description	Default
1	Radius of the bend.	3/8"
2	Bent anchor bolt length.	4"
3	Hook length.	1-1/2"

### Stud length








	Description	Default
1	Define the stud length.	4"

### Nail holes tab

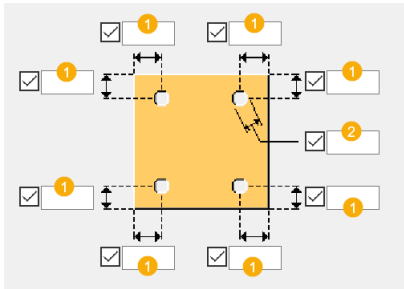
Use the **Nail holes** tab to define the nail hole locations and dimensions.

#### Nail hole locations

Option	Description
	Default No nail holes. AutoDefaults can change this option.
	No nail holes.
	Creates nail holes in the upper right and lower left corners of the plate.
	Creates nail holes in the upper left and lower right corners of the plate.
	Creates nail holes in all four corners of the plate.



## Nail hole dimensions

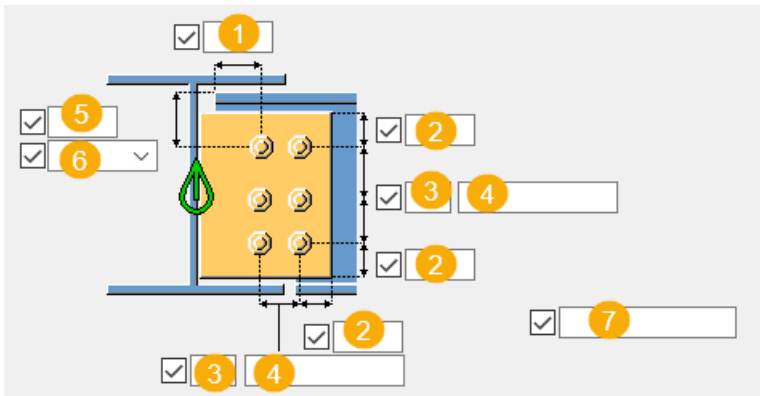


	Description
1	Nail hole edge distance.
2	Nail hole diameter.

## Bolts tab

Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

### Bolt group dimensions



	Description
1	Dimension for horizontal bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Dimension for vertical bolt group position.

	Description
6	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.           <div> </div> </li> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.           <div> </div> </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.           <div> </div> </li> </ul>

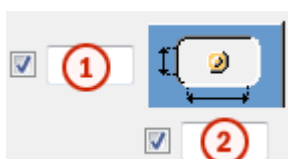
	<b>Description</b>
<b>7</b>	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

### Bolt basic properties

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



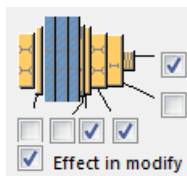
<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.

Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

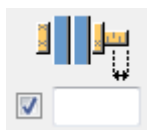
If you want to create a hole only, clear all the check boxes.





To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.





### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.








### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered

Option	Description
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt group orientation

Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design type tab**

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

## **2.5 Splice connections**

This section introduces Tekla Structures splice connection components.

- [Column splice \(42\) \(page 886\)](#)
- [Box girder splice \(45\) \(page 897\)](#)
- [Diagonal splice \(53\) \(page 903\)](#)
- [Splice connection \(77\) \(page 911\)](#)
- [Column splice \(132\) \(page 930\)](#)

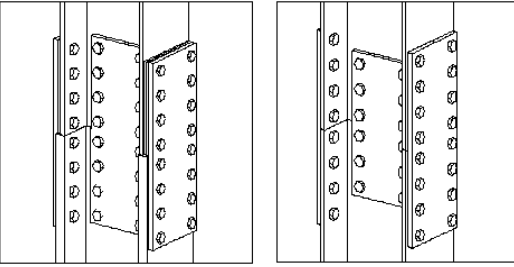
### **Column splice (42)**

**Column splice (42)** connects two columns (or beams) using splice plates bolted to the flanges and webs of both parts. Shim plates are also created when the dimensions of the columns differ.

#### **Objects created**

- Web plates
- Flange plates
- Shim plates (optional)
- Bolts

## Use for

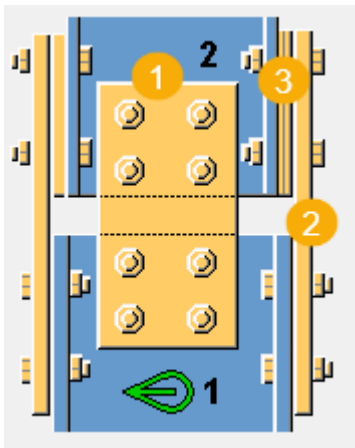
Situation	Description
	Splice plates bolted to the flanges and webs of both parts.

## Selection order

1. Select the main part (beam or column).
2. Select the secondary part (beam or column).

The connection is created automatically when the secondary part is selected.

## Part identification key

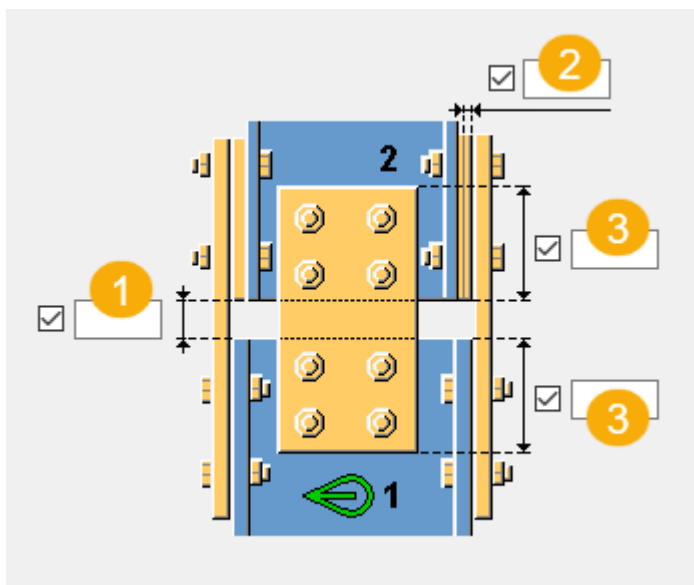


	Description
1	Web plate
2	Flange plate
3	Shim plate

## Picture tab

Use the **Picture** tab to define the plate positions.

## Dimensions



	Description	Default
1	Gap between the main part and the secondary part.	0 mm
2	Shim plate thickness	10 mm
3	Web plate dimensions on the main part and the secondary part.	

### Part tab

Use the **Parts** tab to define the properties of the plates.

### Plates

Option	Description
<b>Web plates</b>	Thickness, width and height of the web plates.
<b>Flange plates</b>	Thickness, width and height of the flange plates.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

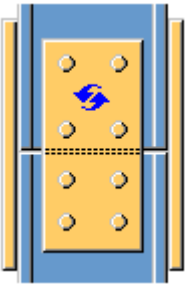
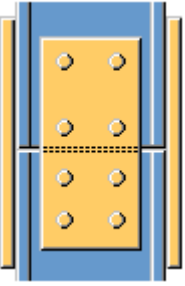


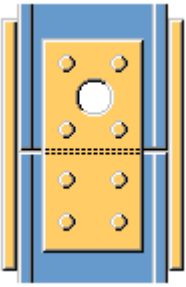
Option	Description	Default
	assembly position number.	
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### ***Parameters tab***

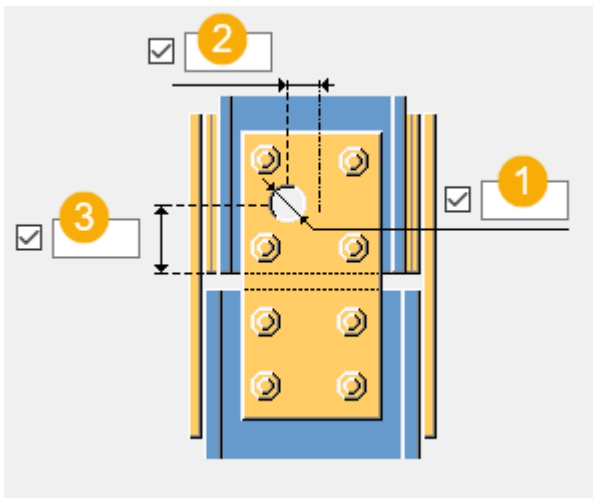
Use the **Parameters** tab to define the lifting hole creation, dimensions, and web plate creation.

### **Lifting hole creation**

Option	Description
	<p>Default</p> <p>Lifting hole is not created.</p> <p>AutoDefaults can change this option.</p>
	<p>Lifting hole is not created.</p>

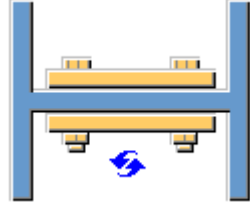
Option	Description
	Lifting hole is created.

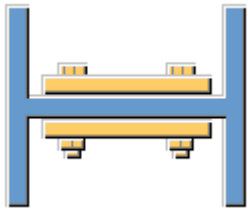
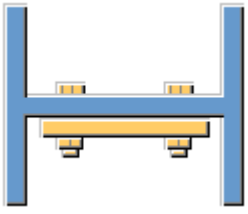
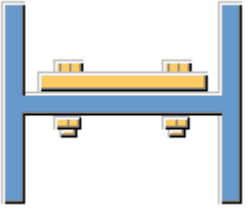
### Lifting hole dimensions



	Description
1	Diameter of the lifting hole.
2	Horizontal dimension for the lifting hole offset from the web plate center line.
3	Vertical dimension from the lifting hole center to the part edge.

### Web plates

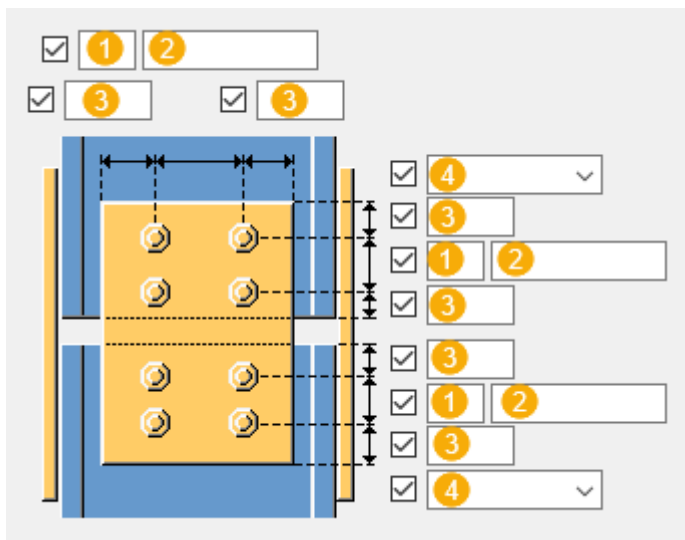
Option	Description
	Default Both web plates are created. AutoDefaults can change this option.

Option	Description
	Both web plates are created.
	Right side web plate is created.
	Left side web plate is created.

**Web bolts tab**

Use the **Web bolts** tab to define the bolt group dimensions and bolt properties.

**Bolt group dimensions**



	Description
1	Number of bolts.

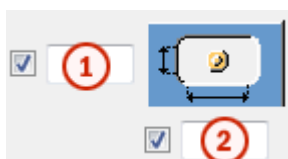
	Description
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Select the bolt type.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### Slotted holes

You can define slotted, oversized, or tapped holes.



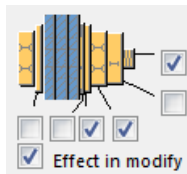
Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.

Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.





To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.





### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

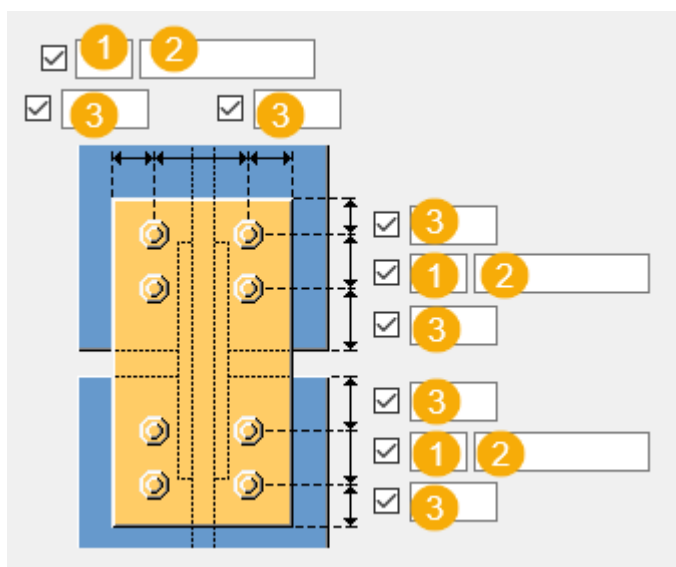
Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered

Option	Description
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Flange bolts tab

Use the **Flange bolts** tab to define the bolt group dimensions and bolt properties.

#### Bolt group dimensions



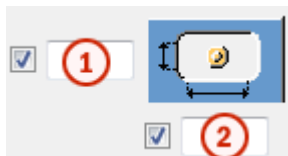
	Description
<b>1</b>	Number of bolts.
<b>2</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

## Slotted holes

You can define slotted, oversized, or tapped holes.



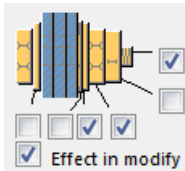
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options	

Option	Description	Default
	depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

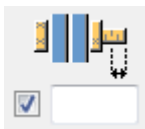
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4



### **General tab**

Click the link below to find out more:  
General tab

### **Design tab**

Click the link below to find out more:

### **Analysis tab**

Click the link below to find out more:  
Analysis tab

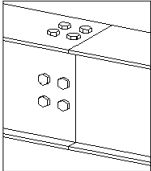
## **Box girder splice (45)**

**Box girder splice (45)** connects two box profiles using fastener plates that are bolted to the secondary part and welded to the main part.

### **Objects created**

- Fastener plates
- Stiffener
- Bolts
- Welds

### **Use for**

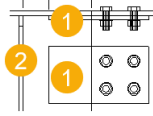
<b>Situation</b>	<b>Description</b>
	Two box profiles connected with fastener plates

### **Selection order**

1. Select the main part.
2. Select the secondary part.

The connection is created automatically when you select the secondary part.

## Part identification key

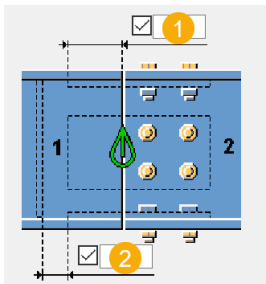


	Description
1	Fastener plate
2	Stiffener

## Picture tab

Use the **Picture** tab to define the plate positions.

## Dimensions



	Description	Default
1	Distance between the fastener plates and main part edge	60 mm
2	Distance between the stiffener and the fastener plates	100 mm

## Parts tab

Use the **Parts** tab to define the part properties.

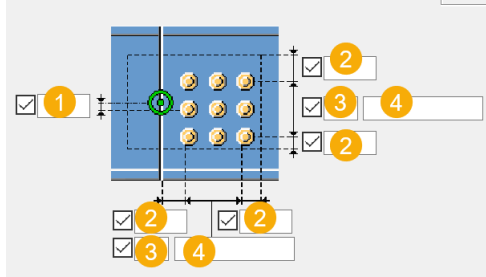
## Parts

Option	Description	Default
<b>Fastener plates</b>	Thickness of the fastener plates	
<b>Stiffener</b>	Thickness of the stiffener	5 mm

### Flange bolt tab

Use the **Flange bolt** tab to define the bolt group dimensions and flange bolt properties.

#### Dimensions



	Description
1	Dimension for horizontal bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

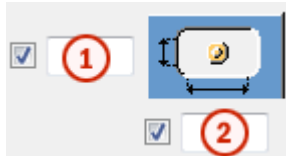
#### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

Option	Description	Default
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

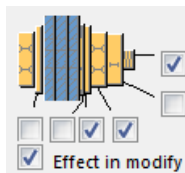


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



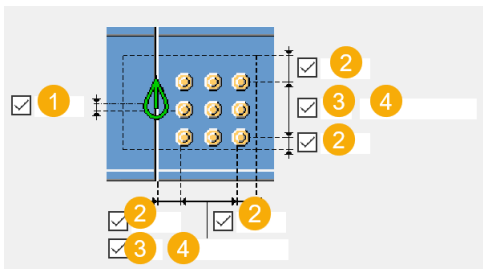
### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Web bolts tab

Use the **Web bolts** tab to define the bolt group dimensions and web bolt properties.

### Bolt group dimensions









	Description
1	Dimension for vertical bolt group position.

	Description
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### **General tab**

Click the link below to find out more:

General tab

### **Design tab**

Click the link below to find out more:

### **Analysis tab**

Click the link below to find out more:

Analysis tab

### **Welds**

Click the link below to find out more:

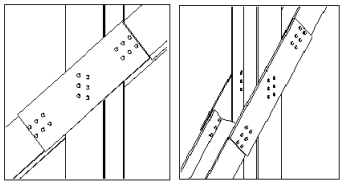
## **Diagonal splice (53)**

**Diagonal splice (53)** connects two beams to a column using connection plates bolted to the column and beam flanges.

### **Objects created**

- Connection plates
- Bolts

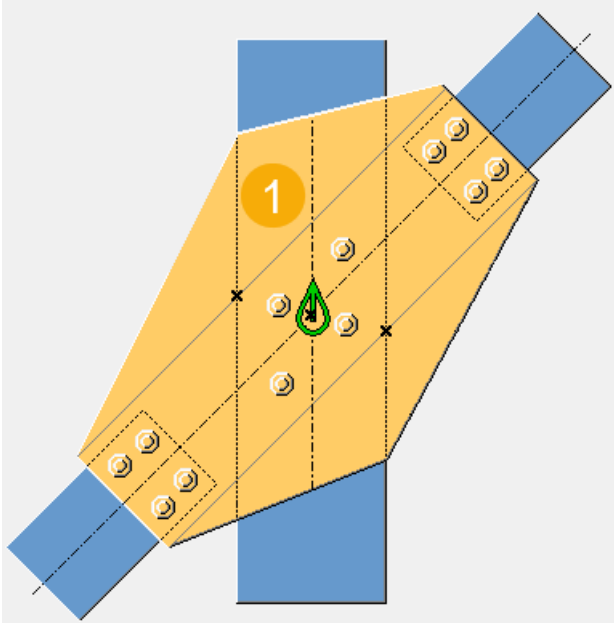
### **Use for**

<b>Situation</b>	<b>Description</b>
	Beams are connected to a column with bolted connection plates.

### **Selection order**

1. Select the main part (column).
2. Select the first secondary part (beam).
3. Select the second secondary part (beam).
4. Click the middle mouse button to create the connection.

## Part identification key

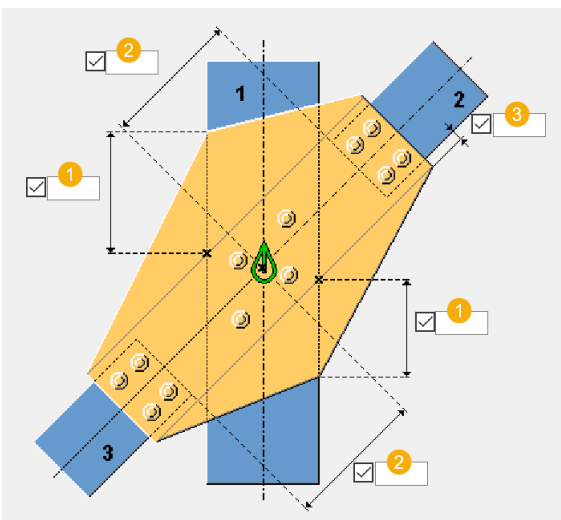


	Description
1	Connection plate

## Picture tab

Use the **Picture** tab to define the geometry of the connection.

## Dimensions





	Description	Default
1	Define a vertex to the connection plate at the lowermost and uppermost intersection point of the column edge and the plate upper or lower edge.	0 Rectangular plate is created.
2	Define the distance to the first selected and second selected secondary part from the column center line to the secondary part end.	If the beams are perpendicular to the column, the default value for this distance is equal to the column flange width.  Otherwise, the default distance is calculated so that the beam does not collide with the column.
3	Define the plate tolerance.  You can use this dimension to increase the plate width.	10 mm

### **Parts tab**

Use the **Parts** tab to define the part properties.

#### **Parts**

Option	Description
<b>Create as</b>	Select whether to create a connection plate or a profile.
<b>Plate</b>	Thickness of the connection plate.
<b>Profile</b>	Select the profile from the profile catalog.
<b>Spacer plate</b>	Thickness, width, and height of the spacer plate.  If the main part profile is higher than the profile of the diagonal parts, spacer plates can be created between the connection plate and the diagonal parts to fill the empty space. To do

Option	Description
	<p>this, the diagonal parts should be centrally connected to the main part.</p> <p>By default, the thickness of the plate is equal to the width of the gap between the connection plate and the secondary beam. If the thickness is defined, the component creates as many plates as can be fitted in the gap.</p>

Option	Description	Default
<b>Pos_No</b>	<p>Prefix and start number for the part position number.</p> <p>Some components have a second row of fields where you can enter the assembly position number.</p>	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tab**


Use the **Parameters** tab to define the connection plate positions.





### **Twin profiles**

If you are using twin profiles as secondary parts, select **Yes** in this option.

When selecting the secondary parts to this connection, select the outer part of the twin profiles.

### **Plate position**

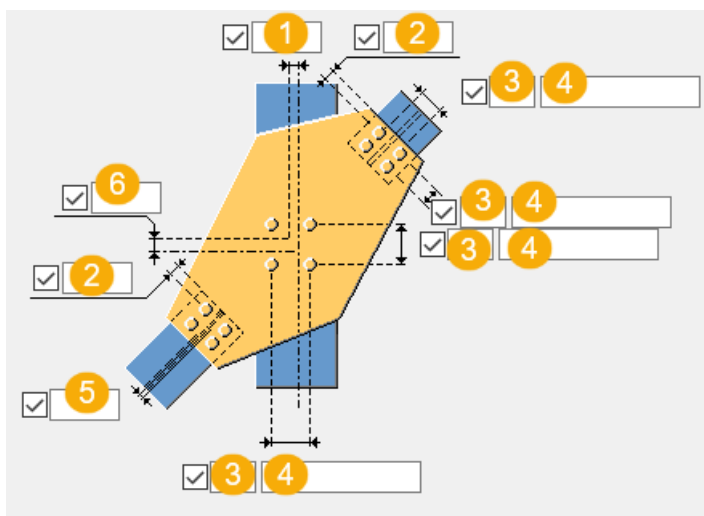
Option	Description
	<p>Default</p> <p>Plates are created on both sides.</p> <p>AutoDefaults can change this option.</p>

Option	Description
	Plate is created on the left side.
	Plates are created on both sides.
	Plate is created on the right side.
	Plates are created on both sides. Long bolts go through the column and beam flanges.

### **Bolts tab**

Use the **Bolts** tab to define the bolt group dimensions and bolt properties.





#### **Bolt group dimensions**



	Description
<b>1</b>	Dimension for horizontal bolt group position.
<b>2</b>	Bolt edge distance.
<b>3</b>	Number of bolts.
<b>4</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>5</b>	Bolt group offset from the connection plate center line.

	<b>Description</b>
<b>6</b>	Dimension for vertical bolt group position.

### Bolt group alignment

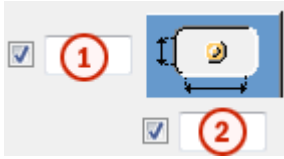
<b>Option</b>	<b>Description</b>
	Default Bolts are not staggered. AutoDefaults can change this option.
	Bolts are not staggered.
	Bolts are staggered and aligned with the secondary part.
	Bolts are staggered and aligned with the main part.

### Bolt basic properties

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

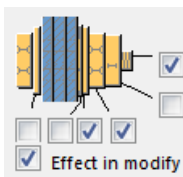


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.






To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase







Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## Bolting direction

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

## Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

[Design tab](#)

## Analysis tab

Click the link below to find out more:

[Analysis tab](#)

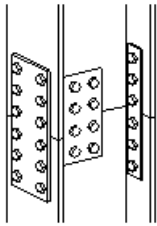
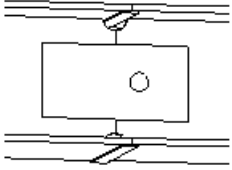
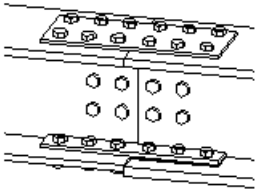
## Splice connection (77)

**Splice connection (77)** creates a splice between two beams or columns. The splice can be bolted or welded, or bolted and welded. This connection also works with rotated and skewed beams, but only with I-shaped cross-sections.

### Objects created

- Flange plates
- Web plates
- Deck plates
- Bolts
- Welds

### Use for

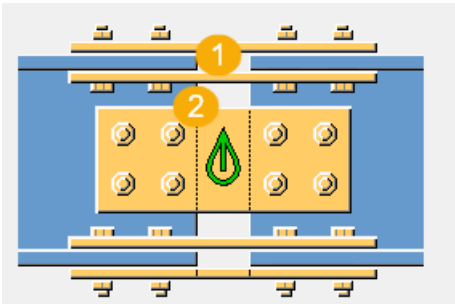
Situation	Description
	Plates are bolted.
	Plates are welded.
	Plates are bolted and welded.

### Selection order

1. Select the main part.
2. Select the secondary part.

The connection is created automatically when the secondary part is selected.

### Part identification key

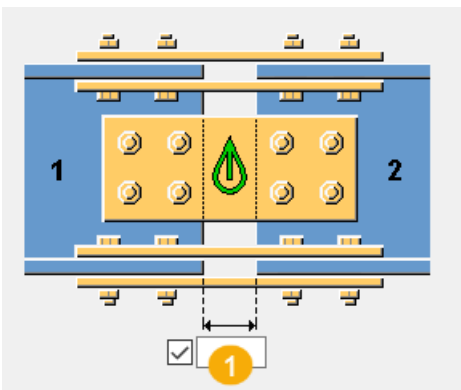


	Part
1	Flange plates
2	Web plates

### Picture tab

Use the **Picture** tab to define the gap between the main and secondary beam, and the gap type.


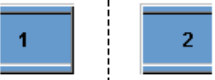


### Gap dimension



	Description	Default
1	Gap between the main part and secondary part.	5 mm or ¼"



## Gap type

Option	Description
	<p>Default Center fit</p> <p>By default, both parts are cut equally (<math>1/2 * \text{entered gap}</math>).</p> <p>AutoDefaults can change this option.</p>
	<p>Center fit</p> <p>The main part and secondary parts are cut equally (<math>1/2 * \text{entered gap}</math>), and placed centrally.</p>
	<p>Offset fit</p> <p>Only the secondary part is cut.</p>
	<p>Offset fit</p> <p>Only the main part is cut.</p>

## Parts tab

Use the **Parts** tab to define the properties of flange plates and spacers.

## Flange plates

Option	Description
<b>Top ext flange pl</b> <b>Top int flange pl</b> <b>Btm ext flange pl</b> <b>Top int flange pl</b>	Flange plate thickness, width, and height.

Option	Description	Default
<b>Pos_No</b>	<p>Prefix and start number for the part position number.</p> <p>Some components have a second row of fields where you can enter the assembly position number.</p>	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in

Option	Description	Default
		<b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Create web connection as

Option	Description
<b>Plates</b>	Plate thickness, width, and height.
<b>Profiles</b>	Select the profile from the profile catalog.

### Spacers

The flange and web spacers are used when the main and secondary beam flange or web thicknesses differ.

Option	Description
<b>Flange spacers</b> <b>Top</b> <b>Bottom</b>	Flange spacer thickness.
<b>Create external flange spacers</b>	Select whether external flange spacers are created.
<b>Web spacers</b>	Web spacer thickness.

### *Parameters tab*

Use the **Parameters** tab to define the location and diameter of the lifting hole, the type of bolts, and loose part and splice plate assembly.

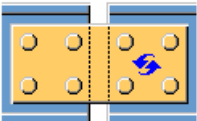
### Bolts and assemblies

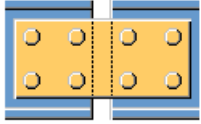
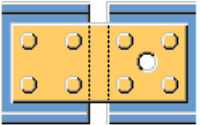
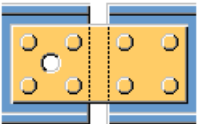
Option	Description
<b>Workshop bolts</b>	<ul style="list-style-type: none"> <li>• <b>None</b> - All bolts are attached at the building site.</li> <li>• <b>Primary member</b> - The bolts in the main part are attached at the workshop, and the bolts in the secondary part are attached at the building site.</li> </ul>

Option	Description
	<ul style="list-style-type: none"> <li>• <b>Secondary member</b> - The bolts in the secondary part are attached at the workshop, and the bolts in the main part are site bolts.</li> </ul>
<b>Loose parts assembly</b>	<ul style="list-style-type: none"> <li>• <b>Primary member</b> - Creates a loose assembly between the spacers and the main part.</li> <li>• <b>Secondary member</b> - Creates a loose assembly between the spacers and the secondary part.</li> <li>• <b>Both</b> - Creates a loose assembly between the spacers and the main part as well as between the spacers and the secondary part.</li> </ul>
<b>Splice plate assembly</b>	<ul style="list-style-type: none"> <li>• <b>None</b> - No assembly is created either between the splice plates or the main and secondary beams. This is the default value.</li> <li>• <b>Primary member</b> - Creates an assembly between the splice plates and the main beam.</li> <li>• <b>Secondary member</b> - Creates an assembly between the splice plates and the secondary beam.</li> <li>• <b>Both</b> - Creates an assembly between the splice plates and both the main and secondary beams.</li> </ul> <p>Note that the assembly is created by welding the splice plates to the appropriate beams.</p>

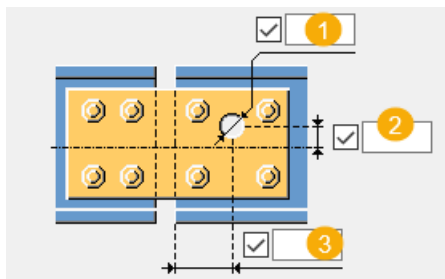
### Lifting hole creation

Select to which part the lifting hole is created: plates, beam, or to both the plates and the beam.

Option	Description
	<p>Default</p> <p>Lifting hole is not created.</p> <p>AutoDefaults can change this option.</p>

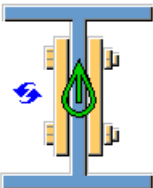
Option	Description
	Lifting hole is not created.
	Lifting hole is created in the secondary part side.
	Lifting hole is created in the main part side.

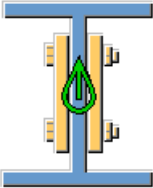


### Lifting hole dimensions



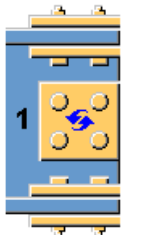
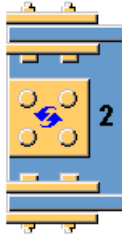
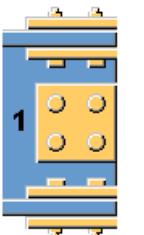
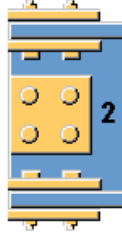
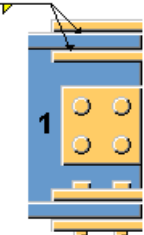
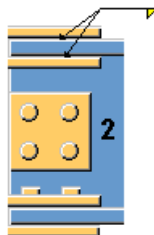
	Option
1	Define the diameter of the lifting hole.
2	Define the vertical location of the lifting hole from the center line of the web.
3	Define the horizontal location of the lifting hole from the end of the secondary beam.

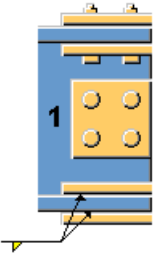
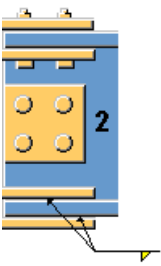
### Web plate creation

Option	Description
	Default Both web plates are created. AutoDefaults can change this option.

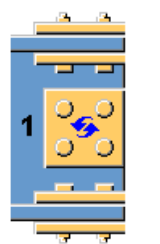
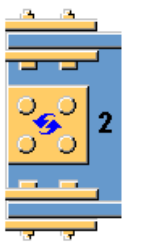
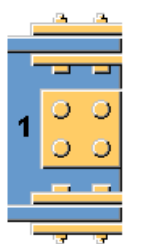
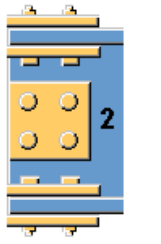
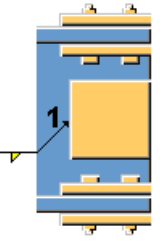
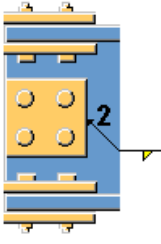
Option	Description
	Both web plates are created.
	Web plate is created on the front side.
	Web plate is created on the back side.

**Attach flange plates to main and secondary parts**

Option	Option	Description
		Default Flange plates are bolted to the main and secondary parts. AutoDefaults can change this option.
		Flange plates are bolted to the main and secondary parts.
		Flange plates are welded to the main and secondary parts.

Option	Option	Description
		

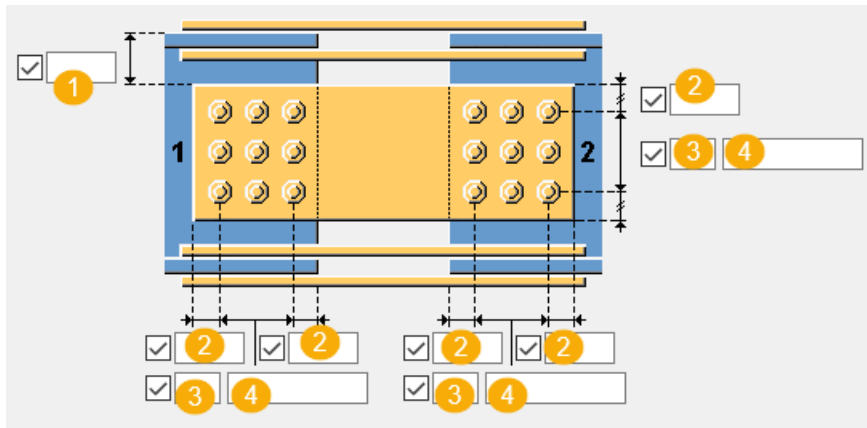
### Attach web plates to main and secondary parts

Option	Option	Description
		<p>Default</p> <p>Web plates are bolted to the main and secondary parts.</p> <p>AutoDefaults can change this option.</p>
		<p>Web plates are bolted to the main and secondary parts.</p>
		<p>Web plates are welded/ bolted to the main and secondary parts.</p>

### **Web bolts tab**

Use the **Web bolts** tab to define the web bolt properties.

## Bolt group dimensions



	Description
1	Dimension for vertical bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

## Staggering of bolts

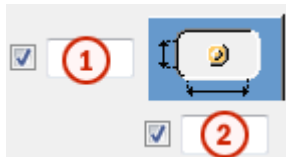
Option	Description
	Select the appropriate staggering option.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

## Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options	

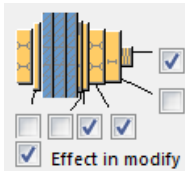


Option	Description	Default
	depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



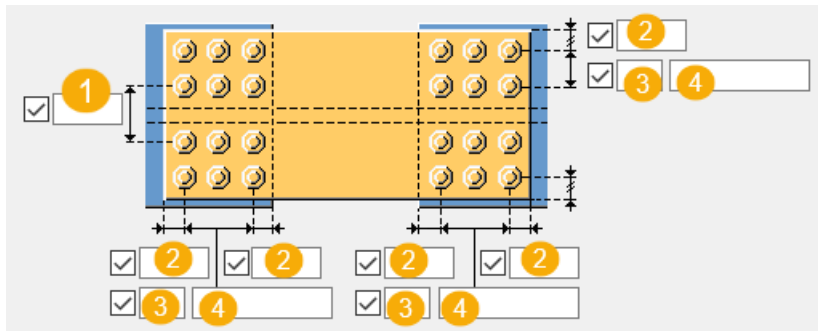
### Bolting direction

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

### ***Top flange bolts / Bottom flange bolts tab***

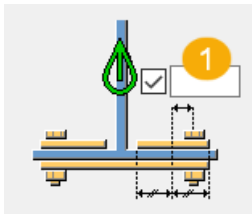
Use the **Top flange bolts** and **Bottom flange bolts** tabs to define the flange bolt properties. On the **Bottom flange bolts** tab, you can select to use the top flange bolt default settings for the bottom bolts.

## Bolt group dimensions



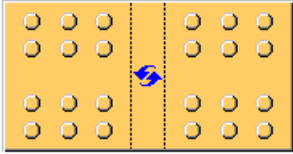
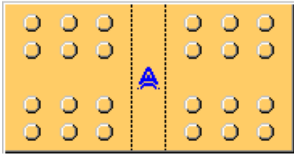
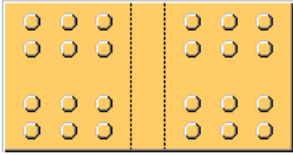
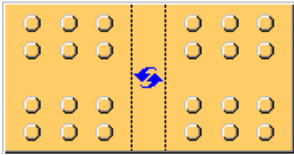
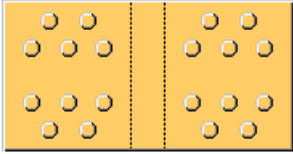
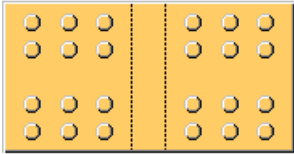
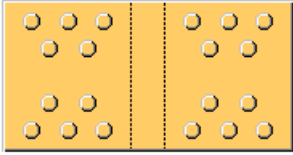
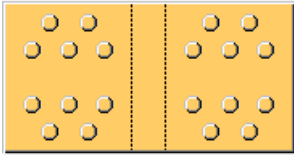
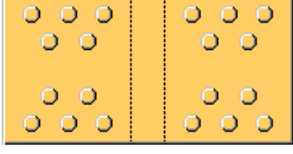
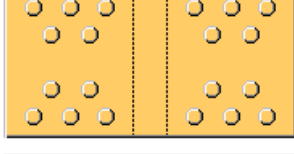
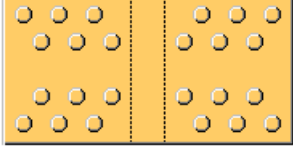
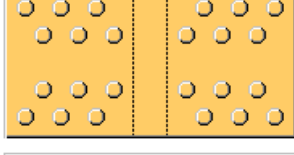
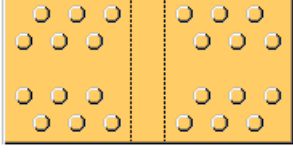
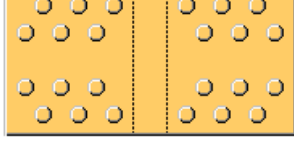
	Description
1	Dimension for vertical bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

## Bolt offset



	Description
1	Define the bolt offset from the center line of the flange plate.

## Staggering of bolts

Top flange bolts	Bottom flange bolts	Description
		Select the appropriate staggering option.
		
		
		
		
		
		

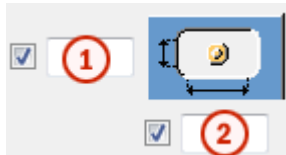
## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.

Option	Description	Default
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### Slotted holes

You can define slotted, oversized, or tapped holes.

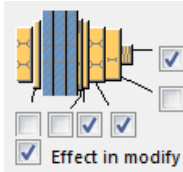


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Weld prep tab

Use the **Weld prep** tab to control weld backing bars and weld access holes. The weld backing bar is used behind the welds connecting the beam flanges.

### Before you start

1. Set the thickness of flange plates to zero on the **Parts** tab. Flange welds and weld preparations are only created if the flange plates do not exist.
2. Click the **Weld** button and enter the correct weld size, type, angle, and other properties. Otherwise weld preparations are not created. Note that weld preparations are not created for all weld types.

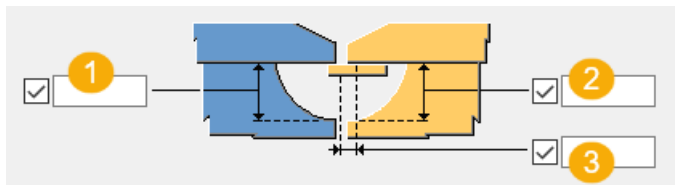
### Backing bar

Option	Description
<b>Backing bar</b>	Backing bar thickness and width.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in






Option	Description	Default
		<b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	



### Weld access hole dimension



	Description
<b>1</b>	Define the weld access hole radius in the main part.
<b>2</b>	Define the weld access hole radius in the secondary part.
<b>3</b>	Define the weld backing bar offset in the direction of the secondary beam.

### Weld access holes

Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	
	Round weld access hole with a radius that you can define in  r <input checked="" type="checkbox"/> <input type="text"/>	

Option	Description	Default
	<p>Extended cone-shaped weld access hole with a radius and dimensions that you can define in</p> <p>R <input checked="" type="checkbox"/> <input type="text"/> and</p> <p>Top Prep x <input checked="" type="checkbox"/> <input type="text"/></p> <p>Bottom Prep x <input checked="" type="checkbox"/> <input type="text"/></p>	
	<p>Cone-shaped weld access hole with radiuses that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and r <input checked="" type="checkbox"/> <input type="text"/></p> <p>Capital <b>R</b> defines the large radius (height). Small <b>r</b> defines the small radius.</p>	<p>R = 35 r = 10</p>

### Weld preps for flanges

Select whether the main or secondary part flange is beveled.

### Weld preps for web

Select whether the main or secondary part web is beveled.

### Include backing bar

Select whether the backing plate is welded to the main part, secondary part, none, or both.




### Backing bar location

Select the backing bar location in relation to the flange.

Option	Description
<b>Auto</b>	Places the backing bars down for beams ( <b>In-Out</b> ) and inside ( <b>In-In</b> ) for columns.
<b>In-In</b>	Places both backing bars to the inner side of flanges.
<b>In-Out</b>	Places the top backing bars to the inner side of the top flange and the bottom back bar to the outer side of the bottom flange.

### Weld backing bar length

Enter the length of the weld backing bar in the box below the options.

Option	Description
	Default Absolute length of the backing bar AutoDefaults can change this option.
	Absolute length of the backing bar
	Extension beyond the edge of the flange

### Deck plates tab

Use the **Deck plates** tab to define whether deck plates are created.

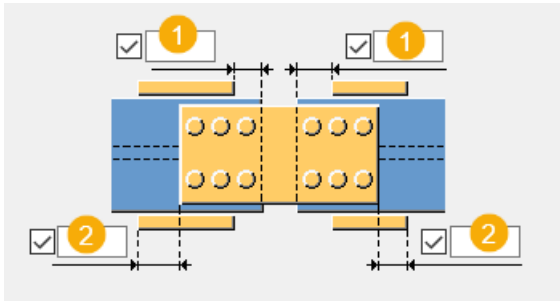
#### Part

Option	Description
<b>Deck supports</b>	Deck plate thickness and width.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	



## Deck plate dimensions



<b>1</b>	Define the deck plate edge distance from the main part edge.
<b>2</b>	Define the deck plate dimension from the web plate edge.

## Deck plate creation

Option	Description
	Default Deck plates are not created. AutoDefaults can change this option.
	Deck plates are not created.
	Deck plates are created on both sides.
	Deck plates are created on the front side.
	Deck plates are created on the back side.

### ***General tab***

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

[Design tab](#)

## ***Analysis tab***

Click the link below to find out more:  
[Analysis tab](#)

## ***Welds***

Click the link below to find out more:

## **Column splice (132)**

**Column splice (132)** creates a splice connection between two columns.

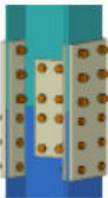
You can create the following splice connection types:

- Two outer flange plates with two web plates
- Four inner flange plates with two web plates
- Division plate with two outer flange plates and four web cleats
- Two outer flange plates, four inner flange plates, and two web plates

### **Objects created**

- Web plate
- Flange plates
- Division plate
- Angle profile
- Web and flange shim plates
- Bolts
- Welds

### **Use for**

<b>Situation</b>	<b>Description</b>
	Two columns connected with web and flange plates.

### **Limitations**

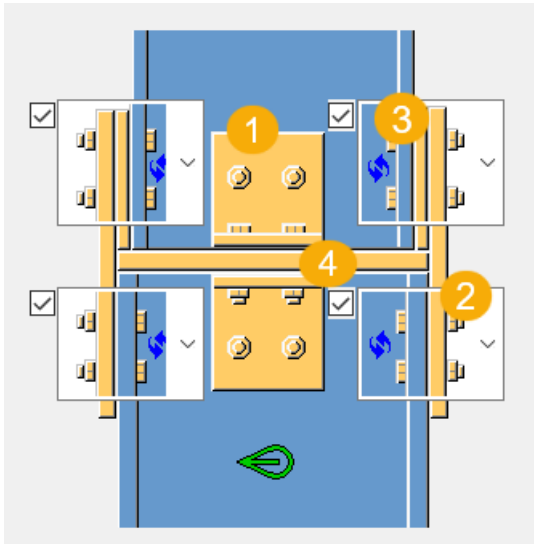
The columns must have a common center line or coinciding faces.

### Selection order

1. Select the main part.
2. Select the secondary part.

The connection is created automatically when you select the secondary part.

### Part identification key



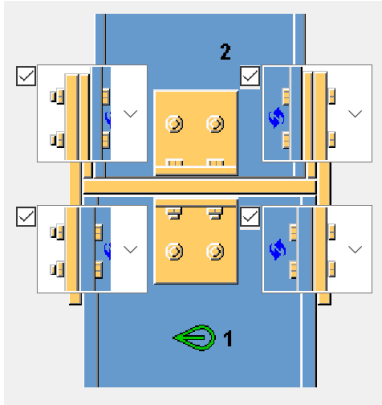
	Description
1	Web plate
2	Flange plate
3	Shim plate
4	Division plate

### Picture tab

Use the **Picture** tab to define the bolting direction of the flange plates and to select whether the plates are bolted or welded.

### Flange plate bolting

Select the bolting direction, or select to weld the plates to both the main part and the secondary part.



Option	Option	Option	Option

**Parts tab**

Use the **Parts** tab to define the part properties.

**Parts**

Option	Description	Default
<b>Web plate</b>	Thickness, width and height of the web plate.	
<b>Ext flange plates</b>	Thickness, width and height of the outer flange plates.	
<b>Int flange plates</b>	Thickness, width and height of the inner flange plates.	

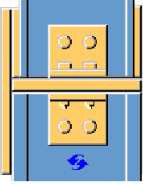
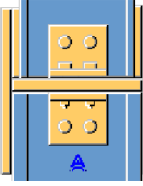
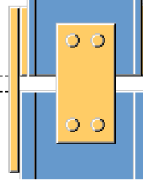
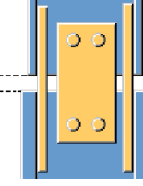
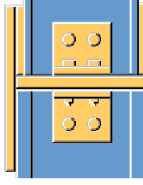
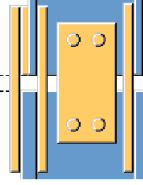
Option	Description	Default
<b>Division plate</b>	Thickness, width and height of the division plate.	The default thickness is 25 mm.
<b>Angle profile</b>	Select the angle profile from the profile catalog.	
<b>Flange spacers</b>	Thickness of the flange shim plates.	
<b>Web spacers</b>	Thickness of the web shim plates.	The default is 2 mm. If you enter a thickness, the largest number of plates of that thickness which fit in the gap will be created.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	



### ***Parameters tab***









Use the **Parameters** tab to define the flange plate and web plate edge cut type, tolerance between the columns, and angle profile and web plate creation.

## Tolerance between columns

Option	Description
	<p>Default</p> <p>No gap between the columns. Division plate is used.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>No gap between the columns. Division plate is used.</p>
	<p>Define the gap between the columns. Outer flange plate is created on one side.</p>
	<p>Define the gap between the columns. Inner flange plates are created.</p>
	<p>No gap between the columns. Division plate is used.</p>
	<p>Define the gap between the columns. Outer and inner flange plates are created.</p>

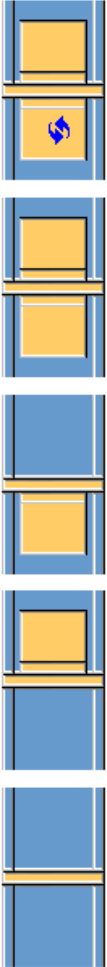
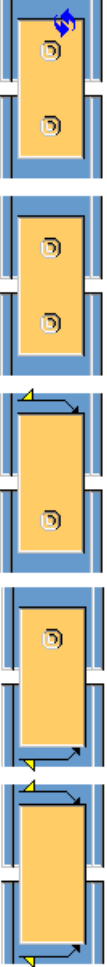
## Angle profile attachment

Option	Option	Description
		<p>Default</p> <p>Angle profile is bolted.</p> <p>AutoDefaults can change this option.</p>

Option	Option	Description
		Angle profile is bolted.
		Angle profile is bolted and welded.
		Angle profile is bolted and welded.
		Angle profile is welded.

### Web plate

Select how the web plate is created. The options depend on whether a division plate or a gap is created between the columns.

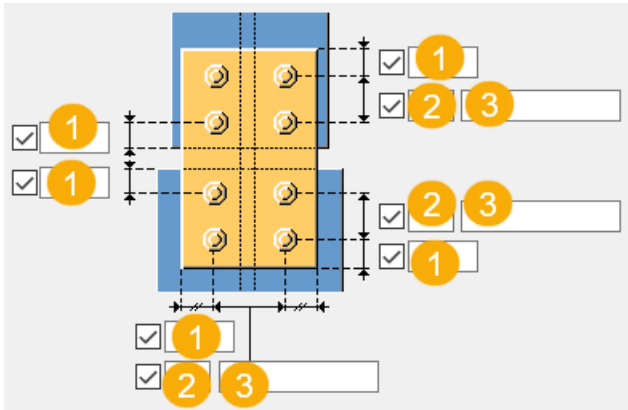
Option	Option
	

***Flange bolt tab***

Use the **Flange bolt** tab to define the bolt group dimensions and bolt properties of flange bolts.



## Bolt group dimensions



	Description
1	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Number of bolts.
	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

## Workshop bolts

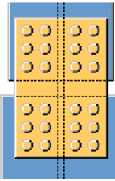
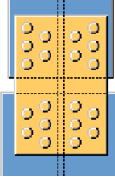
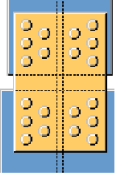
Select to which part the workshop bolts are attached.

- **None:** All bolts are site assembly.
- **Primary member:** Any bolts going to the main part are workshop bolts.
- **Secondary member:** Any bolts going to the secondary part are workshop bolts.

## Staggering

Select an appropriate staggering option.

Option

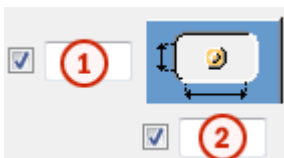
Option




### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### Slotted holes

You can define slotted, oversized, or tapped holes.

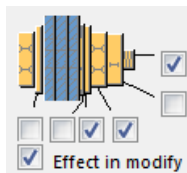


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.









To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



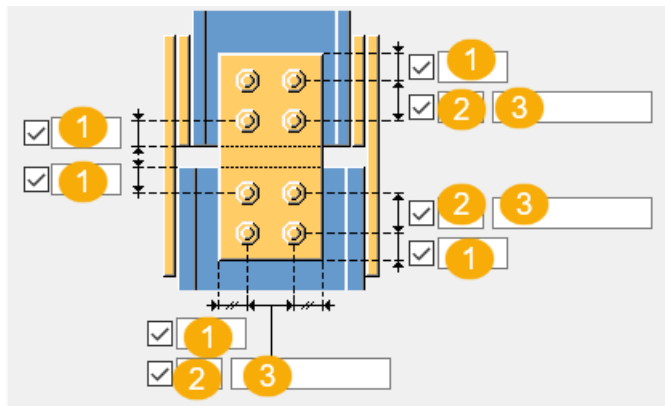
## Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

## Web bolts tab

Use the **Web bolts** tab to define the bolt group dimensions and bolt properties of web bolts.

### Bolt group dimensions



	Description
1	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Number of bolts.

	Description
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

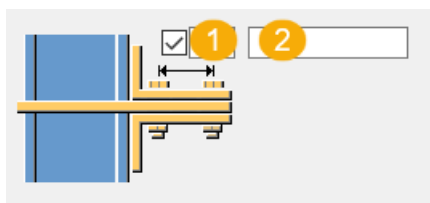
### Workshop bolts

Select to which part the workshop bolts are attached.

- **None:** All bolts are site assembly.
- **Primary member:** Any bolts going to the main part are workshop bolts.
- **Secondary member:** Any bolts going to the secondary part are workshop bolts.

### Angle bolts

Select where the angle bolts are attached: site or workshop.



	Description
1	Number of bolts.
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### General tab

Click the link below to find out more:

### Design tab

Click the link below to find out more:

If a division plate is used, the bearing is always **Yes**. The bearing is set to **No** only if the tolerance between the parts is  $> 0$  mm.

### ***Analysis tab***

Click the link below to find out more:

### ***Welds***

Click the link below to find out more:

## **2.6 Joist connections**

This section introduces Tekla Structures joist connection components.

- [Joist to beam, type 1 \(160\) \(page 942\)](#)
- [Joist to column, type 1 \(161\) \(page 951\)](#)
- [2-Sided joist to column \(162\) \(page 966\)](#)
- [Joist to column, type 2 \(163\) \(page 982\)](#)
- [Joist to beam and column \(164\) \(page 1001\)](#)

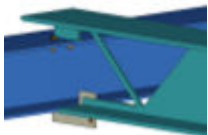
### **Joist to beam, type 1 (160)**

**Joist to beam, type 1 (160)** creates a bolted connection between a beam and a joist. You can define the seat angle size and bolt locations.

#### **Objects created**

- Stabilizer plate
- Bearing plate
- Bolts
- Welds

#### **Use for**

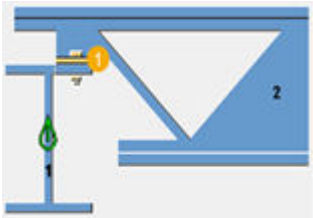
<b>Situation</b>	<b>Description</b>
	Joist connected to a beam. Stabilizer plate is created at the bottom.

### Selection order

1. Select the main part (beam).
2. Select the secondary part (joist).

The connection is created automatically when the secondary part is selected.

### Part identification key

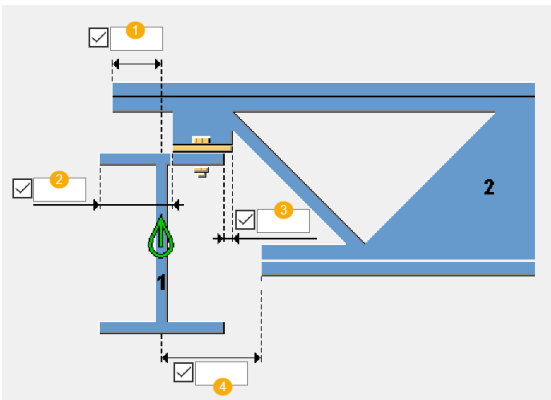


	Description
1	Stabilizer plate

### Picture tab

Use the **Picture** tab to define the connection dimensions.

### Dimensions



	Description	Default
1	Top cord offset from the main part center line	
2	Top cord notch dimension to the main part part edge	
3	Main part offset from the top cord inner edge	
4	Cutback distance from the bottom cord edge to the main part center line	1/2 width of the main part flange + 1"

### Stabilizer tab


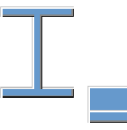

Use the **Stabilizer** tab to define the stabilizer properties and position.

#### Parts


Option	Description
<b>Plate</b>	Thickness, width, and height of the stabilizer plate

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

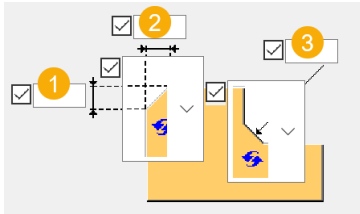
#### Stabilizer creation

Option	Description
	Default Stabilizer is not created. AutoDefaults can change this option.
	Stabilizer is not created.
	Stabilizer is created at the main part flange.



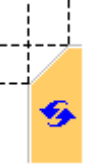

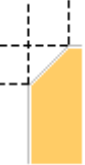

Option	Description
	<p>Stabilizer is created at the main part web.</p> <p>Define the chamfer dimensions of the stabilizer plate.</p>


### Chamfer dimensions



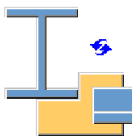


	Description
1	Vertical chamfer dimension
2	Horizontal chamfer dimension
3	Chamfer radius

### Chamfer type

Option	Description
	<p>Default.</p> <p>Line chamfer</p> <p>AutoDefaults can change this option.</p>
	<p>No chamfer</p>
	<p>Line chamfer</p>
	<p>Convex arc chamfer</p>

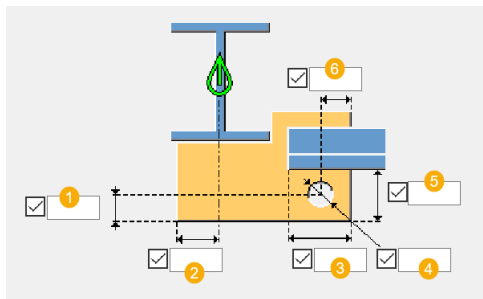
Option	Description
	Concave arc chamfer

### Stabilizer notch direction

Option	Description
	Default Notch direction upwards AutoDefaults can change this option.
	Notch direction upwards
	Notch direction downwards

### Dimensions

The stabilizer is created at the main part flange.

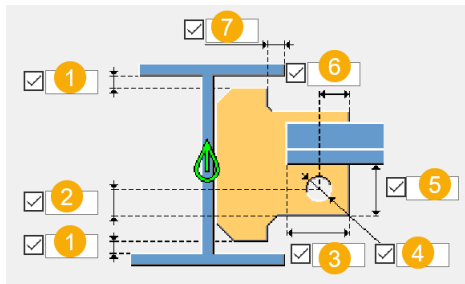


	Description	Default
<b>1</b>	Vertical dimension to the hole center The dimension is measured in the plane of the stabilizer plate.	1.5 x hole diameter
<b>2</b>	Stabilizer offset from the main part center line The dimension is measured along the center line of the stabilizer plate.	½"
<b>3</b>	Overlap length of the bottom cord on the stabilizer plate	3"

	Description	Default
4	Diameter of the hole for cables	13/16"
5	Vertical offset of the stabilizer plate from the bottom cord of the joist	3"
6	Horizontal dimension to the hole center The dimension is measured in the plane of the stabilizer plate.	1.5 x hole diameter

### Dimensions

The stabilizer is created at the main part web.



	Description
1	Vertical edge dimension from the stabilizer plate to the main part flange
2	Vertical dimension to the hole center
3	Overlap length of the bottom cord on the stabilizer plate
4	Diameter of the hole for cables
5	Vertical offset of the stabilizer plate from the bottom cord of the joist
6	Horizontal dimension to the hole center
7	Horizontal edge dimension from the stabilizer notch to the main part edge

### ***Bearing plate tab***

Use the **Bearing plate** tab to define the bearing plate properties.

### Parts

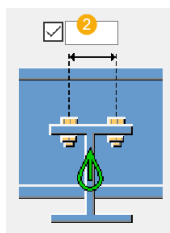
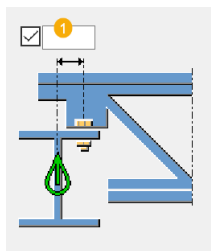
Option	Description
<b>Bearing plate</b>	Thickness and width of the bearing plate

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Bolts tab**

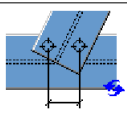
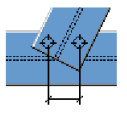
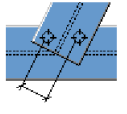
Use the **Bolts** tab to define the bolt properties and the position of the bolts.

### **Dimensions**



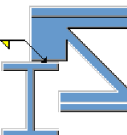


	Description
<b>1</b>	Distance from the center line of the main part to the center line of the bolts
<b>2</b>	Bolt spacing

### Bolt orientation

Option	Description
	Default Bolts are placed square to the main part. AutoDefaults can change this option.
	Bolts are placed square to the main part.
	Bolts are placed square to the joist.

### Bolt creation

Option	Description
	Default Secondary part is bolted to the main part. AutoDefaults can change this option.
	Secondary part is bolted to the main part.
	Secondary part is welded to the main part.

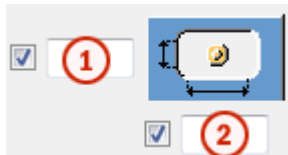
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	

Option	Description	Default
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

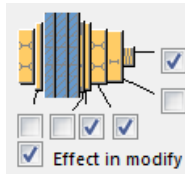


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

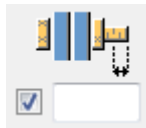
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

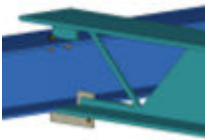
## **Joist to column, type 1 (161)**

**Joist to column, type 1 (161)** creates a bolted connection between a column and a joist, and includes seat angles, cap plate, and stabilizer, either as bolted or welded connections.

### Objects created

- Cap plate
- Bearing plate
- Seat angle
- Stabilizer plate
- Bolts
- Welds

### Use for

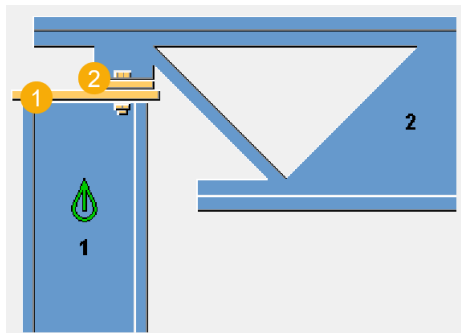
Situation	Description
	Joist connected to a column. Cap plate is bolted to the joist. Stabilizer plate is created and bolted to the joist.

### Selection order

1. Select the main part (column).
2. Select the secondary part (joist).

The connection is created automatically when the secondary part is selected.

### Part identification key



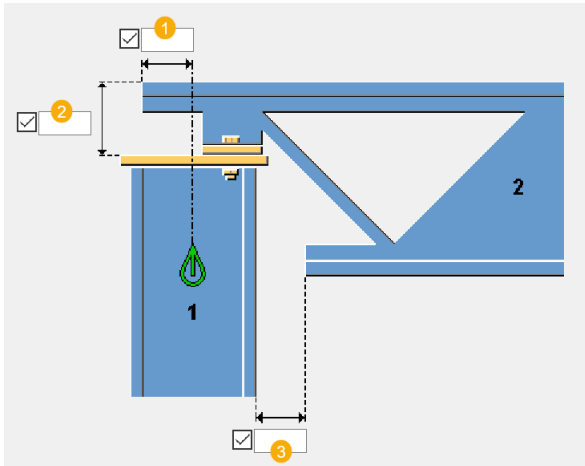
	Description
1	Cap plate
2	Bearing plate

### Picture tab

Use the **Picture** tab to define the connection dimensions.



## Dimensions

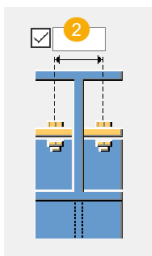
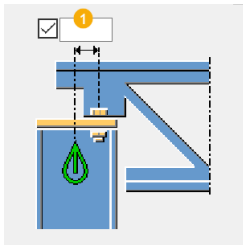


	Description	Default
1	Top cord offset from the main part center line	0
2	Vertical dimension from the top of the cap plate to the top of the joist	2-1/2"
3	Cutback distance of the bottom cord from the main part flange	1"

## Bolts tab

Use the **Bolts** tab to define the bolt properties and the position of bolts.



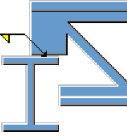
## Dimensions



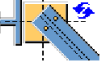
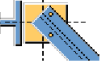
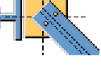
	Description	Default
1	Distance from the main part center line to the center line of the bolt	I-profile columns: 1/2 the thickness of the

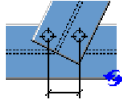
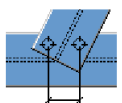
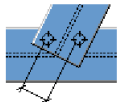
	Description	Default
		main part web + 1-1/2 times the bolt diameter  Tube steel columns: 1/2 the width or length of the column (depending on orientation) + 1-1/2 "
2	Bolt spacing	4 "

### Bolt creation

Option	Description
	Default Joist is bolted to the main part. AutoDefaults can change this option.
	Joist is bolted to the main part.
	Joist is welded to the main part.

### Bolt orientation

Option	Description
	Default Creates the bolts square to the joist. AutoDefaults can change this option.
	Creates the bolts square to the cap plate.
	Creates the bolts square to the joist.

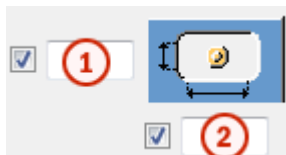
Option	Description
	Default Bolts are placed square to the main part. AutoDefaults can change this option.
	Bolts are placed square to the main part.
	Bolts are placed square to the joist.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

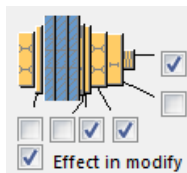


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<p><b>Slotted</b> creates slotted holes.</p> <p><b>Oversized</b> creates oversized or tapped holes.</p> <p><b>No hole</b> does not create holes.</p>	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Plate tab

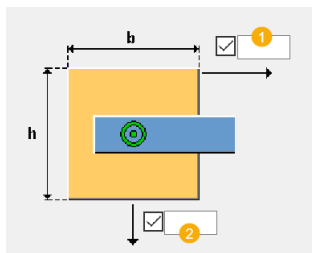
Use the **Plate** tab to define the cap plate properties and dimensions.

## Parts

	Description	Default
<b>Plate</b>	Thickness, width, and height of the cap plate	Thickness: ¼"  By default, the plate is square and both sides of the plate are equal (plate side = (largest value for column width or column height) + 2 X 3"), so the default plate is ¼" X plate side X plate side.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

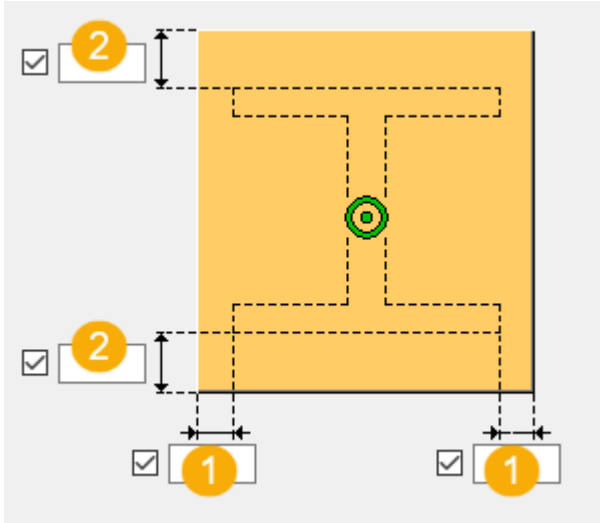
## Cap plate offset



	Description
1	Horizontal offset from the main part
2	Vertical offset from the main part




### Cap plate dimensions

Define the width and length of the cap plate.






	Description
1	Horizontal offset from the main part edge
2	Vertical offset from the main part edge

### Cap plate orientation

Option	Description
	Default Cap plate orientation matches the skewed joist. AutoDefaults can change this option.
	Cap plate orientation matches the skewed joist.
	Cap plate is square to the main part.

## Cap plate slope

Option	Description
	Default Cap plate is aligned with the sloping joist. AutoDefaults can change this option.
	Cap plate is aligned with the sloping joist.
	Cap plate is placed flat at the top of the main part.

## ***Bearing plate tab***

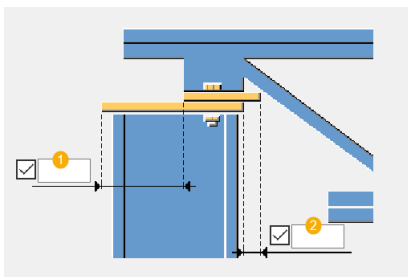
Use the **Bearing plate** tab to define the bearing plate properties, dimensions, and the connection method.

## Parts

Option	Description
<b>Bearing plate</b>	Thickness and width of the bearing plate

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

## Dimensions



	Description
1	Bearing plate edge dimension from the stabilizer plate edge
2	Bearing plate edge dimension from the main part flange

### **Stabilizer tab**

Use the **Stabilizer** tab to define the stabilizer creation, properties, and position.





### Parts

Option	Description
<b>Plate</b>	Thickness, width, and height of the plate
<b>Angle</b>	Select the profile from the profile catalog.

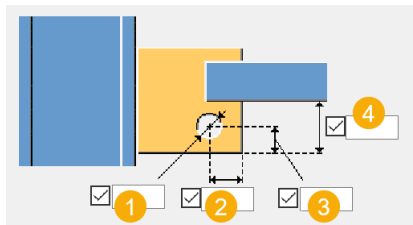
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	



## Stabilizer creation



Option	Description
	Default Stabilizer is not created. AutoDefaults can change this option.
	Stabilizer is not created.
	Stabilizer is created as a plate.
	Stabilizer is created as a seat angle.




## Stabilizer plate dimensions






	Description	Default
1	Cable hole diameter	13/16"
2	Horizontal dimension from the edge of the stabilizer plate to the center of the hole	1.5 X hole diameter
3	Vertical dimension from the edge of the stabilizer plate to the center of the hole	1.5 X hole diameter
4	Vertical dimension from the lower chord of the joist to the bottom of the stabilizer plate	3"

## Stabilizer connection type

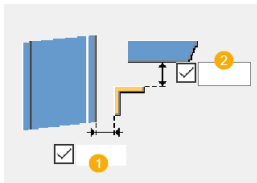
Option	Description
	Default No connection between the stabilizer plate and the joist AutoDefaults can change this option.
	No connection between the stabilizer plate and the joist

Option	Description
	Stabilizer plate is welded to the joist.
	Stabilizer plate is bolted to the joist.
	Stabilizer plate is bolted and welded to the joist.

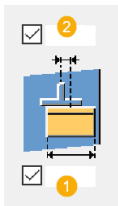
### Stabilizer orientation

Option	Description
	Default Stabilizer plate is aligned with the sloping joist. AutoDefaults can change this option.
	Stabilizer plate is aligned with the sloping joist.
	Stabilizer plate is created square to the main part.

### Seat angle dimensions






	Description
1	Horizontal offset of the seat angle
2	Vertical offset of the seat angle



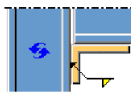
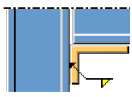
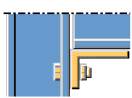
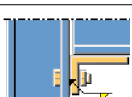
	Description	Default
1	Horizontal offset of the seat angle	0
2	Length of the seat angle	For stabilizers bolted to the column: Bolt

	Description	Default
		<p>pitch /slope specified in the joints.def file + 2- ¼" (this gives a correct angle length for ¾" diameter bolts)</p> <p>For stabilizers welded to the column: Width of the joist</p>


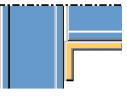
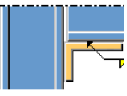
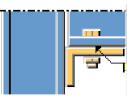
### Seat angle orientation

Option	Description
	<p>Default</p> <p>Longest leg of the seat angle is horizontal.</p> <p>AutoDefaults can change this option.</p>
	<p>Longest leg of the seat angle is horizontal.</p>
	<p>Longest leg of the seat angle is vertical.</p>

### Seat to column

Option	Description
	<p>Default</p> <p>Seat is welded to the main part.</p> <p>AutoDefaults can change this option.</p>
	<p>Seat is welded to the main part.</p>
	<p>Seat is bolted to the main part.</p>
	<p>Seat is bolted and welded to the main part.</p>

## Seat to joist

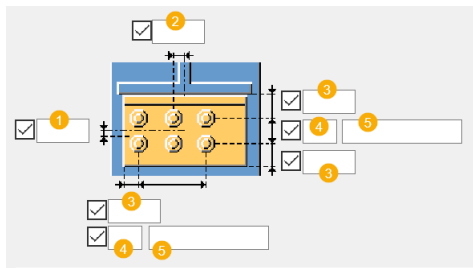
Option	Description
	Default No connection between the seat and the joist. AutoDefaults can change this option.
	No connection between the seat and the joist.
	Seat is welded to the joist.
	Seat is bolted and welded to the joist.

## Stabilizer angle bolts tab

Use the **Stabilizer angle bolts** tab to define the bolt properties and bolt group dimensions in the stabilizer angle connection.

If you have selected to create the stabilizer as a seat angle, the settings on this tab control both the stabilizer seat angle bolts and the main part bolts. If you have selected to create the stabilizer as a plate, only the main part bolts are affected.

## Dimensions



	Description
1	Dimension for vertical bolt group position.
2	Dimension for horizontal bolt group position.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Number of bolts.

	Description
5	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

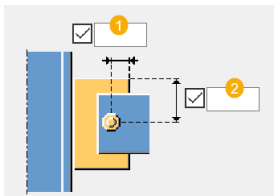
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### ***Stabilizer plate bolts tab***

Use the **Stabilizer plate bolts** tab to define the bolt properties and bolt group dimensions of the stabilizer plate bolts.

### Bolt group dimensions



	Description
1	Horizontal bolt edge distance
2	Vertical bolt edge distance

### **Bolt basic properties**

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### ***General tab***

Click the link below to find out more:

General tab

### ***Design tab***

Click the link below to find out more:

Design tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:


## 2-Sided joist to column (162)

**2-Sided joist to column (162)** creates a bolted connection between a column and two joists. You can define a seat angle and bolt locations.

### Objects created

- Cap plate
- Moment plate
- Stabilizer plate
- Bolts
- Welds

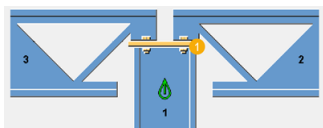
### Use for

Situation	Description
	Two joists connected to a column with a bolted connection.

### Selection order

1. Select the main part (column).
2. Select the first secondary part (joist).
3. Select the second secondary part (joist).
4. Click the middle mouse button to create the connection.

### Part identification key

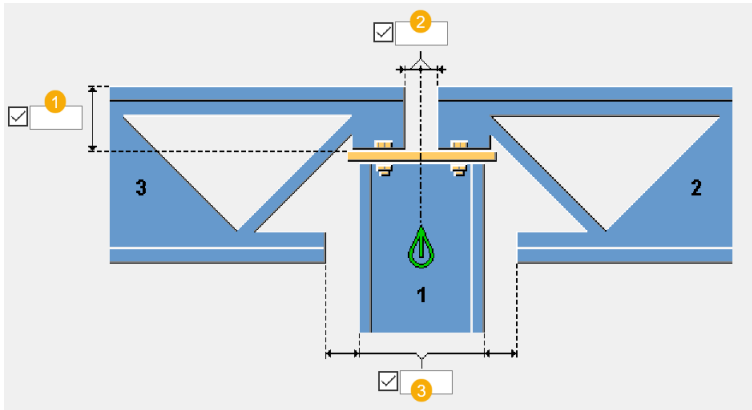


	Description
1	Cap plate

### Picture tab

Use the **Picture** tab to define the connection dimensions.

## Dimensions

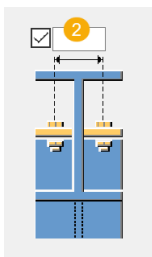
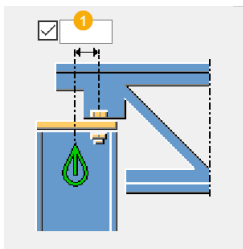


	Description	Default
1	Vertical height of the joist from the top of the cap plate to the top of the joist	2-1/2"
2	Top cord joist offset from the center line of the main part	0
3	Cutback distance of the secondary part bottom cord from the main part	

### ***Bolts tab***

Use the **Bolts** tab to define the bolt properties and the position of bolts in the seat angle connection.



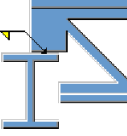
### **Bolt group dimensions**






	Description	Default
1	Distance from the main part center line to the center line of the bolt	For I profile columns: 1/2 the thickness of the main part web + 1-1/2 times the bolt diameter  For tube steel columns: 1/2 the width or length of the column (depending on orientation) + 1-1/2 "
2	Bolt spacing	

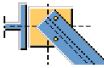
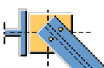
### Joist attachment

Option	Description
	Default Joist is bolted to the main part. AutoDefaults can change this option.
	Joist is bolted to the main part.
	Joist is welded to the main part.

### Bolt orientation

This option controls whether the bolts in the cap plate are square to the column or the joist.

Option	Description
	Default Bolts are placed square to the joist. AutoDefaults can change this option.

Option	Description
	Bolts are placed square to the joist.
	Bolts are placed square to the main part.

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



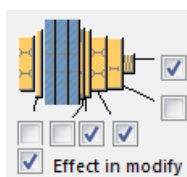
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.

Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

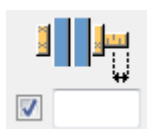
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Cap plate tab

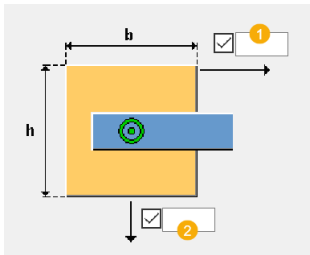
Use the **Cap plate** tab to define the cap plate properties and dimensions.

#### Parts

Option	Description
<b>Cap plate</b>	Thickness, width, and height of the cap plate

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

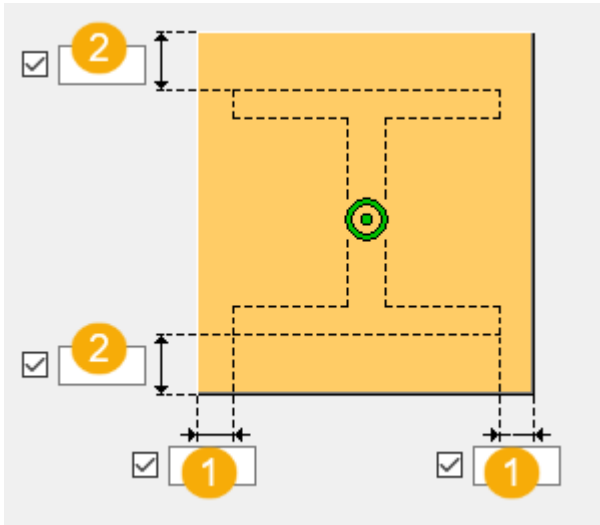
### Cap plate offset



	Description
<b>1</b>	Horizontal offset from the main part
<b>2</b>	Vertical offset from the main part

### Cap plate dimensions

Define the width and length of the cap plate.



	Description
1	Horizontal offset from the main part edge
2	Vertical offset from the main part edge

### Cap plate orientation

Option	Description
	Default Cap plate orientation matches the skewed joint. AutoDefaults can change this option.
	Cap plate orientation matches the skewed joint.
	Cap plate is square to the main part.

### Cap plate slope

Option	Description
	Default Cap plate is aligned with the sloping joist. AutoDefaults can change this option.
	Cap plate is aligned with the sloping joist.
	Cap plate is placed flat at the top of the main part.

### **Moment plate tab**




Use the **Moment plate** tab to define the plate creation, properties, and offsets.

#### **Parts**

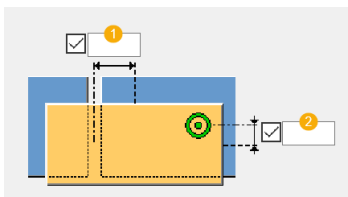
<b>Option</b>	<b>Description</b>
<b>Moment plate</b>	Thickness, width, and height of the moment plate

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

#### **Moment plate creation**

<b>Option</b>	<b>Description</b>
	Default Moment plate is not created. AutoDefaults can change this option.
	Moment plate is not created.
	Moment plate is created.

## Moment plate offset



	Description
1	Horizontal offset from the center line of the main part
2	Vertical offset from the center line of the main part

## Stabilizer tab





Use the **Stabilizer** tab to define the stabilizer creation, properties, and position.

### Parts

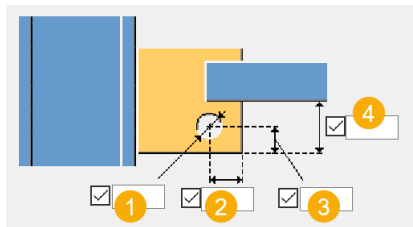
Option	Description
Plate NS, Plate FS	Thickness, width, and height of the plate
Angle NS, Angle FS	Select the profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

## Stabilizer creation

Option	Description
	Default Stabilizer is not created. AutoDefaults can change this option.
	Stabilizer is not created.
	Stabilizer is created as a plate.
	Stabilizer is created as a seat angle.



## Stabilizer plate dimensions






	Description	Default
1	Cable hole diameter	13/16"
2	Horizontal dimension from the edge of the stabilizer plate to the center of the hole	1.5 X hole diameter
3	Vertical dimension from the edge of the stabilizer plate to the center of the hole	3
4	Vertical dimension from the lower chord of the joist to the bottom of the stabilizer plate	1.5 X hole diameter

## Stabilizer connection type




Define how the stabilizer plate is attached to the bottom cord of the joist.

Option	Description
	Default No connection between the stabilizer plate and the joist AutoDefaults can change this option.
	No connection between the stabilizer plate and the joist

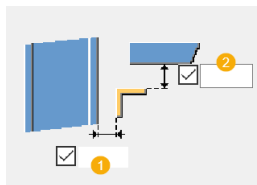


Option	Description
	Stabilizer plate is welded to the joist.
	Stabilizer plate is bolted to the joist.
	Stabilizer plate is bolted and welded to the joist.

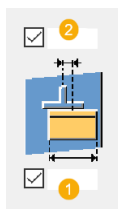
### Stabilizer orientation

Option	Description
	Default Stabilizer plate is aligned with the sloping joist. AutoDefaults can change this option.
	Stabilizer plate is aligned with the sloping joist.
	Stabilizer plate is created square to the main part.

### Seat angle dimensions






	Description
1	Horizontal offset of the seat angle
2	Vertical offset of the seat angle




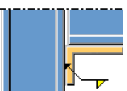


	Description	Default
1	Horizontal offset of the seat angle	
2	Length of the seat angle	For stabilizers bolted to column: Bolt

	Description	Default
		<p>pitch specified in the joints.def file + 2- ¼" (this gives the correct angle length for ¾" diameter bolts)</p> <p>For stabilizers welded to column: Width of the joist</p>





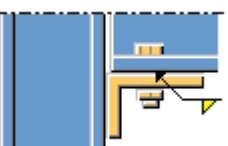
### Seat angle orientation

Option	Description
	<p>Default</p> <p>Longest leg of the seat angle is horizontal.</p> <p>AutoDefaults can change this option.</p>
	<p>Longest leg of the seat angle is horizontal.</p>
	<p>Longest leg of the seat angle is vertical.</p>

### Seat to column

Option	Description
	<p>Default</p> <p>Seat is welded to the main part.</p> <p>AutoDefaults can change this option.</p>
	<p>Seat is welded to the main part.</p>
	<p>Seat is bolted to the main part.</p>
	<p>Seat is bolted and welded to the main part.</p>

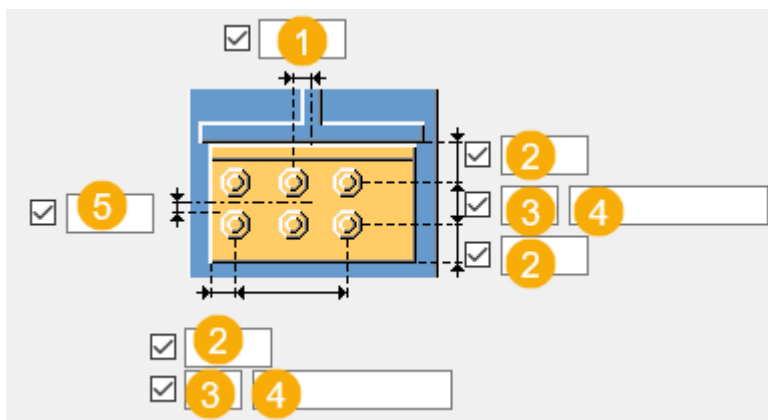
## Seat to joist

Option	Description
	Default No connection between the seat and the joist AutoDefaults can change this option.
	No connection between the seat and the joist
	Seat is welded to the joist.
	Seat is bolted to the joist.
	Seat is bolted and welded to the joist.

### ***Stabilizer angle bolts tab***

Use the **Stabilizer angle bolts** tab to define the bolt group dimensions and the properties of the stabilizer angle bolts. If you have selected on the **Stabilizer** tab that the stabilizer is created as a seat angle, the settings on this tab affect both angles. If the stabilizer is created as a plate, the settings only affect the main part clip angle.

## Dimensions



	Description
<b>1</b>	Dimension for horizontal bolt group position.
<b>2</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>3</b>	Number of bolts.
<b>4</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>5</b>	Dimension for vertical bolt group position.

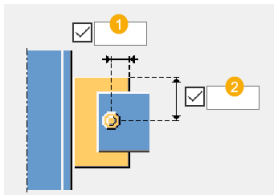
Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

Option	Description	Default
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### ***Stabilizer plate bolts tab***

Use the **Stabilizer plate bolts** tab to define the position and properties of the stabilizer plate bolts.

#### **Bolt position**



	Description	Default
<b>1</b>	Horizontal bolt edge distance	1-1/2"
<b>2</b>	Vertical bolt edge distance	Vertical midpoint of the plate

#### **Bolt basic properties**

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### ***General tab***

Click the link below to find out more:

General tab

### ***Design tab***

Click the link below to find out more:

Design tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

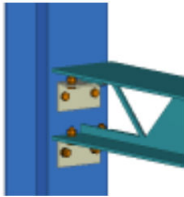
## **Joist to column, type 2 (163)**

**Joist to column, type 2 (163)** creates a bolted connection between a column and a joist. You can define a seat angle and bolt locations.

### **Objects created**

- Seat angle
- Horizontal plate
- Vertical plate
- Stiffeners
- Bearing plate
- Stabilizer plate
- Bolts
- Welds

## Use for

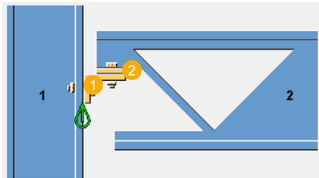
Situation	Description
	Joist is bolted to a column. Seat angle is created.

## Selection order

1. Select the main part (column).
2. Select the secondary part (joist).

The connection is created automatically when the secondary part is selected.

## Part identification key

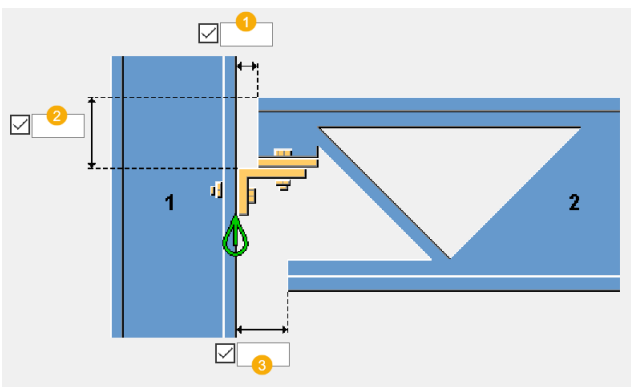


	Description
1	Seat angle
2	Bearing plate

## Picture tab

Use the **Picture** tab to define the connection dimensions.

## Dimensions



	Description	Default
1	Gap dimension between the main part and the upper cord of the joist	1 "
2	Vertical dimension from the seat angle to the secondary part top	2-1/2"
3	Cutback distance of the secondary part bottom cord from the main part flange	1 "

### **Seat tab**

Use the **Seat** tab to define the seat type, attachment, bolt orientation, and plate dimensions.






### **Parts**

Option	Description
<b>Seat profile</b>	Select the profile from the profile catalog.
<b>Horizontal plate</b>	Thickness and width of the horizontal plate
<b>Vertical plate</b>	Thickness and height of the vertical plate

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	






## Seat type

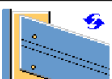
Option	Description
	Default Seat angle is created. Longest leg is aligned with the joist. AutoDefaults can change this option.
	Seat angle is created. Longest leg is aligned with the joist.
	Seat angle is created. Longest leg is aligned with the main part.
	Tee profile is created.
	Built-up tee is created. You can define the dimensions and properties of horizontal and vertical plates when you have selected to create a built-up tee.

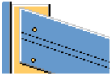
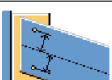
## Seat attachment

This option only works for angle seats and stabilizers.

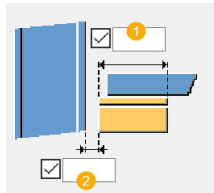
Option	Description
	Default Seat is attached to the main part web. AutoDefaults can change this option.
	Seat is attached to the main part web.
	Seat is attached to the main part flanges.

## Seat bolt orientation

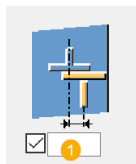
Option	Description
	Default Bolts are aligned with the main part. AutoDefaults can change this option.

Option	Description
	Bolts are aligned with the main part.
	Bolts are aligned with the joist.

### Horizontal plate dimensions

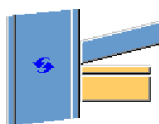

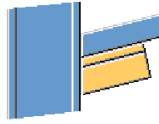


	Description
1	Length of the horizontal plate
2	Offset dimension from the main part

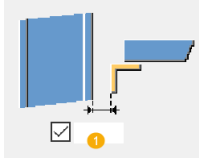


	Description
1	Horizontal offset of the plate

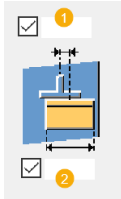
### Horizontal plate alignment

Option	Description
	Default Horizontal plate is aligned perpendicular to the main part. AutoDefaults can change this option.
	Horizontal plate is aligned perpendicular to the main part.
	Horizontal plate is aligned perpendicular to the joist.

## Seat angle dimensions

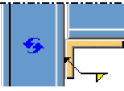
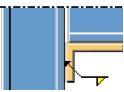




	Description
1	Horizontal offset of the seat angle from the main part edge

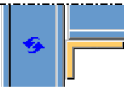


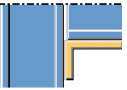
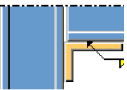


	Description
1	Horizontal offset of the seat angle
2	Length of the seat angle

## Seat to column

Option	Description
	Default Seat is welded to the main part. AutoDefaults can change this option.
	Seat is welded to the main part.
	Seat is bolted to the main part.
	Seat is welded and bolted to the main part.

## Seat to beam

Option	Description
	Default No connection between the seat and the joist AutoDefaults can change this option.

Option	Description
	No connection between the seat and the joist
	Seat is welded to the joist.
	Seat is bolted to the joist.
	Seat is welded and bolted to the joist.

### **Angle seat stiffeners tab**










Use the **Angle seat stiffeners** tab to define the stiffener properties, and stiffener position, shape, and chamfering. Stiffeners are created for seat angles.

#### **Parts**




Option	Description
<b>Stiffeners</b>	Thickness, width, and height of the stiffeners

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Stiffener position

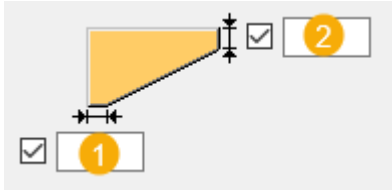
Option	Description
	Default Stiffener is not placed on the seat. AutoDefaults can change this option.
	Stiffener is not placed on the seat.
	Stiffener is placed in the middle.
	Stiffeners are placed on both sides.
	Stiffener is placed on the right side.
	Stiffener is placed on the left side.
	Stiffeners are placed on the right side and in the middle.
	Stiffeners are placed on the left side and in the middle.
	Stiffeners are placed on the left and right side, and in the middle.

### Stiffener shape

	Default Rectangular stiffener AutoDefaults can change this option.
	Rectangular stiffener
	Triangular stiffener

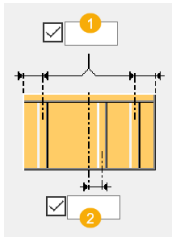
### Stiffener offset dimension

Define the offset of bevel cuts for triangular stiffeners.








	Description
1	Horizontal offset dimension
2	Vertical offset dimension

### Stiffener offsets

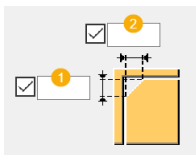


	Description
1	Offset of the end stiffeners from the seat ends
2	Offset of the middle stiffener from the seat center line

### Chamfer type

	Default Chamfer is not created. AutoDefaults can change this option.
	Chamfer is not created.
	Line chamfer
	Covex chamfer
	Concave chamfer

### Chamfer dimensions



	Description
1	Vertical chamfer dimension
2	Horizontal chamfer dimension

### **Bearing plate tab**

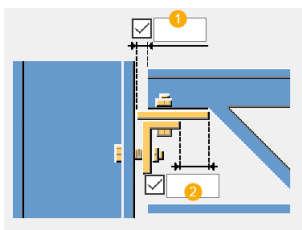
Use the **Bearing plate** tab to define the bearing plate properties, dimensions, and connection method.

### **Parts**

Option	Description
<b>Bearing plate</b>	Thickness and width of the bearing plate

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Dimensions**



	Description
1	Bearing plate dimension from the secondary part edge
2	Bearing plate dimension to the seat angle edge

### **Stabilizer tab**





Use the **Stabilizer** tab to define the stabilizer creation, properties, and position.

#### **Parts**

<b>Part</b>	<b>Description</b>
<b>Plate</b>	Thickness, width, and height of the stabilizer plate
<b>Angle</b>	Select the profile from the profile catalog.

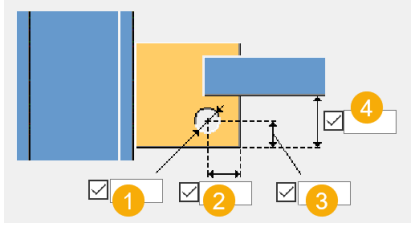
<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

#### **Stabilizer creation**

<b>Option</b>	<b>Description</b>
	Default Stabilizer is not created. AutoDefaults can change this option.
	Stabilizer is not created.
	Stabilizer is created as a plate.
	Stabilizer is created as a seat angle.



## Stabilizer plate dimensions




	Description	
1	Hole diameter	13/16"
2	Horizontal dimension from the edge of the stabilizer plate to the center of the hole	1.5 X hole diameter
3	Vertical dimension from the edge of the stabilizer plate to the center of the hole	3"
4	Vertical dimension from the lower chord of the joist to the bottom of the stabilizer plate	1.5 X hole diameter

## Stabilizer connection type

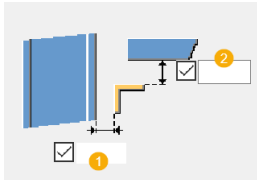
Option	Description
	Default No connection between the stabilizer plate and the joist AutoDefaults can change this option.
	No connection between the stabilizer plate and the joist
	Stabilizer plate is welded to the joist.
	Stabilizer plate is bolted to the joist.
	Stabilizer plate is bolted and welded to the joist.

## Stabilizer orientation

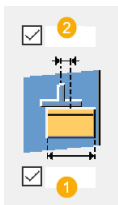
Option	Description
	Default Stabilizer plate is aligned with the sloping joist. AutoDefaults can change this option.
	Stabilizer plate is aligned with the sloping joist.

Option	Description
	Stabilizer plate is created square to the main part.

### Seat angle dimensions






	Description
1	Horizontal offset of the seat angle
2	Vertical offset of the seat angle


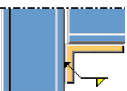




	Description	Default
1	Horizontal offset of the seat angle	
2	Length of the seat angle	<p>For stabilizers bolted to the column: Bolt pitch specified in the <code>joints.def</code> file + 2- ¼" (this gives a correct angle length for ¾" diameter bolts)</p> <p>For stabilizers welded to the column: Width of the joist</p>

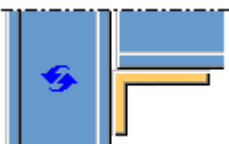

### Seat angle orientation

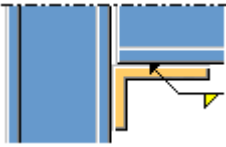


Option	Description
	Default Longest leg of the seat angle is horizontal. AutoDefaults can change this option.
	Longest leg of the seat angle is horizontal.
	Longest leg of the seat angle is vertical.

### Seat to column

Option	Description
	Default Seat is welded to the main part. AutoDefaults can change this option.
	Seat is welded to the main part.
	Seat is bolted to the main part.
	Seat is bolted and welded to the main part.

### Seat to joist

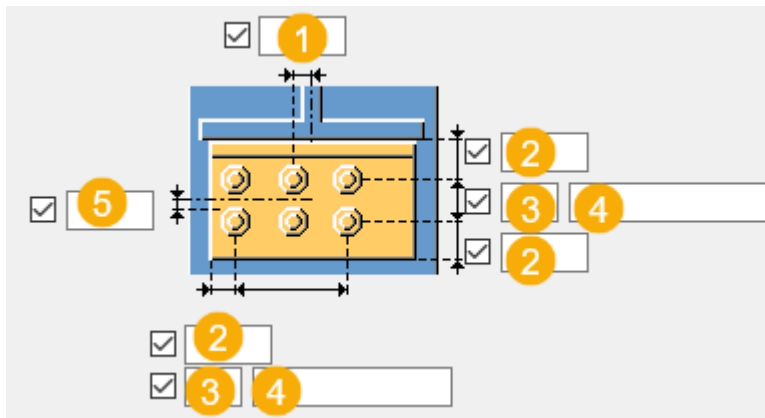
Option	Description
	Default No connection between the seat and the joist AutoDefaults can change this option.
	No connection between the seat and the joist

Option	Description
	Seat is welded to the joist.
	Seat is bolted to the joist.
	Seat is bolted and welded to the joist.

### Seat bolts tab

Use the **Seat bolts** tab to define bolt group dimensions and bolt properties of the seat angle and tee type plate bolts.

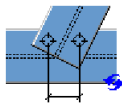
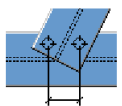
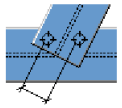
### Bolt group dimensions



	Description
<b>1</b>	Dimension for horizontal bolt group position.
<b>2</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>3</b>	Number of bolts.

	Description
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Dimension for vertical bolt group position.

### Bolt orientation

Option	Description
	Default Bolts are placed square to the main part. AutoDefaults can change this option.
	Bolts are placed square to the main part.
	Bolts are placed square to the joist.

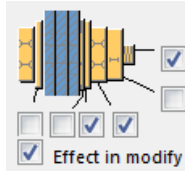
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## Bolt length increase

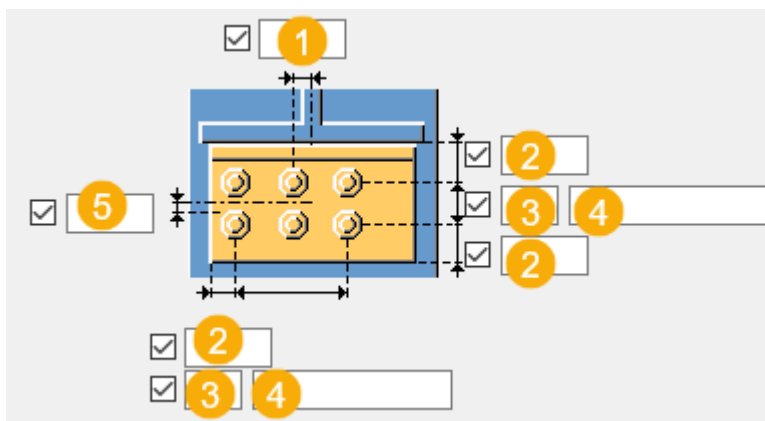
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## Stabilizer angle bolts tab

Use the **Stabilizer angle bolts** tab to define the bolt group dimensions and the properties of the stabilizer angle bolts. If you have selected on the **Stabilizer** tab that the stabilizer is created as a seat angle, the settings on this tab affect both angles. If the stabilizer is created as a plate, the settings only affect the main part clip angle.

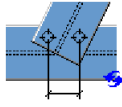
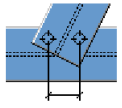
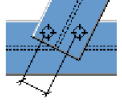
## Bolt group dimensions



	Description
1	Dimension for horizontal bolt group position.

	<b>Description</b>
<b>2</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>3</b>	Number of bolts.
<b>4</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>5</b>	Dimension for vertical bolt group position.

### Bolt orientation

<b>Option</b>	<b>Description</b>
	Default Bolts are placed square to the main part. AutoDefaults can change this option.
	Bolts are placed square to the main part.
	Bolts are placed square to the joist.

### Bolt basic properties

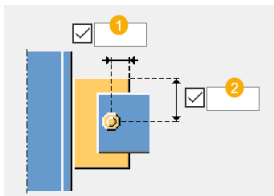
<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### ***Stabilizer plate bolts tab***

Use the **Stabilizer plate bolts** tab to define the position and properties of the stabilizer plate bolts.

#### **Bolt position**



	Description	Default
<b>1</b>	Horizontal bolt edge distance	1-1/2"
<b>2</b>	Vertical bolt edge distance	Vertical midpoint of the plate

#### **Bolt basic properties**

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes



Option	Description	Default
	bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### ***General tab***

Click the link below to find out more:

General tab

### ***Design tab***

Click the link below to find out more:

Design tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

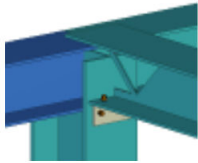
## **Joist to beam and column (164)**

**Joist to beam and column (164)** creates a connection between a column, beam, and joist. You can define a seat angle, cap plate, and bolt locations.

### **Objects created**

- Bearing plate
- Stabilizer plate
- Bolts
- Welds

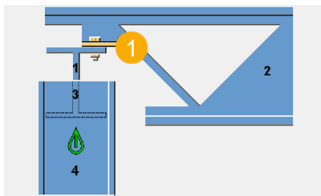
## Use for

Situation	Description
	Joist bolted to a column

## Selection order

1. Select the main part (column).
2. Select the first secondary part (beam).
3. Select the second secondary part (beam).
4. Click the middle mouse button to create the connection.

## Part identification key

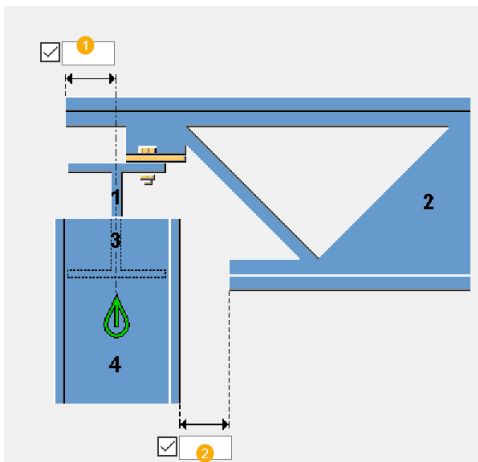


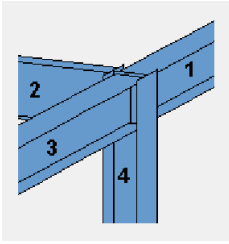
	Description
1	Bearing plate

## Picture tab

Use the **Picture** tab to define the connection dimensions.

## Dimensions





	Description
1	Top cord offset from the column center line
2	Cutback distance of the secondary part bottom cord from the main part

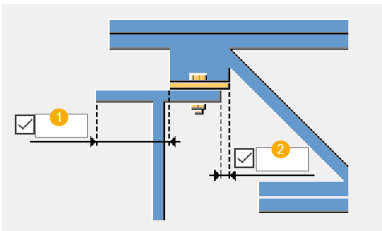
### ***Bearing plate tab***

Use the **Bearing plate** tab to define the bearing plate properties, dimensions, and the connection method.

### **Part**

Part	Description
<b>Bearing plate</b>	Thickness and width of the bearing plate

### **Dimensions**

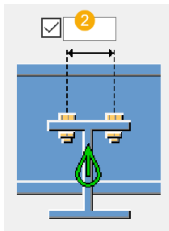
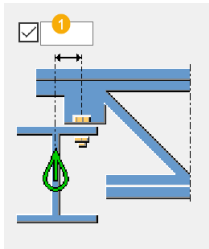


	Description
1	Bearing plate edge dimension to the main part edge
2	Bearing plate inner edge dimension to the main part edge

### ***Bolts tab***


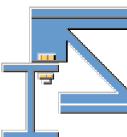
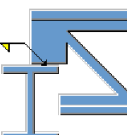
Use the **Bolts** tab to define bolt properties and the position of bolts in the seat angle connection.

## Bolt group dimensions

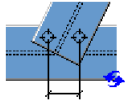


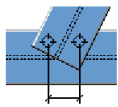
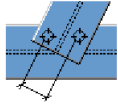
	Description
1	Distance from the main part center line to the center line of the bolt
2	Bolt spacing

## Joist attachment

Option	Description
	Default Joist is bolted to the main part. AutoDefaults can change this option.
	Joist is bolted to the main part.
	Joist is welded to the main part.

## Bolt orientation

Option	Description
	Default Bolts are placed square to the main part. AutoDefaults can change this option.

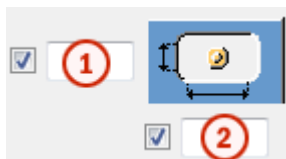
Option	Description
	Bolts are placed square to the main part.
	Bolts are placed square to the joist.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



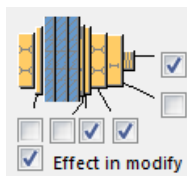
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.

Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Stabilizer tab

Use the **Stabilizer** tab to define the stabilizer creation, properties, and position.





### Parts

Option	Description
<b>Plate</b>	Thickness, width, and height of the stabilizer plate

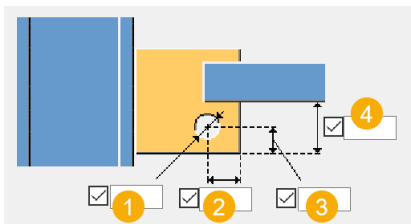
Option	Description
Angle	Select the profile from the profile catalog.

Option	Description	Default
Pos_No	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
Material	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
Name	Name that is shown in drawings and reports.	

### Stabilizer creation






Option	Description
	Default Stabilizer is not created. AutoDefaults can change this option.
	Stabilizer is not created.
	Stabilizer is created as a plate.
	Stabilizer is created as a seat angle.

### Stabilizer plate dimensions






	<b>Description</b>	<b>Default</b>
<b>1</b>	Hole diameter	13/16"
<b>2</b>	Horizontal dimension from the edge of the stabilizer plate to the center of the hole	1.5 X hole diameter
<b>3</b>	Vertical dimension from the edge of the stabilizer plate to the center of the hole	3
<b>4</b>	Vertical dimension from the lower chord of the joist to the bottom of the stabilizer plate	1.5 X hole diameter

### Stabilizer connection type

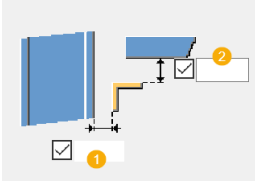
<b>Option</b>	<b>Description</b>
	Default No connection between the stabilizer plate and the joist AutoDefaults can change this option.
	No connection between the stabilizer plate and the joist
	Stabilizer plate is welded to the joist.
	Stabilizer plate is bolted to the joist.
	Stabilizer plate is bolted and welded to the joist.

### Stabilizer orientation

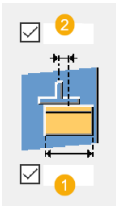
<b>Option</b>	<b>Description</b>
	Default Stabilizer plate is aligned with the sloping joist. AutoDefaults can change this option.
	Stabilizer plate is aligned with the sloping joist.
	Stabilizer plate is created square to the main part.



## Seat angle dimensions






	Description
1	Horizontal offset of the seat angle
2	Vertical offset of the seat angle



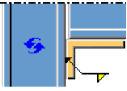



	Description	
1	Horizontal offset of the seat angle	
2	Length of the seat angle	<p>For stabilizers bolted to the column: Bolt pitch specified in the <code>joints.def</code> file + 2- 1/4" (this gives the correct angle length for 3/4" diameter bolts)</p> <p>For stabilizers welded to the column: Width of the joist</p>

## Seat angle orientation



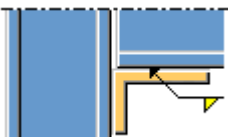

Option	Description
	<p>Default</p> <p>Longest leg of the seat angle is horizontal.</p> <p>AutoDefaults can change this option.</p>
	<p>Longest leg of the seat angle is horizontal.</p>

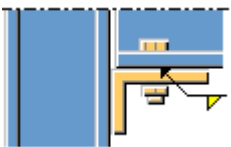
Option	Description
	Longest leg of the seat angle is vertical.

### Seat to column

Option	Description
	Default Seat is welded to the main part. AutoDefaults can change this option.
	Seat is welded to the main part.
	Seat is bolted to the main part.
	Seat is bolted and welded to the main part.

### Seat to joist

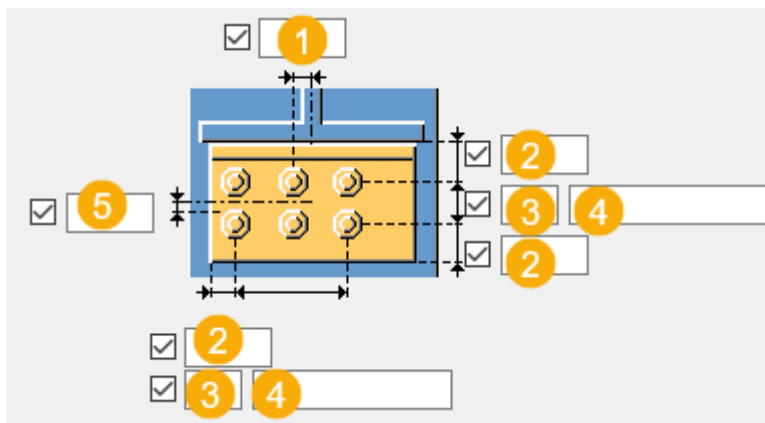
Option	Description
	Default No connection between the seat and the joist AutoDefaults can change this option.
	No connection between the seat and the joist
	Seat is welded to the joist.
	Seat is bolted to the joist.

Option	Description
	Seat is bolted and welded to the joist.

### Stabilizer angle bolts tab

Use the **Stabilizer angle bolts** tab to define the bolt group dimensions and the properties of the stabilizer angle bolts. If you have selected on the **Stabilizer** tab that the stabilizer is created as a seat angle, the settings on this tab affect both angles. If the stabilizer is created as a plate, the settings only affect the main part clip angle.

### Bolt group dimensions



	Description
1	Dimension for horizontal bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Dimension for vertical bolt group position.

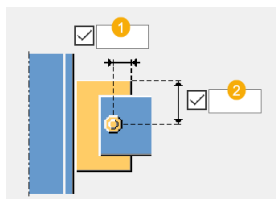
Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.

Option	Description	Default
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### ***Stabilizer plate bolts tab***

Use the **Stabilizer plate bolts** tab to define the position and properties of the stabilizer plate bolts.

#### **Bolt position**



	Description	Default
<b>1</b>	Horizontal bolt edge distance	1-1/2"
<b>2</b>	Vertical bolt edge distance	Vertical midpoint of the plate

#### **Bolt basic properties**

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### ***General tab***

Click the link below to find out more:  
[General tab](#)

### ***Design tab***

Click the link below to find out more:  
[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:  
[Analysis tab](#)

### ***Welds***

Click the link below to find out more:  
[Welds](#)

## **2.7 Welded connections**

This section introduces welded connection components available in Tekla Structures.

- [Cross \(4\) \(page 1014\)](#)
- [Offshore \(9\) \(page 1018\)](#)

- [Fitting \(13\) \(page 1025\)](#)
- [Round tube \(23\) \(page 1029\)](#)
- [Welded column \(31\) \(page 1032\)](#)
- [Welded tee \(32\) \(page 1036\)](#)
- [Weld preparation \(44\) \(page 1050\)](#)
- [New notch \(49\) \(page 1054\)](#)
- [Welded beam to beam \(123\) \(page 1059\)](#)
- [Welded column with stiffeners \(128\) \(page 1068\)](#)
- [Beam prep \(183\) \(page 1088\)](#)
- [Offshore \(194\) \(page 1103\)](#)
- [Doubler plate \(1022\) \(page 1106\)](#)
- [Cap plate detail \(page 1111\)](#)
- [Pipe doubler plate \(page 1117\)](#)
- [Ring plate \(page 1124\)](#)

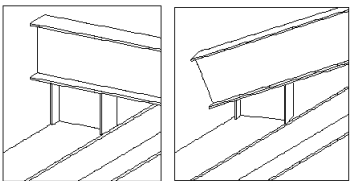
## Cross (4)

**Cross (4)** connects two beams that cross each other by using a profile welded to one of the beams. The beams should not collide with each other. Both horizontal and vertical angles between the profiles can vary.

### Objects created

- Profile
- Welds

### Use for

Situation	Description
	<p>Two beams connected with a welded profile.</p>

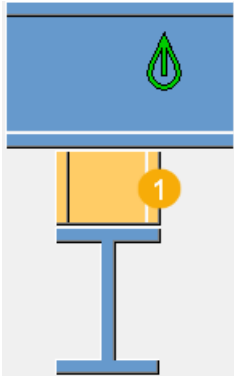
### Selection order

1. Select the main part (beam).

2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key



	Description
1	Profile

### Picture tab

Use the **Picture** tab to define the connection dimensions.

### Secondary part cut

Option	Description
	<p>Define the secondary beam close end cut from the main beam center line.</p> <p>By default, the secondary beam is not cut.</p>

### Parts tab

Use the **Parts** tab to define the part properties.

## Parts

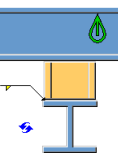
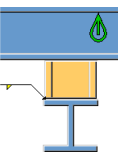
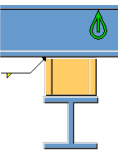
Option	Description
<b>Profile</b>	Select the profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

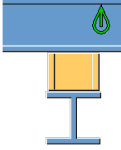
### **Parameters tab**

Use the **Parameters** tab to define the welding location and profile rotation.

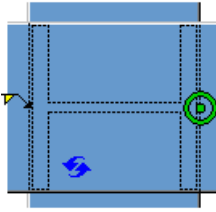
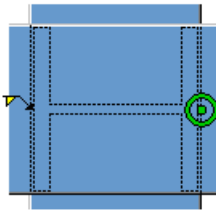
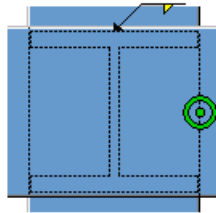
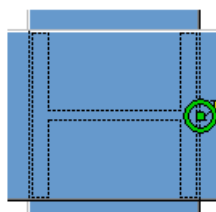
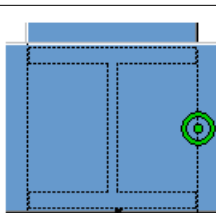
#### **Profile welded to**

Option	Description
	Default Welded to the main part AutoDefaults can change this option.
	Welded to the main part
	Welded to the secondary part



Option	Description
	Not welded

**Profile rotation**

Option	Description
	Default Front AutoDefaults can change this option.
	Front
	Top
	Back
	Below

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

[Design tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

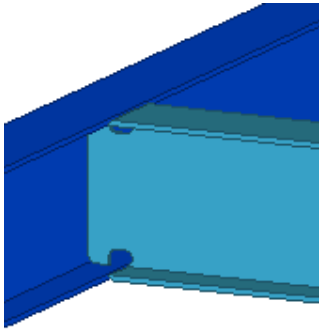
## **Offshore (9)**

**Offshore (9)** connects a beam to another beam with welds. The component is designed to be used in offshore industry for creating notches and complex weld access holes, and to control the notch properties.

### **Objects created**

- Notches
- Welds

### **Use for**

<b>Situation</b>	<b>Description</b>
	Connection between two beams.

## Profile limitations

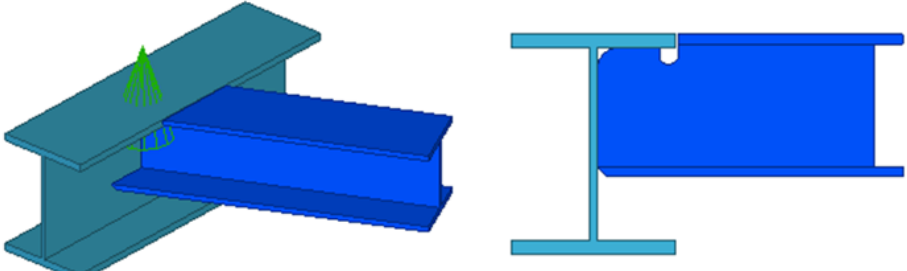
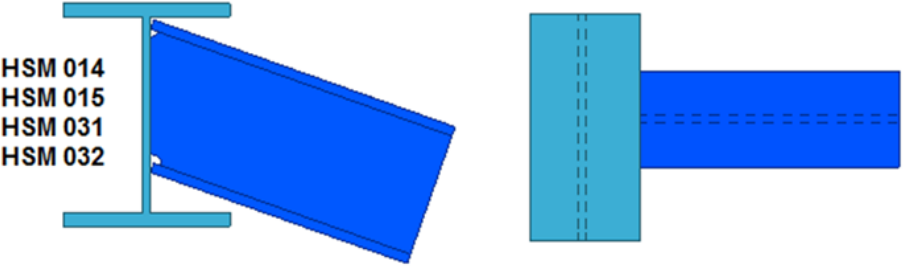
You can create three different notch types:

- **Free**
- **Heerema**
- **HSM**

When creating a **Free** notch type, the main and the secondary beam do not always have to have the same size. You can set them up according to your needs and create the connection.

When creating **Heerema** and **HSM** notch types, the beam size depends on the selected **Heerema** and **HSM** settings.

For all **Free** and **Heerema** types, and most **HSM** types, skewed secondary beams are allowed. Sloped secondary beams are only supported by some specific **HSM** types. See the table below for examples.

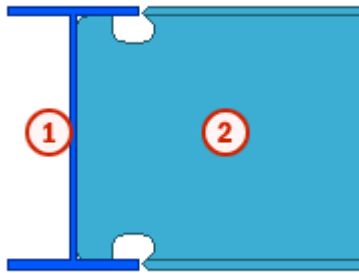
Notch type	Example
Free	
HSM	

## Selection order

1. Select the main part (beam).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

## Part identification key



	Part
1	Beam
2	Beam

### **Picture 1 tab**

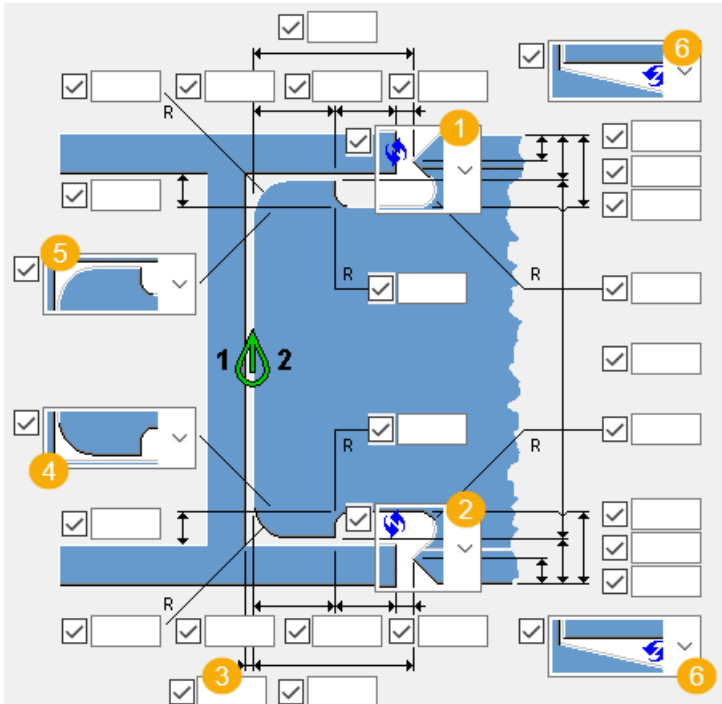
Use the **Picture 1** tab to create notches in the direction of the web.

### **Notch type**

Select the notch type and enter the notch values, if needed.

Option	Description
<b>Free</b>	Enter the notch dimensions.
<b>Heerema</b>	When you select this option, the predefined Heerema options are listed below. The predefined values are entered automatically in the user-defined attributes of the secondary beam.
<b>HSM</b>	When you select this option, the predefined HSM options are listed below. The predefined values are entered automatically in the user-defined attributes of the secondary beam.
<b>No and clean up UDA</b>	No notch is created. The user-defined attributes have no values.

## Notches



	Description
1	Define the top flange notch for the secondary beam.
2	Define the bottom flange notch for the secondary beam.
3	Define a gap between the main beam web and the secondary beam end.

	<b>Description</b>
<b>4</b>	Define the bottom rounding and a possible weld access hole for the secondary beam.
<b>5</b>	Define the top rounding and a possible weld access hole for the secondary beam.
<b>6</b>	Create a cut that follows the sloped flange of the secondary beam.

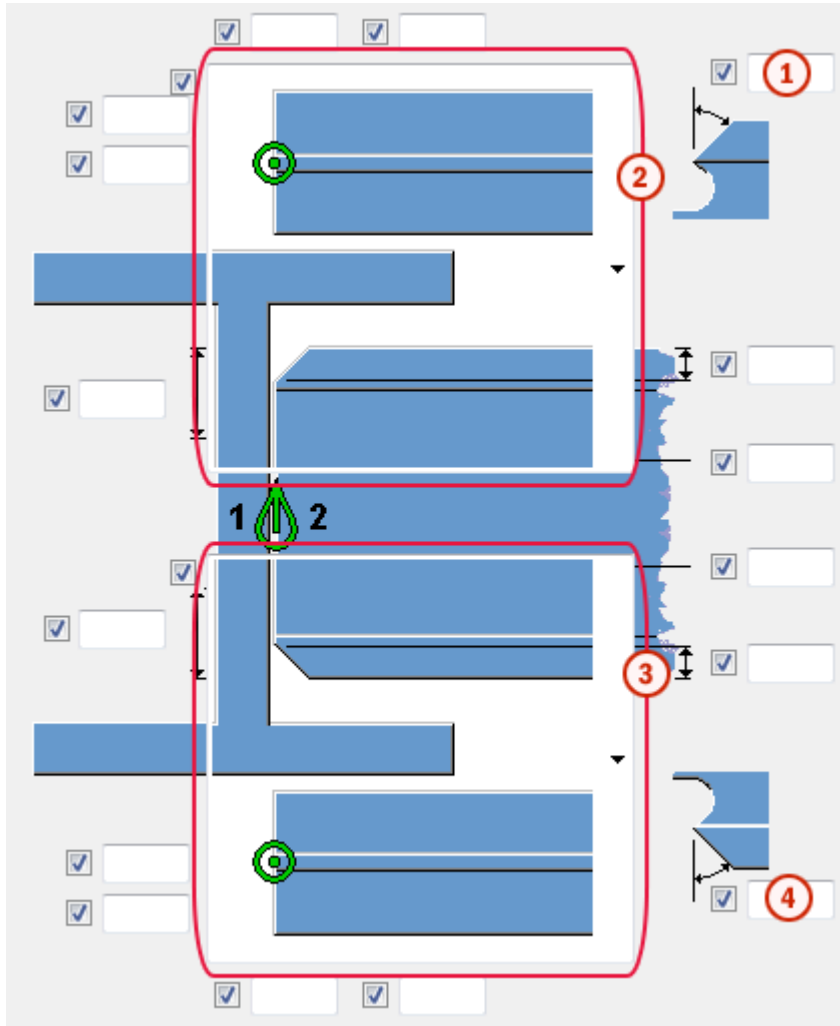
### **Fitting**

Select the type of the fitting.

#### ***Picture 2 tab***

Use the **Picture 2** tab to create notches in the direction of the flange. The options on this tab can only be used if the notch type is set to **Free** on the **Picture 1** tab. If you select a special type of notch (Heerema, HSM) on the **Picture 1** tab, then the predefined values are entered automatically in the user-defined attributes.

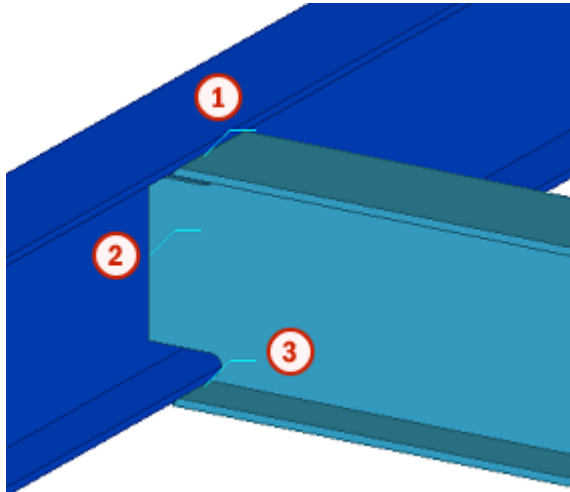
## Notches



	Description
①	Define the bevel angle for the top flange (optional).
②	Define the top flange bevel.
③	Define the bottom flange bevel.
④	Define the bevel angle for the bottom flange (optional).

### ***Weld description tab***

Use the **Weld description** tab to control weld descriptions for the top, web and bottom welds.



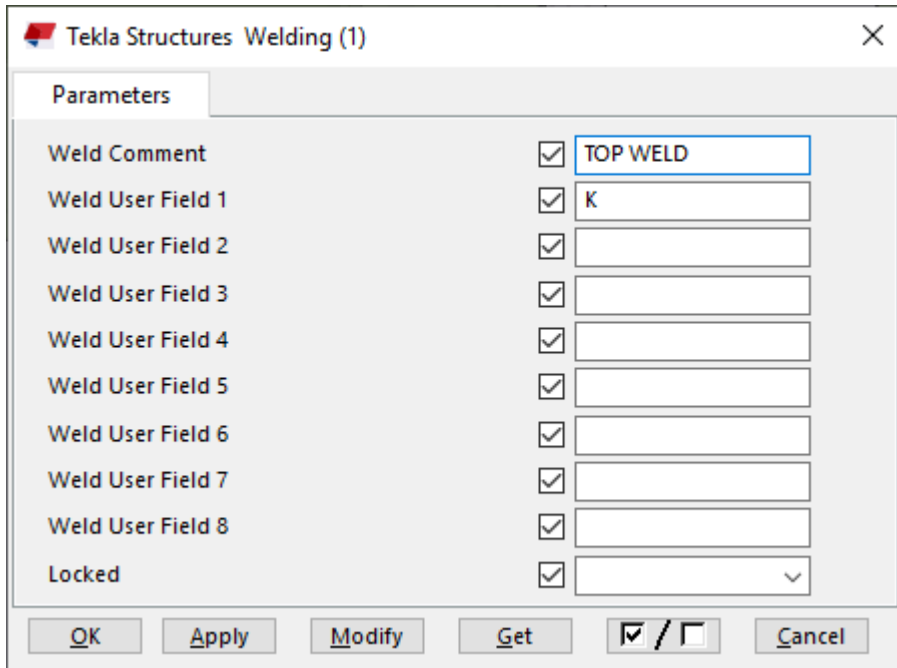
	Description
①	Top weld
②	Web weld
③	Bottom weld

Use the boxes on the **Weld description** tab to define a name for the weld comment. Enter the text `WELD_COMMENT` in the **UDA field**. The descriptions in the **Top**, **Web** and **Bottom** boxes correspond to each weld.

UDA field	<input checked="" type="checkbox"/> WELD_COMMENT
Top	<input checked="" type="checkbox"/> TOP WELD
Web	<input checked="" type="checkbox"/> WEB WELD
Bottom	<input checked="" type="checkbox"/> BOTTOM WELD

Double-click a weld in the model and go to the user-defined attributes of the weld. The text is entered in the **Weld Comment** box.





### ***General tab***

Click the link below to find out more:

[General tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

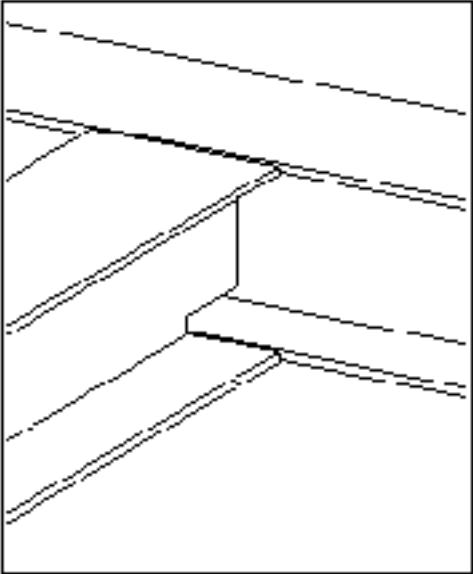

## **Fitting (13)**

**Fitting (13)** connects a beam to a beam using welds.

### **Objects created**

- Stiffeners (2) (optional)
- Welds

## Use for

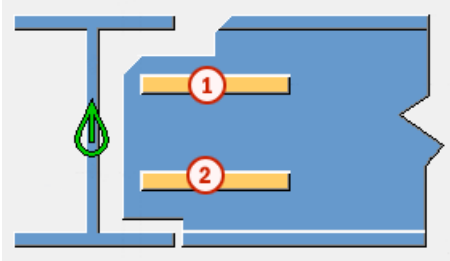
Situation	Description
 A 3D perspective drawing showing two I-beams connected at a right angle. The secondary beam is attached to the top flange of the main beam. The connection is a simple lap joint without any additional stiffeners.	Fitting connection without stiffeners.
 A 3D perspective drawing showing two I-beams connected at a right angle. The secondary beam is attached to the top flange of the main beam. In addition to the main beam, there are two horizontal stiffeners: one positioned above the secondary beam and one below it, both connected to the main beam's flanges.	Fitting connection with upper and lower stiffener.

## Selection order

1. Select the main part (beam).
2. Select the secondary part (beam).

The connection is created automatically when the secondary beam is selected.

## Part identification key

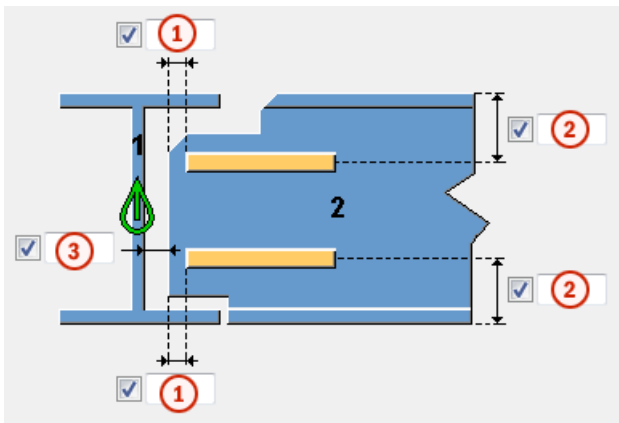


	Part
1	Upper stiffener
2	Lower stiffener

## Picture tab

Use the **Picture** tab to control the fitting dimensions.

## Dimensions



	Description
1	Stiffener horizontal distance from the secondary beam edge.
2	Stiffener vertical distance from the secondary beam edge.
3	Distance between the main beam and the secondary beam.

Option	Description
<b>Max gap allowed to end plate</b>	Enter the tolerance value for fitting the secondary part. Use this option when the secondary part is skewed. The gap is calculated

Option	Description
	<p>using the skew angle and the height of the secondary profile.</p> <p>If the gap is within the tolerance value, the secondary part is fitted in the main part coordinate system. When the defined maximum gap is greater than the actual gap in the model, the secondary part is fitted in the secondary part coordinate system.</p>
<b>Weldings</b>	<p>Select whether welds are created.</p> <p>Welds are created when you select <b>Yes</b>. The default is that welds are not created.</p>

### **Parts tab**

Use the **Parts** tab to control the stiffener properties.

### **Stiffener**

Part	Description
<b>Upper stiffeners</b>	Thickness, width, and height of the upper stiffener.
<b>Lower stiffeners</b>	Thickness, width, and height of the lower stiffener.

Option	Description	Default
<b>Pos_No</b>	<p>Prefix and start number for the part position number.</p> <p>Some components have a second row of fields where you can enter the assembly position number.</p>	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **General tab**

Click the link below to find out more:  
General tab

### **Design tab**

Click the link below to find out more:  
Design tab

### **Analysis tab**

Click the link below to find out more:  
Analysis tab

### **Welds**

Click the link below to find out more:

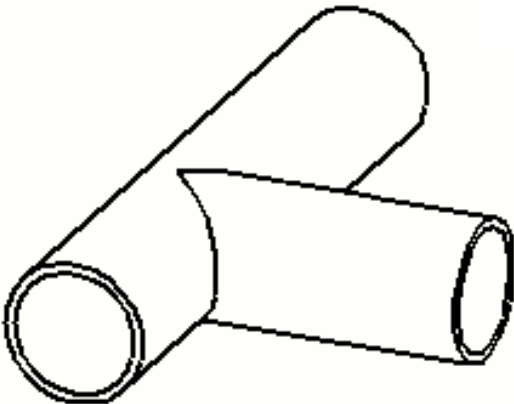
## **Round tube (23)**

**Round tube (23)** connects two round tube profiles with a fitting and welds.

### **Objects created**

- Fitting
- Welds

### **Use for**

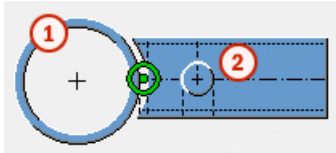
<b>Situation</b>	<b>Description</b>
 A technical line drawing of two cylindrical round tubes. One tube is positioned horizontally in the foreground, and the second tube is positioned behind it, angled upwards. The two tubes are connected at their ends by a fitting, with welds visible at the junction points.	Connection between two round tubes. Fitting and welds are created.

### Selection order

1. Select the main part (first round tube).
2. Select the secondary part (second round tube).

The connection is created automatically when the secondary part is selected.

### Part identification key

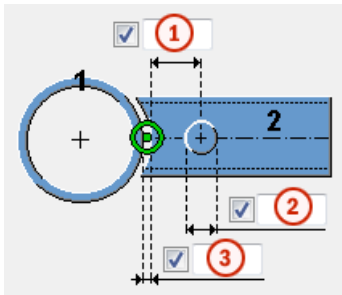


	Part
1	Round tube
2	Round tube

### Picture tab

Use the **Picture** tab to control the dimensions of the secondary round tube fitting and the gap between the round tubes.


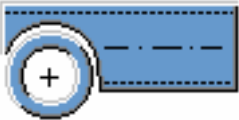
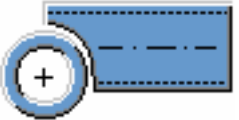
### Part dimensions



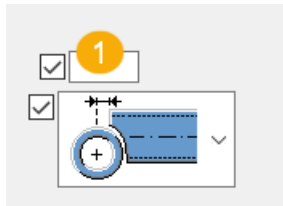
	Description	Default
1	Pop mark offset. You can define the offset if you have set the <b>Position of pop mark</b> option to <b>At minimum angle</b> , <b>At maximum angle</b> , or <b>Both</b> .	100 mm
2	Pop mark diameter. You can define the diameter if you have set the <b>Position of pop mark</b> option to <b>At minimum angle</b> , <b>At maximum angle</b> , or <b>Both</b> .	10 mm

	Description	Default
3	Gap between the main and the secondary round tube.	

### Secondary part fitting

Option	Description
	Default The secondary round tube is cut with the main round tube. AutoDefaults can change this option.
	The secondary round tube is cut with the main round tube.
	The secondary round tube is fitted to the center line of the main round tube and then cut.

### Secondary part cut



	Description
1	Define the secondary part cut distance from the main part center.

### Position of pop mark

Select the position of the pop mark.

### Parameters tab

Use the **Parameters** tab to control whether welds are created and to define the rotation angle and cut tolerance.

Option	Description
<b>Weldings</b>	Define whether welds are created between the round tubes.

Option	Description
<b>Rotation angle of cut part</b>	<p>Define the rotation angle of the cut in the main round tube.</p> <p>In some cases it is necessary to rotate the cut part in the main round tube to make sure the cut is shown correctly. The default is that the cut part is not rotated.</p>
<b>Cut tolerance of sec</b>	Define the cut tolerance of the secondary round tube.

### ***General tab***

Click the link below to find out more:

General tab

### ***Design tab***

Click the link below to find out more:

Design tab

### ***Analysis tab***

Click the links below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

## **Welded column (31)**

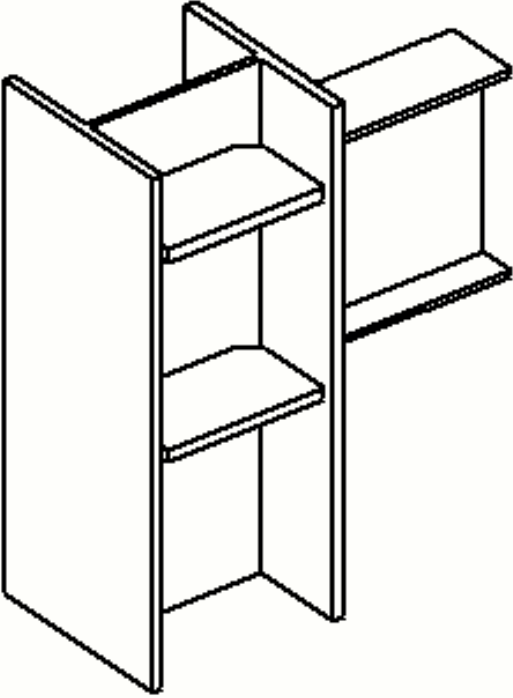
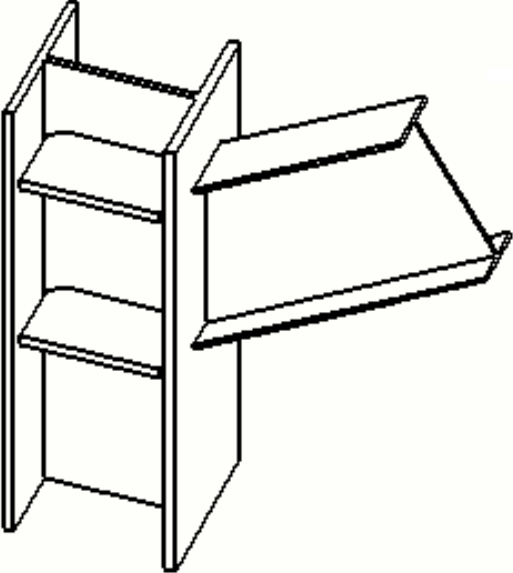
**Welded column (31)** connects a beam to a column flange using fittings and welds. Stiffeners are created between the column flanges.

### **Objects created**

- Stiffeners
- Fittings
- Welds



## Use for

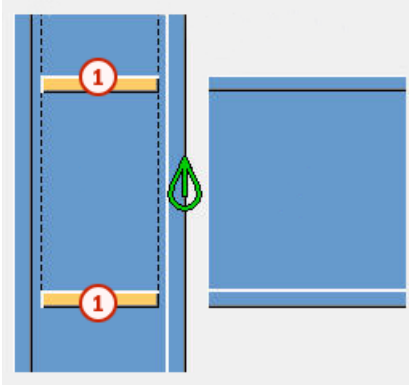
Situation	Description
	Beam welded to a column. Four stiffeners are created.
	Sloped beam welded to a column. Four stiffeners are created.

## Selection order

1. Select the main part (column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

## Part identification key

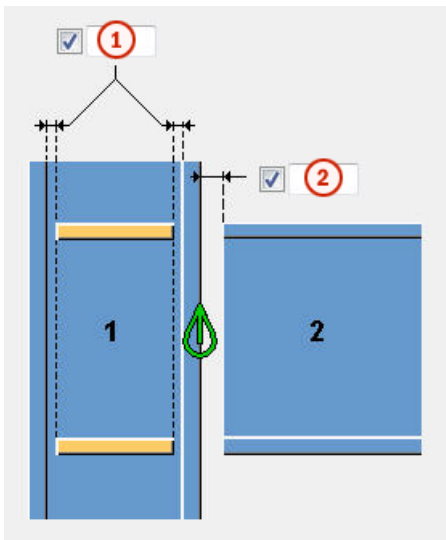


	Part
<b>1</b>	Stiffener

## Picture tab

Use the **Picture** tab to control the dimensions and stiffener positions.

## Dimensions



	Description
<b>1</b>	Distance between the stiffener and the column flange.
<b>2</b>	Distance between the column flange and the edge of the beam. You can define the distance if the <b>Fit secondary</b> option is set to <b>Default</b> or <b>Yes</b> .

## Fit secondary

Define whether the secondary beam can be fitted to the column.

## Parts tab

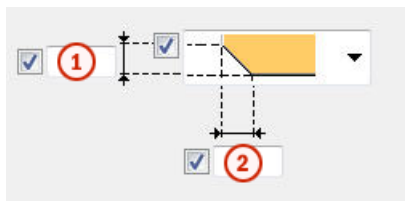
Use the **Parts** tab to control the stiffener properties.

## Stiffeners

Part	Description	Default
<b>Stiffeners</b>	Thickness, width, and height of the stiffeners.	Thickness = 16 mm Width = If the width is not defined, it is based on the flange width. Height = Column web height






Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

## Chamfer dimensions



	Description
1	Vertical chamfer dimension. You can define the vertical dimension for line chamfers.
2	Horizontal chamfer dimension.

### Chamfer type

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

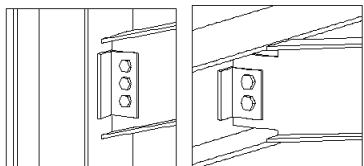
## Welded tee (32)

**Welded tee (32)** connects a beam to a column or to another beam using a T-shaped piece of an I-profile welded to the main part and bolted to the secondary beam web.

### Objects created

- Tee part
- Bolts
- Welds

### Use for

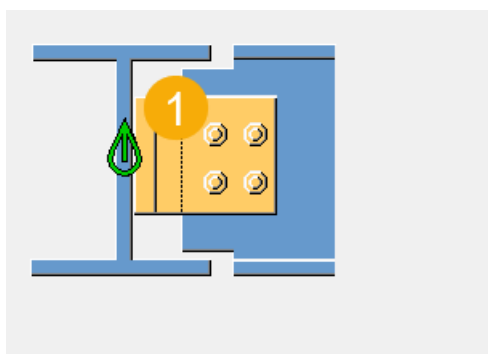
Situation	Description
	Welded tee connected to a column and bolted to a beam.

### Selection order

1. Select the main part.
2. Select the secondary part.

The connection is created automatically when the secondary part is selected.

### Part identification key

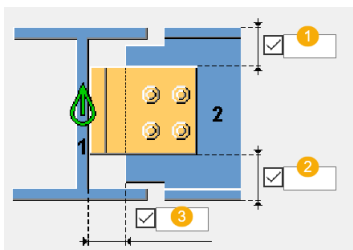


	Description
1	Tee part

### Picture tab

Use the **Picture** tab to define the connection dimensions.

## Dimensions



	Description	Default
1	Tee part edge distance from the secondary part top.	
2	Tee part edge distance from the secondary part bottom.	
3	Gap between the main part and the secondary part. The value you define affects the tee part size.	10 mm

## Parts tab

Use the **Parts** tab to define the part properties.

### Parts

Option	Description	Default
<b>Profile</b>	Select the profile from the profile catalog.	The same as the secondary part profile.


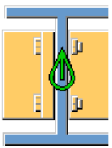
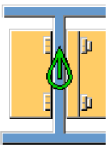
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

Option	Description	Default
<b>Finish</b>	Describes how the part surface has been treated.	

### Parameters tab

Use the **Parameters** tab to define the tee part position.

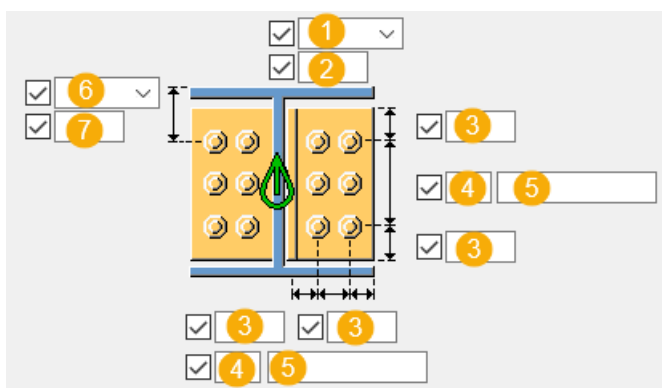
### Tee part position

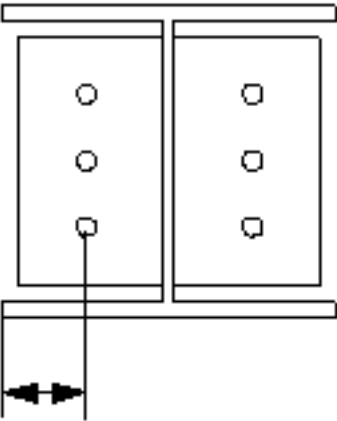
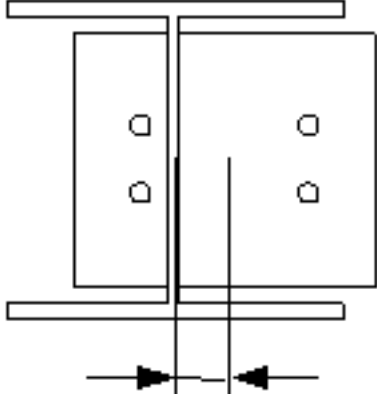
Option	Description
	Default Tee part is on the left side. AutoDefaults can change this option.
	Tee part is on the left side.
	Tee part is on the right side.

### Primary bolts tab

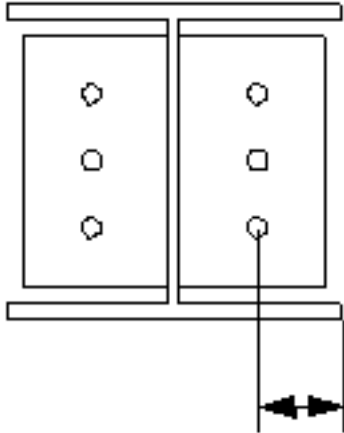
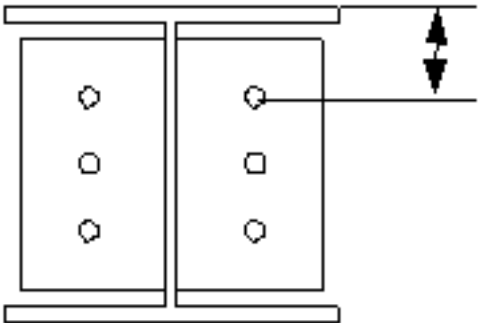
Use the **Primary bolts** tab to define the main part bolt group dimensions and bolt properties.

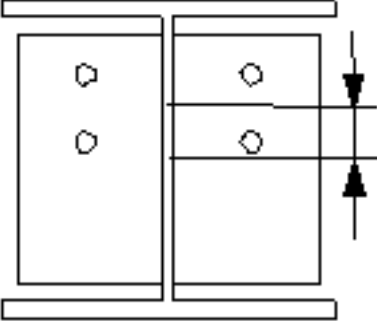
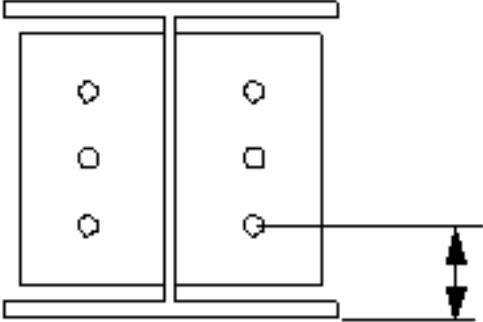
### Bolt group dimensions



	Description
1	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.              </li> <li> <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.              </li> </ul>



	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
<b>2</b>	Dimension for horizontal bolt group position.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>6</b>	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	Description
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>
7	Dimension for vertical bolt group position.

### Connect to primary

Select how the profile is connected to the main part.

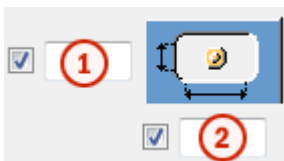
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within	Yes

Option	Description	Default
	the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

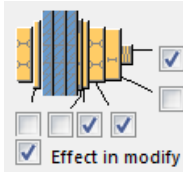


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

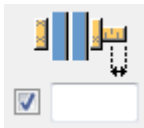
If you want to create a hole only, clear all the check boxes.








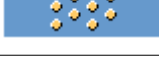
To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



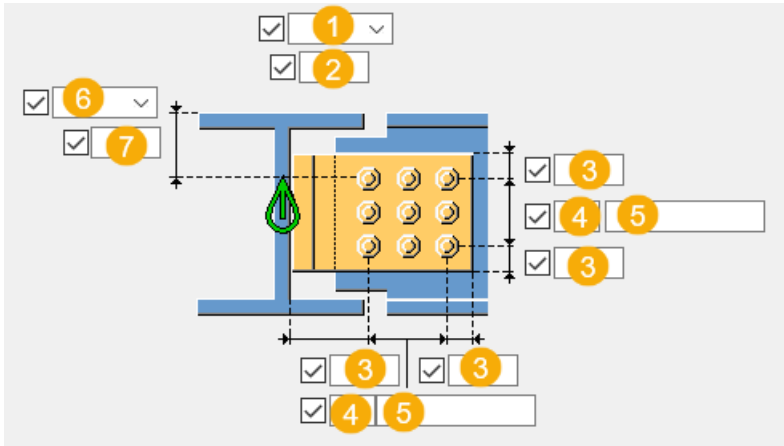
### Staggering of bolts

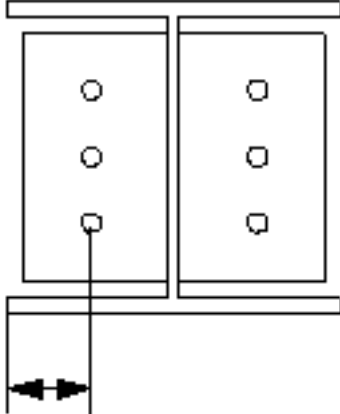
Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Secondary bolts tab

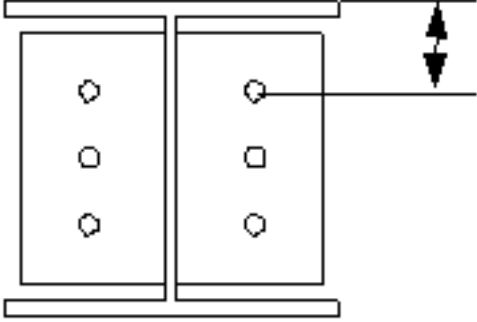
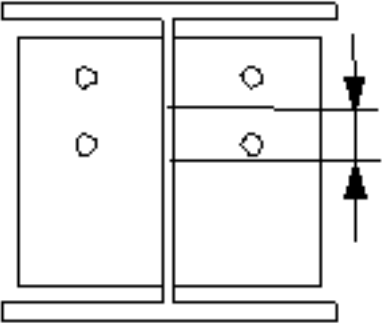
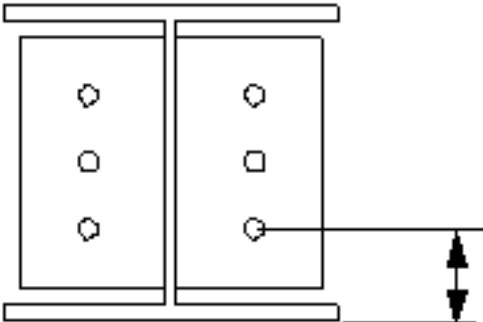
Use the **Secondary bolts** tab to define the secondary part bolt group dimensions and bolt properties.

## Bolt group dimensions



	Description
1	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> <div style="text-align: center;"> </div>
<b>2</b>	Dimension for horizontal bolt group position.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

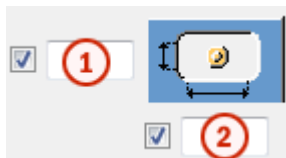
	<b>Description</b>
<b>6</b>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> <div style="text-align: center; margin: 10px 0;">  </div> <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul> <div style="text-align: center; margin: 10px 0;">  </div> <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> <div style="text-align: center; margin: 10px 0;">  </div>
<b>7</b>	Dimension for vertical bolt group position.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

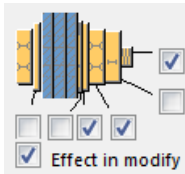


Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

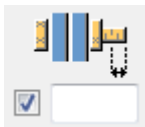
If you want to create a hole only, clear all the check boxes.








To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.


### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3

Option	Description
	Staggered type 4

### ***General tab***

Click the link below to find out more:

General tab

### ***Design tab***

Click the link below to find out more:

Design tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

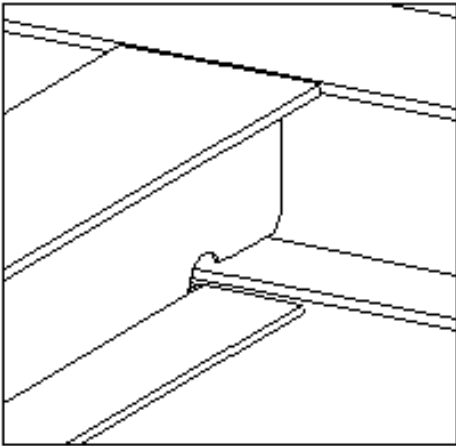
## **Weld preparation (44)**

Connects two beams of I profile with welds. You can shape the secondary beam end with rat holes and other weld preparations. The only allowed beam profile is I-profile.

### **Objects created**

- Welds
- Fitting
- Cuts to shape the beam end

## Use for

Situation	Description
	Beam welded to a beam web. Rat hole at the bottom.

## Before you start

Create two beams.

## Selection order

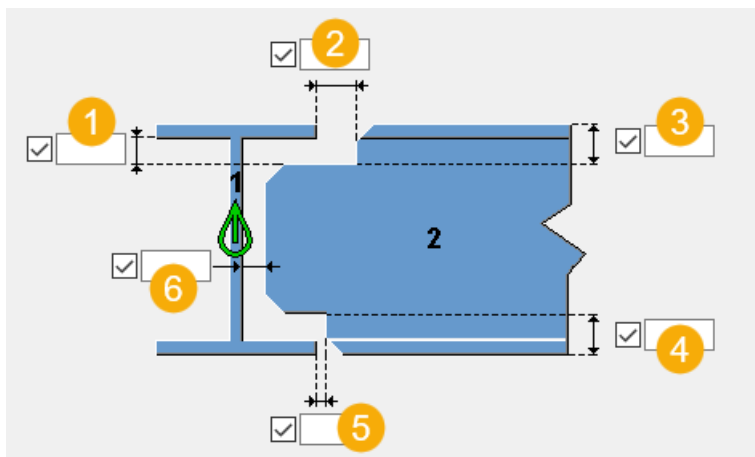
1. Select the main part.
2. Select the secondary part.

The connection is created automatically when the secondary part is selected.

## Picture tab

Use the **Picture** tab to define the connection geometry.

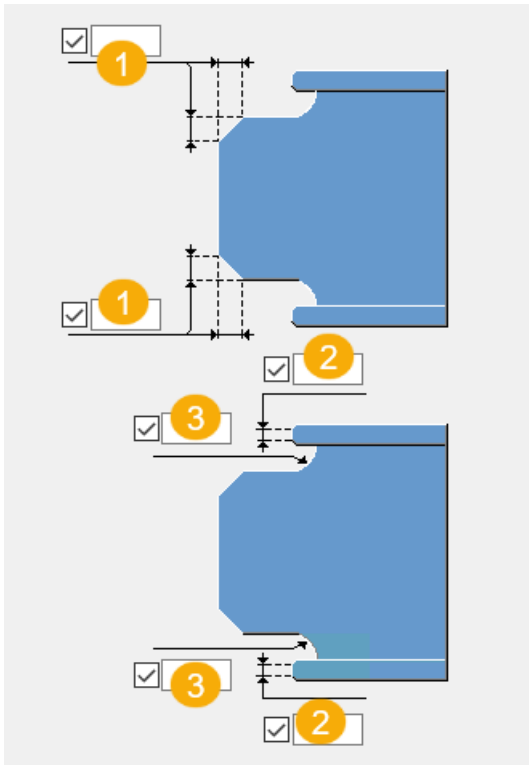
## Dimensions



	<b>Description</b>	<b>Default</b>
<b>1</b>	Vertical tolerance. Tolerance between the main part web and the secondary part flange.	0.2*secondary part flange thickness
<b>2</b>	Flange horizontal tolerance. Horizontal tolerance between the secondary part and the main part upper flange.	3 mm
<b>3</b>	Web upper vertical tolerance. Vertical distance between the secondary part upper edge and the top of the web.	
<b>4</b>	Web lower vertical tolerance. Vertical distance between the secondary part lower edge and the bottom of the web.	
<b>5</b>	Flange horizontal tolerance Horizontal tolerance between the secondary part and the main part lower flange.	3 mm
<b>6</b>	Web horizontal tolerance. Tolerance between the webs of the beams.	0 mm

## Parameters tab

### Beam end shape



	Description
1	Web chamfer Dimensions of the top and bottom chamfers in the secondary part web.
2	Top and bottom flange straight distance.
3	Top and bottom weld access hole radius.

### General tab

Click the link below to find out more:

[General tab](#)

### Design tab

Click the link below to find out more:

## ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

## ***Welds***

Click the link below to find out more:

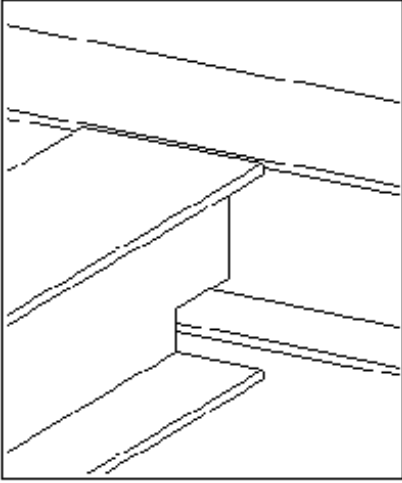
## **New notch (49)**

**New notch (49)** welds a beam to another beam. You can define how to cut the beam end. The connection also creates horizontal stiffeners, if needed.

### **Objects created**

- Cuts to shape beam end
- Welds
- Stiffeners (4) optional

### **Use for**

<b>Situation</b>	<b>Description</b>
	A beam welded to a beam. Bottom of the secondary beam web notched.

### **Before you start**

Create two beams.

### **Selection order**

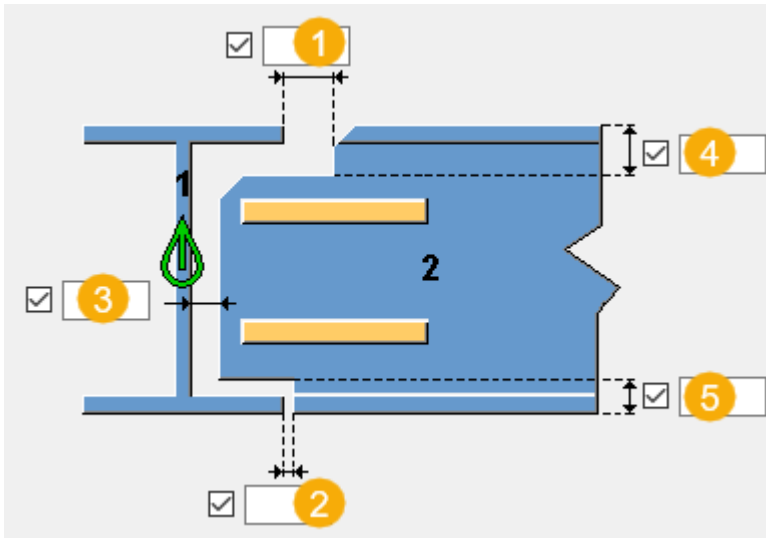
1. Select the main part (beam).

- Select the secondary part (beam to be cut).  
The connection is created automatically when the secondary part is selected.

### Picture tab

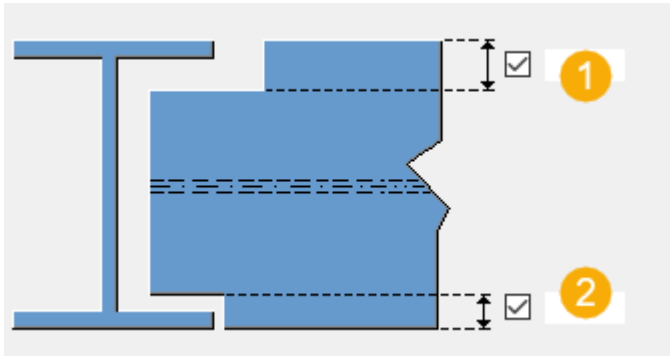
Use the **Picture** tab to define the connection geometry.

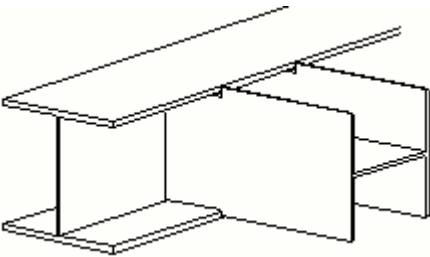
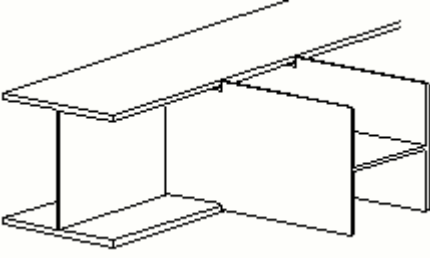
### Dimensions



	Description	Default
1	Horizontal tolerance between the main part and the secondary part upper flanges.	0 mm
2	Lower flange horizontal tolerance between the main part and the secondary part lower flanges.	0 mm
3	Web horizontal tolerance between the main part web and the secondary part web.	0 mm
4	Web upper vertical tolerance. Vertical distance between the secondary part upper edge and the top of the web.	
5	Web lower vertical tolerance. Vertical distance between the secondary part lower edge and the bottom of the web.	

## Secondary beam flange notch dimensions



Description	
1	<p>Notch dimension of the secondary beam top or bottom flange, if the secondary beam is rotated as in the picture below.</p> 
2	<p>Notch dimension of the secondary beam top or bottom flange, if the secondary beam is rotated as in the picture below.</p> 

### Parts tab

Option	Description	Default
<b>Upper/lower stiffeners</b>	Stiffener thickness, width and height.	<p>The default thickness is equal to the beam's upper / lower flange thickness.</p> <p>The default width is <math>0.5 * (\text{upper} / \text{lower})</math></p>

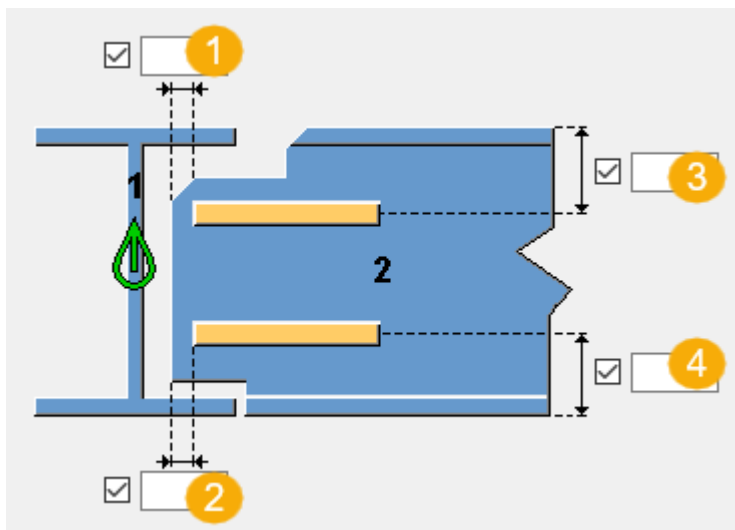


Option	Description	Default
		flange width-web thickness). The default length (height) is 300 mm.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

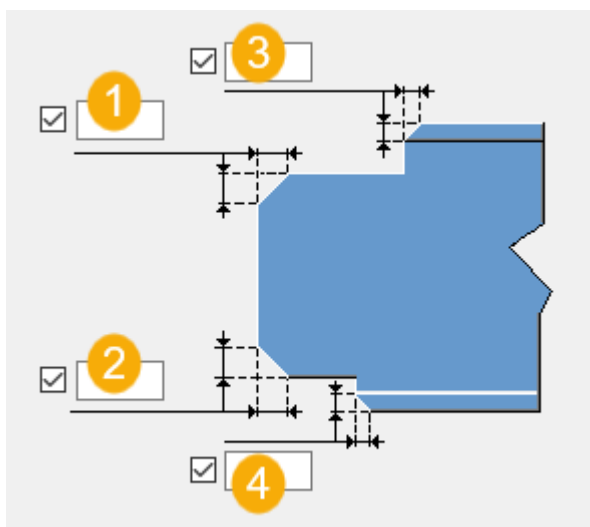
**Parameters tab**

**Stiffener position dimensions**



	Description	Default
1	Upper stiffener horizontal distance from the beam end.	0 mm
2	Lower stiffener horizontal distance from the beam end.	0 mm
3	Upper stiffener vertical distance from the upper flange.	Secondary beam height / 4
4	Lower stiffener vertical distance from the lower flange.	Secondary beam height / 4

### Secondary beam chamfer dimensions



	Description	Default
1	Upper web chamfer dimension.	0 mm
2	Lower web chamfer dimension.	0 mm
3	Upper flange chamfer dimension.	0 mm
4	Lower flange chamfer dimension.	0 mm

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

## **Welded beam to beam (123)**

**Welded beam to beam (123)** connects two beams using a fully welded connection. The beams can have welding preparations. Stiffener plates with welding preparations can also be created.

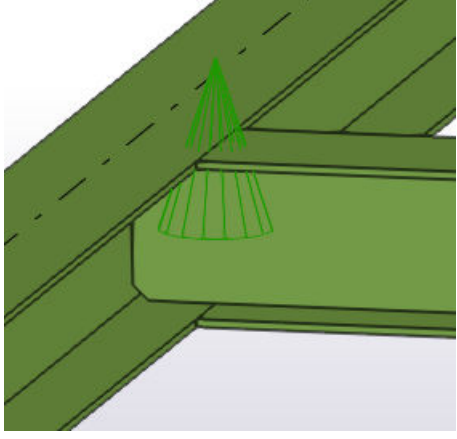
### **Limitations**

- You can only use I-section beams.
- You cannot use beams that are horizontally skewed or vertically sloped.

### **Objects created**

- Stiffeners
- Cuts
- Welds

### **Use for**

<b>Situation</b>	<b>Description</b>
	Fully welded beam to beam connection

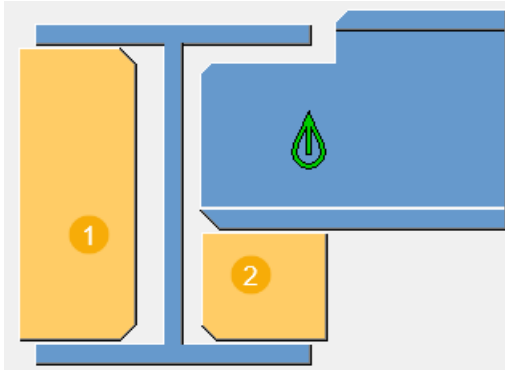
### **Selection order**

1. Select the main part (beam).

- Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key

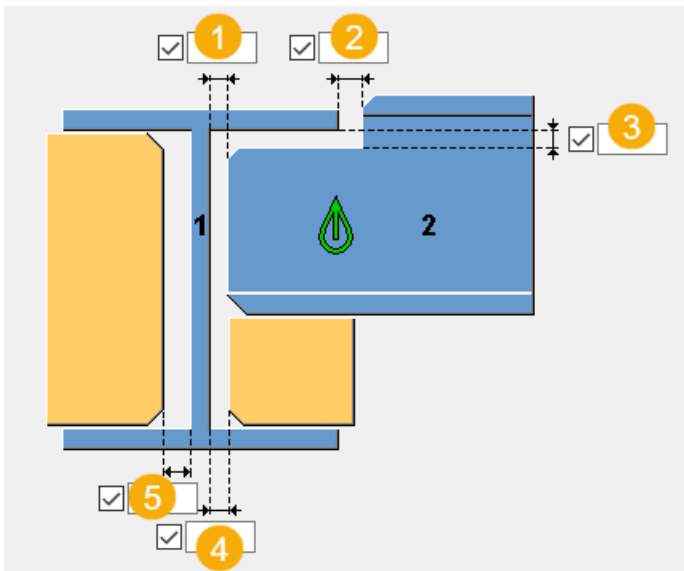


	Description
1	Front stiffener
2	Back stiffener

### Picture tab

Use the **Picture** tab to define the beam and stiffener offset dimensions.

### Dimensions



	<b>Description</b>
<b>1</b>	Gap dimension between the main part web and the secondary part edge.
<b>2</b>	Secondary part offset dimension from the main part flange.
<b>3</b>	Secondary part offset dimension from the underside of the main part flange.
<b>4</b>	Back stiffener offset dimension from the main part web.
<b>5</b>	Front stiffener offset dimension from the main part web.

### **Parameters tab**

Use the **Parameters** tab to define the stiffener plate properties, and whether weld preparations are required.

### **Plates**

<b>Option</b>	<b>Description</b>
<b>Btm stiff plate</b>	Thickness and width of the stiffener on the main beam side.
<b>Back stiffener</b>	Thickness and width of the stiffener located behind the secondary beam.

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Weld preparation creation, beam web and flange thickness**

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Are weld preparations required</b>	Select whether to create weld preparations.	Weld preparations are not created.

Option	Description	Default
<b>Root face thickness of web at U/S of flange</b>	<p>Set the minimum thickness of the main beam web after the weld preparation cut.</p> <p>The minimum value is 2.0 mm. If you do not enter a value, the minimum value is used.</p> <p>Note that if you have defined a double-sided weld preparation, the root face thickness is centred on the web of the beam.</p>	
<b>Root face thickness of web</b>	<p>Set the minimum thickness of the incoming beam web after the weld preparation cut.</p> <p>The minimum value is 2.0 mm.</p> <p>Note that if you have defined a double-sided weld preparation, the root face thickness is centred on the web of the beam.</p>	
<b>Root face thickness for front stiffener</b>	<p>Set the minimum thickness of the front stiffener after the weld preparation cut. The minimum value is 2.0 mm.</p> <p>Note that if you have defined a double-sided weld preparation, the root face thickness is centred on the stiffener.</p>	<p>The default value is the thickness of the flange, that is, no weld preparation other than a gap can be created unless you define a root face thickness.</p>
<b>Root face thickness for rear stiffener</b>	<p>Set the minimum thickness of the back stiffener after the weld preparation cut. The</p>	<p>The default value is the thickness of the flange, that is, no weld preparation other than a gap can be created</p>

Option	Description	Default
	<p>minimum value is 2.0 mm.</p> <p>Note that if you have defined a double-sided weld preparation, the root face thickness is centred on the stiffener.</p>	unless you define a root face thickness.
<b>Use flange slope ratio</b>	Select whether the flange slope ratio is used in notch cuts.	

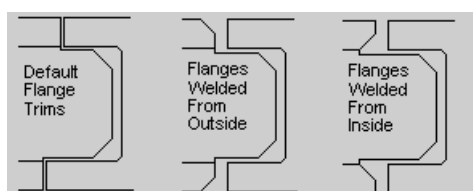
### ***Define weld preparations***

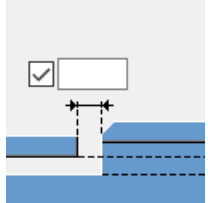
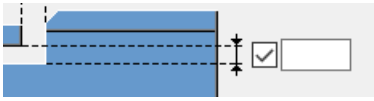
You can apply various weld preparations to the main beam flanges and web, and to the stiffener plates.

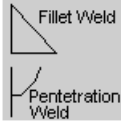
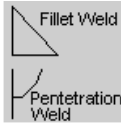
By default, the connection automatically detects whether the top and bottom flanges of the main beam clash with the flanges of the secondary beam. This determines how the weld preparations are handled.

If the main beam does not have the same section size as the secondary beam, the connection detects which flange is free based on which of the top or the bottom flanges are still clashing.

The following explains the basic weld preparation situations of each section of the main beam:

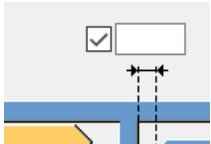




Situation	Description
Default	<p>The top flange is cut back to avoid the top flange of the secondary beam. You can define the secondary part</p>  <p>offset from the main part flange in  and</p> <p>on the <b>Picture</b> tab.</p> <p>Set <b>Are weld preparations required</b> on the <b>Parameters</b> tab to <b>Yes</b>.</p>

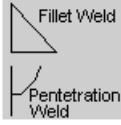
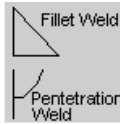
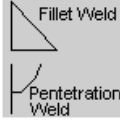
Situation	Description
Weld from the outside	<p>To create a weld preparation that shapes the top flange so that it can be welded from the outside, first set <b>Are weld preparations required</b> on the <b>Parameters</b> tab to <b>Yes</b>.</p> <p>Click the <b>Welds</b> button to define the weld settings:</p> <ul style="list-style-type: none"> <li>For top flange: For weld number <b>1</b>, change the top half of <b>Type</b> from fillet weld to penetration weld</li> </ul> <div style="display: inline-block; vertical-align: middle;">  </div> <p>You can also define the size and angle of the weld.</p> <ul style="list-style-type: none"> <li>For the bottom flange: Modify weld number <b>3</b>.</li> </ul>
Weld from the inside	<p>To create a weld preparation that shapes the top flange so that it can be welded from the inside, first set <b>Are weld preparations required</b> on the <b>Parameters</b> tab to <b>Yes</b>.</p> <p>Click the <b>Welds</b> button to define the weld settings:</p> <ul style="list-style-type: none"> <li>For weld number <b>1</b>, change the bottom half of <b>Type</b></li> </ul> <div style="display: inline-block; vertical-align: middle;">  </div> <p>from fillet weld to penetration weld. You can also define the size and angle of the weld.</p> <ul style="list-style-type: none"> <li>For the bottom flange: Modify weld number <b>3</b>.</li> </ul>

### Main beam web

Note that if you define any weld preparation on the beam web, the weld preparation is created on the vertical face of the web and the horizontal face of the web at the underside of the secondary beam flange.

Situation	Description
Default situation	<p>The default weld preparation of the main beam web is to fit the beam to the side of the secondary beam web.</p> <p>Set <b>Are weld preparations required</b> on the <b>Parameters</b> tab to <b>Yes</b>.</p> <p>If needed, define that a gap is created between the two</p> <div style="display: inline-block; vertical-align: middle;">  </div> <p>webs in   on the <b>Picture</b> tab.</p>



Situation	Description
Weld from the near side	<p>Set <b>Are weld preparations required</b> on the <b>Parameters</b> tab to <b>Yes</b>.</p> <p>Click the <b>Welds</b> button to define the weld settings. For weld number <b>2</b>, change the top half of <b>Type</b> from fillet weld to penetration weld . You can also define the size and angle of the weld.</p> <p>Check on the <b>Parameters</b> tab that the root face thickness values are as needed.</p>
Weld from the far side	<p>Set <b>Are weld preparations required</b> on the <b>Parameters</b> tab to <b>Yes</b>.</p> <p>Click the <b>Welds</b> button to define the weld settings. For weld number <b>2</b>, change the bottom half of <b>Type</b> from fillet weld to penetration weld . You can also define the size and angle of the weld.</p> <p>Check on the <b>Parameters</b> tab that the root face thickness values are as needed.</p>
Weld from both sides	<p>Set <b>Are weld preparations required</b> on the <b>Parameters</b> tab to <b>Yes</b>.</p> <p>Click the <b>Welds</b> button to define the weld settings. For weld number <b>2</b>, change both the top and the bottom halves of <b>Type</b> from fillet weld to penetration weld . You can also define the size and angle of the weld.</p> <p>Check on the <b>Parameters</b> tab that the root face thickness values are as needed.</p>

### Front and back stiffener plates

If you define any weld preparation on the front and back stiffener, it is created on the three stiffener sides that are welded to the main beam and the secondary beam.

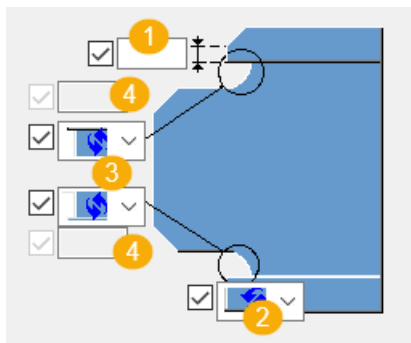
Situation	Description
Default situation	For the default situation, see the description of the main beam web. The welds you need to define are weld

Situation	Description
	number <b>5</b> for the front stiffener and weld number <b>6</b> for the back stiffener.
Weld from the near side	See the description of the main beam web. The welds you need to define are weld number <b>5</b> for the front stiffener and weld number <b>6</b> for the back stiffener.
Weld from the far side	See description of the main beam web. The welds you need to define are weld number <b>5</b> for the front stiffener and weld number <b>6</b> for the back stiffener.
Weld from both sides	See the description of the main beam web. The welds you need to define are weld number <b>5</b> for the front stiffener and weld number <b>6</b> for the back stiffener.

### ***Chamfers tab***

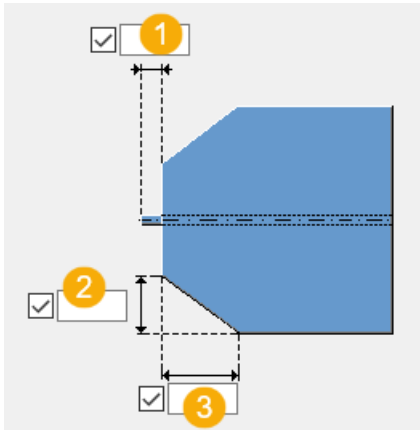
Use the **Chamfers** tab to define the weld access hole dimensions.

### **Secondary beam weld access hole dimensions**



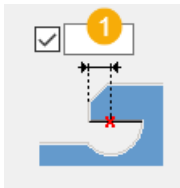
	Description
<b>1</b>	Vertical flange dimension.
<b>2</b>	Flange cut shape.
<b>3</b>	Weld access hole shape.
<b>4</b>	Radius of the weld access hole.

### Beam end dimensions



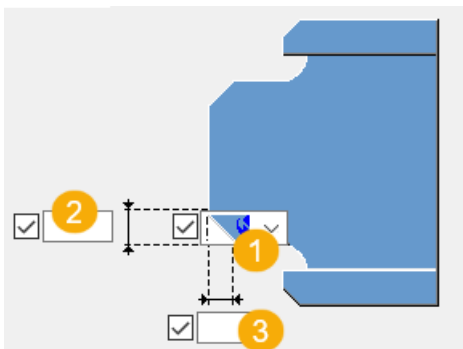
	Description
1	Length of the secondary beam web. This is the flange cut distance from the start of the web.
2	Vertical chamfer dimension.
3	Horizontal chamfer dimension.

### Weld access hole offset



	Description
1	Weld access hole offset along the secondary beam axis.

### Secondary beam web chamfers



	Description
1	Chamfer shape

	<b>Description</b>
<b>2</b>	Vertical chamfer dimension
<b>3</b>	Horizontal chamfer dimension

### ***General tab***

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

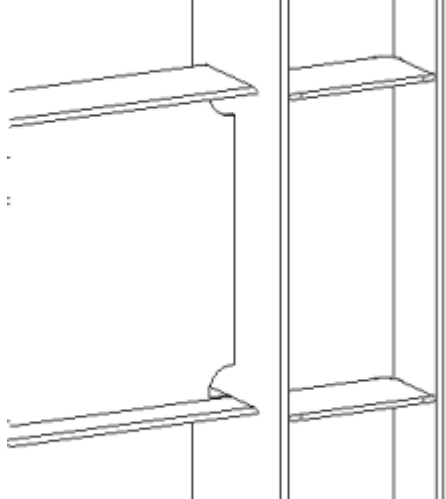
## **Welded column with stiffeners (128)**

Creates a welded beam to column connection. By default, creates the necessary notches in the secondary beam flanges and web. The secondary beam can be level or sloped. Stiffener plates on the opposite side of the column web are optional.

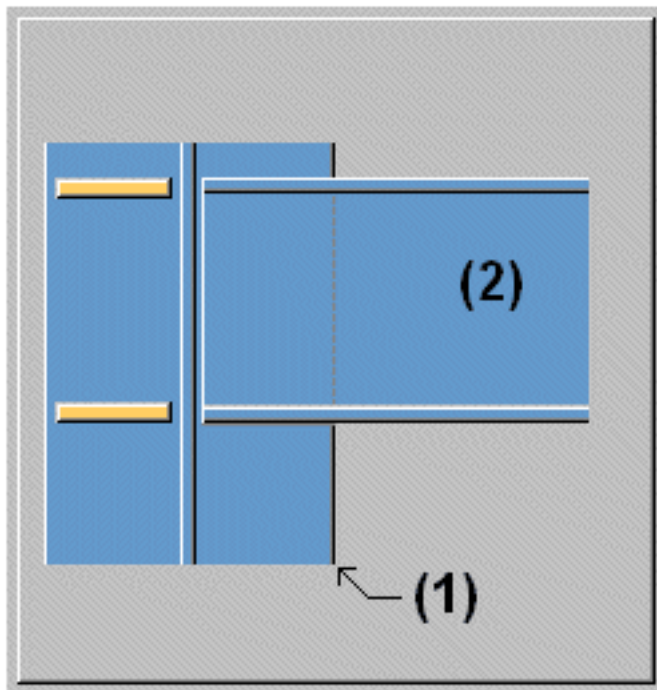
### **Objects created**

- Stiffeners (optional)
- Weld backing bars (optional)
- Web doubler plate (optional)
- Bolts
- Welds
- Cuts

### Use for

Situation	Description
	Welded to the column with weld prep and stiffener options.

### Selection order



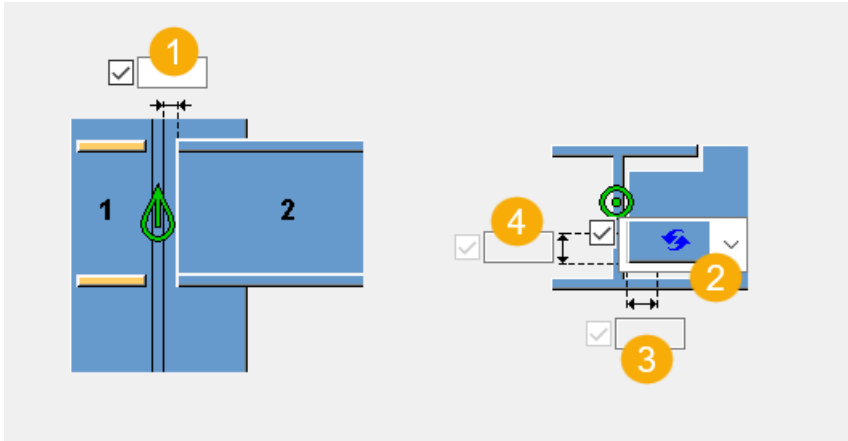
1. Select the main part (column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Picture tab

Use the **Picture** tab to control the gaps and shape of the secondary beam end cut.

### Dimensions



	Description	Default
1	Cutting point of the secondary beam. The cutting point is defined as a gap between the main and the secondary part.	General / gap (0.0625") 2 mm
2	Chamfer type. Options: No, Line, Cope, or Arc.	No chamfer
3	Width of the secondary flange chamfer.	Equal to the fillet radius of the main part profile.
4	Height of the secondary flange chamfer.	Equal to the fillet radius of the main part profile.

**NOTE** This information relates only to the U.S. imperial environment.  
GENERAL defaults can be found in the `joints.def` file in the system folder and can be modified as required.

### Stiffeners tab

Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position, and type.

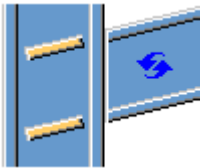
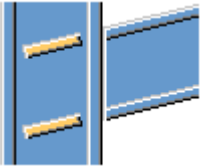
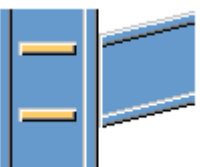
### Stiffener plate dimensions

Part	Description
Top NS	Define the top near side stiffener thickness, width and height.
Top FS	Define the top far side stiffener thickness, width and height.





Part	Description
<b>Bottom NS</b>	Define the bottom near side stiffener thickness, width and height.
<b>Bottom FS</b>	Define the bottom far side stiffener thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	




### Stiffener orientation

Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are parallel to the secondary part.
	Stiffeners are perpendicular to the main part.


### Stiffener creation

Option	Description
	Default Stiffeners are created. AutoDefaults can change this option.
	Automatic Stiffeners are created when necessary.
	No stiffeners are created.
	Stiffeners are created.

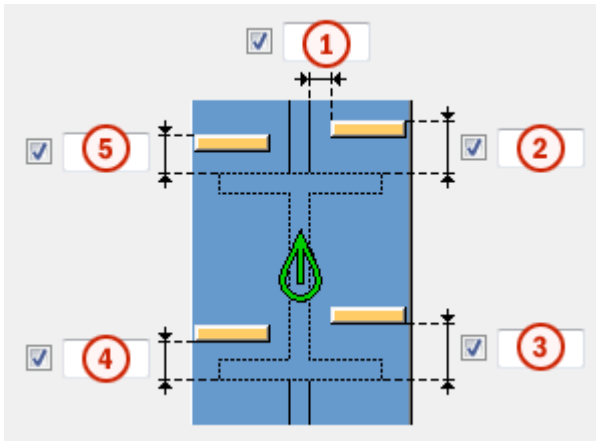
### Stiffener shape

Option	Description
	Default Line chamfered stiffener plates AutoDefaults can change this option.
	Automatic Line chamfered stiffener plates
	Square stiffener plates Stiffener plates with a gap for the main part web rounding



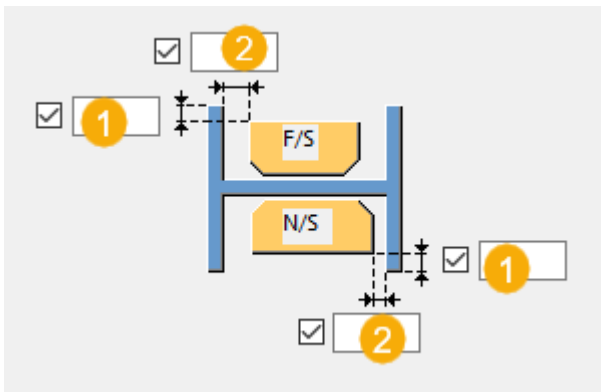
Option	Description
	Line chamfered stiffener plates

### Stiffener positions



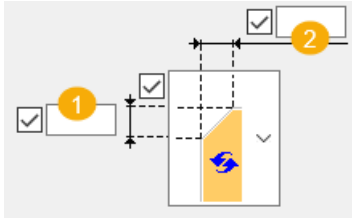
	Description
1	Size of the gap between the stiffener and the beam web edge.
2	Size of the gap between the top near side stiffener and the beam flange edge.
3	Size of the gap between the bottom near side stiffener and the beam flange edge.
4	Size of the gap between the bottom far side stiffener and the beam flange edge.
5	Size of the gap between the top far side stiffener and the beam flange edge.

### Stiffener gap



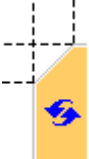



	Description
1	Distance from the edge of the flange to the edge of the stiffener.
2	Size of the gap between the flanges and the stiffener.


### Chamfer dimensions



	Description	Default
1	Vertical dimension of the chamfer.	10 mm
2	Horizontal dimension of the chamfer.	10 mm

### Chamfer type

Option	Description
	Default. Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer

Option	Description
	Concave arc chamfer

### **Beam cut tab**

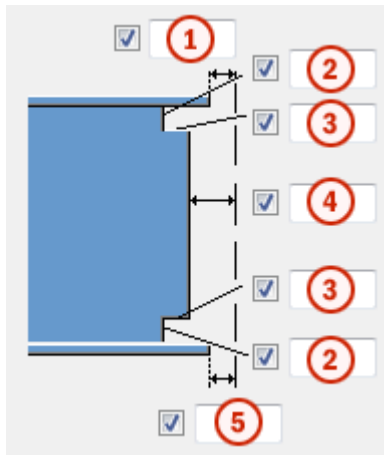
Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts.

### **Weld backing bar**

Option	Description
<b>Weld backing bar</b>	Weld backing bar thickness and width.





Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	




## Weld access hole dimensions







	Description
1	Gap between the secondary part top flange and the main part.
2	Vertical dimensions for the top and the bottom weld access holes.
3	Horizontal dimensions for the top and the bottom weld access holes.
4	Gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.
5	Gap between the secondary part bottom flange and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.

## Weld access holes







Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	

Option	Description	Default
	Round weld access hole with a radius that you can define in r <input checked="" type="checkbox"/> <input type="text"/>	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and Top Prep x <input checked="" type="checkbox"/> <input type="text"/> Bottom Prep x <input checked="" type="checkbox"/> <input type="text"/>	
	Cone-shaped weld access hole with radiuses that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and r <input checked="" type="checkbox"/> <input type="text"/> Capital <b>R</b> defines the large radius (height). Small <b>r</b> defines the small radius.	R = 35 r = 10









### Beam end preparation

Option	Description
	Default Top and bottom flange are prepared. AutoDefaults can change this option.
	Automatic Top and bottom flange are prepared.
	Beam end is not prepared.
	Top and bottom flange are prepared.

## Flange cut



Option for top flange	Option for bottom flange	Description
		Default Flange is not cut. AutoDefaults can change this option.
		Flange is not cut.
		Flange is cut.


## Weld backing bars

Option for top backing bar	Option for bottom backing bar	Description
		Default Backing bars are created inside the flanges. AutoDefaults can change this option.
		No backing bars are created.
		Backing bars are created inside the flanges.
		Backing bars are created outside the flanges.

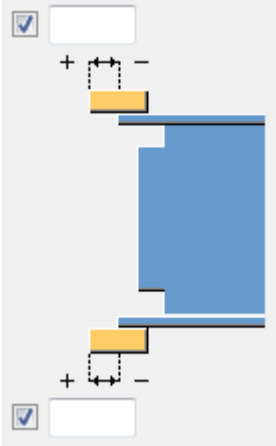
## Weld backing bar length

Enter the length of the weld backing bar in the box below the options.

Option	Description
	Default Absolute length of the backing bar AutoDefaults can change this option.
	Absolute length of the backing bar

Option	Description
	Extension beyond the edge of the flange

### Weld backing bar position

Option	Description
	Enter a positive or a negative value to move the front end of the backing bar relative to the end of the flange.

### Assembly type

Define the location where the weld backing bar welds are made. When you select the **Workshop** option, Tekla Structures includes the backing bars in the assembly.

### Notch tab


Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.





### Automatic notching

Automatic notching options affect both the top and the bottom flange.


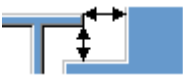
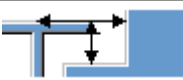
### Notch shape

Automatic notching is switched on when you select a notch shape.

Option	Description
	<p>Default</p> <p>Creates notches to the secondary beam.</p> <p>AutoDefaults can change this option.</p>

Option	Description
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.
	Turns off automatic notching.

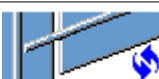

### Notch size

Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.


Enter the horizontal and vertical values for the cuts.



### Flange cut shape



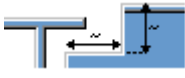
Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.



Option	Description
	Secondary beam flange is cut square.

### Notch dimension rounding




Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.





The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



### Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

## Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.






 

## Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.



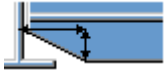



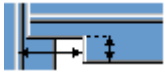
## Side of flange notch

The side of flange notch defines on which side of the beam the notches are created.




Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

## Flange notch shape

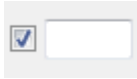
The flange notch shape defines the notch shape in the beam flange.

Option	Description
	<p>Default</p> <p>The entire flange of the secondary beam is cut as far back as you define.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.</p>
	<p>Creates chamfers in the flange.</p> <p>If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.</p>
	<p>Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b>.</p>
	<p>The flange is not cut.</p>
	<p>Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.</p>
	<p>Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b>.</p>

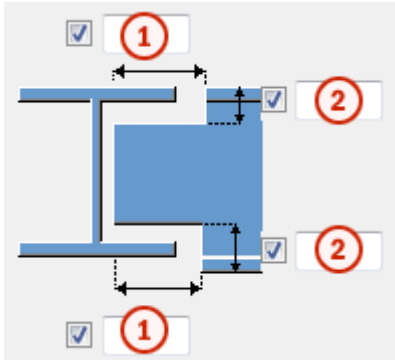
## Flange notch depth

Option	Description
	<p>Default</p> <p>Flange notch depth.</p> <p>AutoDefaults can change this option.</p>
	<p>Flange notch depth.</p>
	<p>Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.</p>

Enter the value for flange notch depth.



### Cut dimensions



	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### ***Doubler plate tab***

Use the **Doubler plate** tab to create doubler plates to strengthen the web of the main part.




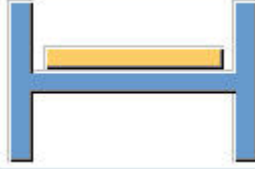
### Web plate

Option	Description
Web plate	Web plate thickness and height.

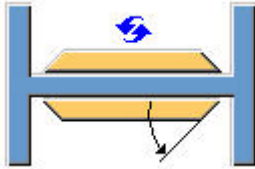
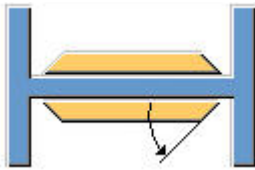
Option	Description	Default
Pos_No	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
Material	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in

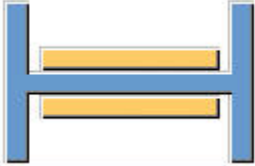
Option	Description	Default
		<b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	

### Doubler plates

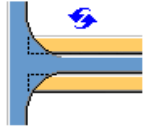
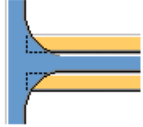

Option	Description
	Default Doubler plates are created on both sides. AutoDefaults can change this option.
	Doubler plates are not created.
	Doubler plate is created on the near side.
	Doubler plate is created on the far side.

### Doubler plate edge shape

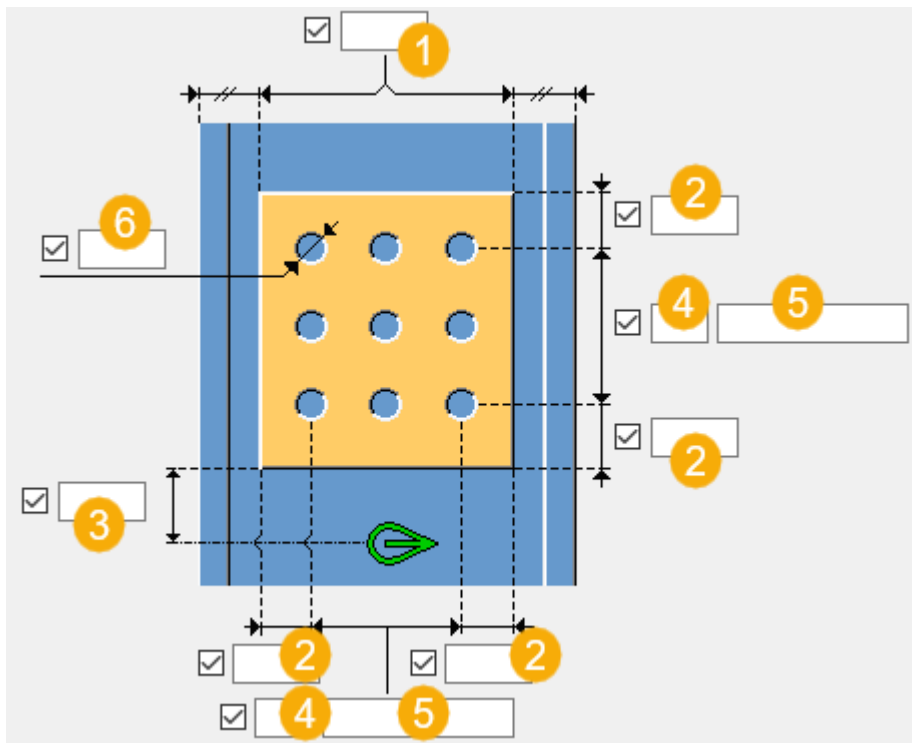
Option	Description
	Default Bevel doubler plates AutoDefaults can change this option.
	Bevel doubler plates Enter the angle in <input checked="" type="checkbox"/> <input type="text"/> (0 - 90)

Option	Description
	Square doubler plates

### Doubler plate cuts

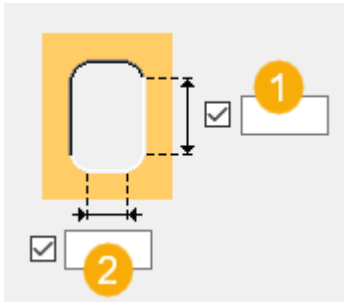
Option	Description
	Default Doubler plates are not cut. AutoDefaults can change this option.
	Doubler plates are not cut.
	Doubler plates are cut in the area that connects the main part web and flange.

### General settings



	Description
1	Edge distance from the column flange.
2	Doubler plate edge distance. Edge distance is the distance from the center of a hole to the edge of the part.
3	Edge distance of the doubler plate in relation to the bottom of the secondary part.
4	Number of holes.
5	Hole spacing. Use a space to separate hole spacing values. Enter a value for each space between holes. For example, if there are 3 holes, enter 2 values.
6	Hole diameter.

### Weld hole size



1	Slot length.
2	Slot width.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

## ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

## ***Welds***

Click the link below to find out more:

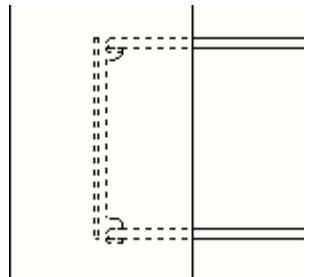
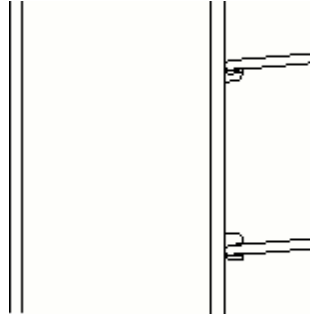
## **Beam prep (183)**

Creates a welded beam to column connection. The end of the beam can be prepared. Web doubler plate in the column is optional. Welds are defined in a separate dialog box that you can access by clicking the **Welds** button.

### **Objects created**

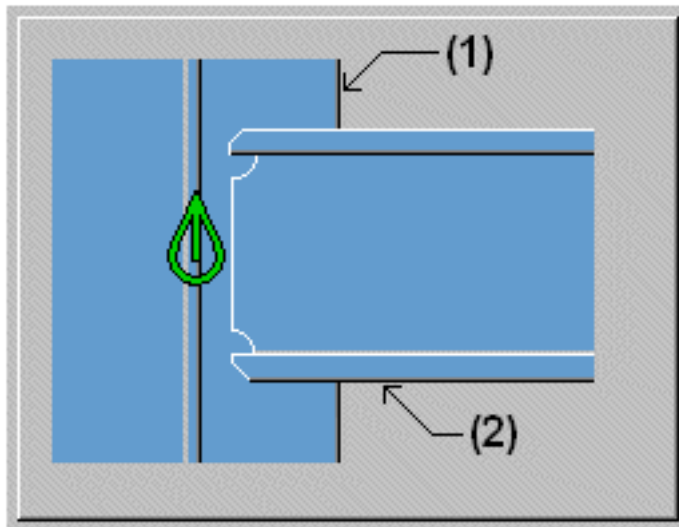
- Web doubler plate (optional)
- Weld backing bars (optional)
- Welds
- Cuts

### **Use for**

<b>Situation</b>	<b>Description</b>
	Beam to column web. Web doubler plate on the opposite side of column web.
	Sloping beam to column flange. Weld backing bars.



## Selection order



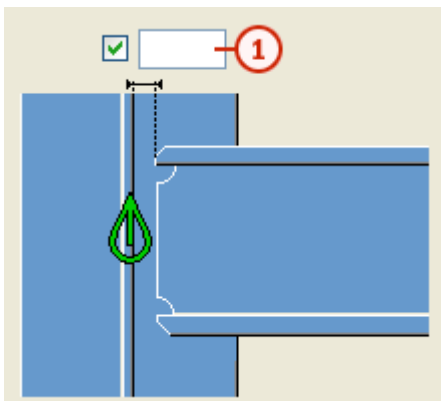
1. Select the main part (column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

## Picture tab

Use the **Picture** tab to set the gap between the main part and the secondary part, and select the beam end cut type.





## Dimensions



	Description
1	Weld gap

## Beam end cut

Define how the beam end is cut. The secondary part is viewed from the side.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary part slopes less than 10 degrees, a square cut is created. Otherwise, a bevel cut is made to the end of the secondary part.
	Square Creates a square cut to the end of the secondary part.
	Bevel Cuts the end of the secondary part parallel to the edge of the main part.

### **Notch tab**





Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.


### **Automatic notching**

Automatic notching options affect both the top and the bottom flange.

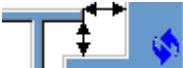

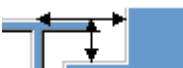
### **Notch shape**

Automatic notching is switched on when you select a notch shape.

Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.

Option	Description
	Turns off automatic notching.




### Notch size

Option	Description
	<p>Default</p> <p>The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.</p> <p>AutoDefaults can change this option.</p>
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.






### Flange cut shape

Option	Description
	<p>Default</p> <p>Secondary beam flange is cut parallel to the main beam.</p> <p>AutoDefaults can change this option.</p>
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

### Notch dimension rounding




Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.





The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



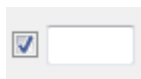
### Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

### Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.








### Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.



### Side of flange notch

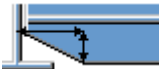



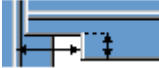
The side of flange notch defines on which side of the beam the notches are created.

Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

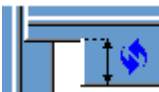
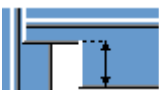

### Flange notch shape

The flange notch shape defines the notch shape in the beam flange.

Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.

Option	Description
	Creates chamfers in the flange. If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.
	Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b> .
	The flange is not cut.
	Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.
	Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b> .

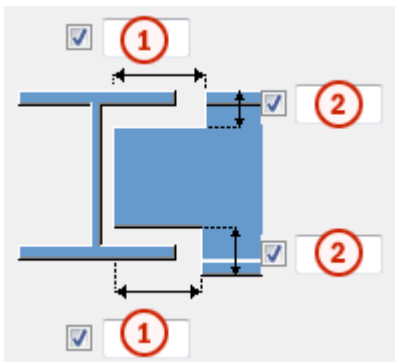
### Flange notch depth

Option	Description
	Default Flange notch depth. AutoDefaults can change this option.
	Flange notch depth.
	Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.

Enter the value for flange notch depth.

### Cut dimensions



	<b>Description</b>	<b>Default</b>
<b>1</b>	Dimensions for the horizontal flange cuts.	10 mm
<b>2</b>	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### ***Beam cut tab***

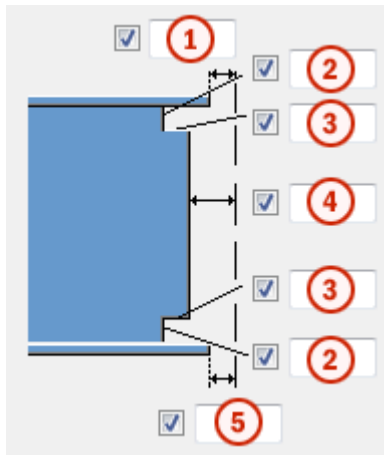
Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts.

### **Weld backing bar**

<b>Option</b>	<b>Description</b>
<b>Weld backing bar</b>	Weld backing bar thickness and width.





<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

## Weld access hole dimensions






	Description
1	Gap between the secondary part top flange and the main part.
2	Vertical dimensions for the top and the bottom weld access holes.
3	Horizontal dimensions for the top and the bottom weld access holes.
4	Gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.
5	Gap between the secondary part bottom flange and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.





## Weld access holes

Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	









Option	Description	Default
	Round weld access hole with a radius that you can define in r <input checked="" type="checkbox"/> <input type="text"/>	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and Top Prep x <input checked="" type="checkbox"/> <input type="text"/> Bottom Prep x <input checked="" type="checkbox"/> <input type="text"/>	
	Cone-shaped weld access hole with radiuses that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and r <input checked="" type="checkbox"/> <input type="text"/> Capital <b>R</b> defines the large radius (height). Small <b>r</b> defines the small radius.	R = 35 r = 10







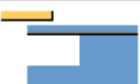

### Beam end preparation

Option	Description
	Default Top and bottom flange are prepared. AutoDefaults can change this option.
	Automatic Top and bottom flange are prepared.
	Beam end is not prepared.
	Top and bottom flange are prepared.

## Flange cut



Option for top flange	Option for bottom flange	Description
		Default Flange is not cut. AutoDefaults can change this option.
		Flange is not cut.
		Flange is cut.


## Weld backing bars

Option for top backing bar	Option for bottom backing bar	Description
		Default Backing bars are created inside the flanges. AutoDefaults can change this option.
		No backing bars are created.
		Backing bars are created inside the flanges.
		Backing bars are created outside the flanges.

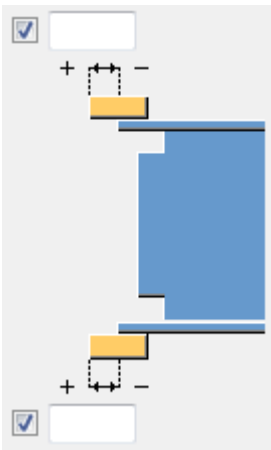
## Weld backing bar length

Enter the length of the weld backing bar in the box below the options.

Option	Description
	Default Absolute length of the backing bar AutoDefaults can change this option.
	Absolute length of the backing bar

Option	Description
	Extension beyond the edge of the flange

### Weld backing bar position

Option	Description
	Enter a positive or a negative value to move the front end of the backing bar relative to the end of the flange.

### Assembly type

Define the location where the weld backing bar welds are made. When you select the **Workshop** option, Tekla Structures includes the backing bars in the assembly.

### Doubler plate tab

Use the **Doubler plate** tab to create doubler plates to strengthen the web of the main part.




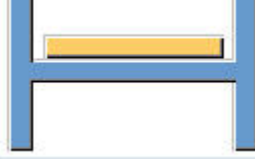
### Web plate

Option	Description
<b>Web plate</b>	Web plate thickness and height.

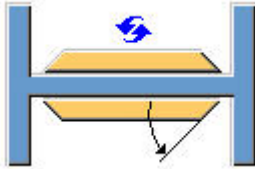
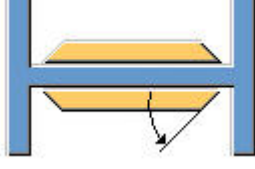
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in


Option	Description	Default
		<b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	

### Doubler plates

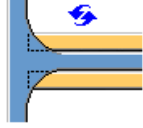
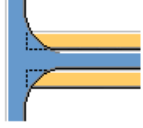

Option	Description
	Default Doubler plates are created on both sides. AutoDefaults can change this option.
	Doubler plates are not created.
	Doubler plate is created on the near side.
	Doubler plate is created on the far side.

### Doubler plate edge shape

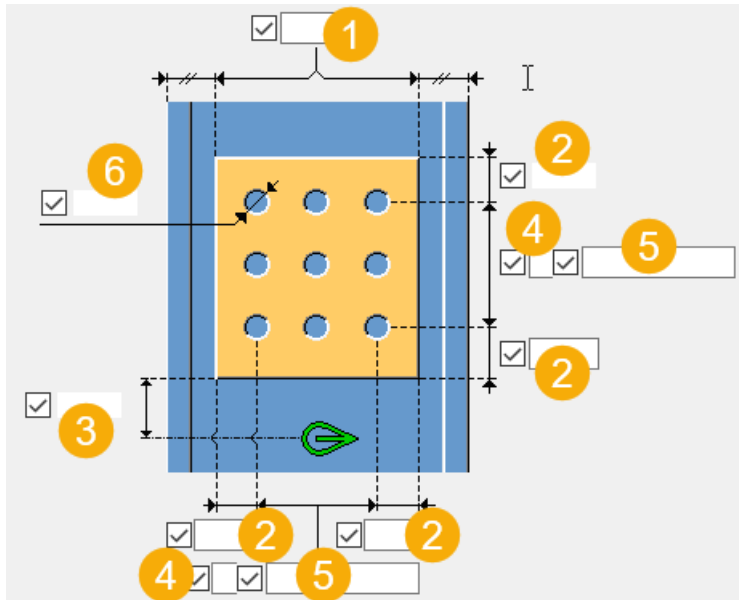
Option	Description
	Default Bevel doubler plates AutoDefaults can change this option.
	Bevel doubler plates Enter the angle in <input checked="" type="checkbox"/> <input type="text"/> (0 - 90)

Option	Description
	Square doubler plates

### Doubler plate cuts

Option	Description
	Default Doubler plates are not cut. AutoDefaults can change this option.
	Doubler plates are not cut.
	Doubler plates are cut in the area that connects the main part web and flange.

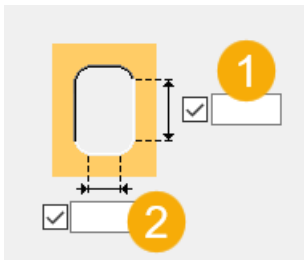
### General settings



	Description
1	Edge distance from the column flange.

	Description
2	Doubler plate edge distance. Edge distance is the distance from the center of a hole to the edge of the part.
3	Edge distance of the doubler plate in relation to the bottom of the secondary part.
4	Number of holes.
5	Hole spacing. Use a space to separate hole spacing values. Enter a value for each space between holes. For example, if there are 3 holes, enter 2 values.
6	Hole diameter.

### Weld hole size



Option	Description
1	Slot length.
2	Slot width.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

## ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

## ***Welds***

Click the link below to find out more:

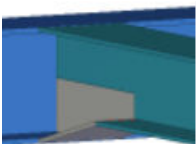
## **Offshore (194)**

**Offshore (194)** creates a beam-to-beam welded connection, which also creates a haunch for different depth beams. The haunch is made of the same size profile as the smaller beam. You can control the length and depth of the cuts and the required welding.

### **Objects created**

- Haunch plates
- Welds

### **Use for**

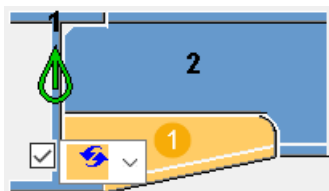
<b>Situation</b>	<b>Description</b>
	Welded offshore connection with haunch plates.

### **Selection order**

1. Select the main part (beam).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### **Part identification key**

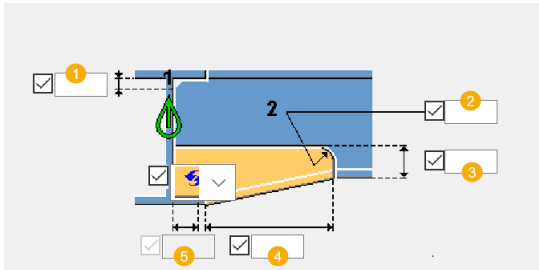


	Description
1	Haunch plate

### Picture tab

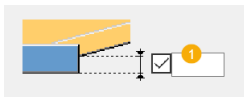
Use the **Picture** tab to define the connection dimensions and chamfers.

### Dimensions



	Description
1	Chamfer size at the top flange.
2	Chamfer radius.
3	Depth of the secondary part cut.
4	Length of the secondary part cut.
5	Chamfer size at the bottom flange for line and convex chamfers.

### Gap distance




	Description
1	Gap distance for the haunched beam flange.

### Chamfer type

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer



Option	Description
	Convex chamfer

### **Parts tab**

Use the **Parts** tab to define whether the haunch is created as a profile or as a plate.

### **Parts**

Option	Description
<b>Beam, Web plate, Flange plates</b>	The haunch profile is the same as that of the supported secondary beam.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **General tab**

Click the link below to find out more:

General tab

### **Design tab**

Click the link below to find out more:

Design tab

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

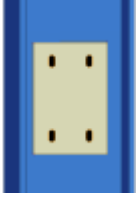
## **Doubler plate (1022)**

**Doubler plate (1022)** creates a web plate to strengthen the main part web.

### **Objects created**

- Web plate
- Welds

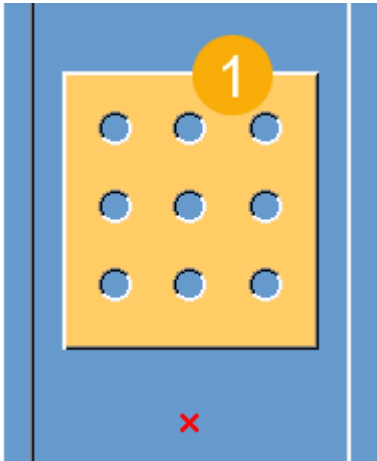
### **Use for**

<b>Situation</b>	<b>Description</b>
	Web plate to main part

### **Selection order**

1. Select the part.
2. Pick a position for the doubler plate.  
The doubler plate is created automatically when you pick the position.

## Part identification key

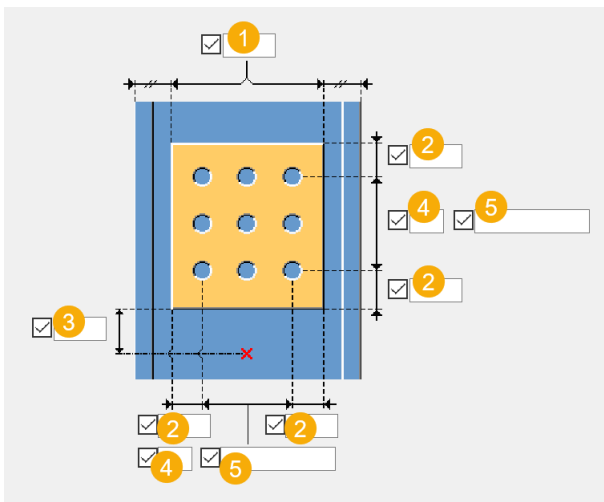


	Description
1	Doubler plate

## Picture tab

Use the **Picture** tab to define the connection dimensions.

## Dimensions



	Description
1	Edge distance from the column flange.
2	Doubler plate edge distance. Edge distance is the distance from the center of a hole to the edge of the part.

	<b>Description</b>
<b>3</b>	Edge distance of the doubler plate in relation to the bottom of the secondary part.
<b>4</b>	Number of holes.
<b>5</b>	Hole spacing. Use a space to separate hole spacing values. Enter a value for each space between holes. For example, if there are 3 holes, enter 2 values.

### ***Parts tab***

Use the **Parts** tab to define the part properties.

### **Parts**



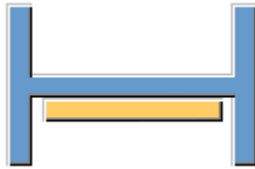
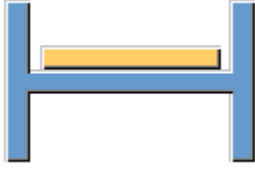

<b>Option</b>	<b>Description</b>
<b>Web plate</b>	Thickness and height of the web plate

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

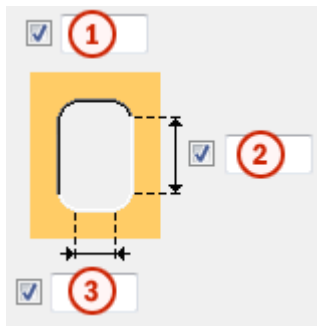
### ***Doubler plate tab***

Use the **Doubler plate** tab to create doubler plates to strengthen the web of the main part.

## Doubler plates

Option	Description
	<p>Default</p> <p>Doubler plates are created on both sides.</p> <p>AutoDefaults can change this option.</p>
	<p>Doubler plates are not created.</p>
	<p>Doubler plate is created on the near side.</p>
	<p>Doubler plate is created on the far side.</p>
	<p>Doubler plates are created on both sides.</p>

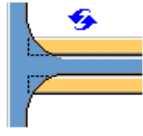
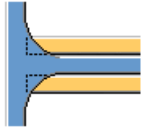

## Weld hole size



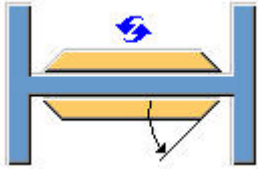
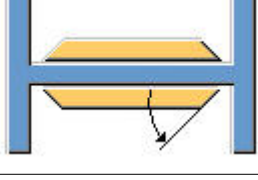
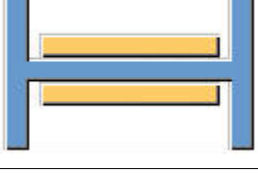
	Description
1	Hole diameter.
2	Slot length.

	Description
3	Slot width.

### Doubler plate cuts

Option	Description
	Default Doubler plates are not cut. AutoDefaults can change this option.
	Doubler plates are not cut.
	Doubler plates are cut in the area that connects the main part web and flange.

### Doubler plate edge shape

Option	Description
	Default Bevel doubler plates AutoDefaults can change this option.
	Bevel doubler plates Enter the angle in <input checked="" type="checkbox"/> <input type="text"/> (0 - 90)
	Square doubler plates

### General tab

Click the link below to find out more:

[General tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

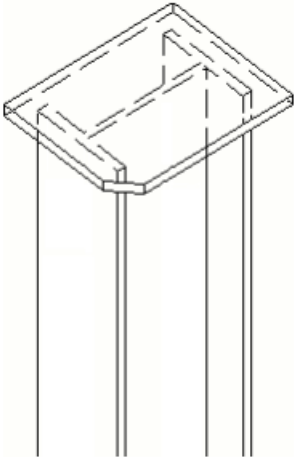
## **Cap plate detail**

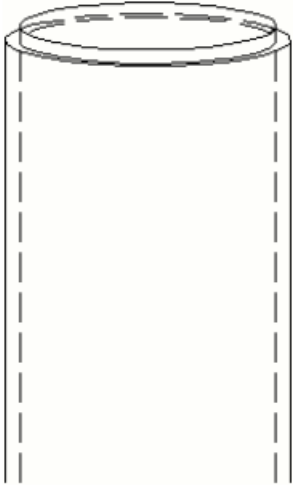
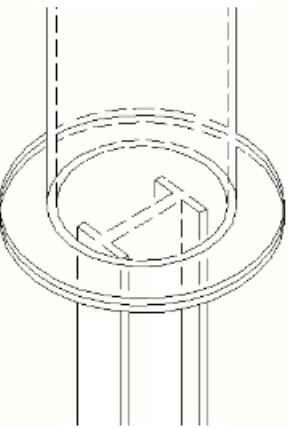
**Cap plate detail** creates a cap plate to a column or a beam, or to a polybeam.

### **Objects created**

- Cap plate

### **Use for**

<b>Situation</b>	<b>Description</b>
	Cap plate with one chamfered corner created on an I profile column.

Situation	Description
	<p>Cap plate created on a pipe profile column.</p>
	<p>One cap plate created on a pipe profile column and another cap plate created on an I profile column.</p>

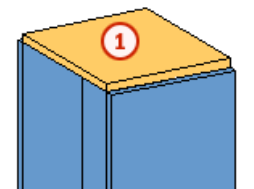
### Selection order

1. Select the main part (beam, column, or polybeam).
2. Pick the position of the cap plate.

You can pick a position on the column center line, side, or anywhere. The cap plate is always centered.

The cap plate is created automatically when you pick the position.

### Part identification key



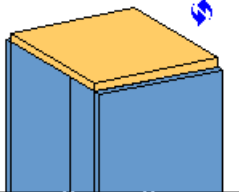
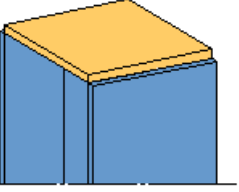
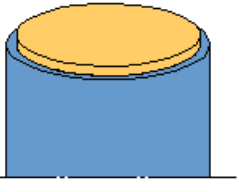


	<b>Part</b>
<b>1</b>	Cap plate

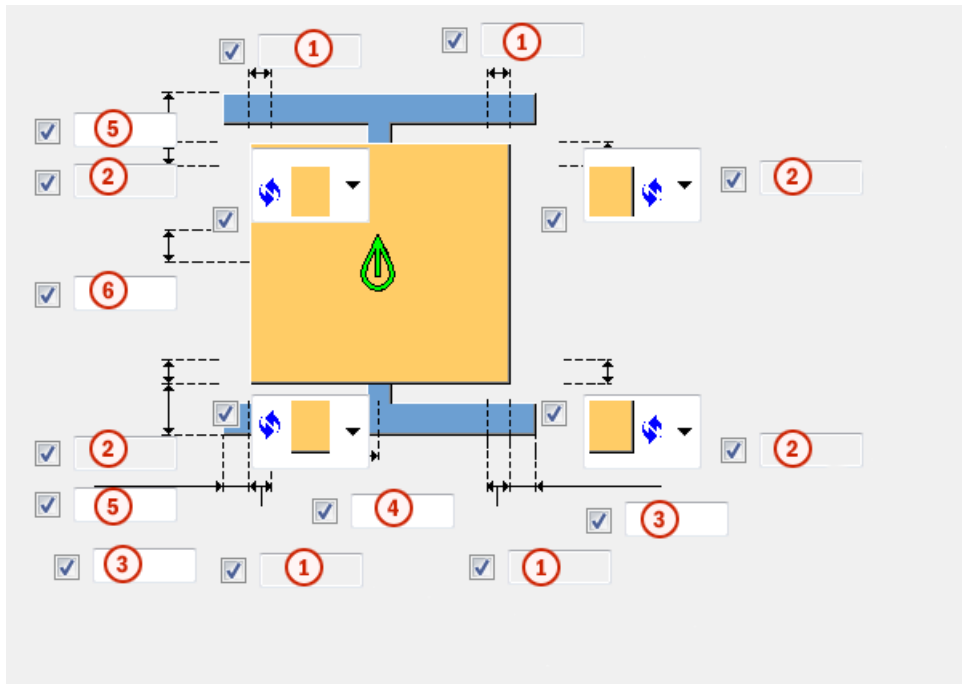
**Picture tab**

Use the **Picture** tab to control the shape and the dimensions the cap plate.

**Cap plate shape**

<b>Option</b>	<b>Description</b>
	Default Rectangular AutoDefaults can change this option.
	Rectangular
	Circular






## Rectangular cap plate dimensions



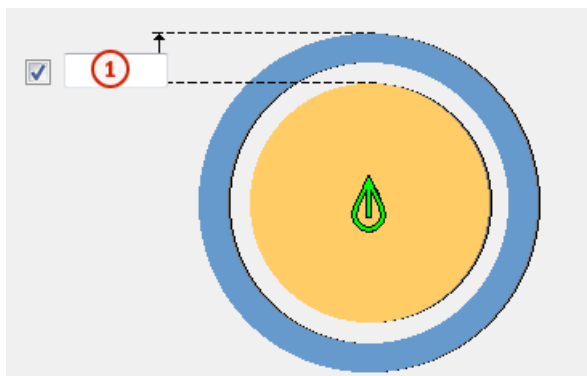
	Description	Default
1	Horizontal chamfer dimension. This option is not available if you have selected <b>No chamfer</b> in the chamfer options.	20 mm
2	Vertical chamfer dimension. This option is not available if you have selected <b>No chamfer</b> in the chamfer options.	20 mm
3	Horizontal edge distance of the cap plate. This option is used only when the plate width on the <b>Parts</b> tab is empty.	0 mm
4	Horizontal offset of the cap plate. This option is used only when the plate height on the <b>Parts</b> tab has a value.	0 mm
5	Vertical edge distance of the cap plate. This option is used only when the plate height on the <b>Parts</b> tab is empty.	10 mm
6	Vertical offset of the cap plate. This option is used only when the plate height on the <b>Parts</b> tab has a value.	0 mm

## Rectangular cap plate chamfers

You can define the chamfers for each corner of the cap plate.

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer The default values of convex arc chamfers in cap plates with an RHS and SHS profile are as follows: <ul style="list-style-type: none"> <li>• If you define the width and the height of a cap plate, the chamfer radius value of the profile is used.</li> <li>• If the profile chamfer radius is equal or smaller than 5 mm, then a 0 mm value is applied.</li> <li>• If you define the cap plate edge distances, an absolute value of the difference between the profile chamfer radius and the highest value of all edge distances is used.</li> </ul>
	Concave arc chamfer

## Circular cap plate dimensions



	Description
1	Cap plate edge distance.

### **Parts tab**

Use the **Parts** tab to control the properties of the cap plate.

### **Part**

Part	Description	Default
<b>Cap plate</b>	Thickness, width, and height of the cap plate.	Thickness = 1.5*(profile web or plate thickness) Width = profile width or profile diameter or height (option 'h'), first one that is not 0. Height = profile height or profile diameter or 200 mm, first one that is not 0.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

### **General tab**

Click the link below to find out more:

[General tab](#)

## Welds

Click the link below to find out more:

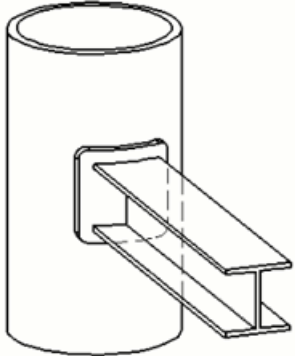
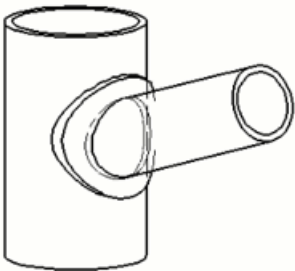
### Pipe doubler plate

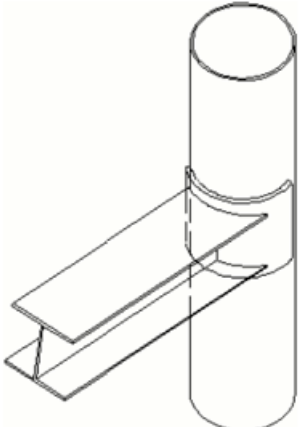
**Pipe doubler plate** creates a doubler plate between the main part and the secondary part. The main part has to be a round profile.

#### Objects created

- Doubler plate
- Welds

#### Use for

Situation	Description
 A technical drawing showing a vertical cylindrical column on the left. A horizontal I-beam beam is attached to the side of the column. A rectangular doubler plate is welded between the column and the web of the I-beam. The plate is shown in a perspective view, with dashed lines indicating its position relative to the column and beam.	Rectangular doubler plate connecting a column and a beam.
 A technical drawing showing a vertical cylindrical column on the left. A smaller cylindrical beam is attached to the side of the column, extending outwards at an angle (skewed). A circular doubler plate is welded between the column and the end of the skewed beam. The plate is shown in a perspective view, with dashed lines indicating its position relative to the column and beam.	Circular doubler plate connecting a column and a beam. The secondary part is skewed.

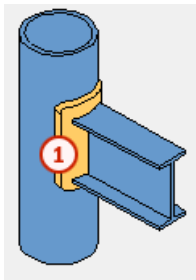
Situation	Description
	<p>Rectangular doubler plate connecting a column and a beam.</p> <p>The secondary part is off-axis.</p>

### Selection order

1. Select the main part (column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key

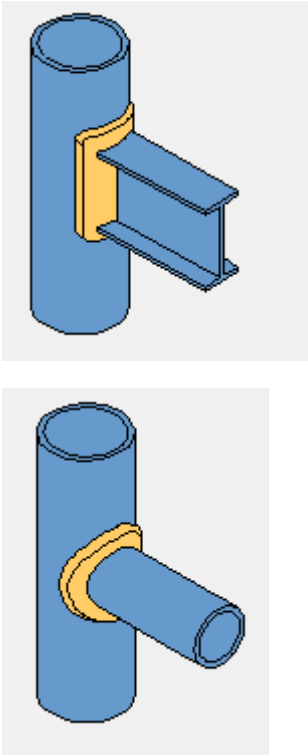


	Part
1	Doubler plate

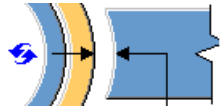
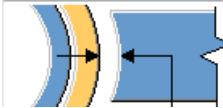
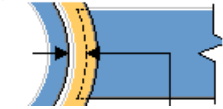
### Picture tab

Use the **Picture** tab to control the type, position, and dimensions of the doubler plate.

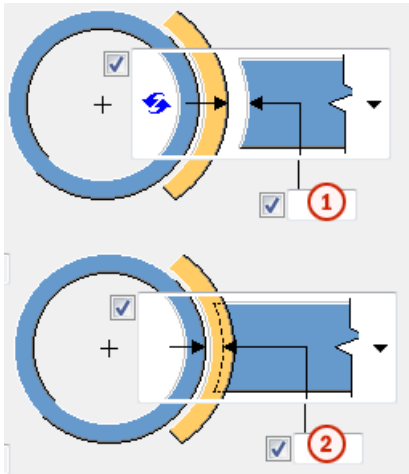
### Doubler plate type

Option	Description
	<p>Select the doubler plate type:</p> <ul style="list-style-type: none"> <li>• <b>Rectangular</b></li> <li>• <b>Circular</b></li> </ul>

### Clearance type

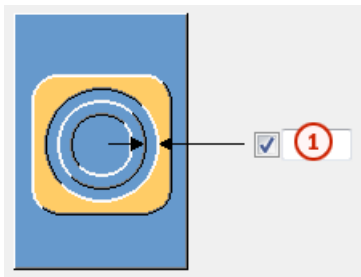
Option	Description
	<p>Default Clearance between the doubler plate and the secondary part. AutoDefaults can change this option.</p>
	<p>Clearance between the doubler plate and the secondary part.</p>
	<p>Clearance between the main part and the secondary part.</p>

### Clearance dimension



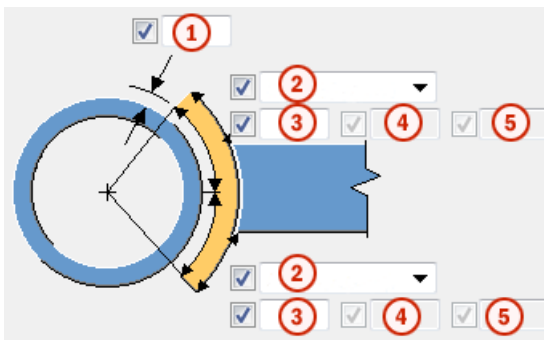
	Description
1	Clearance between the doubler plate and the secondary part.
2	Clearance between the main part and the secondary part.

### Cut clearance

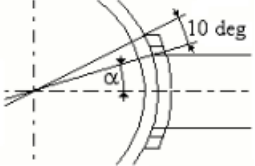


	Description
1	Cut clearance between the doubler plate and the secondary part.

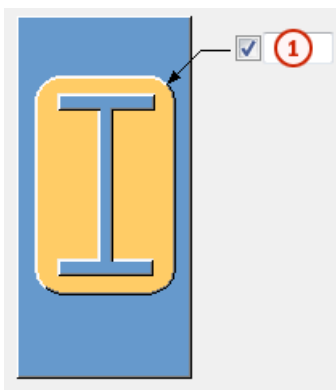
### Rectangular doubler plate dimensions





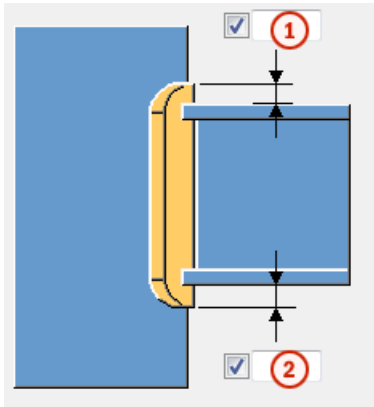
	Description	Default
1	Offset between the column and the doubler plate.	0 mm
2	Measuring type for the doubler plate: <ul style="list-style-type: none"> <li>• Angle (degrees) Define the angle of the doubler plate in degrees.</li> <li>• Dimension Define the arc length of the doubler plate.</li> <li>• Edge Define the arc length of the doubler plate edge.</li> </ul>	Angle
3	Angle of the doubler plate. The angle can be extended up to 360 degrees to go around the main part.	Angle +10 degrees 
4	Dimension value of the doubler plate. The dimension can be extended up to 360 degrees to go around the main part.	length equivalent to the formula angle +10 degrees
5	Edge value of the doubler plate. The edge value can be extended up to 360 degrees to go around the main part.	length equivalent to the formula angle +10 degrees

### Corner rounding dimension for rectangular plate



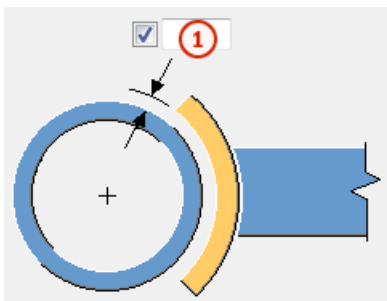
	Description
1	Corner rounding dimension for a rectangular doubler plate. Corners are not created with value 0.

### Doubler plate extension for rectangular plate



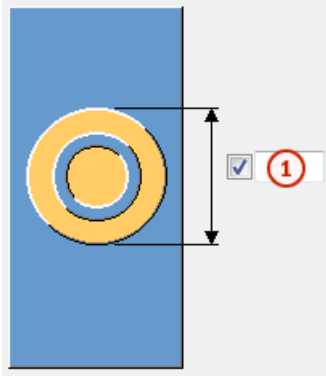
	Description
1	Vertical dimension from the secondary part top edge to doubler plate top edge.
2	Vertical dimension from the secondary part bottom edge to the doubler plate bottom edge.

### Circular doubler plate dimensions



	Description
1	Offset between the column and the doubler plate.

## Circular doubler plate diameter



	Description
1	Diameter of the circular doubler plate.

### Parts tab

Use the **Parts** tab to control the position of the doubler plate.

### Part

Part	Description
Doubler plate	Thickness of the doubler plate.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

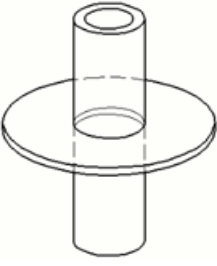
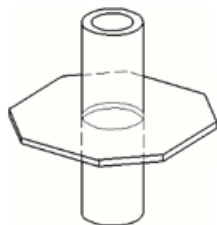
## **Ring plate**

**Ring plate** creates a ring plate. The ring plate can be circular, elliptical, or angular. **Ring plate** creates welds between the column and the ring plate.

### **Objects created**

- Ring plate
- Welds

### **Use for**

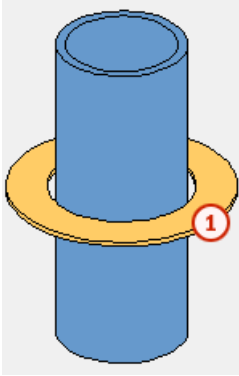
<b>Situation</b>	<b>Description</b>
 A technical drawing showing a vertical cylindrical tube column with a circular ring plate attached to its side. The ring plate is a flat, circular disk that encircles the tube. Hidden lines are used to show the back of the tube and the back of the ring plate.	Circular ring plate on a tube column.
 A technical drawing showing a vertical cylindrical tube column with an angular ring plate attached to its side. The ring plate is a flat, polygonal disk (resembling an octagon) that encircles the tube. Hidden lines are used to show the back of the tube and the back of the ring plate.	Angular ring plate on a tube column.

### Selection order

1. Select the main part (column).
2. Pick a position for the connection.

The connection is created automatically when the position is picked.

### Part identification key



	Part
1	Ring plate

### Picture tab

Use the **Picture** tab to control the shape and the dimensions of the ring plate in the **Ring plate** connection.

### Ring plate type

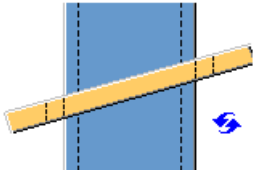
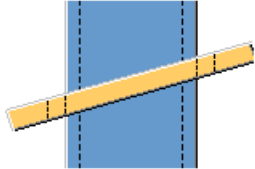
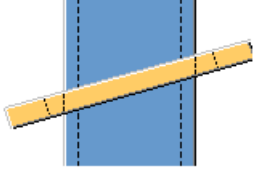
Option	Description	Default
<b>Ring plate</b>	Select the ring plate type: <ul style="list-style-type: none"><li>• <b>Default</b></li><li>• <b>Circular</b></li><li>• <b>Elliptical</b></li><li>• <b>Angular</b></li></ul>	Circular

### Ring plate measuring type

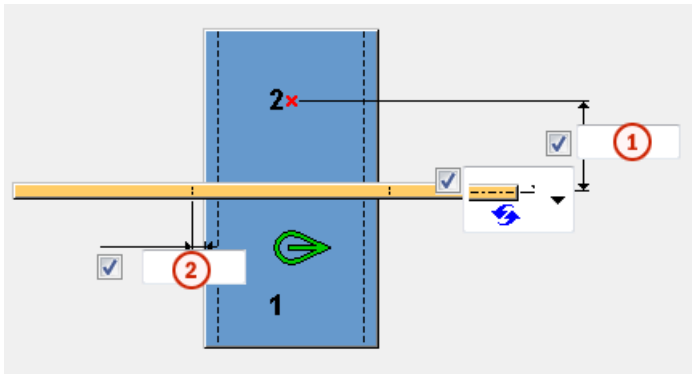
Option	Description	Default
<b>Ring plate measuring type</b>	Select how the ring plate dimension is measured: <ul style="list-style-type: none"><li>• <b>Default</b></li><li>• <b>Plate dimension</b></li></ul>	Plate dimension

Option	Description	Default
	<ul style="list-style-type: none"> <li>• <b>Plate absolute dimension</b></li> </ul>	

### Cut direction





Option	Description
	<p>Default</p> <p>The cut is created along the main part.</p> <p>AutoDefaults can change this option.</p>
	<p>The cut is created along the main part.</p>
	<p>The cut is created perpendicular on the plate.</p>

### Ring plate offset dimensions



	Description
<b>1</b>	Ring plate offset from the picked point.
<b>2</b>	Ring plate clearance from the outer edge of the main part.

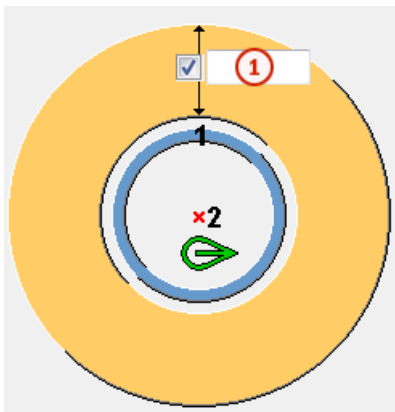
## Ring plate offset measuring

Option	Description
	Default The offset dimension is measured from the center line of the ring plate. AutoDefaults can change this option.
	The offset dimension is measured from the center line of the ring plate.
	The offset dimension is measured from the bottom edge of the ring plate.
	The dimension is measured from the top edge of the ring plate.

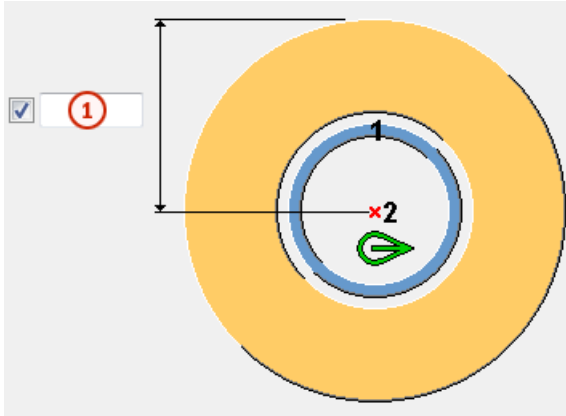
## Create assembly

Option	Description	Default
<b>Create assembly</b>	Define how the parts are included in an assembly: <ul style="list-style-type: none"> <li>• Default</li> <li>• <b>Yes</b> - All parts are in one single assembly.</li> <li>• <b>No</b> - Parts are not included in one single assembly.</li> </ul>	<b>Yes</b>

## Circular ring plate dimensions

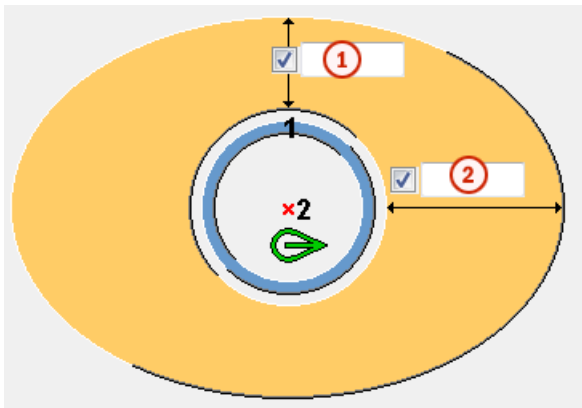


	Description	Default
1	<b>Plate dimension</b> Define the minimum width of the ring plate.	200mm



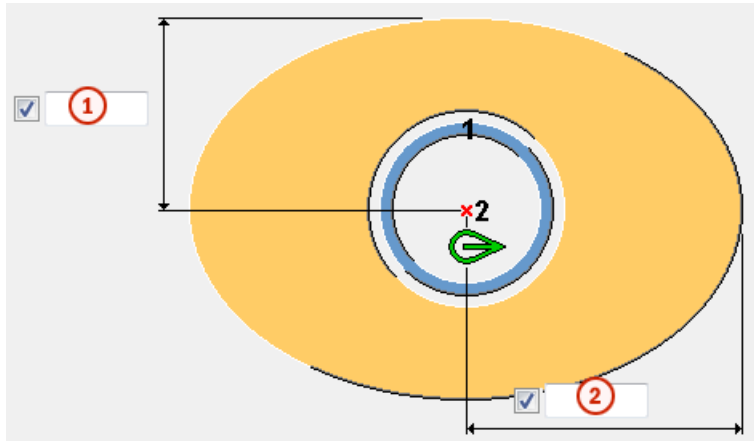
	Description	Default
1	<b>Plate absolute dimension</b> Define the absolute width of the ring plate from the center point.	Minimum width + clearance + part height/2

### Elliptical ring plate dimensions



	Description	Default
1	Ring plate vertical width.	200mm
2	Ring plate horizontal width.	200mm



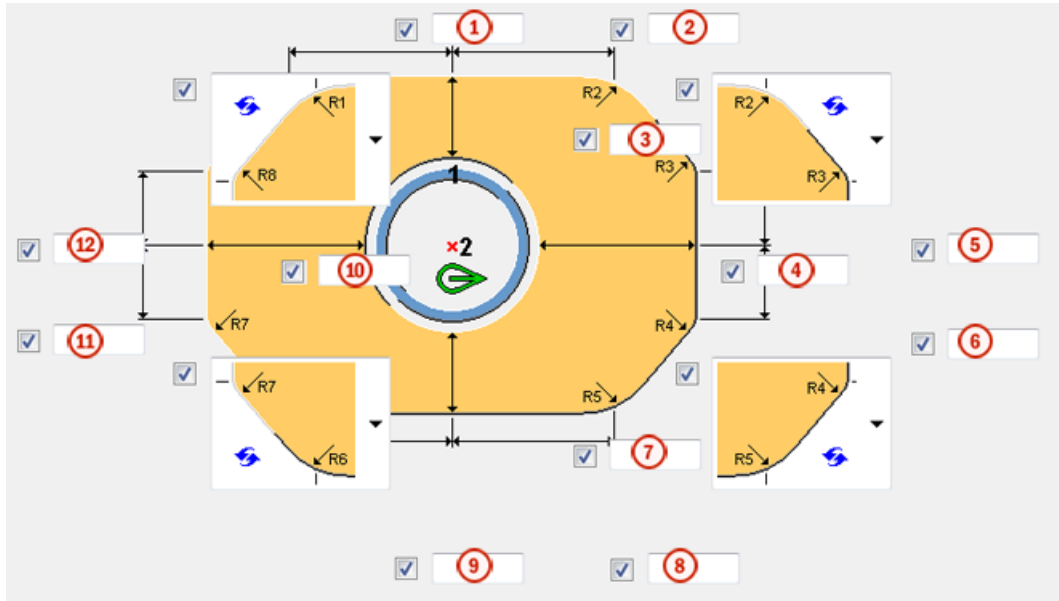


	Description	Default
1	Absolute vertical width of the ring plate from the center point.	Vertical width + clearance + part height/2
2	Absolute horizontal width of the ring plate from the center point.	Horizontal width + clearance + part height/2

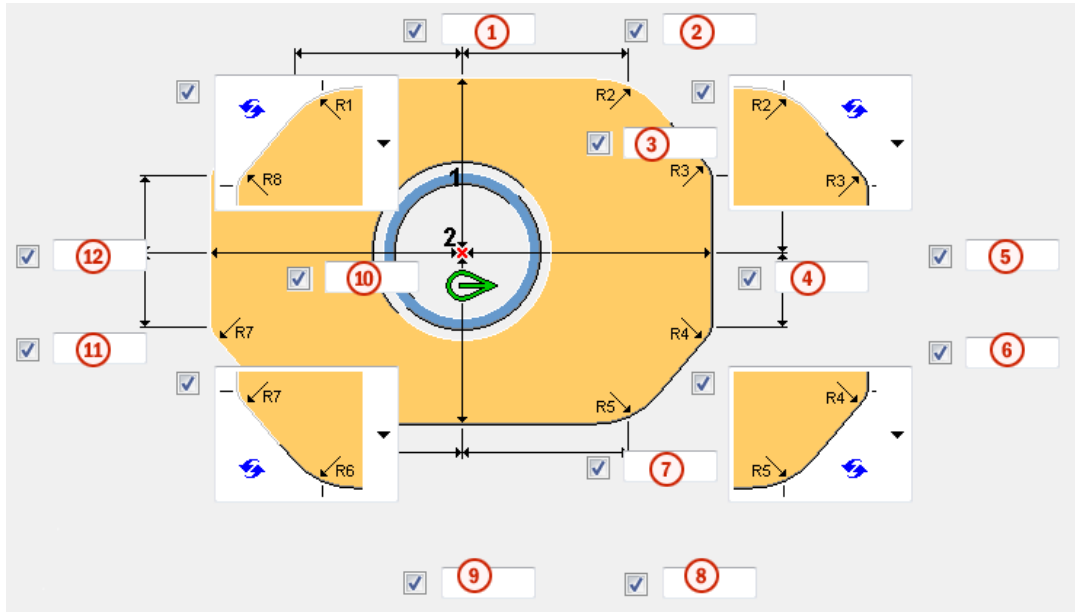
### Angular ring plate dimensions

You can define the radius for each corner.

R1	<input checked="" type="checkbox"/>	<input type="text"/>	R5	<input checked="" type="checkbox"/>	<input type="text"/>
R2	<input checked="" type="checkbox"/>	<input type="text"/>	R6	<input checked="" type="checkbox"/>	<input type="text"/>
R3	<input checked="" type="checkbox"/>	<input type="text"/>	R7	<input checked="" type="checkbox"/>	<input type="text"/>
R4	<input checked="" type="checkbox"/>	<input type="text"/>	R8	<input checked="" type="checkbox"/>	<input type="text"/>



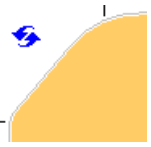
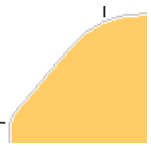

	Description	Default
1	Horizontal distance between corner radius R1 and the picked point.	150mm
2	Horizontal distance between corner radius R2 and the picked point.	150mm
3	Vertical distance between the plate top outer edge and the plate inner edge.	200mm
4	Horizontal distance between the plate right side edge and the plate inner center.	200mm
5	Vertical distance between corner radius R3 and the picked point.	150mm
6	Horizontal distance between corner radius R4 and the picked point.	150mm
7	Vertical distance between the plate bottom outer edge and the plate inner center.	200mm
8	Horizontal distance between corner radius R5 and the picked point.	150mm
9	Horizontal distance between corner radius R6 and the picked point.	150mm
10	Horizontal distance between the plate left side edge and the plate inner edge.	200mm
11	Vertical distance between corner radius R7 and the picked point.	150mm
12	Vertical distance between corner radius R8 and the picked point.	150mm



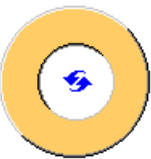
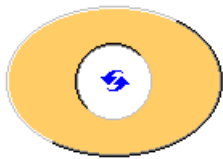







	Description	Default
1	Horizontal distance between corner radius R1 and the picked point.	150mm
2	Horizontal distance between corner radius R2 and the picked point.	150mm
3	Absolute vertical distance between the plate top outer edge and the center point.	Vertical width + clearance + part height/2
4	Absolute horizontal distance between the plate right side edge and the center point.	Horizontal width + clearance + part height/2
5	Vertical distance between corner radius R3 and the picked point.	150mm
6	Horizontal distance between corner radius R4 and the picked point.	150mm
7	Absolute vertical distance between the plate bottom outer edge and the center point.	Vertical width + clearance + part height/2
8	Horizontal distance between corner radius R5 and the picked point.	150mm
9	Horizontal distance between corner radius R6 and the picked point.	150mm
10	Absolute horizontal distance between the plate left side edge and the center point.	Horizontal width + clearance + part height/2


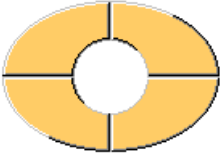

	Description	Default
11	Vertical distance between corner radius R7 and the picked point.	150mm
12	Vertical distance between corner radius R8 and the picked point.	150mm

### Corner shape

Option	Description
	Default Two radius dimensions AutoDefaults can change this option.
	Two radius dimensions
	One radius dimension

### Ring plate

Option (circular)	Option (elliptical)	Option (angular)	Description
			Default One ring plate AutoDefaults can change this option.
			One ring plate
			Two half ring plates

Option (circular)	Option (elliptical)	Option (angular)	Description
			Four quarter ring plates

### **Parts tab**

Use the **Parts** tab to control the properties of the ring plate.

#### **Part**

Part	Description	Default
<b>Ring plate</b>	Thickness of the ring plate.	10mm

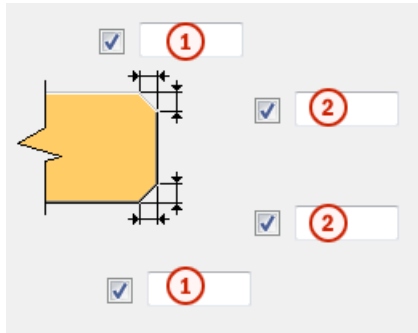
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Chamfers tab**

Use the **Chamfers** tab to control the chamfer properties of the ring plate.

#### **Chamfer dimensions**

For circular and elliptical ring plates, chamfering is created uniformly around the outer perimeter of the ring plate. For angular ring plates, chamfers are created in each corner.



	Description
1	Horizontal dimension of the chamfer.
2	Vertical dimension of the chamfer.

### **General tab**

Click the link below to find out more:  
[General tab](#)

### **Welds**

Click the link below to find out more:

## **2.8 Seated connections**

This section introduces components that can be used in seated connections.

- [Stiffener seating \(12\) \(page 1134\)](#)
- [Seating with nail \(36\) \(page 1144\)](#)
- [Seating \(39\) \(page 1152\)](#)
- [U.S. Seat connection \(72\) \(page 1165\)](#)
- [U.S. Seat connection 2 \(73\) \(page 1179\)](#)
- [U.S. Seat connection 3 \(74\) \(page 1192\)](#)
- [U.S. Seat connection 4 \(75\) \(page 1207\)](#)
- [Angle profile box \(170\) \(page 1217\)](#)

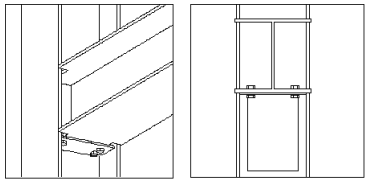
## Stiffener seating (12)

**Stiffener seating (12)** connects a beam to a column with a stiffener that is welded between the column flanges and bolted to the lower flange of the beam. The beam collides with the column web. The connection also cuts the beam flanges and optionally creates an end plate to the secondary part and a seat under the secondary part.

### Objects created

- Stiffener
- Seat
- End plate
- Bolts
- Welds

### Use for

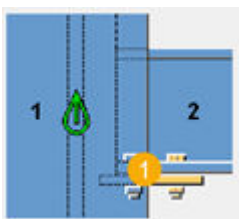
Situation	Description
	Beam connected to a column with a stiffener

### Selection order

1. Select the main part (column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key

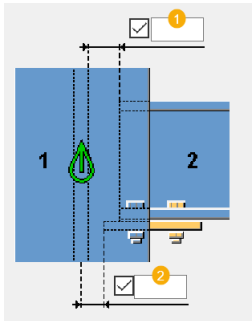


	Description
1	Stiffener

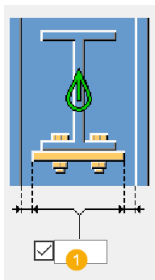
### Picture tab

Use the **Picture** tab to define the connection dimensions.

#### Dimensions



	Description	Default
1	Clearance distance between the column and beam	5 mm
2	Clearance distance between the column and stiffener	0



	Description	Default
1	Gap between the stiffener and the column flanges	0

### Parts tab

Use the **Parts** tab to define the part properties.

#### Parts

Option	Description
<b>Stiffener</b>	Thickness of the stiffener
<b>Seat</b>	Thickness, width, and height of the stiffener
<b>End plate</b>	Thickness of the stiffener

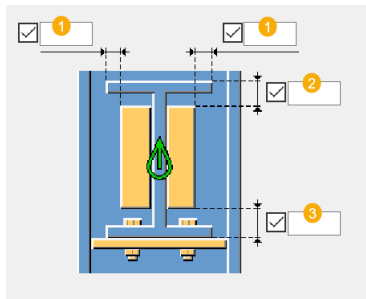


Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tab**

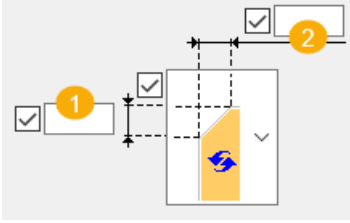
Use the **Parameters** tab to define the end plate dimensions and stiffener chamfering.

### **End plate dimensions**



	Description
<b>1</b>	End plate horizontal edge distance from the secondary part
<b>2</b>	End plate vertical edge distance from the secondary part upper edge
<b>3</b>	End plate vertical edge distance from the secondary part lower edge

## Chamfer dimensions



	Description	Default
<b>1</b>	Vertical dimension of the chamfer.	10 mm
<b>2</b>	Horizontal dimension of the chamfer.	10 mm

## Chamfer type

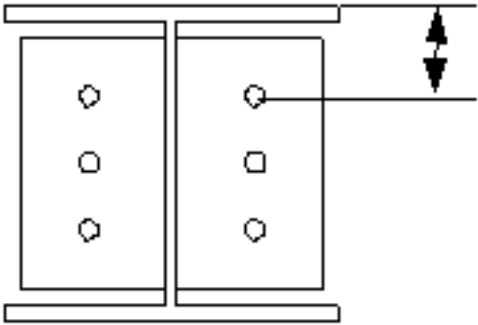
Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

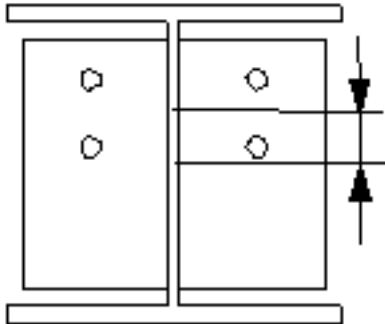
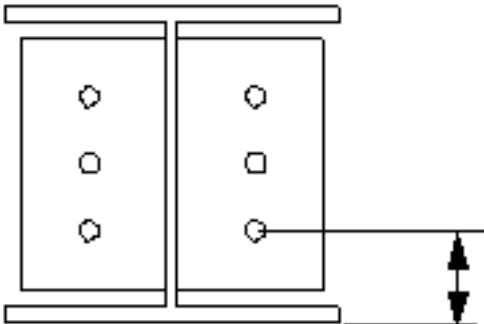
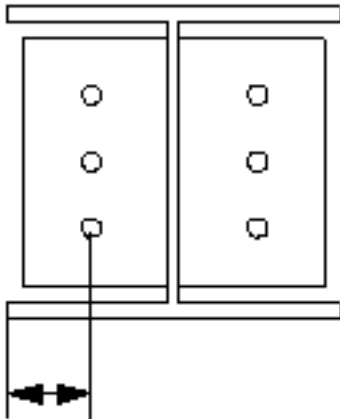
### **Bolts tab**

Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

#### **Bolt group dimensions**



	<b>Description</b>
<b>1</b>	Dimension for vertical bolt group position.
<b>2</b>	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"><li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li></ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>
<b>3</b>	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.              </li> </ul>

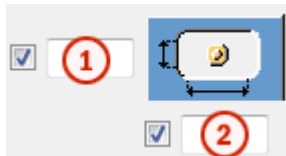
	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> <div style="text-align: center;"> </div>
<b>4</b>	<p>Bolt edge distance.</p> <p>Edge distance is the distance from the center of a bolt to the edge of the part.</p>
<b>5</b>	<p>Number of bolts.</p>
<b>6</b>	<p>Bolt spacing.</p> <p>Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.</p>

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



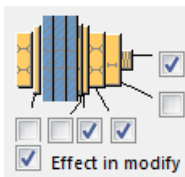
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

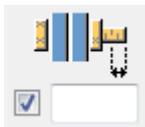
If you want to create a hole only, clear all the check boxes.








To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.


### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3

Option	Description
	Staggered type 4

### **General tab**

Click the link below to find out more:

General tab

### **Design tab**

Click the link below to find out more:

Design tab

### **Analysis tab**

Click the link below to find out more:

Analysis tab

### **Welds**

Click the link below to find out more:

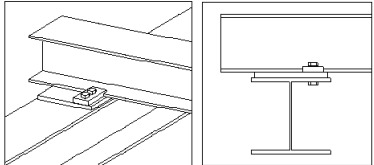
## **Seating with nail (36)**

**Seating with nail (36)** connects two beams that cross, but do not collide with each other, or have a gap greater than 50 mm. Horizontal angles between the profiles can vary. The beams are in parallel planes.

### **Objects created**

- Shim plate
- Bolts

### **Use for**

Situation	Description
	Beams are connected with a bolted shim plate.

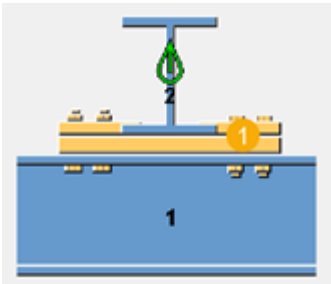


### Selection order

1. Select the main part (beam).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key

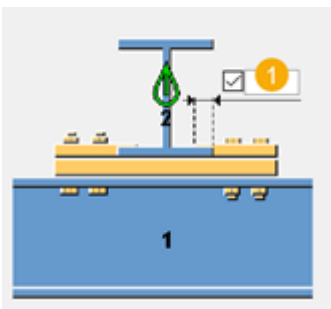


	Description
1	Shim plate

### Picture tab

Use the **Picture** tab to define the shim plate connection length.

### Connection length



	Description
1	Shim plate connection length on the secondary part Width is calculated based on the bolt group edge distances.

### Parts tab

Use the **Parts** tab to define the part properties.

## Parts

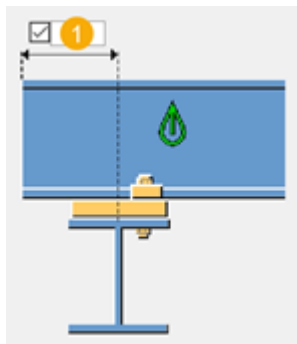
Option	Description
Spacer plate	Thickness of the shim plate

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tab**

Use the **Parameters** tab to define the secondary part end cut.

### **Secondary part cut**

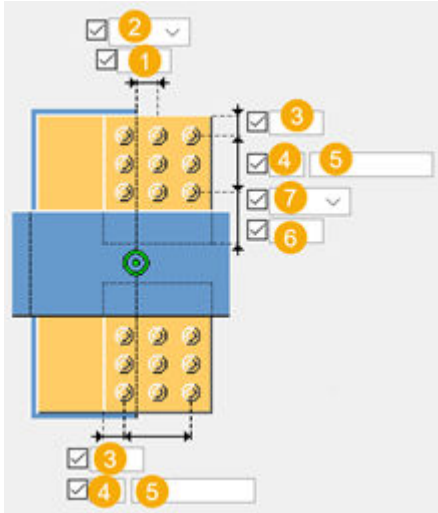


	Description
<b>1</b>	Secondary beam cut dimension from the main part center line  If the overshoot is initially longer than the entered value, nothing is done to the secondary beam. If the entered value is greater than initial overshoot, the secondary beam will be stretched and fitted.

### **Bolts tab**

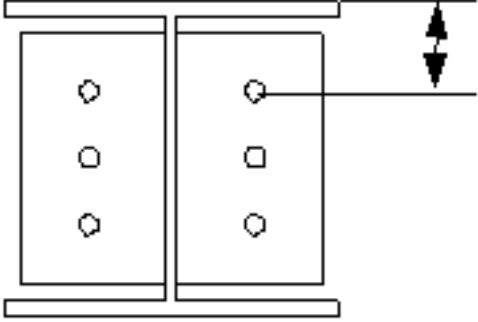
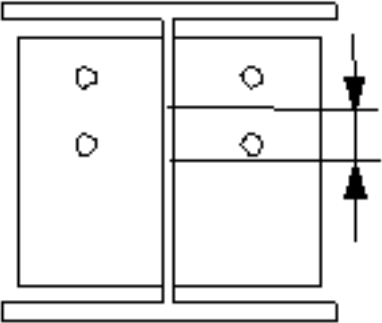
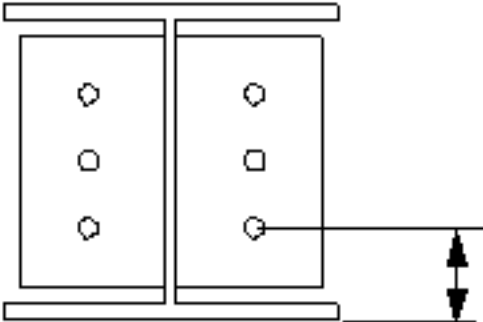
Use the **Bolts** tab to define the bolt group dimensions and the bolt properties.

### **Dimensions**



	<b>Description</b>
<b>1</b>	Dimension for horizontal bolt group position.
<b>2</b>	Select how to measure the dimensions for horizontal bolt group position. <ul style="list-style-type: none"><li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li></ul> <p>The diagram shows two vertical rectangular plates with three bolt holes each. A horizontal dimension line is drawn from the left edge of the left plate to the center of the leftmost bolt hole. A double-headed arrow below the dimension line indicates the measurement direction.</p>

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> <div style="text-align: center;"> </div>
<b>3</b>	<p>Bolt edge distance.</p> <p>Edge distance is the distance from the center of a bolt to the edge of the part.</p>
<b>4</b>	<p>Number of bolts.</p>
<b>5</b>	<p>Bolt spacing.</p> <p>Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.</p>
<b>6</b>	<p>Dimension for vertical bolt group position.</p>

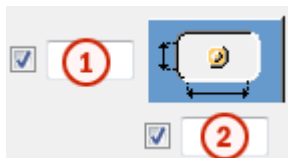
	Description
7	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.              </li> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



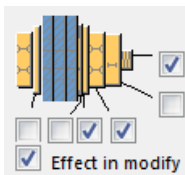
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

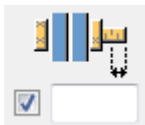
If you want to create a hole only, clear all the check boxes.








To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.


### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3

Option	Description
	Staggered type 4

### ***General tab***

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

## **Seating (39)**

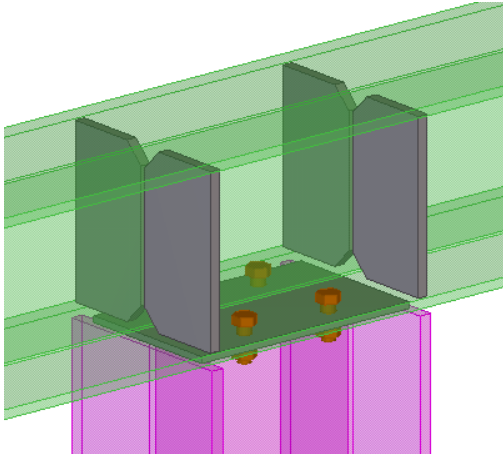
**Seating (39)** connects a column head to one or two beams using an end plate. The end plate is welded to the column head and bolted to the lower flange of the secondary part.

### **Objects created**

- End plate
- Stiffeners
- Bolts
- Washer plates (optional)



## Use for

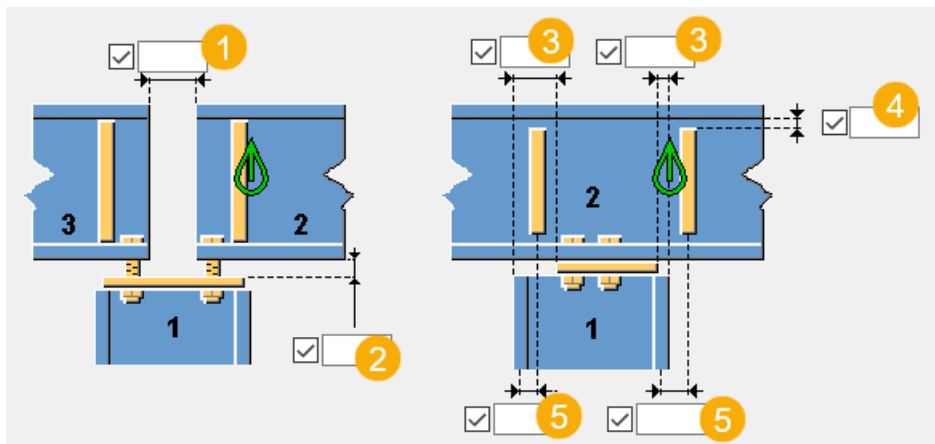
Situation	Description
	<p>Seating connection with end plate and stiffeners.</p>

## Selection order

1. Select the main part (column).
2. Select the first secondary part (beam).
3. Select the second secondary part (beam).
4. Click the middle mouse button to create the connection.

## Picture tab

Use the **Picture** tab to control the end plate and stiffener size and position.






	Description
1	Distance between the first and the second secondary part.
2	Distance between the end plate the secondary parts.

	Description
<b>3</b>	End plate distance from the main part edge. Positive values move end plate edges closer to the column axis and thus decrease the plate size. Negative values increase the plate size. The default value is 10 mm.
<b>4</b>	A gap between stiffener plates and secondary beam flange. The default value is 0 mm.
<b>5</b>	Position of the stiffeners. By default, stiffeners are placed to the same plane as column flanges. Positive offset values move stiffeners to the right and negative to the left.

### Beam end cut

Define how the secondary beam end is cut. The beam is viewed from the side.

Option	Description
	Default Square AutoDefaults can change this option.
	Square Cuts the end of the secondary beam square.
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.

### Parts tab

Use the **Parts** tab to control the end plate, stiffener and washer plate properties.

Define the end plate, stiffener and washer plate thickness, width and height.

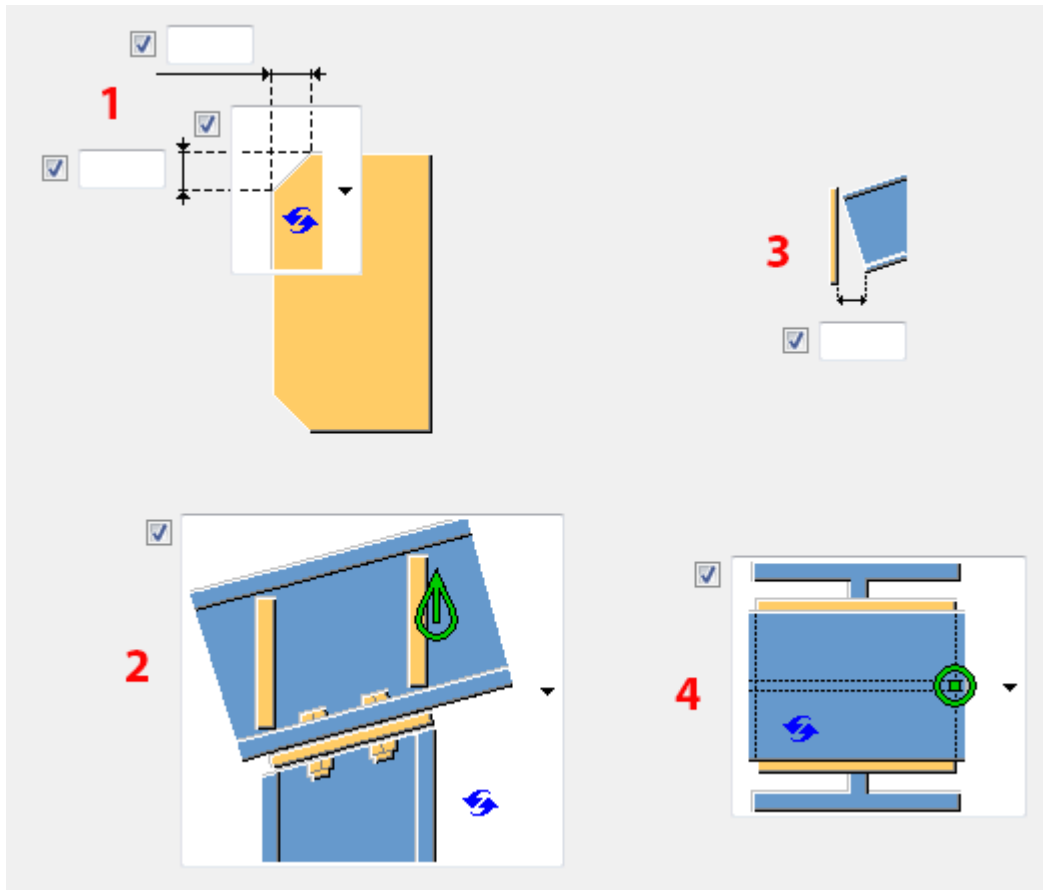
Option	Description
<b>End plate</b>	By default, width is defined by the bolt group horizontal edge distances, and height is defined by the plate edge distances from the left and right edge of the column.  The default value for end plate thickness is 0.5*the screw diameter.


Option	Description
<b>Stiffeners</b>	By default, height is equal to the distance between secondary beam flanges.  If width is not given, stiffener width is defined based on the flange width. The default value for the stiffener thickness is $1.5 \times \text{secondary beam web thickness}$ rounded upwards to: 8, 10, 12, 16, 20, 25, 30, 35, 40, 45, and so on.
<b>Washer plates</b>	Washer plates are small rectangular plates used as washers between the bolt head and the secondary beam flange.  If no thickness is defined, plates are not created.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### ***Parameters tab***

Use the **Parameters** tab to control the chamfer dimensions, and type and the end plate and stiffener orientation.



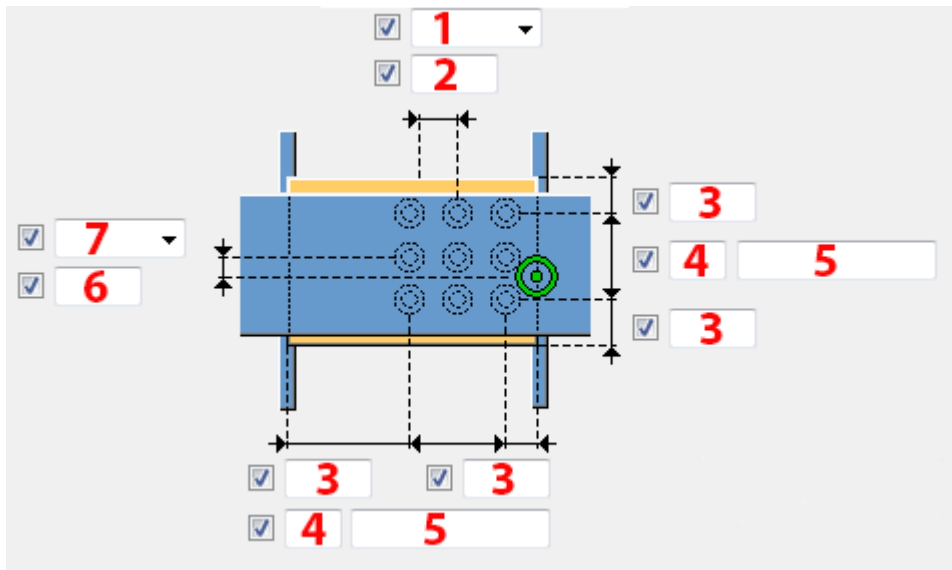
<b>Description</b>	
<b>1</b>	<p>Chamfer type and dimensions.</p> <p>If you select the No chamfer  option, a clash can occur between the stiffener and the I-profile rounding.</p> <p>Additionally, you can define the chamfer dimensions vertically and horizontally. If you select an arc chamfer, the horizontal dimension is the radius, and the vertical dimension has no effect.</p>
<b>2</b>	<p>Select whether stiffeners are perpendicular or parallel to the secondary beam flange.</p>
<b>3</b>	<p>Gap size to end plate.</p> <p>Define the limit value for the gap between the end plate and the secondary or main part. Use this gap when the beam is slightly curved or sloped to decide if the end angle is so small that the beam end can be straight.</p>

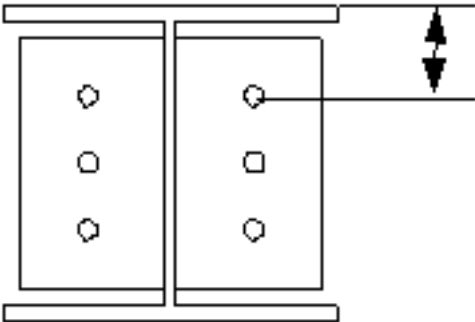
	Description
	If the actual gap is smaller than this value, the beam end is left straight. If the actual gap is larger than this value, the beam end is fitted to the end plate.
4	Select the end plate orientation.

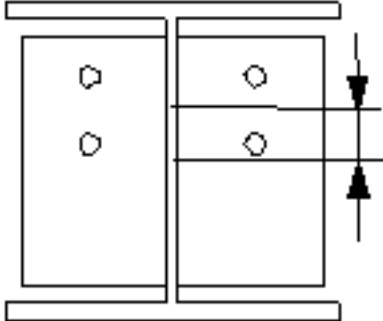
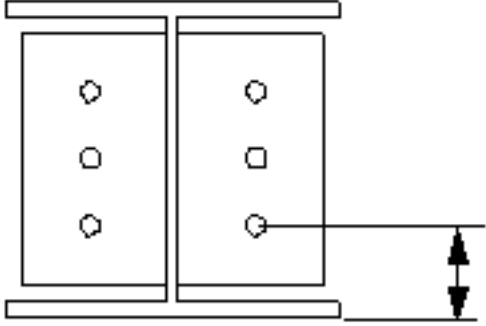
### Bolts tab

Use the **Bolts** tab to control the bolt properties.

### Bolt group dimensions



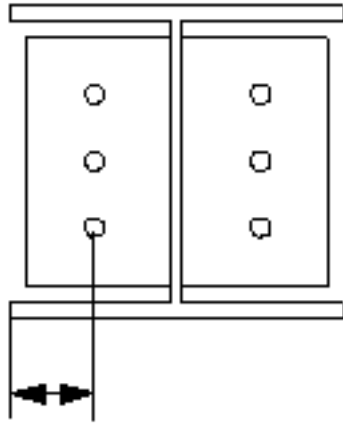
1	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li><b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 
---	--

	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
2	Dimension for vertical bolt group position.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Number of bolts.
5	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
6	Dimension for horizontal bolt group position.

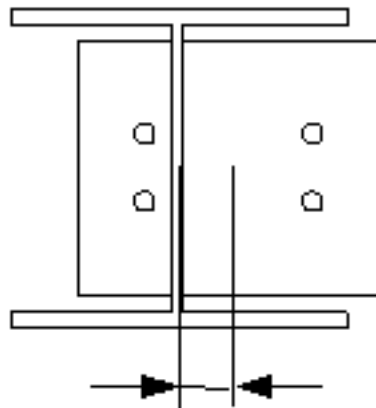
7

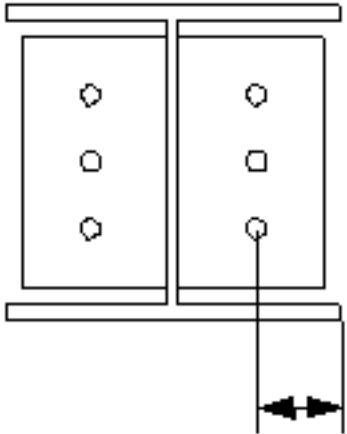
Select how to measure the dimensions for horizontal bolt group position.

- **Left:** From the left edge of the secondary part to the leftmost bolt.



- **Middle:** From the center line of the secondary part to the center line of the bolts.



	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul>
	

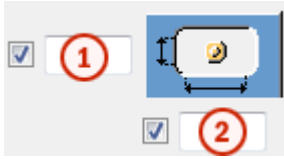
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



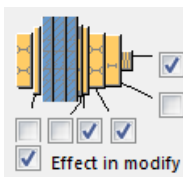


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<p><b>Slotted</b> creates slotted holes.</p> <p><b>Oversized</b> creates oversized or tapped holes.</p> <p><b>No hole</b> does not create holes.</p>	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.







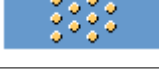

To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

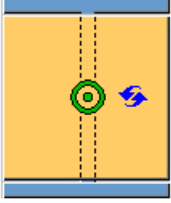
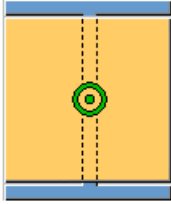
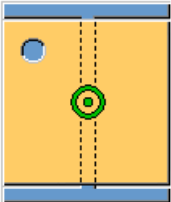
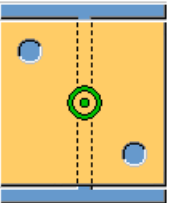
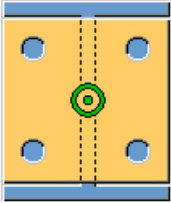
## Holes tab

Use the **Holes** tab to control the galvanizing holes in the end plate.

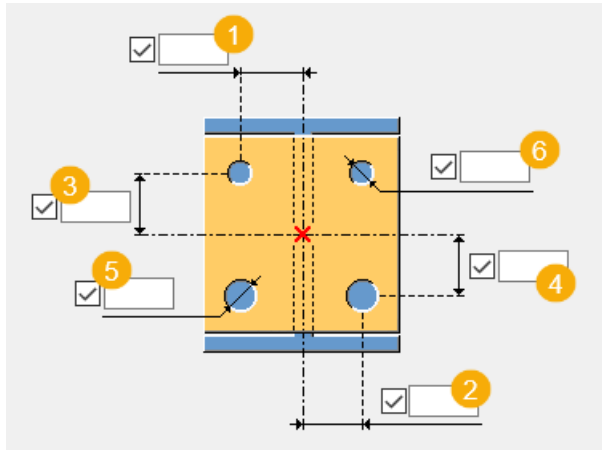
Option	Description
<b>Bolt standard</b>	Select the bolt standard.
<b>Bolt type</b>	Select the bolt type to define the location where the bolts should be attached.
<b>Read data from</b>	<p>You can select to use the <code>sinkholes.dat</code> definition file to specify the default values for horizontal and vertical offsets, and the diameters for upper and lower holes.</p> <p>The file is searched in the following order: Environment common system steel folder (<code>..\Environments\common\system\Steel</code>), model folder, <code>XS_FIRM</code>, <code>XS_PROJECT</code> and <code>XS_SYSTEM</code> folder.</p> <p>You can also select to define the holes in the component dialog box.</p>

### Number of holes

The center of a hole group is the middle point of the beam and the middle point of the haunch, if the haunch exists. The hole groups are composed of 0, 1, 2 or 4 holes.

Option	Description
	Default No holes AutoDefaults can change this option.
	No holes
	1 hole
	2 holes
	4 holes

## Hole positions



	Description
1	Horizontal distance between the secondary beam center and the upper hole.
2	Horizontal distance between the secondary beam center and the lower hole.
3	Vertical distance between the secondary beam center and the upper hole.
4	Vertical distance between the secondary beam center and the lower hole.
5	Diameter of the lower hole.
6	Diameter of the upper hole.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

[Design tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

## Welds

Click the link below to find out more:

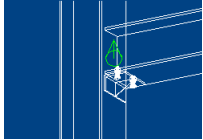
### U.S. Seat connection (72)

**U.S. Seat connection (72)** connects a beam to a column with a seat profile. You can use the connection with rotated and skewed beams and columns. A stabilizer can be placed as an additional connecting part between the beam and the column.

#### Objects created

- Stiffeners
- Seat profile
- Stabilizer
- Bolts
- Welds

#### Use for

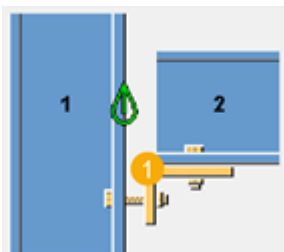
Option	Description
	Beam connected to a column with a seat profile

#### Selection order

1. Select the main part (column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

#### Part identification key

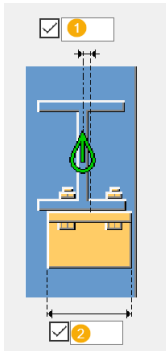


	Description
1	Seat profile

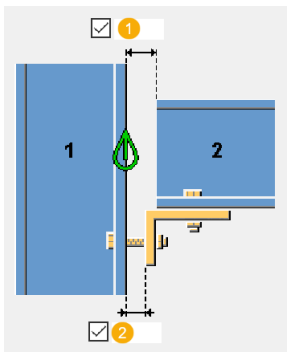
### Picture tab

Use the **Picture** tab to define the connection dimensions.

### Dimensions



	Description
1	Horizontal seat profile offset
2	Length of the seat




	Description
1	Secondary part offset from the main part
2	Seat offset from the main part

### Parts tab

Use the **Parts** tab to define the part properties.

## Parts

Option	Description	Default
<b>Stiffeners</b>	Thickness, width, and height of the stiffeners	<p>The default values for the height and width are based on the seat profile dimensions.</p> <p>The default stiffener thickness is <math>\frac{1}{4}</math>" or 6 mm depending on whether metric or imperial units are used in the model.</p>
<b>Seat profile</b>	Select the profile from the profile catalog.	<p>The default seat profile for straight beams is a 6" x 4" x <math>\frac{1}{2}</math>" angle. For vertically skewed beams the default seat profile is a WT6X15 tee.</p> <p>With straight beams, the seat is placed along a line that is perpendicular to the beam.</p> <p>With vertically skewed beams, the seat is placed along a line that is parallel to the beam.</p>  <p>Note that with vertically skewed beams the seat is always welded to the column, as there is not enough seat surface parallel to the column for bolting.</p>
<b>Stabilizer profile</b>	<p>Select the profile from the profile catalog.</p> <p>Stabilizer is not created unless you select a profile.</p>	

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	


### **Parameters tab**

Use the **Parameters** tab to define the seat fitting, position and orientation, and stiffener position, shape, and chamfering.





### **Seat notching and fitting**

Option	Description
<b>Seat notching and fitting</b>	Select how the seat is notched and fitted to the column. <ul style="list-style-type: none"> <li>• <b>Notch and fit:</b> The beam is notched and fitted to the column. This is the default value.</li> <li>• <b>Notch only:</b> The beam is notched but not fitted.</li> <li>• <b>Fit only:</b> The beam is fitted to the column.</li> <li>• <b>Do not notch or fit:</b> Beam is not notched or fitted.</li> </ul>




### **Stiffener positions**

Option	Description
	Default Stiffener is not placed on the seat. AutoDefaults can change this option.

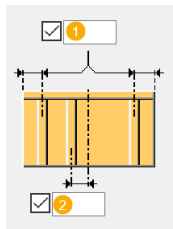


Option	Description
	Stiffener is not placed on the seat.
	Stiffener is placed on the right side.
	Stiffener is placed in the middle.
	Stiffener is placed on the left side.

### Stiffener shape

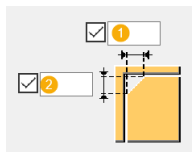
Option	Description
	Default Rectangular stiffener AutoDefaults can change this option.
	Rectangular stiffener
	Triangular stiffener

### Stiffener offsets







	Description
1	Offset of the end stiffeners from the seat ends
2	Offset of the middle stiffener from the seat center line

### Stiffener chamfer dimensions






	Description
1	Horizontal chamfer dimension
2	Vertical chamfer dimension






## Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	Line chamfer
	Convex chamfer
	Concave chamfer


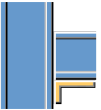
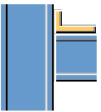
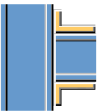
## Beam end cut

Option	Description
	Default Bevel AutoDefaults can change this option.
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.
	Square Cuts the end of the secondary beam square.

## Beam fitting

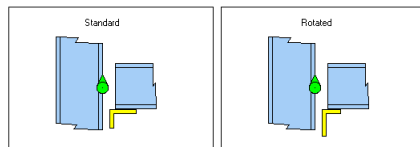
Option	Description
	Default Beam is notched. AutoDefaults can change this option.
	Beam is notched. Beam end is cut.
	Beam is notched. Beam end is not cut.
	Beam is not fitted to the column.
	Beam is fitted to the column.




## Seat position

Option	Description
	Default Seat is placed at the bottom of the beam. AutoDefaults can change this option.
	Seat is placed at the bottom of the beam.
	Seat is placed at the top of the beam.
	Seat is placed both at the top and at the bottom of the beam.




## Seat orientation

Define the seat orientation. For example, if the seat is an angle with uneven legs, the default option for non-vertically skewed beams places the longest leg parallel with the beam, and the shortest leg parallel with the column.

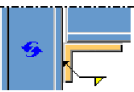




Option	Description
	Default Standard seat, not rotated AutoDefaults can change this option.
	Standard seat, not rotated
	Seat is rotated.

### Seat to beam

Option	Description
	Default Seat is bolted to the beam.
	Seat is bolted to the beam.
	Seat is welded to the beam.

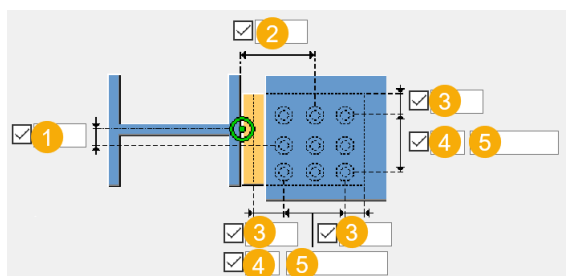
### Seat to column

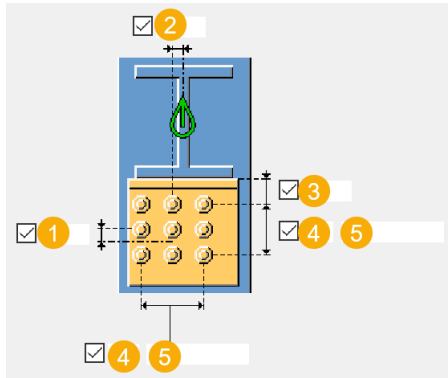
Option	Description
	Default Seat is welded to the column. AutoDefaults can change this option.
	Seat is welded to the column.
	Seat is bolted to the column.

### **Bolts tab**

Use the **Bolts** tab to define bolt group dimensions and bolt properties.

### Bolt group dimensions





	Description
<b>1</b>	Dimension for vertical bolt group position.
<b>2</b>	Dimension for horizontal bolt group position.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

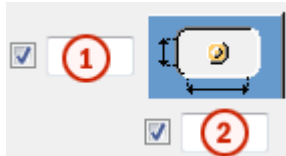
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

Option	Description	Default
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

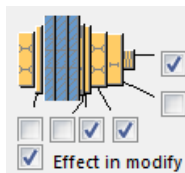


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

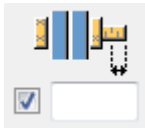
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Stabilizer tab

Use the **Stabilizer** tab to define the stabilizer fitting, position, and orientation.

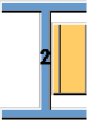
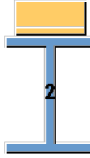
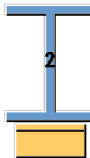
### Stabilizer notching and fitting

Option	Description
<b>Stabilizer notching and fitting</b>	<p>Select how the stabilizer is notched and fitted to the column:</p> <ul style="list-style-type: none"> <li>• <b>Notch and fit:</b> The stabilizer is notched and fitted to the column. This is the default value.</li> <li>• <b>Notch only:</b> The stabilizer is notched but not fitted to the column.</li> <li>• <b>Fit only:</b> The stabilizer is fitted to the column.</li> <li>• <b>Do not notch or fit:</b> The stabilizer is not notched or fitted.</li> </ul>

### Stabilizer position

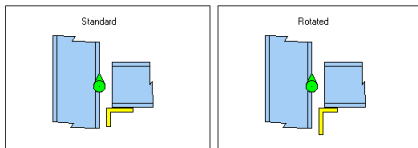
Note that the stabilizer cannot be placed in the same position as the seat.




Option	Description
	<p>Default</p> <p>Stabilizer is placed on the left side of the beam.</p> <p>AutoDefaults can change this option.</p>
	<p>Stabilizer is placed on the left side of the beam.</p>

Option	Description
	Stabilizer is placed on the right side of the beam.
	Stabilizer is placed at the top of the beam.
	Stabilizer is placed at the bottom of the beam.

### Stabilizer orientation

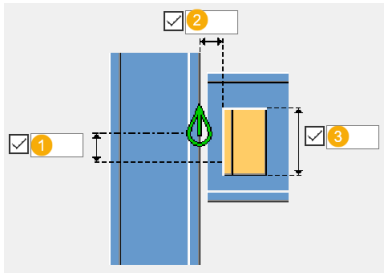
Define the orientation of the stabilizer. For example, if the stabilizer is an angle with uneven legs, the standard option for non-vertically skewed beams places the longest leg of the angle parallel with the beam, and the shortest leg parallel with the column. Selecting the rotated option reverses this.



Option	Description
	Default Standard AutoDefaults can change this option.
	Standard
	Rotated

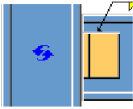




## Stabilizer dimensions



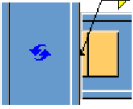
	Description
1	Stabilizer offset in the direction perpendicular to the beam By default, there is no offset.
2	Stabilizer offset from the column By default, there is no offset.
3	Stabilizer length

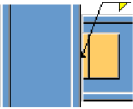

## Stabilizer to beam

Option	Description
	Default Stabilizer is welded to the beam. AutoDefaults can change this option.
	Stabilizer is bolted to the beam.
	Stabilizer is welded to the beam.

## Stabilizer to column

Note that if the column has a tube steel profile, this setting is not taken into account and the stabilizer will be welded to the column.

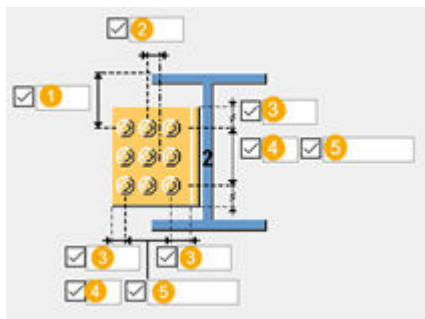
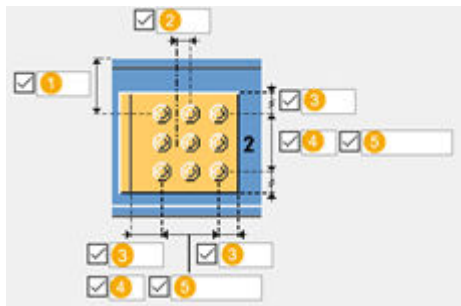
Option	Description
	Default Stabilizer is welded to the column. AutoDefaults can change this option.

Option	Description
	Stabilizer is welded to the column.
	Stabilizer is bolted to the column.

### **Stabilizer bolts tab**

Use the **Stabilizer bolts** tab to define the bolt group dimensions and the bolt location and diameter. Define the rest of the bolt properties on the **Bolts** tab.

### **Bolt group dimensions**



	Description
1	Dimension for vertical bolt group position.
2	Dimension for horizontal bolt group position.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Number of bolts.

	Description
5	<p>Bolt spacing.</p> <p>Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.</p>

### ***General tab***

Click the link below to find out more:

General tab

### ***Design tab***

Click the link below to find out more:

Design tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

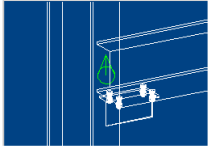
## **U.S. Seat connection 2 (73)**

**U.S. Seat connection 2 (73)** connects a beam to a column. The seat profile is always placed along a line that is parallel to the beam. You can use the connection with rotated and skewed beams and columns. A stabilizer can be placed as an additional connecting part between the beam and the column.

### **Objects created**

- Seat profile
- Stiffeners
- Stabilizer
- Bolts
- Welds

## Use for

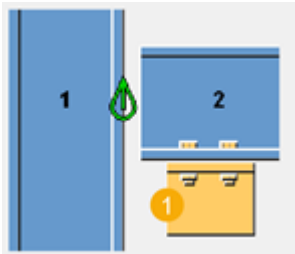
Situation	Description
	Beam connected to a column with a seat profile

## Selection order

1. Select the main part (column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

## Part identification key

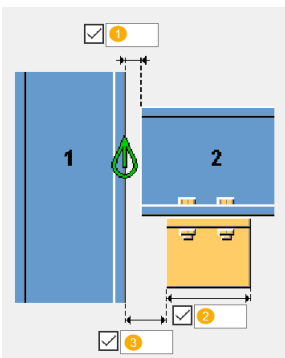


	Description
1	Seat profile

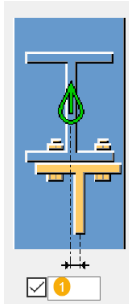
## Picture tab

Use the **Picture** tab to define the offset dimensions of the connection.

## Offset dimensions



	Description
1	Secondary part offset from the main part
2	Length of the seat
3	Seat offset from the main part



	Description
1	Seat offset from the center of the connection

### Parts tab

Use the **Parts** tab to define the part properties.

### Parts

Option	Description	Default
<b>Stiffeners</b>	Thickness, width, and height of the stiffeners	The default values for the height and width are based on the seat profile dimensions.  The default stiffener thickness is $\frac{1}{4}$ " or 6 mm depending on whether metric or imperial units are used in the model.  Stiffeners can only be placed in the connection if an angle profile is used for the seat.
<b>Seat profile</b>	Select the profile from the profile catalog.	
<b>Stabilizer profile</b>	Select the profile from the profile catalog.  Stabilizer is not created unless you select a profile.	

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tab**




Use the **Parameters** tab to define the seat fitting, position and orientation, and stiffener position, shape, and chamfering.

### **Seat notching and fitting**



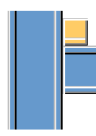

Option	Description
<b>Seat notching and fitting</b>	Select how the seat is notched and fitted to the column. <ul style="list-style-type: none"> <li>• <b>Notch and fit:</b> The beam is notched and fitted to the column. This is the default value.</li> <li>• <b>Notch only:</b> The beam is notched but not fitted.</li> <li>• <b>Fit only:</b> The beam is fitted to the column.</li> <li>• <b>Do not notch or fit:</b> Beam is not notched or fitted.</li> </ul>

### **Beam end cut**




Define how the secondary beam end is cut. The beam is viewed from the side.



Option	Description
	Default Square AutoDefaults can change this option.
	Square Cuts the end of the secondary beam square.
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.

### Seat position




Option	Description
	Default Seat is placed at the bottom of the beam. AutoDefaults can change this option.
	Seat is placed at the bottom of the beam.
	Seat is placed at the top of the beam.
	Seat is placed at both the top and bottom of the beam.

### Beam fitting




Option	Description
	Default Beam is notched. AutoDefaults can change this option.
	Beam is notched. Beam end is cut.
	Beam is notched. Beam end is not cut.

Option	Description
	Beam is not fitted to the column.
	Beam is fitted to the column.




### Seat orientation

Option	Description
	Default Standard seat, not rotated AutoDefaults can change this option.
	Standard seat, not rotated
	Seat is rotated.


### Seat to beam

Option	Description
	Default Seat is bolted to the beam. AutoDefaults can change this option.
	Seat is bolted to the beam.
	Seat is welded to the beam.




### Stiffener positions

Option	Description
	Default Stiffeners are not placed on the seat. AutoDefaults can change this option.
	Stiffeners are not placed on the seat.
	Stiffener is placed on the left side.

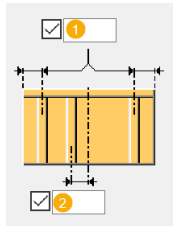


Option	Description
	Stiffener is placed in the middle.
	Stiffener is placed on the right side.

### Stiffener shape

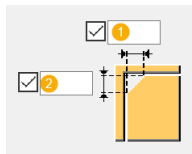
Option	Description
	Default Rectangular stiffener AutoDefaults can change this option.
	Rectangular stiffener
	Triangular stiffener

### Stiffener offsets







	Description
1	Offset of the end stiffeners from the seat ends
2	Offset of the middle stiffener from the seat center line

### Stiffener chamfer dimensions



	Description
1	Horizontal chamfer dimension
2	Vertical chamfer dimension

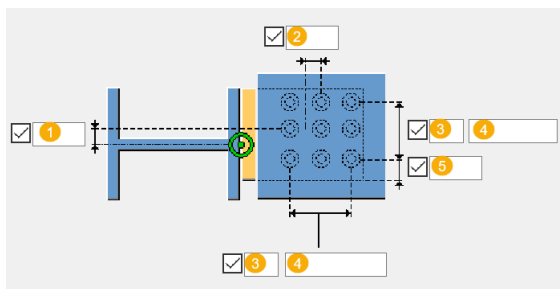
## Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	Line chamfer
	Convex chamfer
	Concave chamfer

## **Bolts tab**

Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

### Bolt group dimensions



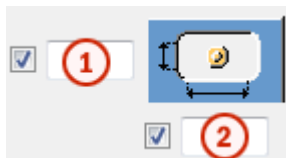
	Description
<b>1</b>	Dimension for horizontal bolt group position from the main part center line
<b>2</b>	Dimension for horizontal bolt group position for the secondary part
<b>3</b>	Number of bolts.
<b>4</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>5</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



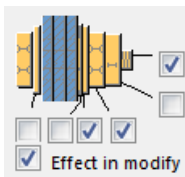
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

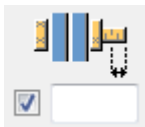
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Stabilizer tab

Use the **Stabilizer** tab to define the stabilizer fitting, position, and orientation.

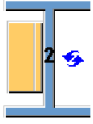
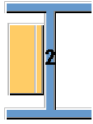
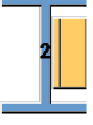
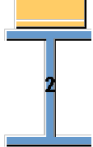
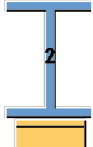
### Stabilizer notching and fitting

Option	Description
<b>Stabilizer notching and fitting</b>	<p>Select how the stabilizer is notched and fitted to the column:</p> <ul style="list-style-type: none"> <li>• <b>Notch and fit:</b> The stabilizer is notched and fitted to the column. This is the default value.</li> <li>• <b>Notch only:</b> The stabilizer is notched but not fitted to the column.</li> <li>• <b>Fit only:</b> The stabilizer is fitted to the column.</li> </ul>

Option	Description
	<ul style="list-style-type: none"> <li>• <b>Do not notch or fit:</b> The stabilizer is not notched or fitted.</li> </ul>

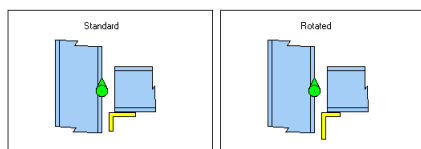
### Stabilizer position




Note that the stabilizer cannot be placed in the same position as the seat.

Option	Description
	<p>Default</p> <p>Stabilizer is placed on the left side of the beam.</p> <p>AutoDefaults can change this option.</p>
	<p>Stabilizer is placed on the left side of the beam.</p>
	<p>Stabilizer is placed on the right side of the beam.</p>
	<p>Stabilizer is placed at the top of the beam.</p>
	<p>Stabilizer is placed at the bottom of the beam.</p>

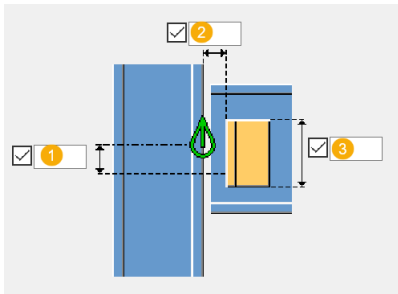
### Stabilizer orientation

Define the orientation of the stabilizer. For example, if the stabilizer is an angle with uneven legs, the standard option for non-vertically skewed beams places the longest leg of the angle parallel with the beam, and the shortest leg parallel with the column. Selecting the rotated option reverses this.



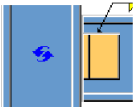

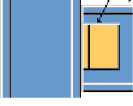
Option	Description
	Default Standard AutoDefaults can change this option.
	Standard
	Rotated

### Stabilizer dimensions



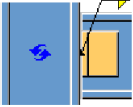
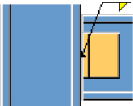

	Description
<b>1</b>	Stabilizer offset in the direction perpendicular to the beam By default, there is no offset.
<b>2</b>	Stabilizer offset from the column By default, there is no offset.
<b>3</b>	Stabilizer length

### Stabilizer to beam

Option	Description
	Default Stabilizer is welded to the beam. AutoDefaults can change this option.
	Stabilizer is bolted to the beam.
	Stabilizer is welded to the beam.

### Stabilizer to column

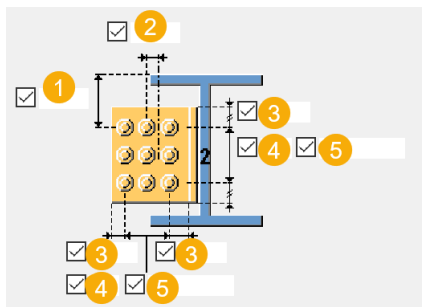
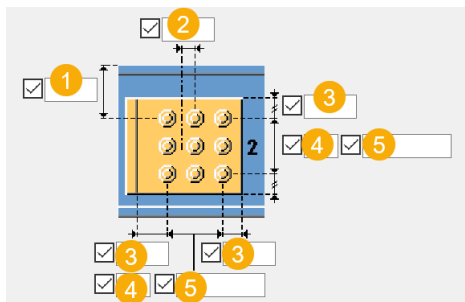
Note that if the column has a tube steel profile, this setting is not taken into account and the stabilizer will be welded to the column.

Option	Description
	Default Stabilizer is welded to the column. AutoDefaults can change this option.
	Stabilizer is welded to the column.
	Stabilizer is bolted to the column.

### Stabilizer bolts tab

Use the **Stabilizer bolts** tab to define the bolt group dimensions and the bolt location and diameter. Define the rest of the bolt properties on the **Bolts** tab.

#### Bolt group dimensions



	Description
1	Dimension for vertical bolt group position.
2	Dimension for horizontal bolt group position.

	<b>Description</b>
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### ***General tab***

Click the link below to find out more:

General tab

### ***Design tab***

Click the link below to find out more:

Design tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

## **U.S. Seat connection 3 (74)**

**U.S. Seat connection 3 (74)** connects two beams to a column when the beams are offset from the column center line. The seat is always placed perpendicular to the beams. You can use the connection with rotated and skewed beams and columns. The seat can be bolted or welded to the beam, but it is always welded to the column.

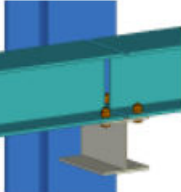
### **Objects created**

- Seat profile
- Stiffeners



- Bolts
- Welds

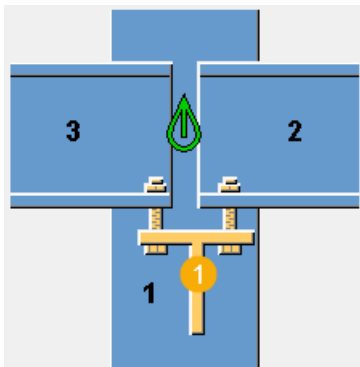
**Use for**

Situation	Description
	Seat profile welded to a column and bolted to two beams.

**Selection order**

1. Select the main part (column).
2. Select the first secondary part (beam).
3. Select the second secondary part (beam).
4. Click the middle mouse button to create the connection.

**Part identification key**

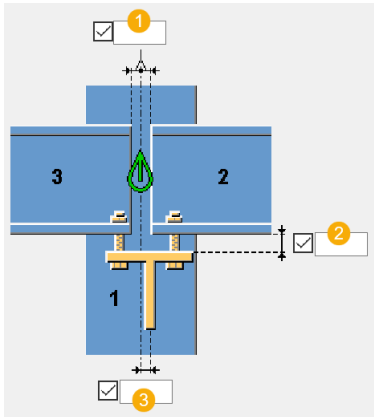


	Description
1	Seat profile

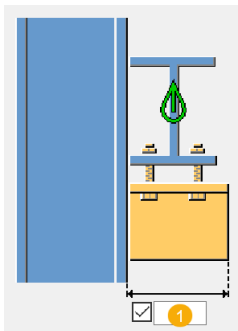
**Picture tab**

Use the **Picture** tab to define the offset dimensions of the connection.

## Offset dimensions



	Description
1	Offset of the beams from the starting point of the connection
2	Offset of the seat from the beams
3	Offset of the seat from the center of the connection



	Description
1	Length of the seat

## Parts tab

Use the **Parts** tab to define the part properties.

## Parts

Option	Description	Default
<b>Stiffeners</b>	Thickness, width and height of the stiffeners. The stiffener height is in the same direction as the column.	The default values for the height and width are based on the seat profile dimensions. The default stiffener thickness is $\frac{1}{4}$ " or 6 mm depending on

Option	Description	Default
		whether metric or imperial units are used in the model.  Stiffeners can only be placed if an angle profile is used for the seat.
<b>Seat profile</b>	Select the profile from the profile catalog.	WT6X15 tee

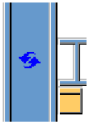

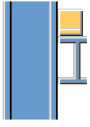
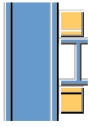
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### ***Parameters tab***




Use the **Parameters** tab to define seat position and orientation, and stiffener position, shape, and chamfering.

Option	Description
<b>Seat notching and fitting</b>	Select how the seat is notched and fitted to the column.
<b>Cut tolerance of sec</b>	Define a cut tolerance of the secondary part.



### Seat position


Option	Description
	Default Seat is placed at the bottom of the beam. AutoDefaults can change this option.
	Seat is placed at the bottom of the beam.
	Seat is placed at the top of the beam.
	Seat is placed at both the top and bottom of the beam.

### Seat to beam

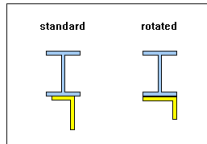
Option	Description
	Default Seat is bolted to the beam. AutoDefaults can change this option.
	Seat is bolted to the beam.
	Seat is welded to the beam.

### Seat orientation




Option	Description
	Default Standard seat, not rotated. AutoDefaults can change this option.
	Standard seat, not rotated.

Option	Description
	Seat is rotated.

If the seat is an angle with uneven legs, the standard option places the shortest leg of the angle against the beam. Selecting rotated reverses this.






### Beam fitting

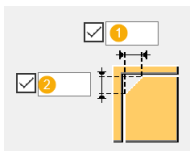
Option	Description
	Default Beam is not fitted to the column. AutoDefaults can change this option.
	Beam is not fitted to the column.
	Beam is fitted to the column.

### Stiffener shape

Stiffeners are only created if an angle profile is used for the seat.





Option	Description
	Default Rectangular stiffener AutoDefaults can change this option.
	Rectangular stiffener
	Triangular stiffener

### Stiffener chamfer dimensions








	Description
1	Horizontal chamfer dimension
2	Vertical chamfer dimension

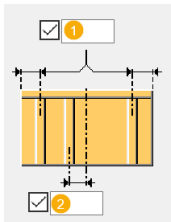
### Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	Line chamfer
	Convex chamfer
	Concave chamfer

### Stiffener positions

Option	Description
	Default Stiffeners are not placed on the seat. AutoDefaults can change this option.
	Stiffeners are not placed on the seat.
	Stiffener is placed on the right side.
	Stiffener is placed in the middle.
	Stiffener is placed on the left side.

### Stiffener offsets

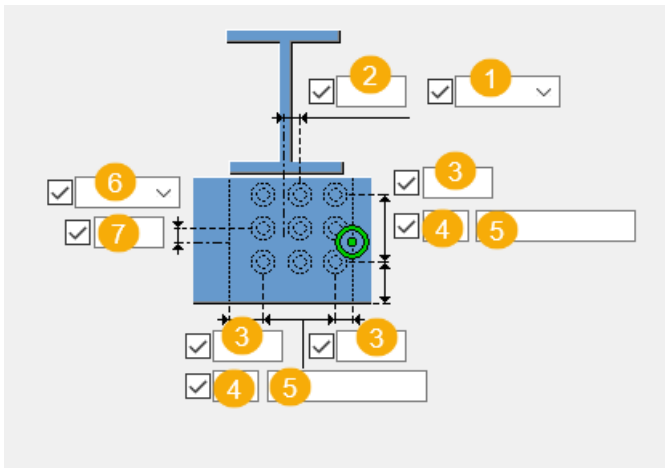


	Description
1	Offset of the end stiffeners from the seat ends.
2	Offset of the center stiffener from the center line of the seat.

### **Bolts tab**

Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

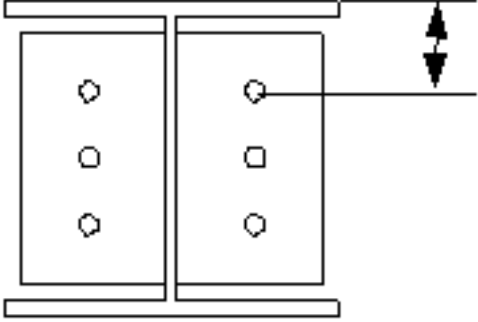
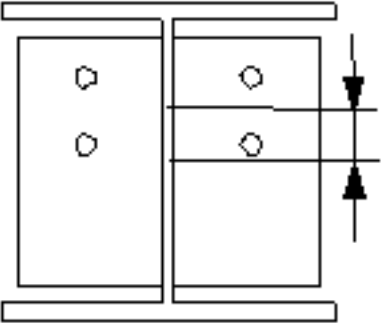
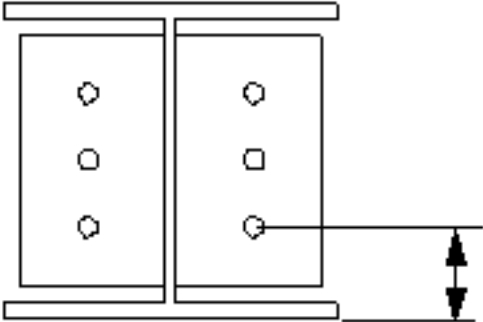
### **Bolt group dimensions**



	Description
1	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li> </ul>

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> <div style="text-align: center;"> </div>
<b>2</b>	Dimension for horizontal bolt group position.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.



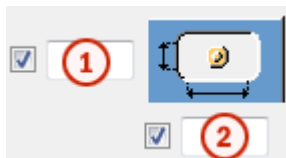
	Description
<p><b>6</b></p>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li> <p><b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</p>  </li> <li> <p><b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</p>  </li> <li> <p><b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</p>  </li> </ul>
<p><b>7</b></p>	<p>Dimension for vertical bolt group position.</p>

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



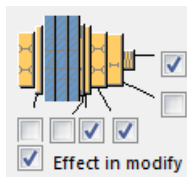
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### **Bolt assembly**

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### **Notch tab**


Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.





#### **Automatic notching**

Automatic notching options affect both the top and the bottom flange.


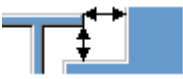
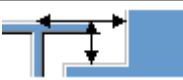
#### **Notch shape**

Automatic notching is switched on when you select a notch shape.

Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.

Option	Description
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.
	Turns off automatic notching.

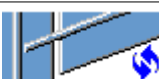

### Notch size


Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.





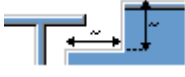
### Flange cut shape

Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.

Option	Description
	Secondary beam flange is cut square.

### Notch dimension rounding

Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.

The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.








### Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.

### Side of flange notch






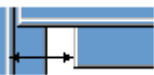
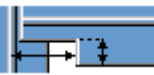
The side of flange notch defines on which side of the beam the notches are created.

Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.

Option	Description
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

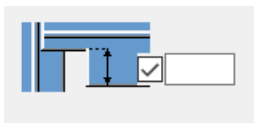
### Flange notch shape

The flange notch shape defines the notch shape in the beam flange.

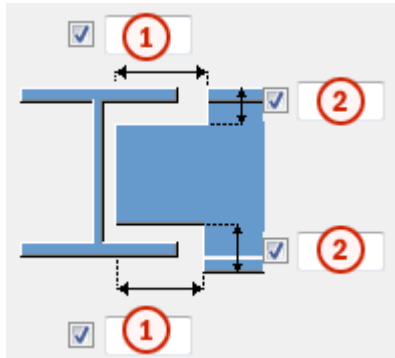
Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.
	Creates chamfers in the flange. If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.
	Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b> .
	The flange is not cut.
	Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.
	Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b> .

### Flange notch depth

Define the flange notch depth.



## Cut dimensions



	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### ***General tab***

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

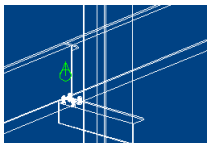
## U.S. Seat connection 4 (75)

**U.S. Seat connection 4 (75)** connects two beams to a column. The seat is always formed along a line that is parallel to the face of the column nearest to the first beam selected. You can use the connection with rotated and skewed beams and columns. The seat can be bolted or welded to the beams and the column.

### Objects created

- Seat profile
- Stiffeners
- Bolts
- Welds

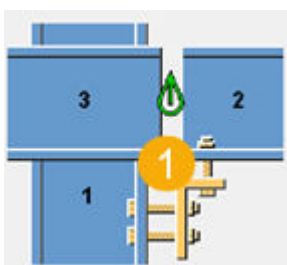
### Use for

Option	Description
	Beams connected to a column

### Selection order

1. Select the main part (column).
2. Select the first secondary part (beam).
3. Select the second secondary part (beam).
4. Click the middle mouse button to create the connection.

### Part identification key



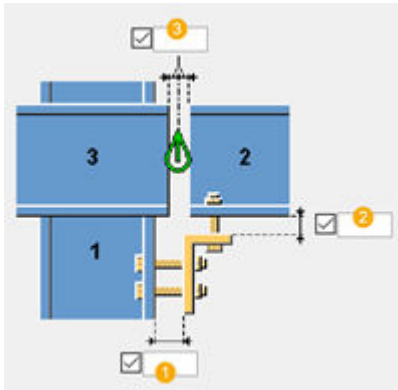
	Description
1	Seat profile

### Picture tab

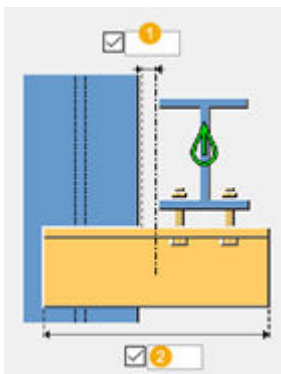
Use the **Picture** tab to define the connection dimensions.



## Dimensions



	Description
1	Seat profile offset from the column
2	Seat profile vertical offset from the beams
3	Beam offset from the connection origin



	Description
1	Horizontal seat profile offset
2	Seat profile length

### **Parts tab**

Use the **Parts** tab to define the part properties.

### **Parts**

Option	Description	Default
<b>Stiffeners</b>	Thickness, width, and height of the stiffeners Stiffeners can only be placed in the connection	The default values for the height and width are



Option	Description	Default
	if an angle profile is used for the seat.	based on the seat profile dimensions.  The default stiffener thickness is ¼" or 6 mm depending on whether metric or imperial units are used in the model.
<b>Seat profile</b>	Select the profile from the profile catalog.  You can select any profile from the catalog.	




Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tab**




Use the **Parameters** tab to define the seat fitting, position and orientation, and the stiffener position, shape, and chamfering.

### **Stiffener positions**

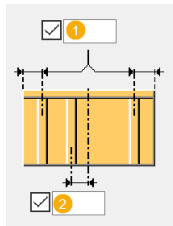
Option	Description
	Default Stiffeners are not placed on the seat. AutoDefaults can change this option.
	Stiffeners are not placed on the seat.

Option	Description
	Stiffener is placed on the right side.
	Stiffener is placed in the middle.
	Stiffener is placed on the left side.

### Stiffener shape

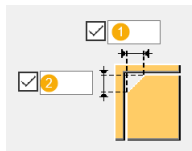
Option	Description
	Default Rectangular stiffener AutoDefaults can change this option.
	Rectangular stiffener
	Triangular stiffener

### Stiffener offsets







	Description
1	Offset of the end stiffeners from the seat ends
2	Offset of the middle stiffener from the seat center line

### Stiffener chamfer dimensions






	Description
1	Horizontal chamfer dimension
2	Vertical chamfer dimension

## Chamfer type




Option	Description
	Default Line chamfer AutoDefaults can change this option.
	Line chamfer
	Convex chamfer
	Concave chamfer

## Seat orientation


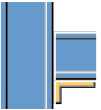
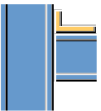
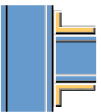
Define the seat orientation. For example, if the seat is an angle with uneven legs, the default option for non-vertically skewed beams places the longest leg parallel with the beam, and the shortest leg parallel with the column.

Option	Description
	Default Longer leg is horizontal. AutoDefaults can change this option.
	Longer leg is horizontal.
	Longer leg is vertical.




## Beam fitting

Option	Description
	Default Beam is not fitted to the column. AutoDefaults can change this option.
	Beam is not fitted to the column.
	Beam is fitted to the column.



## Seat position


Option	Description
	Default Seat is placed at the bottom of the beam. AutoDefaults can change this option.
	Seat is placed at the bottom of the beam.
	Seat is placed at the top of the beam.
	Seat is placed both at the top and at the bottom of the beam.

## Seat to beam

Option	Description
	Default Seat is bolted to the beam. AutoDefaults can change this option.
	Seat is bolted to the beam.
	Seat is welded to the beam.

## Seat to column

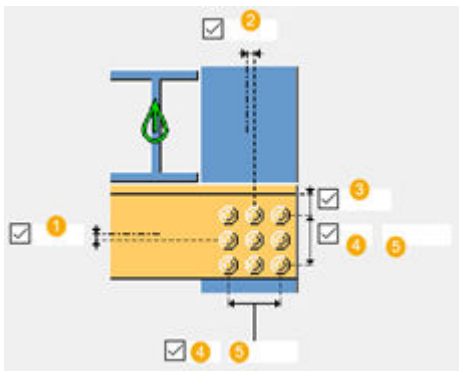
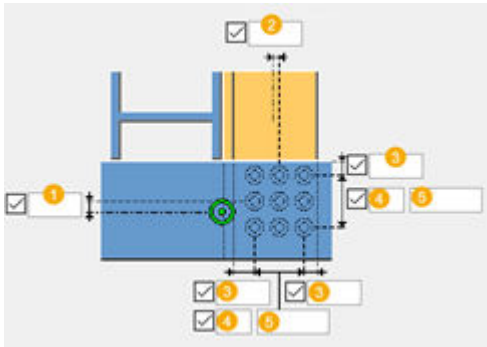
Option	Description
	Default Seat is welded to the column. AutoDefaults can change this option.
	Seat is welded to the column.

Option	Description
	Seat is bolted to the column.

**Bolts tab**

Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

**Bolt group dimensions**



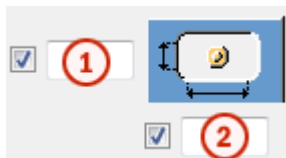
	Description
1	Dimension for vertical bolt group position.
2	Dimension for horizontal bolt group position.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Number of bolts.
5	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



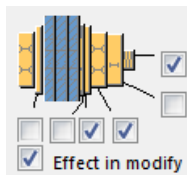
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### **Bolt assembly**

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

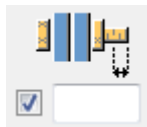
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### ***General tab***

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)



## Welds

Click the link below to find out more:

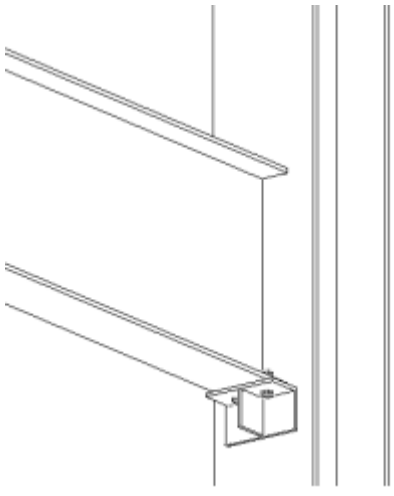
### Angle profile box (170)

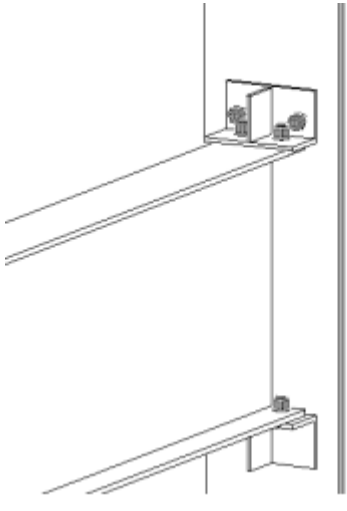
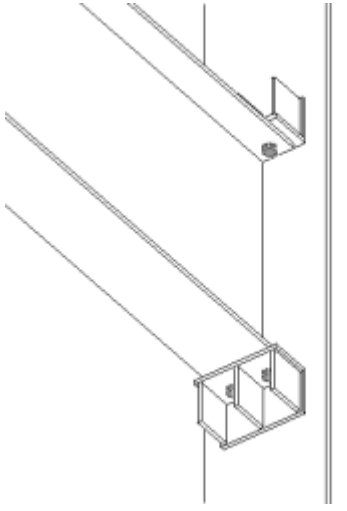
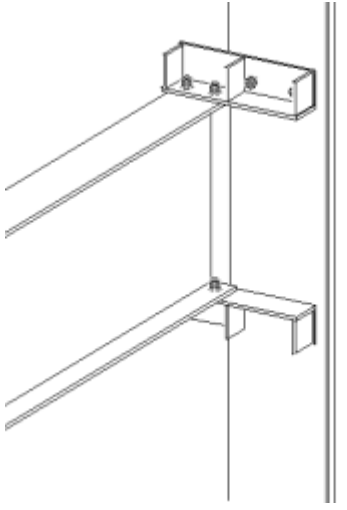
**Angle profile box (170)** connects a beam to a column with a seat angle. The angles can be placed at the top or bottom, or at both top and bottom flange of the secondary beam. Stiffener plates can be welded to the seat angles. Web stiffening plates can also be added to the secondary beam.

#### Objects created

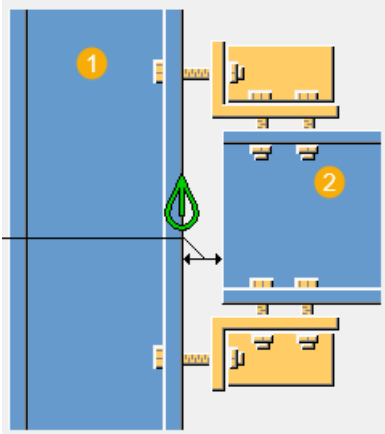
- Clip angles (1 or 2)
- Seat stiffeners (optional)
- Web stiffeners (optional)
- Bolts
- Welds
- Cuts

#### Use for

Situation	Description
 A technical line drawing showing a beam-to-column connection. The beam is positioned horizontally, and the column is vertical. The beam is seated on a seat angle attached to the column. Stiffeners are shown welded to the seat angle and the beam web. The drawing includes perspective and cross-sectional views to illustrate the assembly.	Beam seat with stiffeners.

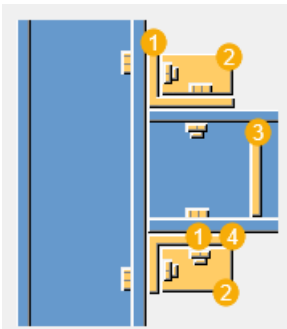
Situation	Description
	<p>Beam seat top and bottom with stiffeners. Various bolting options.</p>
	<p>Beam seat. Multiple stiffener options.</p>
	<p>Beam seat. Offset secondary member.</p>

## Selection order



1. Select the main part (column).
2. Select the secondary part (beam).  
The connection is created automatically when the secondary part is selected.

## Part identification key

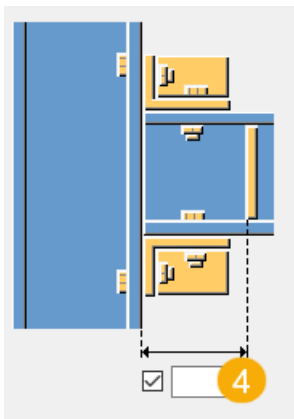
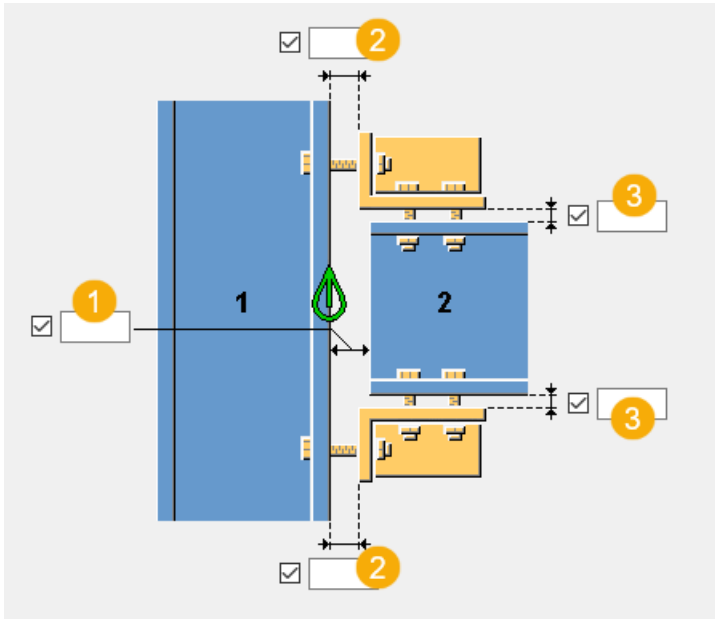


	<b>Part</b>
<b>1</b>	Clip angle
<b>2</b>	Seat stiffener
<b>3</b>	Web stiffener
<b>4</b>	Bottom seat plate

## **Picture tab**

Use the **Picture** tab to control the clearances between the angles and the main and secondary part.

## Dimensions



<b>1</b>	Gap between the main part and the secondary part.	GENERAL / beamedge (0.5") 20 mm
<b>2</b>	Gap between angle profile and the main part.	0
<b>3</b>	Gap between angle profile and the secondary part.	0
<b>4</b>	Distance of the secondary beam web stiffener from the face of the main part.	

**NOTE** This information is relevant only to the imperial environment. GENERAL defaults can be found in the `joints.def` file in the system folder and can be modified as required.

### **Parts tab**

Use **Parts** tab to define the stiffeners, clip angle or bottom plate.

#### **Parts**

<b>Option</b>	<b>Description</b>
<b>Upper stiffener</b> <b>Lower stiffener</b>	Stiffener thickness, width and height.  The default values for the height and width are based on the selected profile or bottom plate dimensions. The default stiffener thickness is 10 mm. The default value in the <code>joints.def</code> file is <code>GENERAL/shearplatethk (0.375")</code> .
<b>Bottom plate</b>	Enter values for thickness and width to create a seat plate instead of a seat angle.
<b>Profile</b>	Select the seat angle profile from the profile catalog.  The default angle profile is <b>L150*100*10</b> or <b>L4X4X3/8</b> . The default value in the <code>joints.def</code> file is <code>GENERAL / lsize</code> .






<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tab**





Use the **Parameters** tab to define the seat angle positions. Seat angles carry loads from the secondary part. Seat angles can be positioned to top, bottom or both flanges of the secondary part. The seat angle can be stiffened, and bolted or welded to the main and secondary parts.

## Notching

When you create the connection to the main part web, the secondary beam can be fitted to the web and notched by the main part flanges.







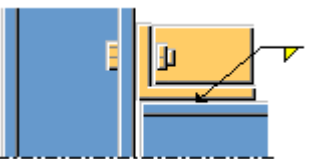

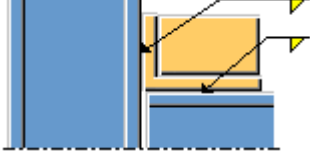
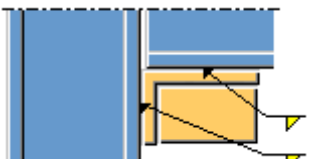
Option	Description
	Default Fitted and notched AutoDefaults can change this option.
	Fitted and notched The secondary part is fitted and notched.
	Fitted The secondary part is fitted, but not notched.
	Notched The secondary part is notched, but not fitted.
	None The secondary part is not fitted or notched.

## Seat position

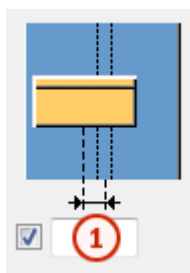
Option	Description
	Default Bottom AutoDefaults can change this option.
	Top Creates a seat at the top of the secondary part.
	Bottom Creates a seat at the bottom of the secondary part.
	Both Creates two seats: one at the top and another at the bottom of the secondary part.

## Seat angle attachment

Seat angle is positioned at the top or at the bottom of the secondary part.





Option for top seat angle	Option for bottom seat angle	Description
		<p>Default Bolted</p> <p>Seat angle is bolted to the main part and to the secondary part.</p> <p>AutoDefaults can change this option.</p>
		<p>Bolted</p> <p>Seat angle is bolted to the main part and to the secondary part.</p>
		<p>Welded-bolted</p> <p>Seat angle is welded to the main part and bolted to the secondary part.</p>
		<p>Bolted-welded</p> <p>Seat angle is bolted to the main part and welded to the secondary part.</p>
		<p>Welded</p> <p>Seat angle is welded to the main part and to the secondary part.</p>

## Seat angle offset







	Description
1	Seat angle horizontal offset from the center line of the main part.

### Seat angle rotation









Option	Description
	Default Seat angle is not rotated. AutoDefaults can change this option.
	Seat angle is not rotated.
	Seat angle is rotated horizontally by 90 degrees. To stiffen the rotated angle, select the <b>Middle</b> option in the <b>Middle stiffener position</b> list.
	Uses a bottom plate as the seat instead of the angle profile.

### Seat angle orientation






Option	Description
	Default The longer leg of the seat angle is connected to the secondary part. AutoDefaults can change this option.
	The longer leg of the seat angle is connected to the secondary part.
	The longer leg of the seat angle is connected to the main part.
	Automatic The longer leg of the seat angle is connected to the part where bolts reach furthest from the seat angle corner.



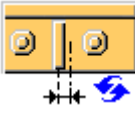
## Stiffener type



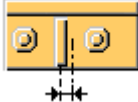
Option	Option	Description
		Default Rectangular stiffener plate AutoDefaults can change this option.
		Rectangular stiffener plate
		Triangular stiffener plate
		The line connecting the ends of the seat angle legs defines the stiffener plate shape.

## Side stiffener position

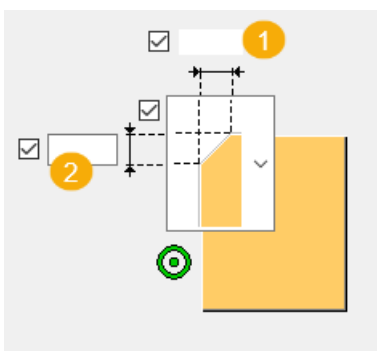
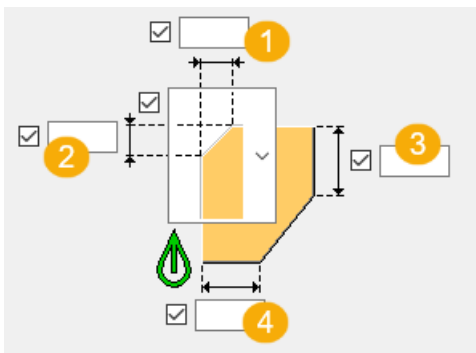
Option	Description
	Default No side stiffeners are created. AutoDefaults can change this option.
	No side stiffeners are created.
	Near side stiffeners are created.
	Far side stiffeners are created.
	Near side and far side stiffeners are created.

## Middle stiffener position

Option	Description
	Default According to bolts AutoDefaults can change this option.



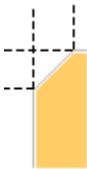


Option	Description
	<p>No middle stiffener plate is created.</p>
	<p>Middle stiffeners</p> <p>The stiffener plate is positioned in the middle of the seat angle.</p> <p>Enter the number of middle stiffeners in the <b>Number of middle stiffeners</b> box.</p> <p>Multiple stiffeners are centered and equally spaced.</p>
	<p>According to bolts</p> <p>The stiffener plate is positioned between the bolts in the middle of the bolt spacing.</p> <p>By default, stiffener is created between every two bolts.</p> <p>Enter the number of middle stiffeners in the box below the <b>According to bolts</b> option.</p>

### Chamfer dimensions



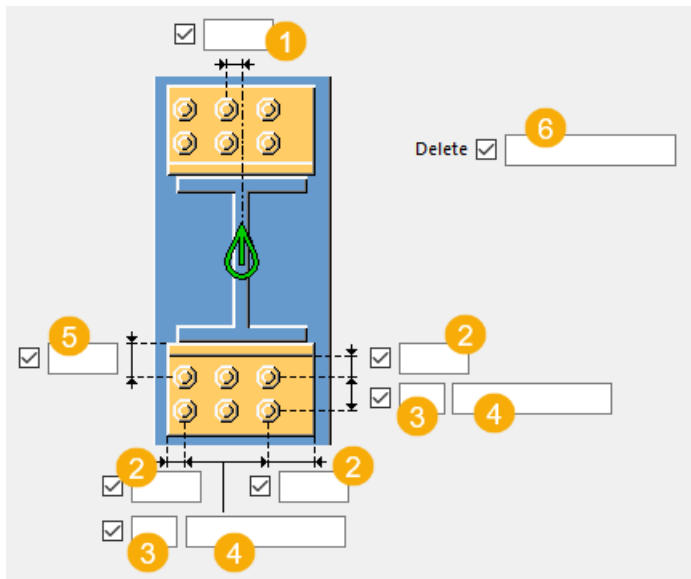
	Description	Default
1	Horizontal dimension of the stiffener plate chamfer.	Equal to angle profile rounding.
2	Vertical dimension of the stiffener plate chamfer.	Equal to angle profile rounding.
3	Vertical dimension of the stiffener plate shape cut line.	
4	Horizontal dimension of the stiffener plate shape cut line.	

### Chamfer type

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### ***Pbolts tab***

Use the **Pbolts** tab to control the properties of the bolts connecting the clip angle to the main part.



	Description
1	Dimension for horizontal bolt group position. The dimension is defined from the middle line of the secondary beam.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Dimension for vertical bolt group position. The dimension is defined from the bottom of the secondary beam.
6	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

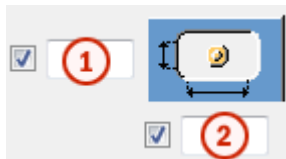
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.

Option	Description	Default
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

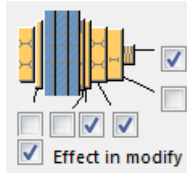


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

## Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.

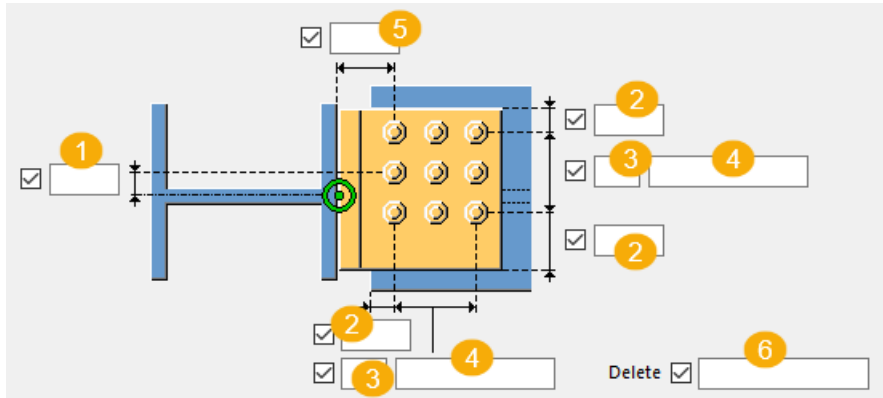


## Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

## ***Sbolts tab***

Use the **Sbolts** tab to control the properties of the bolts connecting the clip angle to the secondary part.



	Description
<b>1</b>	Dimension for vertical bolt group position. The dimension is defined from the middle line of the secondary beam.
<b>2</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>3</b>	Number of bolts.
<b>4</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>5</b>	Dimension for horizontal bolt group position. The dimension is defined from the bottom of the secondary beam.
<b>6</b>	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

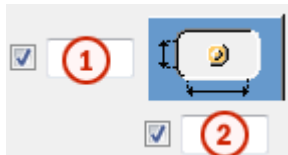
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	

Option	Description	Default
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes







You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	



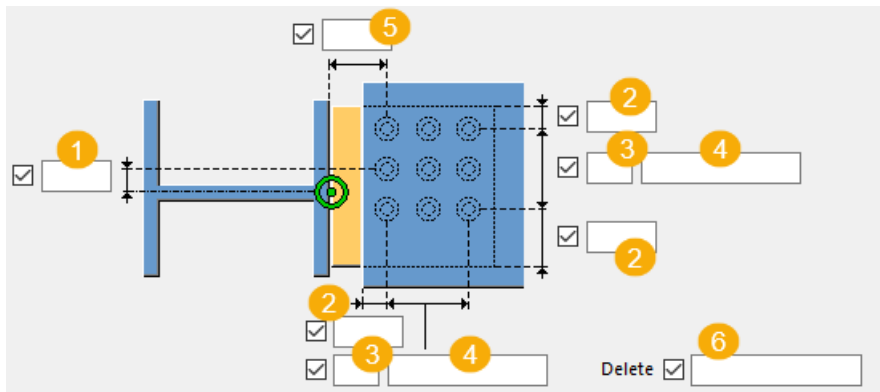
## Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### **SBoltsDown** tab

Use the **SBoltsDown** tab to control the properties of the bolts connecting the bottom seat angle to the secondary part.

### Secondary bolt group dimensions



	Description
1	Horizontal bolt group position from the end of the secondary beam.
2	Bolt edge distance.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

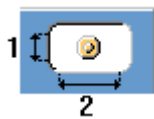
	Description
5	Vertical bolt group position. Reference point is from the bottom of the secondary beam.
6	Deletes bolts from the bolt group. Enter the bolt numbers of the bolts to delete, separated by a space. Bolt numbers run left to right and top down.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.  joints.def: GENERAL / boltDia  16 mm (0.75")
<b>Bolt standard</b>	The bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	The gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether or not the thread may be within the bolted parts when using bolts with a shaft. This has no effect when using full-threaded bolts.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes






You can define slotted, oversized, or tapped holes with the following options.



Option	Description	Default
1	Slotted hole X dimension or allowance for oversized holes.	0, which results in a round hole.
2	Slotted hole Y dimension.	0, which results in a round hole.

Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Member(s) in which slotted holes are created. The options depend on the component.	

### Staggering of bolts

Option	Description
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### **Notch tab**





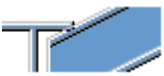
Use the **Notch** tab to automatically create notches for the secondary beams and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

### **Automatic notching**

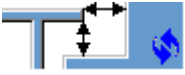
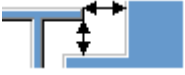
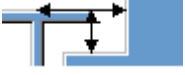
Automatic notching options affect both the top and the bottom flange.

## Notch shape

Automatic notching is switched on when you select a notch shape.

Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.
	Turns off automatic notching.

## Notch size

Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.




Enter the horizontal and vertical values for the cuts.



Horizontal measurement:



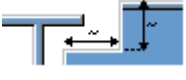
Vertical measurement:

## Flange cut shape

Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

## Notch dimension rounding


Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.



Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.

The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.







## Notch position

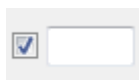
Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.

Option	Description
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

### Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.








### Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.

### Side of flange notch






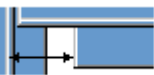
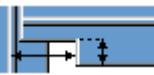
The side of flange notch defines on which side of the beam the notches are created.

Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.


Option	Description
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

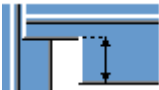

### Flange notch shape

The flange notch shape defines the notch shape in the beam flange.

Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.
	Creates chamfers in the flange. If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.
	Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b> .
	The flange is not cut.
	Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.
	Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b> .

### Flange notch depth

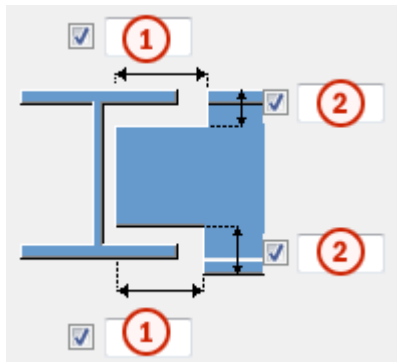
Option	Description
	Default Flange notch depth. AutoDefaults can change this option.

Option	Description
	Flange notch depth.
	Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.

Enter the value for flange notch depth.

### Cut dimensions



	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### Stiffeners tab

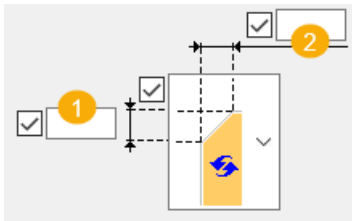
Use the **Stiffeners** tab to control the properties of the near side and far side stiffeners created in the secondary part web.

Option	Description
<b>Stiffener NS</b>	Stiffener thickness, width and height.
<b>Stiffener FS</b>	



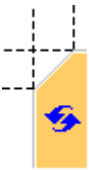

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	




### Chamfer dimensions



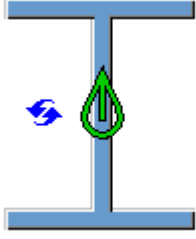
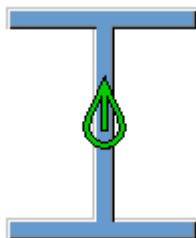

	Description	Default
<b>1</b>	Vertical dimension of the chamfer.	10 mm
<b>2</b>	Horizontal dimension of the chamfer.	10 mm

### Chamfer type

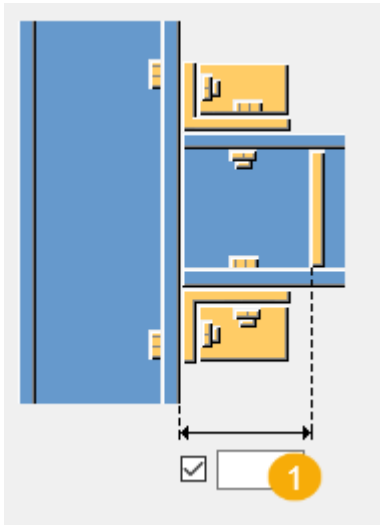
Option	Description
	Default. Line chamfer AutoDefaults can change this option.
	No chamfer

Option	Description
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### Stiffener creation

Option	Description
	Default Stiffeners are not created. AutoDefaults can change this option.
	Stiffeners are not created.
	Stiffeners are created.

## Stiffener position



	Description
1	Stiffener edge distance from the main part flange.

### ***General tab***

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

## 2.9 Opening connections

This section introduces components that can be used in steel openings.

Click the links below to find out more:

- [Create hole around part \(92\) \(page 1244\)](#)
- [Rebar hole \(page 1249\)](#)
- [Notch \(76\) \(page 1252\)](#)

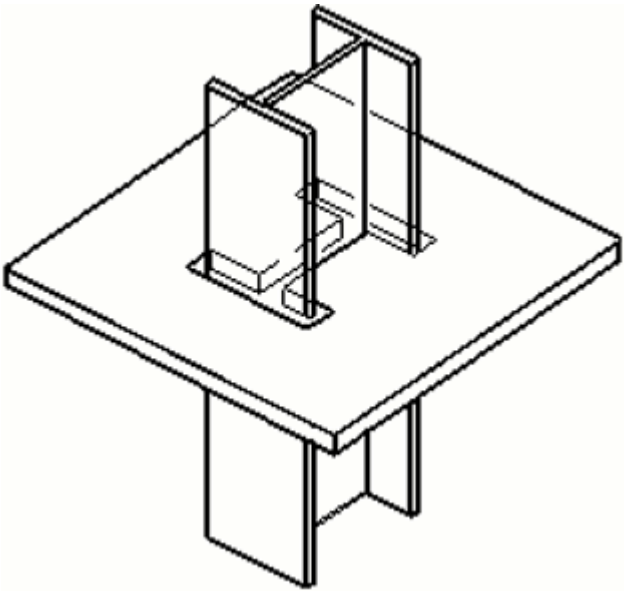
### Create hole around part (92)

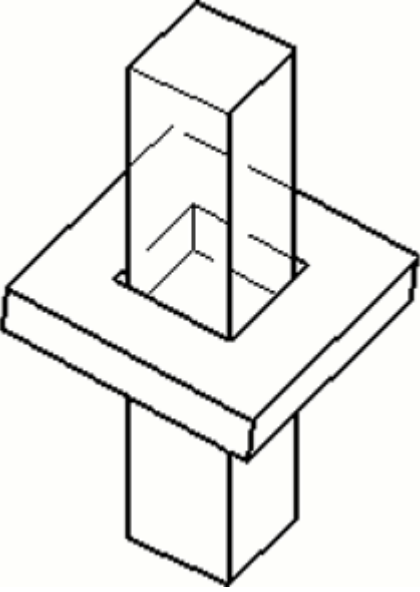

**Create hole around part (92)** cuts a hole to a part using another part. The part that cuts the hole is perpendicular to the part that is cut.

#### Objects created

- Cuts

#### Use for

Situation	Description
 A 3D perspective diagram illustrating the 'Create hole around part (92)' operation. It shows a thick, square steel plate resting on a vertical steel column. A second, thinner steel column is positioned vertically, passing through the center of the plate. The intersection of the two columns creates a rectangular cutout in the top surface of the plate. The diagram uses solid lines for visible edges and dashed lines to indicate hidden parts of the objects.	Steel column creates a cut through a plate.

Situation	Description
	<p>Concrete column creates a cut through a plate.</p>
	<p>Concrete column creates a cut in a plate.</p>

### **Selection order**

1. Select the main part (column).
2. Select the secondary part.

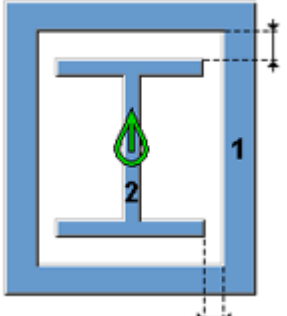
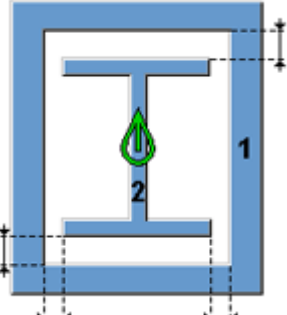
The connection is created automatically when the secondary part is selected.

### **Picture tab**

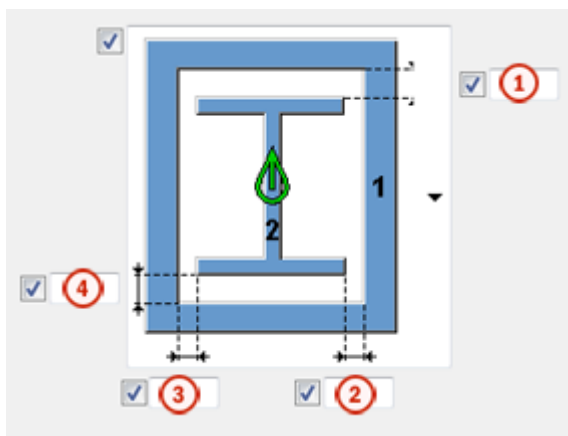
Use the **Picture** tab to control the gap dimensions and whether the dimensions are the same on both sides of the gap.

### **Gap side**

Define whether the gap dimensions are the same on both sides of the gap.

Option	Description
	Gap dimensions are the same on both sides.
	Gap dimensions are different on each side.

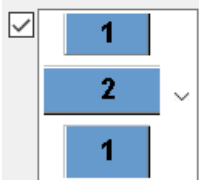
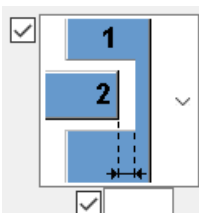
### Gap dimensions



	Description
1	Gap between the column and the secondary part in the vertical direction.
2	Gap between the column and the secondary part in the horizontal direction.
3	Gap between the column and the secondary part in the horizontal direction. To define this dimension, select the option that the gap is different on each side.

	Description
4	<p>Gap between the column and the secondary part in the vertical direction.</p> <p>To define this dimension, select the option that the gap is different on each side.</p>

### Part cut

Option	Description
<input checked="" type="checkbox"/> 	A cut is always created through the whole main part.
<input checked="" type="checkbox"/> 	Define the depth of the cut from the edge of the secondary part.





### Parameters tab

Use the **Parameters** tab to control the cut properties and type of the cut.

### Cut properties

Option	Description
<b>Max. rectangle size</b>	Define the maximum size of a rectangle cut.
<b>Cut perpendicular to main part</b>	<p>Define whether the cut is perpendicular to the main part.</p> <p>This option works for rectangular cuts.</p>
<b>Cut part name</b>	Define a name for the cut part.

## Cut type

Option	Description
	<p>Default</p> <p>Creates an exact or a rectangular cut. AutoDefaults can change this option.</p>
	<p>Rectangular</p> <p>Creates a rectangular cut using the coordinates of the cutting part edges.</p>
	<p>Exact</p> <p>Creates a cut along the edges of the cutting part. The cutting part has to be perpendicular to the part it cuts.</p> <p>You can use this option for I, round and tube profiles.</p>
	<p>Automatic</p> <p>This option selects the cut type depending on the cut size defined in <b>Max. rectangle size</b>.</p> <p>If the size of the cutting part is larger than the size defined in <b>Max. rectangle size</b>, an exact cut is created. Otherwise, a rectangular cut is created.</p>

### **General tab**

Click the link below to find out more:

[General tab](#)



### ***Design tab***

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:

Analysis tab


## **Rebar hole**

**Rebar hole** creates holes for reinforcing bars in a steel column, beam, or contour plate.

### **Objects created**

- Holes
- Cuts

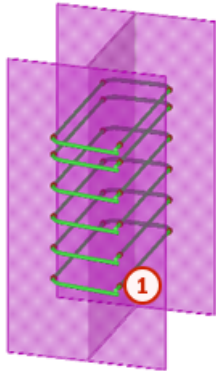
### **Use for**

<b>Situation</b>	<b>Description</b>
	Holes created for reinforcing bars in a steel beam.

### **Selection order**

1. Select the main part (column, beam, or contour plate).
2. Select the secondary part (reinforcing bar group).
3. Click the middle mouse button to create the holes for the reinforcing bars.

## Part identification key



Part	
1	Hole for reinforcing bar

### Parameters tab

Use the **Parameters** tab to control the properties of the reinforcing bar holes.

### Reinforcing bar hole properties

Option	Description	Default
<b>Bolt standard</b>	Select the bolt standard: <ul style="list-style-type: none"> <li>• <b>6914</b></li> <li>• <b>7968</b></li> <li>• <b>7990</b></li> <li>• <b>ASS 1</b></li> <li>• <b>ASS 2</b></li> <li>• <b>UNDEFINED_BOLT</b></li> </ul>	6914
<b>Rounding type</b>	Select the rounding type: <ul style="list-style-type: none"> <li>• <b>None</b> The rounding value is the reinforcing bar diameter + hole tolerance.</li> <li>• <b>Round off</b> The rounding value is the nearest integer number divisible by the rounding precision value.</li> </ul>	No default value Example dimensions: <ul style="list-style-type: none"> <li>• Reinforcing bar diameter = 21.6 mm</li> <li>• Hole tolerance = 3 mm</li> <li>• Rounding precision = 2 mm</li> <li>• None, rounding = 24.6 mm</li> </ul>

Option	Description	Default
	<ul style="list-style-type: none"> <li>• <b>Round up</b> The rounding value is the next integer number divisible by the rounding precision value.</li> <li>• <b>Round down</b> The rounding value is the previous integer number divisible by the rounding precision value.</li> <li>• <b>Round by table</b> Define the reinforcing bar diameter, hole diameter, and the slotted hole extension.</li> </ul>	<ul style="list-style-type: none"> <li>• Round off, rounding = 24 mm</li> <li>• Round up, rounding = 26 mm</li> <li>• Round by own, rounding = 24 mm</li> </ul>
<b>Hole tolerance</b>	Define the hole tolerance.  When you select <b>Round by table</b> as the rounding type, you cannot define the hole tolerance.	0 mm
<b>Rounding precision</b>	Define the rounding precision.  When you select <b>Round by table</b> as the rounding type, you cannot define the rounding precision.	1 mm
<b>Dimension table</b>	Define the reinforcing bar diameter, hole diameter, and slotted hole extension.  To define the dimensions in the table, select the <b>Round by table</b> option as the rounding type.  <b>Rebar hole</b> uses an existing bolt size and adjusts the hole tolerance value until the desired <b>Hole diameter</b> is reached.  Use the + and the - buttons to add and delete rows from the table.	



### ***Advanced tab***

Use the **Advanced** tab to control the hole type, vertical offset, and angle range dimension.

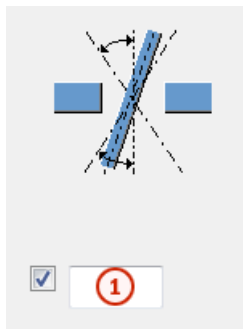
## Hole type

Option	Description	Default
<b>Hole type</b>	Select the hole type: <ul style="list-style-type: none"><li>• <b>Bolt hole</b></li><li>• <b>Part cut</b></li><li>• <b>Bolt hole + part cut</b></li></ul>	Bolt hole

## Vertical offset

Option	Description
	Default The hole is not offset.
	The hole is offset upward to directly support the reinforcing bar to keep the bar in the correct vertical position. The hole can be offset if the hole is a circular hole.

## Angle range dimension



	Description	Default
<b>1</b>	Angle range dimension. A round hole is created within the defined range. Holes that go beyond the range are transformed into slotted holes.	5 mm

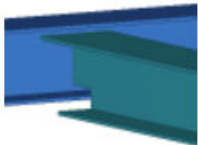
## Notch (76)

**Notch (76)** creates a notch to the secondary beam.

### Objects created

- Cuts

## Use for

Situation	Description
	Secondary beam is notched.

## Selection order

1. Select the main part.
2. Select the secondary part.

The connection is created automatically when the secondary part is selected.

## Notch tab






Use the **Notch** tab to create notches to the secondary beams and to control the notch properties.

## Automatic notching

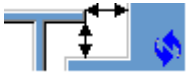

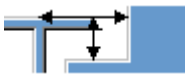
Automatic notching options affect both the top and the bottom flange.

## Notch shape

Automatic notching is switched on when you select a notch shape.

Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.
	Turns off automatic notching.



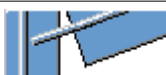
## Notch size

Option	Description
	<p>Default</p> <p>The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.</p> <p>AutoDefaults can change this option.</p>
	<p>The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.</p>
	<p>The notch size is measured from the center line of the main beam and from the top flange of the main beam.</p>



Enter the horizontal and vertical values for the cuts.




## Flange cut shape

Option	Description
	<p>Default</p> <p>Secondary beam flange is cut parallel to the main beam.</p> <p>AutoDefaults can change this option.</p>
	<p>Secondary beam flange is cut parallel to the main beam.</p>
	<p>Secondary beam flange is cut square.</p>

## Notch position

Option	Description
	<p>Default</p> <p>Creates the cut below the main beam flange.</p> <p>AutoDefaults can change this option.</p>
	<p>Creates the cut below the main beam flange.</p>

Option	Description
	Creates the cut above the main beam flange.

### Notch dimension rounding





Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

### Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.



### Side of flange notch





The side of flange notch defines on which side of the beam the notches are created.

Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

### Flange notch

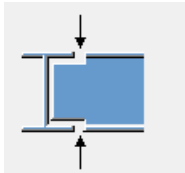
The flange notch shape defines the notch shape in the beam flange.

Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Creates cuts to the flange with default values unless you define other values.

Option	Description
	Creates cuts to the flange according to the value you define to make it flush with the web.
	Creates cuts to the flange according to the values you define.
	Creates chamfers in the flange. If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.
	The flange is not cut.

### Cut dimensions

Define the vertical flange cut dimensions.



### Parameters tab

Use the **Parameters** tab to define the notch type and the clearance between the parts.

Option	Description
<b>Fitting type</b>	Select the type of notch created between the main part and the secondary part.
<b>Clearance</b>	Define the clearance value for the gap created between the parts.

### General tab

Click the link below to find out more:

[General tab](#)

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)



## 2.10 Bracing

This section introduces components that can be used in steel bracing structures.

- [Tensioner \(7\) \(page 1257\)](#)
- [Tensioner brace \(13\) \(page 1276\)](#)
- [Tensioner brace and compression bar \(13\) \(page 1285\)](#)
- [Tensioner central gusset \(18\) \(page 1298\)](#)
- [Traction bar \(52\) \(page 1327\)](#)
- [Turnbuckle bracing \(53\) \(page 1316\)](#)
- [Muffe \(26\) \(page 1324\)](#)
- [Turnbuckle connection \(126\) \(page 1334\)](#)
- [Generation of purlins \(50\) \(page 1339\)](#)
- [Gusset+ T \(page 1352\)](#)

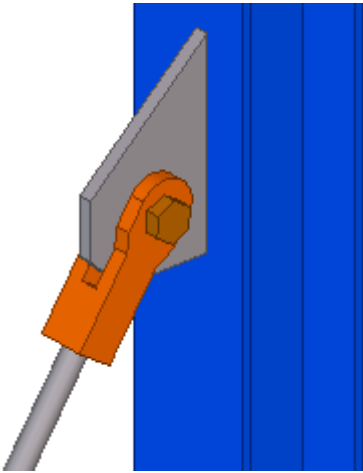
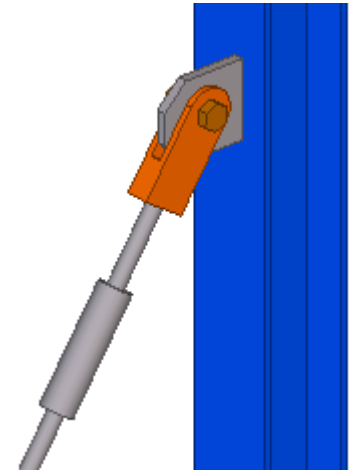
### **Tensioner (7)**

**Tensioner (7)** connects a column or a beam to a brace with a forked plate or a flat plate. Optionally, a gusset plate can be created.

#### **Objects created**

- Gusset plate (optional)
- Forked or flat plate
- Tensioner (optional)
- End plate (optional)
- Bolts
- Welds

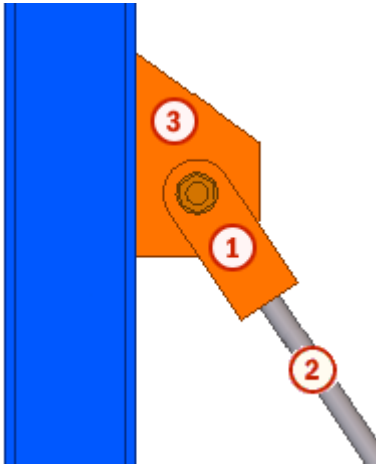
## Use for

Situation	Description
 A 3D perspective diagram showing a grey forked plate with a central hole. An orange bracket is bolted through the hole to a vertical blue structural member. A grey rod is attached to the end of the bracket.	<p>Forked plate is welded to a bracing rod and bolted to a gusset plate.</p> <p>The gusset plate is welded to the main part.</p>
 A 3D perspective diagram showing a grey rod with a sleeve. An orange bracket is bolted to a vertical blue structural member. The rod passes through the bracket.	<p>Simplified tensioner in the bracing rod.</p>

## Selection order

1. Select the main part (column or beam).
2. Select the secondary part(s) (brace).
3. Click the middle mouse button to create the component.

### Part identification key



	Part
1	Connection plate (forked plate)
2	Bracing rod
3	Gusset plate

### Plate tab

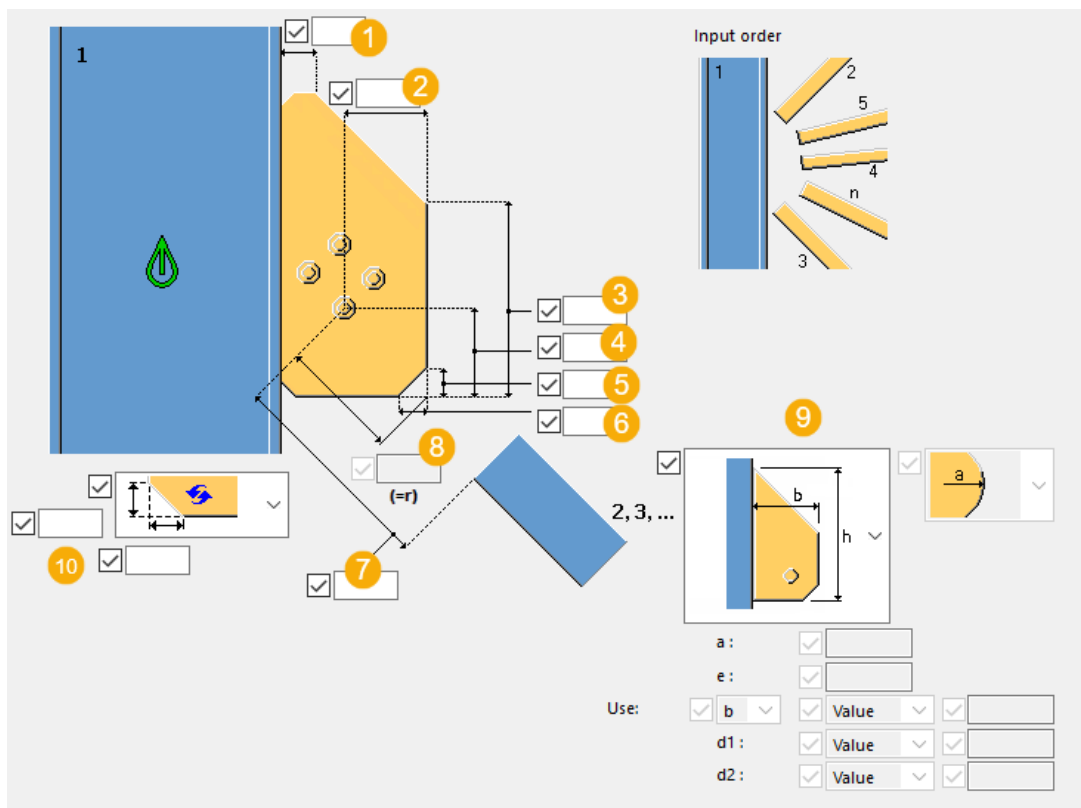
Use the **Plate** tab to control the gusset plate dimensions and shape.

### Plate

Part	Description	Default
<b>Gusset plate</b>	Define the gusset plate thickness, width and height. 	12 mm 100 mm 180 mm

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Gusset plate shape and dimensions



	Description	Default
<b>1</b>	Horizontal top dimension from the column web.	
<b>2</b>	Horizontal bolt edge distance.	50 mm
<b>3</b>	Height of the gusset plate.	80 mm
<b>4</b>	Bottom vertical bolt edge distance.	50 mm
<b>5</b>	Bottom vertical chamfer dimension.	20 mm
<b>6</b>	Bottom horizontal chamfer dimension.	20 mm
<b>7</b>	Bolt edge distance to the bracing rod.	110 mm
<b>8</b>	Bolt edge distance of the chamfer (radius).	
<b>9</b>	Gusset plate shape. Select the plate shape and define the plate dimensions.	
<b>10</b>	Select the chamfer shape. Define the horizontal and vertical chamfer dimensions.	

### **Fork tab**

Use the **Fork** tab to control the size, position, number, orientation and shape of the forked plate.

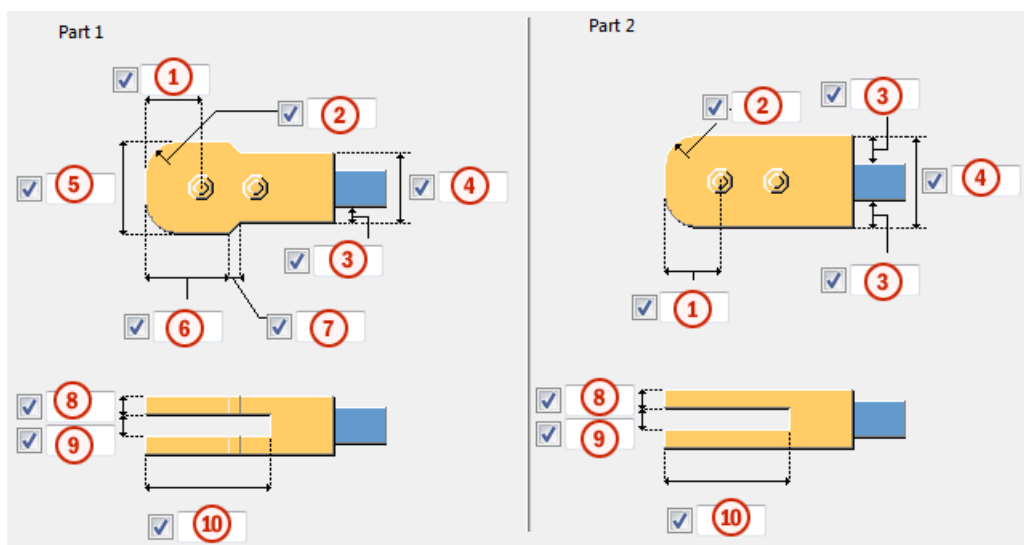
### **Forked plate**

Part	Description
<b>Forked plate</b>	Select the shape for the forked plate: <ul style="list-style-type: none"> <li>• <b>Part 1</b> shape creates a plate with a circular part.</li> <li>• <b>Part 2</b> shape creates a simple plate.</li> </ul>

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part</b>

Option	Description	Default
		<b>material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Forked plate dimensions

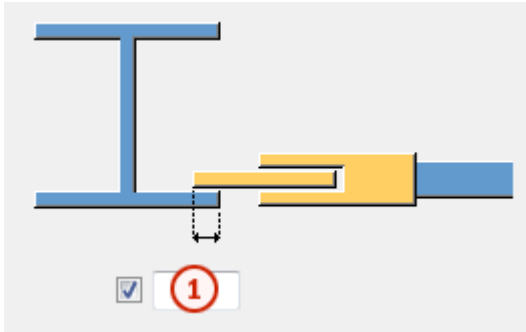


	Description
<b>1</b>	Horizontal bolt edge distance.
<b>2</b>	Chamfer radius of the forked plate.
<b>3</b>	Width of the extension part.
<b>4</b>	Width of the forked plate.
<b>5</b>	Width of the forked plate.
<b>6</b>	Length of the circular part of the forked plate.
<b>7</b>	Chamfer width of the forked plate.
<b>8</b>	Finger thickness of the forked plate.
<b>9</b>	Gap between the fingers of the forked plate.
<b>10</b>	Finger length in the forked plate.

### Parameters tab

Use the **Parameters** tab to control the overlap of the gusset plate and the size, position, number and shape of the end plate.

### Gusset plate overlap



	Description
1	Define how much the gusset plate overlaps with the main part flange. If you do not enter any value, the gusset plate reaches the main part web.

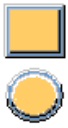


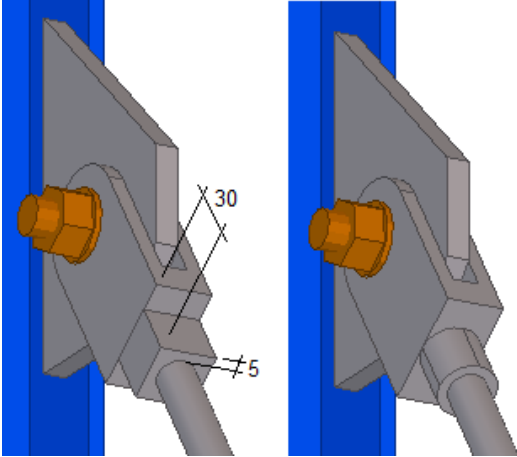
### End plate

1	Define the end plate thickness, width, and height.
---	--

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

Option	Description	Default
<b>Finish</b>	Describes how the part surface has been treated.	

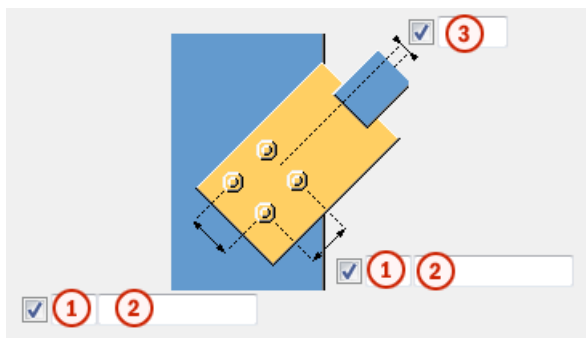
### End plate shape

Option	Description
	Select the end plate shape.
<div style="display: flex; justify-content: space-between; margin-bottom: 5px;"> <span>End plate</span> <span>t</span> <span>b</span> <span>h</span> </div> <input checked="" type="checkbox"/> 30.00 <input type="text"/> <input type="text"/> <input checked="" type="checkbox"/>  <input checked="" type="checkbox"/> -5.00 	Define the end plate offset from the bracing rod.
	

### **Bolts tab**

Use the **Bolts** tab to control the bolt properties.

### Bolt group dimensions





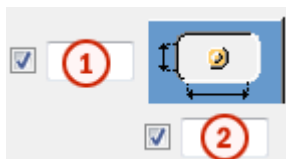
	Description
1	Number of bolts.
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Define the bolt offset from the center line of the bracing rod.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



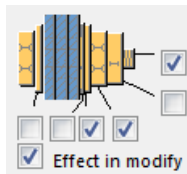
Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.

Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### **Bolt assembly**

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

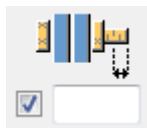
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### ***Tensioner tab***

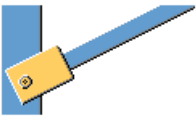
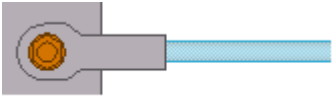
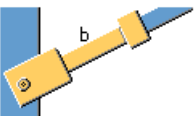
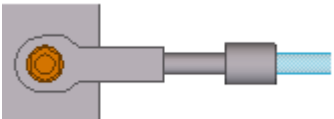
Use the **Tensioner** tab to add a tensioner, to control the bracing levels and bracing offsets.

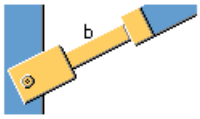
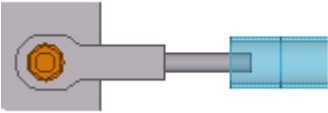
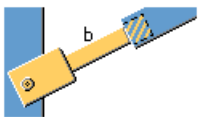
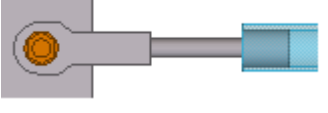
## Part

Part	Description	Default
<b>Tensioner T</b>	Define the tensioner profile by selecting it from the profile catalog.	D40
<b>Part B</b>	If you have created a tensioner, define the extra windbracing profile by selecting it from the profile catalog.	

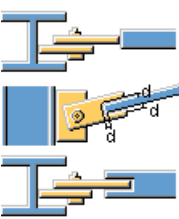

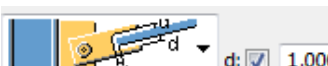
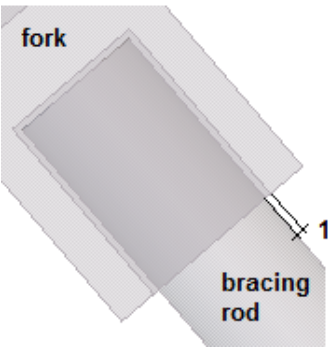
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

## Tensioner

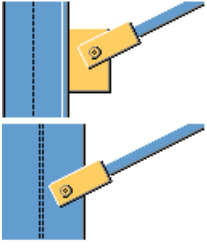
Option	Description	Example
	Tensioner is not created.	
	Tensioner is created.	

Option	Description	Example
	<p>Tensioner is created.</p> <p>Stopper part is added to the bracing. Used for compression tubes.</p>	
	<p>Tensioner is created.</p> <p>Stopper part is placed inside the compression tube.</p>	

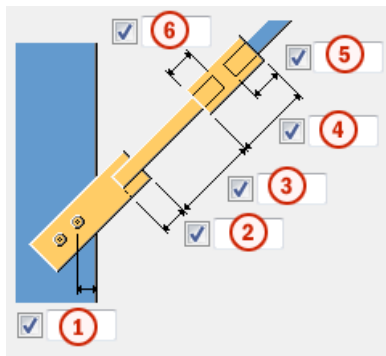
### Opening in forked plate

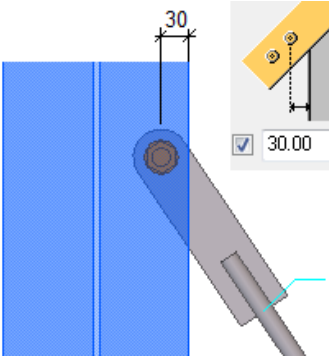
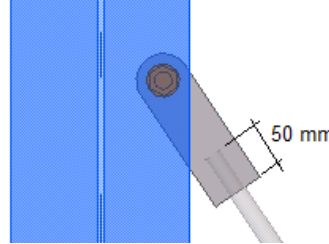
Option	Description	Example
	<p>Select whether an opening is created in the forked plate. The opening is always square.</p> <p>You can define the opening if both the tensioner and extra windbracing are created.</p>	
	<p>Define the gap for the opening.</p> <p>The default value is 1 mm.</p>	 

## Gusset plate

Option	Description
	<p>Select whether a gusset plate is created.</p> <p>If you do not select a gusset plate, only the forked plate will be created.</p>

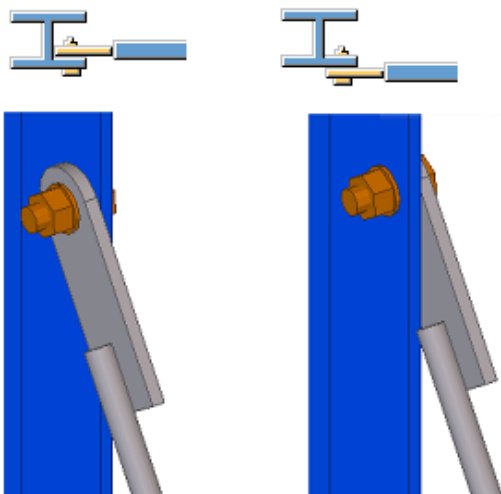
## Bracing dimensions



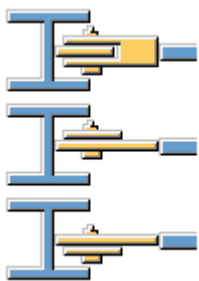
	Description	Example/Default
1	<p>Bolt edge distance from the main part flange when there is no gusset plate.</p> <p>The default value is 30 mm .</p>	
2	<p>Bracing rod overlap.</p>	
3	<p>Length of the extra windbracing between the forked plate and the tensioner.</p>	<p>The default value is 300 mm.</p>
4	<p>Length of the tensioner.</p>	<p>The default value is 40 mm.</p>

	Description	Example/Default
5	Bracing overlap in the tensioner.	The default value is 0 mm.
6	Extra windbracing overlap in the tensioner.	The default value is 0 mm.

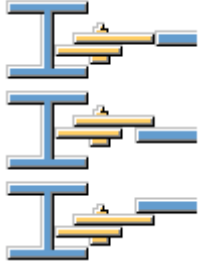
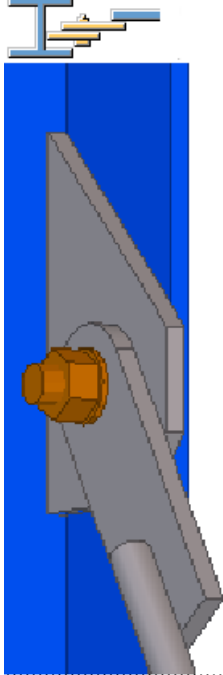
### Bracing position

Option	Description
	<p>Position of the bracing on the main part flange.</p> <p>This option is useful especially if there is no gusset plate.</p>

### Plate position

Option	Description
	<p>Select the position of the forked plate on the main part web.</p>

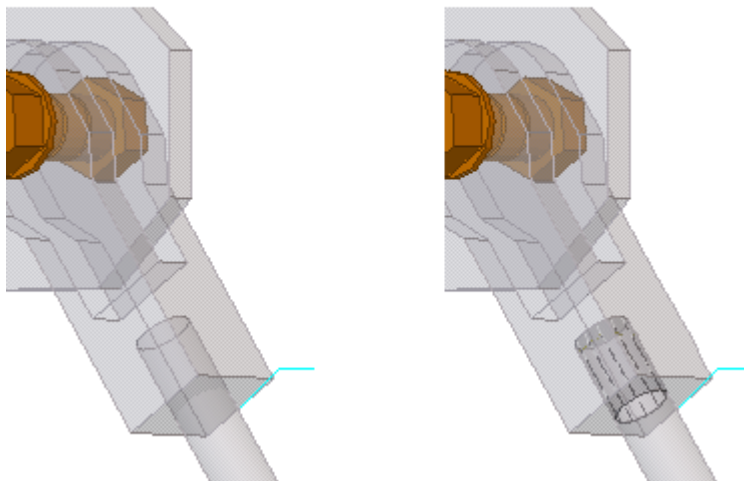
## Forked plate position on bracing

Option	Description	Example
	<p>Select the position of the forked plate on the bracing.</p> <p>This option is useful especially with flat plates.</p>	

### Cut part B in fork

Define whether the forked part is cut if the bracing rod goes through the forked part. The forked part cut adapts to the bracing rod size.

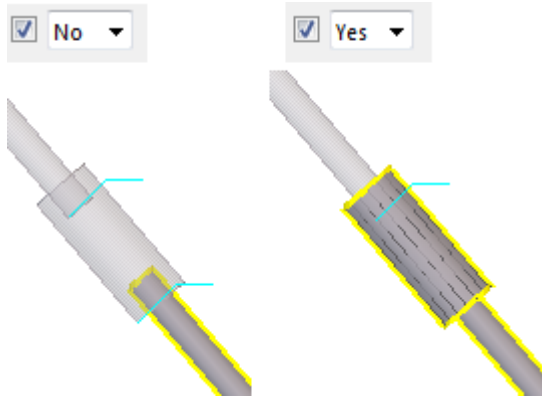
Cut in connection fork  No  Yes
  Cut in connection fork  No  Yes



### Tensioner T add to secondary

Select whether the tensioner is added to the secondary part or handled as a loose part and welded to the bracing rod.

- **Yes** adds the tensioner to the bracing rod.
- **No** welds the tensioner to the bracing rod as a loose part.



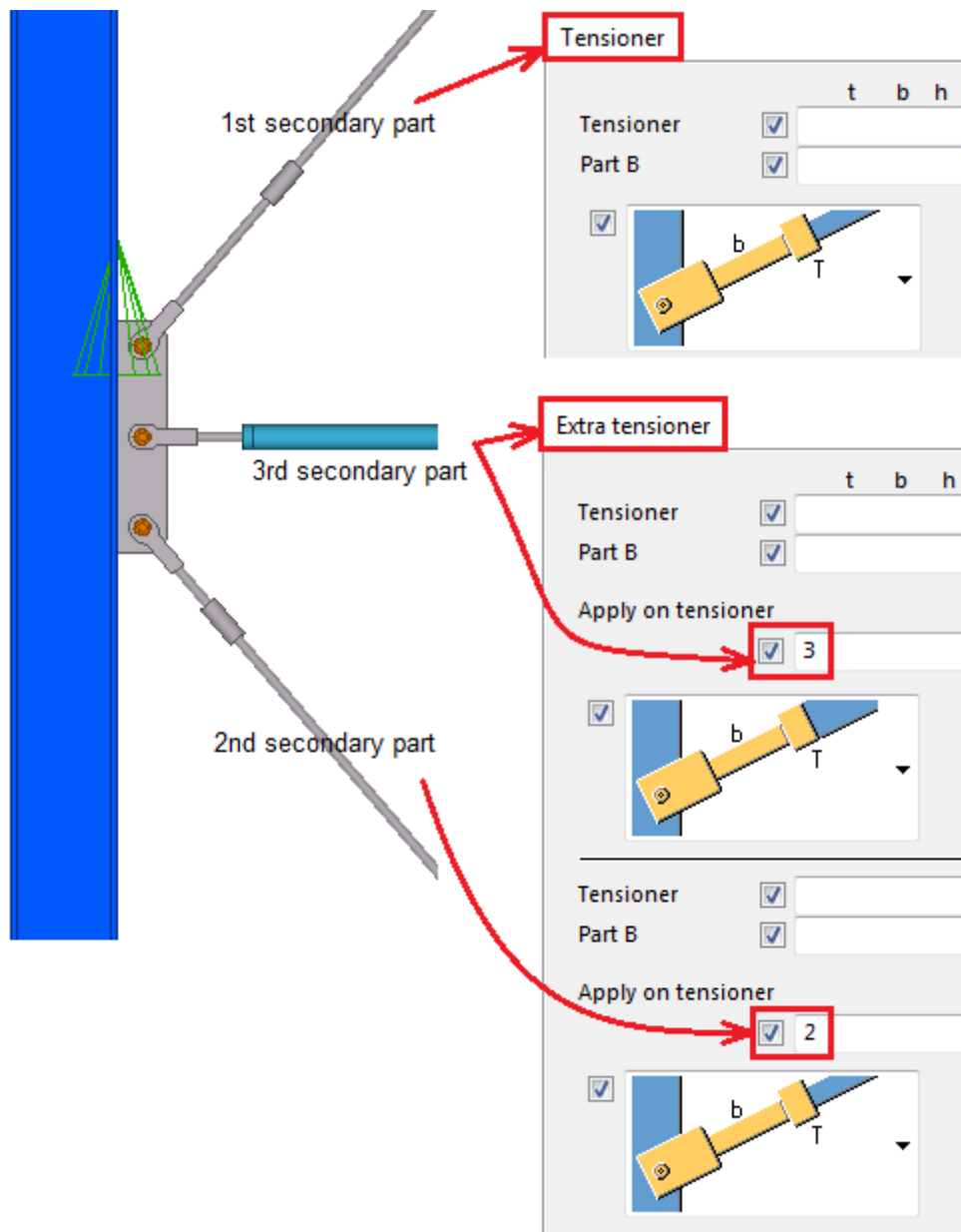
### Extra tensioners tab

Use the **Extra tensioners** tab to add extra tensioners. Two different tensioner types can be defined.

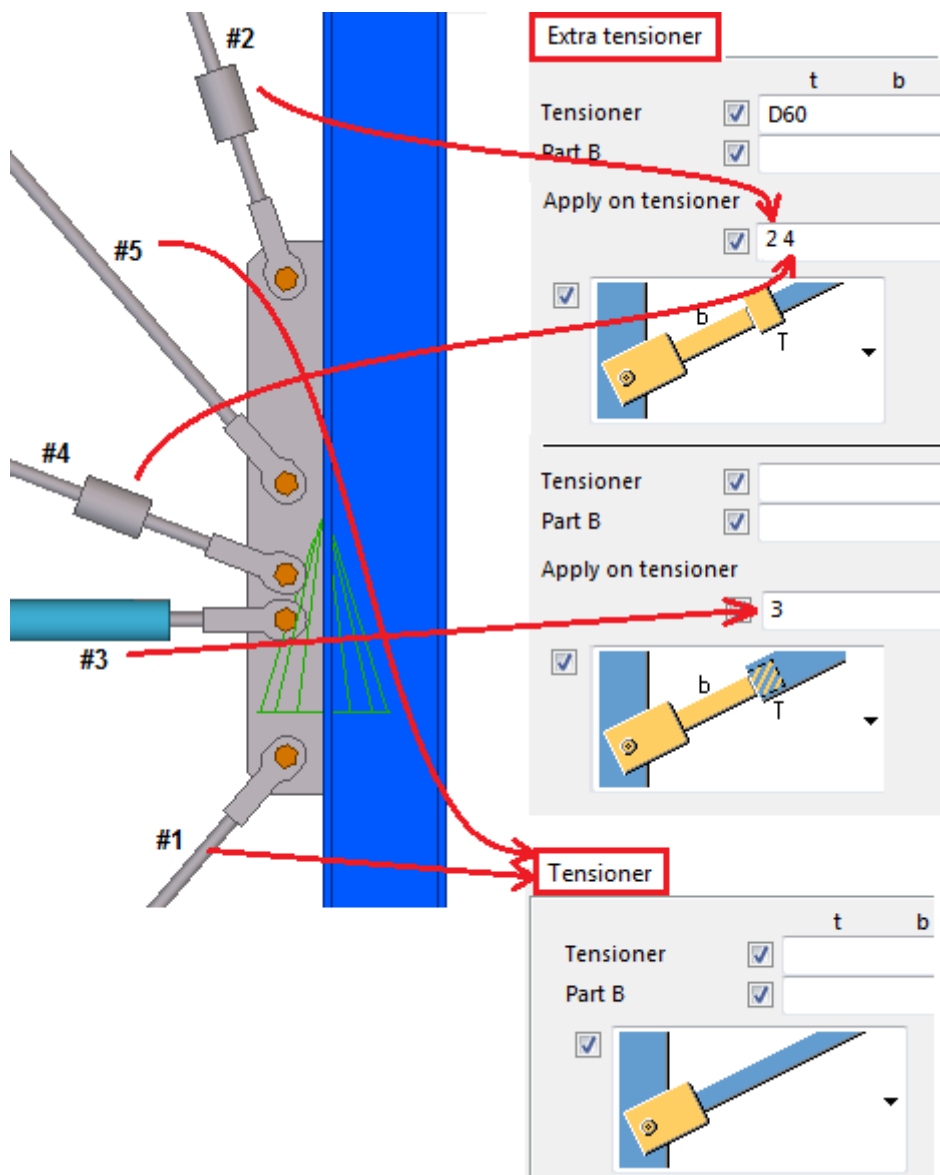
### Extra tensioners

If there is one bracing, define the tensioner on the **Tensioner** tab. If there are more bracings, define the tensioners for the second, third, etc. bracing on the **Extra tensioners** tab. Define the bracing numbers in the **Apply on tensioner number** box.





The tensioners whose numbers are not entered are created with the properties defined on the **Tensioner** tab.



For instructions on tensioner bracing dimensions, **Cut part B in fork** and **Tensioner T add to secondary**, see the instructions on the **Tensioner** tab.

**Parts**

Part	Description
<b>Tensioner T</b>	Define the tensioner profile by selecting it from the profile catalog.
<b>Part B</b>	If you have created a tensioner, define the extra windbracing profile by selecting it from the profile catalog.

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

### ***UDA tab***

Use the **UDA** tab to add information in the user-defined attributes (UDAs) of the parts.

You can define UDAs for the plate and the fork. UDAs can be displayed in drawings and reports.

### ***General tab***

Click the link below to find out more:

General tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

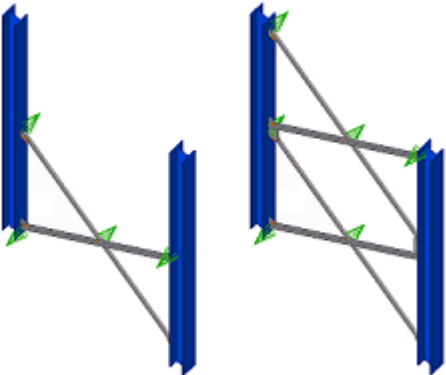
## Tensioner brace (13)

**Tensioner brace (13)** creates one or two bracing crosses between two columns or beams. It is also possible to add connections between columns or beams and the bracing crosses. You can define which connections are used.

### Objects created

- Bracing cross (1 or 2)
- Connections between columns or beams and bracing crosses
- Connections in bracing crosses

### Use for

Situation	Description
	One or two bracing crosses between two columns.

**NOTE** To use **Tensioner brace (13)** you need to set the **Up direction** on the **General** tab to a fixed direction:  $-x,+x,-y,+y,-z$ , or  $+z$ .

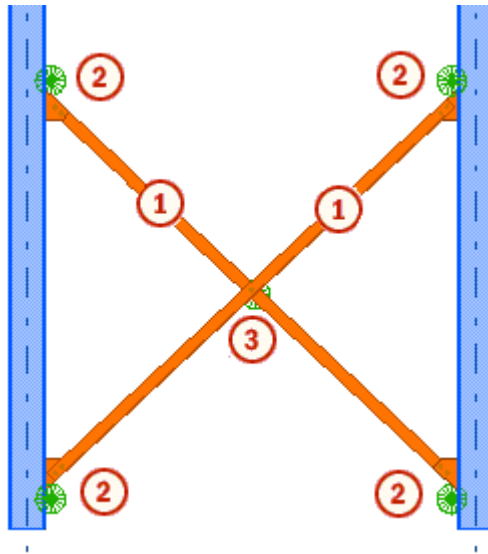
The **Auto** option does not work.

### Selection order

1. Select the first main part (column or beam).
2. Select the second main part (column or beam).

The connection is created automatically when the secondary part is selected.

### Part identification key

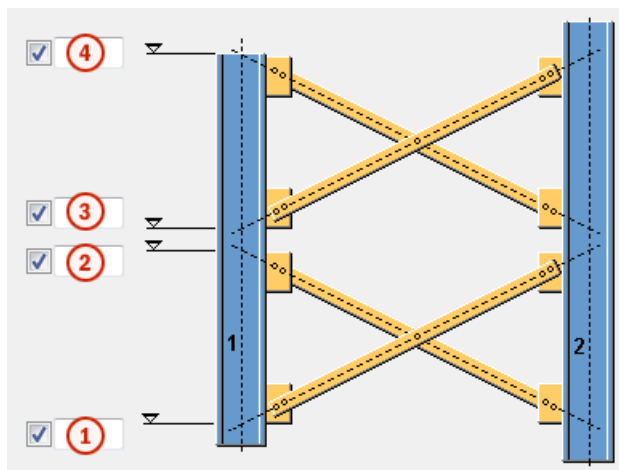


1	Diagonal bracing
2	Connection between the main part and the bracing
3	Connection in the bracing cross

### Picture tab

Use the **Picture** tab to control the bracing levels and bracing offsets.

### Bracing levels



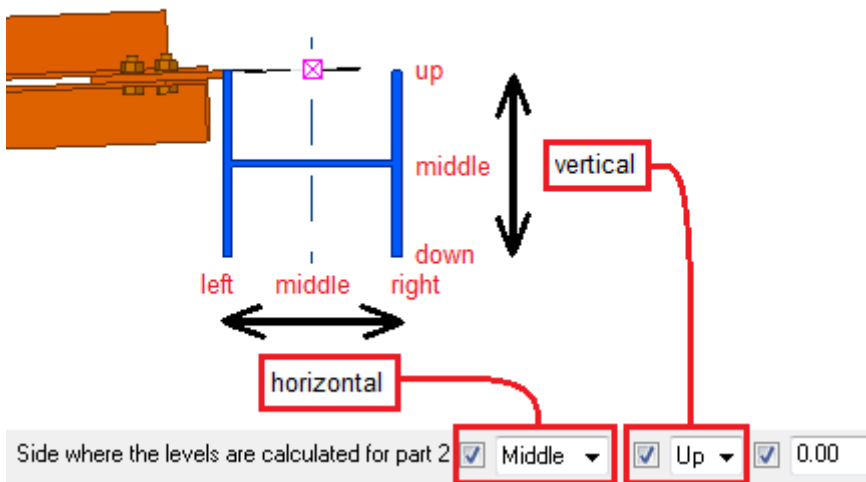
	Description
1	Bottom level of the lower bracing cross.

	Description
2	Top level of the lower bracing cross.
3	Bottom level of the upper bracing cross.
4	Top level of the upper bracing cross.

### Bracing reference

For both main parts, define the reference side of the bracing levels. The reference side can be set for both in the horizontal and the vertical direction.

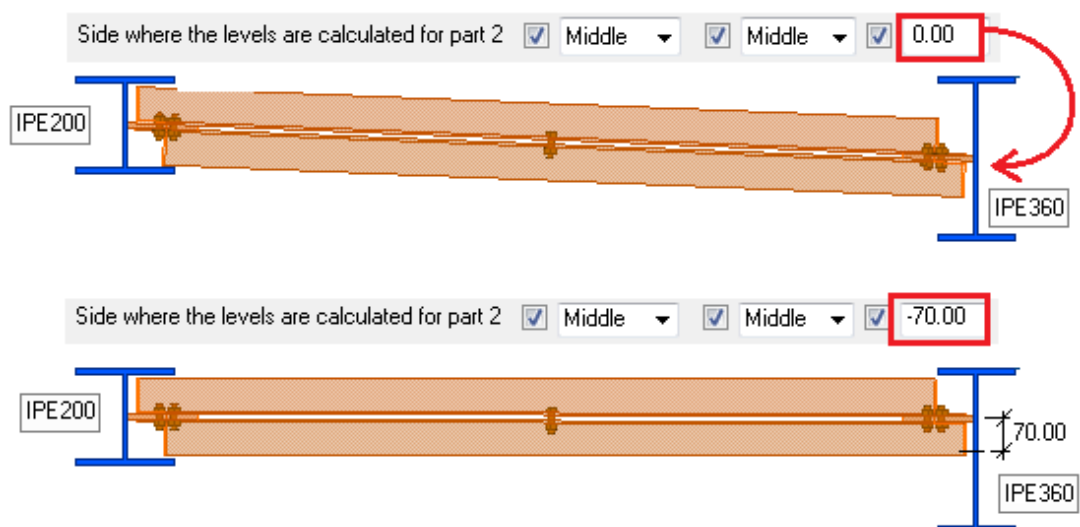
Example:



### Bracing offset

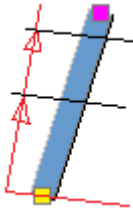
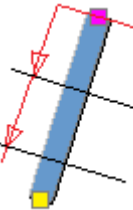
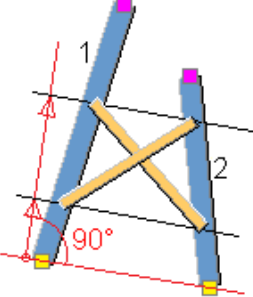
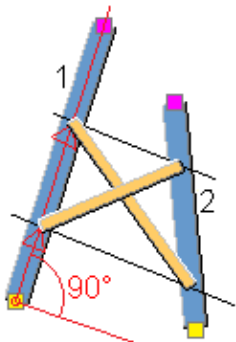
Define the offset perpendicular to the bracing. You can move the created plate or part by entering a value in the x-, y, or z-direction.

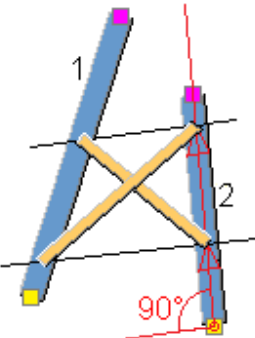
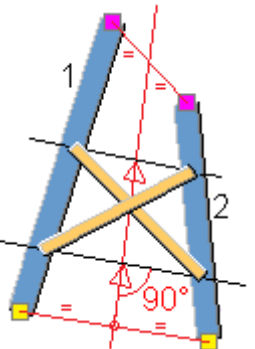
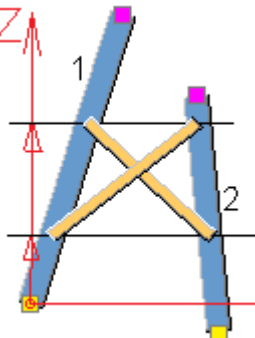
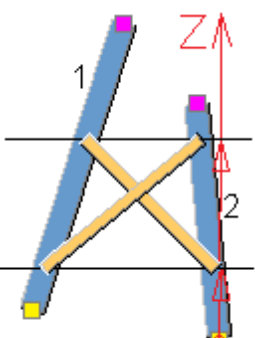
Example:



### Levels tab

Use the **Levels** tab to control the bracing direction when the columns are not parallel.




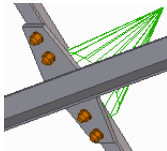


Option	Description		
<b>Direction</b> Select the direction of the bracing.			Start point of the main part as the reference point.
			End point of the main part as the reference point.
<b>Calculation of levels</b> Select the reference line used for positioning the bracing when the main parts are not parallel.			Offset from the start point in part 1, perpendicular to the line through the start points.
			Offset from the start point in part 1, in local x-direction.

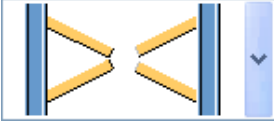
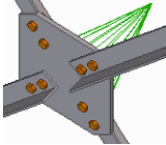

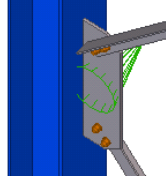

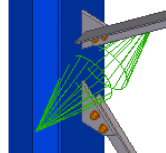
Option	Description	
		 <p>Offset from the start point in part 2, in local x-direction.</p>
		 <p>Reference line through the start and end points of the main parts, offset from the start of the reference line.</p>
		 <p>Offset from the start point in part 1, in z-direction.</p>
		 <p>Offset from the start point in part 2, in z-direction.</p>



### Parts tab

Use the **Parts** tab to control the properties, bracing position, and rotation. Additionally, you can define bracing splitting and shortening values.

Option	Description		
<b>Windbracing</b>	Define the bracing profile by selecting it from the profile catalog.		
<b>Windbracing rotation</b>	<p>Select the rotation for the first and the second bracing element.</p> <p>This option is useful when the bracing elements are crossing and they are connected in the crossing.</p>		
<b>Windbracing translation</b>	<p>Select the offset of the first and the second bracing element from the reference points.</p> <p>This option is useful when the bracing elements are positioned so that the first bracing is alongside the second bracing. Typically, the first bracing element is set to <b>Forwards</b> and the second bracing element to <b>Backwards</b>.</p>		
<b>Splitting the diagonal bracing</b>	<p>Select whether the diagonal bracing elements are split or connected with a component.</p> <p>Define the connecting component on the <b>Joints</b> tab by typing the number of the component in the <b>Connect diagonals with joint number</b> box.</p>	 <p>Bracing is not split.</p> <p>Possible component for connecting the diagonal bracing: <b>Seating (30)</b>.</p>	
	<p>First diagonal bracing element is split.</p> <p>Possible component for connecting the diagonal bracing: <b>Bolted gusset (11)</b>.</p>		
			

Option	Description		
		<p>Second diagonal bracing element is split.</p> <p>Possible component for connecting the diagonal bracing: <b>Bolted gusset (11).</b></p>	
		 <p>Both diagonal bracing elements are split.</p> <p>Possible component for connecting the diagonal bracing: <b>Central gusset (169).</b></p>	
<p><b>Connecting bracing crosses</b></p>	<p>Select whether the gusset plates of two bracing crosses above each other are connected.</p> <p>Define the connecting component on the <b>Joints</b> tab by typing the number of the component in the <b>Connection number</b> box.</p>	 <p>Bracing crosses are connected with a gusset connection.</p> <p>Possible component for connecting the diagonal bracing: <b>Bolted gusset (11).</b></p>	
		 <p>Bracing crosses are not connected. Separate connection is created for each diagonal bracing.</p> <p>Possible component for connecting the diagonal bracing: <b>Bolted gusset (11).</b></p>	

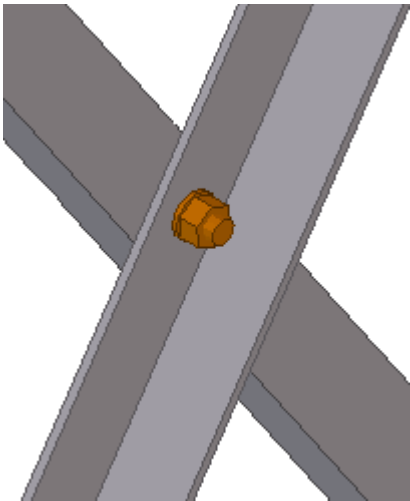
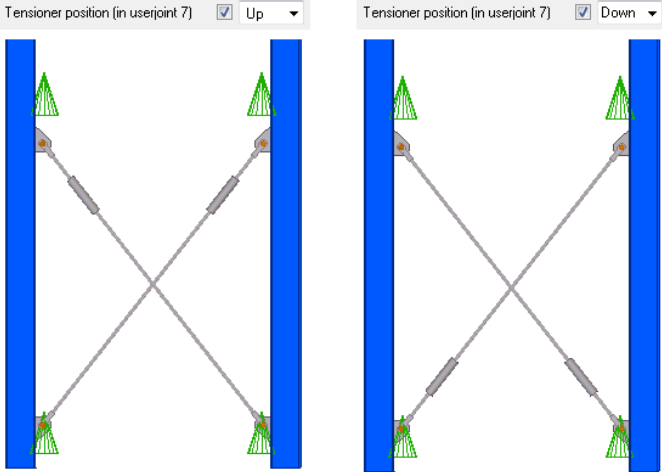
Option	Description
<b>Distance between windbracings</b>	Define the distance between bracing elements. If the bracing elements are crossing each other, this value typically defines the gusset plate thickness.
<b>Shorten windbracings</b>	Define how much the bracing are shortened. The entered value is written in the user-defined attributes of the bracing. The value is used in drawings.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Comment</b>	Add a comment about the part.	

### ***Joints tab***

Use the **Joints** tab to define the components used for connecting the columns or beams and the bracing crosses.

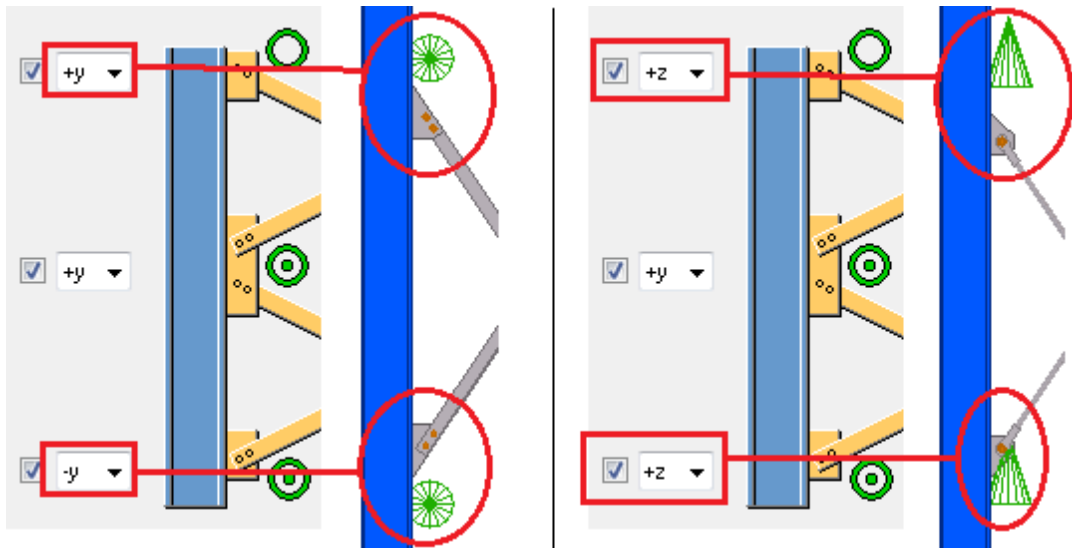
Option	Description
<b>Creation of joints</b>	Select whether connections are created between the bracing elements.  <b>No:</b> Only the bracing elements are created. <b>Yes:</b> Components are added between the bracing elements.
<b>Connection number Connect diagonals with joint number</b>	Type the component number that is used for connecting the bracing or the diagonal bracing cross, and the component application number.

Option	Description
<p><b>Userjoint application number</b></p> <p><b>Joint direction</b></p>	<p>Select the connection direction for the diagonal bracing cross.</p> <ul style="list-style-type: none"> <li>• Default component for the bracing is <b>Bolted gusset (11)</b>.</li> <li>• Default component for the diagonal bracing cross is <b>Seating (30)</b>.</li> </ul> <p>Example:</p> 
<p><b>Configuration file</b></p>	<p>Configuration setting for the connection.</p> <p>For example, if you type <code>CS_M13</code>, it means that a setting named <code>CS_M13</code> must be available for the used connection.</p>
<p><b>Tensioner position</b></p>	<p>Define the tensioner position if the <b>Tensioner (7)</b> connection is used.</p> <p>Example of <b>Tensioner (7)</b> position in both the <b>Up</b> and the <b>Down</b> position.</p> 

### ***Joints dir tab***

Use the **Joints dir** tab to control the up directions of the connections used between the main parts and the diagonal bracing.

In the example below, **Seating (30)** has been defined as the connecting component on the **Joints** tab:



### ***General tab***

Click the link below to find out more:

[General tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

## **Tensioner brace and compression bar (13)**

**Tensioner brace and compression bar (13)** creates one or two bracing crosses between two columns or beams. It is possible to add compression bars between the main parts. You can add connections between the main parts and the bracing crosses, and between the main parts and the compression bars.

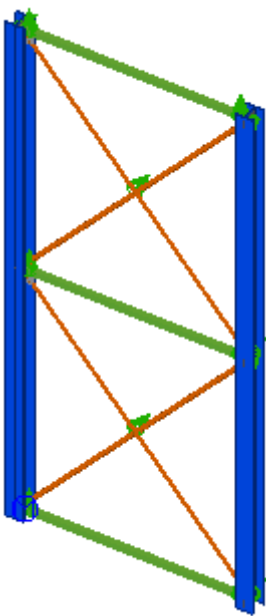
Because you can use other components inside **Tensioner brace and compression bar (13)** to create the connections between parts, the component has a hierarchical component structure. **Tensioner brace and**

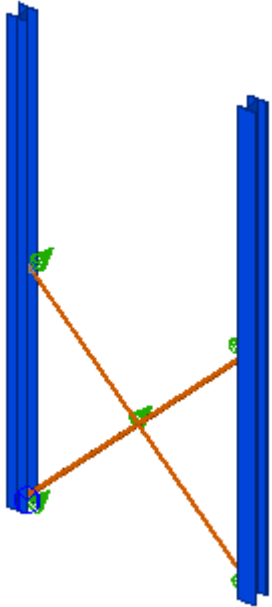
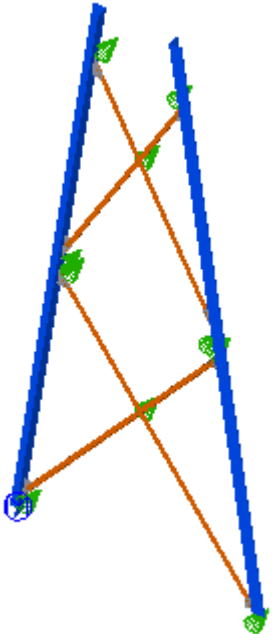
**compression bar (13)** is on the highest level in the component hierarchy (level 0) and the connections are on a lower level (level 1) in the component hierarchy.

**Objects created**

- Bracing (1 or 2)
- Compression bars (optional)
- Connections between main parts and bracing
- Connections between main parts and compression bars
- Connections in bracing crosses

**Use for**

Situation	Description
	Two bracing crosses and three compression bars with connections.

Situation	Description
	<p>One bracing with connections.</p>
	<p>Tapered main parts (mast construction) and two bracing crosses with connections.</p>

**Selection order**

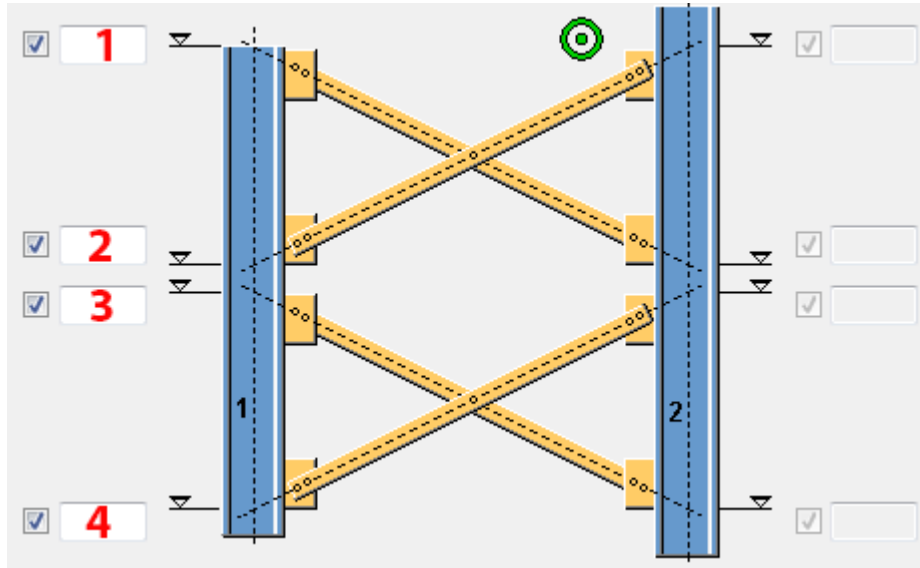
1. Select the first main part (column or beam).
2. Select the second main part (column or beam).

The component is created automatically when the secondary part is selected.

### Picture tab

Use the **Picture** tab to control the bracing levels.

### Bracing levels



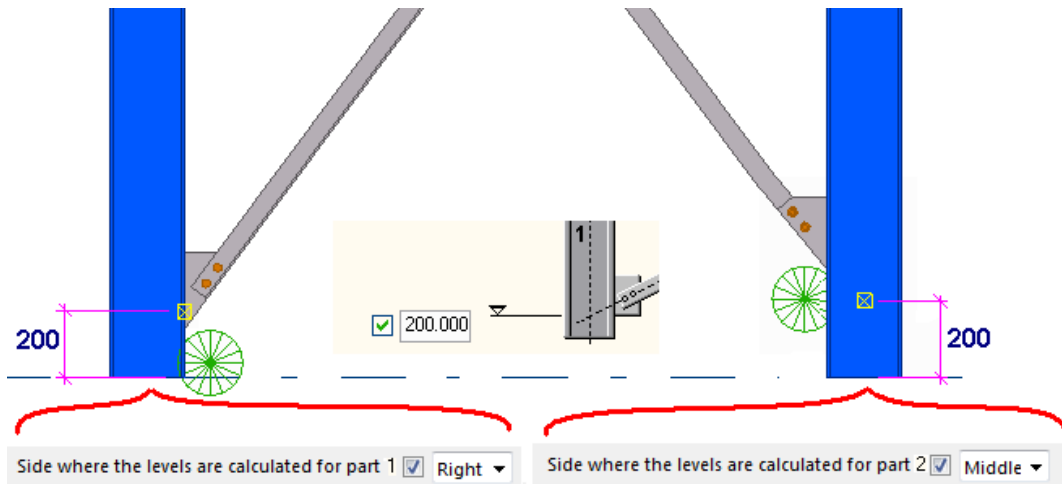
	Description
1	Top level of the upper bracing. If no value is entered, the top bracing is not created.
2	Bottom level of the upper bracing. If no value is entered, the top bracing is not created.
3	Top level of the lower bracing.
4	Bottom level of the lower bracing.

### Bracing reference

For both main parts, define the reference of the bracing levels. The reference can be set for both the horizontal and the vertical direction.

For example:

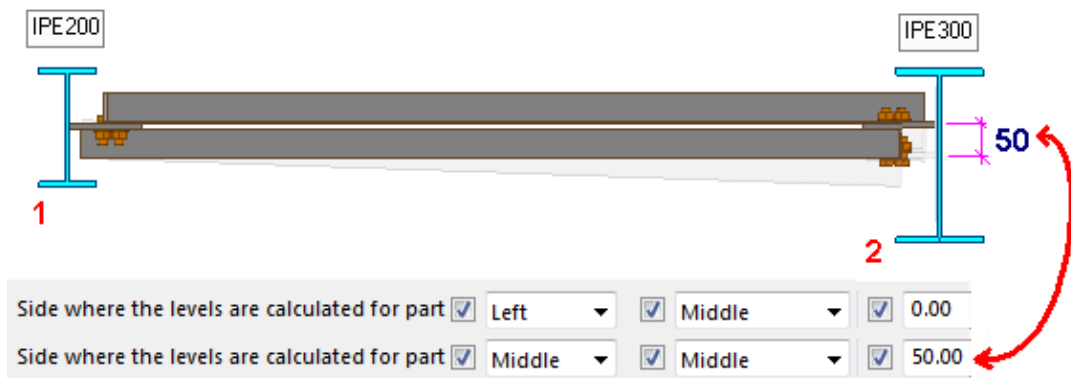




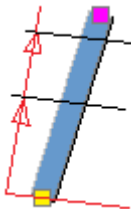
### Bracing offset

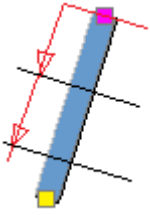
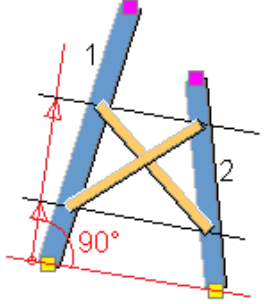
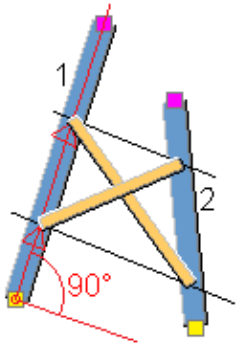
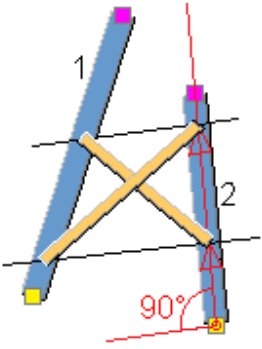
Define the offset perpendicular to the bracing. You can move the created plate or part by entering a value in the x-, y, or z-direction.

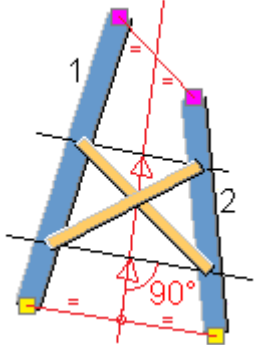
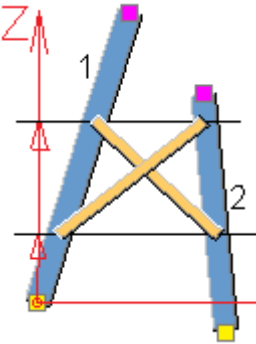
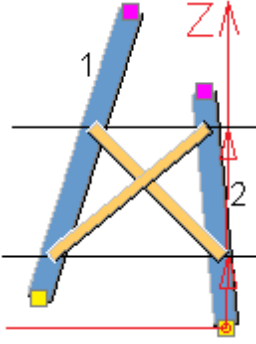
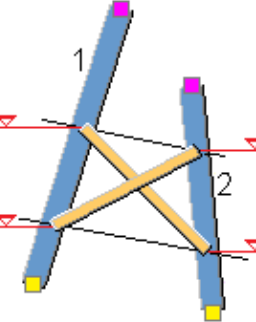
In the example below, the main parts have unequal dimensions and the reference is set to **Middle**. To create the bracing crosses horizontally, an offset must be entered for the biggest part. The needed offset is the height difference between IPE200 and IPE300, divided by 2 = 50mm.



### Bracing direction

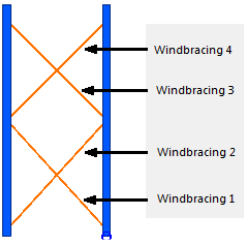

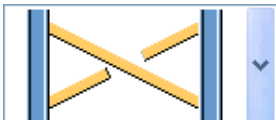

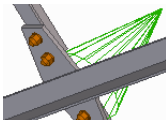
Option	Description		
<b>Direction</b>	Select the direction of the bracing.		Start point of the main part as the reference point.

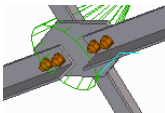
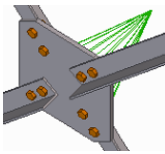
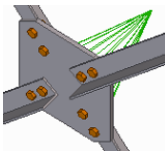
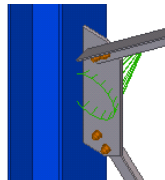
Option	Description		
		End point of the main part as the reference point.	
<b>Calculation of levels</b>	<p>Select the reference line used for positioning the bracing when the main parts are not parallel.</p>		Offset from the start point in part 1, perpendicular to the line through the start points.
		Offset from the start point in part 1, in local x-direction.	
		Offset from the start point in part 2, in local x-direction.	


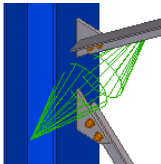
Option	Description	
		 <p>Reference line through the start and end points of the main parts, offset from the start of the reference line.</p>
		 <p>Offset from the start point in part 1, in z-direction.</p>
		 <p>Offset from the start point in part 2, in z-direction.</p>
		 <p>Freely defined values.</p>

### Parts tab

Use the **Parts** tab to control the properties, bracing position, and rotation. Additionally, you can define bracing splitting and shortening values.

Option	Description	
<p><b>Windbracing</b></p> 	<p>Define the bracing profile by selecting it from the profile catalog.</p>	
<p><b>Windbracing position in plane</b></p>	<p>Set the position in plane for the first and the second bracing element.</p>	
<p><b>Windbracing rotation</b></p>	<p>Select the rotation for the first and the second bracing element.</p> <p>This option is useful when the bracing elements are crossing and they are connected in the crossing.</p>	
<p><b>Windbracing translation</b></p>	<p>Select the offset of the first and the second bracing element from the reference points.</p> <p>This option is useful when the bracing elements are positioned so that the first bracing is alongside the second bracing. Typically, the first bracing element is set to <b>Forwards</b> and the second bracing element to <b>Backwards</b>.</p>	
<p><b>Splitting the diagonal bracing</b></p> <p>Select whether the diagonal bracing elements are split or connected with a component.</p> <p>Define the connecting component on the <b>Joints</b> tab by typing the number of the component in the <b>Connect diagonals with joint number</b> box.</p>	 <p>Bracing is not split.</p> <p>Possible component for connecting the diagonal bracing: <b>Seating (30)</b>.</p> 	 

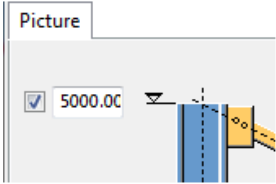
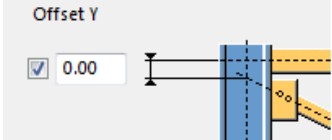
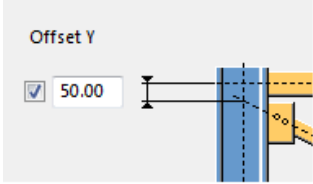
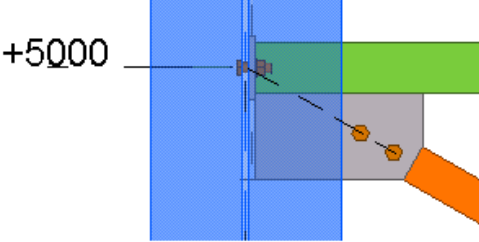
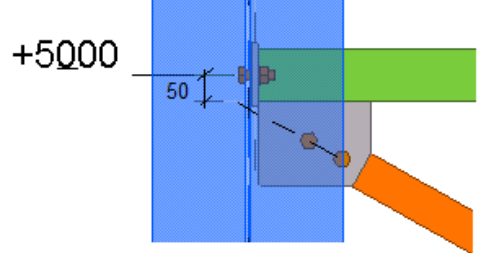
Option	Description		
		<p>First diagonal bracing element is split.</p> <p>Possible component for connecting the diagonal bracing: <b>Bolted gusset (11).</b></p>	
		<p>Second diagonal bracing element is split.</p> <p>Possible component for connecting the diagonal bracing: <b>Bolted gusset (11).</b></p>	
		<p>Both diagonal bracing elements are split.</p> <p>Possible component for connecting the diagonal bracing: <b>Central gusset (169).</b></p>	
<p><b>Connecting bracing crosses</b></p>	<p>Select whether the gusset plates of two bracing crosses above each other are connected.</p> <p>Define the connecting component on the <b>Joints</b> tab by typing the number of the component in the <b>Connection number</b> box.</p>	<p>Bracing crosses are connected with a gusset connection.</p> <p>Possible component for connecting the diagonal bracing: <b>Bolted gusset (11).</b></p>	

Option	Description	
		 <p>Bracing crosses are not connected. Separate connection is created for each diagonal bracing.</p> <p>Possible component for connecting the diagonal bracing: <b>Bolted gusset (11).</b></p>
<b>Distance between windbracings</b>	<p>Define the distance between bracing elements.</p> <p>If the bracing elements are crossing each other, this value typically defines the gusset plate thickness.</p>	
<b>Shorten windbracings</b>	<p>Define how much the bracing are shortened.</p> <p>The entered value is written in the user-defined attributes of the bracing. The value is used in drawings.</p>	

Option	Description	Default
<b>Pos_No</b>	<p>Prefix and start number for the part position number.</p> <p>Some components have a second row of fields where you can enter the assembly position number.</p>	<p>The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options.</b></p>
<b>Material</b>	<p>Material grade.</p>	<p>The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options.</b></p>
<b>Name</b>	<p>Name that is shown in drawings and reports.</p>	
<b>Class</b>	<p>Part class number.</p>	
<b>Finish</b>	<p>Describes how the part surface has been treated.</p>	

### Compression bar tab

Use the **Compression bar** tab to define the compression bar properties.

Option	Description
<b>Compression bar</b>	Define the compression bar thickness, width and height.
<b>Create bar</b>	Select whether the compression bar is created. You can define up to three compression bars.
<b>Y offsets</b> <b>X offsets</b>	Define the horizontal and vertical offset of the bracing. Reference is the level defined on the <b>Picture</b> tab. For example: <div style="display: flex; justify-content: space-around; align-items: flex-start; margin-top: 10px;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <div style="text-align: center;">  <p>+5000</p> </div> <div style="text-align: center;">  <p>+5000</p> <p>50</p> </div> </div>
<b>Position in plane</b> <b>Rotation</b> <b>Position in depth</b>	Select the orientation of the compression bars.

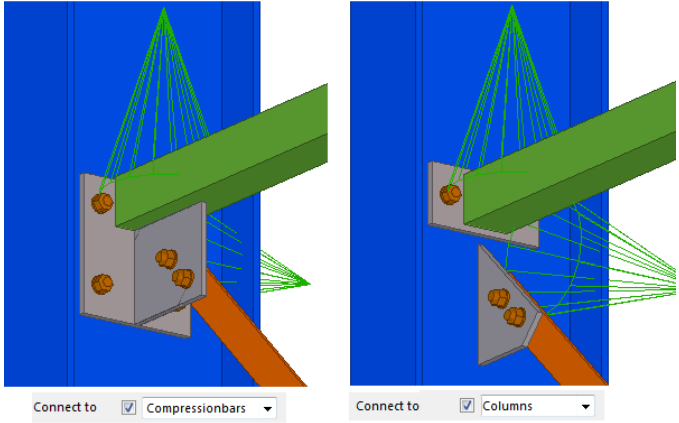
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

### ***Joints tab***

Use the **Joints** tab to define the components used for connecting the main parts and the diagonal bracing elements and the compression bars.

Option	Description
<b>Creation of joints</b>	Select whether connections are created between the bracing elements.  <b>No:</b> Only the bracing elements are created. <b>Yes:</b> Components are added between the bracing elements.
<b>Connect to</b>	Select whether the bracing elements are connected to the main parts or the compression bars.  For example:

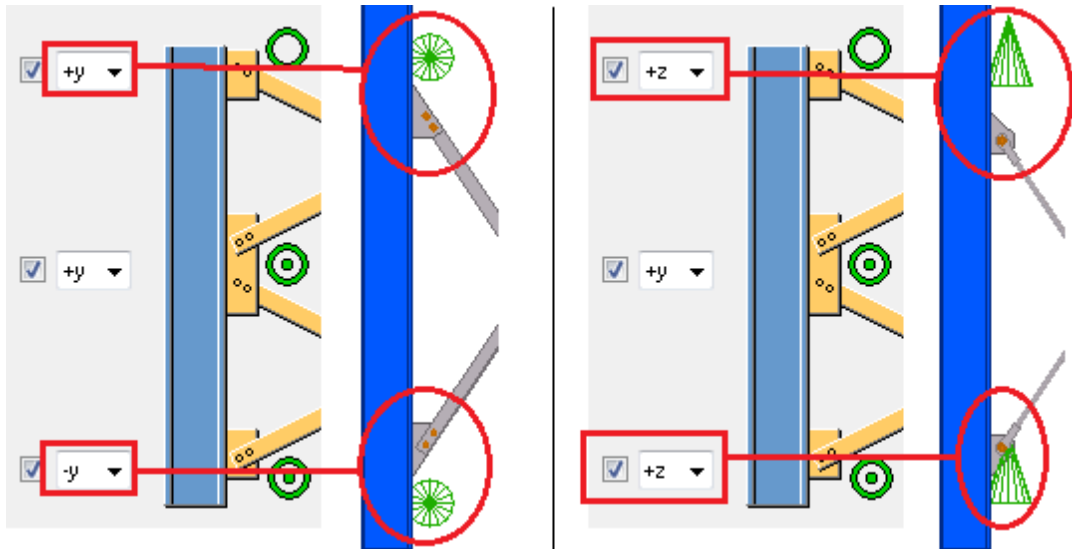


Option	Description
	
<p><b>Connection number</b></p> <p><b>Connect diagonals with joint number</b></p> <p><b>Userjoint application number</b></p> <p><b>Joint direction</b></p>	<p>Type the component number that is used for connecting the bracing, the diagonal bracing cross, or the compression bar, and the component application number. Select the connection direction for the diagonal bracing cross.</p> <ul style="list-style-type: none"> <li>• Default component for the bracing is <b>Bolted gusset (11)</b>.</li> <li>• Default component for the diagonal bracing cross is <b>Seating (30)</b>.</li> <li>• Default component for the compression bar is <b>End plate (144)</b>.</li> </ul>
<p><b>Configuration file for the joint</b></p>	<p>Configuration setting for the connection.</p> <p>For example, if you type <code>CS_M13</code>, it means that a setting named <code>CS_M13</code> must be available for the used connection.</p>
<p><b>Tensioner position</b></p>	<p>Define the tensioner position if the <b>Tensioner (7)</b> connection is used.</p>

### ***Joints dir tab***

Use the **Joints dir** tab to control the up directions of the connections used between the main parts and the diagonal bracing, and the up direction of the connections used between the main parts and the compression bars.

In the example below, **Seating (30)** has been defined as the connecting component on the **Joints** tab:



### **UDA tab**

Use the **UDA** tab to add information in the user-defined attributes (UDAs) of the parts.

<b>Option</b>	<b>Description</b>
<b>Part</b>	Select to which part the related information can be saved.
<b>UDA name</b>	Enter the name of the user-defined attribute.
<b>Type</b>	Select the UDA type. Use <b>String</b> for text, <b>Integer</b> for numbers, <b>Float</b> for numbers with decimals and <b>Option</b> for selecting an item in a list.
<b>Value</b>	Enter the value that is saved to the user-defined attribute. Use text and/or numbers, depending on the defined UDA type.

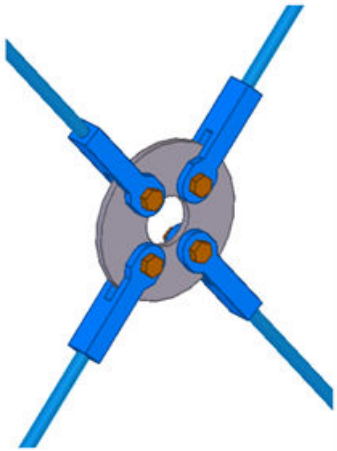
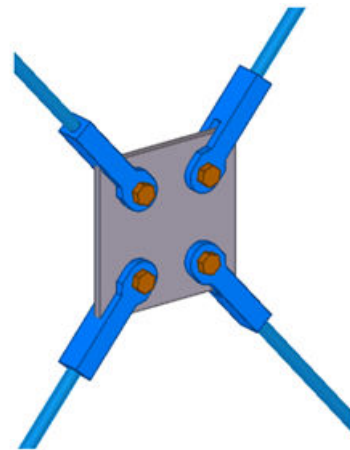
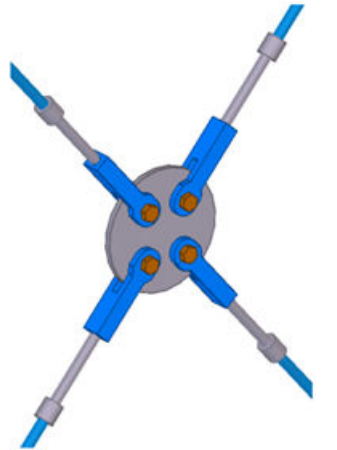
## **Tensioner central gusset (18)**

**Tensioner central gusset (18)** creates a gusset plate to connect bracing bars.

### **Objects created**

- Gusset plate
- Fork or plate
- Tensioners (optional)
- Bolts
- Welds

**Use for**

<b>Situation</b>	<b>Description</b>
	Round gusset plate with a hole.
	Square gusset plate.
	Round gusset plate. Tensioners are created.

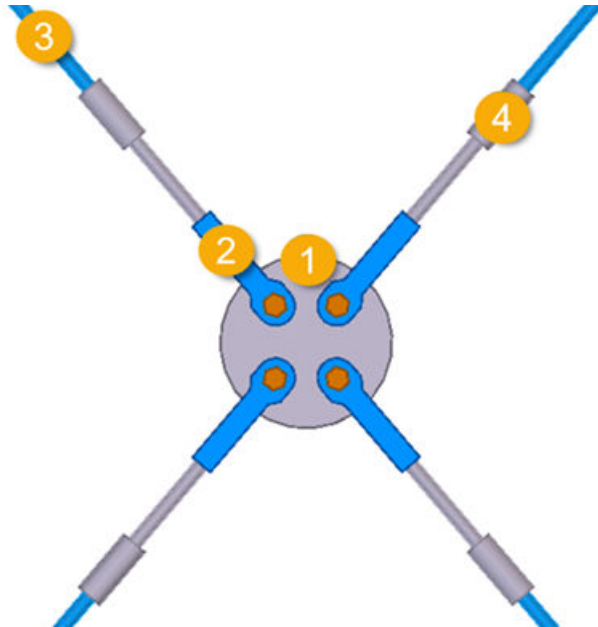
**Before you start**

Model at least 3 bracing bars.

### Selection order

1. Select the bracing bars.
2. Click the middle mouse button to create the central gusset plate and the forks.

### Part identification key

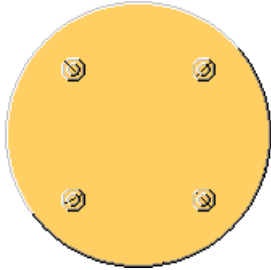
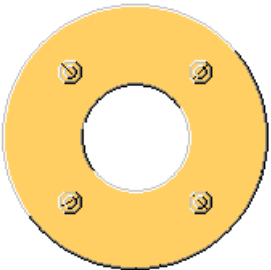
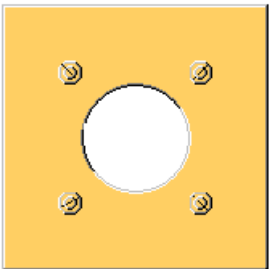
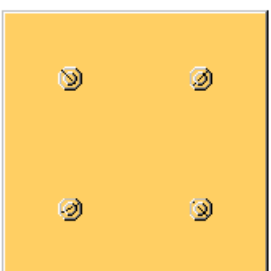


	Description
1	Gusset plate
2	Fork
3	Bracing bar
4	Tensioner

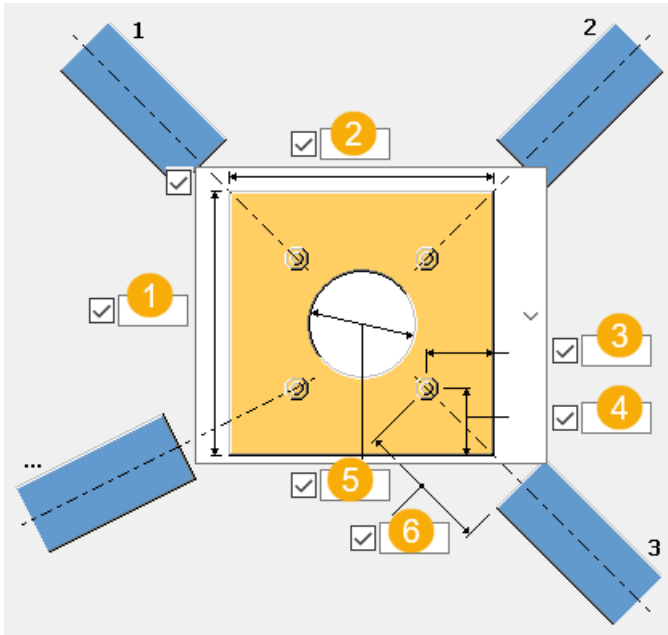
### Picture tab

Use the **Picture** tab to define the shape and the dimensions of the central plate.

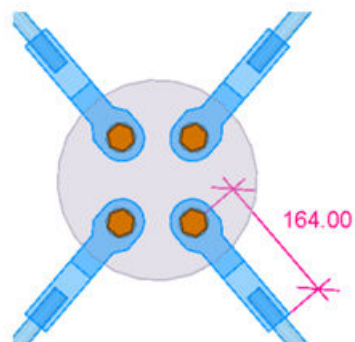
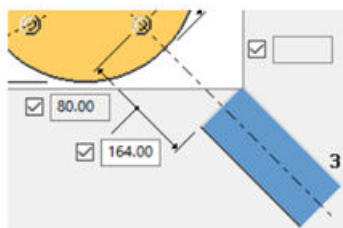
## Gusset plate shape

Option	Description
 A circular yellow gusset plate with four bolt holes arranged in a square pattern.	Circular gusset plate
 A circular yellow gusset plate with a central circular hole and four bolt holes arranged in a square pattern.	Circular gusset plate with a hole
 A square yellow gusset plate with a central circular hole and four bolt holes arranged in a square pattern.	Square gusset plate with a hole
 A square yellow gusset plate with four bolt holes arranged in a square pattern.	Square gusset plate


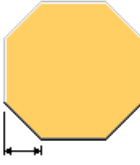

## Gusset plate dimensions



	Description
1	Height of the gusset plate.
2	Width of the square gusset plate.
3	Bolt edge distance. Horizontal bolt edge distance for square gusset plates.
4	Vertical bolt edge distance for square gusset plates.
5	Diameter of the hole in the gusset plate.
6	Fork length, calculated from the center of the hole to the end of the fork.

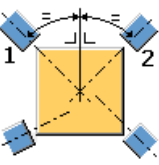
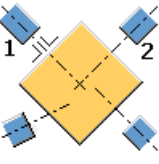


### Chamfer shape and dimension

Option	Description
	No chamfers
	Line chamfer Define the chamfer dimension.
	Convex chamfer Define the chamfer dimension.

### Gusset plate position

Select the position of the gusset plate relative to the bracing bars.

Option	Description
	Middle of the corner between the first and the second bar.
	Perpendicular to the first bar.

### Create plate as

- **Contour plate.** The profile can be PL12, for example.
- **Beam.** The profile can be PL300\*300, for example.

Enter the prefix of the beam profile. You can only enter the prefix if the plate is created as a beam profile.

### Fork tab

Use the **Fork** tab to define the fork properties.

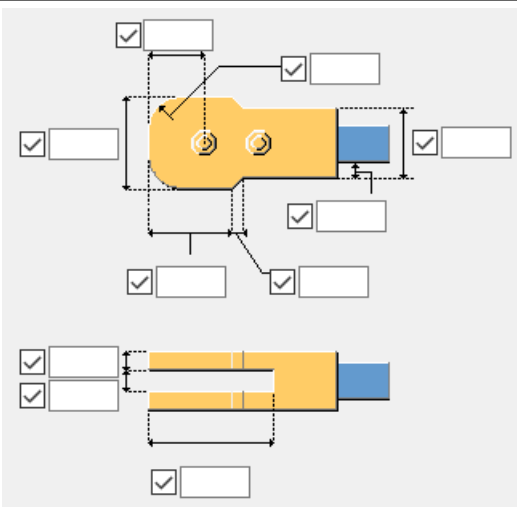
## Parts

Option	Description
<b>Plate</b>	Thickness of the fork.

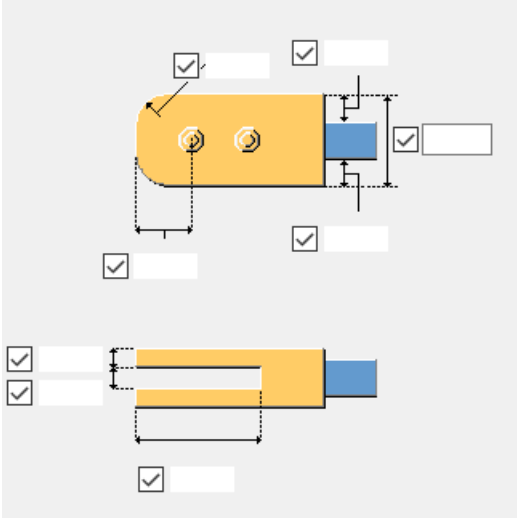
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

## Part shape and dimensions

Select the shape of the fork: **Part 1** or **Part 2**.

Options	Description
	Define the dimensions of the reduced fork.



Options	Description
	Define the dimensions of the fork.

### Parameters tab

Use the **Parameters** tab to define the end plate properties, shape, and dimensions.




### Parts

Option	Description
<b>End plate</b>	Thickness, width, and height of the end plate.


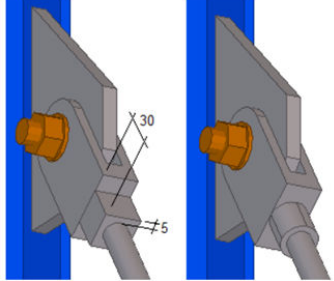
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

Option	Description	Default
<b>Finish</b>	Describes how the part surface has been treated.	

### End plate shape

Option	Description
	Default Square AutoDefaults can change this option.
	Square
	Round

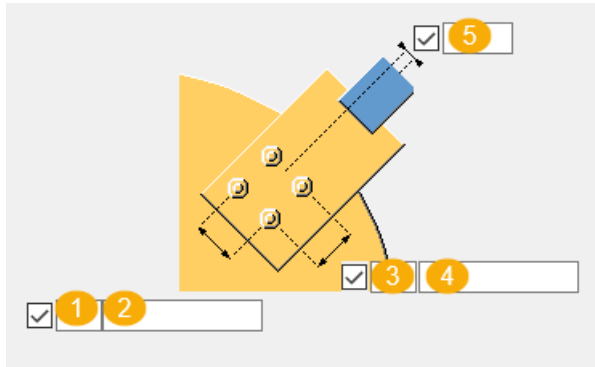
### End plate offset

Option	Description	Example
	Define the end plate offset from the bracing bar.	End plate thickness is set to 30 and the offset is set to 5. 

### **Bolts tab**

Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

## Bolt group dimensions



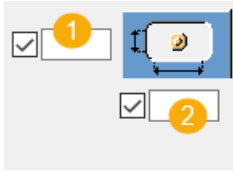
	Description
1	Number of bolts in the longitudinal direction (axial to the bar).
2	Bolt spacing in the longitudinal direction.
3	Number of bolts in the transverse direction.
4	Bolt spacing in the transverse direction.
5	Bolt group offset in the transverse direction.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	20 mm
<b>Bolt standard</b>	Bolt standard to be used inside the component.	4014-8.8
<b>Tolerance</b>	Gap between the bolt and the hole.	3 mm
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	
<b>Assembly type</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define the dimensions of the slotted holes in the horizontal and vertical direction, and a gap for oversized R tapped holes. The default is 0 mm, which creates a circular hole.

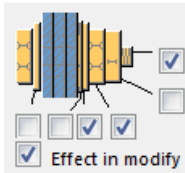


	Description
1	Vertical dimension of the slotted hole.
2	Horizontal dimension of the slotted hole.

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

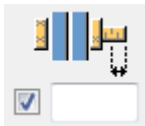
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Tensioner T tab

Use the **Tensioner T** tab to define the properties and dimensions of the tensioners.

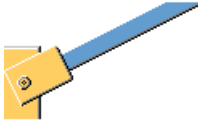
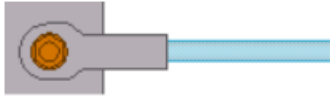
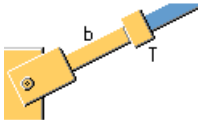
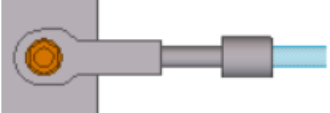
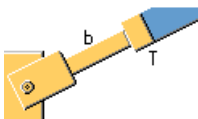
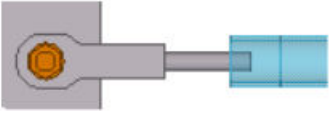
### Parts

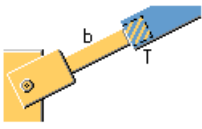
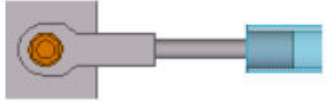
Option	Description	Default
<b>Tensioner T</b>	Select the profile from the profile catalog.	D40

Option	Description	Default
<b>Part B</b>	Select the profile from the profile catalog.  This is the bar profile between the fork and the tensioner.	

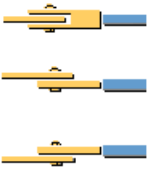
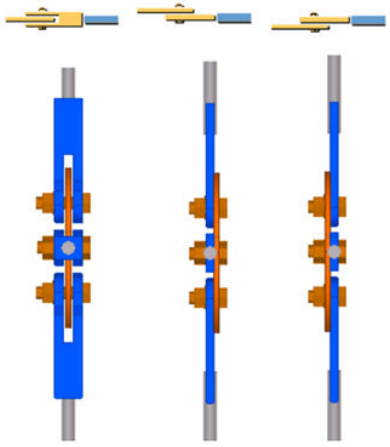
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Create tensioner


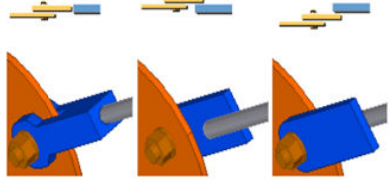
Option	Description	Example
	Tensioner is not created.	
	Tensioner is created.	
	Tensioner is created.  The stopper part is added to the bracing.	

Opion	Description	Example
	Used for compression tubes.	
	Tensioner is created. The stopper part is placed inside the compression tube.	

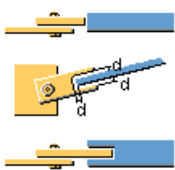
### Plate position


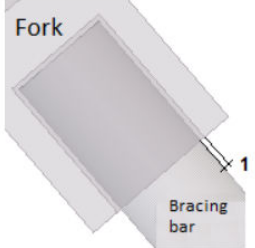
Option	Descriptino	Example
	Define the position of the plate on the fork.	

### Fork position

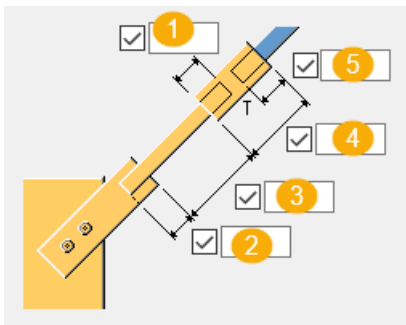
Option	Description	Example
	Define the position of the fork on the bracing bar.	

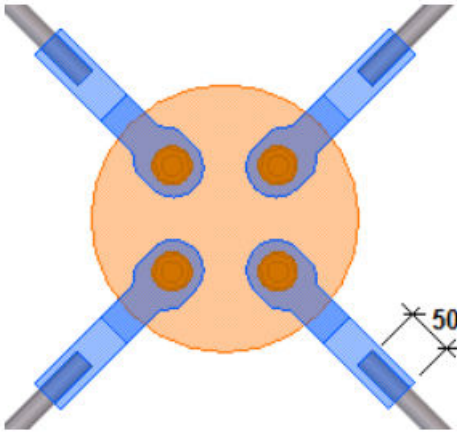
### Opening in fork

Option	Description	Example
	Select whether an opening is created in the fork. The opening is always square. You can define the opening if both the tensioner and an extra	

Option	Description	Example
	bracing bar are created.	
d: <input checked="" type="checkbox"/> <input type="text"/>	Define the gap for the opening.	<p>The default value is 1 mm.</p>  

### Dimensions

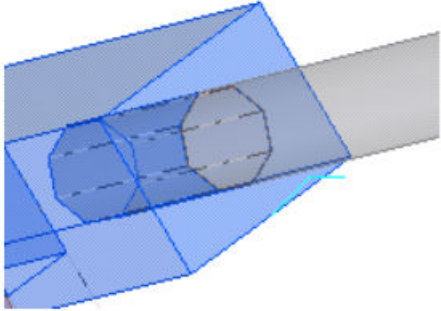
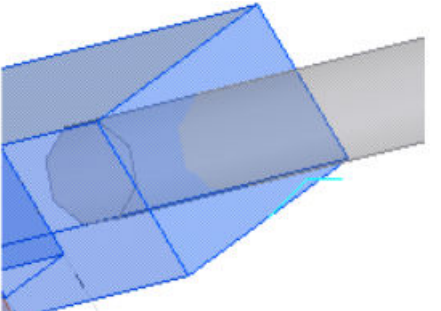


	Description	Default
<b>1</b>	Define an overlap for the extra bracing bar in the tensioner.	0 mm
<b>2</b>	Define an overlap for the bracing bar. 	
<b>3</b>	Define the length of the extra bracing bar between the fork and the tensioner.	300 mm

	Description	Default
4	Define the length of the tensioner.	40 mm
5	Define an overlap for the bracing bar in the tensioner.	0 mm

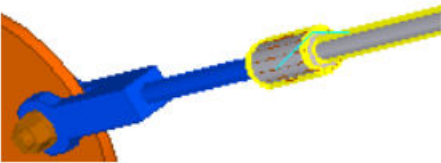
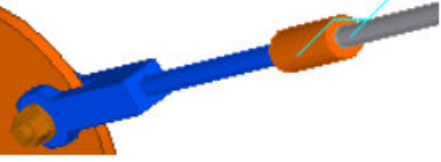
### Cut part B in fork

Select whether the fork is cut if the bracing bar goes through the fork. The fork cut adapts to the size of the bracing bar.

Example	Description
	Part B is cut.
	Part B is not cut.

### Tensioner T add to secondary

Select whether the tensioner is added to the bracing bar, or handled as a loose part and welded to the bracing bar.

	Select <b>Yes</b> to add the tensioner to the bracing bar.
	Select <b>No</b> to weld the tensioner to the bracing bar.

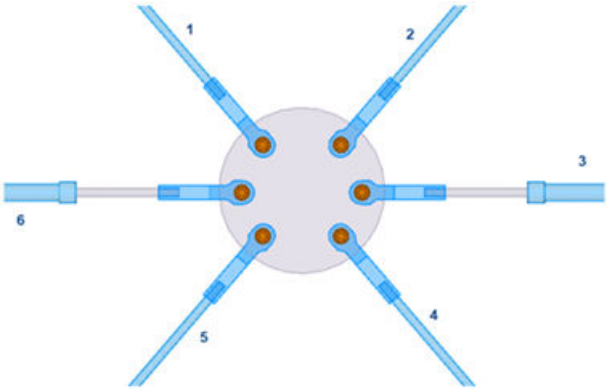


### Extra tensioners

Use the **Extra tensioners** tab to define the properties and dimensions of extra tensioners. You can define two types of tensioners. You can define extra tensioners if more than one bracing bar is connected. If there is only one bracing bar, the settings on the **Tensioner T** tab are used for tensioners.

### Parts

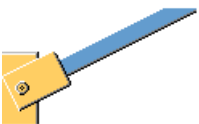
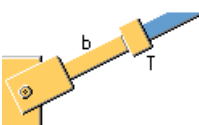
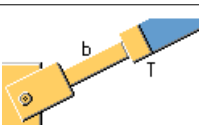
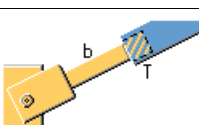
Option	Description
<b>Tensioner T</b>	Select the profile from the profile catalog.
<b>Part B</b>	Select the profile from the profile catalog.  This is the bar profile between the fork and the tensioner.

Option	Description
<b>Apply on tensioner number</b>	Define the bars on which the setting for the extra tensioners is applied. Use a space to define several bar numbers.  

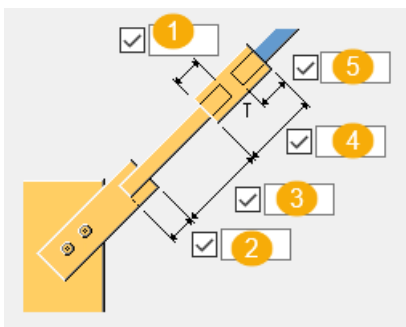
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the

Option	Description	Default
		<b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Create tensioner

Option	Description
	Tensioner is not created.
	Tensioner is created.
	Tensioner is created. The stopper part is added to the bracing. Used for compression tubes.
	Tensioner is created. The stopper part is placed inside the compression tube.

### Dimensions



	Description
<b>1</b>	Define an overlap for the extra bracing bar in the tensioner.
<b>2</b>	Define an overlap for the bracing bar.

	Description
3	Define the length of the extra bracing bar between the fork and the tensioner.
4	Define the length of the tensioner.
5	Define an overlap for the bracing bar in the tensioner.

### Cut part B in fork

Select whether the fork is cut if the bracing bar goes through the fork (**Yes**). The fork cut adapts to the size of the bracing bar.

### Tensioner T add to secondary

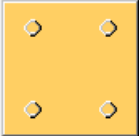

Select whether the tensioner is added to the bracing bar (**Yes**), or handled as a loose part and welded to the bracing bar.

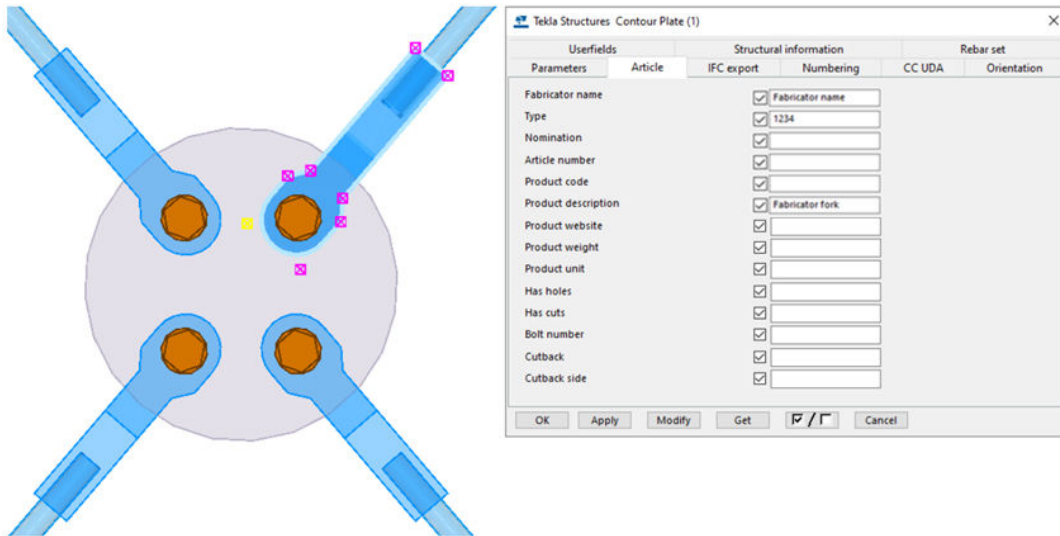
### UDA tab

Use the **UDA** tab to define user-defined attributes (UDA). The attributes are written to the central gusset and forks.

### Example

Define the needed user-defined attributes.

	Plate	Fork
		
Fabricator name	<input checked="" type="checkbox"/> <input type="text"/>	<input checked="" type="checkbox"/> Fabricator name
Type	<input checked="" type="checkbox"/> <input type="text"/>	<input checked="" type="checkbox"/> 1234
Nomination	<input checked="" type="checkbox"/> <input type="text"/>	<input checked="" type="checkbox"/> <input type="text"/>
Article number	<input checked="" type="checkbox"/> <input type="text"/>	<input checked="" type="checkbox"/> <input type="text"/>
Product code	<input checked="" type="checkbox"/> <input type="text"/>	<input checked="" type="checkbox"/> <input type="text"/>
Product description	<input checked="" type="checkbox"/> <input type="text"/>	<input checked="" type="checkbox"/> Fabricator fork



### ***General tab***

Click the link below to find out more:  
[General tab](#)

### ***Analysis tab***

Click the link below to find out more:  
[Analysis tab](#)

### ***Welds***

Click the link below to find out more:  
[Welds](#)

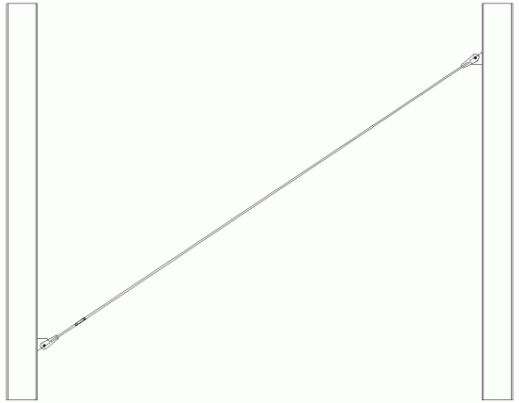
## **Turnbuckle bracing (S3)**

**Turnbuckle bracing (S3)** creates a turnbuckle assembly, rods, and end connections.

### **Objects created**

- Turnbuckle
- Rod
- Fastener plate
- Gusset plate
- Bolts

## Use for

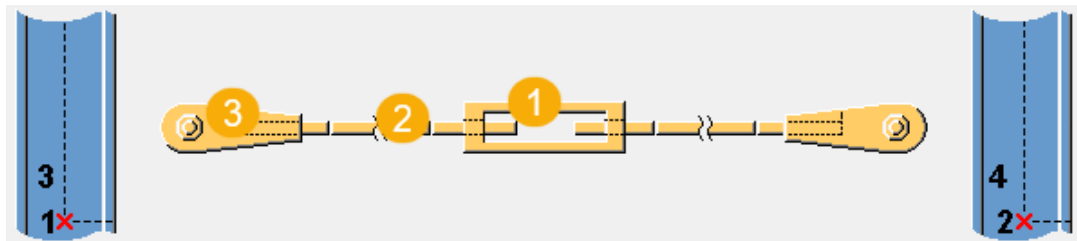
Situation	Description
	Turnbuckle connection

## Selection order

1. Pick the first point.
2. Pick the second point.
3. Select the first part.
4. Select the second part.

The connection is created automatically when the second part is selected.

## Part identification key

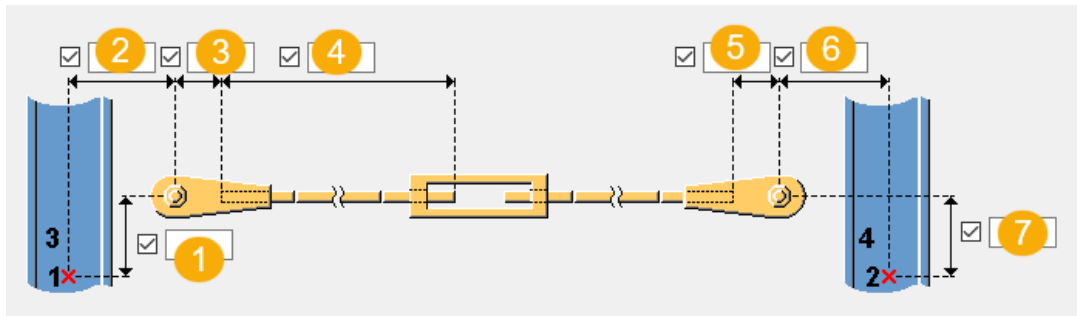


	Description
1	Turnbuckle
2	Rod
3	Fastener plate/Gusset plate

## Picture tab

Use the **Picture** tab to define the turnbuckle dimensions.

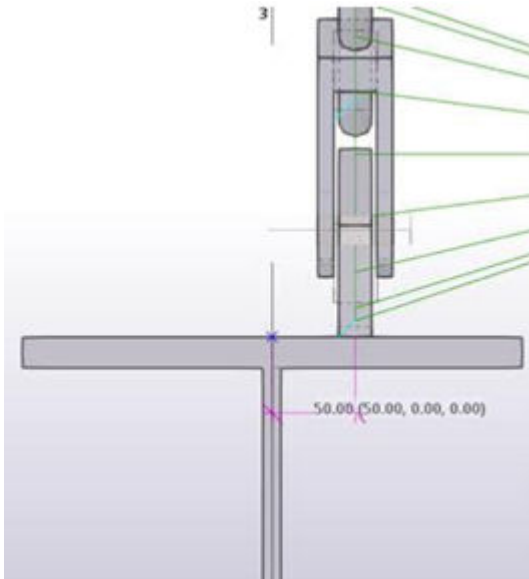
## Dimensions



	Description	Default
<b>1</b>	Offset between the first picked position and the actual generation point.	0 mm
<b>2</b>	Distance from the first bolt to the center line of the first part.	First part collision point + 100 mm
<b>3</b>	Distance from the first bolt to the end of the first rod. Used with battledores or clevises.	100 mm
<b>4</b>	Fixed length of the rod. The length of the second rod is automatically calculated.	400 mm
<b>5</b>	Distance from the first bolt to the end of the second rod. Used with battledores or clevises.	100 mm
<b>6</b>	Distance from the first bolt to the center line of the second part.	Second part collision point + 100 mm
<b>7</b>	Offset between the first picked position and the actual generation point.	0 mm

### Rod depth offset


Define the fastener/gusset plate offset from the part center line. By default, the fastener plate/gusset plate is located in line with the part center line.



### **Turnbuckle tab**

Use the **Turnbuckle** tab to define the turnbuckle dimensions, thread type and cuts, and whether the turnbuckle is created as an assembly or as single parts.

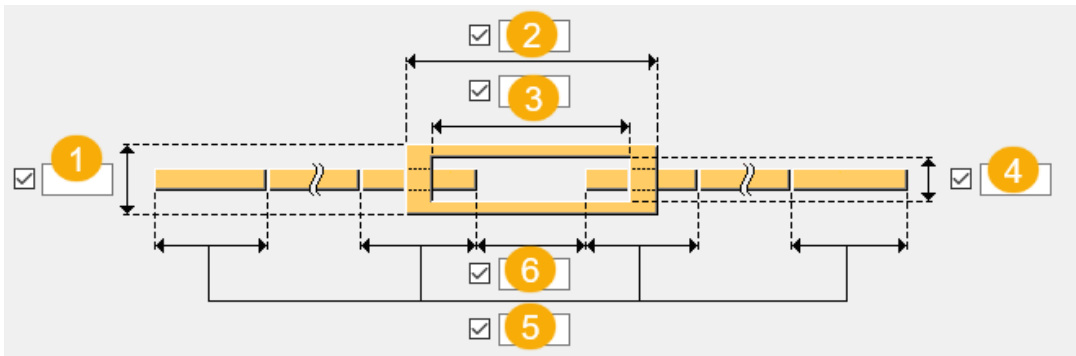
### **Parts**

<b>Option</b>	<b>Description</b>
<b>Rod</b>	Select the rod profile from the profile catalog.
<b>Turnbuckle</b>	Select whether to create a turnbuckle. 

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the

Option	Description	Default
		<b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	

### Dimensions



	Description	Default
<b>1</b>	Outer diameter of the turnbuckle	Diameter of the rod + 2 x turnbuckle thickness
<b>2</b>	Length of the turnbuckle	50 mm
<b>3</b>	Length of the turnbuckle opening	Length of the turnbuckle - 20 mm
<b>4</b>	Width of the turnbuckle opening	Rod thickness - 1
<b>5</b>	Length of the thread cut	100 mm
<b>6</b>	Gap between the rods	100 mm

### Thread type



Define the direction of the threads at the turnbuckle.

Option	Description
	RH - LH (right hand - left hand) Tekla Structures stores RH as a user-defined attribute to the first rod and LH as a user-defined attribute to the second rod.
	LH - RH (left hand - right hand) Tekla Structures stores LH as a user-defined attribute to the first rod and


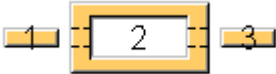


Option	Description
	RH as a user-defined attribute to the second rod.

### Create thread cuts

Option	Description
	Threads are not cut.
	Threads are cut.

### Assembly / single part turnbuckle

Option	Description
	Assembly
	Single parts

### Connection tab

Use the **Connection** tab to define the plate properties and the connection type.

### Parts


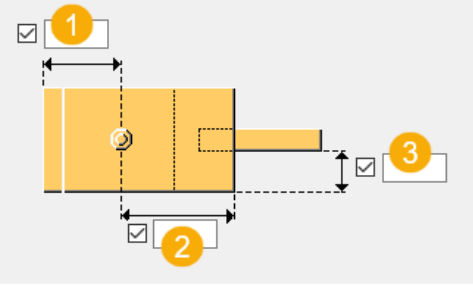
Option	Description
<b>Fastener plate</b>	Thickness, width and height of the fastener plate.
<b>Gusset plate</b>	Thickness, width and height of the gusset plate.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part</b>

Option	Description	Default
		<b>material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Connection type

Select the connection type: **Battledore**, **Clevis**, **Bolted gusset**, or **Tube gusset**.

Option	Description	Default
<b>Battledore side</b>	Select whether the battledore and gusset are generated in front of or behind the rod generation plane. 	Front
Battledore dimensions	 <b>1</b> Distance from the bolt to the edge of the fastener plate. <b>2</b> Distance from the bolt to the gusset plate edge. <b>3</b> Clearance between the gusset corner and the rod.	<b>1</b> 60 mm <b>2</b> 2.5 x bolt diameter <b>3</b> (Fastener plate width – Rod diameter) / 2
<b>Clevis pin size</b>	Clevis pin size is the value stored as a free attribute to the clevis. Used only with clevis.	Bolt diameter + 4 mm
<b>Connection setting</b>	User-defined attribute file for the bolted gusset or tube gusset connection.	

### **Bolts tab**

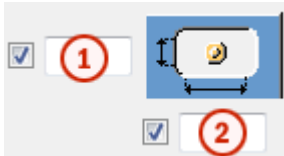
Use the **Bolts** tab to define the bolt properties.

#### **Bolt basic properties**

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

#### **Slotted holes**

You can define slotted, oversized, or tapped holes.



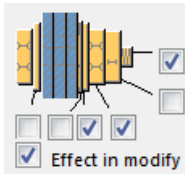
<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



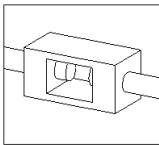
### Muffe (26)

**Muffe (26)** connects two beams with a rectangular plate that has a hole in the middle.

#### Objects created

- Rectangular plate (muffe)

#### Use for

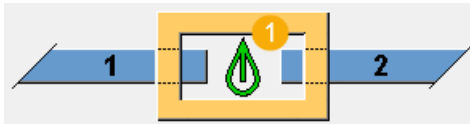
Situation	Description
	Two beams connected with a rectangular plate that has a hole in the middle.

### Selection order

1. Select the main part.
2. Select the secondary part.

The connection is created automatically when the secondary part is selected.

### Part identification key

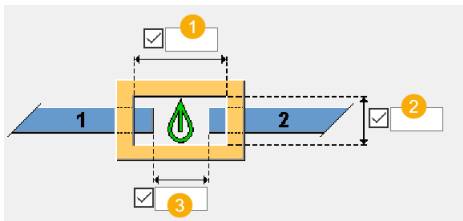


	Description
1	Rectangular plate with a hole

### Picture tab

Use the **Picture** tab to define the connection dimensions.

### Dimensions



	Description	Default
1	Horizontal dimension of the hole.	$0.5 * \text{muffe height}$
2	Vertical dimension of the hole.	Muffe thickness - 30 mm
3	Distance between the main part and the secondary part.	$0.5 * \text{muffe height} - 50 \text{ mm}$

### Parts tab

Use the **Parts** tab to define the plate properties.

## Muffe

You can use a profile or a custom component to create the plate. If you select a custom component from the **Applications & components** catalog, define the custom settings, up direction, and rotation.

Option	Description	Default
<b>Muffe</b>	Thickness, width, and height of the plate.	Thickness and width: 100 mm Height: 200 mm

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

## Parameters tab

Use the **Parameters** tab to define the bolt hole tolerance.

### Tolerance

Option	Description
<b>Tolerance of bolt hole</b>	Define the tolerance value. By default, the tolerance is zero.

## General tab

Click the link below to find out more:

[General tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Design tab***

Click the link below to find out more:

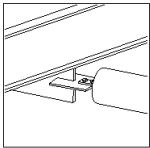
## **Traction bar (52)**

**Traction bar (52)** connects a tube profile to a plate with two strips.

### **Objects created**

- Strips
- Bolts
- Welds

### **Use for**

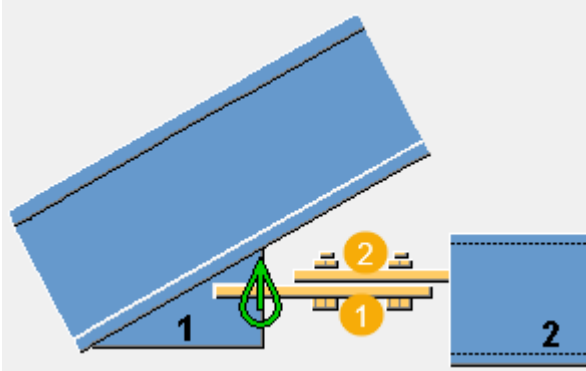
<b>Situation</b>	<b>Description</b>
	Tube profile connected to a plate with strips

### **Selection order**

1. Select the main part.
2. Select the secondary part.

The connection is created automatically when the secondary part is selected.

## Part identification key

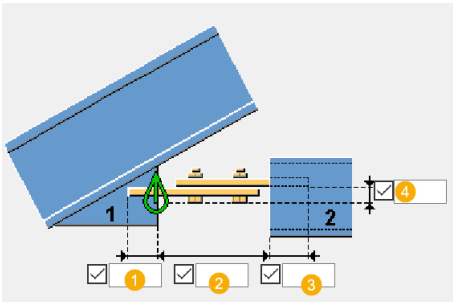


	Description
1	Strip to the main part
2	Strip to the secondary part

## Picture tab

Use the **Picture** tab to define the connection dimensions.

## Dimensions



	Description	Default
1	Length of the strip part that is cutting the plate	100 mm
2	Distance between the plate and the beam	
3	Length of the strip part that is cutting the beam	100 mm
4	Vertical position of the strip from the centre line of the secondary part	0

## Parts tab

Use the **Parts** tab to define the part properties.



## Parts

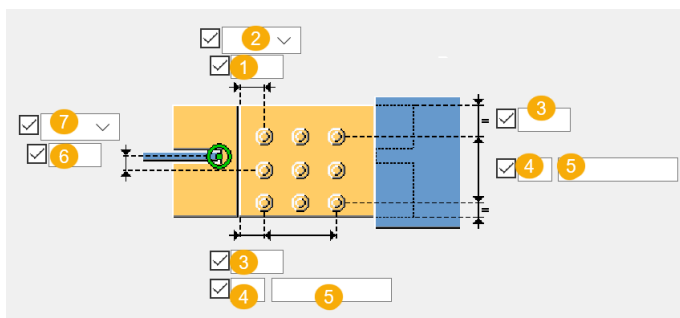
Option	Description
<b>Strip to primary</b>	Thickness, width, and height of the strip
<b>Strip to secondary</b>	Thickness, width, and height of the strip

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Bolts tab**

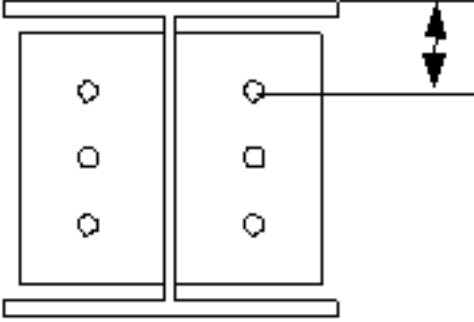
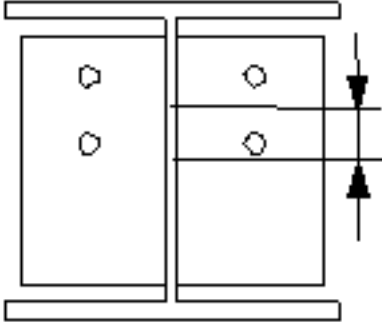
Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

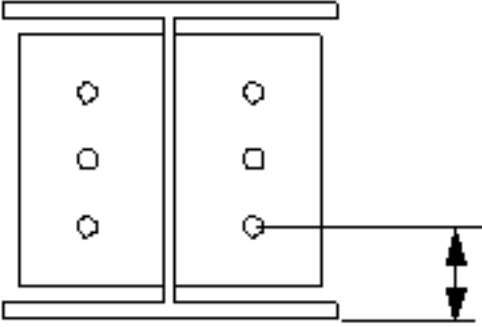
### **Bolt group dimensions**



	Description
<b>1</b>	Dimension for horizontal bolt group position.

	<b>Description</b>
<b>2</b>	<ul style="list-style-type: none"> <li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> <div style="text-align: center;"> </div>

	<b>Description</b>
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>6</b>	Dimension for vertical bolt group position.
<b>7</b>	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> <div style="text-align: center; margin: 10px 0;">  </div> <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul> <div style="text-align: center; margin: 10px 0;">  </div>

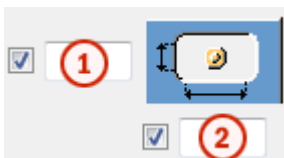
	Description
	<ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

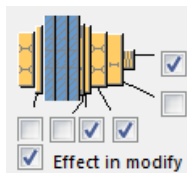


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.









To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### ***General tab***

Click the link below to find out more:  
[General tab](#)

### ***Design tab***

Click the link below to find out more:  
[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:  
[Analysis tab](#)

### ***Welds***

Click the link below to find out more:  
[Welds](#)

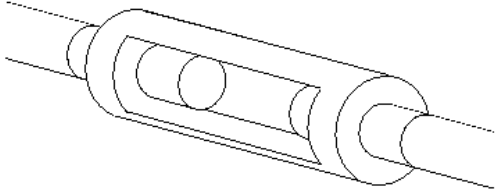
## Turnbuckle connection (126)

**Turnbuckle connection (126)** creates a turnbuckle assembly. The parts that are connected must be parallel. Tekla Structures creates the connection objects symmetrically.

### Objects created

- Turnbuckle

### Use for

Situation	Description
	Turnbuckle connection

### Selection order

1. Select the main part.
2. Select the secondary part.

Note that the parts must be parallel.

The connection is created automatically when the secondary part is selected.

### Part identification key

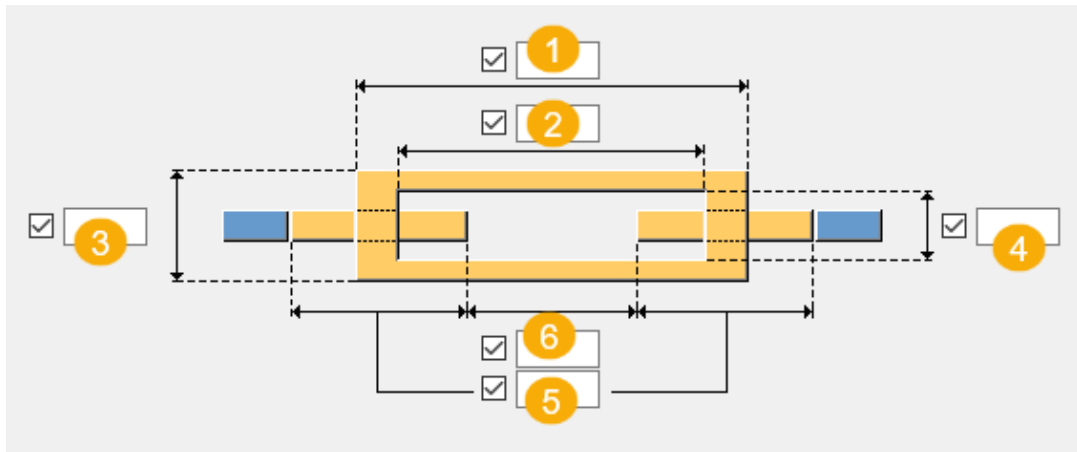


	Description
1	Turnbuckle

### Picture tab

Use the **Picture** tab to define the dimensions of the turnbuckle.

## Dimensions



	Description	Default
1	Length of the turnbuckle	50 mm
2	Length of the turnbuckle opening	Length of the turnbuckle - 20 mm
3	Outer diameter of the turnbuckle	Diameter of the rod + 2 x turnbuckle thickness
4	Width of the turnbuckle opening	Rod thickness - 1
5	Length of the thread cut	100 mm
6	Distance between the thread cuts	Half of the turnbuckle length

### **Parts tab**

Use the **Parts** tab to define whether the turnbuckle is created as a profile or as a custom component.

### **Create as**

Use this option to select whether to create the turnbuckle as a profile or as a custom component.



Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	



If you select to create the turnbuckle as a custom component, select the custom component from the **Applications & components** catalog and define the custom settings, up direction, rotation, and length.


### **Parameters tab**

Use the **Parameters** tab to define the thread type, cuts and size, and whether the turnbuckle is created as an assembly or as single parts.




### **Thread type**

Define the direction of the threads at the turnbuckle.

Option	Description
	Default RH – LH (right hand – left hand) Tekla Structures stores RH as a user-defined attribute to the first rod and LH as a user-defined attribute to the second rod. AutoDefaults can change this option.
	RH – LH (right hand – left hand) Tekla Structures stores RH as a user-defined attribute to the first rod and LH as a user-defined attribute to the second rod.




Option	Description
	LH – RH (left hand – right hand) Tekla Structures stores LH as a user-defined attribute to the first rod and RH as a user-defined attribute to the second rod.

### Create thread cuts

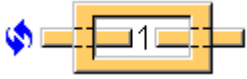
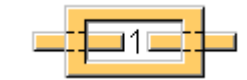
Option	Description
	Default Threads are cut. AutoDefaults can change this option.
	Threads are cut.
	Threads are not cut.

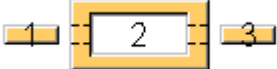
### Thread size

When you have selected that threads are not cut, you can select the size of the thread and create the thread 1 mm smaller.

Option	Description
	Default Thread size is not changed. AutoDefaults can change this option.
	Thread size is not changed.
	Thread is created 1 mm smaller.

### Assembly / single part turnbuckle

Option	Description
	Default Assembly AutoDefaults can change this option.
	Assembly

Option	Description
	Single parts

### ***General tab***

Click the link below to find out more:  
[General tab](#)

### ***Design tab***

Click the link below to find out more:  
[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:  
[Analysis tab](#)

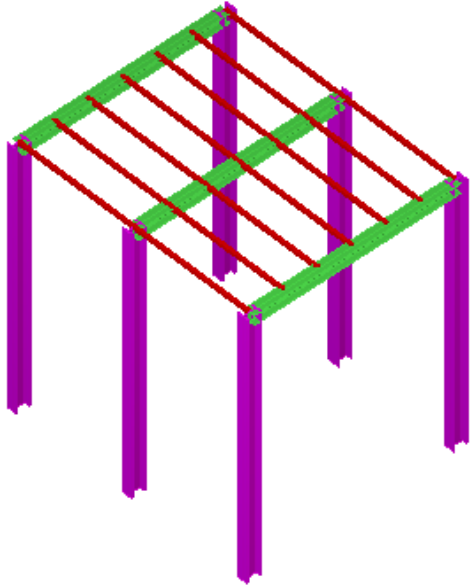

## **Generation of purlins (50)**

**Generation of purlins (50)** creates multiple profiles that can be used as wall or roof purlins, panels, or timber or concrete parts.

### **Objects created**

- Purlins

## Use for

Situation	Description
 A 3D perspective diagram of a roof structure. The roof is supported by several vertical purple columns. The roof's main structure is shown in green, with a network of red lines representing purlins. The purlins are arranged in a grid pattern, with some lines running parallel to the roof's slope and others perpendicular to it.	Purlins
 A 2D perspective diagram of a wall panel. The panel is a large red rectangle with a grid of black lines. The grid consists of several horizontal and vertical lines, creating a series of smaller rectangular sections within the larger panel.	Wall panel

### Selection order

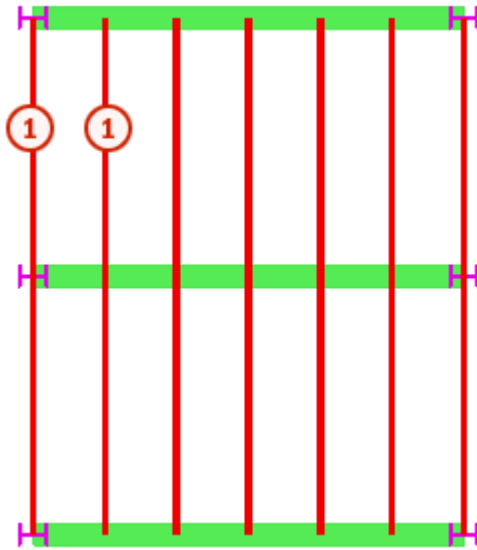
1. Pick the start point of the purlins.
2. Select the parts that divide up the purlins.
3. Click the middle mouse button to create the purlins.

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**NOTE** The placement of the purlins is defined by the input parts.

---

## Part identification key

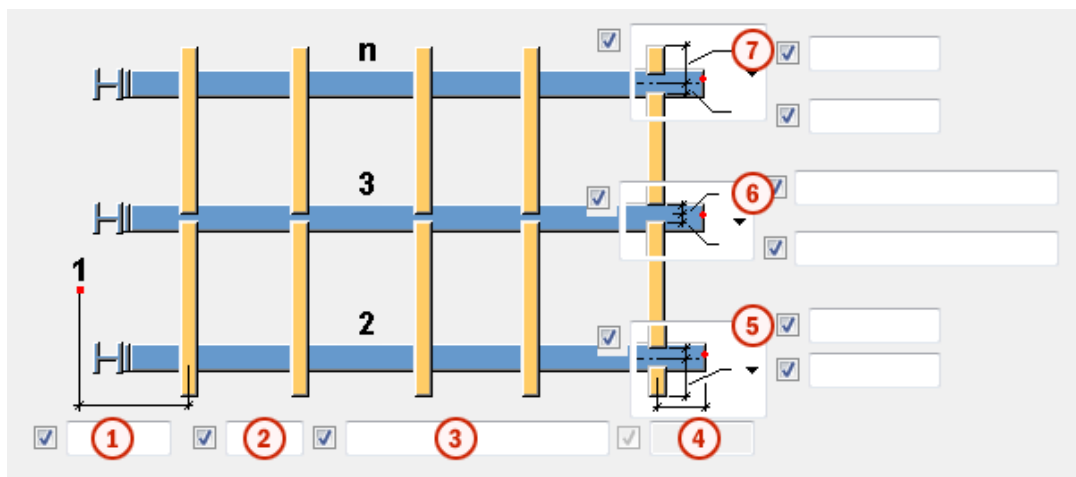


	Part
1	Purlin

## Picture tab

Use the **Picture** tab to control the number of purlins, distances between the purlins and purlin overhang lengths.

## Purlin dimensions

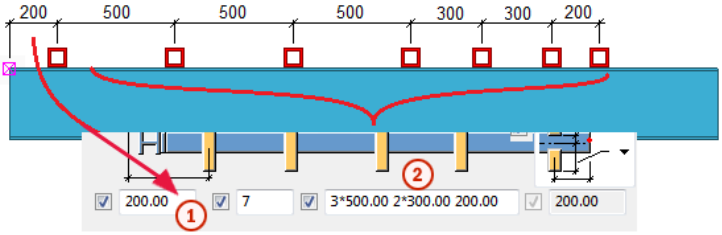
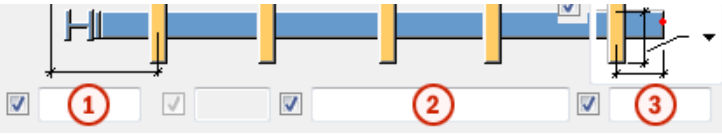


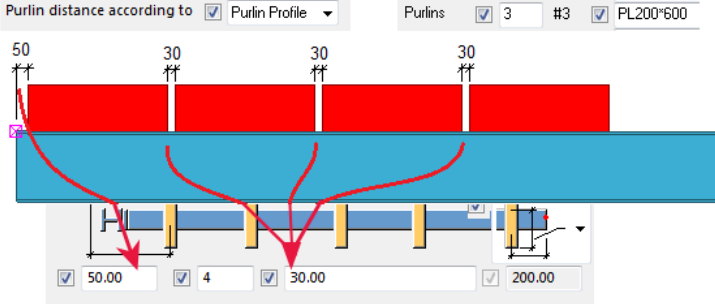
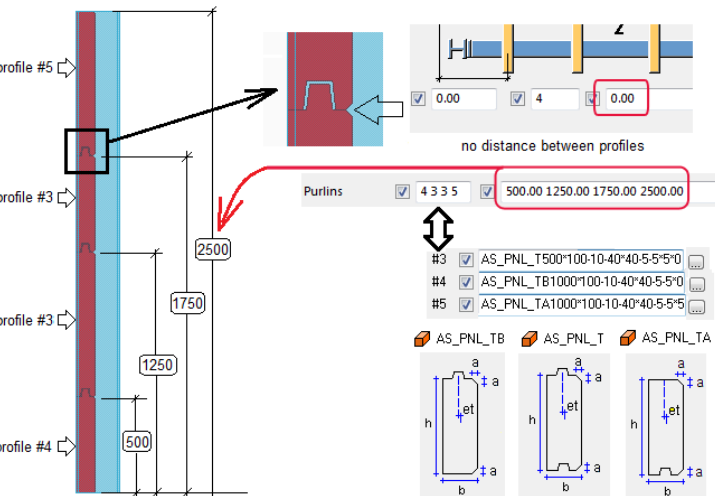
	Description
1	Define the edge distance from the picked point to the first purlin.

	Description
2	Define the number of purlins.
3	Define the distance between the purlins. The distances are calculated from center-to-center.
4	Define the edge distance from the last purlin to the part end point. The distance depends on the option <b>Purlin distance according to</b> .
5	Define the type and length for purlin overhangs in the purlin start.
6	Define how the purlins are split and the size of the gap between the purlins.
7	Define the type and length for purlin overhangs in the purlin end.

### Purlin distances

Define how the distances between purlins are calculated.

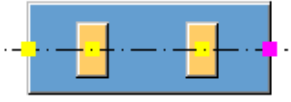
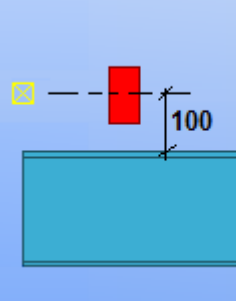
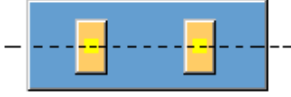
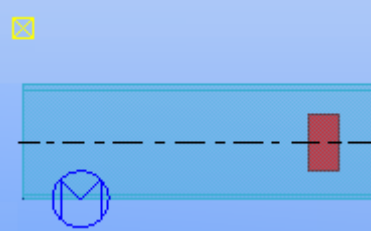
Option	Description
<b>Exact number of purlins</b>	<p>Define the purlin start point with an edge distance <b>①</b>.</p> <p>The remaining length is divided according to the values in <b>②</b>.</p> <p>For example:</p> 
<b>Fill to the end</b>	<p>Define the purlin start point with an edge distance in <b>①</b>. The remaining length is divided according to the values in <b>②</b>, considering the edge distance in <b>③</b>.</p> 

Option	Description
<p><b>Purlin profile</b></p>	<p>Intermediate distances</p> <p>Define the distances between the purlins. This is suitable especially for concrete floors.</p> <p>For example, define the distances on the <b>Picture</b> tab and the purlin profile properties on the <b>Parts</b> tab:</p> 
<p><b>Divide equally</b></p>	<p>Purlin distances are equally divided by the length of profiles.</p>
<p><b>Purlin type</b></p>	<p>This option is recommended for vertical profiles, such as concrete walls or panels.</p> <p>The height of the part that is set in the purlin profile properties on the <b>Parts</b> tab can be overridden by the levels defined in the <b>Top level purlin panels</b> option on the <b>Parts</b> tab.</p> <p>For example:</p>  <p>The width of the panel that is set in the purlin profile properties on the <b>Parts</b> tab can be overridden by the <b>Plate thickness</b> option on the <b>Parts</b> tab. If the <b>Plate thickness</b> option is empty, then the plate thickness in the profile properties is used.</p>

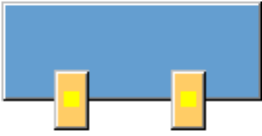
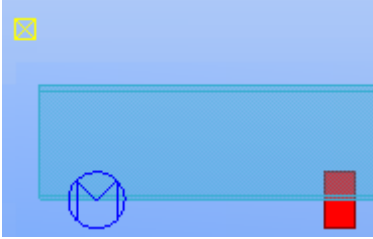


Option	Description
	<p>For example:</p> <p>AS_PNL_TA1000*<b>100</b>*10-40*40-5-5*0</p> <p style="text-align: center;">↓ profile width</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>100</p> </div> <div style="text-align: center;">  <p>200.00</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;">   </div>

### Level

Define the purlin level compared to the main part.

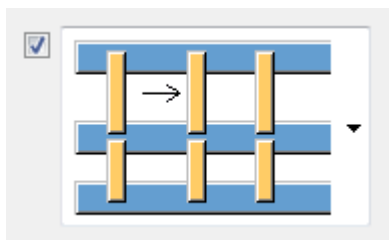
Option	Description
	<p>Reference point of main part</p>  <div style="border: 1px solid #ccc; padding: 5px; margin-top: 5px;"> <p>Position</p> <p><input checked="" type="checkbox"/> On plane: Middle ▾ 0.000</p> <p><input checked="" type="checkbox"/> Rotation: Top ▾ -0.0000</p> <p><input checked="" type="checkbox"/> At depth: <b>Behind ▾ 100.000</b></p> </div>
	<p>Centerline of main part</p> 



Option	Description
	<p>Bottom face of main part</p> 
	<p>Top face of main part</p> 

### Purlin direction

Define which direction is used for the new purlins.



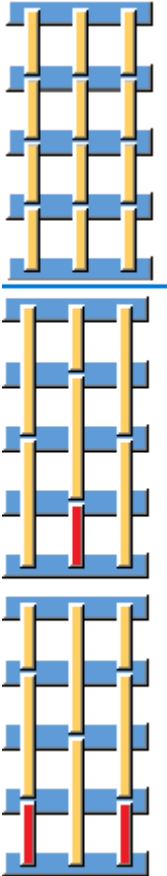
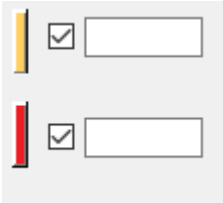
### Purlin overlap

Select whether purlins can overlap (**Yes**) or not (**No**). Setting purlins to overlap helps in root sheeting, for example.

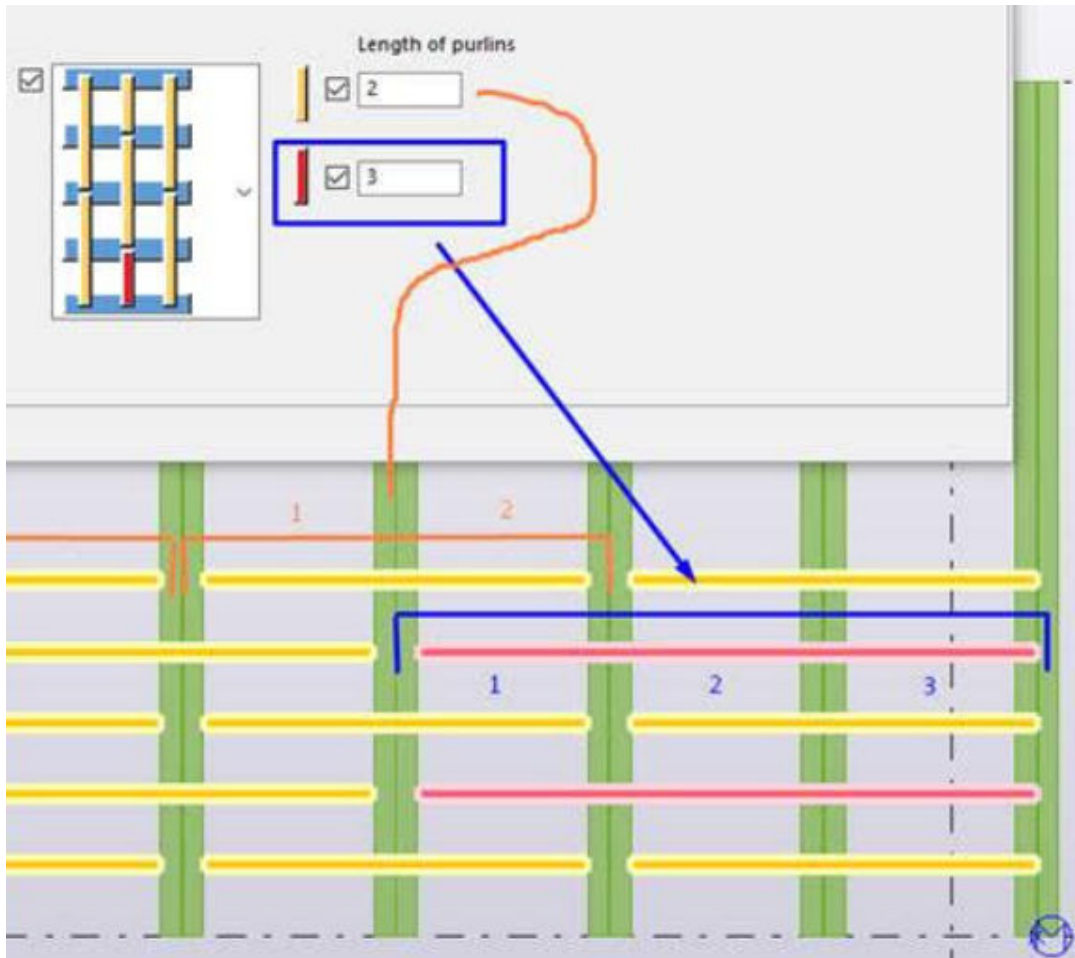
Note that if you set the overlap to **No** and the distance between the purlins is smaller than the width of the purlins, only one of the purlins is created.

### Length of purlins

Define how the purlins are split. You can select both a pattern for the purlins and define how many gaps a purlin will cover.

Option	Description
	<p>Select a pattern for the purlins from the list. The patterns with red purlins control the first purlin in odd or even purlin rows.</p>
	<p>Enter the number of gaps that a purlin covers in the length boxes.</p>

For example:



**Parts tab**

Use the **Parts** tab to control the purlin properties and purlin positioning.

**Purlin profile**

Option	Description
<b>Purlin</b>	Define the purlin thickness, width and height. The default value is PL100*100.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
	assembly position number.	
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Comment</b>	Add a comment about the part.	

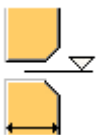
### Purlin position


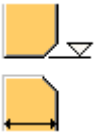
Option	Description
<b>Purlins</b>	Define the number of purlins per type. Multiple purlin types can be defined. Separate the numbers with a space. For example 1*1 4*2 results in 1 purlin of type <b>#1</b> and 4 purlins of type <b>#2</b> .
<b>Inverse</b>	Invert the local direction of the purlin. This is useful especially for asymmetrical profiles.  You can define the inversion separately for each purlin type.  The options are: 0= direction is inverted 1= direction is not inverted
<b>On plane</b>	In the first box, define the purlin position in the horizontal plane.  You can define the position separately for each purlin type.  The options are: 0 = middle 1 = left 2 = right  In the second box, enter a value to define a horizontal offset.

Option	Description
<b>Rotation</b>	<p>In the first box, enter the rotation of the purlin.</p> <p>You can define the rotation separately for each purlin type.</p> <p>The options are:</p> <p>0= back</p> <p>1= below</p> <p>2= front</p> <p>3= top</p> <p>In the second box, enter an angle for other rotation angles.</p>
<b>At depth</b>	<p>In the first box, define the purlin position in the vertical plane.</p> <p>You can define the position separately for each purlin type.</p> <p>The options are:</p> <p>0 = middle</p> <p>1 = front</p> <p>2 = behind</p> <p>In the second box, enter a value to define a vertical offset.</p>
<b>Purlin panel levels</b>	<p>Enter one or more values to define elevations. This is useful especially for panels.</p> <p>Separate the numbers with a space. Use this option only if you have set the <b>Purlin distance according to</b> option to <b>Purlin type</b> on the <b>Picture</b> tab.</p>

### Elevation

Define the reference for the purlin elevations, for example, for wall panels. The elevations are set in the **Top level purlin panels** option.

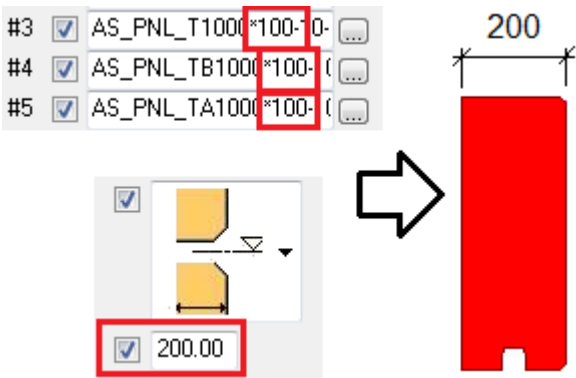
Option	Description
	Elevation is in between the parts.

Option	Description
	Elevation is on the top side of the bottom part.
	Elevation is on the bottom side of the top part.

### Panel thickness

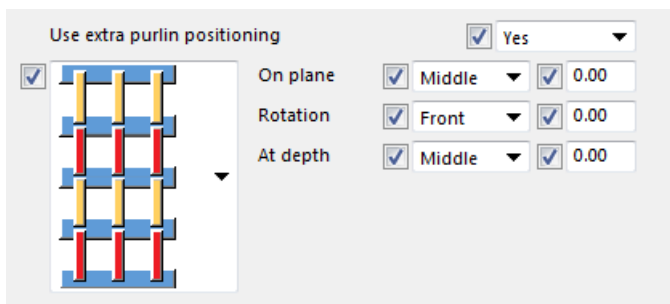
Define the thickness of the panels. This works only with parametric profiles, such as AS\_PNL. Use this option only if you have set the **Purlin distance according to** option to **Purlin type** on the **Picture** tab.

The defined panel thickness overrides the width set in the purlin profile properties.

	Description	Default
<b>Plate thickness</b>	<p>For example:</p> 	100 mm

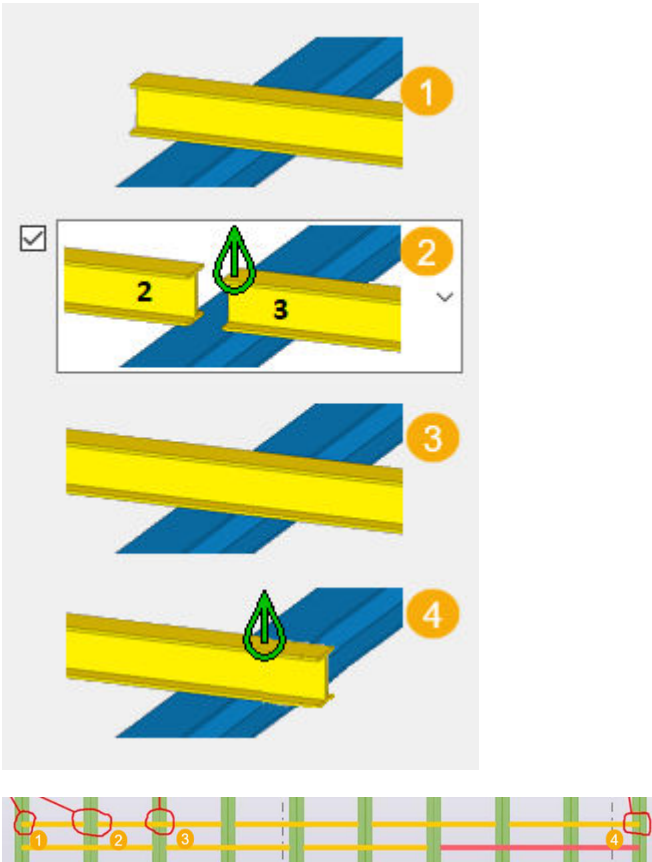
### Use extra purlin positioning

Set the **Use extra purlin positioning** option to **Yes** to change the position and rotation of each even or odd purlin.



### Joints tab

Use the **Joints** tab to define the components used for connecting the beams and the purlins.

Option	Description
<p><b>Creation of joints</b></p>	<p>Select whether connections are created.</p> <p><b>No:</b> Only the purlins are created.</p> <p><b>Yes:</b> Components are added between the purlins and the beams.</p>
<p>Connection type</p> 	<p>Select the connection type from the list. You can select a suitable custom component or a connection, or you can select one of the predefined connections.</p> <p>You can define the connections for the start connection (1), middle connection with two parts (2), middle connection with one part (3), and the end connection (4).</p>
<p><b>Component name / number</b></p>	<p>If you have selected a custom component or a connection as the connection type, select the custom component or connection from the <b>Applications &amp; components</b> catalog.</p>

Option	Description
<b>Configuration file</b>	Select the configuration settings for the connection.
<b>Direction, Class</b>	The values you define are shown on the <b>General</b> tab of the selected connection.

### **UDA tab**

Use the **UDA** tab to add information in the user-defined attributes (UDAs) of the parts. You can define up to 5 UDA names.

Option	Description
<b>UDA name</b>	Enter the name of the user-defined attribute.  For example, to add a comment UDA, open the <code>objects.inp</code> file in a text editor and search for <code>comment</code> . The following attribute is shown:  <pre>attribute("comment", "j_comment", string, "%s", no, none, "0.0", "0.0")</pre> The first text between the quotation marks is the UDA name, <code>comment</code> . The entered name is case sensitive.
<b>Type</b>	Select the UDA type.  Use <b>String</b> for text, <b>Integer</b> for numbers, <b>Float</b> for numbers with decimals and <b>Option</b> for selecting an item in a list. You can find the UDA type in the <code>objects.inp</code> file.
<b>Value</b>	Enter a value for the UDA. Use text and/or numbers, depending on the defined UDA type.

### **Gusset+ T**

**Gusset+T** connects a beam or a brace to another beam by welding a T profile to the end of the beam and bolting this profile to a shear plate gusset on the main part. The main part is typically an H or I profile, and the secondary part is typically a square or round hollow profile, though channels and other profiles can also be used.

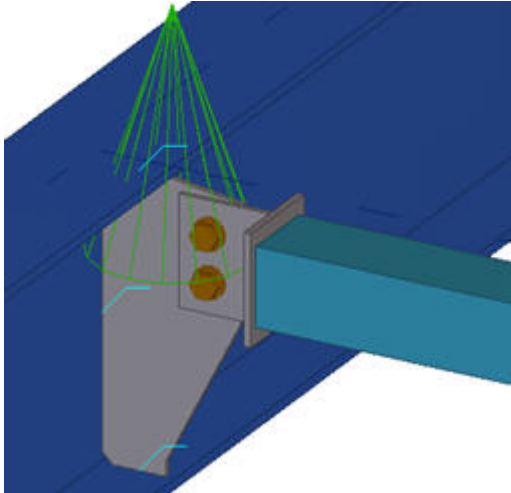
#### **Objects created**

- Stiffener
- Gusset plate
- Cut T profile (brace connection)
- Built up T profile (brace connection)



- Welds
- Bolts

**Use for**

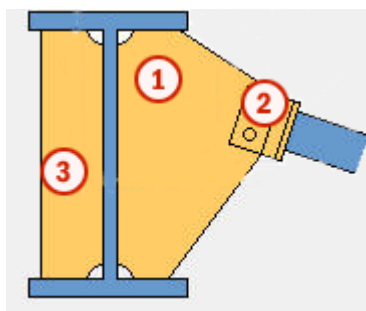
Situation	Description
	<p>T profile welded to beam and bolted to gusset plate on main part.</p>

**Selection order**

1. Select the main part (beam).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

**Part identification key**

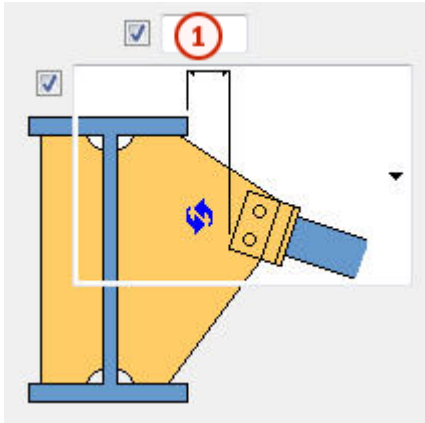


	Part
1	Gusset plate
2	Brace connection (T profile)
3	Stiffener

### Picture tab

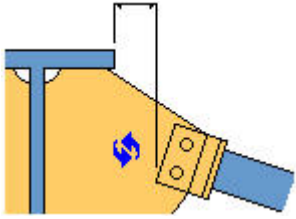
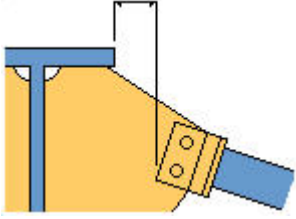
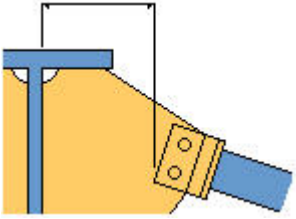
Use the **Picture** tab to control the gap and gusset plate dimensions and the shape of the gusset plate.

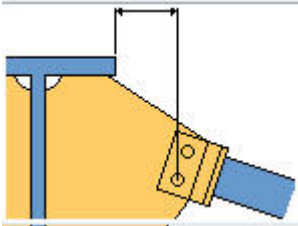
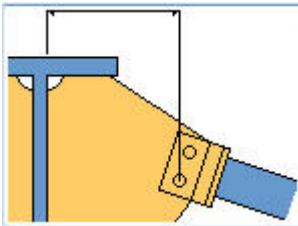
### Gap dimension



	Description	Default
1	Gap dimension.	10 mm




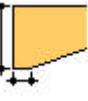
### Gap dimension options

Option	Description
	Default Gap between the edge of the main part flange and the nearest corner of the gusset plate. AutoDefaults can change this option.
	Gap between the edge of the main part flange and the nearest corner of the gusset plate.
	Gap between the face of the main part web and the nearest corner of the gusset plate.

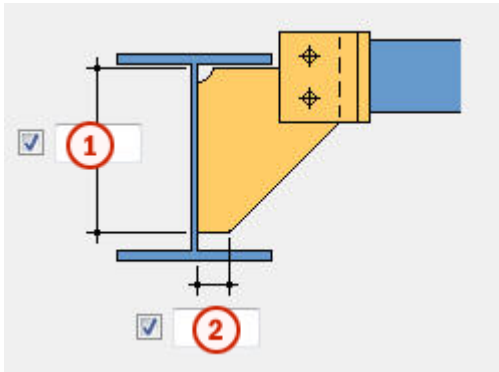
Option	Description
	Gap between the edge of the main part flange and the nearest bolt.
	Gap between the face of the main part web and the nearest bolt.

### Gusset plate shape

You can further modify the gusset plate shape by defining the dimensions on the **Picture** and the **Gusset** tab.

Option	Description
	<p>Default</p> <p>Regular trapezoidal gusset plate.</p> <p>AutoDefaults can change this option.</p>
	<p>Regular trapezoidal gusset plate.</p> <p>You can use all the gap and straight portion settings on the <b>Gusset</b> tab page to modify this gusset plate.</p> <p>If the gusset plate extends above the upper flange, or below the lower flange, use the extended gusset plate chamfer dimensions instead of the straight edge dimensions of the gusset plate flange.</p>
	<p>Square corner on the upper side of the gusset plate.</p> <p>You can use all the gap options to modify this gusset plate. The lower flange straight edge can also be used.</p>
	<p>Partial depth gusset plate.</p> <p>Define the height and straight edge explained in <b>Gusset plate dimensions</b>.</p> <p>If the gusset plate extends above the upper flange, use the extended gusset plate chamfer dimensions.</p>

## Gusset plate dimensions



	Description	Default
1	Partial gusset plate height on the web.	
2	Partial gusset plate straight edge.	20 mm

### Gusset tab

Use the **Gusset** tab to control the position and dimensions of the gusset plate and stiffener creation.

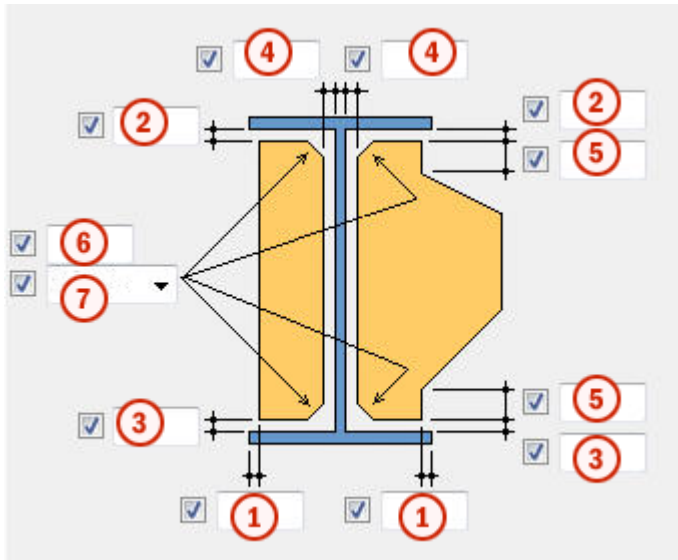
### Gusset and stiffener

Option	Description	Default
<b>Gusset</b>	Gusset plate thickness	6 mm
<b>Stiffener</b>	Stiffener thickness	Gusset plate thickness

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

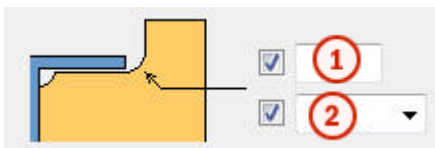
Option	Description	Default
<b>Finish</b>	Describes how the part surface has been treated.	

### Gusset and stiffener dimensions



	Description	Default
<b>1</b>	Distance of the gusset plate/stiffener from the edge of the flange.	
<b>2</b>	Gap between the upper flange and the gusset plate/stiffener.	
<b>3</b>	Gap between the lower flange and the gusset plate/stiffener.	
<b>4</b>	Gap between the web and the gusset plate/stiffener.	
<b>5</b>	Straight portion of the gusset plate from the flange before it begins to slope to the brace.	
<b>6</b>	Size of the gusset plate/stiffener chamfer.	
<b>7</b>	Chamfer shape for the gusset plate/stiffener corners.	Line chamfer

### Chamfer type and size

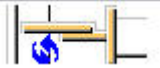




	Description	Default
1	Chamfer size for the gusset plate when the gusset plate extends above or below the main part flange.	5
2	Chamfer type for the extended gusset plate.	Concave arc chamfer







	Description	Default
1	Chamfer size for the square corner on the upper side of the gusset plate.	20
2	Chamfer type for the square corner.	Concave arc chamfer

### Gusset position

Option	Description
	Default Gusset plate above the Cut T profile. AutoDefaults can change this option.
	Gusset plate above the Cut T profile.
	Gusset plate below the Cut T profile.

### Stiffener creation

Option	Description
	Default No stiffener. AutoDefaults can change this option.
	Stiffener perpendicular to the main part.
	Stiffener aligned with the gusset.
	No stiffener.

### **Brace connection tab**

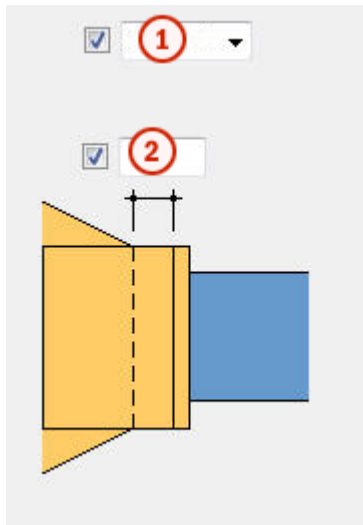
Use the **Brace connection** tab to define how the brace is connected to the gusset plate.

#### **Profile properties**

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Cut T</b>	Cut T profile thickness, width and height by selecting the profile from the profile catalog.	Gusset plate thickness
<b>Flange</b>	Flange thickness for the Built up T profile.  Note that you must first define the profile type to be <b>Built up T</b> .	6 mm
<b>Web</b>	Web thickness for the Built up T profile.  Note that you must first define the profile type to be <b>Built up T</b> .	6 mm

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

## Brace connection profile



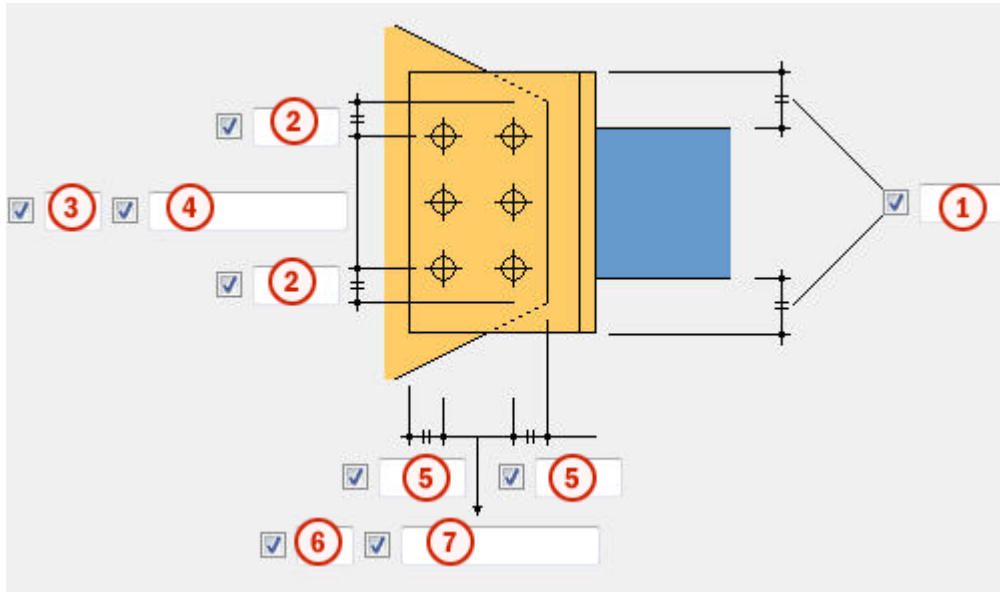
	Description	Default
<b>1</b>	Type of the T profile to be used in the brace connection. When you select <b>Built up T</b> , also define the gap between the gusset plate and the Built up T profile.	
<b>2</b>	Gap between the gusset plate edge and the flange of the Built up T profile.	10 mm

### **Bolts tab**

Use the **Bolts** tab to control the properties of bolts that connect the gusset plate to the T profile.



## Bolt group dimensions



	Description	Default
<b>1</b>	Minimum T profile extension for the top and bottom of the brace connection.	10 mm
<b>2</b>	Bolt edge distance.	40 mm
<b>3</b>	Number of bolts.	2
<b>4</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.	60 mm
<b>5</b>	Bolt edge distance.	40 mm
<b>6</b>	Number of bolts.	1
<b>7</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.	60 mm

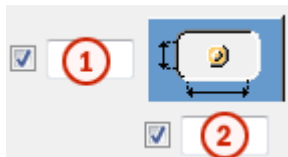
## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.

Option	Description	Default
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

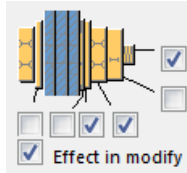


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

## **Bolt assembly**

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

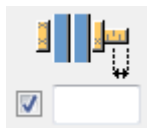
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## **Main part welds / Cut T welds tabs**

Use the **Main part welds** and the **Cut T welds** tabs to define the weld properties. You can select whether continuous, chain intermittent, or staggered intermittent weld shapes are used.

Click the link below to find out more:

## **General tab**

Click the link below to find out more:

General tab

## **Design tab**

Click the link below to find out more:

Design tab

## **Analysis tab**

Click the link below to find out more:

Analysis tab

## 2.11 Tubes

This section introduces components that can be used in steel tube connections.

Click the links below to find out more:

- [Tube splice \(6\) \(page 1364\)](#)
- [Tube gusset \(20\) \(page 1372\)](#)
- [Squeezed tube bolted \(102\) \(page 1401\)](#)
- [Squeezed tube \(103\) \(page 1414\)](#)
- [Tube-Chamfer \(page 1421\)](#)
- [Tube-CrossingSaddle \(page 1423\)](#)
- [Tube-MitreSaddle+Hole \(page 1425\)](#)
- [Tube-Saddle+Hole \(page 1427\)](#)
- [Tube-SlottedHole \(page 1431\)](#)

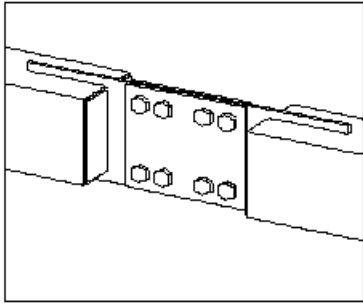
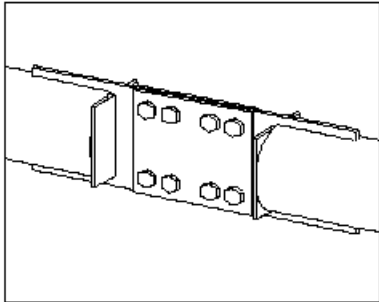
### Tube splice (6)

**Tube splice (6)** connects two rectangular hollow core sections or round tubes with splice plates. End plates are created at both ends of the connection. Connection plates create cuts into the connected parts.

#### Objects created

- Splice plates
- Connection plates
- End plates
- Welds
- Bolts
- Cuts

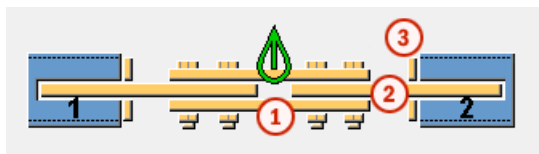
## Use for

Situation	Description
	Tube splice connection to rectangular hollow core sections.
	Tube splice connection to round tubes.

## Selection order

1. Select the main part (column or beam).
2. Select the secondary part (column or beam).  
The connection is created automatically when the secondary part is selected.

## Part identification key

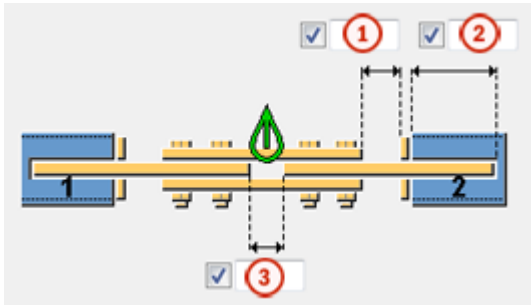


	Part
1	Splice plate
2	Connection plate
3	End plate

## Picture tab

Use the **Picture** tab to control the positions of the plates.

## Plate position






	Description	Default
1	Distance between the splice plate and the end plate.	10 mm
2	Connection plate cut depth. The cut depth affects the size of the connection plate.	150 mm
3	Distance between the connection plates.	20 mm

## Cut creation

Define whether connection plates create cuts to the parts they connect, and whether end plates are cut.

Option	Description
	Default Connection plate does not create a cut. AutoDefaults can change this option.
	Connection plate does not create a cut.
	Connection plate creates a rectangular cut. Define the horizontal and vertical cut dimensions.
	Connection plate creates a round cut. Define the horizontal and vertical cut dimensions, and the radius of the cut.

Option	Description
	Default End plate is not cut. AutoDefaults can change this option.
	End plate is not cut.
	End plate is cut.

### **Parts tab**

Use the **Parts** tab to control the size, position, material, name and finish of the plates.

### **Plate**

Option	Description
<b>Splice plate</b>	Splice plate thickness.
<b>Connection plate</b>	Connection plate thickness.
<b>End plate</b>	End plate thickness.

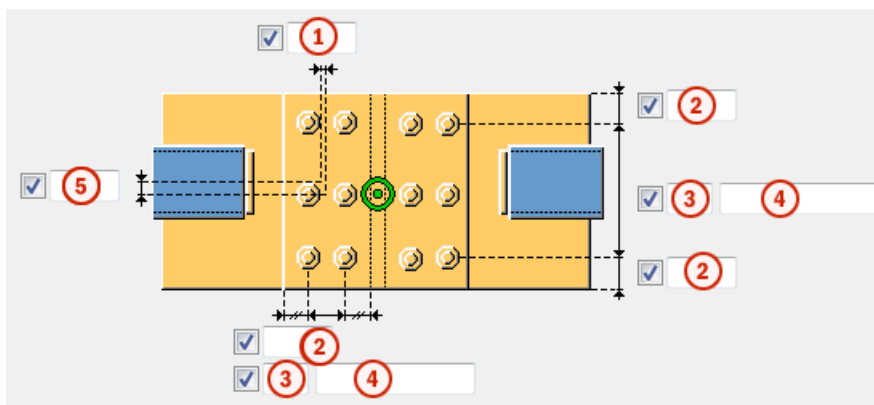
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

Option	Description	Default
<b>Finish</b>	Describes how the part surface has been treated.	

### **Bolts tab**

Use the **Bolts** tab to control the properties of the bolts that connect the splice plates and the connection plates.

#### **Bolt group dimensions**







	Description
<b>1</b>	Dimension for horizontal bolt group position.
<b>2</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>3</b>	Number of bolts.
<b>4</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>5</b>	Dimension for the bolt group position from the center line of the connected parts.

#### **Staggering of bolts**

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered



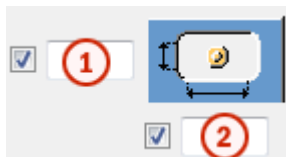
Option	Description
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



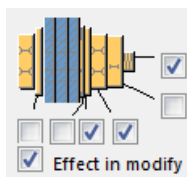
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.

Option	Description	Default
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
Rotate Slots	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
Slots in	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase




Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



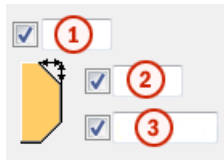
### End plates tab

Use the **End plates** tab to control the shape and the dimensions of the end plate.

### End plate shape

Option	Description
	Square Default
	Square
	Round

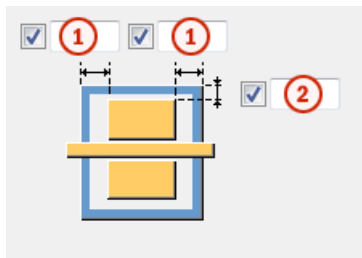
### End plate chamfer dimensions



	Description
1	Horizontal chamfer dimension.
2	Vertical chamfer dimension.
3	Select the chamfer type.

### End plate dimensions

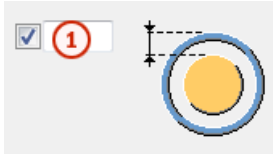
Define the dimensions of the square end plate.



	Description
1	Horizontal dimension from the edge of the end plate to the flange of the column or the beam.
2	Vertical dimension from the edge of the end plate to the flange of the column or the beam.

### End plate dimensions

Define the dimension of the round end plate.



	Description
1	Dimension from the edge of the end plate to the outer edge of the column or the beam.

### ***General tab***

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

## **Tube gusset (20)**

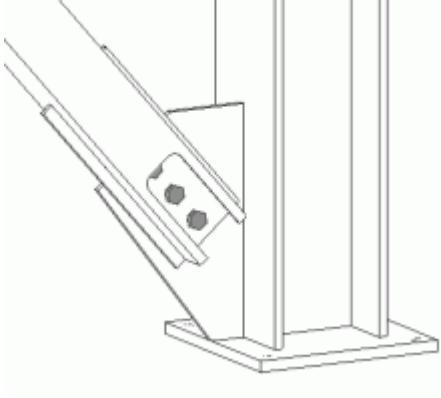
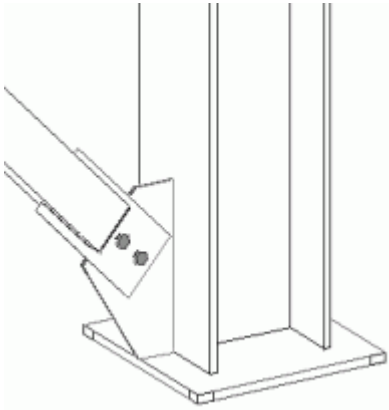
**Tube gusset (20)** connects 1 to 10 hollow braces to a beam or a column using a gusset plate. The braces need to have a rectangular hollow section (RHS) or a tube profile. The connection bolts the braces to the gusset plate using a connection plate and an optional tongue plate. The hollow braces can be sealed with end plates.

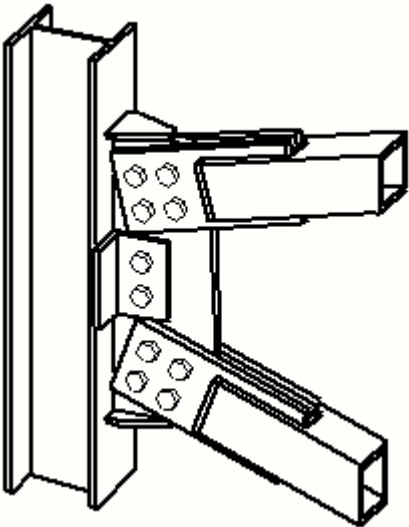
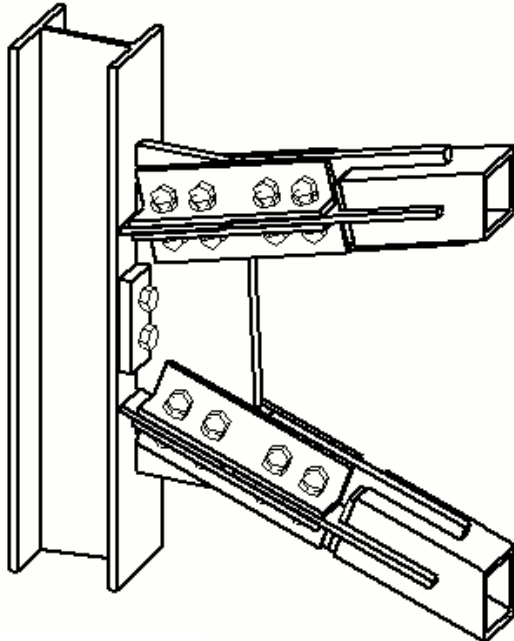
### **Objects created**

- Gusset plate
- Connection plates
- Clip angles
- End plates (seal plates)

- Tongue plates
- Cover plates
- Stiffeners
- Bolts
- Welds

**Use for**

<b>Situation</b>	<b>Description</b>
	<p>Gusset plate is welded to column flange.</p> <p>Brace is welded to connection plate. The end of the brace is notched to accommodate the bolts in the connection between the connection plate and the gusset plate.</p>
	<p>Gusset plate is welded to column flange.</p> <p>Brace is bolted to gusset plate using a tongue plate.</p>

Situation	Description
	<p>Gusset plate is connected to column flange with clip angles.</p> <p>Brace is bolted to gusset plate using a tongue plate. The braces are sealed with end plates, and stiffeners are created.</p>
	<p>Gusset plate is connected to column flange with a connection plate.</p> <p>Cross plates and cover plates are created.</p>

### Before you start

Create a beam or a column and 1 to 10 braces with RHS or tube profile.

### Selection order

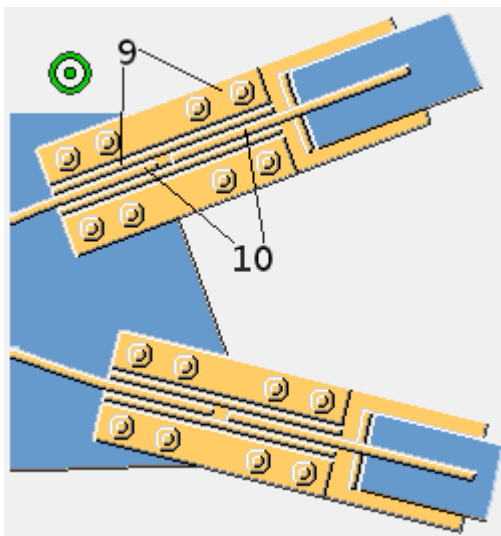
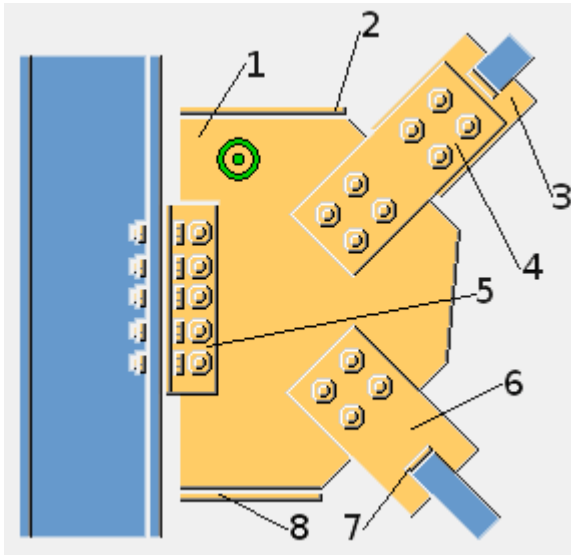
1. Select the main part (column or beam).
2. Select the secondary part (first brace).
3. Select the second secondary part (second brace).
4. Select the subsequent secondary parts (subsequent braces).
5. Click the middle mouse button to create the connection.

---

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

---

### Part identification key



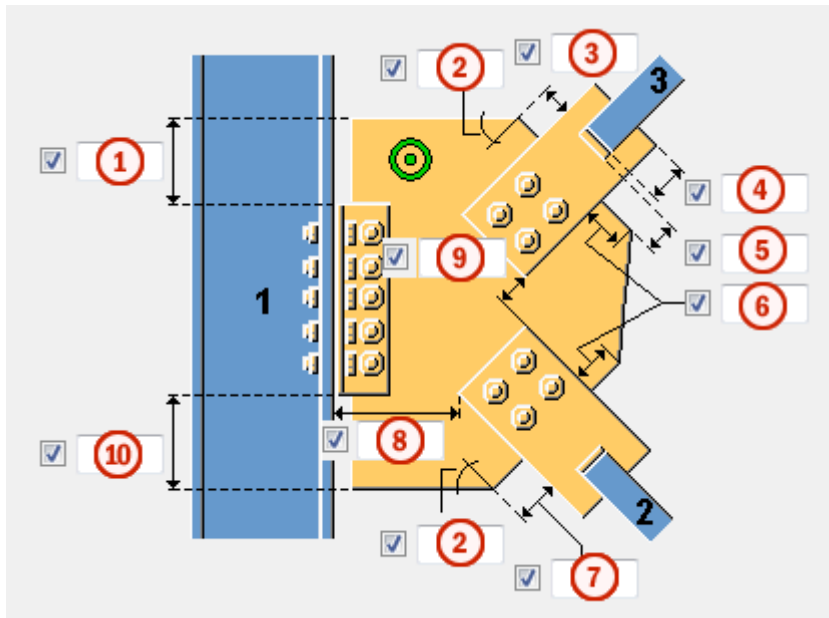
	Part
1	Gusset
2	Stiffener 1
3	Tongue plate
4	Cover plate Created on the <b>Brace conn</b> tab.
5	Clip angle

<b>Part</b>	
<b>6</b>	Connection plate Created on the <b>Brace conn</b> tab.
<b>7</b>	End plates (seal plates)
<b>8</b>	Stiffener 2
<b>9</b>	Cover plate Created on the <b>Cross plates</b> tab.
<b>10</b>	Cross plate

### **Picture tab**

Use the **Picture** tab to control the gusset plate dimensions and positioning.

### **Dimensions**



	<b>Description</b>	<b>Default</b>
<b>1</b>	Distance between the clip angle or connection plate upper edge and the gusset plate upper edge.	
<b>2</b>	Corner angle of the gusset plate (in degrees). This value affects the gusset plate shape.	
<b>3</b>	Length of the edge of the gusset plate that is perpendicular to the uppermost brace. This value affects the gusset plate shape.	





	Description	Default
4	Brace length on the connection plate. Enter a negative value to prevent the connection plate from being inside the brace.	150 mm
5	Distance between the gusset plate and the brace. If the braces are sealed with end plates, the distance is between the gusset plate and the end plate.	20 mm
6	Length of the edges of the gusset plate perpendicular to the braces. This value affects the gusset plate shape.	
7	Length of the edge of the gusset plate that is perpendicular to the lowest brace. This value affects the gusset plate shape.	
8	Distance between the main part and the first picked brace.	
9	Distance between the braces.	
10	Distance between the clip angle or the connection plate lower edge and the gusset plate lower edge.	

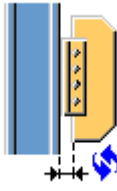

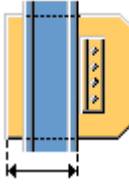
**NOTE** The following examples show only some of the available options. You will find more options on the **Picture** tab.

### Gusset plate positioning

Define how the gusset plate is positioned when a base plate is used.

Option	Description
	Default Gusset plate is parallel to the main part. AutoDefaults can change this option.
	Gusset plate is parallel to the brace.

## Gusset plate dimensions

Option	Description
	<p>Default</p> <p>Gusset plate does not run through the main part.</p> <p>Define the gusset plate cut dimension.</p> <p>AutoDefaults can change this option.</p>
	<p>Gusset plate does not run through the main part.</p> <p>Define the gusset plate cut dimension.</p>
	<p>Gusset plate runs through the main part.</p> <p>Define the gusset plate extension dimension.</p>

## Gusset tab

Use the **Gusset** tab to control the gusset plate properties, shape and position, and clip angle properties and orientation.

## Plates

Option	Description	Default
<b>Gusset</b>	Gusset plate thickness, width and height.	
<b>Connection plates</b>	Connection plate thickness and width.	no connection plate is created
<b>L profile</b>	Clip angle profile by selecting it from the profile catalog.	L100*100*10




Option	Description	Default
<b>Pos_No</b>	<p>Prefix and start number for the part position number.</p> <p>Some components have a second row of fields</p>	<p>The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b>.</p>

Option	Description	Default
	where you can enter the assembly position number.	
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

**NOTE** The following examples show only some of the available options. You will find more options on the **Gusset** tab.



### Gusset plate connection

Define how the gusset plate is connected to the main part.

Option	Description
	Default Gusset plate is welded directly to the main part. AutoDefaults can change this option.
	Gusset plate is connected to the main part with clip angles. Select to which side of the gusset plate the clip angles are created.
	Gusset plate is connected to the main part with a connection plate. Select to which side of the gusset plate the connection plate is created.



### Clip angle orientation

Define how the clip angle is placed on the connection.

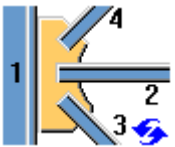
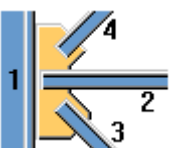
Option	Description
	<p>Default</p> <p>Clip angle is placed on the connection so that the longer leg is connected to the gusset plate.</p> <p>AutoDefaults can change this option.</p>
	<p>Clip angle is placed on the connection so that the longer leg is connected to the main part.</p>

### Gusset plate shape

When you select the option to optimize the gusset plate weight, you can define whether the selection order of the braces affects the position of the braces.




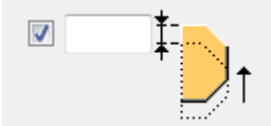
Option	Description
	<p>Default</p> <p>AutoDefaults can change this option.</p>
	<p>This option optimizes the gusset plate weight.</p>

### Brace position

Option	Description
	<p>Default</p> <p>The brace position is not affected.</p> <p>AutoDefaults can change this option.</p>
	<p>The first selected brace is placed closest to the main part.</p>

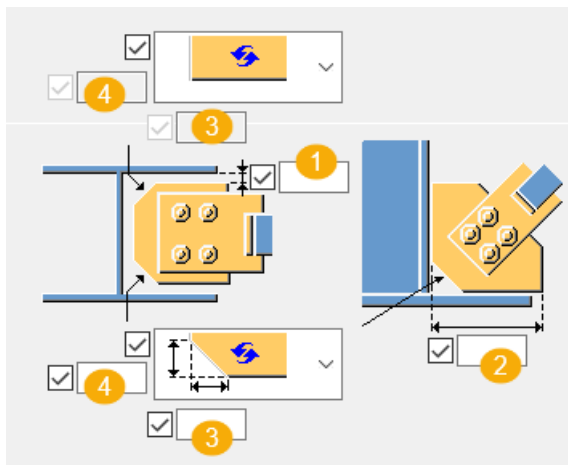
### Gusset plate position on the brace

Define where to place the gusset plate on the brace. If needed, you can fine-tune the gusset plate position by moving the gusset plate in the z or in the y direction.

Option	Description
	<p>Default</p> <p>Gusset plate is positioned in the middle of the brace.</p> <p>AutoDefaults can change this option.</p>
	<p>Gusset plate is positioned on the top flange of the brace.</p>
	<p>Define how much the gusset plate is moved in the z direction.</p>
	<p>Define how much the gusset plate is moved in the y direction.</p>

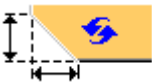


### Gusset plate chamfer

Define the gusset plate chamfer type and dimensions.



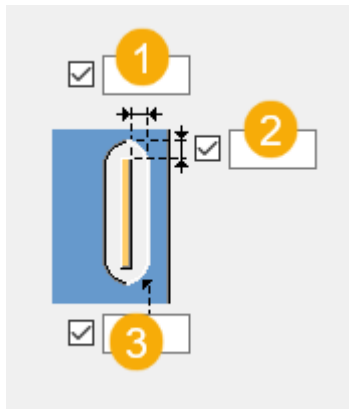
	Description	Default
1	Distance between the connection plate and the inner flange of the main part.	
2	Horizontal distance between the gusset plate edge and the flange of the main part.	
3	Horizontal dimension of the chamfer. By default, the second chamfer is not created.	10 mm
4	Vertical dimension of the chamfer. By default, the second chamfer is not created.	10 mm

Define the chamfer type.

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	Convex arc chamfer
	Concave arc chamfer

### Cut size

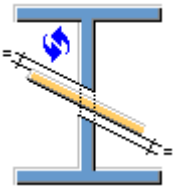
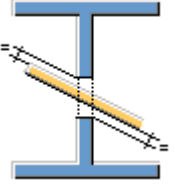
If the gusset plate runs through the main part, define the size of the cut created for the gusset plate.



	Description
1	Define the horizontal size of the cut.
2	Define the vertical size of the cut.
3	Define the radius of the round cut.

### Cut options

If you use beam-column-beam connections and want the gusset plate to create a cut, you can define how the cut runs through the main part.

Option	Description
	Default Cut is created according to the gusset plate orientation. AutoDefaults can change this option.
	Straight cut.

### **Brace conn tab**

Use the **Brace conn** tab to control connection plate, tongue plate, and end plate properties .

### **Brace connection**


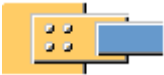
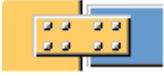


Option	Description	Default
<b>Connection plate</b>	Thickness, width and height of the connection plate.	thickness = 20 mm
<b>End plates</b>	Thickness, width and height of the end plate.	thickness = 5 mm
<b>Middle end plate</b>	Thickness and height of the middle end plate.	no middle end plate is created
<b>Tongue plate</b>	Thickness and height of the tongue plate.	no tongue plate is created
<b>Cover plate</b>	Thickness, width and height of the cover plate.	no cover plate is created
<b>Stiffener</b>	Thickness, width and height of the stiffener.	no stiffener is created

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

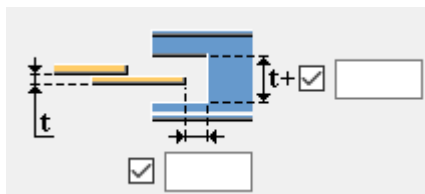
### Brace connection types

Define how the brace is connected to the connection plate.

Option	Description
	Default Brace is welded AutoDefaults can change this option.
	Brace is welded.
	Brace is bolted.
	Brace is welded and notched around the nuts.
	Tongue plate and cover plate are created.

### Cut in bracing

If needed, you can create a cut in the bracing.



Define the width of the cut in the bracing, where **t** is the thickness of the connection plate.

Define the length of the cut in the bracing from the edge of the connection plate.



### Gusset and connection plate distance



Define the distance between the gusset plate and the connection plate.

### Round cut in bracing



If needed, you can create a round cut in the bracing. Enter the radius value.

**NOTE** The following examples show only some of the available options. You will find more options on the **Brace conn** tab.

### Connection plate


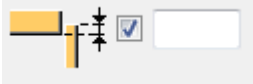

Define whether the brace is notched or the connection plate cut when the connection plate is connected to the brace.

Option	Description
	Default Brace is notched. AutoDefaults can change this option.
	Connection plate is cut.
	Connection plate is cut, but the part of the connection plate created inside the bracing is not deleted.
	If you cut the connection plate, you can define the size of the gap between the brace and the connection plate.


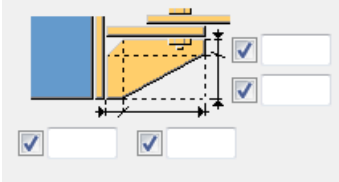
### Number of connection plates

Define whether one or two connection plates are used for connecting the brace to the gusset plate.

Option	Description
	Default One connection plate. AutoDefaults can change this option.



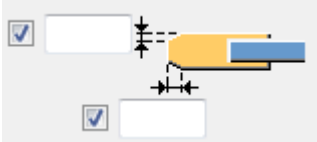
Option	Description
	Two connection plates and a middle end plate at the ends of the connection plates.
	If a middle end plate is created, you can define the width of the end plate.
	Select the middle end plate position.

### Connection plate stiffeners

Option	Description
	<p>To create stiffeners, define the stiffener thickness.</p> <p>By default, one stiffener is created. When you select to create two connection plates, you can also select to create one stiffener on the left or one on the right, or one stiffener on both the left and the right side.</p>
	Define the inner and outer chamfers of the stiffeners.



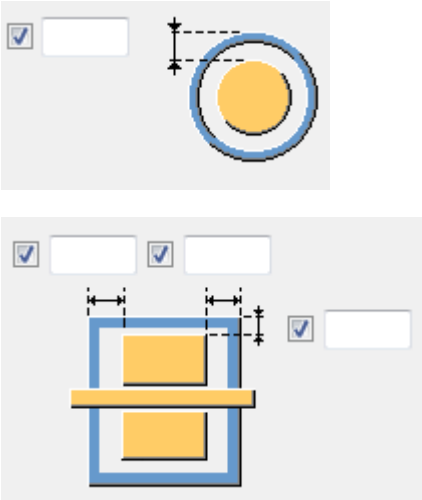
### Connection plate chamfer

Define whether the connection plate is chamfered.

Option	Description
	<p>Default</p> <p>No chamfers are created.</p> <p>AutoDefaults can change this option.</p>
	Chamfers are created.
	If you create chamfers, define the vertical and horizontal chamfer dimensions.

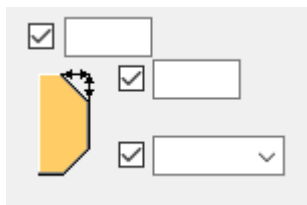
## End plates

If you use the end plates to seal the braces, define the end plate shape and dimensions.

Option	Description
	Default Square end plate. AutoDefaults can change this option.
	Round end plate.
	End plate edge distance from the brace outer edge.

## End plate chamfer

Define the end plate chamfer type and horizontal and vertical dimensions.



## Stiffeners tab

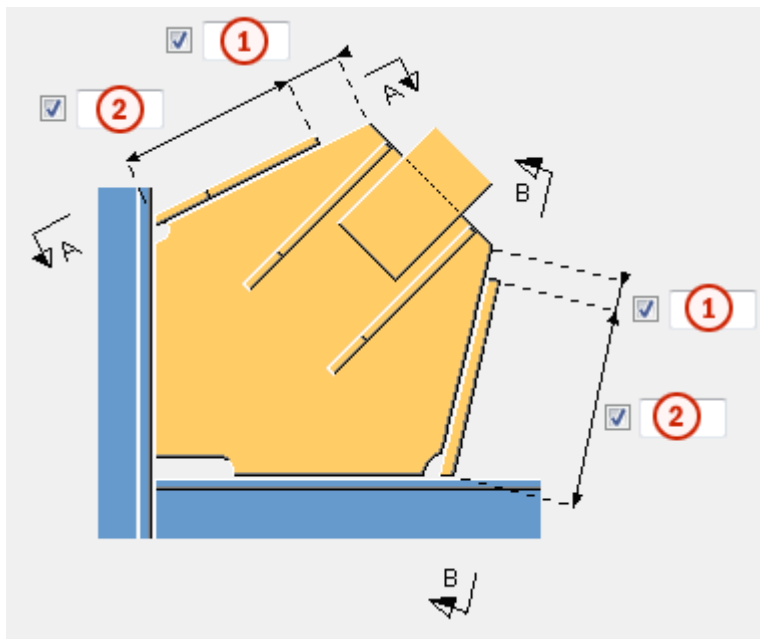
Use the **Stiffeners** tab to control the stiffener properties and dimensions.

### Stiffeners

Option	Description	Default
<b>Stiffener 1</b>	Stiffener thickness.	no stiffener is created
<b>Stiffener 2</b>		

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Stiffener length

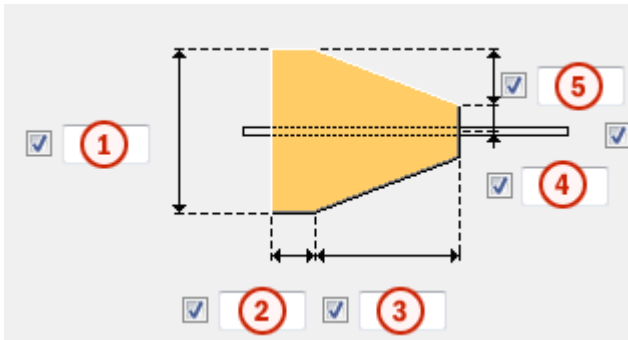


	Description
<b>1</b>	Distance between the stiffener edge and the gusset plate edge.
<b>2</b>	Length of stiffener.








You can fit the stiffeners to the main part. By default, the stiffeners are not fitted.

### Stiffener dimensions

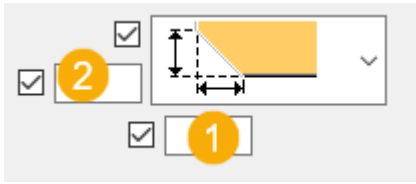


	Description
1	Width of the stiffener.
2	Length of the stiffener base.
3	Length of the skew part of the stiffener.
4	Distance from the stiffener center line.
5	Vertical distance between the stiffener base and the skew part.

### Chamfer type

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

## Chamfer dimensions

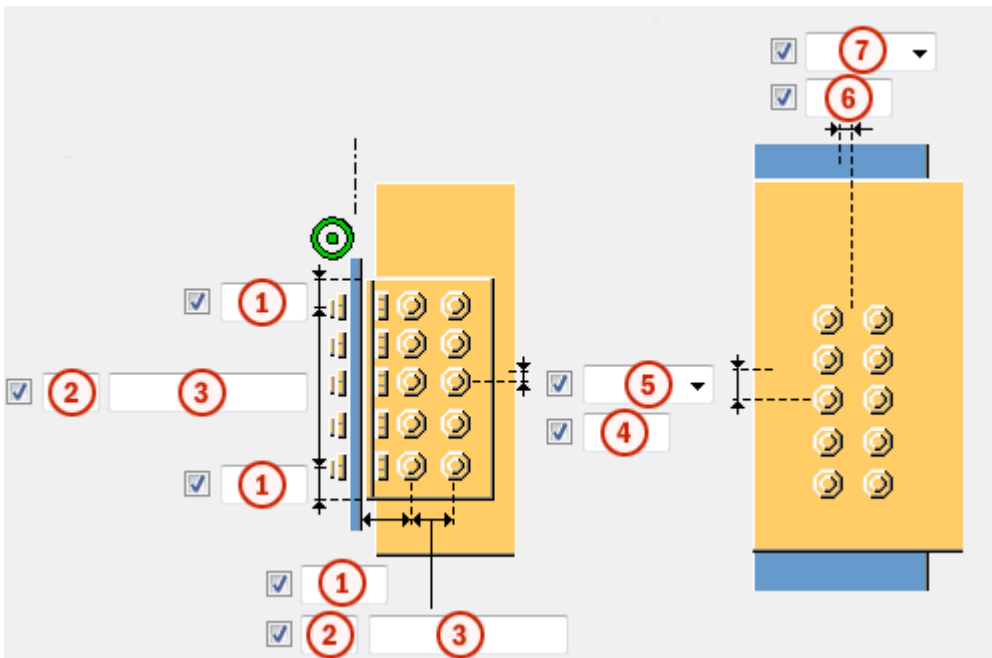


	Description
1	Horizontal dimension of the chamfer.
2	Vertical dimension of the chamfer.

## Gusset conn tab

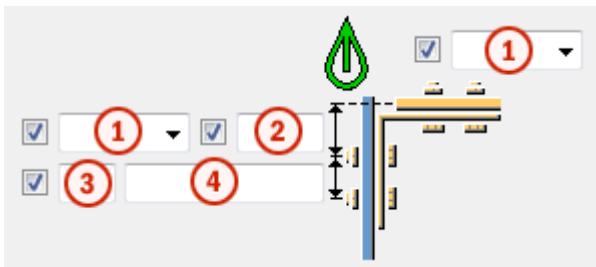
Use the **Gusset conn** tab to control the bolt group properties for bolts that connect the gusset plate to the main part, and to control the clip angle attachment.

## Bolt group dimensions on gusset plate



	Description
1	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Number of bolts.

	Description
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
4	Dimension for vertical bolt group position.
5	Select how to measure the dimensions for vertical bolt group position.
6	Dimension for horizontal bolt group position.
7	Select how to measure the dimensions for horizontal bolt group position.







	Description
1	Location where the bolts should be attached.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

**NOTE** The following examples show only some of the available options. You will find more options on the **Gusset conn** tab.

### Clip angle attachment type



Define how the clip angle is attached to the gusset plate and to the main part.

Option	Description
	Default Both parts are bolted. AutoDefaults can change this option.
	Automatic When the main part is a tube profile, the clip angles are welded to the main






Option	Description
	part and bolted to the secondary part. Otherwise the clip angles are bolted to both parts.
	Main part is bolted and secondary part is welded.
	Main part is welded and secondary part is bolted.
	Both parts are bolted.
	Both parts are welded.

### Bolts on gusset plate


Define whether the gusset plate is connected to the main part with bolts when no clip angles are used.

Option	Description
	Default Bolts are not created in the gusset plate. AutoDefaults can change this option.
	Bolts are created in the gusset plate.

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3



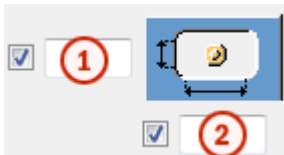
Option	Description
	Staggered type 4

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



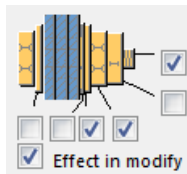
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.

Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

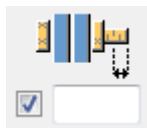
If you want to create a hole only, clear all the check boxes.





To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.


### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Bolting direction

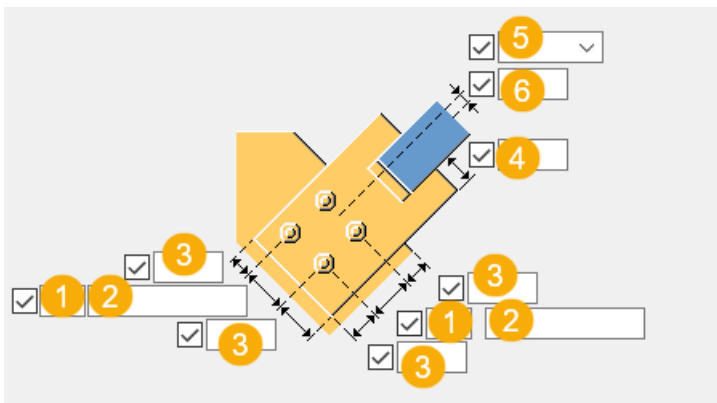
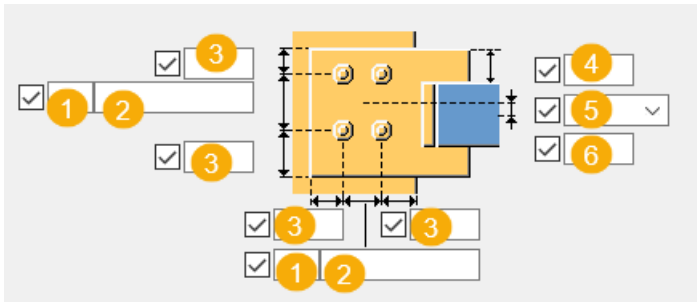
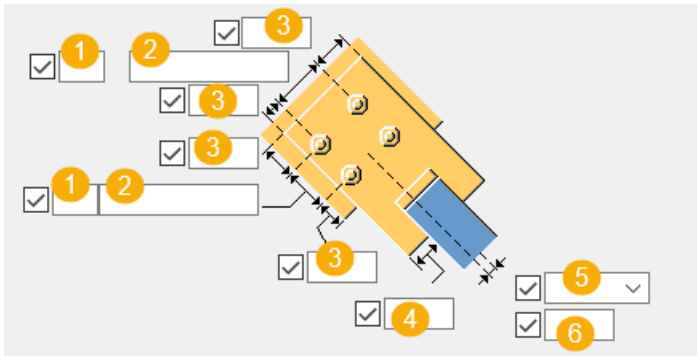
Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1

Option	Description
	Bolting direction 2

**Brace bolts 1/Brace bolts 2/Brace bolts 3 tab**

Use the **Brace bolts 1**, **Brace bolts 2** and **Brace bolts 3** tabs to control the bolts that connect the first, the second, and the subsequent braces to the gusset plate.

**Bolt group dimensions on connection plates**

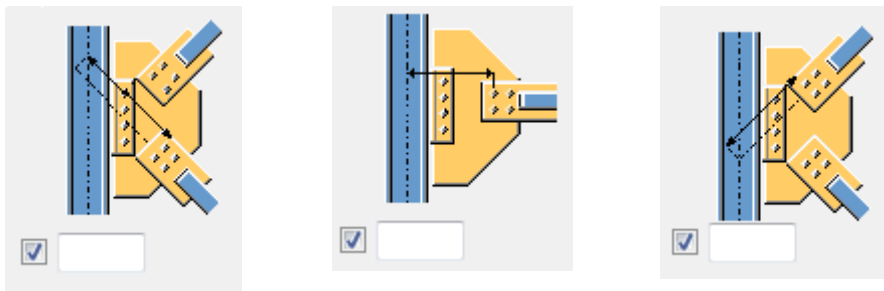


	Description
1	Number of bolts.

	Description
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Distance between the brace and the connection plate edge.
5	Select how to measure the dimensions for vertical bolt group position.
6	Dimension for vertical bolt group position.


### Bolt distance

Define the minimum distance from the connection plate bolts to the intersection point of the main part and brace center lines. If a brace is perpendicular to the main part, the distance is measured from the main part center line to the nearest bolts.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3

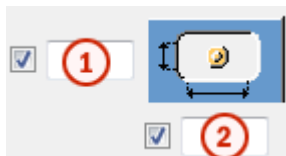
Option	Description
	Staggered type 4

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	

Option	Description	Default
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

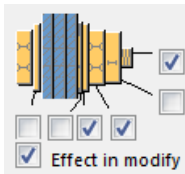
### Bolt type

Select the bolt type to define the location where the bolts should be attached.

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

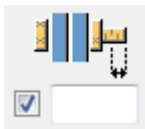
If you want to create a hole only, clear all the check boxes.





To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.


### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Bolting direction

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1

Option	Description
	Bolting direction 2

### ***Cross plates tab***

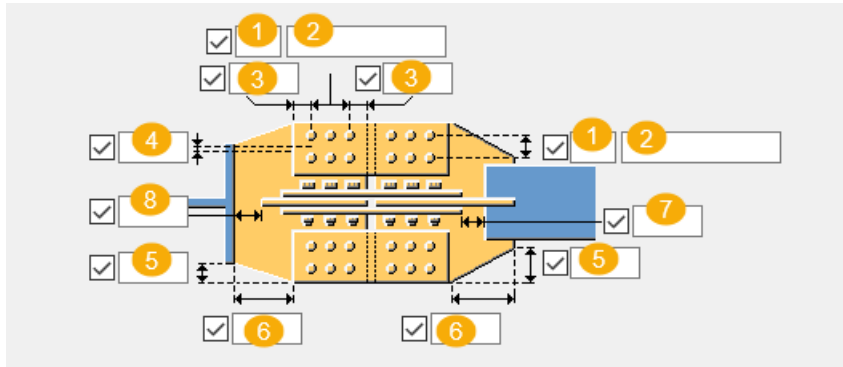
Use the **Cross plates** tab to control the cross plate and the cover plate properties and position.

### **Cross plates**

Option	Description	Default
<b>Cross plate</b>	Thickness, width and height of the cover plate.	no cross plate is created
<b>Cover plate</b>	Thickness, width and height of the cover plate.	no cover plate is created

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	




## Bolt group dimensions



	Description
1	Number of bolts.
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Dimension for the horizontal bolt group position.
5	Vertical dimension of the chamfer.
6	Horizontal dimension of the chamfer.
7	Distance between the end of the brace cap plate and the edge of the splice plate.
8	Clearance of the cross plate edge on the gusset plate from the surface of the main part.




## Cross and cover plate position

Define the position of the cross plate and the cover plate.

Option	Description
	Default Cover plate is created on both sides of the cross plate. AutoDefaults can change this option.
	Cover plate is created on top of the cross plate.
	Cover plate is created on the bottom of the cross plate.



## Bolting direction

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

[Design tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

## **Squeezed tube bolted (102)**

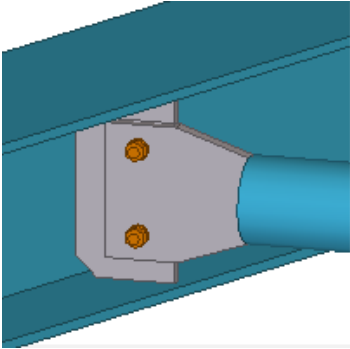
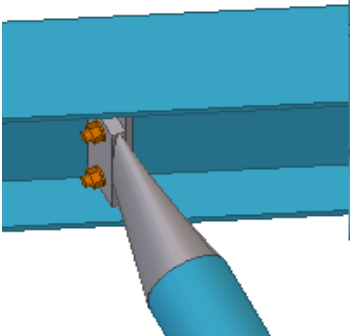
**Squeezed tube bolted (102)** creates a squeezed part between the main part and a tubular profile. The main part must be an I or H profile. The squeezed part can either be a tube that is squeezed at one end and then welded to a plate, or a contour plate.

### **Objects created**

- Squeezed tube, or reducing contour plate
- Stiffeners

- Bolts
- Welds

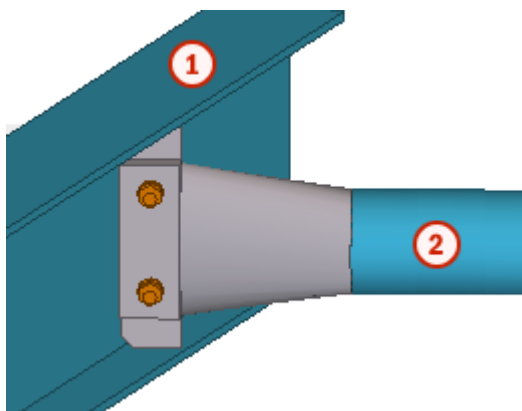
**Use for**

Situation	Description
	<p>A tubular profile is welded to a bracing which is bolted to a gusset plate. The gusset plate is welded to the main part.</p>
	<p>A simplified tensioner profile.</p>

**Selection order**

1. Select the main part (I or H profile).
2. Select the secondary part (tubular profile).  
The squeezed part is created automatically.

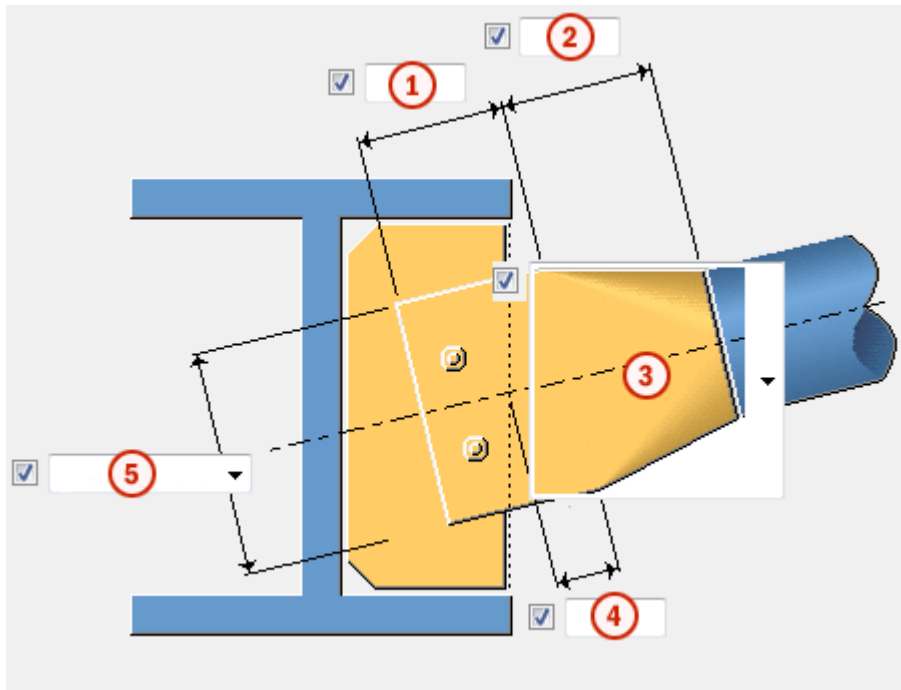
**Part identification key**



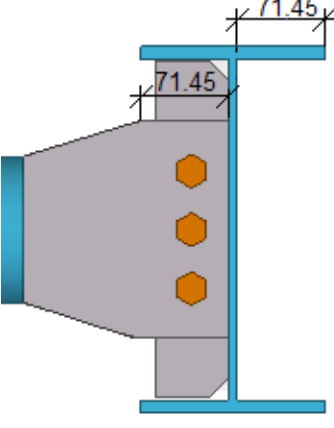
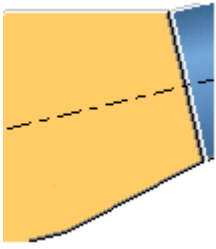
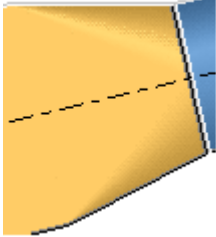
	Part
1	Main part (I profile)
2	Tubular profile

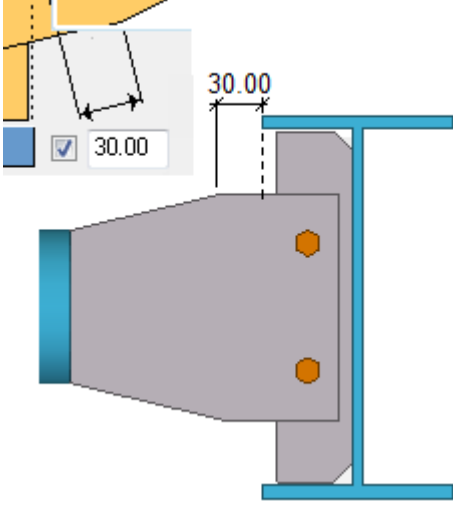
**Picture tab**

Use the **Picture** tab to control the bracing levels and offsets.



	Description	Default
1	Width of the squeezed part extension.	Depends on main part: main part width - web thickness / 2. Example:

	Description	Default
		
2	Width of the squeezed part.	120 mm
3	Select the type of the reducing part. Plate:  Squeezed tube: 	
4	Horizontal edge offset. Example:	0 mm

	Description	Default
		
5	Select how the height of the squeezed part extension is calculated.	

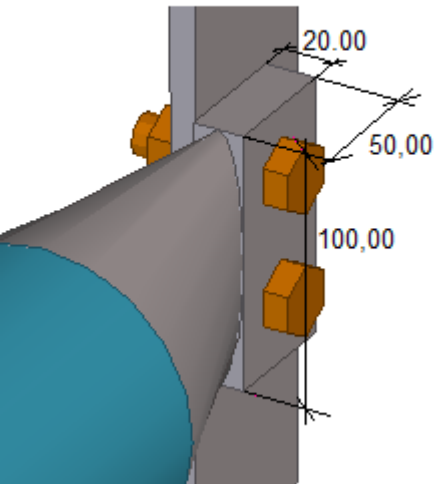
### **Parts tab**

Use the **Parts** tab to control the dimensions of the squeezed part and the stiffener properties.

### **Squeezed part**

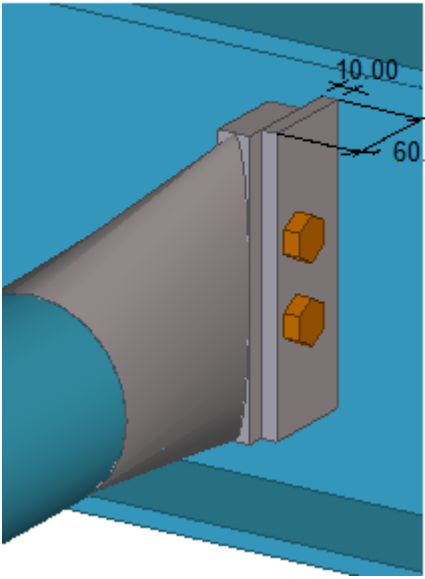
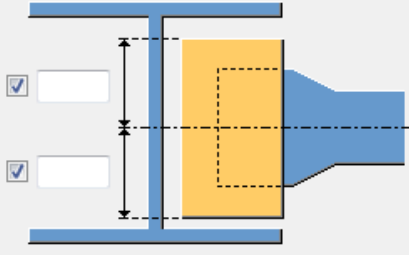
Define the dimensions and properties of the squeezed part extension.

Option	Description
<b>Squeezed part</b>	Thickness, width and height of the squeezed part extension. Example:

Option	Description								
	<div style="border: 1px solid gray; padding: 2px;"> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;"></td> <td style="width: 15%; text-align: center;">t</td> <td style="width: 15%; text-align: center;">b</td> <td style="width: 15%; text-align: center;">h</td> </tr> <tr> <td>Squeezed part <input checked="" type="checkbox"/></td> <td style="text-align: center;">20.00</td> <td style="text-align: center;">50.00</td> <td style="text-align: center;">100.00</td> </tr> </table> </div>  <p>Use the second row to define the width of the squeezed part. The width defined on the <b>Parts</b> tab overrides the width defined on the <b>Picture</b> tab.</p>		t	b	h	Squeezed part <input checked="" type="checkbox"/>	20.00	50.00	100.00
	t	b	h						
Squeezed part <input checked="" type="checkbox"/>	20.00	50.00	100.00						
<b>Parts add</b>	<p>Select whether the squeezed parts are handled as loose parts, meaning that they are not attached to any other profile in the component, or whether they are added to the secondary part.</p> <ul style="list-style-type: none"> <li>• <b>Yes</b> Squeezed parts are part added to the tubular profile.</li> <li>• <b>No</b> Squeezed parts remain loose parts.</li> </ul>								

### Stiffeners

Option	Description
<b>Stiffeners are</b>	<p>Select whether the stiffeners are created as stiffeners or as plates.</p> <ul style="list-style-type: none"> <li>• <b>Stiffeners</b> Define the stiffener dimensions on the <b>Stiffeners</b> tab.</li> </ul>

Option	Description
	<ul style="list-style-type: none"> <li>• <b>Plate stiffeners</b> Define the dimensions using the <b>Stiffener plate</b> boxes.</li> </ul>
<b>Stiffener plate</b>	<p>Define the thickness and width of the stiffener plate.</p> <hr/> <p><b>NOTE</b> You cannot define the plate height. The height is equal to squeezed part height defined on the <b>Picture</b> tab.</p> <div style="border: 1px solid gray; padding: 2px;">       Stiffener plate <input checked="" type="checkbox"/> 10.00 60.00     </div> 
	<p>Define the stiffener plate height above and below the tubular profile center line. These values only take effect if you have set the <b>Stiffeners are</b> option to <b>Plate stiffeners</b>.</p>

Option	Description	Default
<b>Pos_No</b>	<p>Prefix and start number for the part position number.</p> <p>Some components have a second row of fields where you can enter the</p>	<p>The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b>.</p>

Option	Description	Default
	assembly position number.	
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

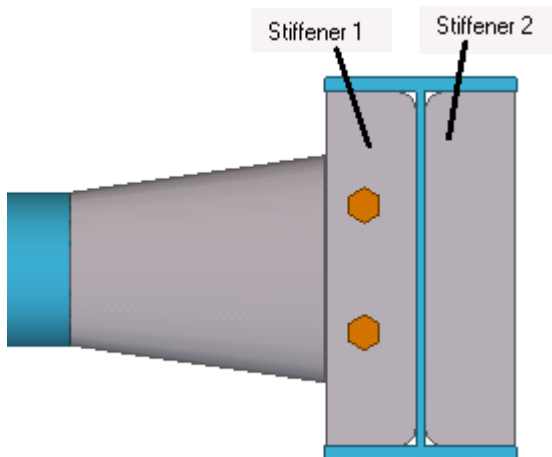
### **Stiffeners tab**

Use the **Stiffeners** tab to control the stiffener properties.

#### **Stiffener 1, Stiffener 2**

**NOTE** The options on this tab work only if you have set the **Stiffeners are** option to **Stiffeners** on the **Parts** tab.

**Stiffener 1** is the stiffener on the side of the squeezed tube. **Stiffener 2** is the stiffener on the other side of the web.



Define the thickness, width and height of the stiffeners.

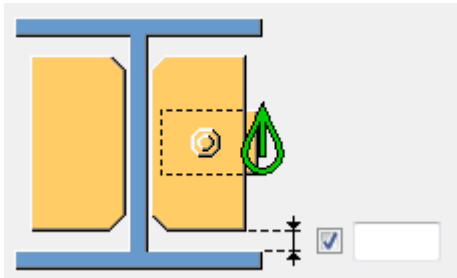
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .



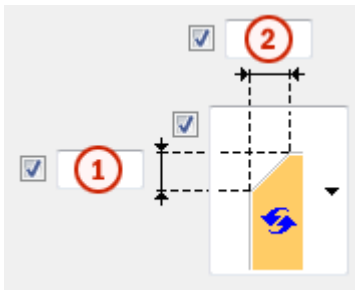
Option	Description	Default
	assembly position number.	
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Stiffener gap

Define the size of the gap between the beam flange and the stiffener.








### Chamfer dimensions



	Description
<b>1</b>	Vertical dimension of the chamfer.
<b>2</b>	Horizontal dimension of the chamfer.

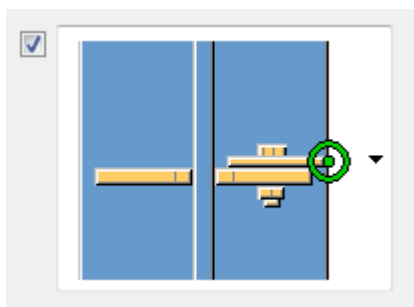
### Chamfer type

Option	Description
	Default. Line chamfer AutoDefaults can change this option.

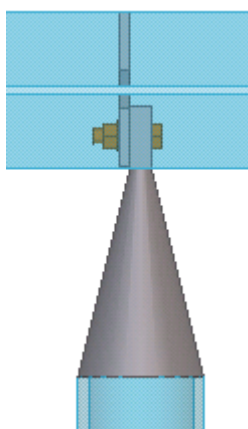
Option	Description
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### Stiffener side

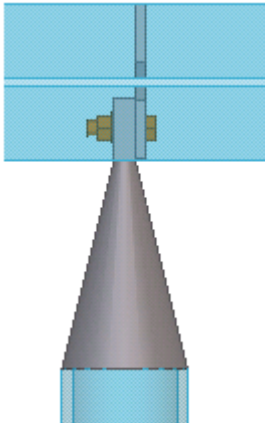
Define the side of the stiffeners.



On the left side of the squeezed part:



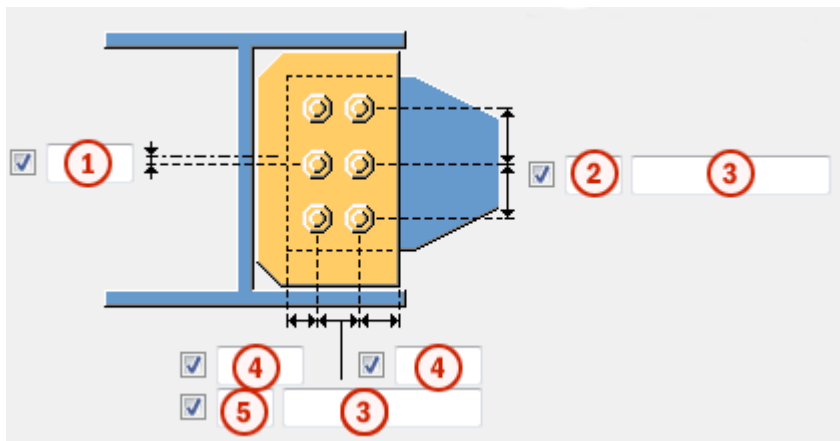
On the right side of the squeezed part:



### ***Bolts tab***






Use the **Bolts** tab to control the bolts.

### **Bolt group dimensions**



	<b>Description</b>	<b>Default</b>
<b>1</b>	Bolt vertical offset from the center line.	0 mm
<b>2</b>	Number of bolts in vertical direction.	2
<b>3</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.	
<b>4</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.	55 mm
<b>5</b>	Number of bolts in horizontal direction.	1

## Bolt group orientation

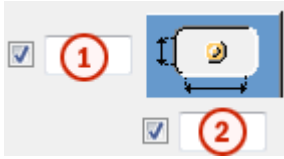
Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.

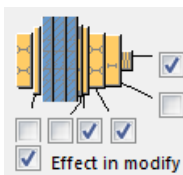


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<p><b>Slotted</b> creates slotted holes.</p> <p><b>Oversized</b> creates oversized or tapped holes.</p> <p><b>No hole</b> does not create holes.</p>	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### **General tab**

Click the link below to find out more:  
General tab

### **Analysis tab**

Click the link below to find out more:  
Analysis tab

### **Welds**

Click the link below to find out more:

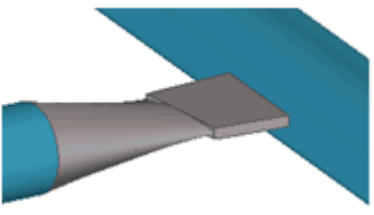

## **Squeezed tube (103)**

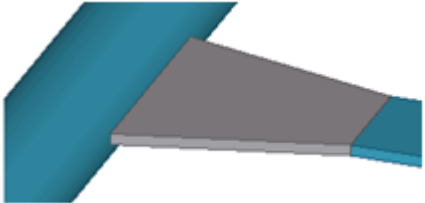
**Squeezed tube (103)** creates a squeezed part between two tube profiles. The squeezed part can be either a tube that is squeezed at one end and then welded to a plate, or a contour plate. It is also possible to define a connection where no squeezed tubes or contour plates are created, but the profiles are connected with cuts, fittings, and welds.

### **Objects created**

- Squeezed tube and/or contour plate

### **Use for**

<b>Situation</b>	<b>Description</b>
 A 3D perspective view showing a grey cylindrical tube being compressed against a blue rectangular plate. The tube is being squeezed from the left, and its right end is in contact with the plate.	Tube that is squeezed at one end and welded to a plate.
 A 3D perspective view showing a grey cylindrical tube being compressed into a circular opening. The tube is being squeezed from the right, and its left end is entering the opening.	Tube that is squeezed at one end and welded to a plate.

Situation	Description
	Contour plate.

### Selection order

1. Select the main part.
2. Select the secondary part.  
The squeezed part is created.

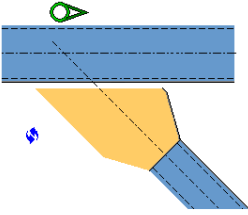
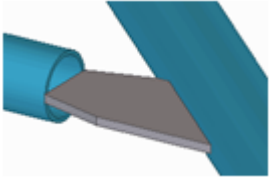
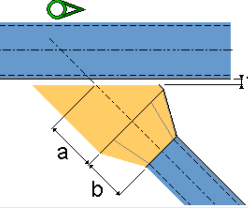

### Picture tab

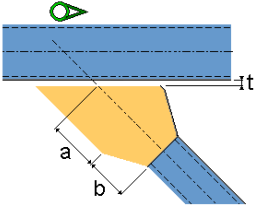
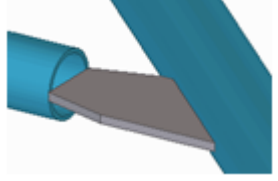
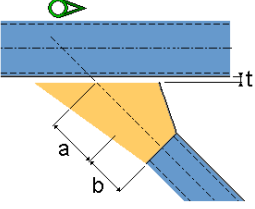

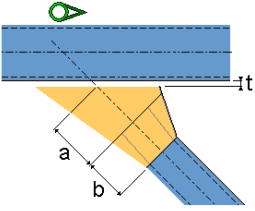
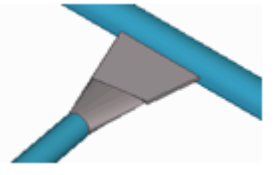
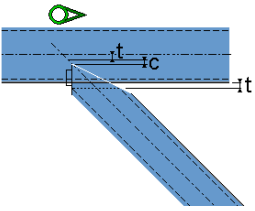
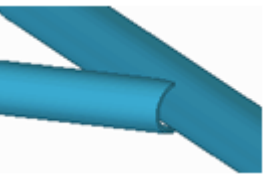
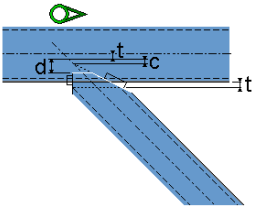
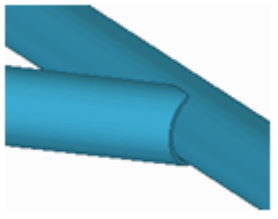
Use the **Picture** tab to define the shape and dimensions of the squeezed part, and whether the profiles are connected with a squeezed part or with cuts, fittings, or welds.

### Squeezed part

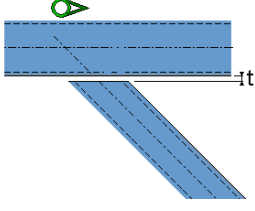
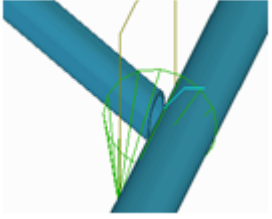
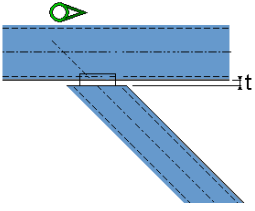
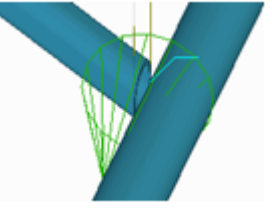
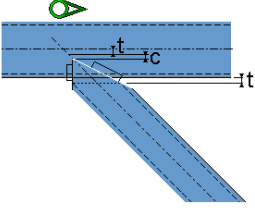
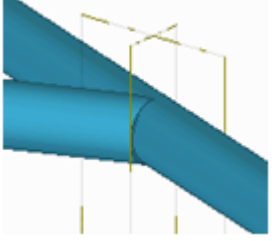
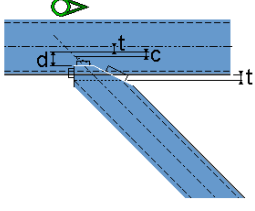
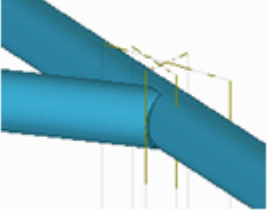
The first five options create squeezed tubes and contour plates.

The last six options do not create new parts but line cuts, fittings and welds.

Option	Description	Example
	<p>Default</p> <p>Main and secondary parts are tube profiles.</p> <p>A plate is used as a connecting profile, with one wide end and one parallel end.</p>	
	<p>A squeezed part and a contour plate are created.</p> <p>The tube profile reduces to a contour plate. You can define the length of the squeezed part using dimension <b>b</b>.</p> <p>Use dimension <b>t</b> to define the gap between the plate and the main part.</p>	

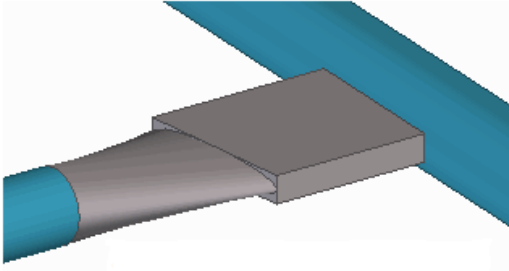
Option	Description	Example
	<p>Same as the <b>Default</b> option.</p> <p>Use dimensions <b>a</b> and <b>b</b> to define the length of the wide part and the parallel part of the plate.</p> <p>Use dimension <b>t</b> to define the gap between the plate and the main part.</p>	
	<p>Use dimensions <b>a</b> and <b>b</b> to define the plate length. The plate widens along its length.</p> <p>Use dimension <b>t</b> to define the gap between the plate and the main part.</p>	
	<p>Use dimensions <b>a</b> and <b>b</b> to define the plate length. The widening starts at the squeezed part and continues along the contour plate.</p> <p>Use dimension <b>t</b> to define the gap between the plate and the main part.</p>	
	<p>No new parts are created.</p> <p>The secondary part is adapted to the main part using a fitting and a line cut.</p> <p>Use dimension <b>c</b> to define an offset from the centerline of the main part (default value = 15 mm).</p> <p>Use dimension <b>t</b> to define the gap between the plate and the main part.</p>	
	<p>No new parts are created.</p> <p>The secondary part is adapted to the main part using a fitting and two line cuts.</p> <p>Use dimension <b>d</b> to define the distance to the center of the main part.</p> <p>Use dimension <b>t</b> to define the gap between the plate and the main part.</p>	



Option	Description	Example
	<p>No new parts are created.</p> <p>The secondary part is shortened with a fitting.</p> <p>Optionally, the secondary part can be welded to the main part.</p> <p>Use dimension <b>t</b> to define the gap between the plate and the main part.</p>	
	<p>No new parts are created.</p> <p>The secondary part is shortened with a line cut.</p> <p>Optionally, the secondary part can be welded to the main part.</p> <p>Use dimension <b>t</b> to define the gap between the plate and the main part.</p>	
	<p>No new parts are created.</p> <p>The secondary part is shortened with a line cut.</p> <p>Optionally, the secondary part can be welded to the main part.</p> <p>Use dimension <b>t</b> to define the gap between the plate and the main part.</p>	
	<p>No new parts are created.</p> <p>The secondary part is shortened with a line cut.</p> <p>Optionally, the secondary part can be welded to main part.</p> <p>Use dimension <b>t</b> to define the gap between the plate and the main part.</p>	

### Parts tab

Use the **Parts** tab to define the thickness and width of the squeezed part end.

Option	Description
<b>Squeezed part</b>	<p>Thickness and width of the squeezed part end.</p> <p>The front end of the squeezed part has the same profile as the secondary part.</p> <p>The squeezed part end and the contour plate are of the same size.</p> 

Option	Description	Default
<b>Pos_No</b>	<p>Prefix and start number for the part position number.</p> <p>Some components have a second row of fields where you can enter the assembly position number.</p>	<p>The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b>.</p>
<b>Material</b>	Material grade.	<p>The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b>.</p>
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Comment</b>	Add a comment about the part.	

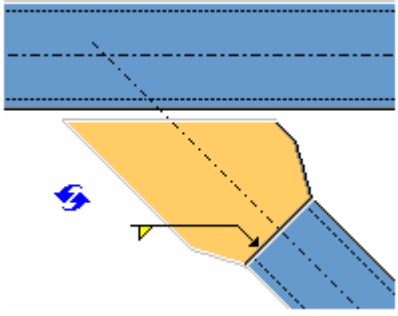
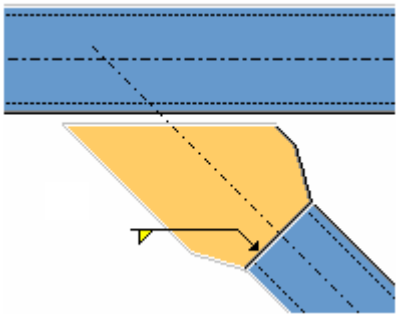
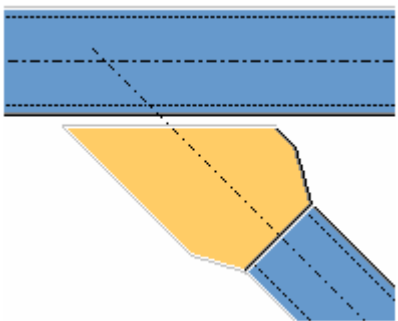
### ***Parameters tab***

Use the **Parameters** tab to define whether the secondary part is welded to the main part, whether the secondary part, the squeezed part and the contour plate are handled as a single part, and how the squeezed part is flattened.

Option	Description
<b>B squeezed part</b>	Define how the squeezed part is flattened. The options are: <ul style="list-style-type: none"> <li>• <math>((D_e - t) * \pi + t) / 2</math> (default)</li> <li>• <math>(D_e * \pi) / 2</math></li> </ul> <b>D<sub>e</sub></b> = secondary tube profile

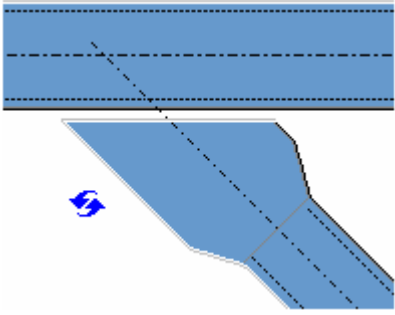
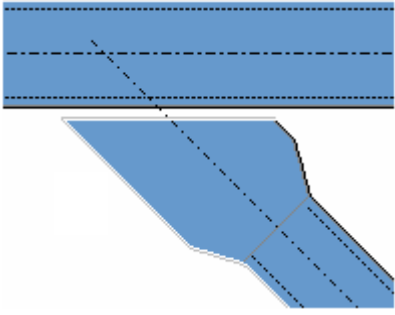
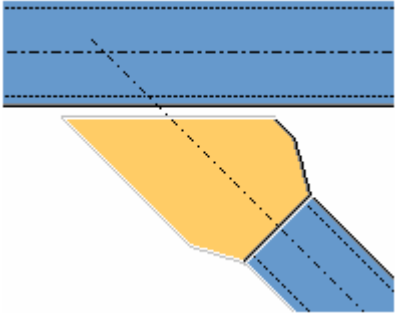
### Welding

Define whether the secondary part is welded to the main part.

Option	Description
	Default Secondary part is welded to the main part. AutoDefaults can change this option.
	Secondary part is welded to the main part.
	Secondary part is not welded to the main part.

### Part add

Define whether the secondary part, the squeezed part and the contour plate are handled as a single part.

Option	Description
	<p>Default</p> <p>Secondary part, the squeezed part and the contour plate are not handled as a single part.</p> <p>AutoDefaults can change this option.</p>
	<p>Secondary part, the squeezed part and the contour plate are not handled as a single part.</p>
	<p>Secondary part, the squeezed part and the contour plate are handled as a single part.</p> <p>The squeezed part gets the profile properties from the secondary part.</p>

### ***General tab***

Click the link below to find out more:

[General tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

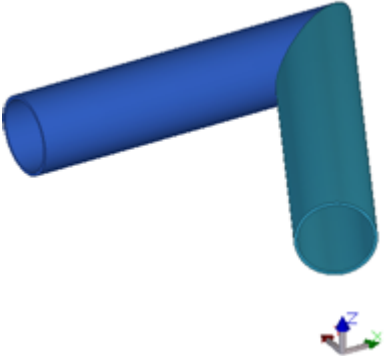
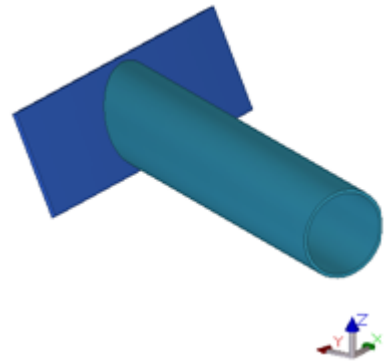
## Tube-Chamfer

**Tube-Chamfer** connects a round tube to a plate or to a round tube. If the main part is tube, the secondary tube needs to be of equal diameter. The tubes are chamfered.

### Objects created

- Cuts
- Welds

### Use for

Situation	Description
	Tube-to-tube connection.
	Tube-to-plate connection.

### Limitations

- No support for polybeams or contour plates.
- No support for non-plate profiles on the main part (for example, H/I beam or square tube)

### Selection order

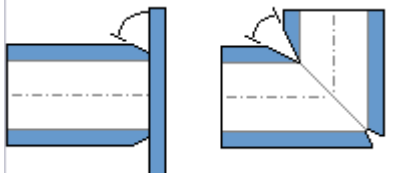

1. Select the main part (round tube or plate).

- Select the secondary part (round tube of equal diameter).  
The connection is created automatically when the secondary part is selected.

### **Parameters tab**

Use the **Parameters** tab to control the chamfers.

### **Connection options**

Option	Description
	<p><b>Chamfer</b></p> <p>Fits the secondary tube to a plate, or the main and secondary tubes along the median angle plane.</p>
	<p><b>Offshore Chamfer</b></p> <p>Creates back bevel during the tube NC file creation. No actual back bevel is created in the model.</p>

**NOTE** **Offshore Chamfer** information is used only in NC data, and no actual back bevels are created in the model.

### **Tube NC Parameters**

Option	Description
<b>Bevel angle</b>	<p>The weld preparation angle created during NC processing of the tube.</p> <p>For a tube-to-tube chamfer this option creates a bevel to both tubes, adding up to the defined angle.</p>
<b>Root opening above</b>	<p>The gap between the parts. The gap is created in the model.</p>
<b>Shrinkage</b>	<p>The shrinkage considered during NC processing of the tube. The shrinkage value has no effect on the model.</p>
<b>Maximum torch angle</b>	<p>Maximum torch angle.</p> <p>The default is 70.0.</p>
<b>Minimum torch angle</b>	<p>Minimum torch angle.</p> <p>The default is -70.0.</p>

---

**NOTE Bevel angle** information is used only in NC data, and no actual weld preparations are created in the model.

---

### ***Welding tab***

Click the link below to find out more:

### ***General tab***

Click the link below to find out more:

General tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

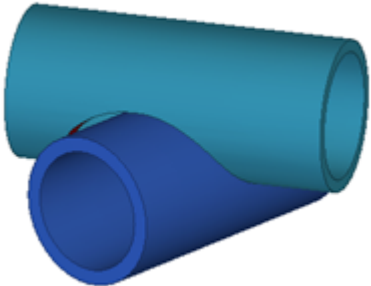
## **Tube-CrossingSaddle**

**Tube-CrossingSaddle** connects a round tube to a round tube. The connection creates a saddle cut to the secondary tube.

### **Objects created**

- Cuts
- Welds

### **Use for**

<b>Situation</b>	<b>Description</b>
	Crossing saddle connection.

## Limitations

- No support for polybeams or contour plates.

## Selection order

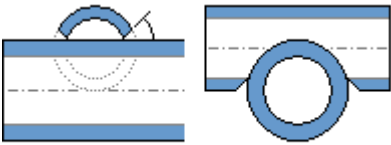
1. Select the main part (round tube).
2. Select the secondary part (round tube).

The connection is created automatically when the secondary part is selected.

## Parameters tab

Use the **Parameters** tab to control the saddle cuts.

## Connection options

Option	Description
	<b>Crossing Saddle</b> Creates a crossing saddle to the secondary part.

## Tube NC Parameters

Option	Description
<b>Bevel angle</b>	The weld preparation angle created during NC processing of the tube. The bevel is created to the secondary part.
<b>Root opening above</b>	The gap between the parts. The gap is created in the model.
<b>Shrinkage</b>	The shrinkage considered during NC processing of the tube. The shrinkage value has no effect on the model.
<b>Maximum torch angle</b>	Maximum torch angle. The default is 70.0.
<b>Minimum torch angle</b>	Minimum torch angle. The default is -70.0.

**NOTE** **Bevel angle** information is used only in NC data, and no actual weld preparations are created in the model.



### ***Welding tab***

Click the link below to find out more:

### ***General tab***

Click the link below to find out more:

General tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

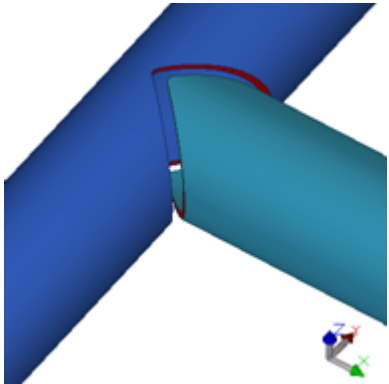
## **Tube-MitreSaddle+Hole**

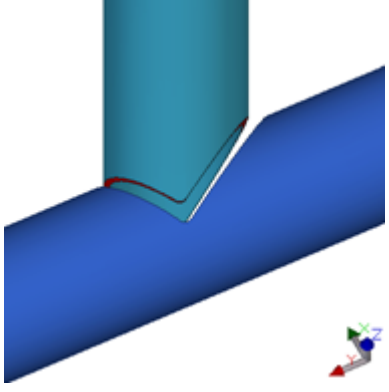
**Tube-MitreSaddle+Hole** connects a round tube to a round tube of equal diameter. The connection creates mitre holes to the main part and mitre cuts to the secondary part.

### **Objects created**

- Cuts
- Welds

### **Use for**

<b>Situation</b>	<b>Description</b>
	Mitre saddle and hole connection.

Situation	Description
	

### Limitations

- No support for polybeams.
- Parts are only cut, not fitted. Short parts or parts at a steep angle may not show correct results.

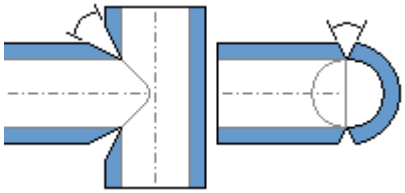
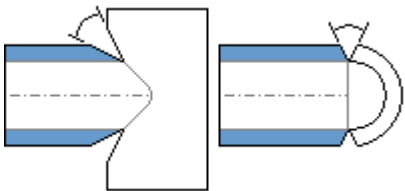
### Selection order

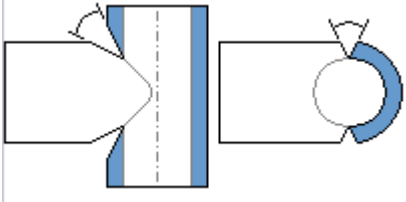
1. Select the main part (round tube).
2. Select the secondary part (round tube of equal diameter).  
The connection is created automatically when the secondary part is selected.

### Parameters tab

Use the **Parameters** tab to control the mitre holes and cuts.

### Connection options

Option	Description
	<p><b>Saddle + Hole</b></p> <p>Creates a mitre cut (double mitre) to the secondary part, and a mitre hole to the main part.</p>
	<p><b>Saddle Only</b></p> <p>Creates a mitre cut to the secondary part. No mitre hole is created to the main part.</p>

Option	Description
	<p><b>Hole Only</b></p> <p>Creates a mitre hole to the main part. No mitre saddle is created to the secondary part.</p>

### Tube NC Parameters

Option	Description
<b>Bevel angle</b>	The weld preparation angle created during NC processing of the tube.
<b>Root opening above</b>	The gap between the parts. The gap is created in the model.
<b>Shrinkage</b>	The shrinkage considered during NC processing of the tube. The shrinkage value has no effect on the model.
<b>Maximum torch angle</b>	Maximum torch angle. The default is 70.0.
<b>Minimum torch angle</b>	Minimum torch angle. The default is -70.0.

**NOTE** **Bevel angle** information is used only in NC data, and no actual weld preparations are created in the model.

### ***Weldings tab***

Click the link below to find out more:

### ***General tab***

Click the link below to find out more:

General tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

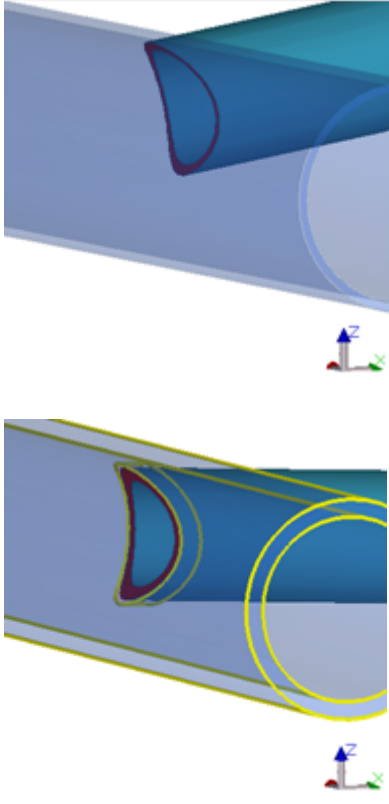
## Tube-Saddle+Hole

**Tube-Saddle+Hole** connects a round tube to a round tube of equal or smaller diameter. The connection creates holes to the main part and saddles to the secondary part.

### Objects created

- Cuts
- Welds

### Use for

Situation	Description
	Saddle connection.

### Limitations

- No support for polybeams.
- The parts are only cut, not fitted.

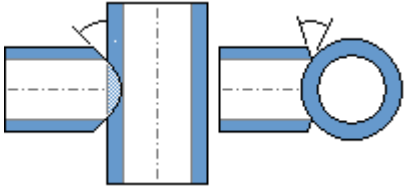
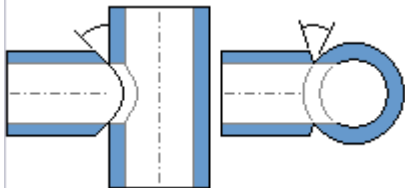
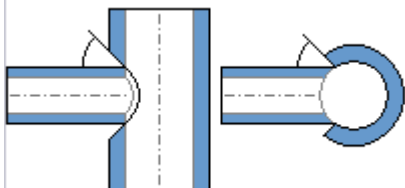
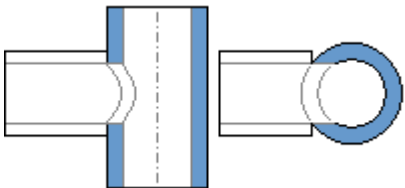
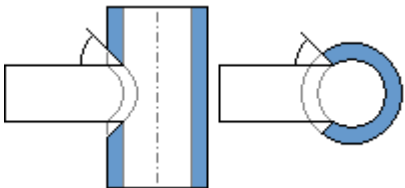
### Selection order

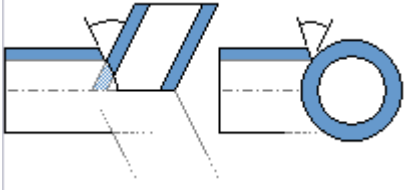

1. Select the main part (round tube).
2. Select the secondary part (round tube of equal or smaller diameter).  
The connection is created automatically when the secondary part is selected.

### Parameters tab

Use the **Parameters** tab to control the saddles and holes.

### Connection options

Option	Description
 The diagram shows a cross-section of a main part (left) and a secondary part (right). The secondary part is a ring that fits over the main part. A saddle is formed on the secondary part, fitting it to the main part. Weld preparations are shown on the secondary part.	<b>Saddle</b> Creates a standard saddle on the secondary part, fitting it to the main part. Weld preparations are created to the secondary part during NC processing.
 The diagram shows a cross-section of a main part (left) and a secondary part (right). The secondary part is a ring that fits over the main part. A saddle is formed on the secondary part, fitting it to the main part. A hole is also created in the main part, matching the inner diameter of the secondary part. Weld preparations are shown on the secondary part.	<b>Set-on Saddle+Hole</b> Creates a standard saddle on the secondary part, fitting it to the main part. Creates also a hole in the main part which matches the inner diameter of the secondary part. Weld preparations are created to the secondary part during NC processing.
 The diagram shows a cross-section of a main part (left) and a secondary part (right). The secondary part is a ring that fits into the main part. A saddle is formed on the secondary part, fitting it to the inner surface of the main part. A hole is also created in the main part, matching the outer diameter of the secondary part. Weld preparations are shown on the hole in the main part.	<b>Set-in Saddle+Hole</b> Creates a saddle on the secondary part, fitting it to the inner surface of the main part. Creates also a hole in the main part which matches the outer diameter of the secondary part. Weld preparations are created to the hole on the main part during NC processing.
 The diagram shows a cross-section of a main part (left) and a secondary part (right). The secondary part is a ring that fits over the main part. A hole is created in the main part, matching the inner diameter of the secondary part. The secondary part is not modified in any way. No weld preparations are shown.	<b>Set-on Hole Only</b> Creates a hole in the main part which matches the inner diameter of the secondary tube. The secondary part is not modified in any way. No weld preparations are created during NC processing.
 The diagram shows a cross-section of a main part (left) and a secondary part (right). The secondary part is a ring that fits into the main part. A hole is created in the main part, matching the outer diameter of the secondary part. The secondary part is not modified in any way. No weld preparations are shown.	<b>Set-in Hole Only</b> Creates a hole in the main part which matches the outer diameter of the

Option	Description
	<p>secondary part. The secondary part is not modified in any way.</p> <p>Weld preparations are created to the hole on the main part during NC processing.</p>
	<p><b>Edge Saddle</b></p> <p>Creates a partial saddle on the secondary part to a main part which only partially overlaps with the secondary part.</p> <p>Weld preparations are created to the secondary part during NC processing.</p>
	<p><b>Offshore Saddle</b></p> <p>Creates back bevel during the tube NC file creation. No actual back bevel is created in the model.</p>

**NOTE Offshore Saddle** information is used only in NC data, and no actual back bevels are created in the model.

### Tube NC Parameters

Option	Description
<b>Bevel angle</b>	The weld preparation angle created during NC processing of the tube.
<b>Root opening above</b>	The gap between the parts. The gap is created in the model.
<b>Shrinkage</b>	The shrinkage considered during NC processing of the tube. The shrinkage value has no effect on the model.
<b>Maximum torch angle</b>	Maximum torch angle. The default is 70.0.
<b>Minimum torch angle</b>	Minimum torch angle. The default is -70.0.

**NOTE Bevel angle** information is used only in NC data, and no actual weld preparations are created in the model.

### ***Welding tab***

Click the link below to find out more:

### ***General tab***

Click the link below to find out more:

General tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

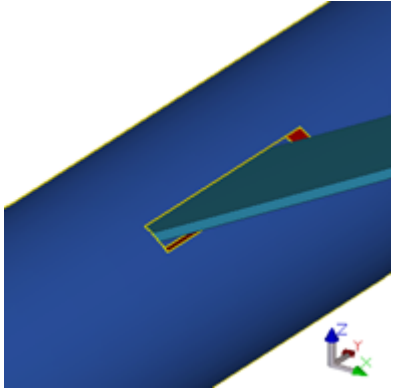
## **Tube-SlottedHole**

**Tube-SlottedHole** connects a plate to a round tube. This connection creates a slotted hole to the main part.

### **Objects created**

- Cuts
- Welds

### **Use for**

<b>Situation</b>	<b>Description</b>
	Slotted hole with a plate.

### **Limitations**

- No support for polybeams or contour plates.
- The hole is created only to one side of the main part. **Tube-SlottedHole** cannot be used for creating penetrating slots.

- Connections are not created for plates which are not parallel to the main axis of the tube.

### Selection order

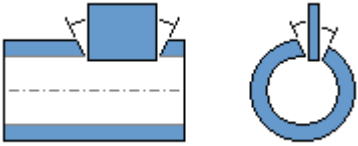
1. Select the main part (round tube).
2. Select the secondary part (plate).

The connection is created automatically when the secondary part is selected.

### Parameters tab

Use the **Parameters** tab to control the slotted holes.

### Connection options

Option	Description
	<p><b>Slotted Hole</b></p> <p>Creates a slotted hole to the main part.</p>

### Tube NC Parameters

Option	Description
<b>Bevel angle</b>	<p>The weld preparation angle created during NC processing of the tube.</p> <p>The bevel is created to the slotted hole.</p>
<b>Root opening above</b>	<p>The gap between the plate and the tube. The gap is created in the model.</p>
<b>Maximum torch angle</b>	<p>Maximum torch angle.</p> <p>The default is 70.0.</p>
<b>Minimum torch angle</b>	<p>Minimum torch angle.</p> <p>The default is -70.0.</p>

---

**NOTE** **Bevel angle** information is used only in NC data, and no actual weld preparations are created in the model.

---

### Weldings tab

Click the link below to find out more:



### **General tab**

Click the link below to find out more:  
General tab

### **Analysis tab**

Click the link below to find out more:  
Analysis tab

## **2.12 Platework**

This section introduces components that can be used in steel platework.

Click the links below to find out more:

- [Rectangle to circle \(17\) \(page 1433\)](#)
- [Triangles generation \(19\) \(page 1440\)](#)
- [Unfold surface \(21\) \(page 1449\)](#)

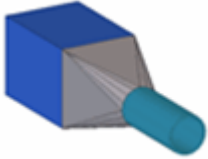
### **Rectangle to circle (17)**

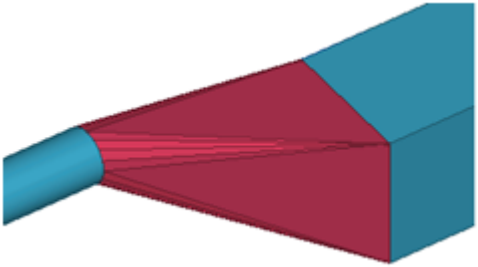
**Rectangle to circle (17)** creates a reducing piece between a rectangular profile and a circular or an elliptical profile. The reducing piece consists of several triangular plates.

#### **Objects created**

- Reducing piece

#### **Use for**

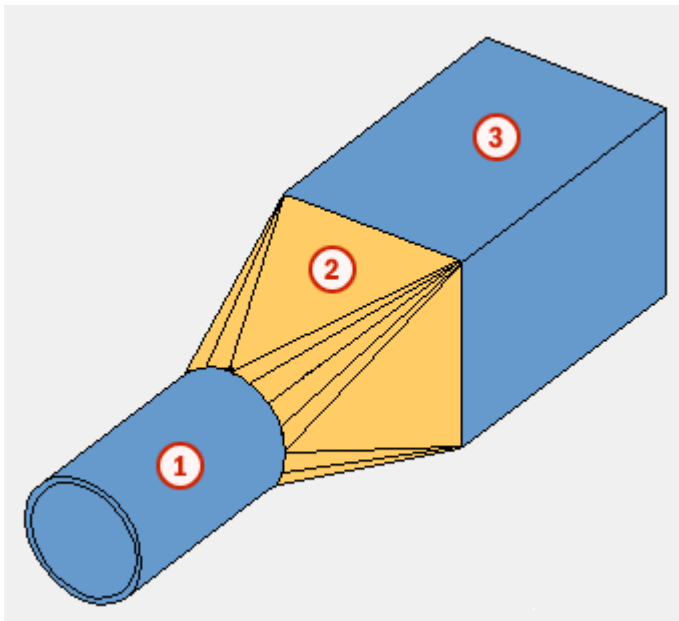
<b>Situation</b>	<b>Description</b>
	Reducing piece between rectangular and circular profile.

Situation	Description
	

**Selection order**

1. Select the main part (rectangular profile).
2. Select the secondary part (circular or elliptical profile).
3. Click the middle mouse button to create the reducing piece.

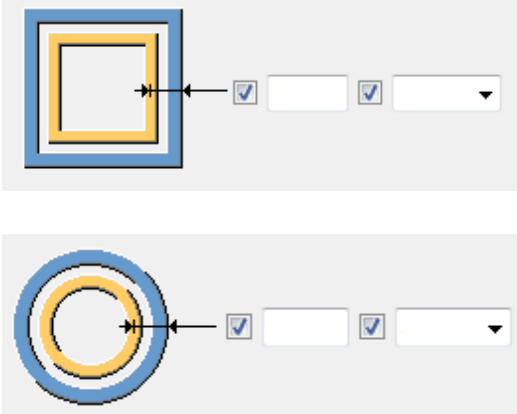
**Part identification key**



	Part
1	Circular profile
2	Reducing piece
3	Rectangular profile

**Picture tab**

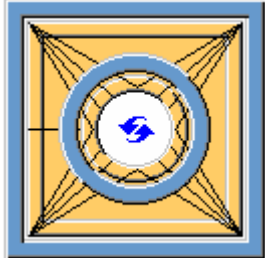
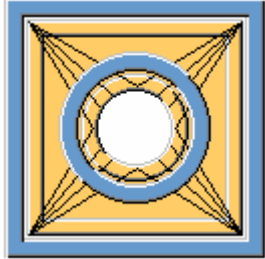
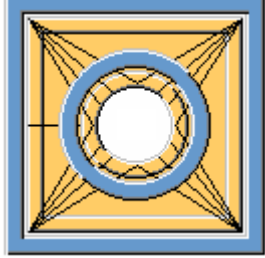
Use the **Picture** tab to define the number of parts which the reducing piece consists of, and the offset for the rectangular and circular profile end.

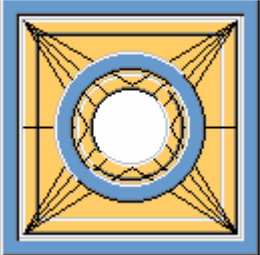
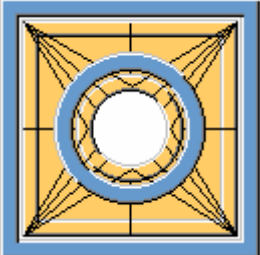
Option	Description
	<p>Define the offset for the rectangular and the circular profile end.</p> <p>The options are:</p> <ul style="list-style-type: none"> <li>• <b>Offset</b> Fixed distance.</li> <li>• <b>% x t</b> Percentage of the plate thickness.</li> </ul>

### Number of cuts

Define the number of parts which the reducing piece consists of.

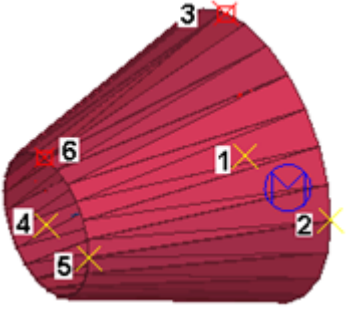
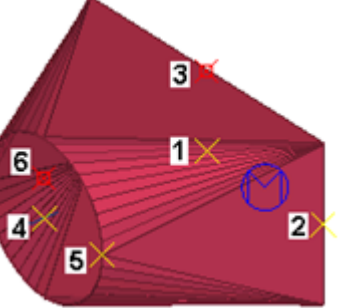
By default, there is one cut in the reducing piece.

Option	Description
	<p>Default One cut AutoDefaults can change this option.</p>
	<p>No cuts</p>
	<p>One cut</p>

Option	Description
	Two cuts
	Four cuts

### Manual creation of reducing piece

You can create the reducing piece without existing profiles by picking three points at each end of the reducing piece. The picked points define the size of the reducing piece. You can define the shape of the manually created reducing piece on the **Parameters** tab.

Option	Description
	Picking order of the points: <ul style="list-style-type: none"> <li>• center point</li> <li>• horizontal distance</li> <li>• vertical distance</li> </ul>
	

### **Parts tab**

Use the **Parts** tab to define the thickness of the triangular plates in the reducing piece and the reducing piece position.

### **Triangle**

<b>Option</b>	<b>Description</b>
<b>Triangle</b>	Triangular plate thickness.

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Comment</b>	Add a comment about the part.	

### **Position in depth**

Select the position of the plate segments. The default is **Middle**.

### **Parameters tab**

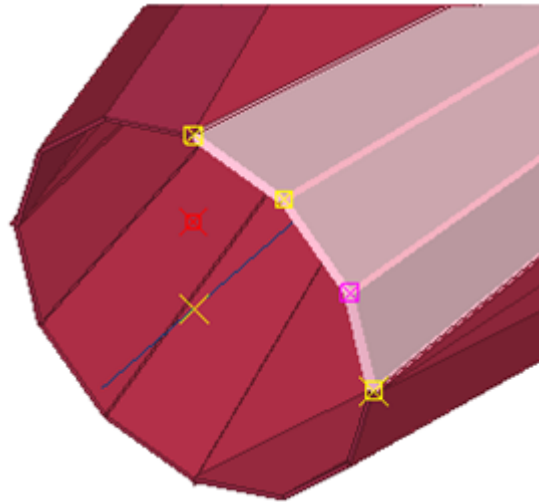
Use the **Parameters** tab to define the shape of the reducing piece end, to increase or decrease the number of triangular plates, and to define whether the triangular plates are welded.

### **Secondary segments**

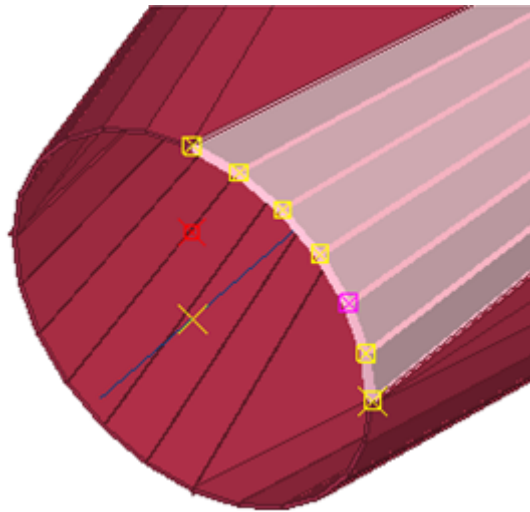
Define the number of the triangular plates in the reducing piece.

The more triangular plates are created, the more accurate is the shape of the reducing piece.

3 x 4 plates





6 x 4 plates


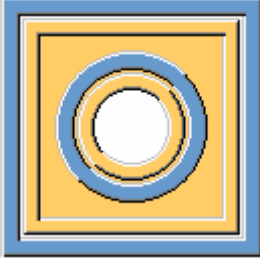
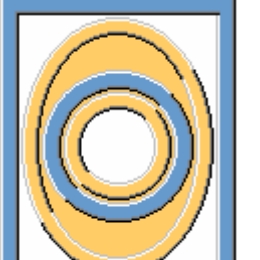
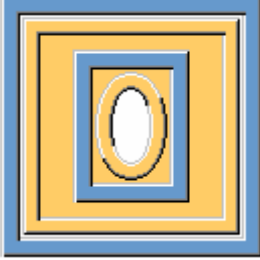
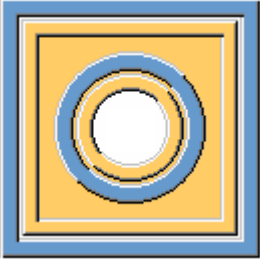
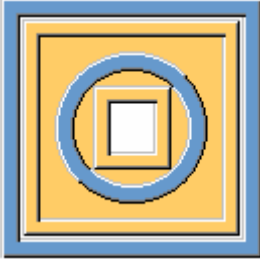


### First/second shape

Define the shape of the reducing piece end if you have manually created the reducing piece by picking points in the order shown on the **Picture** tab.

By default, the shape of the reducing piece end is circular.

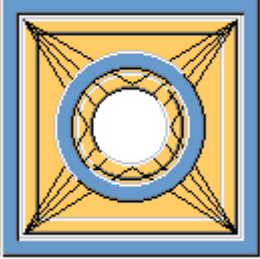
First shape	Second shape	Description
		<p>Default Circle AutoDefaults can change this option.</p>

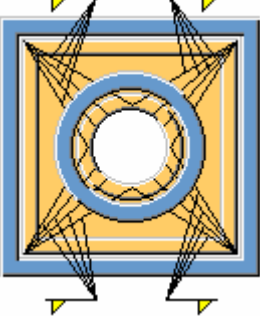
First shape	Second shape	Description
		Circle
		Ellipse This option works only if the main or secondary part has a rectangular profile.
		Rectangle

### Welding of the plates

Define whether the triangular plates are welded.

Select the **Welding** option if you later need to show the unfolded assembly of triangular plates in an assembly drawing.

Option	Description
	Plates are not welded.

Option	Description
	Plates are welded.

### **Welds**

Click the link below to find out more:

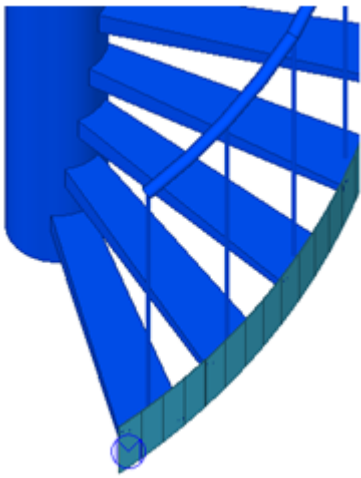
### **Triangles generation (19)**

**Triangles generation (19)** creates triangular plates, or profiles, for double-curved surfaces, for example, for spiral stair stringers. A double-curved surface is created by placing multiple flat triangular plates side by side. The triangular plates are welded together to enable unfolding of the plates. If needed, you can unfold the triangular plates using **Unfold surface (21)**.

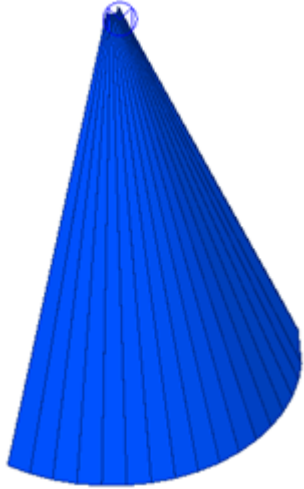
### **Object created**

- Triangular plates

### **Use for**

Situation	Description
	Curved surfaces consisting of triangular plates.



Situation	Description
	

### Before you start

Create points in the model which define the shape of the curved surface. A minimum of 8 points are needed.

Alternatively, you can define the coordinates of the points in an ASCII file, and use the file to create the triangular plates. In ASCII files, the values are separated by spaces, and the decimals in the values are separated by periods, for example:

```
0.0 0.0 0.0 6000.0 0.0 -0.0
1620.7 -2010.1 500.0 6995.1 -3159.4 500.0
```

### ASCII file example

The ASCII file for the coordinates of the points has a specific structure. A pair of coordinates is defined on each row with x-, y- and z-values.

The coordinates need to be placed at even distances from each other. Therefore, the first row contains a range of numbers that help to place the coordinates evenly.

The coordinate pairs are defined on the next rows. The first three values define the local offset (x-,y-, z-) from the first point, and the last three values define the offset from the second point.

```

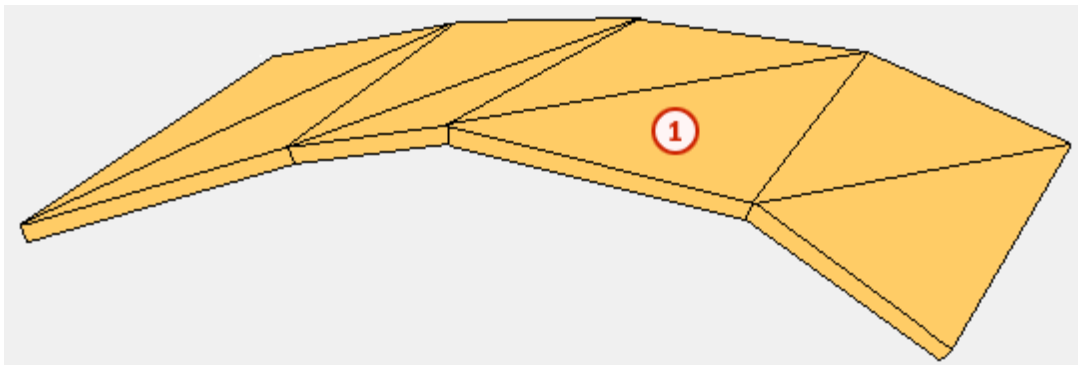
model_points_file.txt
File Edit Format View Help
01234567890123456789012345678901234567890123456789
  0.0      0.0      0.0      0.0     -1161.9    -3000.0
 12.9     1.7      0.0     313.7    -1120.6    -3000.0
 25.0     6.7     -0.0     605.9    -999.5    -3000.0
 35.4    14.6      0.0     856.9    -806.9    -3000.0
 43.3    25.0     -0.0    1049.5   -555.9    -3000.0
 48.3    37.1      0.0    1170.6   -263.7    -3000.0
 50.0    50.0      0.0    1211.9     50.0    -3000.0
 48.3    62.9      0.0    1170.6    363.7    -3000.0
 43.3    75.0      0.0    1049.5    655.9    -3000.0
 35.4    85.4      0.0     605.9    1099.5   -3000.0
 25.0    93.3      0.0     313.7    1220.6   -3000.0

```

**Selection order**

1. Pick the points in the order shown on the **Picture** tab.
2. Click the middle mouse button to create the curved surface.

**Part identification key**



	<b>Part</b>
<b>1</b>	Triangular plate

**Picture tab**

Use the **Picture** tab to define whether the plates are created according to the picked points in the model or according to the coordinates defined in an ASCII file, and to set the global displacement.

**Plate definition**

<b>Option</b>	<b>Description</b>
<b>With picked points</b>	Shape of the triangular plate by picking the points that you have previously created.


Option	Description
<b>Read points in ASCII file</b>	Shape of the triangular plate by giving the coordinates in an ASCII file.

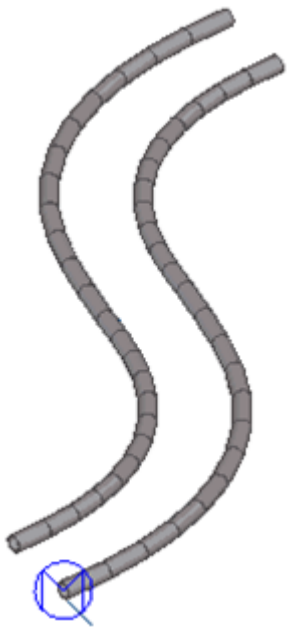
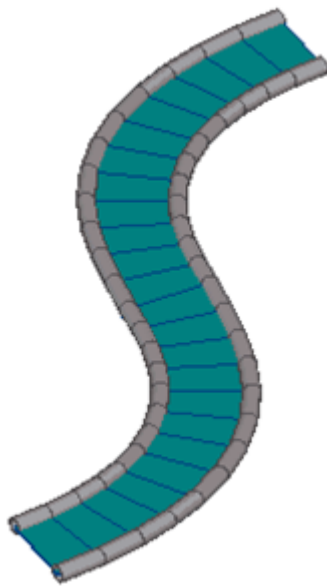
### Offset

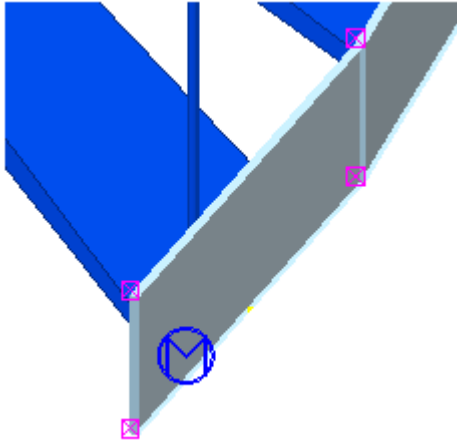
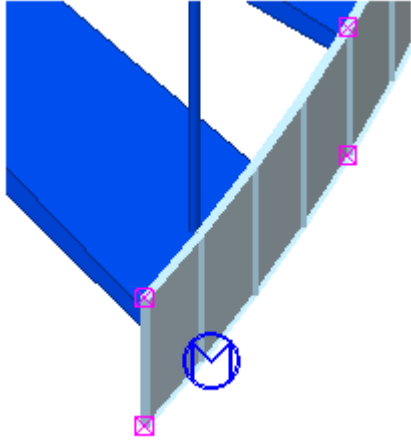
Use **Global displacement** to define an offset for the created plates or profiles in x, y and/or z direction.

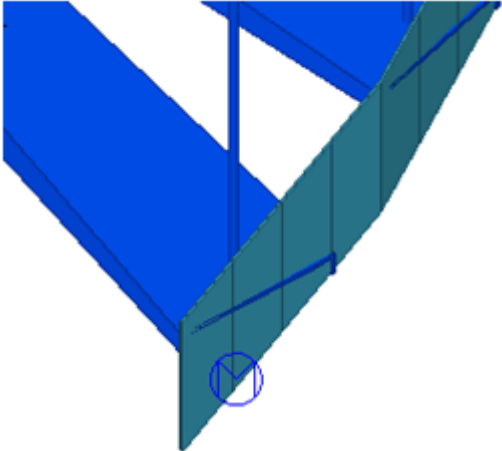

### Parameters tab

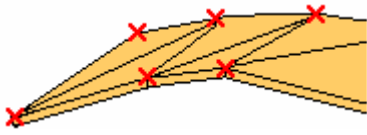



Use the **Parameters** tab to define the ASCII file, whether plates or profiles are created, and how extra points are handled.

Option	Description
<b>File name</b>	Enter the name of the ASCII file where you have defined the coordinates for the points. The file is searched from the model folder.
<b>Create plates profiles</b>	Define whether plates or profiles are created. By default, plates are created. You can define the plate properties on the <b>Plate</b> tab and the profile properties on the <b>Profile</b> tab.
	Plates are created: 

Option	Description
	<p>Profiles are created:</p> 
	<p>Plates and profiles are created:</p> 
<p><b>Number of extra points</b></p>	<p>Define whether extra points are automatically created between the picked points, or set coordinates, to smoothen the plates.</p>

Option	Description
	<p>Number of extra points: 0</p> 
	<p>Number of extra points: 3</p> 
<p><b>Method to calculate extra points</b></p>	<p>If the curved plates form an arc, define whether the arc is taken into account for extra point calculation.</p>

Option	Description
	<p>The <b>1st order</b> option does not take the arc into account for extra point calculation.</p> 
	<p>The <b>3rd order</b> option takes the arc into account, and the extra points are placed in the same arc as the original points.</p> 
	<p>The <b>Cardinal spline total length</b> option uses Cardinal spline interpolation over all points.</p>
	<p>The <b>Cardinal spline in middle</b> option uses Cardinal spline interpolation only for middle points.</p>
<p><b>Smoothness spline 0-1</b></p>	<p>Define the smoothing spline.</p>
<p><b>Coplane distance</b></p>	<p>Define the coplane distance.</p>
<p><b>Create points</b></p>	<p>Define whether points are placed on every coordinate.</p>

Option	Description
	Points are placed on every coordinate: 
	No points: 
<b>Close curve</b>	Define whether the contour is closed.
	Contour is closed: 
	Contour is not closed: 

### **Plate tab**

Use the **Plate** tab to define the plate properties and position.

Option	Description
<b>Plate</b>	Triangular plate thickness.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

### Offset

Define the position of the triangular plates relative to the picked points or the coordinates.

### Join plates

Define whether the triangular plates are attached to each other.

Select the **Welding** option if you later need to unfold the triangular plates. The triangular plates form an assembly which can be flattened by using **Unfold surface (21)**.

### Profile tab

Use the **Profile** tab to define the profile properties and position.

### Profile

Option	Description
<b>Profile</b>	Define the profile by selecting it from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

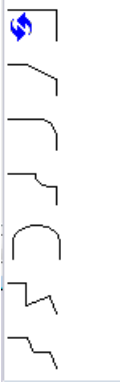
### Profile orientation

Use **Position in plane**, **Rotation** and **Position in depth** options to define the orientation of the profile.



### Chamfers tab

Use the **Chamfers** tab to define chamfers for the created triangular plates.

	Select the chamfer shape.
<b>X, Y</b>	Enter the x and y direction coordinates.
<b>Position</b>	Select the relative position for each vertex. <b>Picked points</b> are the input points of the component. <b>Extra points</b> are points that the component creates. Enter the number of extra points on the <b>Parameters</b> tab to define the fragmentation of the result surface.
<b>Angle conditions</b>	Set the angle interval for each vertex. For example, if you set $> 0$ and $< 90$ , all angles are between 0 and 90.

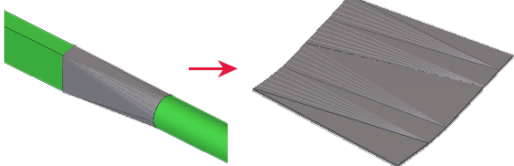
### Unfold surface (21)

**Unfold surface (21)** unfolds welded plates. The unfolded plates are created to a location that you have defined. Use **Unfold surface (21)** to unfold triangular plates created with, for example, **Triangles generation (19)**. You can also create assembly drawings from the unfolded plates.

#### Objects created

- Unfolded plates

## Use for

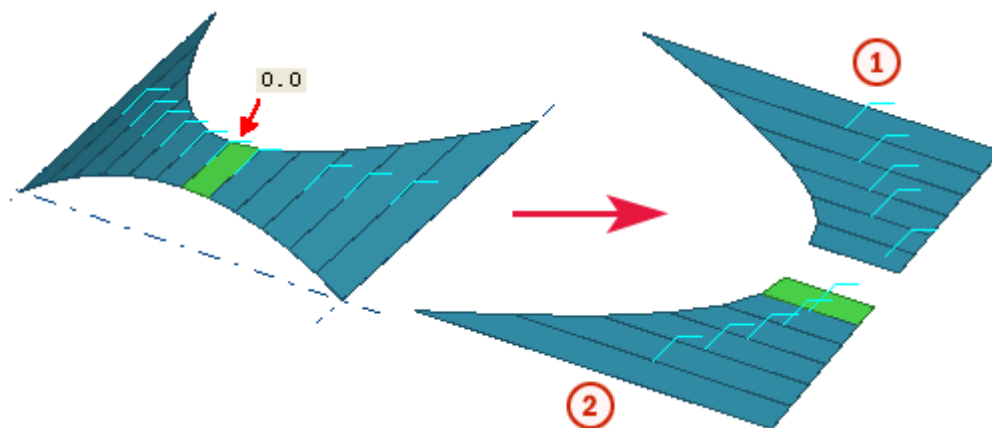
Situation	Description
	Unfolded triangular plates

## Limitations

- **Unfold surface (21)** only works with contour plates. Do not use **Unfold surface (21)** to unfold beams or polybeams.
- We recommend that you use the same position-in-depth settings for all plates.
- In some cases, an error can occur when unfolding complex surfaces that have holes. You can use the **Do not refine edges** option on the **Big plate** tab to prevent this.
- **Unfold surface (21)** preserves anti-material cuts, line cuts, and bolts. Edge chamfers are not preserved.
- The plates should be neighbors with no gaps between them.
- The plates must be welded as neighbors. Welds must not have zero size.

**NOTE** If the weld size between the triangular plates is set to 0.0, **Unfold surface (21)** unfolds only one triangular plate, not all the welded triangular plates.

If needed, you can create breaks in the unfolded shape using the weld sizes. For example, if the default weld size is 5.0, but one weld gets size 0.0, a break is created to the unfolded plate.



Option	Description
1	Unfolded form

Option	Description
2	Unfolded form

### Selection order

1. Select a location for the unfolded plate.
2. Select a triangular plate.

The unfolded plate is created to a location you have defined.

### Plates tab

Use the **Plates** tab to define the thickness of the unfolded plate and whether the properties of the triangular plates are used in the unfolded plate.

Option	Description
<b>Replace</b>	Thickness of the unfolded plate. If you do not enter any value, the thickness of the triangular plates is used.

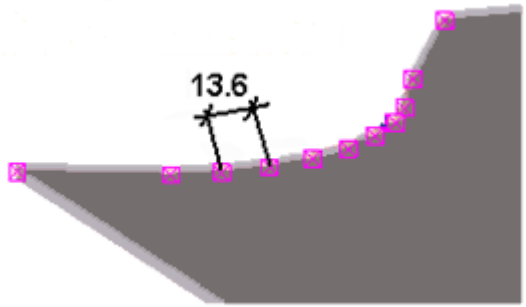
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

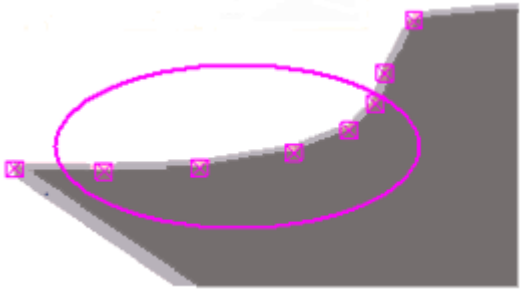
Option	Description
<b>Part to unfold</b>	Select which part to unfold: the main part or the selected part of the assembly.
<b>Zero welds</b>	Select whether to ignore the plates that are connected by zero welds or not.

Option	Description
<b>Unfolding by</b>	Select how the plates should be unfolded: <ul style="list-style-type: none"> <li>By <b>Geometry</b> - in the order in which the original plates were created.</li> <li>By <b>Welds</b> - in the way the pieces of original plates were welded together.</li> </ul>
<b>Profile</b>	Select the second column of the check boxes if you want to use the properties of the triangular plates in the unfolded plate.  If you are unfolding a plate created with <b>Rectangle to circle (17)</b> , and want to maintain the assembly position numbers defined in <b>Rectangle to circle (17)</b> , clear the second check box next to the <b>Profile</b> option.
<b>Name</b>	
<b>Material</b>	
<b>Class</b>	


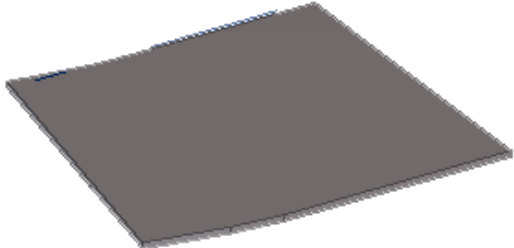
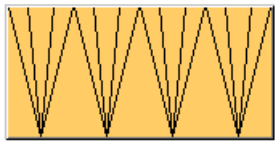
### **Big plate tab**

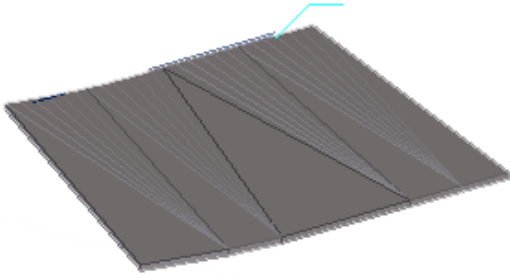
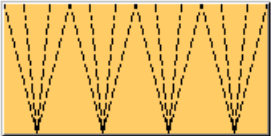
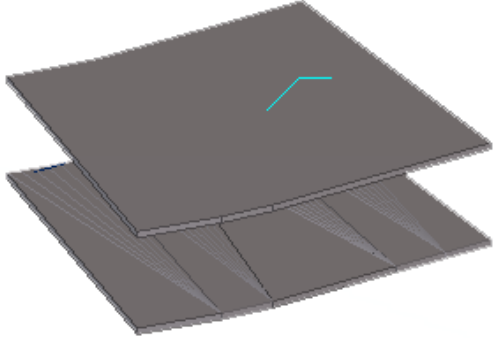
Use the **Big plate** tab to define the type and the accuracy of the unfolded plate.

Option	Description
<b>Merge points</b>	Define the accuracy of the unfolded plate by adding or removing points.  Select whether the points in the resulting unfolded plate are merged or not.
<b>Merge limit</b>	If you want to merge points, define the limit for the merging. The points that are closer to each other than the set limit are merged. <ul style="list-style-type: none"> <li>Points are not merged.</li> </ul> 

Option	Description
	<ul style="list-style-type: none"> <li>Points are merged, and the merge limit is 15.00.</li> </ul> 
<b>Attach with</b>	Select how the final plates are connected.

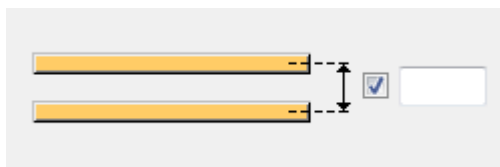
**Unfolded plate type and offset**

Option	Description
<b>Type</b>	<p><b>One plate</b></p>  <p>One plate is created.</p> 
	<p><b>Plates</b></p>  <p>Plates are welded together.</p>

Option	Description
	 <p><b>Both</b></p>  <p>Both one plate and a plate with welds are created.</p>  <p>If you select <b>Both</b>, you can define the distance between the plates using the <b>Offset</b> option.</p>

**Offset**

Define the distance between the unfolded plates.



**Do not refine edges**

This option prevents errors that may sometimes occur when unfolding complex surfaces that have holes.

### ***Parameters tab***

Use the **Parameters** tab to define the weld reference text in an assembly drawing.

#### **Text in drawings**

<b>Option</b>	<b>Description</b>
<b>Prefix</b>	First part of the text that is shown in assembly drawings, for example, Angle=.
<b>Format</b>	Format in which the size of the unfolding is displayed.
<b>Postfix</b>	Last part of the text that is shown in assembly drawings, for example, degrees.

### ***UDA tab***

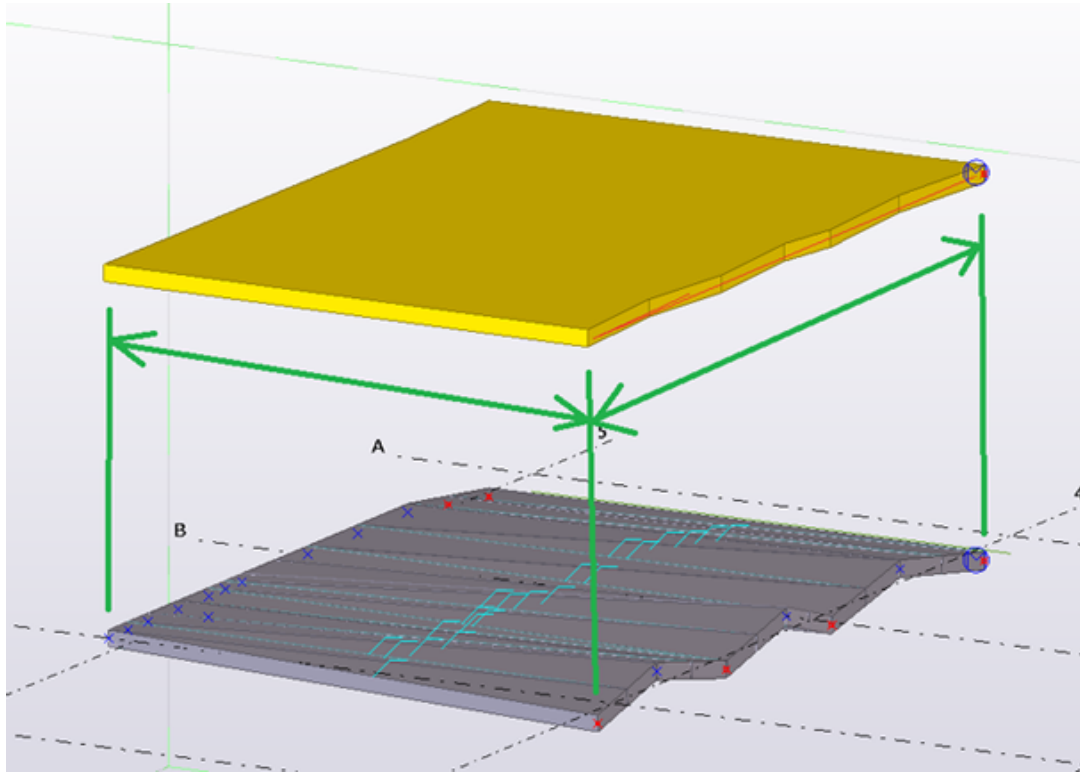
Use the **UDA** tab to copy the original numbering and user-defined attributes (UDAs) from the original plates to the unfolded plate.

<b>Option</b>	<b>Description</b>
<b>Set following parameters</b>	Copy the properties of the original plates to the UDAs of the unfolded plate. Enter the name of the UDA for each property that you want to copy.
<b>Copy following UDAs</b>	Define which UDAs are always copied from the original plates to the unfolded plate.

### ***Surrounding rectangle tab***

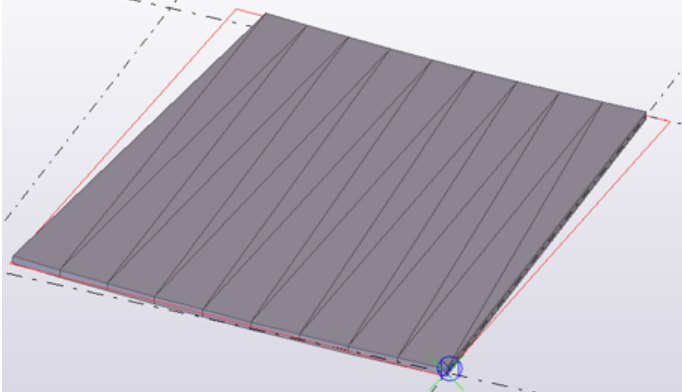
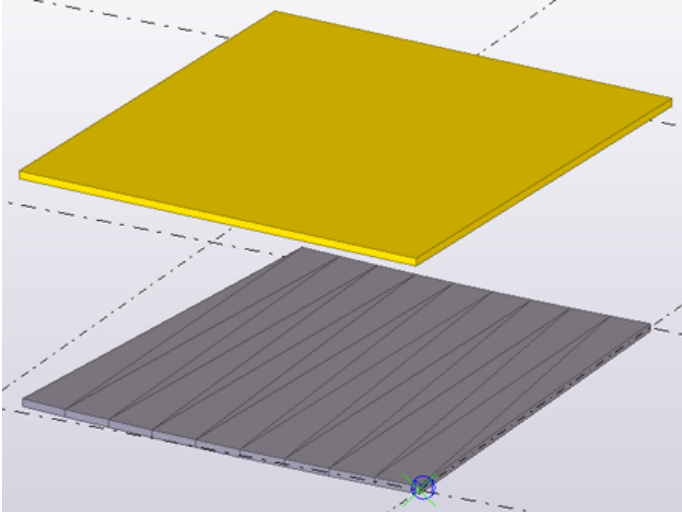
Use the **Surrounding rectangle** tab to calculate the length and width of the smallest rectangle around the unfolded area or the big plate.

The example image below shows the dimensions with green arrows.



Option	Description
<p><b>Calculate surrounding rectangle</b></p>	<p>Select one of the following:</p> <ul style="list-style-type: none"> <li>• <b>No</b> (default). Surrounding rectangle is not created. You cannot enter any user-defined attribute (UDA) value or plate properties.</li> <li>• <b>Yes</b> Enter the UDAs for length and width. The rectangle is created with the dimensions defined in the UDAs.</li> <li>• <b>Yes and create construction lines</b> Enter the UDAs for length and width. The shape of the surrounding rectangle is shown with construction lines.  Plates are unfolded by keeping the original smaller plates (mostly triangles), and with one big plate. Two rectangles are created: one around the original plates and one around the big plate.</li> </ul>



Option	Description
	 <ul style="list-style-type: none"> <li> <b>Yes and create plate</b>            Enter the UDAs for length and width, and the plate properties and the offset.            The rectangle is created as a plate. The rectangular plate has the same thickness as the unfolded plate (defined on the <b>Plates</b> tab).            Check on the <b>UDA</b> tab that you have entered the UDAs needed for the rectangular plate.         </li> </ul> 
<b>UDA to put length</b> <b>UDA to put width</b>	<p>Enter the user-defined attributes (UDA) for length and width that are used in the surrounding rectangle.</p> <p>The calculated length and width cannot be saved if you do not enter the UDAs. Note that you have to enter both UDAs to save the calculated dimensions.</p>

Option	Description
<b>Rectangular plate</b>	The rectangular plate has the same thickness, part position number, material, name and class as the unfolded plate.  Define the UDAs for the plate on the <b>UDA</b> tab.
<b>Offset</b>	Define the perpendicular offset to the unfolded plate. By default, the offset is zero.

### Rectangular plate properties

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

## 2.13 Frames

This section introduces components that can be used in steel frames.

Click the links below to find out more:

- [Truss \(S78\) \(page 1458\)](#)
- [Opening Frame \(page 1468\)](#)

### Truss (S78)

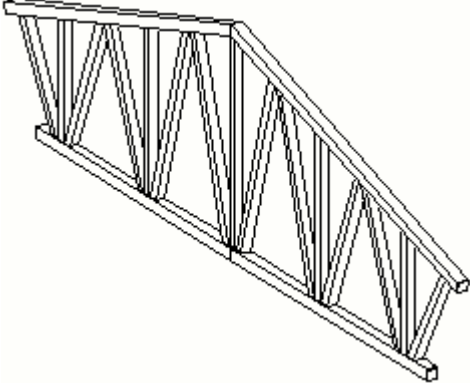
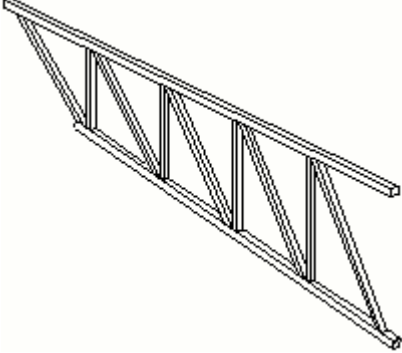
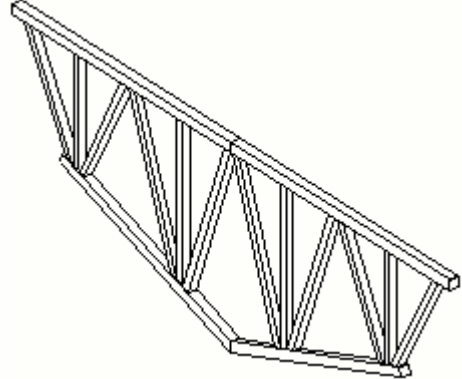
**Truss (S78)** creates a truss between selected points. **Truss (S78)** does not create any connections to existing parts.

#### Objects created

- Top chord

- Bottom chord
- Diagonals
- Verticals between diagonals
- Cap plates

**Use for**

Situation	Description
	<p>Truss with top chord, tilted bottom chord, cap plates, diagonals and verticals.</p>
	<p>Truss with top chord, bottom chord, cap plates, diagonals and verticals.</p>
	<p>Truss with top chord, bottom chord, cap plates, diagonals and verticals.</p>

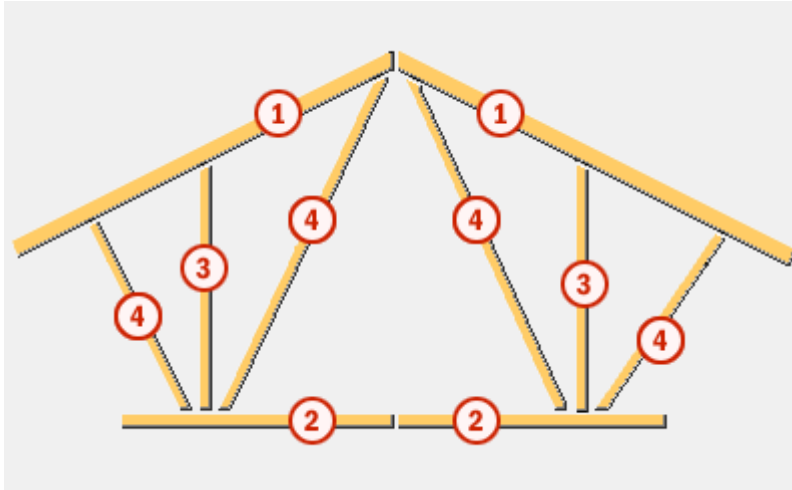
**Selection order**

1. Pick the start point of the truss.

2. Pick the end point of the truss.

The truss is created automatically when the end point is picked.

### Part identification key

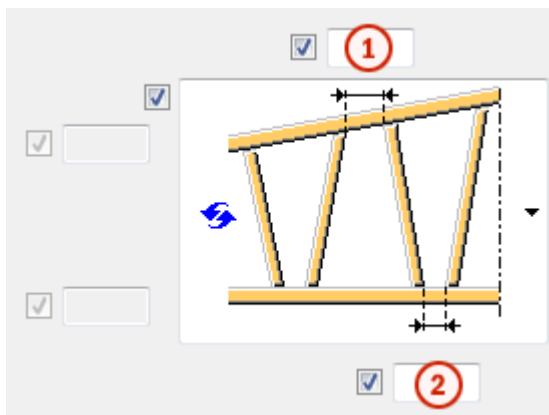


	Part
1	Top chord
2	Bottom chord
3	Vertical
4	Diagonal

### Picture tab

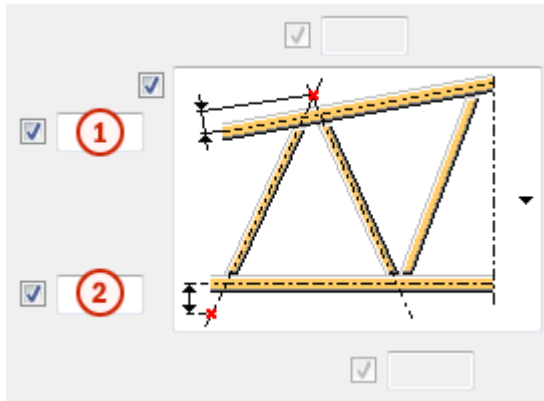
Use the **Picture** tab to control the gap created between diagonals, the eccentricity of the diagonals, and the dimensions of the parts.

### Gap dimensions



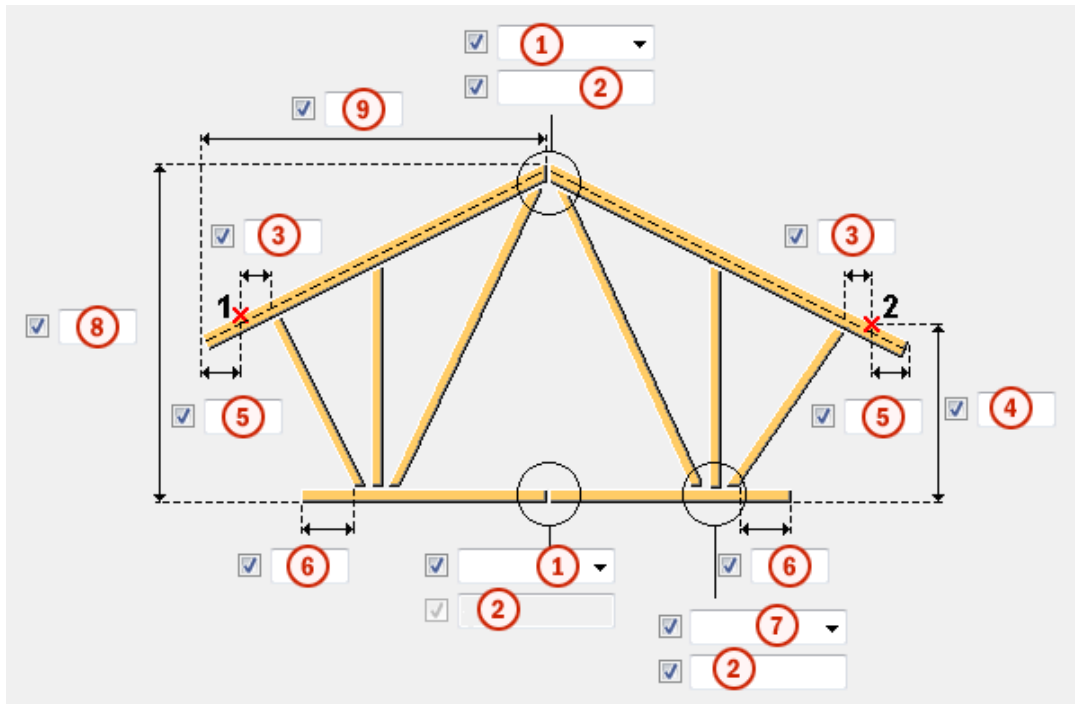
	<b>Description</b>	<b>Default</b>
<b>1</b>	Gap between the diagonals at the top chord.	20 mm
<b>2</b>	Gap between the diagonals at the bottom chord.	20 mm

### Eccentricity dimensions



	<b>Description</b>	<b>Default</b>
<b>1</b>	Eccentricity of the diagonal intersection at the top chord.	20 mm
<b>2</b>	Eccentricity of the diagonal intersection at the bottom chord.	20 mm

## Part dimensions



	Description	Default
1	Define how the top and bottom chords are connected. <ul style="list-style-type: none"> <li>• <b>Apex haunch (106)</b> Use with top and bottom chord I profiles.</li> <li>• <b>Joining plates (14)</b></li> <li>• <b>Welded</b></li> <li>• <b>Continuous</b> Creates a continuous top or bottom chord.</li> </ul>	Welded
2	Select an attribute file for the connection.	standard
3	Horizontal distance between the start/end point of the truss and the first/last diagonal.	200 mm
4	Vertical distance between the start/end point of the truss and the bottom level of the bottom chord.	1000 mm
5	Top chord extension from the start/end point of the truss.	0 mm
6	Bottom chord extension from the first and the last diagonal/vertical to the chord end.	240 mm

	Description	Default
7	Define how the chords, diagonals and verticals are connected. <ul style="list-style-type: none"> <li>• <b>Gusset plate (11)</b></li> <li>• <b>Round tube (23)</b> Used with round tube profiles.</li> <li>• <b>Welded</b></li> </ul>	Welded
8	Vertical distance between the truss apex and the bottom level of the bottom chord.	2000 mm
9	Horizontal distance between the top chord extension and the truss apex.	entire truss length/2

### Parts tab

Use the **Parts** tab to control the profiles for chords, diagonals and verticals.

### Profiles

You can define the profiles for the top and bottom chords, and up to seven profile types for the diagonals and verticals.

Use the **Diagonals** and the **Verticals** fields to define how the different profiles are created.

Option	Description	Default
<b>Top Chord</b>	Define the top chord profile by selecting it from the profile catalog.	CFRHS100*4
<b>Bottom Chord</b>	Define the bottom chord profile by selecting it from the profile catalog.	CFRHS100*4
<b>Profile 1 - Profile 7</b>	Define a profile by selecting it from the profile catalog.	CFRHS80*4

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

### Diagonals and verticals creation for left (1) and right (2) side

1	Diagonals	<input checked="" type="checkbox"/>	<input type="text"/>
2	Diagonals	<input checked="" type="checkbox"/>	<input type="text"/>
1	Verticals	<input checked="" type="checkbox"/>	<input type="text"/>
2	Verticals	<input checked="" type="checkbox"/>	<input type="text"/>

Options	Description
<b>Diagonals</b>	<p>Define how the diagonals are created using the above profiles.</p> <ul style="list-style-type: none"> <li>The diagonals are created by multiplying the number of diagonals with the type of profile, <math>number * profile</math>.</li> </ul> <p>For example, <math>2 * 3</math> creates two diagonals of the type <b>Profile 3</b>.</p> <p>For example, <math>1 * 2</math> is the same as <math>2</math>, and creates one diagonal of the type <b>Profile 2</b>.</p> <ul style="list-style-type: none"> <li>The number of diagonals results from the pattern. For example, <math>2 * 3 - 1</math> creates 4 diagonals.</li> <li>The diagonals are created from the start/end point towards the truss center.</li> </ul> <p>If you have set the <b>Truss type</b> to <b>Single pitch truss</b> on the <b>Parameters</b> tab, the second <b>Diagonals</b> row is ignored. The diagonals are created from the start point to the end point of the truss.</p>
<b>Verticals</b>	<p>Define how verticals are created using the above profiles.</p> <p>The verticals are positioned between the diagonals, and the maximum number of verticals results from the number of diagonals.</p>

### Twin profiles

Define whether the top or the bottom chord is created using twin profiles.



### Top and bottom chord type

Option	Description
└┐	Short legs up Default
┐└	Short legs down
└└	Long legs up
┐┐	Long legs down

### Diagonal and vertical type

Option	Description
└┐	Short leg up Default
┐└	Short leg down
└└	Long leg up
┐┐	Long leg down

### Clearance

Define the gap between the twin profiles.

### **Parameters tab**

Use the **Parameters** tab to control the truss assembly, and the diagonals and verticals creation.

### **Assembly main part**







Define which part is the main part in the truss assembly.

- **Left Top Chord**  
Additional welds are created between the truss and the left top chord.
- **Right Top Chord**  
Additional welds are created between the truss and the right top chord.
- **Left Bottom Chord**  
Additional welds are created between the truss and the left bottom chord.
- **Right Bottom Chord**  
Additional welds are created between the truss and the right bottom chord.
- **None**  
The assembly main part is controlled by the bolts/welds that the **Truss (S78)** creates and the connections used between the parts. If all bolts/welds

are set to **Site**, then each part (top/bottom chords, verticals, diagonals) forms an individual assembly.





### Verticals at truss end

Define whether a vertical is created to the truss ends.

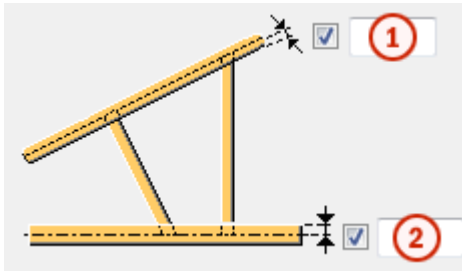
Option for start point	Option for end point	Description
		Default No vertical is created to the end. AutoDefaults can change this option.
		No vertical is created to the end.
		Vertical is created to the end.

### Middle verticals

Define whether the verticals are created between diagonals.





Option	Description
	Default No middle verticals are created. AutoDefaults can change this option.
	No middle verticals are created.
	Verticals are created between the diagonals.
	Verticals are created between the diagonals. Verticals and diagonals form an N-type truss.

## Extension for verticals and diagonals






	Description	Default
1	Extension for diagonals and verticals in the top chord.	0 mm
2	Extension for diagonals and verticals in the bottom chord.	0 mm

## Truss type

Option	Description
	Default Single pitch truss AutoDefaults can change this option.
	Single pitch truss Top chord is horizontal. Bottom chord can be sloped.
	Ridge truss If the apex and the start/end point of the truss are of equal height, the chords are horizontal.
	Upside-down ridge truss If the apex and the start/end point of the truss are of equal height, the chords are horizontal.

## Truss style

Option	Description
	Default WWW AutoDefaults can change this option.

Option	Description
	WWW The first diagonal begins from the top chord.
	AAA The first diagonal begins from the bottom chord.

### Cap plate tab







Use the **Cap Plate** tab to control the cap plate creation.

### Connection 1002 properties for cap plate

Cap plates are created using the **End plate detail (1002)** component that has a given set of properties. You can name the properties sets.

### Top and bottom chord cap plates

Define whether a cap plate is created.

Option for left side cap plates	Option for right side cap plates	Description
		Default No cap plate is created. AutoDefaults can change this option.
		No cap plate is created.
		Cap plate is created.

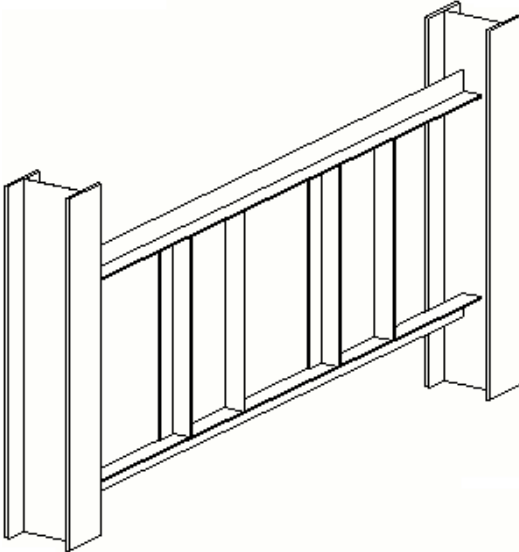
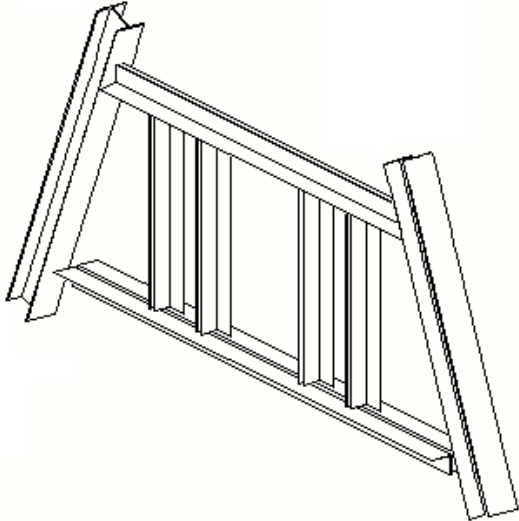
## Opening Frame

**Opening Frame** creates an open frame for wall, roof, or floor openings. The frame is created between beams or columns.

### Objects created

- Top frame
- Bottom frame
- Vertical posts
- Additional component (optional)

## Use for

Situation	Description
 A 3D perspective drawing of a steel frame. It consists of two vertical columns on the left and right. A top horizontal beam connects the top of the columns, and a bottom horizontal beam connects the bottom. Between the columns, there are two pairs of vertical posts, one pair near each column, forming an open frame structure.	Open frame between two columns with top frame, bottom frame, and two pairs of vertical posts.
 A 3D perspective drawing of a steel frame. It consists of two columns that are skewed relative to each other, one leaning towards the left and the other towards the right. A top horizontal beam connects the top of the columns, and a bottom horizontal beam connects the bottom. Between the columns, there are two pairs of vertical posts, one pair near each column, forming an open frame structure.	Open frame between two skew columns with top frame, bottom frame, and two pairs of vertical posts.

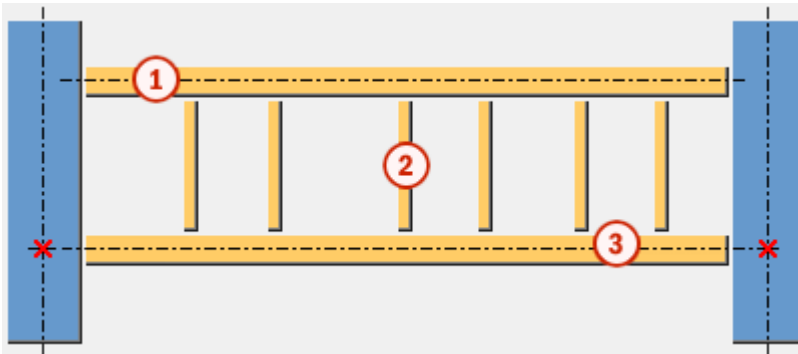
### Before you start

Create two columns or beams.

### Selection order

1. Select the main part.
2. Select the secondary part.
3. Pick the start point of the opening frame.
4. Pick the end point of the opening frame.

## Part identification key

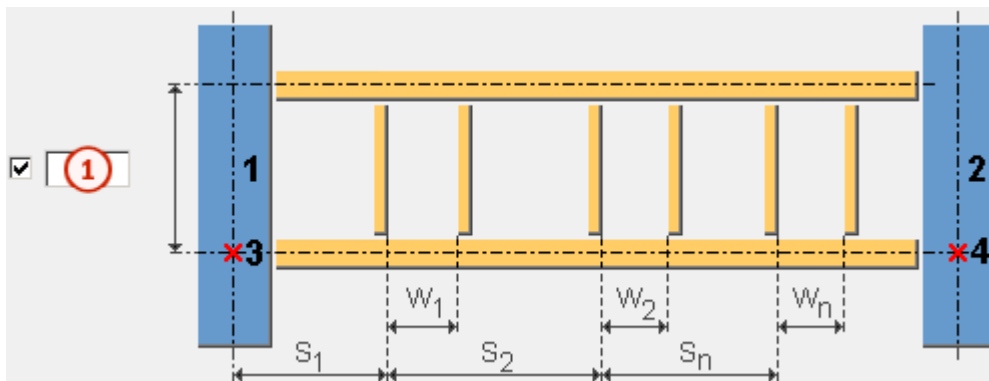


	Part
1	Top frame
2	Vertical post
3	Bottom frame

## Picture tab

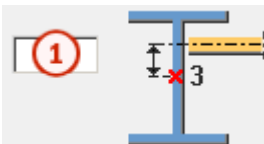
Use the **Picture** tab to control the frame position, offsets, and spacings.

### Frame distance



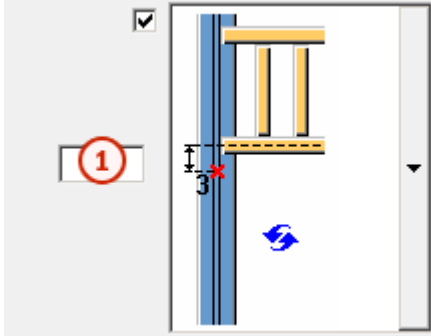
	Description	Default
1	Distance between the top and the bottom frames.	1200 mm

### Frame horizontal offset



	Description	Default
1	Horizontal offset of the frame from the start/end point.	0 mm

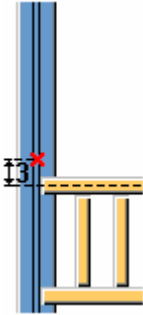
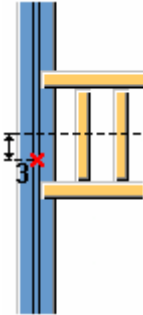
### Frame vertical offset



	Description	Default
1	Vertical offset of the frame from the start/end point.	0 mm

### Frame position




Option	Description
	Default Top AutoDefaults can change this option.
	Top

Option	Description
	Bottom
	Middle

### Frame mirroring

Mirror the frame in relation to the start point and the end point.

When the frame is mirrored, also part rotation and additional connections follow the mirroring.

Option	Description
	Default Frame is not mirrored. AutoDefaults can change this option.
	Frame is not mirrored.
	Frame is mirrored.



## Created parts

Option	Description	Default
<b>Frames to create</b>	Define whether top, bottom, or both frames are created.	Both
<b>Pairs vertical posts</b>	Define how many pairs of vertical posts are created.	3
<b>Spacing pairs (S1, S2, Sn)</b>	<p>Spacing between the pairs.</p> <p>The spacing is measured from the first vertical post inner side of the first pair to the first vertical post inner side of the second pair.</p> <ul style="list-style-type: none"> <li>• If the spacing value between the posts exceeds the bottom frame length, then only top and bottom frames are created, and a warning message is displayed.</li> <li>• If the number of spacings is greater than the number of the entered spacing values, the missing spacing values are the same as the last spacing value.</li> </ul> <p>For example, if <b>Pairs vertical posts</b> = 4 and <b>Spacing pairs</b> = 100 200, the spacing values are 100 200 200.</p>	1800 mm
<b>Spacing vertical posts (W1, W2, Wn)</b>	<p>Spacing between the vertical posts in the pairs.</p> <p>The spacing is measured from the first vertical post inner side to the</p>	500 mm

Option	Description	Default
	<p>second vertical post inner side.</p> <p>If the number of spacings is greater than the number of the entered spacing values, the missing spacing values are the same as the last spacing value.</p>	
<b>Create welds</b>	<p>Define whether welds are created.</p> <p>The options are:</p> <ul style="list-style-type: none"> <li>• <b>Posts-Frames (5)</b> Welds are created only for posts on frames.</li> <li>• <b>Columns-Frames (1-4)</b> Welds are created only for frames on column.</li> <li>• <b>All</b> All welds are created.</li> <li>• <b>No</b> No welds are created.</li> </ul>	Posts-Frames (5)

### **Parts tab**

Use the **Parts** tab to define the part properties.

### **Dimensions**

Option	Description	Default
<b>Top Frame</b>	Top frame profile by selecting it from the profile catalog.	L100*50*5
<b>Bottom Frame</b>	Bottom frame profile by selecting it from the profile catalog.	L100*50*5
<b>Vertical Posts</b>	Vertical post profiles by selecting them from the profile catalog.	L100*50*5

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

### Twin profiles








Option	Description	Default
<b>Twin profiles</b>	<ul style="list-style-type: none"> <li>• <b>No</b> Top frame, bottom frame, or vertical posts are created using single profiles.</li> <li>• <b>Yes</b> Top frame, bottom frame, or vertical posts are created using twin profiles. The twin profile is composed of the profile that you selected from the profile catalog.</li> </ul>	No

### Type





Define the profile rotation for single profiles or for twin profiles.

Options for single profile:

Option	Description
└┘	Type 1

Option	Description
	Type 2
	Type 3
	Type 4
	Type 5
	Type 6
	Type 7
	Type 8

Options for twin profile:

Option	Description
	Type 1
	Type 2
	Type 3
	Type 4

### Clearance

Option	Description	Default
<b>Clearance</b>	Clearance between the twin profiles.  You can define the clearance only if the <b>Twin Profile</b> field is set to <b>Yes</b> .	0 mm

### Position

Option	Description	Default
<b>On plane</b>	Part position on work plane.	Middle
<b>Rotation</b>	Define how much the part is rotated around its axis on the work plane.  You can define the rotation only for twin profiles. Define the rotation for single profiles in the <b>Type</b> field.	Front

Option	Description	Default
<b>At depth</b>	Part position, in terms of depth, perpendicular to the work plane.	Middle

### **Connections tab**

Use the **Connections** tab to define the properties of connection components that are created between the parts.

#### **Connection properties**

**NOTE** With twin profiles the connection is created between only one part of the twin profile, and thus the connection is not well supported. If you use connections to connect twin profiles, a warning message is displayed.

Option	Description	Default
<b>Connection number</b>	Define a connection that connects the parts by selecting it from the component catalog.  If the field is empty or set to 0, welds are created instead.	
<b>Attribute file</b>	Select an attribute file for the connection.	standard

### **Welds tab**

Click the link below to find out more:

## **2.14 Stairs**

This section introduces components that can be used in steel stairs.

- [Rail connection \(70\) \(page 1478\)](#)
- [Stairs \(S71\) \(page 1491\)](#)
- [Wooden steps pan \(S72\) \(page 1511\)](#)
- [Polybeam pan \(S73\) \(page 1525\)](#)
- [Handrail 1 \(74\) \(page 1540\)](#)
- [Z pan \(S74\) \(page 1545\)](#)

- [Kickplate \(S75\) \(page 1581\)](#)
- [Stanchions \(S76\) \(page 1589\)](#)
- [Railings \(S77\) \(page 1596\)](#)
- [Stairs \(S82\) \(page 1628\)](#)
- [Stanchion side plate \(83\) \(page 1632\)](#)
- [Multiple beam railing \(S84\) \(page 1642\)](#)
- [Stringer to channel \(127\) \(page 1647\)](#)
- [Connection plate \(1026\) \(page 1655\)](#)
- [Stair base detail \(1038\) \(page 1662\)](#)
- [Stair base detail \(1039\) \(page 1668\)](#)
- [Stair base detail \(1043\) \(page 1674\)](#)
- [Ladder \(S35\) \(page 1686\)](#)
- [Cage ladder \(S60\) \(page 1695\)](#)
- [Ship Ladder \(page 1710\)](#)
- [Wall Rails \(page 1730\)](#)

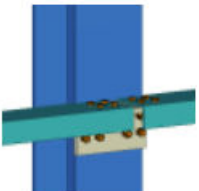
## Rail connection (70)

**Rail connection (70)** connects an existing handrail and an existing column with a clip angle with either welded or bolted connections.

### Objects created

- Clip angle
- Bolts
- Welds
- Cuts

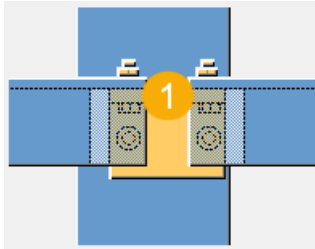
### Use for

Situation	Description
	<p>Handrail is connected to a column with bolted clip angle.</p>

### Selection order

1. Select the main part (column).
2. Select the secondary parts (handrail).
  - With continuous handrails, select the rail.
  - With spliced handrails, select the first rail and then the second rail.
3. Click the middle mouse button to create the connection.

### Part identification key

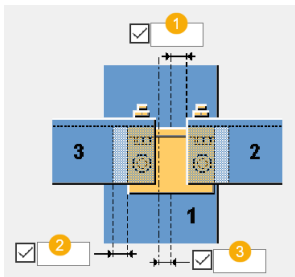


	Description
1	Clip angle

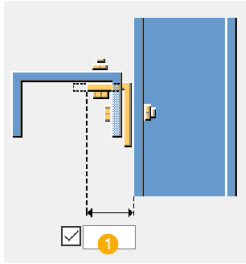
### Picture tab

Use the **Picture** tab to define the connection dimensions.

### Dimensions



	Description
1	Rail end cut back dimension.
2	Rail end clearance dimension from the clip angle.
3	Clip angle offset from the center line of the column.



	Description
1	Length of the outstanding leg of the clip angle.

### **Parts tab**

Use the **Parts** tab to define the part properties.

#### **Parts**

Option	Description
<b>Connecting profile</b>	Select the profile from the profile catalog.




Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### **Parameters tab**




Use the **Parameters** tab to define the clip angle position and attachment type.







### Clip angle location

Option	Description
	Default The clip angle is created below the handrail. AutoDefaults can change this option.
	The clip angle is created above the handrail.
	The clip angle is created below the handrail.



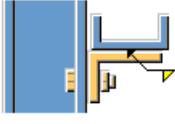
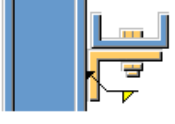
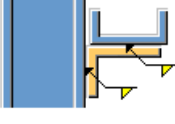
### Clip angle direction

Option	Description
	Default The clip angle is created with the vertical leg toed down. AutoDefaults can change this option.
	The clip angle is created with the vertical leg toed down.
	The clip angle is created with the vertical leg toed up.

### Outstanding leg position

	Default The long leg is positioned horizontally. AutoDefaults can change this option.
	Automatic Tekla Structures determines which way the long leg is positioned.
	The long leg is positioned horizontally.
	The long leg is positioned vertically.

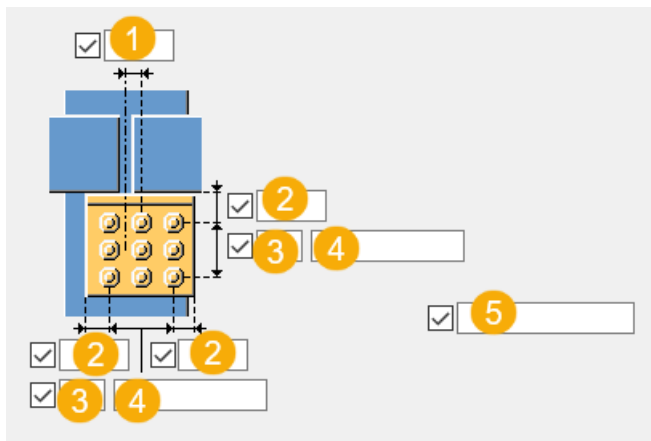
## Attachment type

Option	Description
	Default The clip angle is bolted. AutoDefaults can change this option.
	The clip angle is bolted.
	The clip angle is welded to the handrail and bolted to the column.
	The clip angle is bolted to the handrail and welded to the column.
	The clip angle is welded.

### ***Pbolts tab***

Use the **Pbolts** tab to define the properties of the bolts connecting the clip angle to the main part.

### **Bolt group dimensions**



	Description
<b>1</b>	Dimension for horizontal bolt group position.

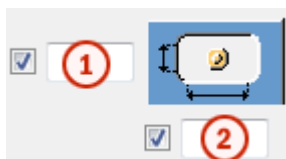
	Description
<b>2</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>3</b>	Number of bolts.
<b>4</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>5</b>	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

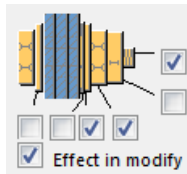


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

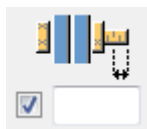
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

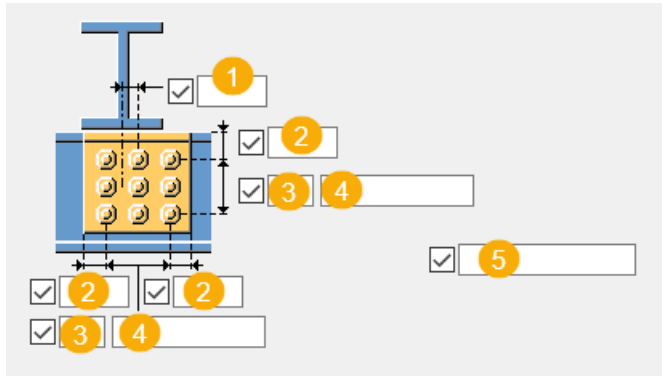
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### *Sbolts tab*

Use the **Sbolts** tab to define the properties of the bolts connecting the clip angle to the secondary part.

## Bolt group dimensions



	Description
1	Dimension for horizontal bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

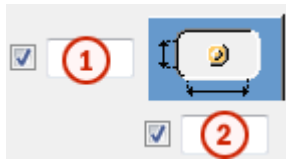
## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

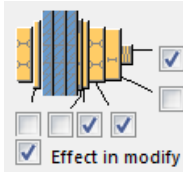


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

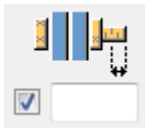
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### **Notch tab**





Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.


### **Automatic notching**

Automatic notching options affect both the top and the bottom flange.

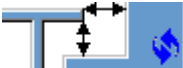

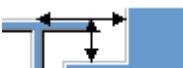
### **Notch shape**

Automatic notching is switched on when you select a notch shape.

<b>Option</b>	<b>Description</b>
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.

Option	Description
	Turns off automatic notching.




### Notch size

Option	Description
	<p>Default</p> <p>The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.</p> <p>AutoDefaults can change this option.</p>
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.





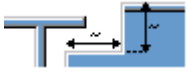
### Flange cut shape

Option	Description
	<p>Default</p> <p>Secondary beam flange is cut parallel to the main beam.</p> <p>AutoDefaults can change this option.</p>
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

### Notch dimension rounding

Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.



Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.

The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.








### Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.



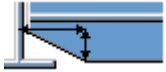



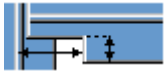
### Side of flange notch

The side of flange notch defines on which side of the beam the notches are created.

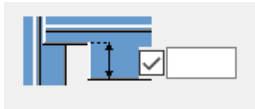
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

## Flange notch shape

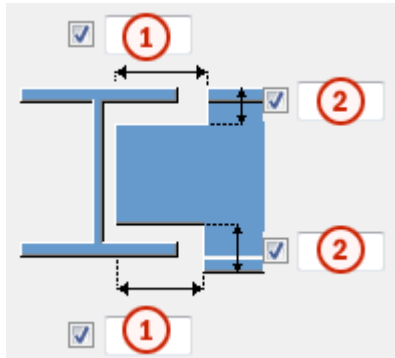
The flange notch shape defines the notch shape in the beam flange.

Option	Description
	<p>Default</p> <p>The entire flange of the secondary beam is cut as far back as you define.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.</p>
	<p>Creates chamfers in the flange.</p> <p>If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.</p>
	<p>Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b>.</p>
	<p>The flange is not cut.</p>
	<p>Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.</p>
	<p>Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b>.</p>

## Flange notch depth

Option	Description
	<p>Flange notch depth</p>

## Cut dimensions



	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### ***General tab***

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

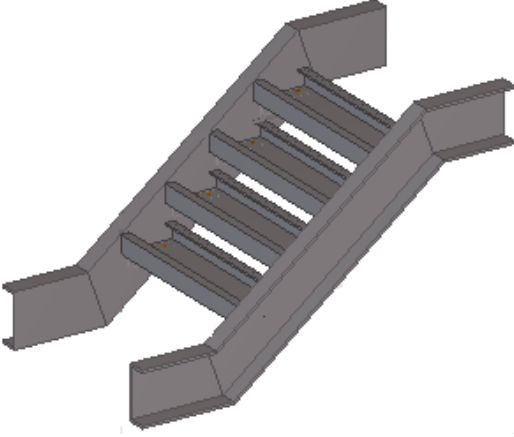
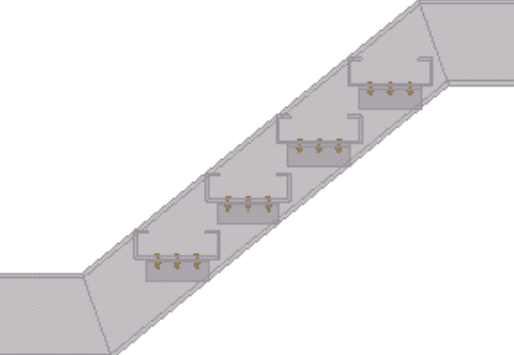
## Stairs (S71)

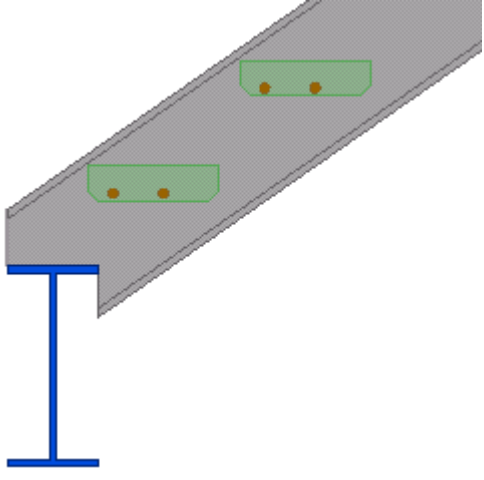
**Stairs (S71)** creates straight stairs with optional top and bottom landings. The stairs consist of stringers, possible landings and the actual steps.

### Objects created

- Stringers
- Steps
- Landings (optional)
- Brackets
- Plates (optional)
- Cuts (optional)
- Bolts
- Welds

### Use for

Situation	Description
	Stairs with horizontal top and bottom landings.
	U pan profile steps with brackets. Brackets are welded to the stringers and bolted to the steps.

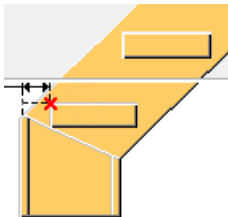
Situation	Description
	<p>Stairs with stringers notched to the supporting beam.</p> <p>Steps are catalogue steps.</p> <p>You may also use your own custom components as steps.</p>

### Before you start

If the stringers are notched, create the supporting beams before creating the stairs.

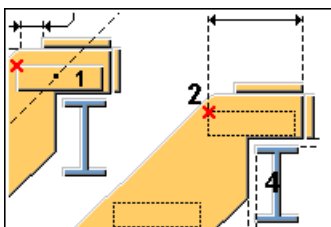
### Selection order

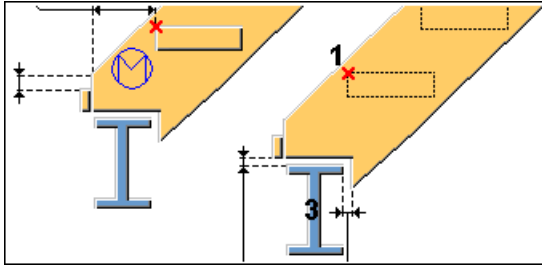
1. Pick a point to indicate the nosing point of the first step.



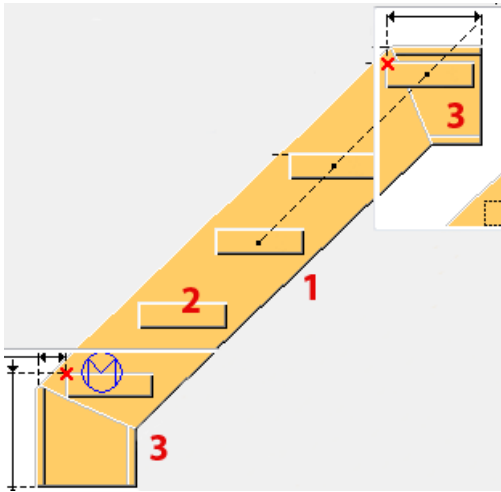
2. Pick another point to indicate the nosing point of the last step.  
Note that the order in which the points are picked has no effect.
3. Click the middle mouse button to create the stairs.

If you have selected the following notched options on the **Picture** tab, select the supporting beams and then click the middle mouse button.





### Part identification key



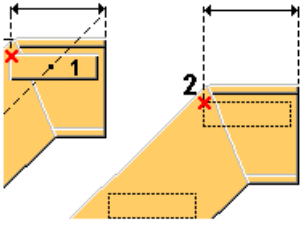
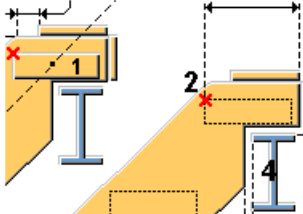
	Part
1	Stringer
2	Step
3	Landings

### Picture tab

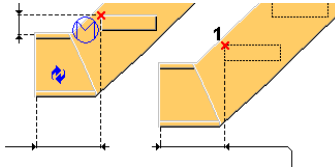
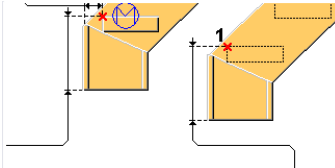
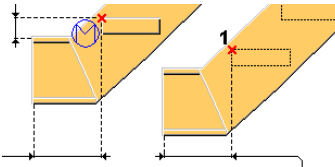
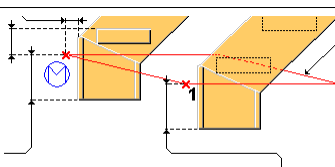
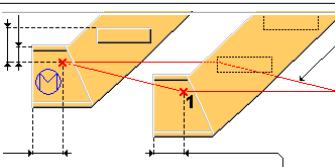
Use the **Picture** tab to control the landing types, and the shape and the location of the stringers in relation to the points you pick when creating the stairs.

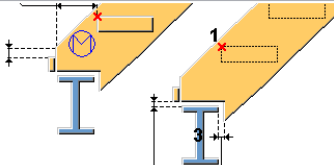
### Top landing types

Option	Description
	Default Horizontal AutoDefaults can change this option.

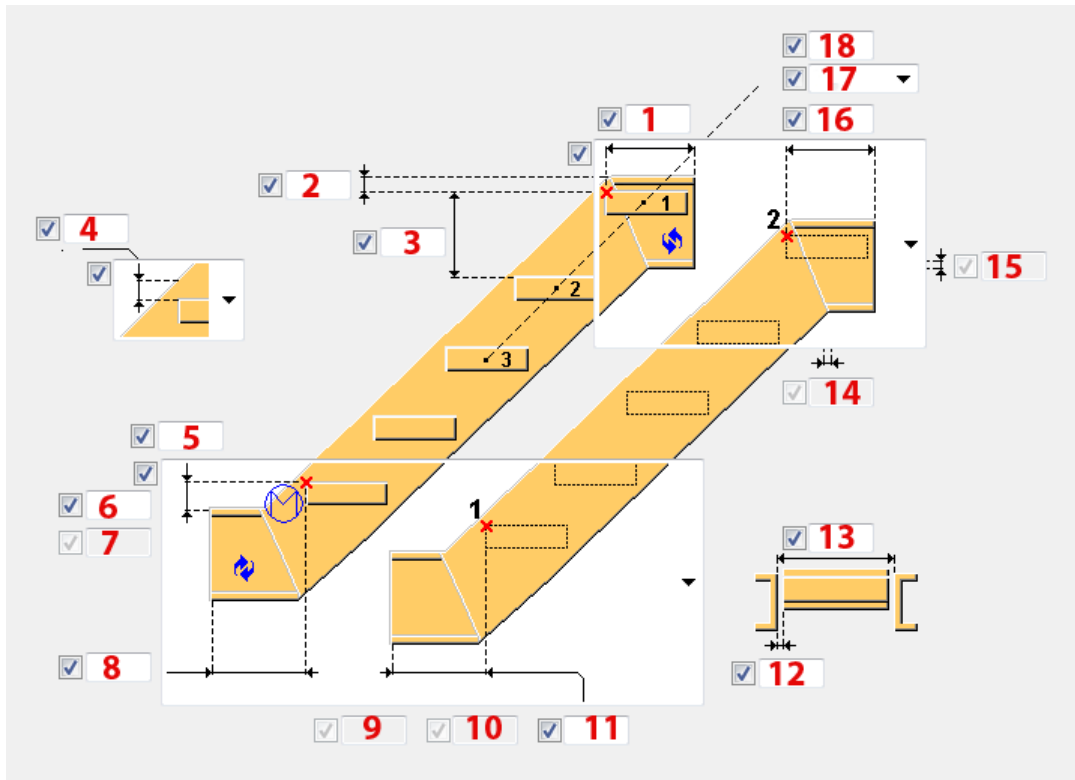
Option	Description
	Horizontal
	Notched The stringer top is on the supporting part. Vertical and horizontal plates are welded at the end of the stringer.

### Bottom landing types

Option	Description
	Default Horizontal AutoDefaults can change this option.
	Vertical Creates a vertical landing where the lower point is on the top plane of the last step.
	Horizontal Creates a horizontal landing where the lower point is on the top plane of the last step.
	Vertical lowered point Creates a vertical landing where the lower point is at the top of steel or on the floor level.
	Horizontal lowered point Creates a horizontal landing where the lower point is at the top of steel or on the floor level.

Option	Description
	<p><b>Notched</b></p> <p>Creates a notch to the bottom of the stringer. A vertical plate is welded at the end of the stringer.</p>

### Stair dimensions



	Description	Default
<b>1</b>	<p>Define the distance between the upper point and the end of the left top landing.</p> <p>If you set the value to 0 mm, the left top landing is not created.</p> <p>If you set the top landing type to notched, define the cut dimension of the horizontal plate from the stringer edge.</p>	0 mm



	Description	Default
2	<p>Define the vertical distance from the upper point to the top of steel of the top landing.</p> <p>If the top landing is not created, the stringer top of steel is used.</p> <p>If you set the top landing type to notched, define the vertical distance from the upper point to the stringer top horizontal cut.</p>	200 mm
3	<p>Define the maximum distance allowed between two consecutive steps.</p> <p>The spacing between the steps is calculated using the step spacing type <b>Exact</b> or <b>Equal</b>, and the number of steps.</p> <p>For example, if the step height should be 200 mm, the <b>Exact</b> setting creates steps of exactly this height (enter the number of steps as an integer). The <b>Equal</b> setting creates the required number of steps from the bottom to the top, with the height calculated as close to 200 mm as possible.</p>	$(Z*220) / (Z+220)$ mm, where Z is the vertical distance between the 2 picked points.
4	<p>Select the direction of the nosing dimension of the steps:</p> <ul style="list-style-type: none"> <li>• Vertical</li> <li>• Horizontal</li> <li>• Perpendicular</li> </ul> <p>Define the nosing dimension of the steps. This dimension depends on the direction you have selected.</p>	Vertical 0 mm
5	<p>Define this dimension based on the selected bottom landing type:</p> <ul style="list-style-type: none"> <li>• Horizontal or horizontal lowered point bottom landing.  Define the vertical distance from the lower point to the top of steel of the bottom landing.</li> <li>• Vertical or vertical lowered point bottom landing.  Define the horizontal distance from the lower picked point to the most distant face of the bottom landing.</li> </ul>	150 mm

	<b>Description</b>	<b>Default</b>
	<ul style="list-style-type: none"> <li>Notched bottom landing.</li> </ul> <p>Define the horizontal distance from the lower point to the stringer vertical cut. By default, the cut is made at the supporting part edge.</p>	
<b>6</b>	<p>Define the vertical dimension from the lower point to the first step.</p> <p>You can define this dimension when the step spacing type is set to <b>Equal</b> and the bottom landing type is either vertical or horizontal lowered point.</p>	Equal with vertical spacing between steps
<b>7</b>	<p>Define the cut dimension of the vertical plate from the stringer edge.</p> <p>You can define this dimension when the bottom landing type is set to notched.</p>	0 mm
<b>8</b> <b>11</b>	<p>Define this dimension based on the selected bottom landing type:</p> <ul style="list-style-type: none"> <li>Horizontal or horizontal lowered point bottom landing.</li> </ul> <p>Define the horizontal edge distance between the lower point and the bottom landing.</p> <ul style="list-style-type: none"> <li>Vertical or vertical lowered point bottom landing.</li> </ul> <p>Define the vertical edge distance between the lower point and the lowest point of the bottom landing.</p>	600 mm
<b>9</b>	<p>Define the vertical gap between the lower supporting part and the stringer cut.</p> <p>You can define this dimension when you have set the bottom landing type to notched.</p>	0 mm
<b>10</b>	<p>Define the horizontal gap between the lower supporting part and the stringer cut.</p> <p>You can define this dimension when you have set the bottom landing type to notched.</p>	0 mm
<b>12</b>	<p>Define the dimension to shorten the steps equally on both sides.</p>	0 mm
<b>13</b>	<p>Define the width of the steps.</p>	1000 mm

	<b>Description</b>	<b>Default</b>
<b>14</b>	<p>Define the horizontal gap between the upper supporting part and the stringer cut.</p> <p>You can define this dimension when you have set the top landing type to notched.</p>	0 mm
<b>15</b>	<p>Define the vertical gap between the upper supporting part and the stringer cut.</p> <p>You can define this dimension when you have set the top landing type to notched.</p>	0 mm
<b>16</b>	<p>Define this dimension based on the selected top landing type:</p> <ul style="list-style-type: none"> <li>• Horizontal top landing. Define the distance between the upper point and the end of the stringer.</li> <li>• Notched top landing. Define the horizontal distance between the upper point and the stringer vertical cut. By default the cut is made at the supporting part edge.</li> </ul> <p>If you set this dimension to 0 mm, the top landing is not created.</p>	0 mm
<b>17</b>	<p>Select the step spacing type:</p> <ul style="list-style-type: none"> <li>• <b>Exact</b> creates the steps of exactly the defined height. Enter the number of steps as an integer.</li> <li>• <b>Equal</b> creates the required number of steps from the bottom to the top, with the height calculated as close as possible to the defined step height.</li> </ul> <p>The spacing type controls how the vertical spacing between the steps is calculated.</p> <p>If you select <b>Exact</b> and set the bottom landing type to horizontal or vertical lower point, the steps are spaced from the upper point to the lower point. In all other cases the steps are spaced from the lower point to the upper point.</p>	<b>Equal</b>

	Description	Default
18	<p>Enter the number of steps.</p> <p>This option depends on step spacing type and step spacing.</p> <p>If you set the step spacing type to <b>Exact</b>, or to <b>Equal</b> and the spacing distance is not defined, <b>Stairs (S71)</b> creates the number of steps you have defined.</p>	

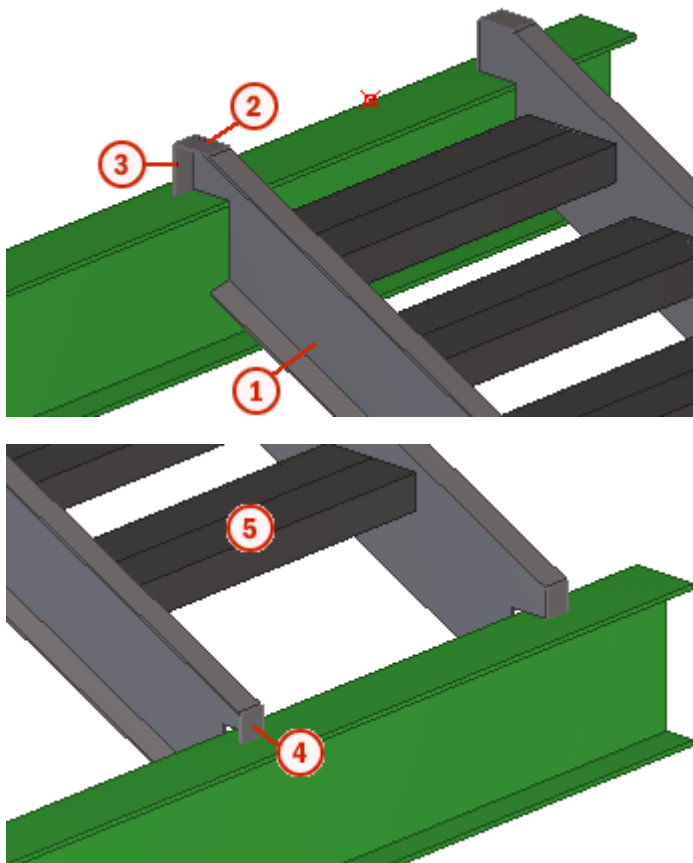
### Vertical landing offset

Define the vertical offset for the left and right horizontal landing at the top and bottom of the stringers.

### Stair set up tab

Use the **Stair setup** tab to control the part properties, top and bottom steps, position of the stairs on the horizontal plane, and rotation of stringers and steps.

### Stair part properties




	<b>Part</b>	<b>Description</b>	<b>Default</b>
<b>1</b>	<b>Left stringer</b>	Always created Select a profile from the profile catalog.	BLU400*2 The default name is STRINGER.
<b>1</b>	<b>Right stringer</b>	Always created Select a profile from the profile catalog.	BLU400*2 The default name is STRINGER.
<b>2</b>	<b>Upper H plate</b>	Created only if the top of the stringer is on the supporting beam.	6 mm The default name is PLATE.
<b>3</b>	<b>Upper V plate</b>	Created only if the top of the stringer is on the supporting beam.	6 mm The default name is PLATE.
<b>4</b>	<b>Lower V plate</b>	Created only if the bottom of the stringer is on the supporting beam.	6 mm The default name is PLATE.
<b>5</b>	<b>Catalogue step</b>	Created only if <b>Step type</b> is set to <b>Catalogue step</b> . In this case, the U-pan steps, brackets, and bolts defined on the other tabs are ignored.	First profile from the <b>Catalogue step</b> list, defined in the <code>steps.dat</code> text file in the system folder. The list changes according to the selected environment. The default name is STEP.

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

Option	Description	Default
<b>Finish</b>	Describes how the part surface has been treated.	

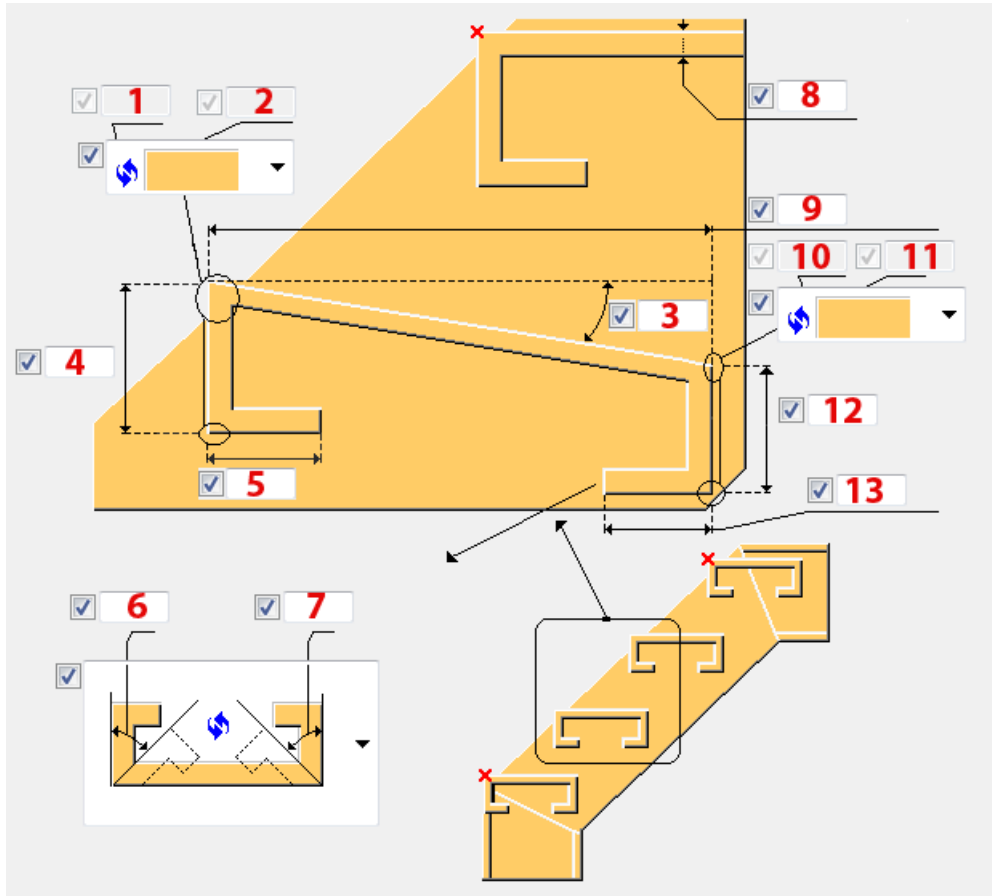
### Stair setup settings

Option	Description
<b>Step type</b>	<ul style="list-style-type: none"> <li>• <b>Steps:</b> The steps are created from the steel pan that is defined on the <b>Steps</b> tab.</li> <li>• <b>Catalogue step:</b> The steps are created from the profile defined in the <b>Catalogue step</b> option. The options on the <b>Steps</b> and <b>Bracket</b> tabs are not used.</li> </ul>
<b>Create assembly</b>	Select which parts of the stair component form an assembly. The default is stringers.
<b>Stringer reference line</b>	<ul style="list-style-type: none"> <li>• <b>Above:</b> The line positioned on the inside of the stairs on the top face is used as the reference line.</li> <li>• <b>Nosing:</b> The nosing line of the steps is used as the reference line.</li> </ul> <p>The reference line is used for workshop drawings.</p>
<b>Steps rotation</b>	Rotation of the step around its axis. The default is <b>Top</b> .
<b>Position in plane</b>	Position of the stairs. The middle line of steps is used as the reference line. The default is <b>Right</b> .
<b>Offset</b>	Offset of the stairs on the plane from the position that is set in the <b>Position in plane</b> option. The default offset is 0 mm.
<b>Bolt Type</b>	Select the bolt type for catalogue steps. If you select the <b>Workshop</b> option, the bolts are shown in workshop assembly drawings in the list of workshop bolts.
<b>Bolt tolerance</b>	Define the bolt hole tolerance for catalogue steps.
<b>Stringer rotation</b>	Rotation of the stringer around its axis. The default is top 
<b>Create top step</b>	Define whether the first step of the stairs (the highest step) is created. By default, the first step is created.
<b>Create bottom step</b>	Define whether the last step of the stairs (the lowest step) is created. By default, the last step is created.

## Steps tab

Use the **Steps** tab to control the shape and the size of U pan steps. Instead of a U pan, you can create the steps by using a catalog profile, or a custom part or component.

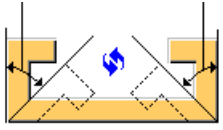
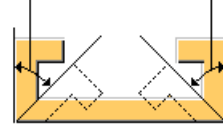
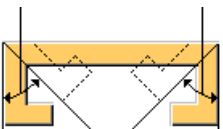

### U-pan step dimensions



	Description	Default
<b>1, 2, 10, 11</b>	Define the chamfer values on both sides of the step.  Select the chamfer type to set the shape of the front and back corner of the step.	15 mm
<b>3</b>	Define the angle of the step relative to the horizontal line.  The angle can be positive or negative.	0 degrees

	<b>Description</b>	<b>Default</b>
<b>4, 12</b>	Define the height of the step.	100 mm
<b>5, 13</b>	Define the length of the horizontal portion of the U pan.	50 mm
<b>6, 7</b>	Define the angle of the vertical portion of the step relative to the vertical line.  The angle can be positive or negative.	0 degrees
<b>8</b>	Define the thickness of the U pan step material.	10 mm
<b>9</b>	Define the width of the step.	Bracket length * 1/0.7

### Step type

<b>Option</b>	<b>Description</b>
	Default U pan legs up AutoDefaults can change this option.
	U pan legs up
	U pan legs down
	Custom Define the custom profile options.



## Custom profile

Option	Description	Default
<b>Step profile</b>	Select a profile from the profile catalog. You can select a step profile when the <b>Step type</b> is set to custom and the <b>Part name/Joint no.</b> option has not been set.	PL100*80 The default name is <code>STEP</code> .
<b>Part name/ Joint no.</b>	Select a custom part or a connection from the <b>Applications &amp; components</b> catalog.	
<b>Attribute file</b>	Select the attribute file.	standard
<b>Vertical position</b>	Select the vertical depth position of a step that is created as a custom part. If you are using a custom connection, this option is not used.	Middle
<b>Horizontal position</b>	Select the horizontal on plane position of a step that is created as custom part. If you are using a custom connection, this option is not used.	Middle

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
	assembly position number.	
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

### **Bracket tab**

Use the **Bracket** tab to set up brackets, and the connection between the brackets and the steps, and the brackets and the stringers. The brackets support the angle profiles under the steps.

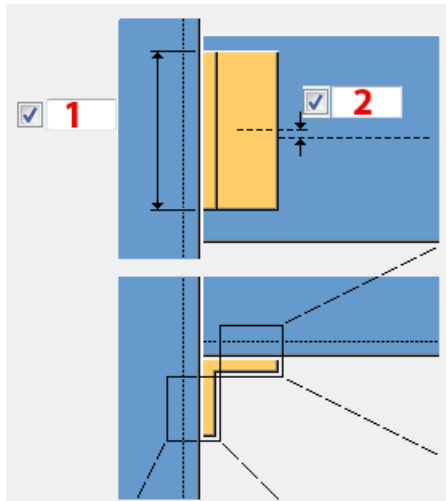
### **Bracket**

Part	Description	Default
<b>L profile</b>	To create an L profile, select a profile from the profile catalog.	BLL80*80*10 The default name is L_Profile.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

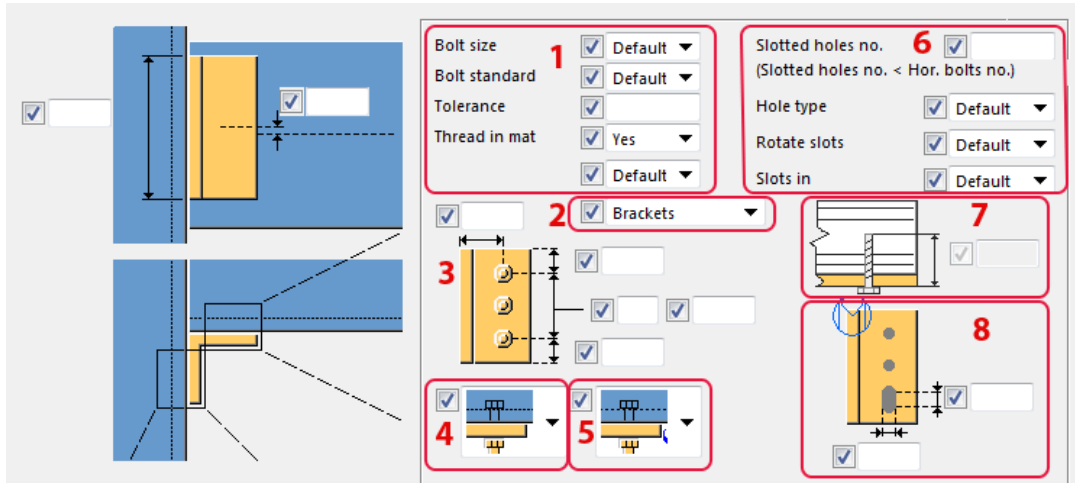
### Bracket dimensions








	Description
<b>1</b>	Define the length of the bracket. The default length is calculated according to the bracket-to-step or bracket-to-stringer bolt dimensions, depending on which are bigger.
<b>2</b>	Define the bracket offset dimension from the center line of the step. The default is 0 mm.

### Bracket-to-step connection

Define the properties of the bolts that connect the bracket to the step.

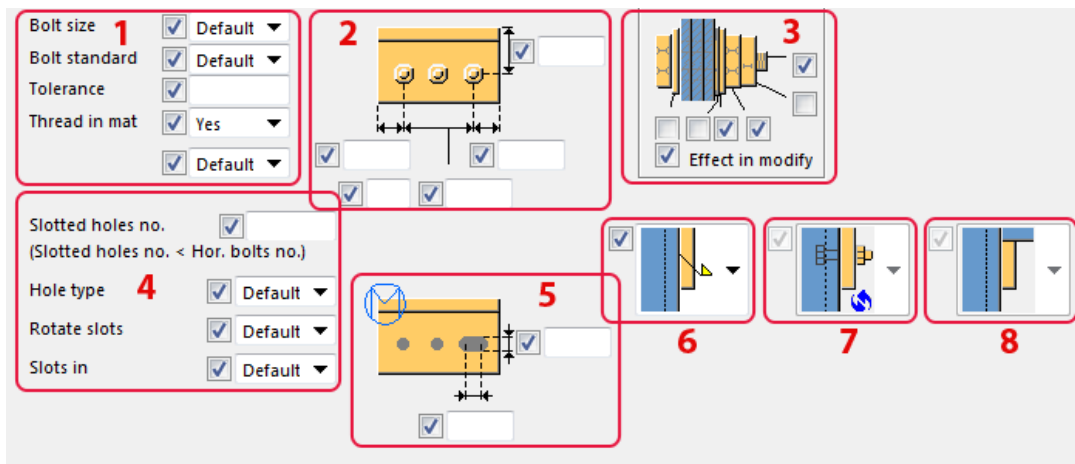


Description	
<b>1</b>	<p>Define the basic bolt basic properties:</p> <ul style="list-style-type: none"> <li>• <b>Bolt size</b> defines the bolt diameter. Available sizes are defined in the bolt assembly catalog.</li> <li>• <b>Bolt standard</b> defines the bolt standard to be used inside the component. Available standards are defined in the bolt assembly catalog.</li> <li>• <b>Tolerance</b> defines the gap between the bolt and the hole.</li> <li>• <b>Thread in mat</b> defines whether the thread may be within the bolted parts when bolts are used with a shaft. This has no effect when full-threaded bolts are used.</li> </ul>
<b>2</b>	Select whether brackets are created or not.
<b>3</b>	Define the bolt group dimensions.
<b>4</b>	<p>Select the connection type between the steps and the brackets:</p> <ul style="list-style-type: none"> <li>• Bolted <ul style="list-style-type: none"> <li></li> <li>Bolted is the default.</li> </ul> </li> <li>• Welded <ul style="list-style-type: none"> <li></li> </ul> </li> <li>• No connection <ul style="list-style-type: none"> <li></li> </ul> </li> <li>• Plate bracket</li> </ul>




	Description
	 <p>Bracket angle leg is not created.</p> <ul style="list-style-type: none"> <li>Holes only</li> </ul> 
5	Select the bolt direction.
6	Define the slotted hole properties: <ul style="list-style-type: none"> <li><b>Slotted holes no.</b> defines the number of slotted holes.</li> <li><b>Hole type</b> creates either <b>Slotted</b> holes, or <b>Oversized</b> or tapped holes.</li> <li><b>Rotate slots</b> rotates slots when the hole type is slotted.</li> <li><b>Slots in</b> defines in which parts the slotted holes are created.</li> </ul>
7	Define the exact length of the bolts. You can define the length of the bolts if the <b>Step type</b> is set to on the <b>Steps</b> tab.
8	Define the slotted hole dimensions.




### Bracket-to-stringer connection

Define the properties of the bolts that connect the bracket to the stringer.



	Description
1	Define the basic bolt properties: <ul style="list-style-type: none"> <li><b>Bolt size</b> defines the bolt diameter. Available sizes are defined in the bolt assembly catalog.</li> <li><b>Bolt standard</b> defines the bolt standard to be used inside the component. Available standards are defined in the bolt assembly catalog.</li> </ul>

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Tolerance</b> defines the gap between the bolt and the hole.</li> <li>• <b>Thread in mat</b> defines whether the thread may be within the bolted parts when bolts are used with a shaft. This has no effect when full-threaded bolts are used.</li> </ul>
<b>2</b>	Define the bolt group dimensions.
<b>3</b>	Define the bolt assembl.  The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly. If you want to create a hole only, clear all the check boxes. To modify the bolt assembly in an existing component, select the <b>Effect in modify</b> check box and click <b>Modify</b> .
<b>4</b>	Define the slotted hole properties. <ul style="list-style-type: none"> <li>• <b>Slotted holes no.</b> defines the number of slotted holes.</li> <li>• <b>Hole type</b> creates either <b>Slotted</b> holes, or <b>Oversized</b> or tapped holes.</li> <li>• <b>Rotate slots</b> rotates slots when the hole type is slotted.</li> <li>• <b>Slots in</b> defines in which parts the slotted holes are created.</li> </ul>
<b>5</b>	Define the slotted hole dimensions.
<b>6</b>	Select the connection type between the stringer and the brackets: <ul style="list-style-type: none"> <li>• Bolted               <div style="text-align: center;">  </div> <p style="text-align: center;">Bolted is the default.</p> </li> <li>• Welded               <div style="text-align: center;">  </div> </li> <li>• No connection               <div style="text-align: center;">  </div> </li> </ul>
<b>7</b>	Select the bolt direction.
<b>8</b>	Set the bracket position of a plate bracket: <ul style="list-style-type: none"> <li>• Below the step</li> </ul>

	Description
	 <p>Below the step is the default.</p> <ul style="list-style-type: none"> <li>• Between the step and the stringer</li> </ul>  <p>You can use this option when you have set the connection type between the steps and the brackets to the plate bracket option</p> 

## ***Welds***

Click the link below to find out more:

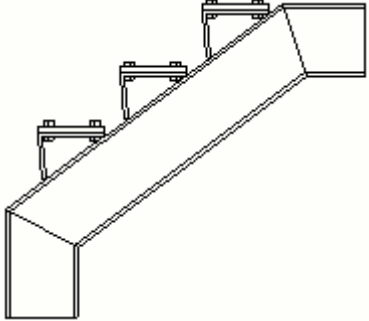
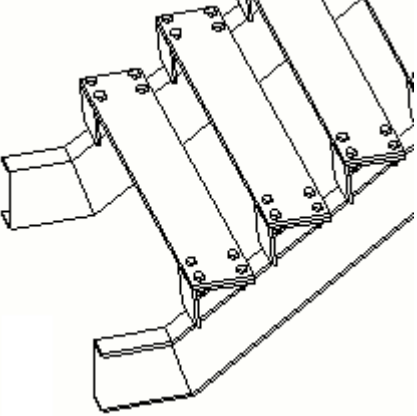
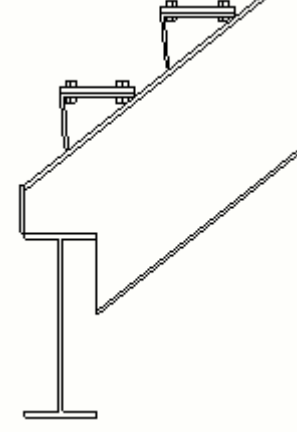
## **Wooden steps pan (S72)**

**Wooden steps pan (S72)** creates straight stairs with optional top and bottom landings. The stairs consist of stringers, possible landings and the actual steps.

### **Objects created**

- Stringers
- Steps
- Landings (optional)
- Brackets
- Plates to the stringer ends (optional)
- Bolts
- Welds

## Use for

Situation	Description
 A 3D perspective drawing of a staircase. The stringers are vertical, and the steps are wooden. The bottom landing is vertical, meaning the stringer is perpendicular to the ground at the base.	Stairs with wooden steps. Vertical bottom landing type.
 A 3D perspective drawing of a staircase. The stringers are C-shaped steel profiles. The steps are wooden and bolted to steel brackets. The bottom landing is horizontal, meaning the stringer is parallel to the ground at the base.	Stairs with C-shaped stringers. Horizontal bottom landing type. Wooden steps are bolted to steel brackets.
 A 2D cross-sectional diagram of a staircase. A vertical I-beam supporting beam is shown. The stringer is notched to fit over the top flange of the beam. The steps are shown as a series of horizontal lines.	Stairs with stringers notched to the supporting beam.

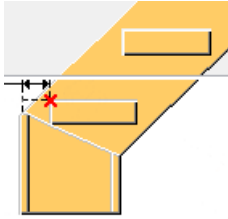
### Before you start

If the stringers are notched to bear on the supporting beams, create the supporting beams before creating the stairs.

### Selection order

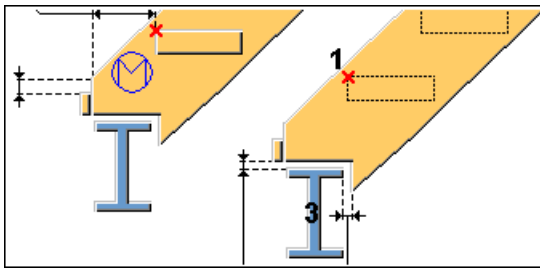
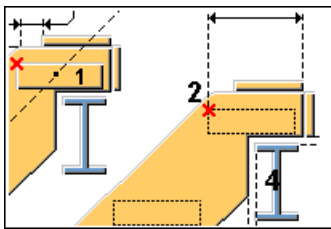
1. Pick a point to indicate the nosing point of the first step.



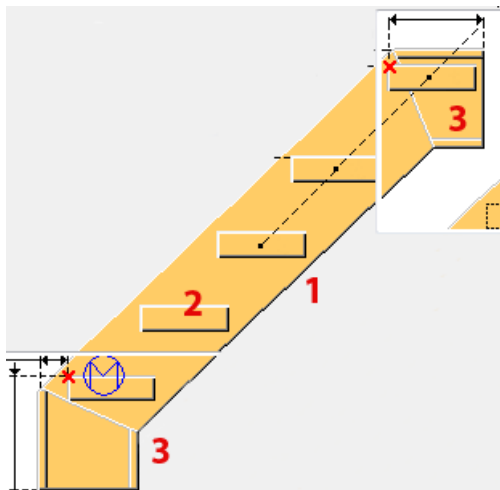


2. Pick another point to indicate the nosing point of the last step.  
The order in which the points are picked has no effect.
3. Click the middle mouse button to create the stairs.

If you have selected the following notched options on the **Picture** tab, select the supporting beams and then click the middle mouse button.



### Part identification key

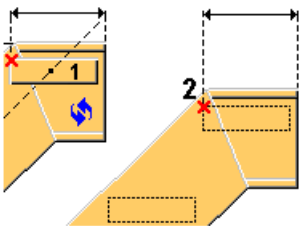
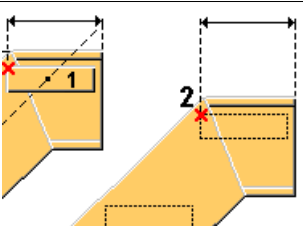
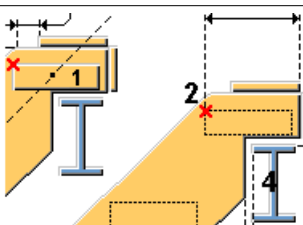


	Part
1	Stringer
2	Step
3	Landings

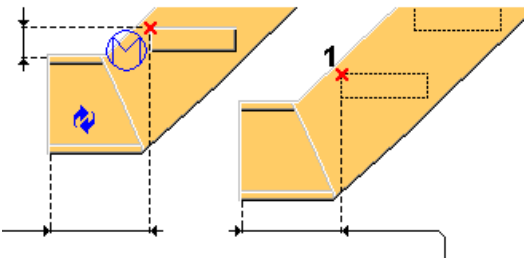
### Picture tab

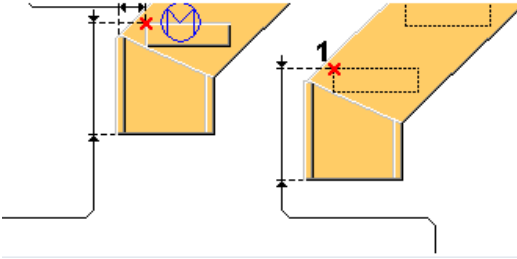
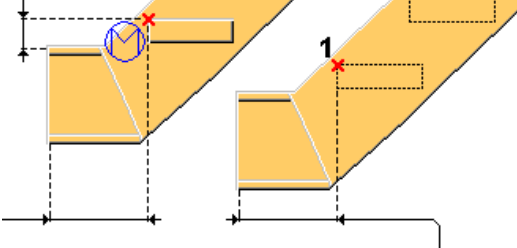
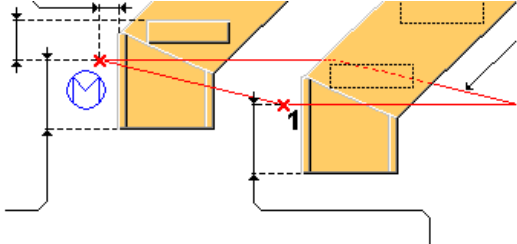
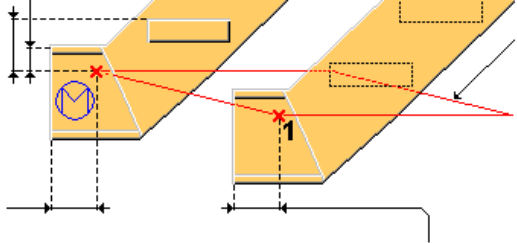
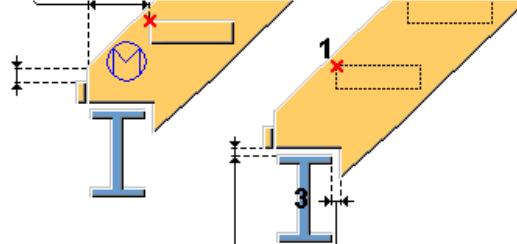
Use the **Picture** tab to control the stringer geometry and the nosing points of the steps.

### Top landing type

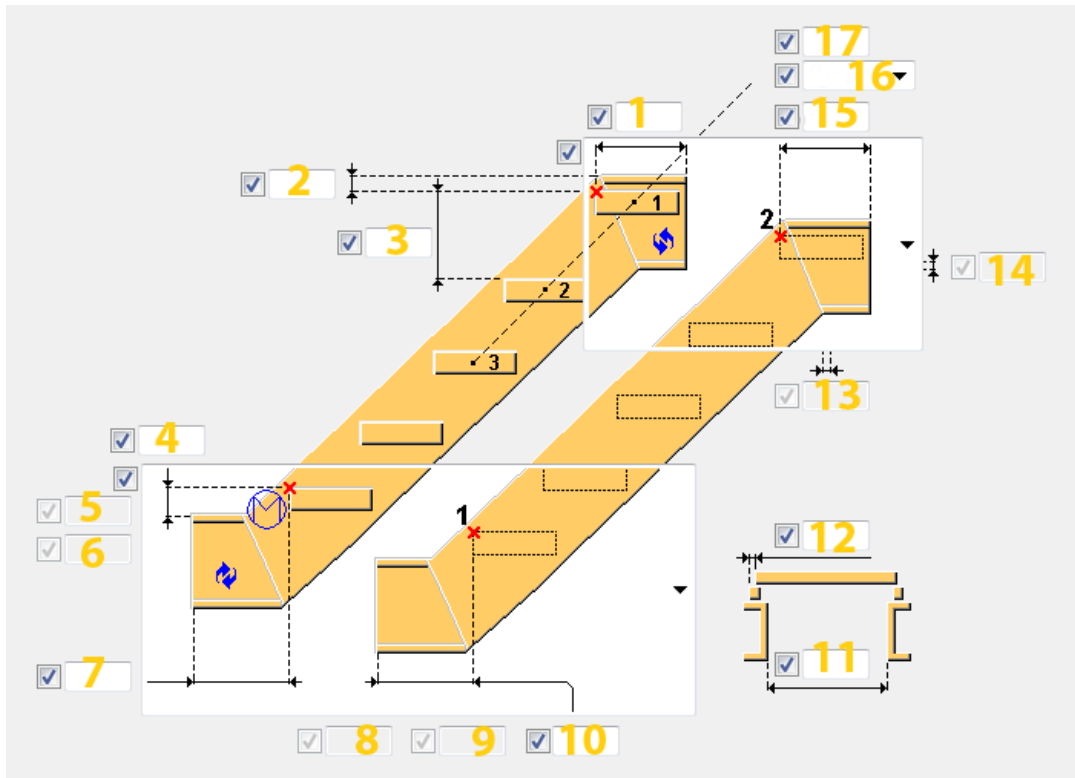
Option	Description
	Default
	Horizontal landing
	Notched The stringer top is on the supporting part. Vertical and horizontal plates are welded at the end of the stringer.

### Bottom landing type

Option	Description
	Default

Option	Description
	<p><b>Vertical</b></p> <p>Creates a vertical landing where the lower picked point is on the top plane of the last step.</p>
	<p><b>Horizontal</b></p> <p>Creates a horizontal landing where the lower picked point is on the top plane of the last step.</p>
	<p><b>Vertical lowered point</b></p> <p>The picked point is at the top of steel or finish floor.</p>
	<p><b>Horizontal lowered point</b></p> <p>The picked point is at the top of steel or finish floor.</p>
	<p><b>Notched</b></p> <p>Creates a notch to the bottom of the stringer to bear on the supporting part. A vertical plate is welded at the end of the stringer.</p>

## Stair dimensions



	Description	Default
<b>1</b>	<p>Define the distance between the upper point and the end of the left top landing.</p> <p>If you set the value to 0 mm, the left top landing is not created.</p> <p>If you set the top landing type to notched, define the cut dimension of the horizontal plate from the stringer edge.</p>	0 mm
<b>2</b>	<p>Define the vertical distance from the upper point to the top of steel of the top landing.</p> <p>If the upper landing is not created, the stringer top of steel is used.</p> <p>If you set the top landing type to notched, define the vertical distance from the upper point to the stringer top horizontal cut.</p>	200 mm

	<b>Description</b>	<b>Default</b>
<b>3</b>	<p>Define the maximum distance allowed between two consecutive steps.</p> <p>The spacing between the steps is calculated using the step spacing type <b>Exact</b> or <b>Equal</b>, and the number of steps.</p> <p>For example, if the step height should be 200 mm, the <b>Exact</b> setting creates steps of exactly this height (enter the number of steps as an integer). The <b>Equal</b> setting creates the required number of steps from the bottom to the top, with the height calculated as close to 200 mm as possible.</p>	$(Z*220) / (Z+220)$ mm, where Z is the vertical distance between the 2 picked points.
<b>4</b>	<p>Define this dimension based on the selected bottom landing type:</p> <ul style="list-style-type: none"> <li>• Horizontal or horizontal lowered point Define the vertical distance between the lower picked point and the top of steel of the bottom landing.</li> <li>• Vertical or vertical lowered point Define the horizontal distance between the lower picked point and the most distant face of the bottom landing.</li> <li>• No bottom landing is selected Define the horizontal distance from the lower picked point to the stringer vertical cut. By default, the cut is made at the supporting part edge.</li> </ul>	150 mm
<b>5</b>	<p>Define the vertical dimension from the lower point to the first step.</p> <p>You can define this dimension when the step spacing type is set to <b>Equal</b> and the bottom landing type is either vertical or horizontal lowered point.</p>	equal with vertical spacing between steps
<b>6</b>	<p>Define the cut dimension of the vertical plate from the stringer edge.</p> <p>You can define this dimension when the bottom landing type is set to notched.</p>	0 mm

	<b>Description</b>	<b>Default</b>
<b>7 10</b>	<p>Define this dimension based on the selected bottom landing type:</p> <ul style="list-style-type: none"> <li>Horizontal or horizontal lowered point bottom landing. Define the horizontal edge distance between the lower point and the bottom landing.</li> <li>Vertical or vertical lowered point bottom landing. Define the vertical edge distance between the lower point and the lowest point of the bottom landing.</li> </ul>	600 mm
<b>8</b>	<p>Define the vertical gap between the lower supporting part and the stringer cut. You can define this dimension when you have set the bottom landing type to notched.</p>	0 mm
<b>9</b>	<p>Define the horizontal gap between the lower supporting part and the stringer cut. You can define this dimension when you have set the bottom landing type to notched.</p>	0 mm
<b>11</b>	Define the width of the steps.	0 mm
<b>12</b>	Define the dimension to shorten the steps equally on both sides.	1000 mm
<b>13</b>	<p>Define the horizontal gap between the upper supporting part and the stringer cut. You can define this dimension when you have set the top landing type to notched.</p>	0 mm
<b>14</b>	<p>Define the vertical gap between the upper supporting part and the stringer cut. You can define this dimension when you have set the top landing type to notched.</p>	0 mm
<b>15</b>	<p>Define this dimension based on the selected top landing type:</p> <ul style="list-style-type: none"> <li>Horizontal top landing. Define the distance between the upper point and the end of the stringer.</li> </ul>	0 mm

	Description	Default
	<ul style="list-style-type: none"> <li>Notched top landing.</li> </ul> <p>Define the horizontal distance between the upper point and the stringer vertical cut. By default the cut is made at the supporting part edge.</p> <p>If you set this dimension to 0 mm, the top landing is not created.</p>	
16	<p>Select the step spacing type:</p> <ul style="list-style-type: none"> <li><b>Exact</b> creates the steps of exactly the defined height. Enter the number of steps as an integer.</li> <li><b>Equal</b> creates the required number of steps from the bottom to the top, with the height calculated as close as possible to the defined step height.</li> </ul> <p>The spacing type controls how the vertical spacing between the steps is calculated.</p> <p>If you select <b>Exact</b> and set the bottom landing type to horizontal or vertical lower point, the steps are spaced from the upper point to the lower point. In all other cases the steps are spaced from the lower point to the upper point.</p>	Equal
17	<p>Enter the number of steps.</p> <p>This option depends on step spacing type and step spacing.</p> <p>If you set the step spacing type to <b>Exact</b>, or to <b>Equal</b> and the spacing distance is not defined, <b>Wooden steps pan (S72)</b> creates the number of steps you have defined.</p>	Calculated from the vertical distance between the 2 picked points and the spacing between steps (3)

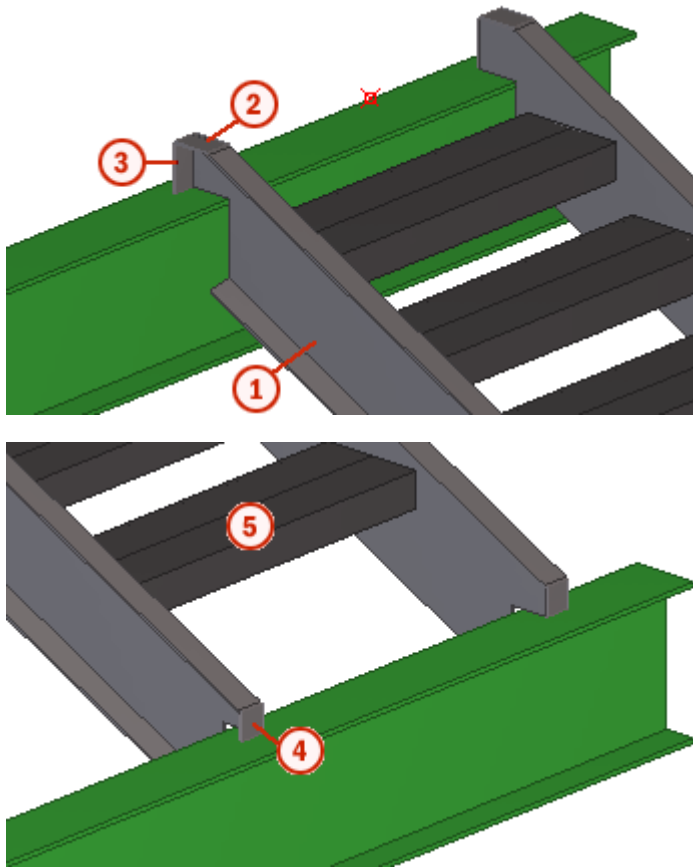
### Vertical landing offset

Define the vertical offset for the left and right horizontal landing at the top and bottom of the stringers.

### Stair setup tab

Use the **Stair setup** tab to control the part properties, top and bottom steps, position of the stairs on the horizontal plane, and rotation of stringers and steps.

## Stair part properties




	Part	Description	Default
1	<b>Left stringer</b>	Always created Select a profile from the profile catalog.	BLU400*2 The default name is STRINGER.
1	<b>Right stringer</b>	Always created Select a profile from the profile catalog.	BLU400*2 The default name is STRINGER.
2	<b>Upper H plate</b>	Created only if the top of the stringer is on the supporting beam.	6 mm The default name is PLATE.
3	<b>Upper V plate</b>	Created only if the top of the stringer is on the supporting beam.	6 mm The default name is PLATE.
4	<b>Lower V plate</b>	Created only if the bottom of the stringer is on the supporting beam.	6 mm The default name is PLATE.



Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

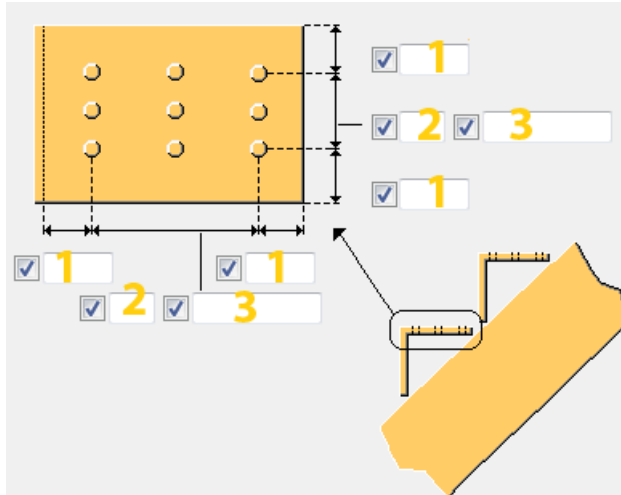
### Stair setup settings

Option	Description
<b>Create assembly</b>	Define which parts of the stair component form an assembly. The default is stringers.
<b>Stringer reference line</b>	<ul style="list-style-type: none"> <li><b>Above:</b> The line positioned on the inside of the stairs on the top face is used as the reference line.</li> <li><b>Nosing:</b> The nosing line of the steps is used as the reference line.</li> </ul> <p>The reference line is used for workshop drawings.</p>
<b>Steps rotation</b>	Rotation of the step around its axis. The default is <b>Top</b> .
<b>Position in plane</b>	Position of the stairs. The middle line of steps is used as the reference line. The default is <b>Right</b> .
<b>Offset</b>	Offset of the stairs on the plane from the position that is set in the <b>Position in plane</b> option.  The default offset is 0 mm.
<b>Stringer rotation</b>	Rotation of the stringer around its axis. The default is top 
<b>Create top step</b>	Define whether the first step of the stairs (the highest step) is created. By default, the first step is created.
<b>Create bottom step</b>	Define whether the last step of the stairs (the lowest step) is created. By default, the last step is created.

### Bolts tab

Use the **Bolts** tab to control the properties of the bolt group that connects the wooden steps to the brackets.

### Bolt group dimensions

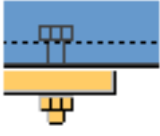


	Description	Default
1	Bolt edge distance.	bolt diameter * 1.5
2	Number of bolts.	2
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.	100 mm

### Bolting direction

Use to change the direction of bolts.

Option	Description
	Default.
	Bolted from the bracket to the step.

Option	Description
	Bolted from the step to the bracket.

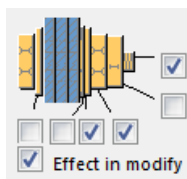
### Bolt basic properties

	Description	Default
<b>Bolt size</b>	Bolt diameter.	20 mm
<b>Bolt standard</b>	The bolt standard to be used inside the component.	7990
<b>Tolerance</b>	The gap between the bolt and the hole.	2 mm
<b>Thread in mat</b>	Defines whether or not the thread may be within the bolted parts when using bolts with a shaft. This has no effect when using full-threaded bolts.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Wooden pan tab

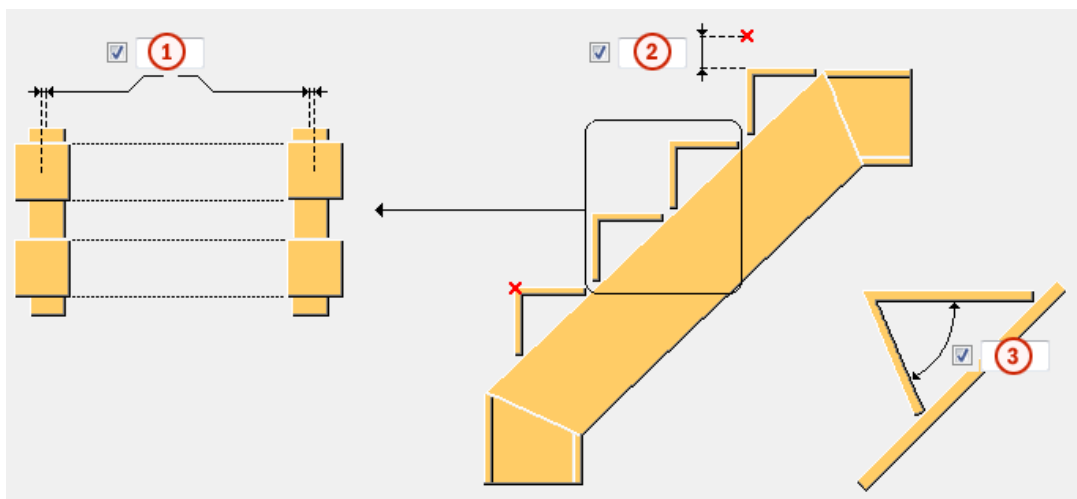
Use the **Wooden pan** tab to define the step profile and the properties of the folded plate brackets.

## Step bracket and profile

Part	Description	Default
<b>Step bracket</b>	To create a step bracket, select a profile from the profile catalog.	PL10*150
<b>Step profile</b>	To create steps, select a profile from the profile catalog.	

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

## Bracket dimensions



	<b>Description</b>	<b>Default</b>
①	Define the offset dimension that moves the folded bracket plates relative to the center line of the stringer.	0 mm
②	Define the thickness of the steps that will be placed on the folded brackets. The actual steps will not be created, only the brackets height will be resized.	0 mm
③	Define the angle for the bracket to be folded, in degrees.	0

### ***Welds***

Click the link below to find out more:

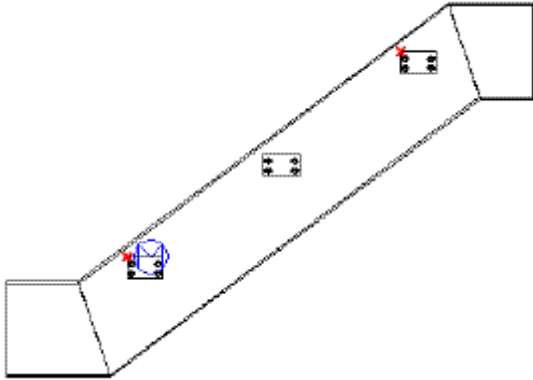
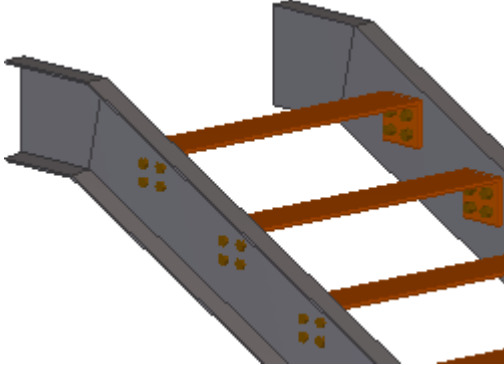
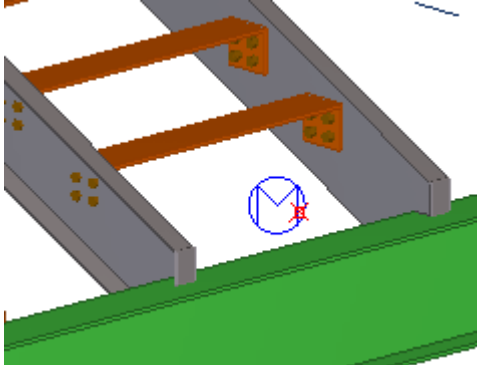
### **Polybeam pan (S73)**

**Polybeam pan (S73)** creates straight stairs with optional top and bottom landings. The stairs consist of stringers, possible landings, and the actual steps created with plates.

#### **Objects created**

- Stringers
- Steps
- Landings (optional)
- Cuts to notch the stringer (optional)
- Plates (optional)
- Bolts
- Welds

## Use for

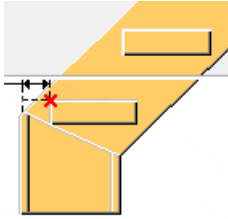
Situation	Description
 A 3D wireframe diagram of a staircase stringer. It shows the profile of the stringer with three selection icons: a blue circle with a white 'M' and a red 'x' at the bottom, and two black squares with white 'M' and red 'x' at the top.	Polybeam pan stairs.
 A 3D perspective view of a grey stringer with three brown treads. The top of the stringer is horizontal, creating a landing. The stringer is supported by a green base.	Top of the stringer is created as horizontal landing.
 A 3D perspective view of a grey stringer with three brown treads. The bottom of the stringer is notched to fit onto a green supporting beam. A blue circle with a white 'M' and a red 'x' is positioned at the notch.	Bottom of the stringer is notched to bear on the supporting beam. The same option is also available for the top of the stringer.

### Before you start

If the stringers are notched to bear on the supporting beams, create the supporting beams before creating the stairs.

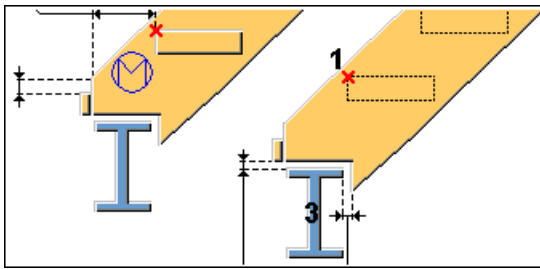
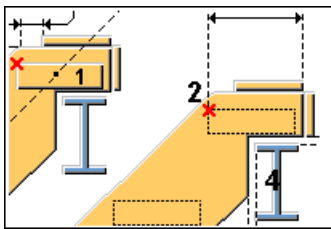
### Selection order

1. Pick a point to indicate the nosing point of the first step.

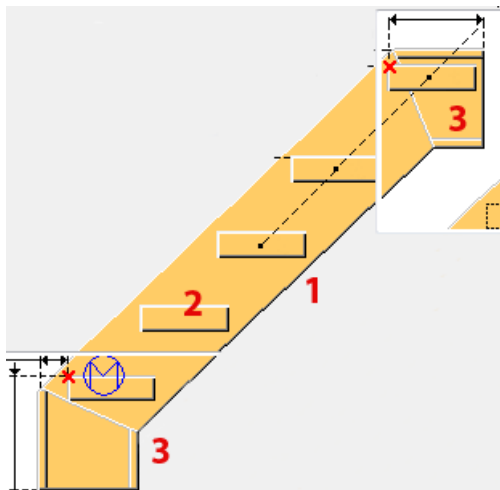


2. Pick another point to indicate the nosing point of the last step.  
Note that the order in which the points are picked has no effect.
3. Click the middle mouse button to create the stairs.

If you have selected the following notched options on the **Picture** tab, select the supporting beams and then click the middle mouse button.



### Part identification key



	Part
1	Stringer
2	Step
3	Landings

### Picture tab

Use the **Picture** tab to control the stringer geometry and the nosing points of the steps.

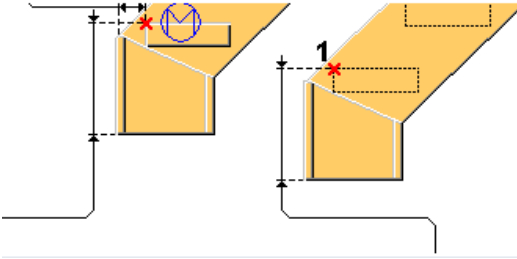
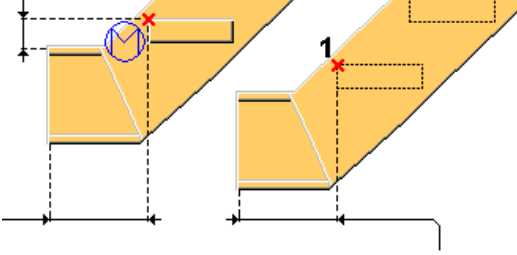
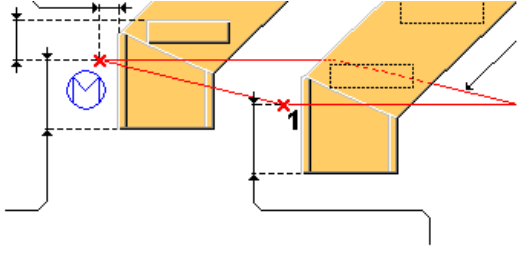
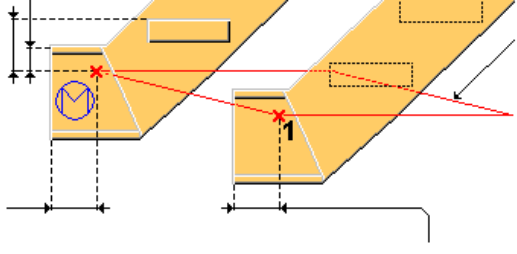
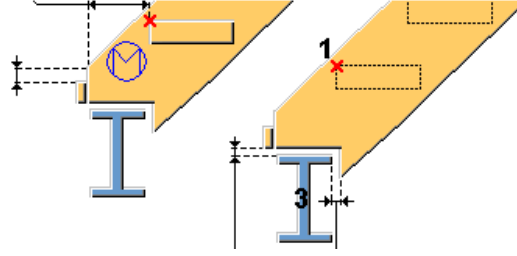
### Top landing type

Option	Description
	Default
	Horizontal landing
	Notched The stringer top is on the supporting part. Vertical and horizontal plates are welded at the end of the stringer.

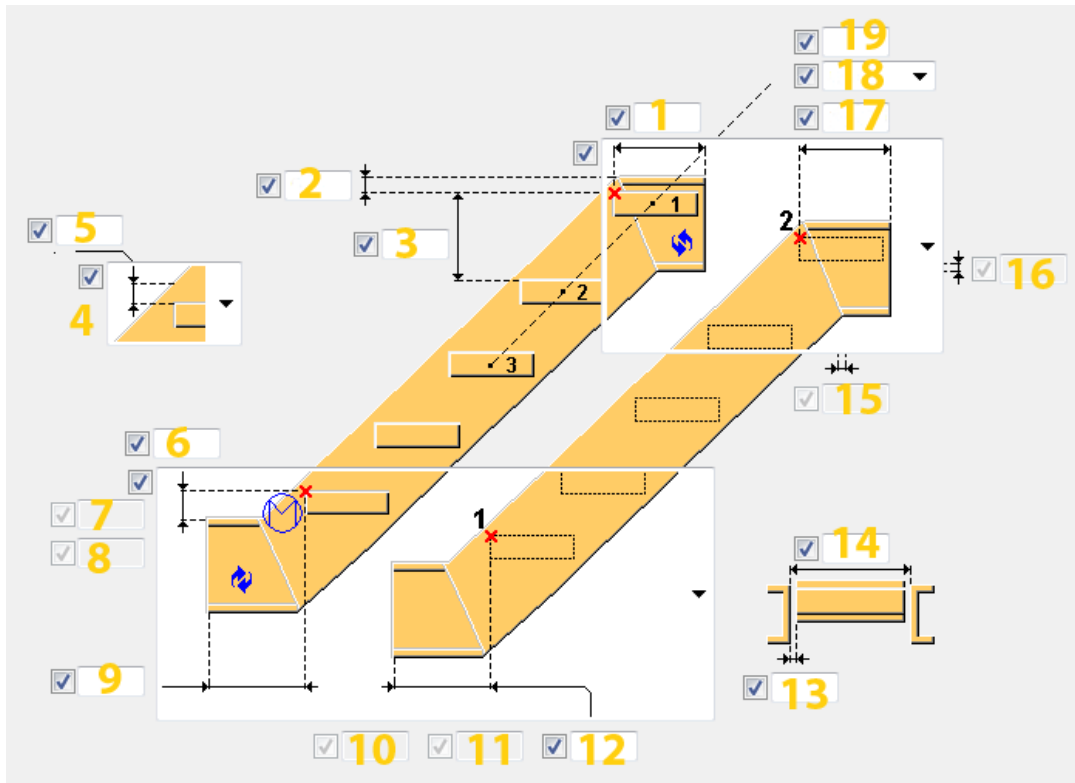
### Bottom landing type

Option	Description
	Default



Option	Description
	<p><b>Vertical</b></p> <p>Creates a vertical landing where the lower picked point is on the top plane of the last step.</p>
	<p><b>Horizontal</b></p> <p>Creates a horizontal landing where the lower picked point is on the top plane of the last step.</p>
	<p><b>Vertical lowered point</b></p> <p>The picked point is at the top of steel or finish floor.</p>
	<p><b>Horizontal lowered point</b></p> <p>The picked point is at top of steel or finish floor.</p>
	<p><b>Notched</b></p> <p>Created a notch to the bottom of the stringer to bear on the supporting part. A vertical plate is welded at the end of the stringer.</p>

## Stair dimensions



	Description	Default
1	<p>Define the distance between the upper point and the end of the left top landing.</p> <p>If you set the value to 0 mm, the left top landing is not created.</p> <p>If you set the top landing type to notched, define the cut dimension of the horizontal plate from the stringer edge.</p>	0 mm
2	<p>Define the vertical distance from the upper point to the top of steel of the top landing.</p> <p>If the top landing is not created, the stringer top of steel is used.</p> <p>If you set the top landing type to notched, define the vertical distance from the upper point to the stringer top horizontal cut.</p>	200 mm

	<b>Description</b>	<b>Default</b>
<b>3</b>	<p>Define the maximum distance allowed between two consecutive steps.</p> <p>The spacing between the steps is calculated using the step spacing type <b>Exact</b> or <b>Equal</b>, and the number of steps.</p> <p>For example, if the step height should be 200 mm, the <b>Exact</b> setting creates steps of exactly this height (enter the number of steps as an integer). The <b>Equal</b> setting creates the required number of steps from the bottom to the top, with the height calculated as close to 200 mm as possible.</p>	$(Z*220) / (Z+220)$ mm, where Z is the vertical distance between the 2 picked points.
<b>4</b>	<p>Select the direction of the nosing dimension of the steps:</p> <ul style="list-style-type: none"> <li>• Vertical</li> <li>• Horizontal</li> <li>• Perpendicular</li> </ul>	Vertical
<b>5</b>	<p>Define the nosing dimension of the steps. This dimension depends on the direction you have selected.</p>	0 mm
<b>6</b>	<p>Define this dimension based on the selected bottom landing type:</p> <ul style="list-style-type: none"> <li>• Horizontal or horizontal lowered point bottom landing                Define the vertical distance from the lower point to the top of steel of the bottom landing.</li> <li>• Vertical or vertical lowered point bottom landing                Define the horizontal distance from the lower picked point to the most distant face of the bottom landing.</li> <li>• Notched bottom landing                Define the horizontal distance from the lower point to the stringer vertical cut. By default, the cut is made at the supporting part edge.</li> </ul>	150 mm
<b>7</b>	<p>Define the vertical dimension from the lower point to the first step.</p> <p>You can define this dimension when the step spacing type is set to <b>Equal</b> and the</p>	Equal with vertical spacing between steps

	<b>Description</b>	<b>Default</b>
	bottom landing type is either vertical or horizontal lowered point.	
<b>8</b>	Define the cut dimension of the vertical plate from the stringer edge. You can define this dimension when the bottom landing type is set to notched.	0 mm
<b>9</b> <b>12</b>	Define this dimension based on the selected bottom landing type: <ul style="list-style-type: none"> <li>Horizontal or horizontal lowered point bottom landing. Define the horizontal edge distance between the lower point and the bottom landing.</li> <li>Vertical or vertical lowered point bottom landing. Define the vertical edge distance between the lower point and the lowest point of the bottom landing.</li> </ul>	600 mm
<b>10</b>	Define the vertical gap between the lower supporting part and the stringer cut. You can define this dimension when you have set the bottom landing type to notched.	0 mm
<b>11</b>	Define the horizontal gap between the lower supporting part and the stringer cut. You can define this dimension when you have set the bottom landing type to notched.	0 mm
<b>13</b>	Define the dimension to shorten the steps equally on both sides.	0 mm
<b>14</b>	Define the width of the steps.	1000 mm
<b>15</b>	Define the horizontal gap between the upper supporting part and the stringer cut. You can define this dimension when you have set the top landing type to notched.	0 mm
<b>16</b>	Define the vertical gap between the upper supporting part and the stringer cut. You can define this dimension when you have set the top landing type to notched.	0 mm

	Description	Default
17	<p>Define this dimension based on the selected top landing type:</p> <ul style="list-style-type: none"> <li>Horizontal top landing. Define the distance between the upper point and the end of the stringer.</li> <li>Notched top landing. Define the horizontal distance between the upper point and the stringer vertical cut. By default the cut is made at the supporting part edge.</li> </ul> <p>If you set this dimension to 0 mm, the top landing is not created.</p>	0 mm
18	<p>Select the step spacing type:</p> <ul style="list-style-type: none"> <li><b>Exact</b> creates the steps of exactly the defined height. Enter the number of steps as an integer.</li> <li><b>Equal</b> creates the required number of steps from the bottom to the top, with the height calculated as close as possible to the defined step height.</li> </ul> <p>The spacing type controls how the vertical spacing between the steps is calculated.</p> <p>If you select <b>Exact</b> and set the bottom landing type to horizontal or vertical lower point, the steps are spaced from the upper point to the lower point. In all other cases the steps are spaced from the lower point to the upper point.</p>	<b>Equal</b>
19	<p>Enter the number of steps.</p> <p>This option depends on step spacing type and step spacing.</p> <p>If you set the step spacing type to <b>Exact</b>, or to <b>Equal</b> and the spacing distance is not defined, <b>Polybeam pan (S73)</b> creates the number of steps you have defined.</p>	Calculated from the vertical distance between the picked points and the spacing between the steps

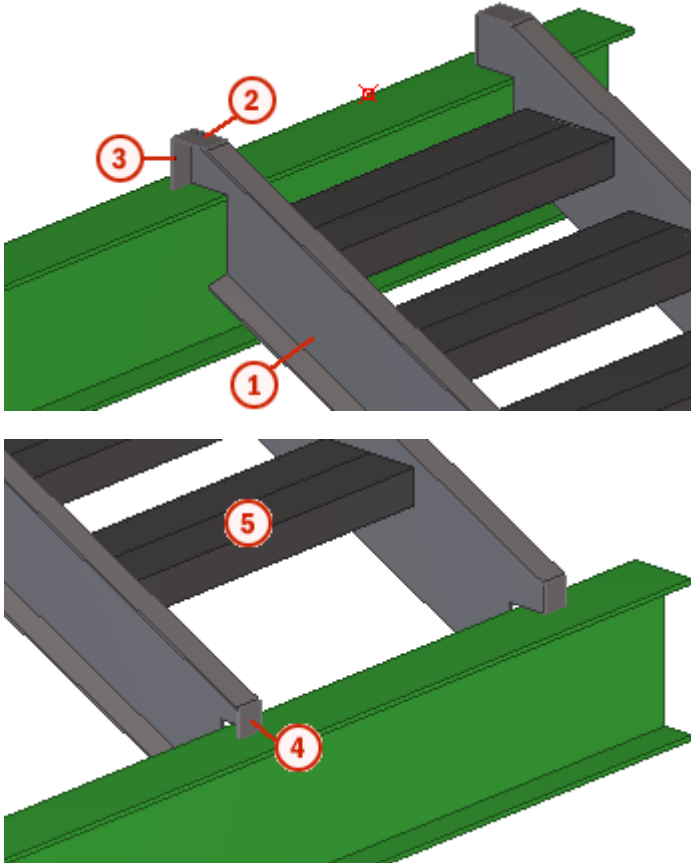
### Vertical landing offset

Define the vertical offset for the left and right horizontal landing at the top and bottom of the stringers.

### Stair setup tab

Use the **Stair setup** tab to control the part properties, top and bottom steps, position of the stairs on the horizontal plane, and rotation of stringers and steps.

### Stair part properties




	Part	Description	Default
1	<b>Left stringer</b>	Always created Select a profile from the profile catalog.	BLU400*2 The default name is STRINGER.
1	<b>Right stringer</b>	Always created Select a profile from the profile catalog.	BLU400*2 The default name is STRINGER.
2	<b>Upper H plate</b>	Created only if the top of the stringer is on the supporting beam.	6 mm The default name is PLATE.
3	<b>Upper V plate</b>	Created only if the top of the stringer is on the supporting beam.	6 mm The default name is PLATE.

	<b>Part</b>	<b>Description</b>	<b>Default</b>
<b>4</b>	<b>Lower V plate</b>	Created only if the bottom of the stringer in on the supporting beam.	6 mm The default name is PLATE.

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

### Stair setup settings

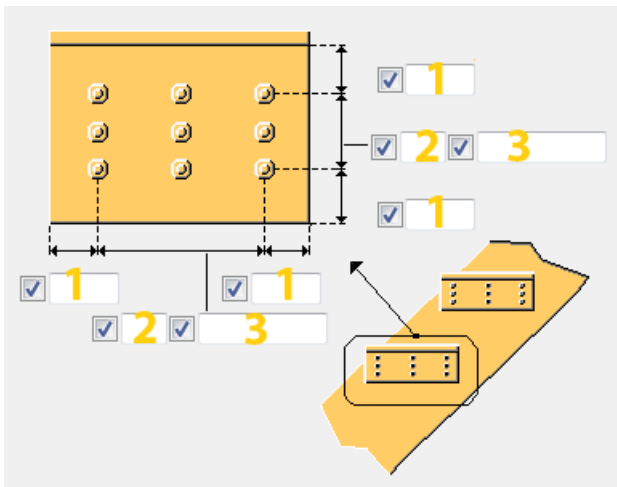
<b>Option</b>	<b>Description</b>
<b>Create assembly</b>	Define which parts of the stair component form an assembly. The default is stringers.
<b>Stringer reference line</b>	<ul style="list-style-type: none"> <li>• <b>Above:</b> The line positioned on the inside of the stairs on the top face is used as the reference line.</li> <li>• <b>Nosing:</b> The nosing line of the steps is used as the reference line.</li> </ul> <p>The reference line is used for workshop drawings.</p>
<b>Steps rotation</b>	Rotation of the step around its axis. The default is <b>Top</b> .
<b>Position in plane</b>	Position of the stairs. The middle line of steps is used as the reference line. The default is <b>Right</b> .
<b>Offset</b>	Offset of the stairs on the plane from the position that is set in the <b>Position in plane</b> option.  The default offset is 0 mm.
<b>Stringer rotation</b>	Rotation of the stringer around its axis. The default is top 

Option	Description
<b>Create top step</b>	Define whether the first step of the stairs (the highest step) is created. By default, the first step is created.
<b>Create bottom step</b>	Define whether the last step of the stairs (the lowest step) is created. By default, the last step is created.

### **Bolts tab**

Use the **Bolts** tab to control the properties of the bolt group that connects the steps to the stringers.

### **Bolt group dimensions**

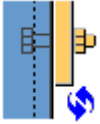
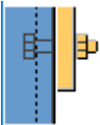
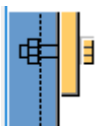


Note that if you define the vertical dimensions of the step on the **Polybeam pan** tab, the dimensions defined on the **Polybeam pan** tab are used.

	Description	Default
<b>1</b>	Bolt edge distance.	bolt diameter * 1.5
<b>2</b>	Number of bolts.	2
<b>3</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.	100 mm



## Bolting direction

Option	Description
	Default. Bolted from the step to the bracket. AutoDefaults can change this option.
	Bolted from the step to the bracket.
	Bolted from the bracket to the step.

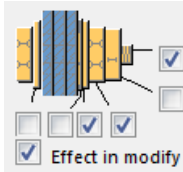
## Bolt basic properties

	Description	Default
<b>Bolt size</b>	Bolt diameter.	20 mm
<b>Bolt standard</b>	The bolt standard to be used inside the component.	7990
<b>Tolerance</b>	The gap between the bolt and the hole.	2 mm
<b>Thread in mat</b>	Defines whether or not the thread may be within the bolted parts when using bolts with a shaft. This has no effect when using full-threaded bolts.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

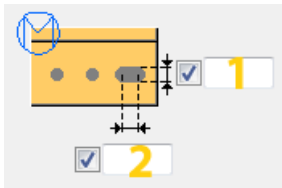
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Slotted holes no</b>	Define the number of slotted holes.	
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### ***Polybeam pan tab***

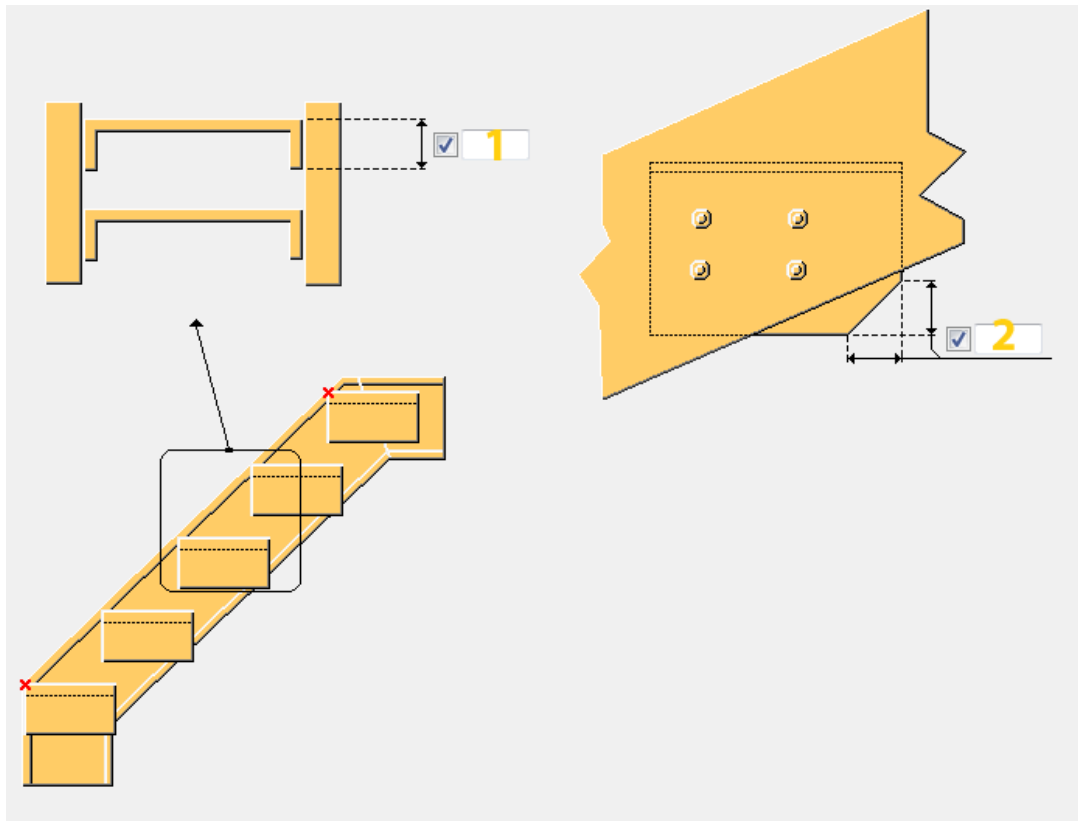
Use the **Polybeam pan** tab to define the step profile properties and dimensions.

## Plate

Part	Description	Default
<b>Plate profile</b>	To create a plate profile, select a profile from the profile catalog.	PL10*150

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

## Step profile dimensions



	Description	Default
1	Define the height of the vertical part of the step.	Vertical dimension value defined on the <b>Bolts</b> tab.
2	Define the symmetrical chamfer for the back corner of the all step plates.	0 mm

## Welds

Click the link below to find out more:

## Handrail 1 (74)

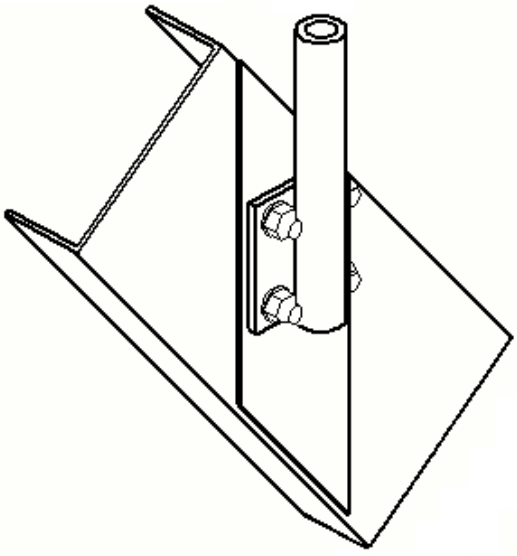
**Handrail 1 (74)** connects a column to a beam using a cover plate and an end plate.

### Objects created

- Cover plate
- End plate

- Bolts
- Welds
- Cuts

**Use for**

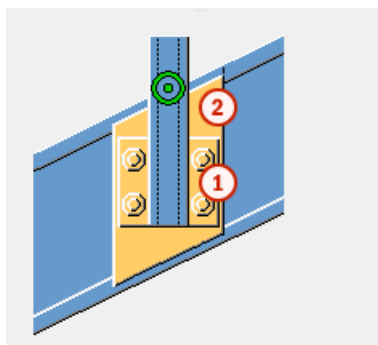
Situation	Description
	<p>Beam to column connection.</p>

**Selection order**

1. Select the main part (beam).
2. Select the secondary part (column).

The connection is created automatically when the secondary part is selected.

**Part identification key**

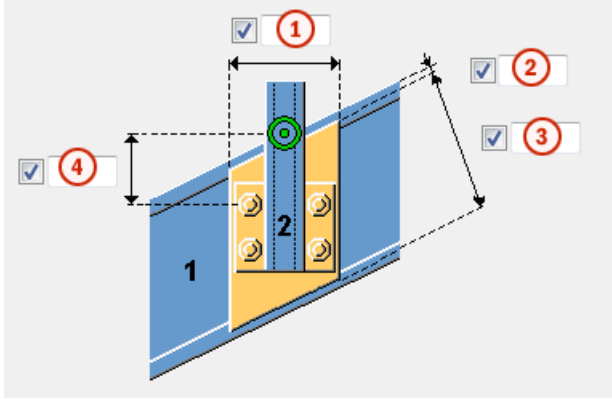


	Part
1	Cover plate
2	End plate

### Picture tab

Use the **Picture** tab to control the plate dimensions.

### Plate dimensions



	Description
1	Horizontal dimension of the cover plate.
2	Distance between the upper edge of the cover plate and the beam flange.
3	Vertical dimension of the cover plate.
4	Bolt edge distance.

### Parts tab

Use the **Parts** tab to control the plate properties.

### Plate

Option	Description
Cover plate	Cover plate thickness.
End plate	End plate thickness.

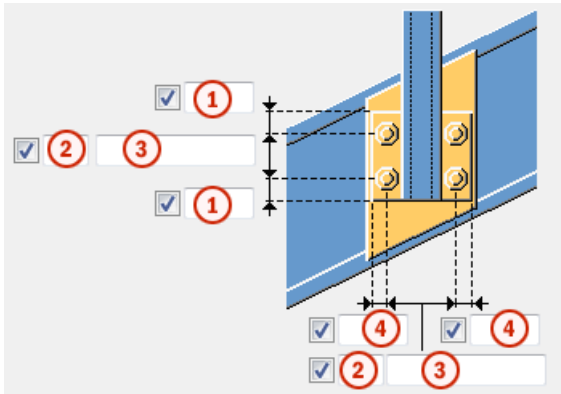
Option	Description	Default
Pos_No	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Bolts tab**

Use the **Bolts** tab to control the bolt properties.

#### **Bolt group dimensions**



	Description
<b>1</b>	Dimension for vertical bolt group position.
<b>2</b>	Number of bolts.
<b>3</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>4</b>	Dimension for horizontal bolt group position.

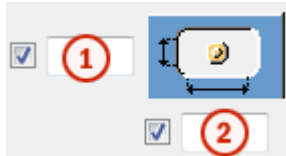
#### **Bolt basic properties**

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.

Option	Description	Default
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



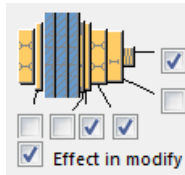
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.



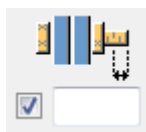
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### **General tab**

Click the link below to find out more:

[General tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

## **Z pan (S74)**

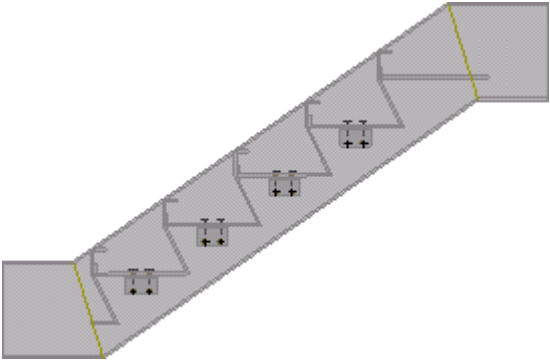
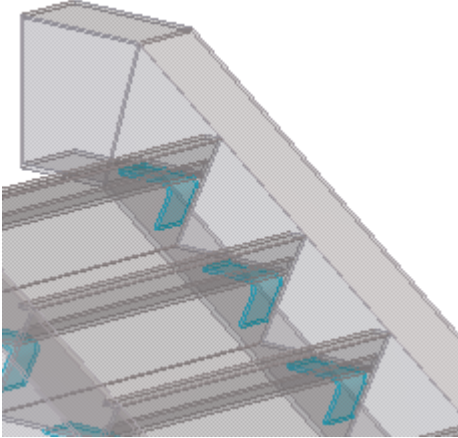
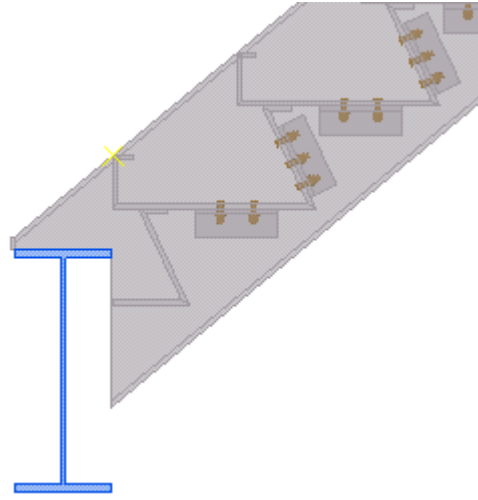
**Z pan (S74)** creates straight stairs with optional top and bottom landings. The stairs consist of stringers, possible landings, and the actual steps. The steps can be connected to stringers with horizontal brackets, vertical brackets, or with bent plate brackets.

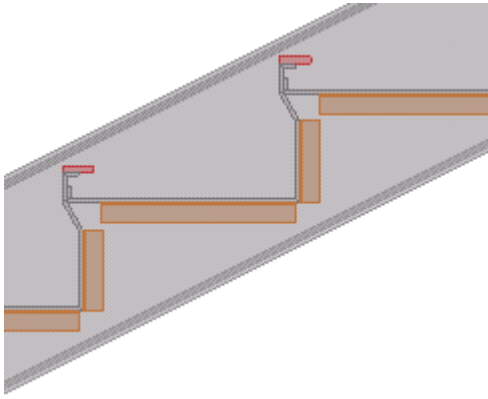
### **Objects created**

- Stringers
- Steps

- Landings (optional)
- Brackets
- Bolts
- Welds

**Use for**

Situation	Description
 <p>A 3D perspective diagram of a staircase. The steps are made of Z-shaped metal pans. Each step is connected to a vertical stringer by a horizontal metal bracket. The brackets are bolted to the stringer. The top and bottom of the staircase are shown as horizontal landings.</p>	<p>Stairs with Z-pan steps. Horizontal top and bottom landings.</p> <p>Steps are connected to stringers with bolted horizontal brackets.</p>
 <p>A 3D perspective diagram of a staircase. The steps are connected to a vertical stringer using bent metal plates. The plates are bent at a 90-degree angle to fit between the stringer and the step.</p>	<p>Stairs with bent plate brackets.</p> <p>Steps are connected to stringers with bent plate brackets.</p>
 <p>A 3D perspective diagram of a staircase. The stringer is a vertical I-beam that has been notched to fit the steps. The steps are connected to the stringer using vertical and horizontal brackets, which are bolted to the stringer.</p>	<p>Stairs with stringers notched to the supporting beam.</p> <p>Steps are connected to stringers with vertical and horizontal brackets.</p>

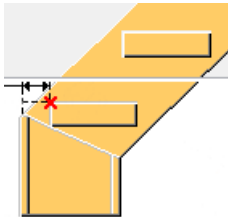
Situation	Description
	<p>Stairs with 90 degree bends at the top and bottom of the treads.</p> <p>Steps are connected to stringers with vertical and horizontal brackets.</p> <p>Red nose profile at the front edge of the steps.</p>

### Before you start

If the stringers are notched to bear on the supporting beams, create the supporting beams before creating the stairs.

### Selection order

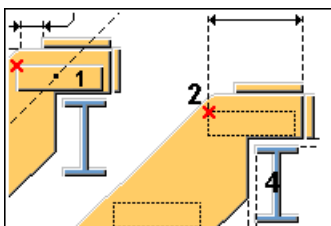
1. Pick a point to indicate the nosing point of the first step.

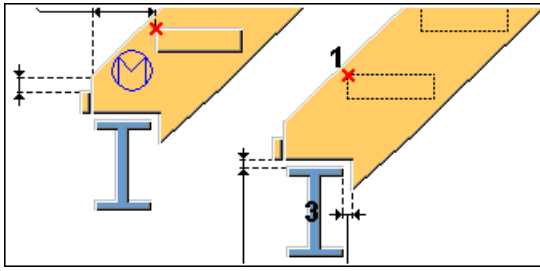


2. Pick another point to indicate the nosing point of the last step.  
Note that the order in which the points are picked has no effect.

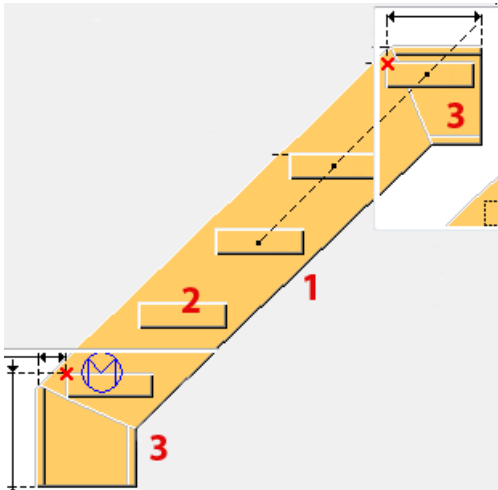
3. Click the middle mouse button to create the stairs.

If you have selected the following notched options on the **Picture** tab, select the supporting beams and then click the middle mouse button.





**Part identification key**



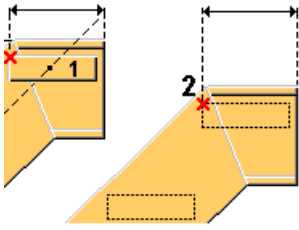
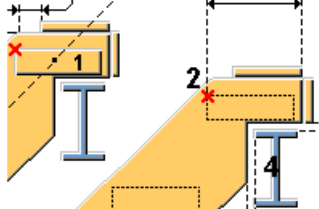
	Part
1	Stringer
2	Step
3	Landings

**Picture tab**

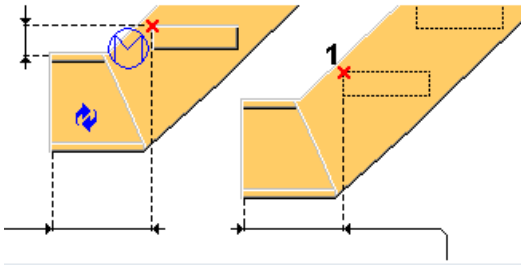
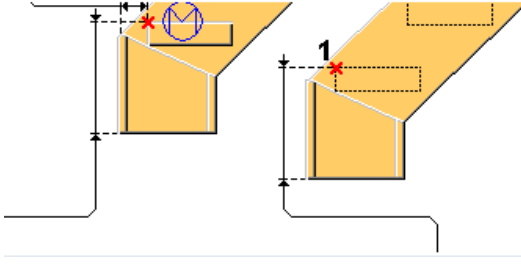
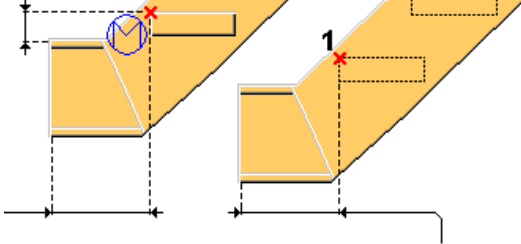
Use the **Picture** tab to control the stringer geometry and the nosing points of the steps.

**Top landing type**

Option	Description
	Default

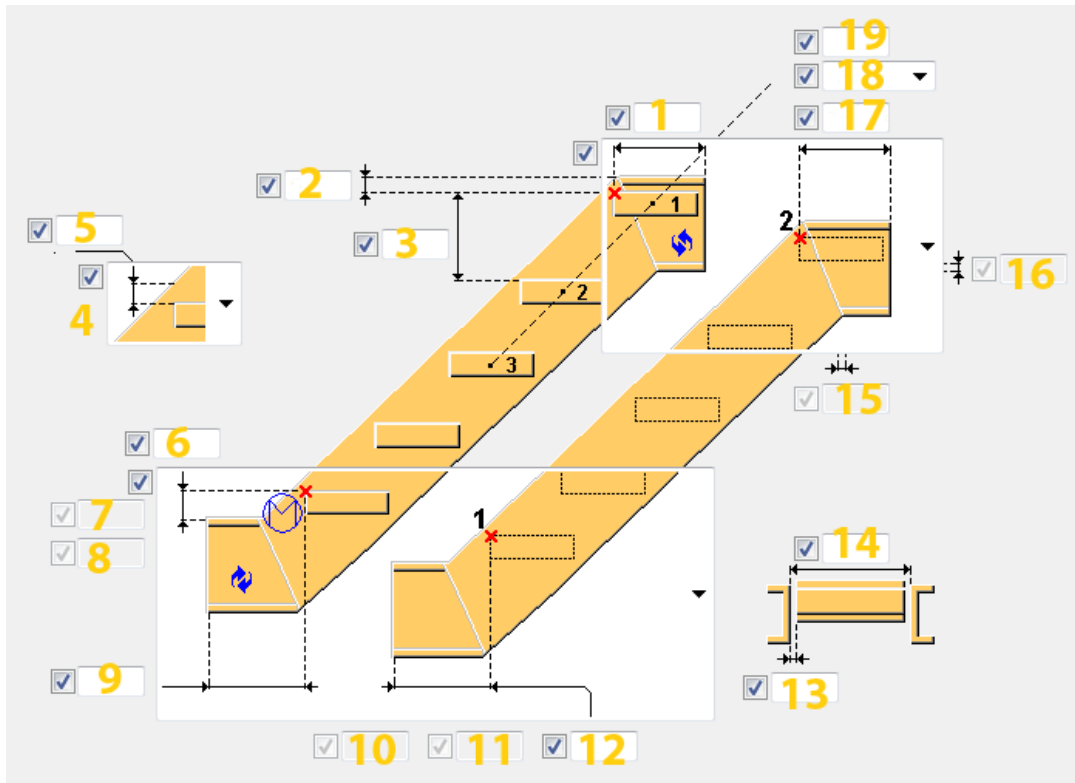
Option	Description
 <p>The diagram shows two side views of a horizontal landing. The left view shows a stringer (1) and a landing plate (2) with a red 'x' indicating a pick point. The right view shows a similar setup with a red 'x' on the landing plate (2).</p>	Horizontal landing
 <p>The diagram shows two side views of a notched landing. The left view shows a stringer (1) and a landing plate (2) with a red 'x' indicating a pick point. The right view shows a stringer (4) and a landing plate (2) with a red 'x' indicating a pick point.</p>	Notched The stringer top is on the supporting part. Vertical and horizontal plates are welded at the end of the stringer.

### Bottom landing type

Option	Description
 <p>The diagram shows two side views of a default bottom landing. The left view shows a stringer (1) and a landing plate (2) with a red 'x' indicating a pick point. The right view shows a stringer (1) and a landing plate (2) with a red 'x' indicating a pick point.</p>	Default
 <p>The diagram shows two side views of a vertical bottom landing. The left view shows a stringer (1) and a landing plate (2) with a red 'x' indicating a pick point. The right view shows a stringer (1) and a landing plate (2) with a red 'x' indicating a pick point.</p>	Vertical Creates a vertical landing where the lower picked point is on the top plane of the last step.
 <p>The diagram shows two side views of a horizontal bottom landing. The left view shows a stringer (1) and a landing plate (2) with a red 'x' indicating a pick point. The right view shows a stringer (1) and a landing plate (2) with a red 'x' indicating a pick point.</p>	Horizontal Creates a horizontal landing where the lower picked point is on the top plane of the last step.

Option	Description
	<p>Vertical lowered point</p> <p>The picked point is at the top of steel or finish floor.</p>
	<p>Horizontal lowered point</p> <p>The picked point is at top of steel or finish floor.</p>
	<p>Notched</p> <p>Creates a notch to the bottom of the stringer to bear on the supporting part. A vertical plate is welded at the end of the stringer.</p>

## Stair dimensions



	Description	Default
1	<p>Define the distance between the upper point and the end of the left top landing.</p> <p>If you set the value to 0 mm, the left top landing is not created.</p> <p>If you set the top landing type to notched, define the cut dimension of the horizontal plate from the stringer edge.</p>	0 mm
2	<p>Define the vertical distance from the upper point to the top of steel of the top landing.</p> <p>If the top landing is not created, the stringer top of steel is used.</p> <p>If you set the top landing type to notched, define the vertical distance from the upper point to the stringer top horizontal cut.</p>	200 mm

	<b>Description</b>	<b>Default</b>
<b>3</b>	<p>Define the maximum distance allowed between two consecutive steps.</p> <p>The spacing between the steps is calculated using the step spacing type <b>Exact</b> or <b>Equal</b>, and the number of steps.</p> <p>For example, if the step height should be 200 mm, the <b>Exact</b> setting creates steps of exactly this height (enter the number of steps as an integer). The <b>Equal</b> setting creates the required number of steps from the bottom to the top, with the height calculated as close to 200 mm as possible.</p>	$(Z*220) / (Z+220)$ mm, where Z is the vertical distance between the 2 picked points.
<b>4</b>	<p>Select the direction of the nosing dimension of the steps:</p> <ul style="list-style-type: none"> <li>• Vertical</li> <li>• Horizontal</li> <li>• Perpendicular</li> </ul>	Vertical
<b>5</b>	<p>Define the nosing dimension of the steps. This dimension depends on the direction you have selected.</p>	0 mm
<b>6</b>	<p>Define this dimension based on the selected bottom landing type:</p> <ul style="list-style-type: none"> <li>• Horizontal or horizontal lowered point bottom landing                Define the vertical distance from the lower point to the top of steel of the bottom landing.</li> <li>• Vertical or vertical lowered point bottom landing                Define the horizontal distance from the lower picked point to the most distant face of the bottom landing.</li> <li>• Notched bottom landing                Define the horizontal distance from the lower point to the stringer vertical cut. By default, the cut is made at the supporting part edge.</li> </ul>	150 mm
<b>7</b>	<p>Define the vertical dimension from the lower point to the first step.</p> <p>You can define this dimension when the step spacing type is set to <b>Equal</b> and the</p>	Equal with vertical spacing between steps



	<b>Description</b>	<b>Default</b>
	bottom landing type is either vertical or horizontal lowered point.	
<b>8</b>	Define the cut dimension of the vertical plate from the stringer edge. You can define this dimension when the bottom landing type is set to notched.	0 mm
<b>9</b> <b>12</b>	Define this dimension based on the selected bottom landing type: <ul style="list-style-type: none"> <li>Horizontal or horizontal lowered point bottom landing. Define the horizontal edge distance between the lower point and the bottom landing.</li> <li>Vertical or vertical lowered point bottom landing. Define the vertical edge distance between the lower point and the lowest point of the bottom landing.</li> </ul>	600 mm
<b>10</b>	Define the vertical gap between the lower supporting part and the stringer cut. You can define this dimension when you have set the bottom landing type to notched.	0 mm
<b>11</b>	Define the horizontal gap between the lower supporting part and the stringer cut. You can define this dimension when you have set the bottom landing type to notched.	0 mm
<b>13</b>	Define the dimension to shorten the steps equally on both sides.	0 mm
<b>14</b>	Define the width of the steps.	1000 mm
<b>15</b>	Define the horizontal gap between the upper supporting part and the stringer cut. You can define this dimension when you have set the top landing type to notched.	0 mm
<b>16</b>	Define the vertical gap between the upper supporting part and the stringer cut. You can define this dimension when you have set the top landing type to notched.	0 mm

	Description	Default
17	<p>Define this dimension based on the selected top landing type:</p> <ul style="list-style-type: none"> <li>Horizontal top landing. Define the distance between the upper point and the end of the stringer.</li> <li>Notched top landing. Define the horizontal distance between the upper point and the stringer vertical cut. By default the cut is made at the supporting part edge.</li> </ul> <p>If you set this dimension to 0 mm, the top landing is not created.</p>	0 mm
18	<p>Select the step spacing type:</p> <ul style="list-style-type: none"> <li><b>Exact</b> creates the steps of exactly the defined height. Enter the number of steps as an integer.</li> <li><b>Equal</b> creates the required number of steps from the bottom to the top, with the height calculated as close as possible to the defined step height.</li> </ul> <p>The spacing type controls how the vertical spacing between the steps is calculated.</p> <p>If you select <b>Exact</b> and set the bottom landing type to horizontal or vertical lower point, the steps are spaced from the upper point to the lower point. In all other cases the steps are spaced from the lower point to the upper point.</p>	<b>Equal</b>
19	<p>Enter the number of steps.</p> <p>This option depends on step spacing type and step spacing.</p> <p>If you set the step spacing type to <b>Exact</b>, or to <b>Equal</b> and the spacing distance is not defined, <b>Z pan (S74)</b> creates the number of steps you have defined.</p>	Calculated from the vertical distance between the picked points and the spacing between the steps

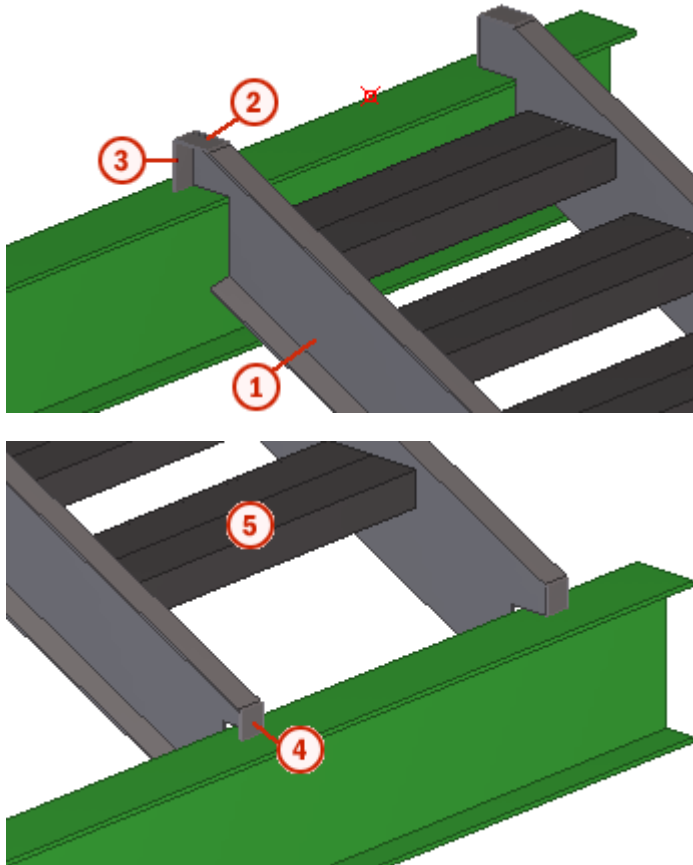
### Vertical landing offset

Define the vertical offset for the left and right horizontal landing at the top and bottom of the stringers.

### Stair setup tab

Use the **Stair setup** tab to control the part properties, top and bottom steps, position of the stairs on the horizontal plane, and rotation of stringers and steps.

### Stair part properties




	Part	Description	Default
1	<b>Left stringer</b>	Always created Select a profile from the profile catalog.	BLU400*2 The default name is STRINGER.
1	<b>Right stringer</b>	Always created Select a profile from the profile catalog.	BLU400*2 The default name is STRINGER.
2	<b>Upper H plate</b>	Created only if the top of the stringer is on the supporting beam.	6 mm The default name is PLATE.
3	<b>Upper V plate</b>	Created only if the top of the stringer is on the supporting beam.	6 mm The default name is PLATE.

	<b>Part</b>	<b>Description</b>	<b>Default</b>
<b>4</b>	<b>Lower V plate</b>	Created only if the bottom of the stringer in on the supporting beam.	6 mm The default name is PLATE.

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

### Stair setup settings


<b>Option</b>	<b>Description</b>
<b>Create assembly</b>	Define which parts of the stair component form an assembly. The default is stringers.
<b>Stringer reference line</b>	<ul style="list-style-type: none"> <li>• <b>Above:</b> The line positioned on the inside of the stairs on the top face is used as the reference line.</li> <li>• <b>Nosing:</b> The nosing line of the steps is used as the reference line.</li> </ul> <p>The reference line is used for workshop drawings.</p>
<b>Position in plane</b>	Position of the stairs. The middle line of steps is used as the reference line. The default is <b>Right</b> .
<b>Offset</b>	Offset of the stairs on the plane from the position that is set in the <b>Position in plane</b> option.  The default offset is 0 mm.
<b>Stringer rotation</b>	Rotation of the stringer around its axis. The default is top 
<b>Create top step</b>	Define whether the first step of the stairs (the highest step) is created. By default, the first step is created.

Option	Description
<b>Create bottom step</b>	Define whether the last step of the stairs (the lowest step) is created. By default, the last step is created.
<b>Bracket</b>	Select how the steps are connected to the stringers: <ul style="list-style-type: none"> <li>• Default</li> <li>• Horizontal bracket</li> <li>• Horizontal and vertical brackets</li> <li>• Bent plate bracket</li> </ul>

### **Z pan tab**

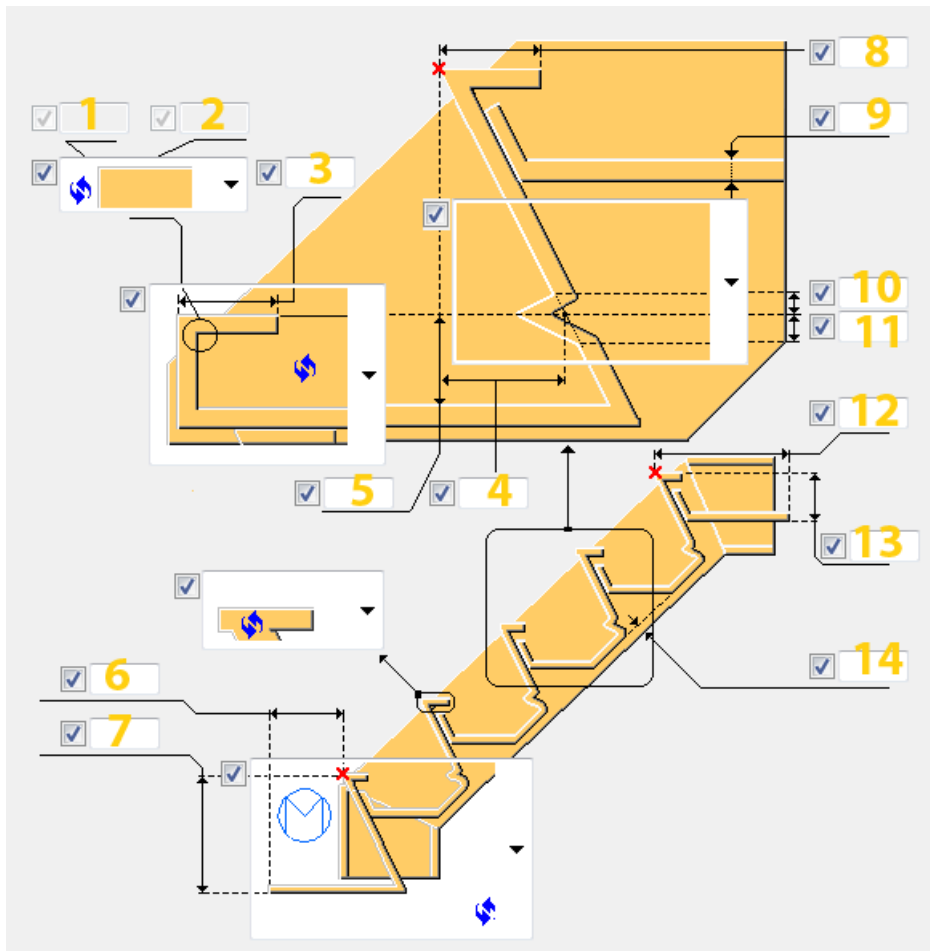
Use the **Z pan** tab to control the size and shape of the Z pan steps.

### **Profiles**

Profile	Description	Default
<b>Step profile</b>	<p>Step profile is calculated from the thickness you enter for the Z pan plate when defining the Z pan dimensions.</p> <p>Select an appropriate material for the step profile. In the US imperial environment, Tekla Structures saves the selected material in the <b>Gage material</b> user-defined attribute of the step profile. You can use this information in reports and in the bill of material of drawings.</p>	
<b>Nose profile</b>	<p>Created only if <b>Nosing piece</b> is set to <b>Create nose</b>.</p>  <p>To create the nose profile, select the profile from the profile catalog.</p>	PL160*10

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	





### Z pan dimensions



	Description	Default
<b>1</b> <b>2</b>	Define the chamfer dimensions for the front edge.	15 mm
<b>3</b>	Define the length of the front part of the step according to the selected front edge type.	40 mm
<b>4</b>	Define back wall slope width between the nosing point vertical line and the Z pan back wall (concrete level lip set-off point).	100 mm
<b>5</b>	Define the height of the inner step dimension where the concrete will be poured.	100 mm
<b>6</b> <b>7</b>	Define the width and height of the bottom step.	height = 200 mm width = 0 mm
<b>8</b>	Define the horizontal dimension for the Z pans that have a skewed front edge.	60 mm
<b>9</b>	Define the thickness of the Z pan plate.	10 mm
<b>10</b> <b>11</b>	Define the lip dimensions of the back wall of the step.  You can define these dimensions if <b>Back wall type</b> is set to <b>Lip</b> .	15 mm
<b>12</b>	Define the horizontal length of the top step.  This is the horizontal distance between the top nosing point and the end of the top step horizontal section.	300 mm
<b>13</b>	Define the height of the top step.  This is the vertical distance between the top nosing point and the end of the top step horizontal end.	100 mm
<b>14</b>	Define the bottom line clearance for the steps that prevent the bottom portion of the Z pan from overlapping the bottom end of the stringer.	20 mm

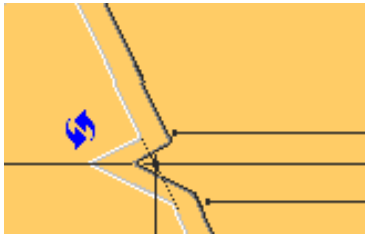
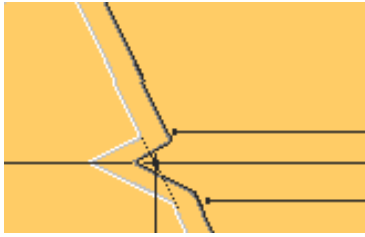

### Chamfer type

Select the shape of the step front edge.

Option	Description
	None
	Line
	Rounding
	Arc

### Back wall type

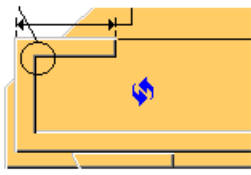
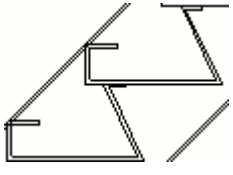
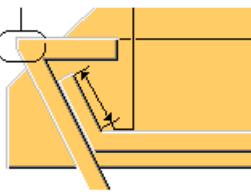
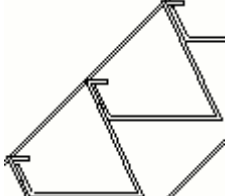
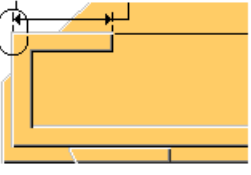
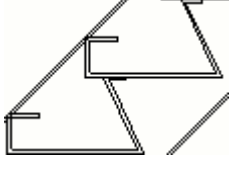
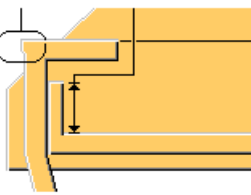
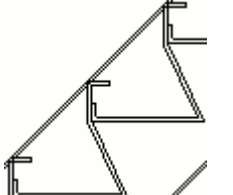
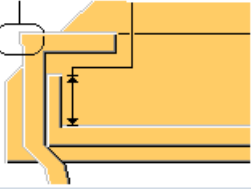
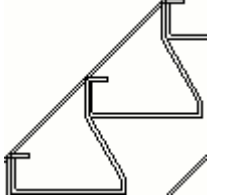
Select the Z pan back wall type.

Option	Description
	Default
	Lip
	Straight

### Front edge type




Select how a pan connects to the pan below.



Option	Description	Example
	<p>Default</p> <p>Rectangular front edge.</p> <p>AutoDefaults can change this option.</p>	
	<p>Skewed front edge.</p> <p>Pan overlaps the lower one and continues in the same angle as the back wall.</p>	
	<p>Rectangular front edge.</p> <p>Pans do not overlap each other.</p>	
	<p>Rectangular front edge.</p> <p>Pan overlaps the lower one and continues in the same angle as the back wall.</p>	
	<p>Rectangular front edge.</p> <p>Pan overlaps the lower one and continues at a 30-degree angle.</p>	


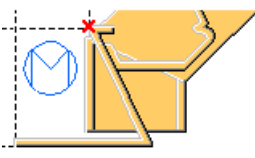
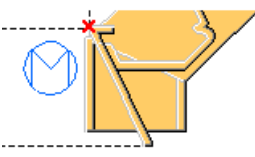
### Nosing piece

Select whether the nosing piece is created on top of the step.

Option	Description
	<p>Default</p> <p>No nose.</p> <p>AutoDefaults can change this option.</p>
	<p>No nose.</p>
	<p>Create nose.</p>

## Horizontal part

Select whether the bottom pan has a horizontal part. Enter the vertical distance from the bottom of the pan to the top level of the Z pan (concrete slab thickness) in Z pan dimensions.

Option	Description
	Default Create horizontal part. AutoDefaults can change this option.
	Create horizontal part.
	No horizontal part.

## Horizontal bracket tab

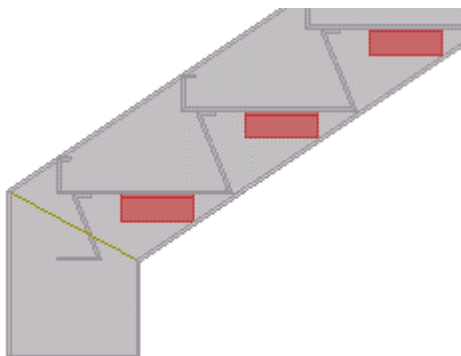
Use the **Horizontal bracket** tab to control the properties and attachment of the horizontal brackets. The horizontal brackets are angle profiles underneath the treads.

### Preconditions

Before you can set the properties of the horizontal brackets, set the following option:

- On the **Stair set-up** tab, set **Bracket** to **Horizontal bracket** or **Horizontal and vertical brackets**.

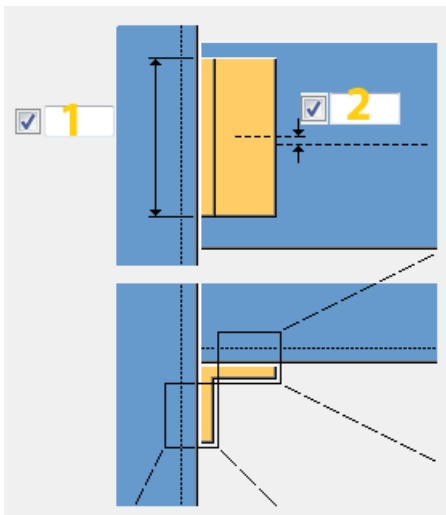
## L profile



Part	Description	Default
<b>L profile</b>	Created only if brackets are created.  Select the profile from the profile catalog.	BLL80*80*10

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

### Bracket dimensions

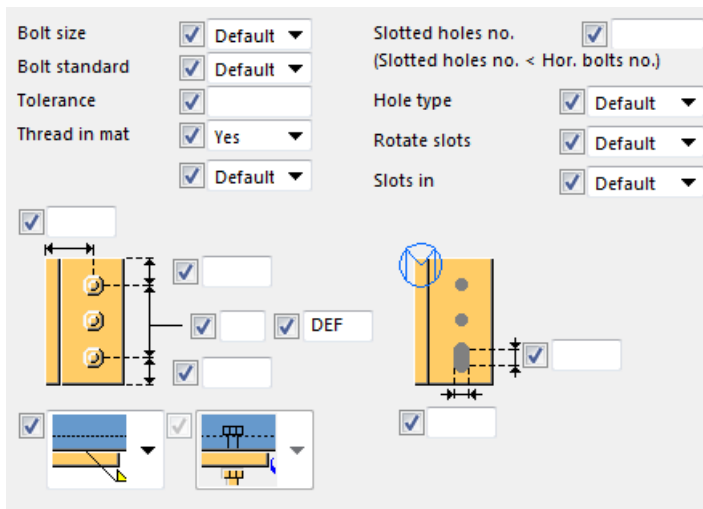


<b>1</b>	Define the length of the bracket.  The default length is calculated according to bracket-to-step or bracket-to-stringer bolt dimensions, depending on which one is bigger.
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<b>2</b>	<p>Define the dimension to offset the bracket from the center line of the thread.</p> <p>The default is 0 mm.</p>
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### Bracket-to-step connection

Define the properties of the bolts that connect the brackets to the steps.

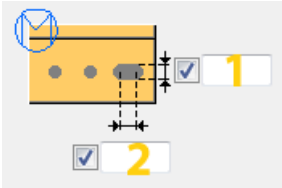


### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

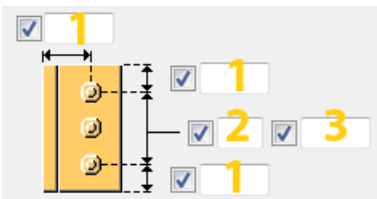
## Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Slotted holes no</b>	Define the number of slotted holes.	
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

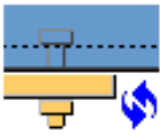
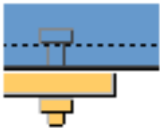
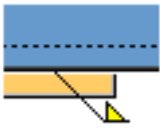
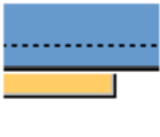
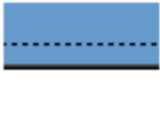
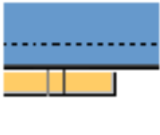
## Bolt group dimensions



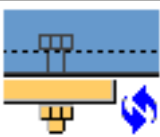
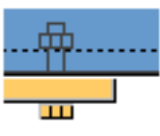
	Description	Default
1	Bolt edge distance.	bolt diameter * 1.5
2	Number of bolts.	2
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For	100 mm

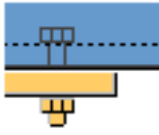
	Description	Default
	example, if there are 3 bolts, enter 2 values.	

### Bracket-to-step connection type

Option	Description
	Default.
	Bolted.
	Welded.
	No connection.
	No bracket angle leg. The bracket is a plate instead of an angle.
	Holes only.

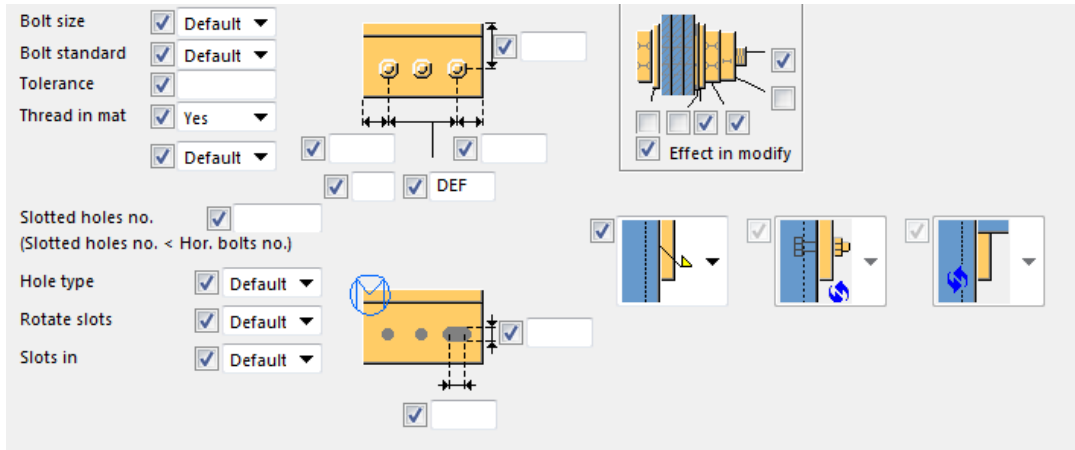
### Bolting direction

Option	Description
	Default.
	Bolted from the bracket to the step.

Option	Description
	Bolted from the step to the bracket.

### Bracket-to-stringer connection

Define the properties of the bolts that connect the brackets to the stringers.

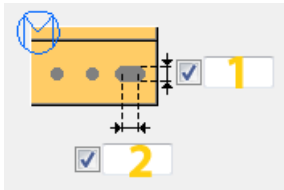


### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

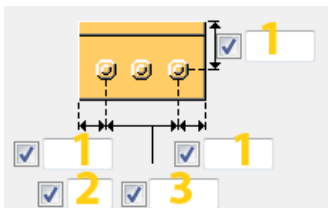
## Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Slotted holes no</b>	Define the number of slotted holes.	
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

## Bolt group dimensions



	Description	Default
<b>1</b>	Bolt edge distance.	bolt diameter * 1.5
<b>2</b>	Number of bolts.	2
<b>3</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For	100 mm

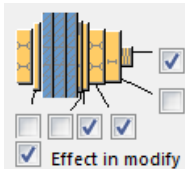


	Description	Default
	example, if there are 3 bolts, enter 2 values.	

### Bolt assembly

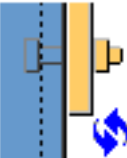
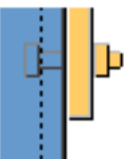
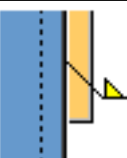

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.

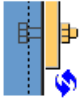
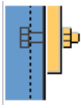
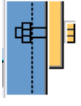


To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bracket-to-stringer connection type

Option	Description
	Default. Bolted. AutoDefaults can change this option.
	Bolted.
	Welded.
	No connection.

## Bolting direction

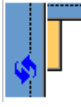
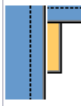
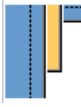
Option	Description
	Default. Bolted from the bracket to the stringer. AutoDefaults can change this option.
	Bolted from the bracket to the stringer.
	Bolted from the stringer to the bracket.

## Bracket position

Define the position of the plate-type bracket. The bracket can be positioned below the step, or between the step and the stringer.

You can define the bracket position if the bracket is a created as a plate instead of an angle.



Option	Description
	Default Below the step. AutoDefaults can change this option.
	Below the step.
	Between the stringer and step.

## Vertical bracket tab

Use the **Vertical bracket** tab to control the properties and attachment of the vertical brackets. The vertical brackets are angle profiles underneath the treads and they support the vertical portion of the stair treads.

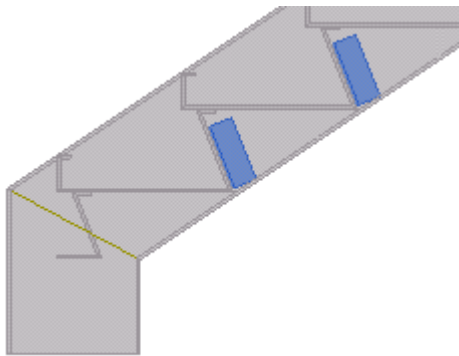
## Preconditions

Before you can set the properties of the vertical brackets, set the following options:

- On the **Stair set up** tab, set **Bracket** to **Horizontal and vertical brackets**.
- On the **Z pan** tab, set the **Back wall type** to **Straight**.



## L profile

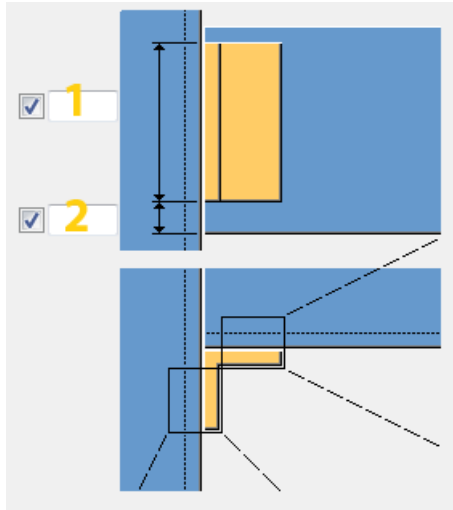


Part	Description	Default
<b>L profile</b>	Created only if brackets are created.  Select the profile from the profile catalog.	BLL80*80*10

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the

Option	Description	Default
		<b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

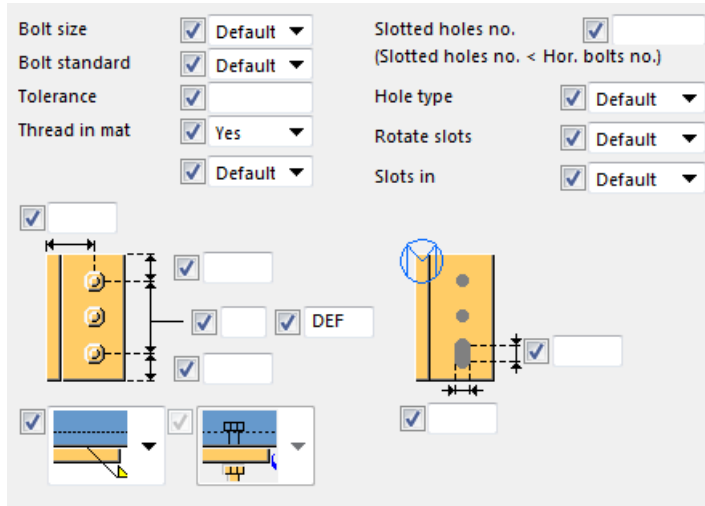
### Bracket dimensions



	Description	Default
<b>1</b>	Define the height of the bracket.	Default height is calculated according to bracket-to-step or bracket-to-stringer bolt dimensions, depending on which one is bigger.
<b>2</b>	Define the dimension to offset the bracket from the Z pan edge.	25 mm

### Bracket-to-step connection

Define the properties of the bolts that connect the brackets to the steps.

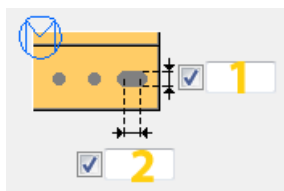


### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

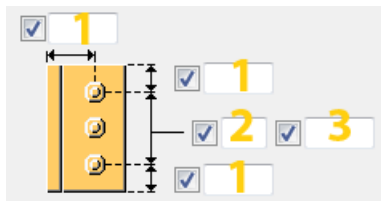
### Slotted holes

You can define slotted, oversized, or tapped holes.



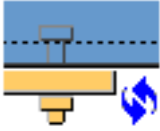
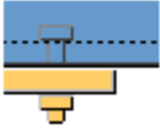
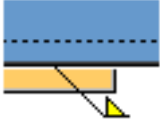
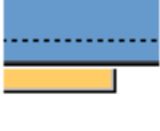


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Slotted holes no</b>	Define the number of slotted holes.	
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt group dimensions

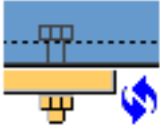
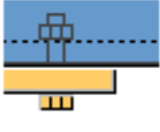
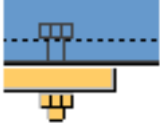


	Description	Default
1	Bolt edge distance.	bolt diameter * 1.5
2	Number of bolts.	2
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.	100 mm

### Bracket-to-step connection type

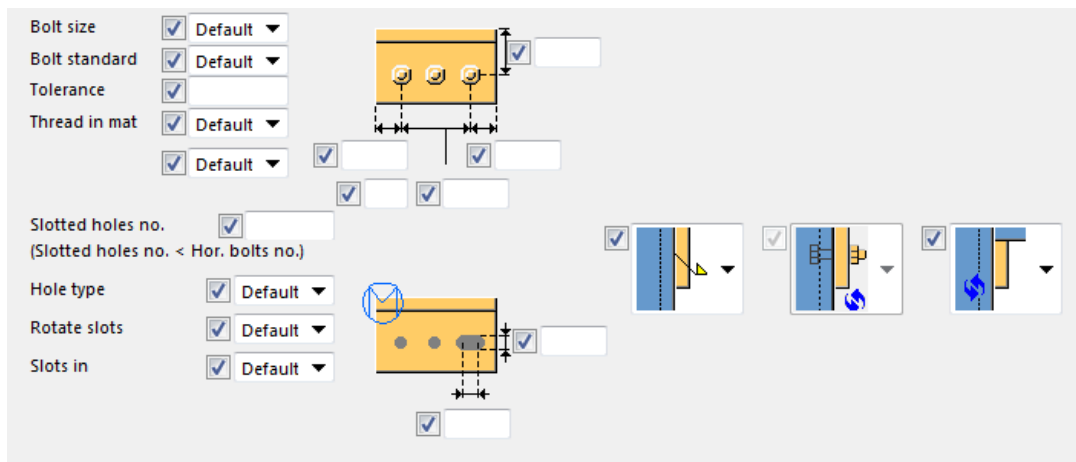
Option	Description
	Default.
	Bolted.
	Welded.
	No connection.
	No bracket angle leg. The bracket is a plate instead of an angle.
	Holes only.

### Bolting direction

Option	Description
	Default.
	Bolted from the bracket to the step.
	Bolted from the step to the bracket.

## Bracket-to-stringer connection

Define the properties of the bolts that connect the brackets to the stringers.



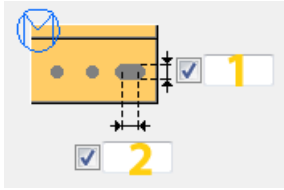
## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

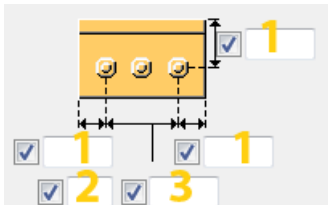
You can define slotted, oversized, or tapped holes.





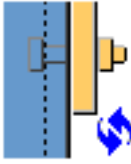
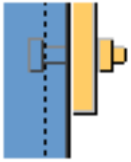
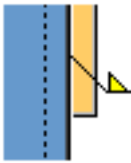
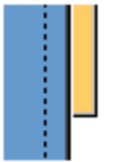
Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Slotted holes no</b>	Define the number of slotted holes.	
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt group dimensions

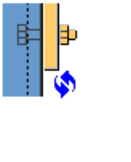
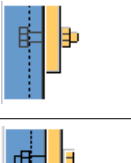



	Description	Default
1	Bolt edge distance.	bolt diameter * 1.5
2	Number of bolts.	2
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.	100 mm

### Bracket-to-stringer connection type

Option	Description
	Default. Bolted. AutoDefaults can change this option.
	Bolted.
	Welded.
	No connection.

### Bolting direction

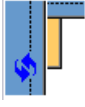
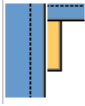

Option	Description
	Default. Bolted from the bracket to the stringer. AutoDefaults can change this option.
	Bolted from the bracket to the stringer.
	Bolted from the stringer to the bracket.

### Bracket position

Define the position of the plate-type bracket. The bracket can be positioned below the step, or between the step and the stringer.

You can define the bracket position if the bracket is a created as a plate instead of an angle.



Option	Description
	Default Below the step. AutoDefaults can change this option.
	Below the step.
	Between the stringer and step.

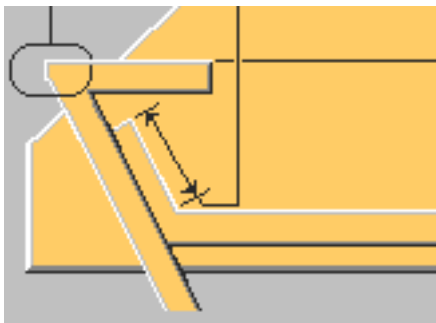
### ***Bent plate bracket tab***

Use the **Bent plate bracket** tab to control the dimensions and other properties of the bent plate bracket. You can use the bent plate bracket for connecting the Z pan steps to the stringers instead of horizontal or vertical brackets.

### **Preconditions**

To create the bent plate bracket, set the following options:

- On the **Stair setup** tab, set **Bracket** to **Bent plate bracket**.
- On the **Z pan** tab, set **Front edge type** to the following option:



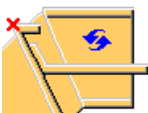


### **Bent plate profile**

Part	Description	Default
<b>Bent plate profile</b>	Created if <b>Bracket</b> is set to <b>Bent plate bracket</b> on the <b>Stair setup</b> tab.	BPL80*10

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	


### Create top step bent plate bracket



Select whether to create the bent bracket for the top step.

Option	Description
	Default Bent plate bracket is not created. AutoDefaults can change this option.
	Bent plate bracket is not created.
	Bent plate bracket is created.

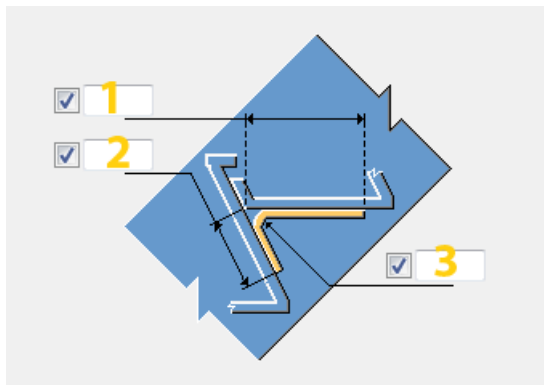
### Create bottom step bent plate bracket

Select whether to create the bent bracket for the bottom step.

Option	Description
	Default Bent plate bracket is not created. AutoDefaults can change this option.

Option	Description
	Bent plate bracket is not created.
	Bent plate bracket is created.

### Bent bracket dimensions



	Description	Default
1	Define the horizontal distance from the step corner to the bent plate edge.	200 mm
2	Define the vertical distance from the step corner to the bent plate edge.	100 mm
3	Define the radius of the round bending.	$1 / 3 * \text{vertical dimension}$

### Welds

Click the link below to find out more:

### Kickplate (S75)

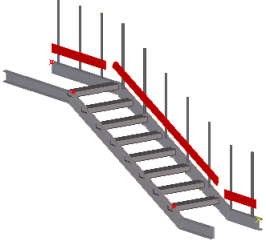
**Kickplate (S75)** creates one or more kickplates at the bottom of stanchions.

### Objects created

- Kickplates

- Welds

### Use for

Situation	Description
	Kickplates are connected to stanchions.

### Before you start

Create stringers, beams, or slabs, and then stanchions using the **Stanchions (S76)** component, for example.

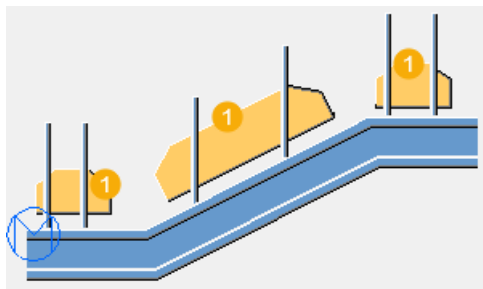
### Selection order

1. Select the main parts (stringers/beams/slabs).
2. Select the first stanchion.
3. If **Stanchion selection** on the **Picture** tab is set to **Default** or **Use all**, and the stanchions have been created with **Stanchions (S76)**, click the middle mouse button to create the component.

If the stanchions are modeled separately or **Stanchion selection** is set to **Use selected**, select the second stanchion, then third and so on, and click the middle mouse button.

Note that if you modify the component, all connected components will be deleted. For example, modifying stanchions deletes the connected kickplates and railings.

### Part identification key



	Description
1	Kickplate




### Picture tab

Use the **Picture** tab to define the kickplate dimensions, chamfers, and sides.

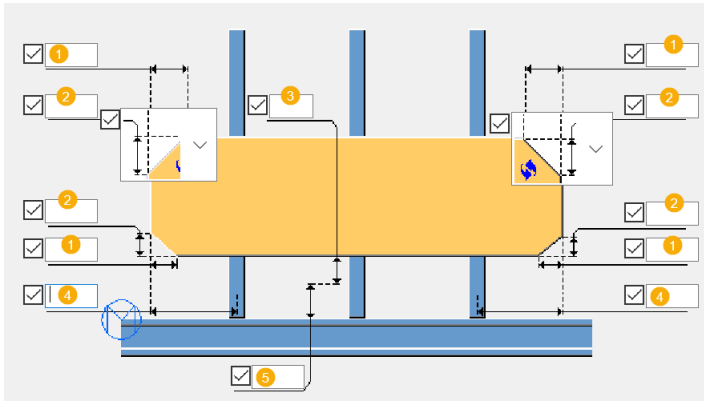
### Part selection

Option	Description	Default
<b>Stair parts selection</b>	Define how the stringers or beams are considered: <ul style="list-style-type: none"><li>• <b>Use selected:</b> Only the selected stringers are considered for creating kickplates on.</li><li>• <b>Use all:</b> If one or more of the selected stringers are part of a stair, then all the stringers in the same direction with the selected one, inside the stair, will be selected as well.</li></ul>	<b>Use all</b>
<b>Stanchion selection</b>	<ul style="list-style-type: none"><li>• <b>Use selected:</b> Only the selected stanchions are considered for creating kickplates on.</li><li>• <b>Use all:</b> If one or more of the selected stanchions are part of a stanchions macro, then all the stanchions in the same direction with the selected one, inside the stair macro, will be selected as well.</li></ul>	<b>Use all</b>

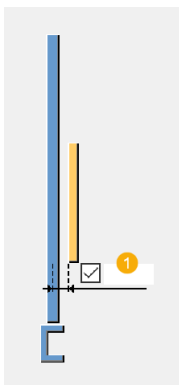
### Kickplate on skewed stringer

	Default Kickplate is created on the skewed stringer. AutoDefaults can change this option.
	Kickplate is not created on the skewed stringer.
	Kickplate is created on the skewed stringer.

## Dimensions

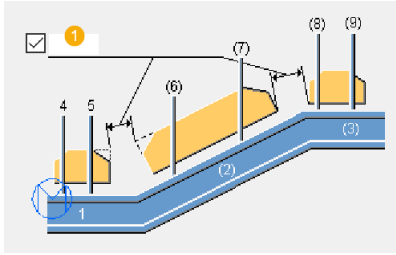


	Description	Default
1	Horizontal chamfer for the plate corner.	0 mm
2	Vertical chamfer for line chamfers and chamfer radius for round chamfers. If a kickplate is split in pieces, only the first and last piece will be chamfered.	0 mm
3	Kickplate height, referenced to the floor height.	200 mm
4	Kickplate extensions for the left or right sides.	150 mm
5	Floor height	0 mm



	Description	Default
1	Gap between the kickplates and the stanchions. The offset direction of the plates depends on which side of the stanchions the plates are created.	0 mm





	Description	Default
1	Gap between two consecutive kickplates. The dimension is considered perpendicular on the bisecting lines between the two plates and is calculated from the closest corners between the points.	10 mm


### Chamfer type

Chamfer type for the top vertical corners of the kickplate. If the plate is split in pieces, only the first and last piece are chamfered.

Option	Option	Description
		Default Line chamfer AutoDefaults can change this option.
		Line chamfer
		Round chamfer










### Kickplate side

Option	Description
	Default Kickplates are created on the left side of the stanchions. AutoDefaults can change this option.
	Kickplates are created on the left side of the stanchions.
	Kickplates are created on the right side of the stanchions.

Option	Description
	Kickplates are centred on the stanchions line, and they are split in pieces between the stanchions.

### Rotation

Select a suitable kickplate rotation option.

Options










### Parameters tab

Use the **Parameters** tab to define the part properties, and kickplate cut and connection type.





### Parts

Option	Description	Default
<b>Kickplate</b>	Select the profile from the profile catalog.  The kickplate is created as a polygon plate if you do not select a profile.	
<b>Profile max. length</b>	Maximum length of the kickplate.	5000 mm
<b>Kick plate as contour plate</b>	Define how the kick plate is created. <ul style="list-style-type: none"> <li>Select <b>Yes</b> to create it as a contour plate.</li> <li>Select <b>No</b> to create the kick plate as the</li> </ul>	

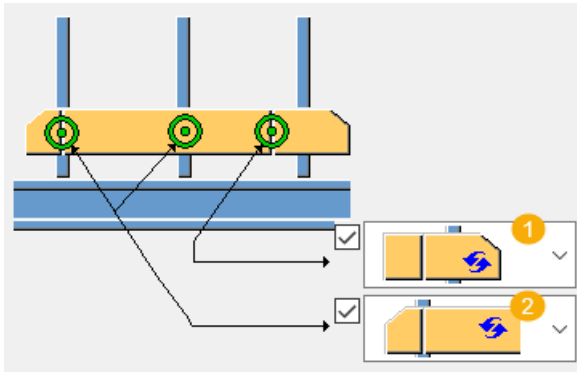
Option	Description	Default
	selected beam profile.	

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	





### Kickplate cut type




Option	Description
	Default No cut AutoDefaults can change this option.
	No cut
	Cut at maximum length The kickplate is split in pieces if its total length is more than defined in <b>Profile max length</b> .
	Cut at every stanchion The kickplate is split in pieces by cut planes defined by the stanchion centre lines.


## Connection type



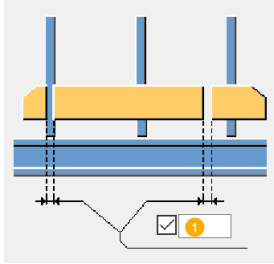
	Description
1	Connection type between one or two kickplate pieces and a stanchion (main part).
2	Connection type between two consecutive kickplate pieces.

Option	Description
	Default No connection AutoDefaults can change this option.
	No connection
	Welding
	Connection When you set the connection type to connection, a standard Tekla Structures connection is used as defined in <b>Connection name</b> and <b>Attribute file</b> .

Option	Description
	Default No connection AutoDefaults can change this option.
	No connection
	Welding

Option	Description
	<p>Connection</p> <p>When you set the connection type to connection, a standard Tekla Structures connection is used as defined in <b>Connection name</b> and <b>Attribute file</b>.</p>

### Gap between plates



	Description
1	Gap between two consecutive pieces of the same kickplate.

### Welds

Click the link below to find out more:

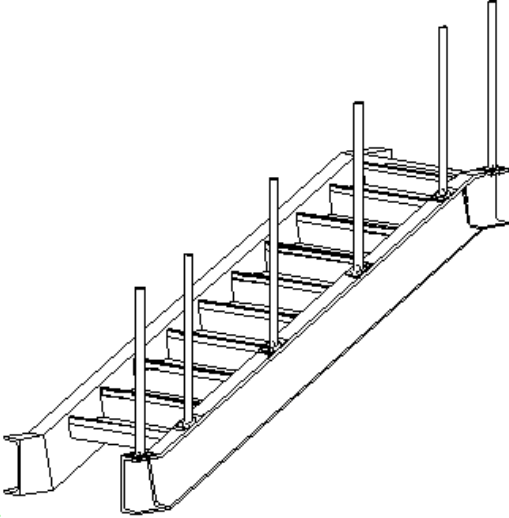
### Stanchions (S76)

**Stanchions (S76)** creates stanchions on one or more horizontal or skew stair stringers. Stanchions can also be used on concrete slabs.

#### Objects created

- First stanchion
- Middle stanchions
- Last stanchion

## Use for

Situation	Description
	Stanchions bolted on a stringer.

## Limitations

**NOTE** If you modify **Stanchions (S76)**, all connected components are deleted. For example, modifying the stanchions deletes stairs, railings, and other components connected to the stanchions.

## Before you start

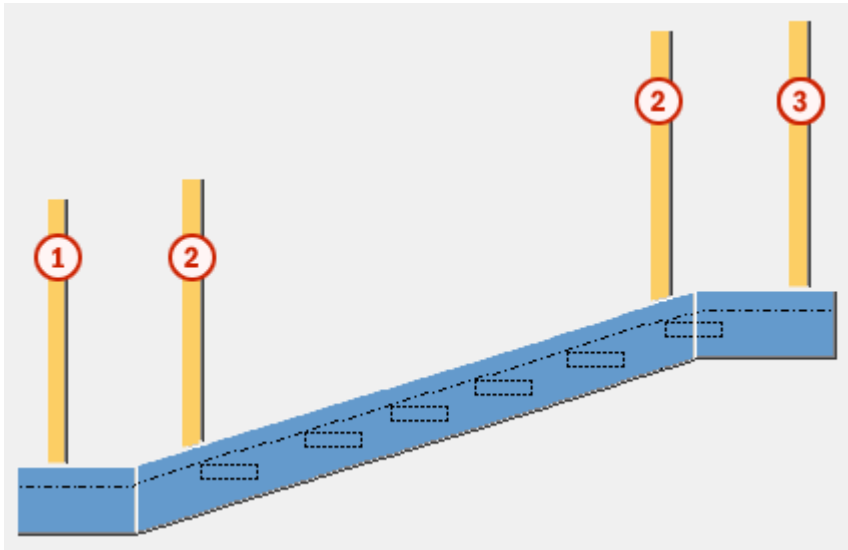
Create stringers, beams, or slabs or other parts to connect the stanchions.

## Selection order

1. Pick the start point.
2. Pick the end point.
3. Select the lower landing (optional).
4. Select the stringer.
5. Select the upper landing (optional).

Click the middle mouse button to create the component.

## Part identification key



	Part
1	First stanchion
2	Middle stanchions
3	Last stanchion

### **Picture tab**

Use the **Picture** tab to control the stanchion creation.

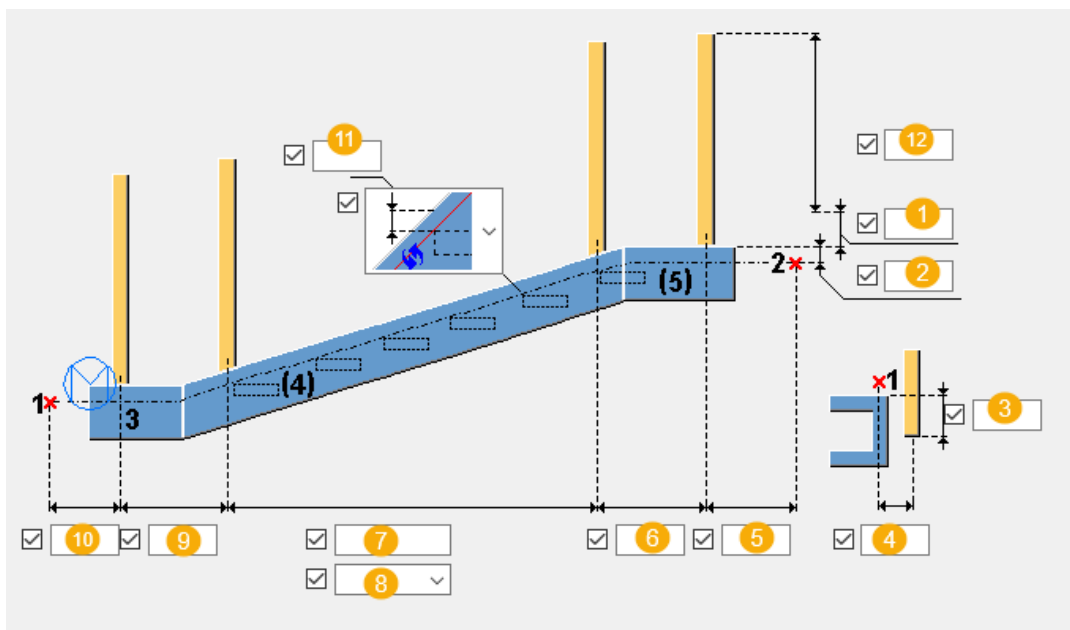
### **Stair parts selection**

By default, the **Use all** option is used.

- **Use selected:** the stanchions are created only to the selected parts.
- **Use all:** if you have created one or more stringers using a stair component, select this option.

All the stringers which are part of the stair component and have the same direction are selected.

## Part positions



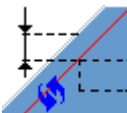
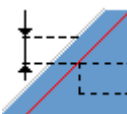
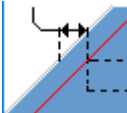
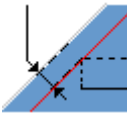
	Description	Default
1	Additional height to the stanchion.	
2	Height of the floor level.	1300 mm
3	Stanchion bottom point vertical offset.	0 mm
4	Stanchion bottom point horizontal offset.	0 mm
5	Distance between the second selected point and the last stanchion.	300 mm
6	Distance between the last two stanchions.	0 mm
7	Space between the stanchions. Use the value 8 to define the spacing type.	1000 mm
8	Stanchion spacing type. <ul style="list-style-type: none"> <li>Maximum <p>The spacing value in the box 7 defines the maximum space between the stanchions. As many equally spaced middle stanchions as needed are created. The space between the stanchions is less or equal to the maximum distance.</p> </li> <li>Exact <p>The space between the middle stanchions is exactly the spacing value in the box 7. Enter the spacing values</p> </li> </ul>	Maximum



	Description	Default
	using the following formats: 6*950 or 1000 800 800 1000 800.	
<b>9</b>	Distance between the first two stanchions.	0 mm
<b>10</b>	Distance between the first selected point and the first stanchion.	300 mm
<b>11</b>	Nosing dimension of the steps.	
<b>12</b>	Stanchion height from the floor level.	1300 mm

### Nosing direction

Define the nosing direction.

Option	Description
	Default Vertical AutoDefaults can change this option.
	Vertical
	Horizontal
	Perpendicular

### Parts tab

Use the **Parts** tab to control the stanchion profiles.

### Stanchion profile

Option	Description
<b>First Stanchion</b>	Define the first stanchion profile by selecting it from the profile catalog. First stanchion is always created. The default name is STANCHION.

Option	Description
<b>Middle Stanchion</b>	Define the middle stanchion profile by selecting it from the profile catalog. Middle stanchion is always created. The default name is STANCHION.
<b>Last Stanchion</b>	Define the last stanchion profile by selecting it from the profile catalog. Last stanchion is always created. The default name is STANCHION.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	





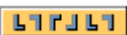

### Stanchion profile rotation

Define the stanchion profile rotation and position.

Option	Description	Default
<b>Profile rotation</b>	Stanchion profile rotation and position.	Rotation = <code>Front</code> Position = <code>Middle</code>
<b>Rotation value</b>	Stanchion profile rotation angle (in degrees) and the plane offset.	Rotation angle = 0 Offset = 0 mm

## Stanchion profile rotation type

Define the rotation combinations for consecutive stanchions.

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2
	Type 3
	Type 4
	Type 5

## Parameters tab

Use the **Parameters** tab to control how the stanchions are connected to the stairs.

### Connection properties

Option	Description
<b>Connection setting type</b>	Define whether pre-defined or custom settings are used for connecting the stanchions to the stairs.  By default, the pre-defined settings are used.
<b>Stanchion connection type</b>	Connection type for stanchions.  By default, the weld default connection type is used.  This field is active only if you have set the <b>Connection setting type</b> to <b>Pre-defined settings</b> .
<b>Connection number</b>	Define a connection that connects stanchions to the stairs by selecting it from the component catalog.
<b>Connection properties</b>	Select an attribute file for the connection.
<b>Direction</b>	Connection direction.
<b>Stanchion product name</b>	Enter the product name.

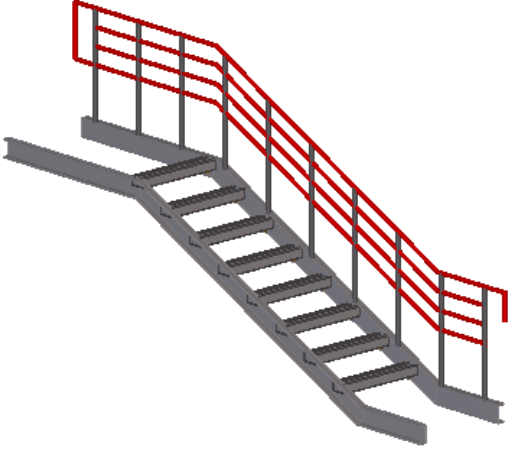
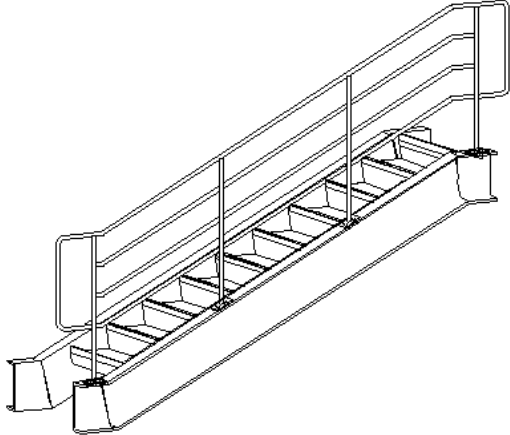
## Railings (S77)

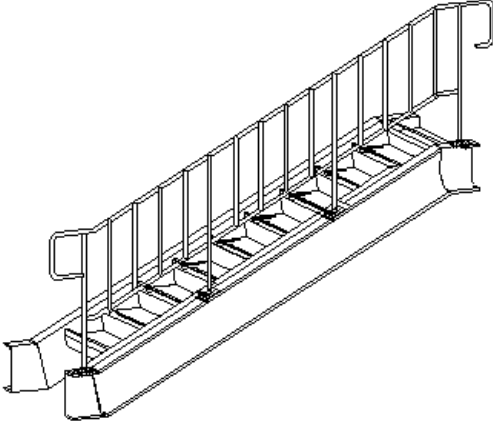
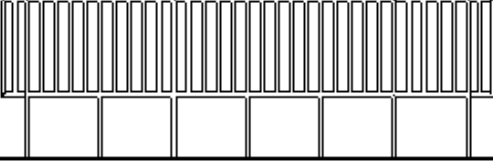
**Railings (S77)** creates railings connected to two or more stanchions. The railings can be handrails in stairs or guardrails in a horizontal beam or slab.

### Objects created

- Top rail
- Middle rails (horizontal or vertical)
- Bottom rail
- Panels
- Bends

### Use for

Situation	Description
 A 3D perspective rendering of a staircase with a red railing system. The railing consists of a top rail, a middle rail, and a bottom rail, all connected by vertical stanchions. The railing follows the slope of the stairs and has a horizontal section at the top and bottom.	Horizontal railings
 A line drawing of a staircase railing system. The railing is connected to four vertical stanchions. The railing consists of a top rail, a middle rail, and a bottom rail. The railing follows the slope of the stairs and has horizontal sections at the top and bottom.	Horizontal railings connected to four stanchions

Situation	Description
	Vertical railings connected to four stanchions
	Guardrail with vertical railings

### Before you start

Create the stanchions using, for example, **Stanchions (S76)**.

### Selection order

1. Select the first stanchion.
2. If the stanchions are created with **Stanchions (S76)**, and on the **Picture** tab the **Stanchion selection** is set to **Use all** or **Default**, the railings are created when you click the middle mouse button.

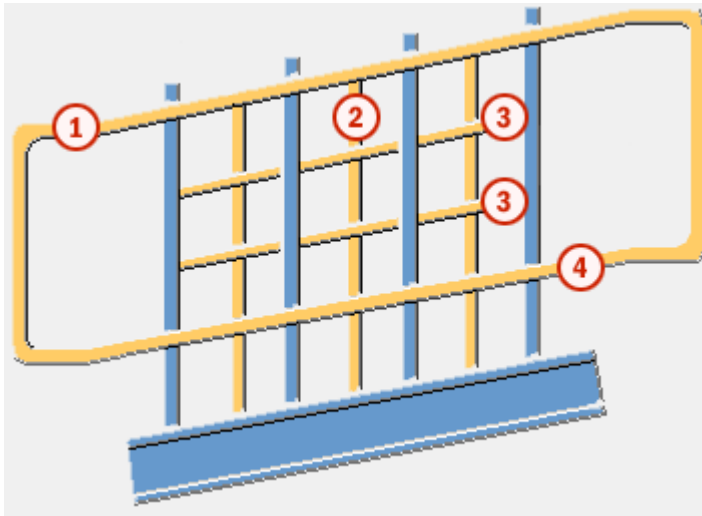
OR

1. Select the first stanchion.
2. If the stanchions are created separately, or on the **Picture** tab the **Stanchion selection** is set to **Use selected**, select the second, third, and so on, stanchion.

The order in which the stanchions are selected defines the positioning of the railings. The two first selected stanchions define the left and right directions of the railings.

3. Click the middle mouse button to create the railings.

## Part identification key



	Part
1	Top rail
2	Vertical rails
3	Middle rails
4	Bottom rail

### **Picture tab**

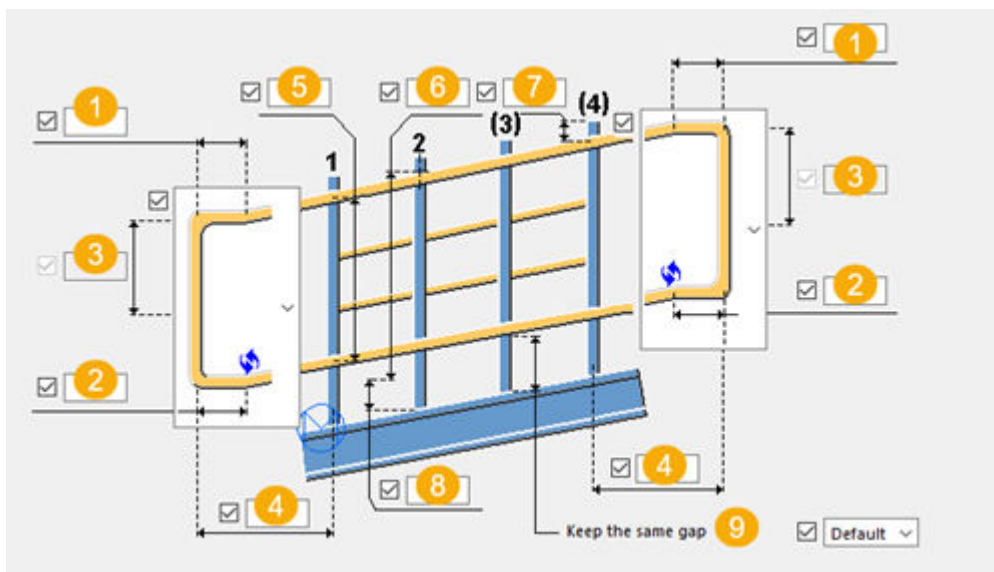
Use the **Picture** tab to control the railings and the closures.

### **Stanchion selection**

By default, the **Use all** option is used.

- **Use selected:** the railings are created only to the selected stanchions.
- **Use all:** select this option when the stanchions are created with **Stanchions (S76)**.

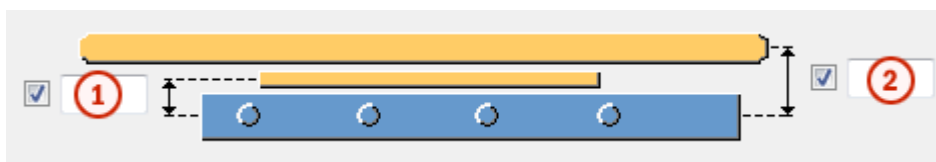
## Part positions



	Description	Default
<b>1</b>	Horizontal length of the closure in the top rail and where the bending is created in the closure.  When you use the closure type 4 and enter a negative value in this box, the top and bottom rails are shortened.	150 mm
<b>2</b>	Horizontal length of the closure in the bottom rail.  When you use the closure type 4 and the value in the <b>1</b> box is 0, you can shorten the bottom rails by entering a positive value in this box.	150 mm
<b>3</b>	Vertical length of the closure.  Available for closure types 2 and 3.	half the value of <b>5</b>
<b>4</b>	Full horizontal length of the closure from the first or the last stanchion.	300 mm
<b>5</b>	Distance between the top and the bottom rails.  If the middle rails are positioned evenly between the top and bottom rails, the spacing between them is adjusted if the distance between the top and the bottom rails is modified.	800 mm

	Description	Default
6	Height of the railing from the floor level. If you modify the floor level, the height of the railing is modified as well.	defined by the height of the stanchion
7	Length of the stanchion extension over the railing. Use this option if the <b>Top rail to stanchion fitting</b> is set to <b>Stanchion partcut</b> on the <b>Parameters</b> tab.	0 mm
8	Floor level from the bottom of the stanchion. If you modify the floor level, the height of the railing is modified as well.	0 mm
9	Select whether to keep the same distance between the bottom rail and the bottom of the stanchions.	<b>No</b>

### Railing offset





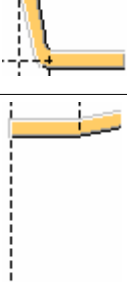
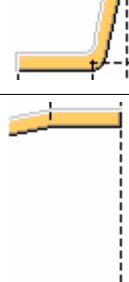
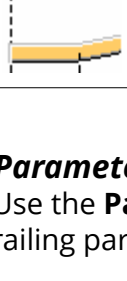
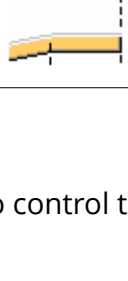


	Description
1	Vertical distance between the middle rails and the stanchion center.
2	Vertical distance between the top or the bottom rail and the stanchion center.

### Left and right closure

Option	Description
	Default Type 1 AutoDefaults can change this option.



Option		Description
		Type 1
		Type 2
		Type 3
		Type 4

### **Parameters tab**

Use the **Parameters** tab to control the cuts, fitting, and gaps between the railing parts.

### **Continuity profile**

Option	Description
<b>Top Continuity profile</b>	<p>Define the continuity profile by selecting it from the profile catalog.</p> <p>The top continuity profile is created if the length of the continuous profile is more than 0 and <b>Top rail parts gap</b> is set to <b>Yes</b>.</p> <p>The default name is RAIL.</p>

Option	Description
<b>Middle Continuity profile</b>	Define the continuity profile by selecting it from the profile catalog. The middle continuity profile is created if the length of the continuous profile is more than 0 and <b>Midd. rail parts gap</b> is set to <b>Yes</b> . The default name is RAIL.
<b>Bottom Continuity profile</b>	Define the continuity profile by selecting it from the profile catalog. The bottom continuity profile is created if the length of the continuous profile is more than 0 and <b>Bott. rail parts gap</b> is set to <b>Yes</b> . The default name is RAIL.

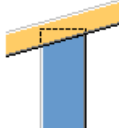
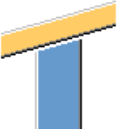
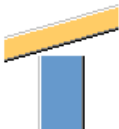
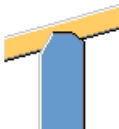
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

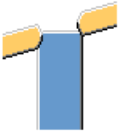
### Rail length





Option	Description	Default
<b>Top rail max. length</b>	Maximum length of the top rail.	3000 mm

Option	Description	Default
<b>Middle rail max. length</b>	Maximum length of the middle rail.	3000 mm
<b>Bottom rail max. length</b>	Maximum length of the bottom rail.	3000 mm

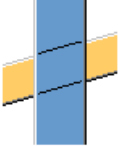
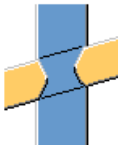
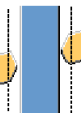
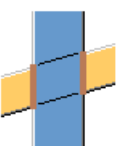
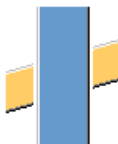
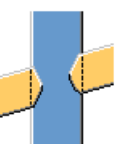
### Rail fittings

Option	Description
<b>Top rail to stanchion fitting</b>	<p>Select the fitting type between the top rail and the stanchions.</p> <p>Define the cut tolerance and the fitting distance using the <b>Top stanchion cut tolerance</b> and <b>Top rail to stanchion fitting distance</b> options. The parts are first cut and then fitted.</p> <p>By default, no fitting is created.</p> <ul style="list-style-type: none"> <li>•  No fitting is created.</li> <li>•  Stanchions are fitted to rail.</li> <li>•  Stanchions are cut by a horizontal plane.</li> <li>•  Stanchions are cut by the rails.</li> </ul>

Option	Description
	<ul style="list-style-type: none"> <li>  <p>Rails are cut by the stanchions.</p> </li> </ul>
<b>Top rail to stanchion fitting distance</b>	Fitting distance between the top rail center line and the stanchion.
<b>Top stanchion cut tolerance</b>	Cut tolerance between the top rail and the stanchions.

Option	Description
<b>Top rail at end stanchions</b>	<p>Select the fitting type between the top rail and the first or last stanchion if the start or end closure is not created.</p> <ul style="list-style-type: none"> <li> <p>Corner is not fitted. This is the default option.</p>  </li> <li> <p>Corner is fitted on both sides and a bent part is created.</p>  </li> <li> <p>Corner is not fitted.</p>  </li> <li> <p>Corner is fitted in the middle.</p>  </li> </ul>

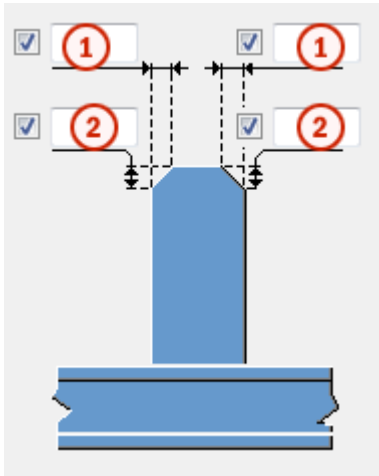
Option	Description
<b>Other rail to stanchion fitting</b>	<p>Select the fitting type between the middle or bottom rail and the stanchions.</p> <p>Define the cut tolerance and the fitting distance using the <b>Other stanchion cut tolerance</b> and <b>Other rail to stanchion fitting distance</b> options. The parts are first cut and then fitted.</p> <p>By default, no cuts are created.</p>

Option	Description
	<ul style="list-style-type: none"> <li>  <p>No cut is created.</p> </li> <li>  <p>Stanchions are cut by the rails.</p> </li> <li>  <p>Rails are cut by the stanchions.</p> </li> <li>  <p>Stanchions are cut by the rails through a slotted hole.</p> </li> <li>  <p>Rails are fitted to the stanchions.</p> </li> <li>  <p>Rails are cut by the stanchions without any tolerance.</p> </li> </ul>
<b>Other rail to stanchion fitting distance</b>	Fitting distance between the middle or bottom rail center line and the stanchion.
<b>Other stanchion cut tolerance</b>	Part cut tolerance between the middle or the bottom rail and the stanchions.

## Rail cuts

Option	Description
<b>Top rail cuts</b>	<p>Define how the top rail is cut.</p> <p>By default, the <b>At max stanchion</b> option is used.</p> <ul style="list-style-type: none"> <li>• <b>At max stanchion</b> Starting from the first stanchion, without the closures, the <b>Top rail max. length</b> is measured along the rail and the cut is made at the last stanchion included in the measured distance.</li> <li>• <b>At max length</b> Starting from the first point of the rail, including the closure, the <b>Top rail max. length</b> is measured along the rail and the cut is made at the maximum length.</li> <li>• <b>Every stanchion</b> A cut is made to the rail at each stanchion.</li> <li>• <b>At max length no closure</b> Starting from the first stanchion, without the closures, the <b>Top rail max. length</b> is measured along the rail and the cut is made at the maximum length.</li> </ul>
<b>Middle rail cuts</b>	<p>Define how the middle rail is cut.</p> <p>By default, the <b>At max stanchion</b> option is used.</p>
<b>Bottom rail cuts</b>	<p>Define how the bottom rail is cut.</p> <p>By default, the <b>At max stanchion</b> option is used.</p>

### Chamfer dimensions

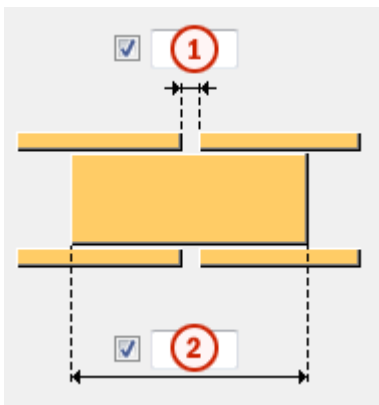


	Description
1	Horizontal chamfer dimension for the stanchions.
2	Vertical chamfer dimension for the stanchions.

### Gap

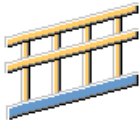
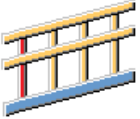
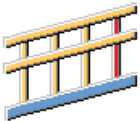
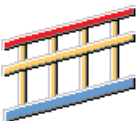
Option	Description
<b>Top rail parts gap</b> <b>Midd. rail parts gap</b> <b>Bott. rail parts gap</b>	Select whether a gap is created between the rail parts. By default, no gap is created.

### Gap between parts



	Description
1	Size of the gap between two consecutive rail parts.
2	Length of the continuous profile.

## Assembly

Option	Description
<p><b>Create assembly</b></p>	<p>Select which part of the railing is the main part of the assembly.</p> <p>By default, no assembly is created.</p> <ul style="list-style-type: none"> <li>•  <p>No assembly is created. This is also the default option.</p> </li> <li>•  <p>The first stanchion is the main part of the assembly.</p> </li> <li>•  <p>The last stanchion is the main part of the assembly.</p> </li> <li>•  <p>The first rail part after the first stanchion is the main part of the assembly.</p> <p>If you have created continuous profiles for all the rails, multiple assemblies are created.</p> </li> </ul>

### **Rails tab**

Use the **Rails** tab to control the profiles, bending cuts, and connections for the top and the bottom rails.










## Rail and closure profiles

Option	Description
<b>Top rail profile</b>	Define the top rail profile by selecting it from the profile catalog. Top rail is always created.
<b>Bottom rail profile</b>	Define the bottom rail profile by selecting it from the profile catalog. Bottom rail is always created.
<b>Start closure</b>	Define the start closure by selecting it from the profile catalog. By default, the <b>Start closure</b> profile is the same as the <b>Top rail profile</b> .
<b>End closure</b>	Define the end closure by selecting it from the profile catalog. By default, the <b>End closure</b> profile is the same as the <b>Top rail profile</b> .


Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	




## Closure bending cuts

Option	Description
	Default No cut AutoDefaults can change this option.
	No cut No cut is created near the corner.
	Both side cuts The rail corner is cut at the left and the right side. The dimensions for the cut are defined on the <b>Bends</b> tab.
	Middle corner cut The rail corner is cut in the middle.
	Mitre corner cut The rail corner is cut by a plane on the bisecting line.
	Left side cut The rail corner is cut at the left side. The dimensions for the cut are defined on the <b>Bends</b> tab.
	Right side cut The rail corner is cut at the right side. The dimensions for the cut are defined on the <b>Bends</b> tab.

## Cut position of the rails





Define the cut position for the top and the bottom rails and for the closure types 1 and 4.


Option	Description
	Default Closure near side cut AutoDefaults can change this option.

Option	Description
	<p>Closure near side cut</p> <p>The rail passes through the first or the last stanchion and is cut at its surface.</p> <p>The closure is cut at the near side surface of the stanchion, without intersecting it.</p>
	<p>Middle stanchion cut</p> <p>The rail passes through the first or the last stanchion and is cut at its middle line.</p> <p>The closure is cut at the middle line of the stanchion, intersecting it.</p>
	<p>Closure far side cut</p> <p>The rail is cut at the surface of the stanchion, without intersecting it.</p> <p>The closure is cut at the other far side surface of the stanchion, intersecting it.</p>

### Cut position for the other bending

Define the cut position for the other bendings than the corners of the closures.

Option	Description
	<p>Default</p> <p>No cut is created.</p> <p>AutoDefaults can change this option.</p>
	<p>No cut is created.</p>
	<p>Both side cuts</p> <p>The rail bending is cut at the left and the right side.</p> <p>The dimensions for the cut are defined on the <b>Bends</b> tab.</p>
	<p>Middle corner cut</p> <p>The rail bending is cut in the middle.</p>

Option	Description
	Mitre corner cut The rail bending is cut by a plane on the bisecting line.










### Top rail position / Bottom rail position

Define the horizontal railing position.

By default, the **Middle** option is used.

### Top rail rotation / Bottom rail rotation

Define the profile rotation for all horizontal rails.

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2
	Type 3
	Type 4
	Type 5
	Type 6
	Type 7
	Type 8

### Top rail and bottom rail connection properties

Option	Description
<b>Top rail connection, Bottom rail connection</b>	Select whether to use a system or a custom component to connect the

Option	Description
	top and bottom rails to the stanchions.
<b>Component</b>	Select a system or custom component from the <b>Applications &amp; components</b> catalog.
<b>Attribute file</b>	Select an attribute file for the component.
<b>Up direction</b>	Select the up direction.
<b>Rotation</b>	Select the rotation for the selected component.
<b>Rotation value</b>	Enter the rotation value.

### ***Middle Rails tab***

Use the **Middle Rails** tab to control the horizontal middle rails.

### **Rail profile**

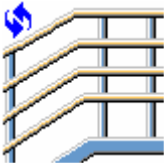
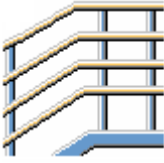

Option	Description
<b>1</b>	Define the middle rail profile by selecting it from the profile catalog.  By default, the size of middle rail profile is the same as the size of the top rail profile.  The default name is MIDDLE RAIL.
<b>2</b>	
<b>3</b>	
<b>4</b>	


Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

Option	Description	Default
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Middle rail type

Option	Description
<b>Middle rail profiles</b>	<p>Number of rails and the rail profile used for middle rails.</p> <p>For example, 3*2 creates three horizontal middle rails, with the profile defined in profile <b>2</b>.</p> <p>For example, 2*2 1 creates two horizontal middle rails, with the profile defined in profile <b>2</b> and one or more rails (depending of the number of rails needed), with the profile defined in profile <b>1</b>.</p> <p>For example, 3 creates horizontal middle rails with the profile defined in profile <b>3</b>. The number of rails is defined by the number set for the horizontal or vertical middle rails.</p> <p>By default, only rails with profile from profile <b>1</b> are created.</p>

Option	Description
	<p>Default</p> <p>Creates horizontal middle rails.</p> <p>AutoDefaults can change this option.</p>
	Creates horizontal middle rails.
	Creates vertical middle rails (pickets) defined on the <b>Vertical Rails</b> tab.

Option	Description
	Creates panels.










### Middle rail position

Define the horizontal railing position.






By default, the **Middle** option is used.

### Middle rail rotation









Define the profile rotation for all horizontal rails.

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2
	Type 3
	Type 4
	Type 5
	Type 6
	Type 7
	Type 8


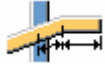
### Cut position for the bending

Option	Description
	Default No cut AutoDefaults can change this option.
	No cut No cut is created.
	Both side cuts The rail bending is cut at the left and right side. The dimensions for the cut are defined on the <b>Bends</b> tab.
	Middle corner cut The rail bending is cut in the middle.
	Mitre corner cut The rail bending is cut by a plane on the bisecting line.

### Horizontal middle rail extension

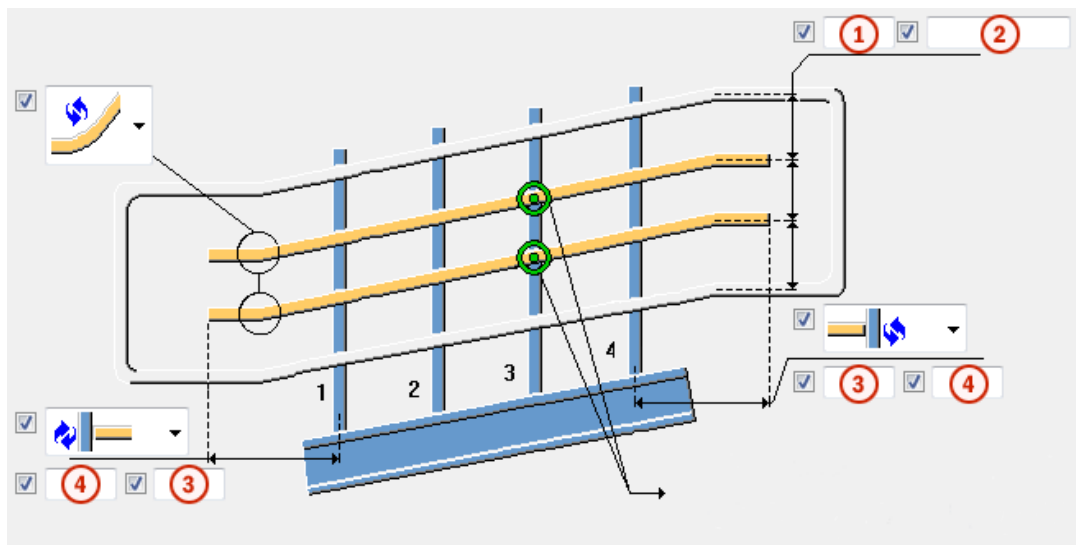
Option		Description
		Default No extension AutoDefaults can change this option.
		No extension The middle rail ends at the inside stanchion surface, without intersecting the stanchion.
		Pass through stanchion The middle rail ends at the outside stanchion surface, intersecting the stanchion.
		Horizontal extension The middle rails are extended inside the



Option		Description
		closure by a horizontal value. If the railing is skew, the extension is bent according to the closure dimensions.  The rail can be shortened by entering a negative value in the box <b>3</b> .
		Horizontal and skew extension  The middle rails are extended by two horizontal dimensions. <b>3</b> is for the horizontal rail length and <b>4</b> is for the skew rail length.

### Closure bend cuts

This section is not active if you have set the middle rail type to vertical middle rails.



	Description
<b>1</b>	Number of horizontal middle rails.
<b>2</b>	Spacing between the horizontal middle rails.

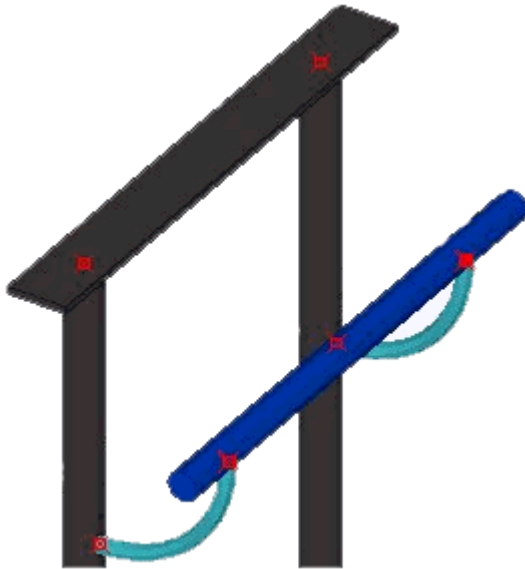
	<b>Description</b>
<b>3</b>	Length of the middle rail horizontal extension inside the closure. The rail can be shortened by entering a negative value. Use this box when the horizontal middle rail extension is set to horizontal extension.
<b>4</b>	Length of the middle rail horizontal and skew extension. The middle rails are extended by two horizontal dimensions. <b>3</b> is for the horizontal rail length and <b>4</b> is for the skew rail length. Use this box when the horizontal middle rail extension is set to horizontal and skew extension.

### Middle rail connection properties

<b>Option</b>	<b>Description</b>
<b>Middle rail connection</b>	Select whether to use a system or custom component to connect the middle rails to the stanchions.
<b>Component</b>	Select a system or custom component from the <b>Applications &amp; components</b> catalog.
<b>Attribute file</b>	Select an attribute file for the component.
<b>Up direction</b>	Select the up direction.
<b>Rotation</b>	Select the rotation for the selected component.
<b>Rotation value</b>	Enter the rotation value.
<b>Connect to</b>	Select whether one rail or two rails are connected to stanchions. <ul style="list-style-type: none"> <li>• <b>One rail:</b> Creates one component between one stanchion and one rail.</li> <li>• <b>Two rails, two connections:</b> Creates two components, one between the stanchion and rail, and one between the same stanchion and the other rail.  Usually two rails meet the stanchion.</li> <li>• <b>Two rails, one connection:</b> Creates one component between the stanchion and two rails.</li> </ul>

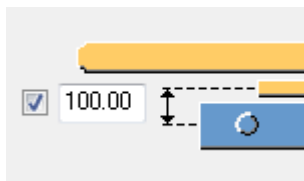
## Grab rail

Grab rail can be a single middle rail that is vertically and horizontally offset from the top rail. You can use a system or a custom component to connect the rail to stanchions. You can also select the end of the grab rail. If the grab rail comes from a skew stringer, you can extend the grab rail with skew and horizontal dimensions.

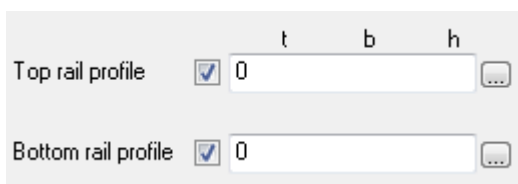


To create a grab rail:

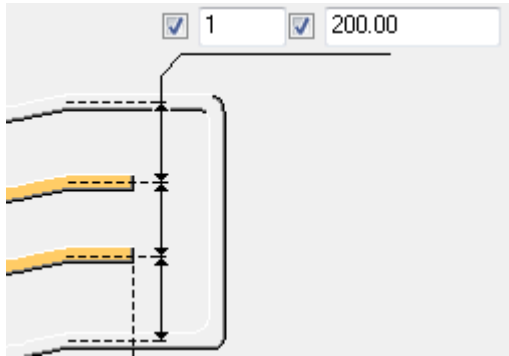
1. On the **Picture** tab, offset the middle rails from the stanchions.



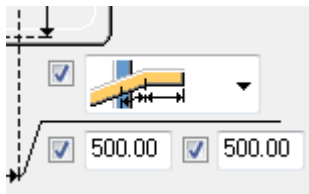
2. On the **Rails** tab, set the profile for top and bottom rails to 0 so that those rails are not created.



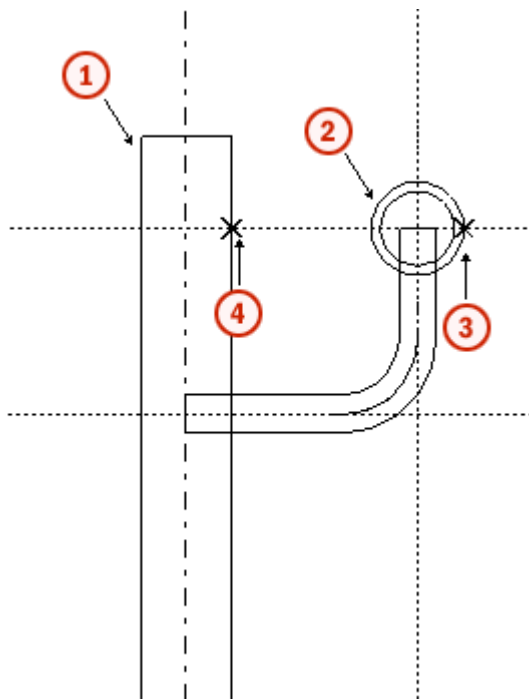
3. On the **Middle Rails** tab, set the number of horizontal rails to 1 and adjust the spacing for the handrail.



4. If you want to extend the end of the grab rail and have a horizontal part, select the horizontal and skew extension option on the **Middle Rails** tab, and enter the skew and horizontal distances.



5. Create the custom seam.  
Pick the points on the outer extension of the main and secondary parts.









	Description
1	Main part
2	Secondary part
3	First picked point
4	Second picked point

- Save the standard properties for the custom seam.
- On the **Middle Rails** tab, use the custom seam name and properties and set the component direction.


### **Vertical Rails tab**





Use the **Vertical Rails** tab to control the vertical rails (pickets). The options on the **Vertical Rails** tab are active only if you have set the middle rail type to vertical middle rails on the **Middle Rails** tab.

### **Pickets**

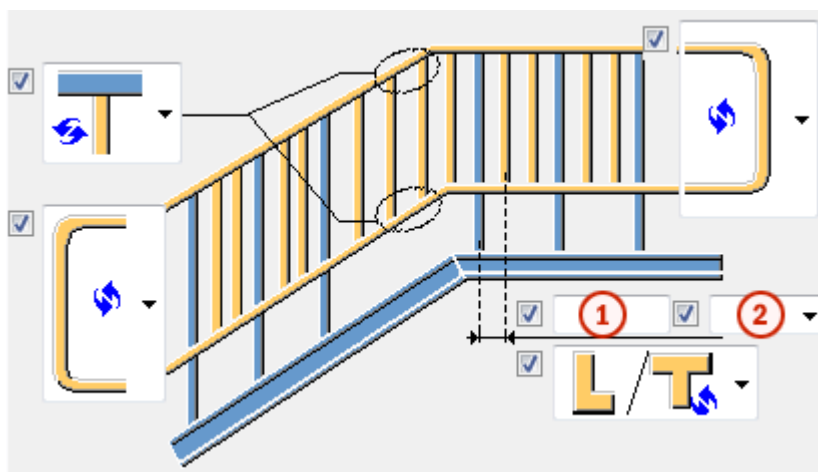
Option		Description
		Default Pickets are not created inside the closure. AutoDefaults can change this option.
		Pickets are not created inside the closure.
		Pickets are created inside the closure when you use the closure type 1 or 4.

### **Connection type between the pickets and the top and bottom rails**

Option	Description
	Default None AutoDefaults can change this option.

Option	Description
	None The pickets are created from the top rail center to the bottom rail center.
	Fitted The pickets are fitted at the creation points by a plane that follows the slope of the horizontal rails.
	Part cut The pickets are cut on both sides by the horizontal rail profiles.
	Connection The pickets are connected to the top and bottom rail with a system connection.

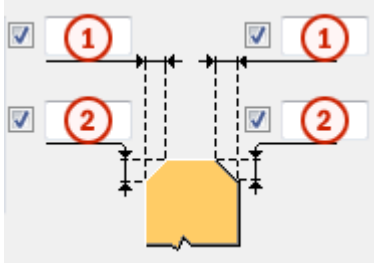
### Picket spacing



Option	Description
1	Picket spacing between two consecutive stanchions.
2	Spacing type. By default, the equal spacing option is used. <ul style="list-style-type: none"> <li>Exact The space between two consecutive pickets is exactly the spacing value <b>1</b>. As many pickets as possible are positioned between two consecutive stanchions. The pickets are positioned centered between the stanchions so that the space between the first stanchion and the first pickets and the second stanchion and the last pickets is equal.</li> </ul>

Option	Description
	<ul style="list-style-type: none"> <li>Equal</li> </ul> <p>The spacing value <b>1</b> defines the maximum spacing. The pickets are placed evenly between the stanchions.</p>









### Chamfer dimensions




	Description
1	Horizontal chamfer dimension for the pickets.
2	Vertical chamfer dimension for the pickets.

### Profile rotation

Define the profile rotation for all vertical rails.

Option	Description
	Default
	Type 1
	Type 2
	Type 3
	Type 4
	Type 5
	Type 6
	Type 7

Option	Description
	Type 8

### Connection properties

Option	Description
<b>Vertical rail top joint</b>	Define the number of the component that connects the pickets to the top rail by selecting it from the component catalog.  You cannot use a custom component.  Select also an attribute file for the component.
<b>Vertical rail bottom joint</b>	Define the number of the connection that connects the pickets to the bottom rail by selecting it from the component catalog.  You cannot use a custom component.  Select also an attribute file for the component.

### **Panels tab**

Use the **Panels** tab to create panels between the stanchions. No other vertical or horizontal rails are created when the panels are created. The options on the **Panels** tab are active only if you have set the middle rail type to panels on the **Middle Rails** tab. You can use custom seams to create the middle panels and custom details to create the closure panels.

### Panel properties

Option	Description
<b>Part name/Joint no.</b>	Define the number of the custom component used in panel creation by selecting it from the component catalog.
<b>Attribute file</b>	Select an attribute file for the custom component.
<b>Seam dir.</b>	Define the seam direction.

### Panel type

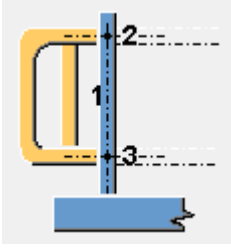
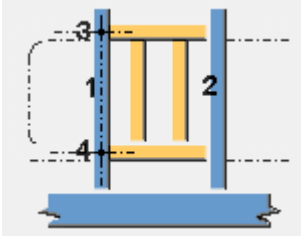
For custom details the numbers in the images correspond to the following parts:

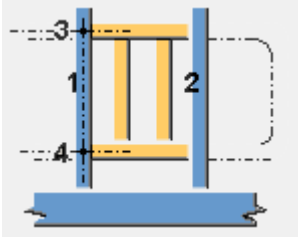
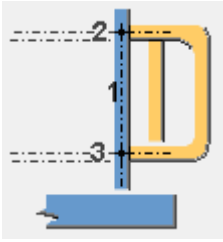
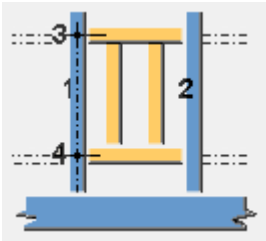
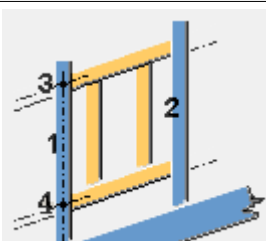
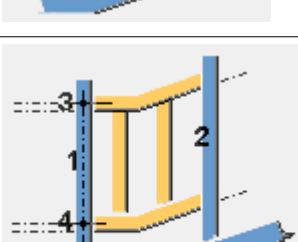
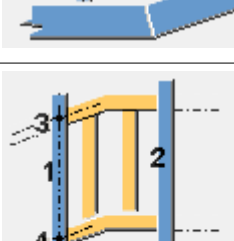


Number	Part
1	First stanchion, which is the main part of the detail.
2	Point at the top of the first stanchion, which is the first input point of the detail.
3	Point at the bottom of the first stanchion, which is the second input point of the detail.

For custom seams the numbers in the images correspond to the following parts:

Number	Part
1	First stanchion, which is the main part of the seam.
2	Second stanchion, which is the secondary part of the seam.
3	Point at the top of the first stanchion, which is the first input point of the seam.
4	Point at the bottom of the first stanchion, which is the second input point of the seam.

Option	Description
	<p>Left closure panel</p> <p>Use a custom detail to create the panel.</p> <p>The panel connects to one stanchion only.</p>
	<p>First panel</p> <p>Use a custom seam to create the panel.</p> <p>The panel can be of different size than the rest of the panels.</p>

Option	Description
	<p>Last panel</p> <p>Use a custom seam to create the panel.</p> <p>The panel can be of different size than the rest of the panels.</p>
	<p>Right closure panel</p> <p>Use a custom detail to create the panel.</p> <p>The panel connects to one stanchion only.</p>
	<p>Regular horizontal panel</p> <p>Use a custom seam to create the panel.</p>
	<p>Regular skew panel</p> <p>Use a custom seam to create the panel.</p>
	<p>Horizontal panel, skew junction (bottom)</p> <p>Use a custom seam to create the panel.</p>
	<p>Horizontal panel, skew junction (top)</p> <p>Use a custom seam to create the panel.</p>

### **Bends tab**

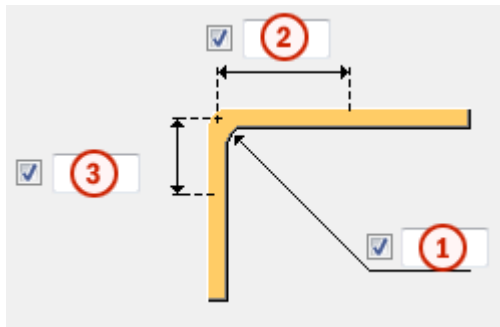
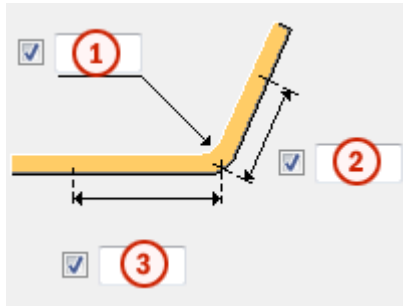
Use the **Bends** tab to set the bending cut position on the rails and the profiles for the bent rails parts.

### **Bend profile**

<b>Option</b>	<b>Description</b>
<b>Bend</b>	Define the bend rail profile by selecting it from the profile catalog.  Created only if you have set the closure bend cuts to both side cut, left side cut, or right side cut on the <b>Rails</b> tab.
<b>90 degree</b>	Define the rail profile by selecting it from the profile catalog.  Created only if you have set the cut position for the bending to both side cut on the <b>Rails</b> or <b>Middle Rails</b> tab.

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

## Bend dimensions



Option	Description	Default
1	Bending radius for the rail parts.	50 mm
2	Cut distance along the rails on the right side of the bending. You can define this distance separately for both rail ends.	75 mm
3	Cut distance along the rails on the left side of the bending. You can define this distance separately for both rail ends.	75 mm

## Welds

Click the link below to find out more:

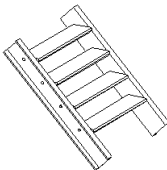
## Stairs (S82)

**Stairs (S82)** creates straight stairs with optional upper and lower landings. The stairs consist of stringers, possible landings and the actual steps. The stairs are created between two picked positions that define the upper and lower positions of the sloping stringers, taking into account the flooring thickness. The lower position defines the top level of the lowest step and the upper position the top level of the topmost step.

### Objects created

- Stringers
- Steps
- Landings (optional)
- Welds

### Use for

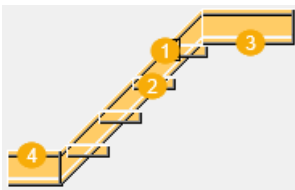
Situation	Description
	Stairs created with stringers and steps

### Selection order

1. Pick the first position.
2. Pick the second position.

The stairs are created automatically when you pick the second position.

### Part identification key

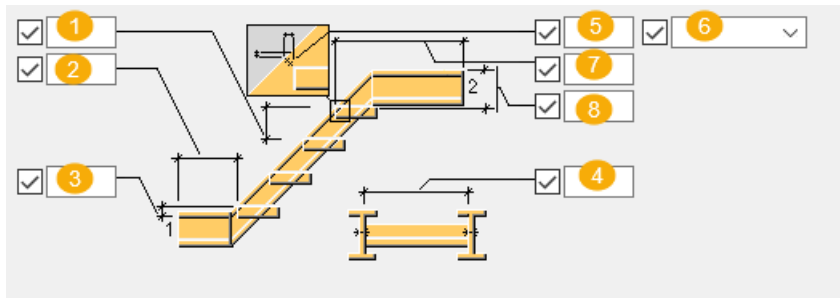


	Description
1	Stringer
2	Step
3	Top landing
4	Bottom landing

### Picture tab

Use the **Picture** tab to define the stair dimensions.

## Stair dimensions



	Description	Default
<b>1</b>	Maximum height between the steps.	230 mm  The default value for the step height is calculated as follows: $(Z * 220) / (Z + 220)$ mm, where Z is the height of the stairs.
<b>2</b>	Bottom landing length You need to define the length to create the landing.	Bottom landing beam is not created.
<b>3</b>	Bottom flooring thickness. Vertical distance from the lower picked point to the stringer top level.	30 mm
<b>4</b>	The distance the steps are inset between the stringers.	20 mm
<b>5</b>	Top flooring thickness Vertical distance from the upper picked point to the stringer top level.	30 mm
<b>6</b>	Vertical distance orientation	
<b>7</b>	Width of the stairs (horizontal length of the steps)	1000 mm
<b>8</b>	Top landing length You need to define the length to create the landing.	Top landing beam is not created.

### **Parts tab**

Use the **Parts** tab to define the stringer profile properties.

## Parts

Part	Description	Default
<b>Stringer profile</b>	Select the profile for stringers and landing beams from the profile catalog.	U200

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tab**

Use the **Parameters** tab to control the stringer rotation, mirroring, position in plane, step profile, and top and bottom step creation.

Option	Description	Default
<b>Stringer rotation</b>	Define the stringer rotation around its axis on the work plane.	<b>Top</b>
<b>Mirroring</b>	Select whether the stringer is mirrored.	
<b>Position in plane</b>	Define the stair position on the work plane.	<b>Right</b>
<b>Offset</b>	Define the beam offset for the selected position in plane.	0
<b>Step profile</b>	Select the step profile.  The step types are more precisely defined in the <code>steps.dat</code> file. The file defines the form of the step, and the	

Option	Description	Default
	place and size of the holes in the stringers. Each line in the file describes one step type.  The actual step is created as a contour plate.	
<b>Create top step</b>	Select whether the top step is created.	<b>Yes</b> , top step is created.
<b>Create bottom step</b>	Select whether the bottom step is created.	<b>Yes</b> , bottom step is created.
<b>Create assembly</b>	Select whether to create an assembly that includes all the parts of the stairs or stringers.  With <b>All</b> , the steps are welded to the stringers with invisible weldings and an assembly drawing of the stairs can be created.	<b>No</b>
<b>Bolt tolerance</b>	Define the bolt hole tolerance for catalogue steps.	

### ***Welds***

Click the link below to find out more:

### **Stanchion side plate (83)**

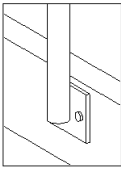
**Stanchion side plate (83)** connects a stanchion to the side of a stringer with a connection plate.

#### **Objects created**

- Connection plate
- Bolts
- Welds



## Use for

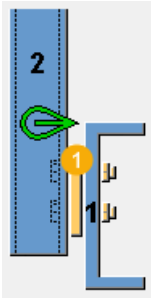
Situation	Description
	Stanchion is connected to the side of a stringer.

## Selection order

1. Select the main part.
2. Select the secondary part.

The connection is created automatically when the secondary part is selected.

## Part identification key

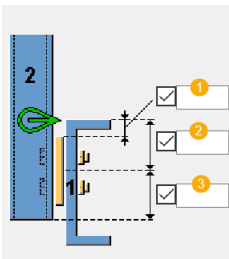


	Description
1	Connection plate

## Picture tab

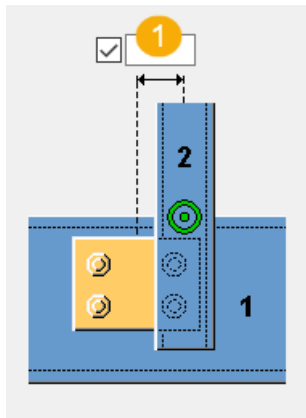
Use the **Picture** tab to control the connection dimensions.

## Dimensions



	Description	Default
1	Connection plate distance from the main part upper edge Positive values make the plate smaller.	
2	Vertical position Define the uppermost bolt position as a distance from the stanchion top edge to the uppermost bolt.	76 mm
3	Fit distance Define the stanchion cut level as a distance from the uppermost bolt to the stanchion bottom.	Cut at the bottom level

### Plate offset



	Description
1	Horizontal offset of the connection plate

### Parts tab

Use the **Parts** tab to define the part properties.



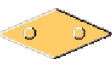




#### Part

Optionq	Description	Default
<b>Connection plate</b>	Thickness and width of the connection plate.	For rectangular plates: thickness 10 mm and width 120 mm.

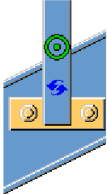
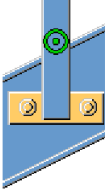
### Parameters tab

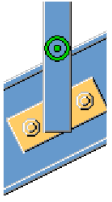
Use the **Parameters** tab to define the connection plate orientation and chamfers.

## Plate type

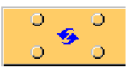
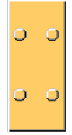

Option	Description
	Default Rectangular AutoDefaults can change this option.
	Rectangular
	Diamond
	Triangular
	Circular
	Rectangular by bolts The plate size is determined by the values you enter on the <b>Bolts</b> tab.
	Circular by bolts The plate size is determined by the values you enter on the <b>Bolts</b> tab.

## Plate orientation in skewed situations





Option	Description
	Default Perpendicular to the secondary part AutoDefaults can change this option.
	Perpendicular to the secondary part

Option	Description
	Oriented to the main part

### Plate orientation

Option	Description
	Default Horizontal AutoDefaults can change this option.
	Perpendicular
	Horizontal

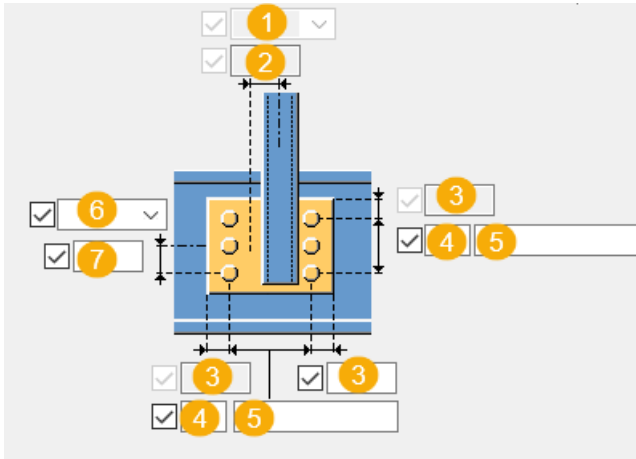
### Chamfer type

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer Define the horizontal and vertical chamfer dimensions.
	Round chamfer Define the chamfer radius.

### **Bolts tab**

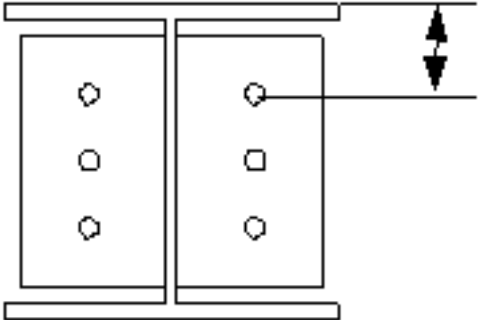
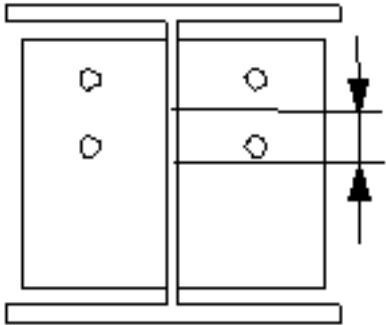
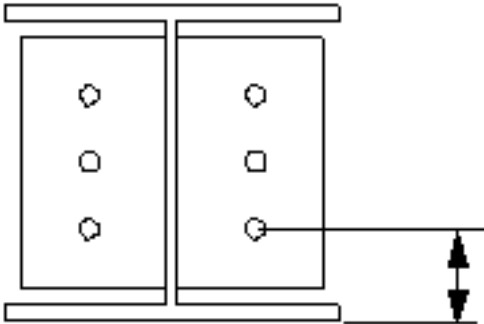
Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

## Bolt group dimensions



	Description
1	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Left:</b> From the left edge of the secondary part to the leftmost bolt. </li> </ul>

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> <div style="text-align: center;"> </div>
<b>2</b>	Dimension for horizontal bolt group position.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

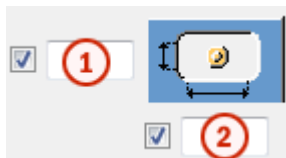
	Description
<p><b>6</b></p>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li> <p><b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</p>  </li> <li> <p><b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</p>  </li> <li> <p><b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</p>  </li> </ul>
<p><b>7</b></p>	<p>Dimension for vertical bolt group position.</p>

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

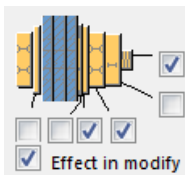


Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

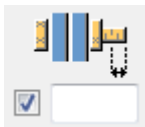
If you want to create a hole only, clear all the check boxes.








To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.


### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3

Option	Description
	Staggered type 4

### ***General tab***

Click the link below to find out more:  
[General tab](#)

### ***Design tab***

Click the link below to find out more:  
[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:  
[Analysis tab](#)

### ***Welds***

Click the link below to find out more:


## **Multiple beam railing (S84)**

**Multiple beam railing (S84)** creates stanchions and railings connected on one or more beams.

### **Objects created**

- Handrail (top rail)
- Knee rail (bottom rail)
- Stanchions
- Toe plates
- Welds

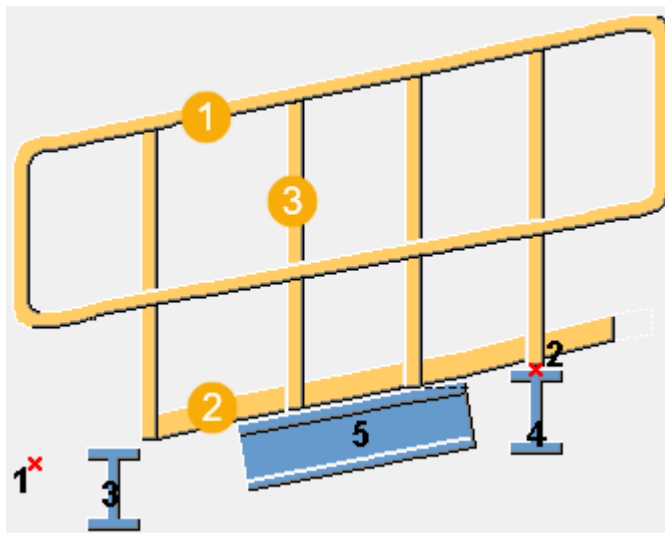
## Use for

Situation	Description
	Railing created on multiple beams.

## Selection order

1. Pick the first position for the railing.
2. Pick the second position for the railing.
3. Select the first beam.
4. Select the second beam, and the subsequent beams if needed.
5. Click the middle mouse button to create the railing.

## Part identification key

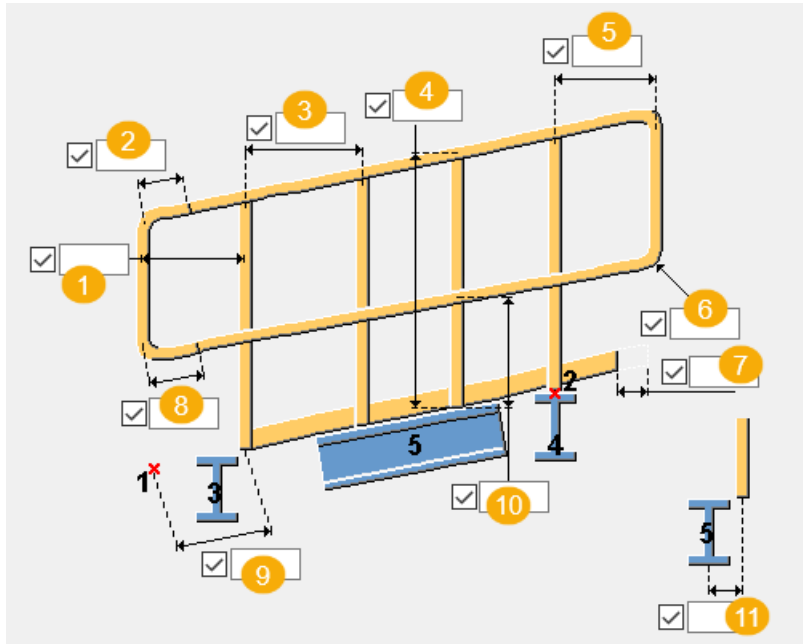


	Description
1	Railing Top rail and bottom rail are created.
2	Toe plate
3	Stanchion

## Picture tab

Use the **Picture** tab define the railing dimensions.

## Railing dimensions



	Description
<b>1</b>	Full horizontal length of the closure from the first or the last stanchion.
<b>2</b>	Horizontal length of the closure in the top rail and where the bending is created in the closure.
<b>3</b>	Horizontal distance between the stanchions.
<b>4</b>	Distance between the top rail and the beam.
<b>5</b>	Full horizontal length of the closure from the first or the last stanchion.
<b>6</b>	Bending angle
<b>7</b>	Toe plate start/end distance from the start/end of the railing.
<b>8</b>	Horizontal length of the closure in the bottom rail and where the bending is created in the closure.
<b>9</b>	Horizontal distance to the first stanchion from the first input point. This is the position of the first stanchion from the first input point.
<b>10</b>	Distance between the beam and bottom rail.
<b>11</b>	Vertical distance between the beam center and stanchion center.

### **Parts tab**

Use the **Parts** tab control the railing part properties.

#### **Parts**

<b>Option</b>	<b>Description</b>
<b>Stanchion profile</b>	Select the stanchion profile from the profile catalog.
<b>Hand rail profile</b>	Select the hand rail profile from the profile catalog.
<b>Knee rail profile</b>	Select the knee rail profile from the profile catalog.
<b>Toe plate</b>	Thickness and height of the toe plate.

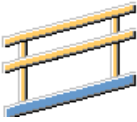
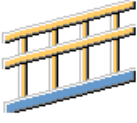
<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tab**

Use the **Parameters** tab to define whether stanchions and toe plates are created, and the positions of stanchions, railings, and railing cuts.




<b>Option</b>	<b>Description</b>
<b>Stanchion product name</b>	Enter the stanchion name.
<b>Bend product name</b>	Enter the bend name.
<b>Toe plate max length</b>	Define the maximum length of the toe plate.
<b>Create assembly</b>	Select whether to create an assembly of the parts.

### Stanchion creation

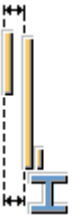

Option	Description
	Stanchions are not created.
	Stanchions are created.

### Railing cut positions

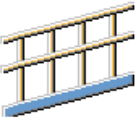
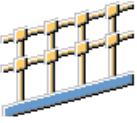
Select the railing cut position and define the cut dimension.

Option	Description
	Railing is cut at the second stanchion.
	Railing is cut at the first stanchion.
	Railing is cut at each stanchion.

### Stanchion and railing position

Option	Description
	Stanchions and railings are created on the left side of the beams.
	Stanchions and railings are created on the right side of the beams.

## Toe plate creation

Option	Description
	Toe plates are not created.
	Toe plates are created.

## Welds

Click the link below to find out more:

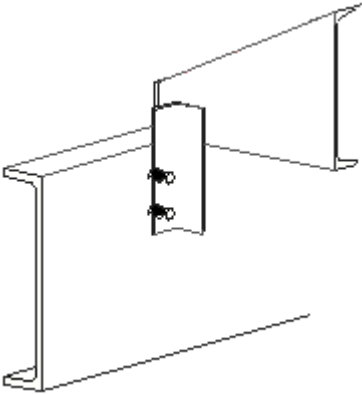
## Stringer to channel (127)

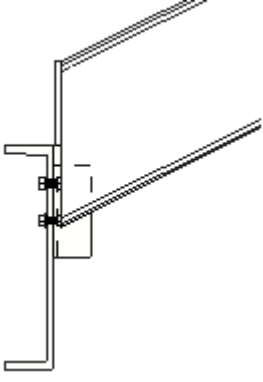
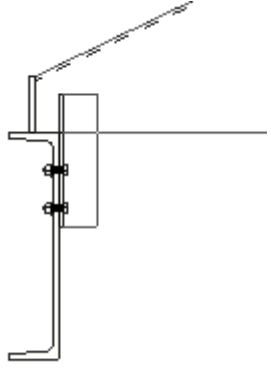
**Stringer to channel (127)** connects a stringer to a channel with an angle profile. The angle profile is welded to the stringer and bolted to the channel. A vertical plate is welded to the end of the stringer.

### Objects created

- Angle plate
- Vertical plate (optional)
- Bolts
- Welds
- Cuts to shape the end of the stringer

### Use for

Situation	Description
	The angle profile is bolted to the channel and welded to the stringer. The stringer is cut horizontally to the top level of the channel.

Situation	Description
	No horizontal cut in the stringer.
	A vertical plate is created to the end of the stringer.

### Limitations

**Stringer to channel (127)** works only if the connecting profile is an angle.

### Before you start

Create a stringer and a channel.

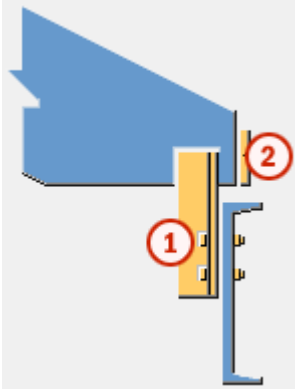
### Selection order

1. Select the main part (a channel).
2. Select the secondary part (a stringer).

The connection is created automatically when the secondary part is selected.



### Part identification key



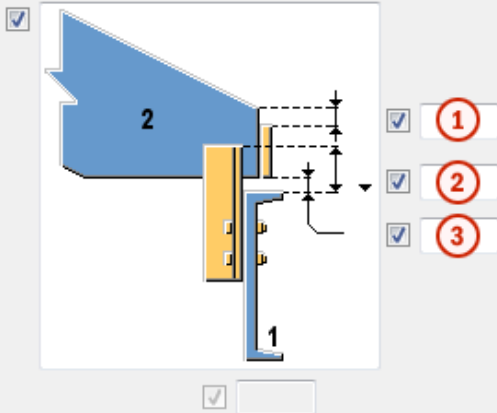
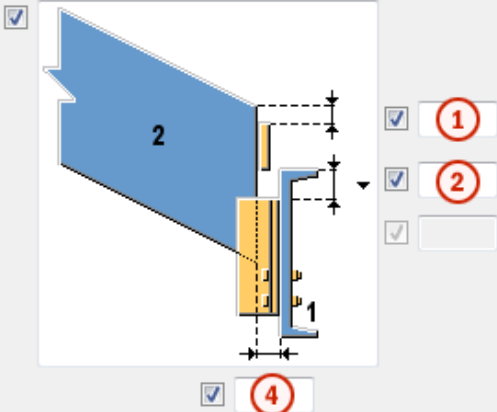
	Part
1	Angle profile
2	Vertical plate

### Picture tab

Use the **Picture** tab to define the position of the angle profile and the vertical plate, and whether the stringer is cut.

### Stringer cut

Option	Description
<input checked="" type="checkbox"/>	Option 1 Default

Option	Description
	<p>Option 2</p> <p>The stringer is cut horizontally to the top level of the channel.</p>
	<p>Option 3</p> <p>No horizontal cut in the stringer.</p>

	Description	Default
1	<p>Position of the vertical plate.</p> <p>Define the vertical distance from the stringer top edge to the vertical plate top.</p>	0
2	<p>Position of the angle profile.</p> <p>Define the vertical distance from the channel top to the angle profile top.</p>	<p>Option 1 or 2:</p> <ul style="list-style-type: none"> <li>• metric: 65 mm</li> <li>• imperial: 2"1/2</li> </ul> <p>Option 3:</p> <ul style="list-style-type: none"> <li>• 0</li> </ul>
3	<p>Location of the stringer cut.</p> <p>Define the vertical distance from the channel top edge to the plane where the stringer is cut horizontally and the bottom of the vertical plate is positioned.</p>	<ul style="list-style-type: none"> <li>• metric: 12 mm</li> <li>• imperial: 1/2"</li> </ul>

	Description	Default
4	Location of the stringer cut. Define the horizontal distance from the channel web to the stringer.	<ul style="list-style-type: none"> <li>metric: 12 mm</li> <li>imperial: 1/2"</li> </ul>

### **Parts tab**

Use the **Parts** tab to control the properties of the vertical plate and the angle profile.

### **Vertical plate and angle profile**

Option	Description	Default
<b>Vertical plate</b>	Vertical plate thickness. If you set the value to 0, no vertical plate is created.	metric: 10 mm imperial: 3/8" The default name is PROFILE.
<b>Angle</b>	Define the angle profile by selecting it from the profile catalog. If you do not select an L profile, the connection will not be created.	metric: L75*6 imperial: L3X3X1/4 The default name is ANGLE.

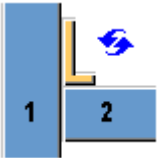
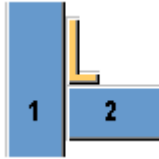
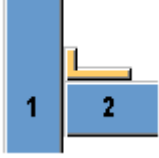
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Parameters tab

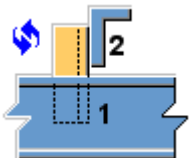
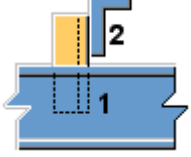
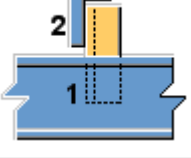
Use the **Parameters** tab to control the leg orientation and the position of the angle profile.

### Angle profile leg orientation

If the legs of the angle profile are of uneven length, you can switch their position.

Option	Description
	Default The longer leg of the angle profile is connected to the channel. AutoDefaults can change this option.
	The longer leg of the angle profile is connected to the channel.
	The longer leg of the angle profile is connected to the stringer.

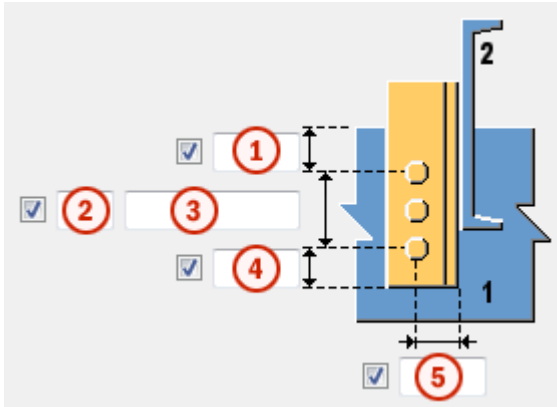
### Angle profile position

Option	Description
	Default Angle profile is on the outer surface of the channel. AutoDefaults can change this option.
	Angle profile is on the outer surface of the channel.
	Angle profile is on the inner surface the channel.

### Bolts tab

Use the **Bolts** tab to control the bolts that connect the angle profile to the channel.

### Bolt group dimensions



	Description	Default
1	Vertical distance from the top of the channel to the center of the top bolt.	metric: 75 mm imperial: 3"
2	Number of bolts.	2
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.	metric: 75 mm imperial: 3"
4	Vertical distance from the bottom of the angle profile to the center of the bottom bolt.	metric: 40 mm imperial: 1"1/2
5	Horizontal distance from the stringer edge to the center line of the bolts.	metric: 40 mm imperial: 1"1/2

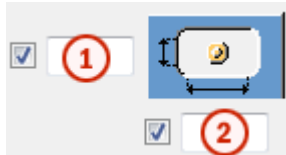
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	

Option	Description	Default
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

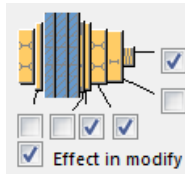


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

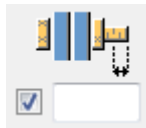
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### **General tab**

Click the link below to find out more:

[General tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

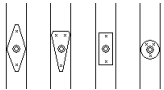
## **Connection plate (1026)**

**Connection plate (1026)** creates a connection plate to a picked position on a selected part.

### **Objects created**

- Connection plate
- Bolts

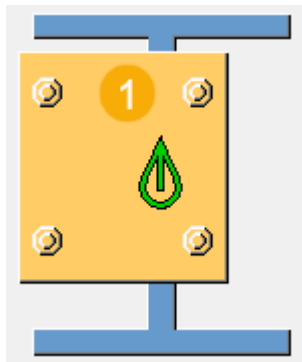
## Use for

Situation	Description
	<p>The connection creates a connection plate to a picked position. The shape of the plate can be diamond, triangular, rectangular, or circular.</p>

## Selection order

1. Select the part.
2. Pick a point to indicate the connection plate position.  
The connection plate is created automatically when you pick the point.

## Part identification key

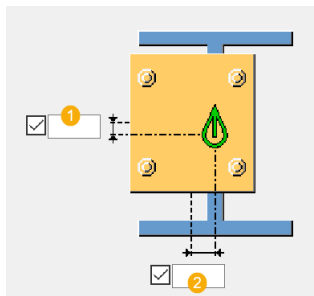


	Description
1	Connection plate

## Picture tab

Use the **Picture** tab to define the connection position.

## Plate position



	Description
1	Vertical position of the connection plate



	Description
2	Horizontal position of the connection plate

### **Parts tab**

Use the **Parts** tab to define the part properties.

#### **Parts**


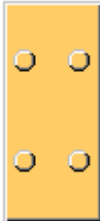



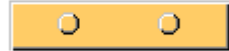
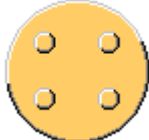
Option	Description	Default
<b>Plate</b>	Thickness and width of the connection plate	Thickness = 10 mm Width = 120 mm for rectangular and diamond shaped plates

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	





### **Parameters tab**

Use the **Parameters** tab to define the connection plate shape, chamfer shape, and chamfer dimensions.

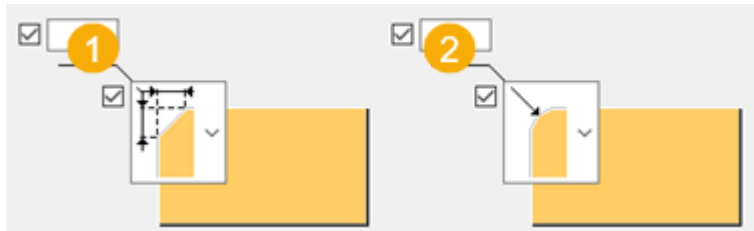
## Connection plate shape

Option	Description
	<p>Default Rectangular AutoDefaults can change this option.</p>
	<p>Rectangular</p>
	<p>Diamond</p>
	<p>Triangular</p>
	<p>Circular</p>
	<p>Rectangular by bolts The connection plate size is determined by the values you define on the <b>Bolts</b> tab.</p>
	<p>Circular by bolts The connection plate size is determined by the values you define on the <b>Bolts</b> tab.</p>

## Chamfer shape

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex chamfer

## Chamfer dimensions

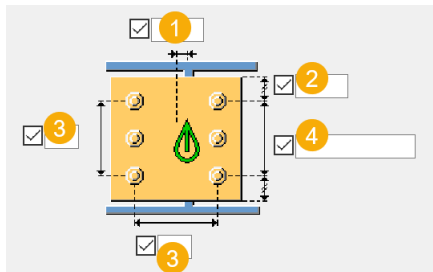


	Description	Default
1	Define the horizontal and vertical dimension of the line chamfer.	20 mm
2	Define the chamfer radius of the convex chamfer.	20 mm

## **Bolts tab**

Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

### Bolt group dimensions



	Description
1	Dimension for horizontal bolt group position.

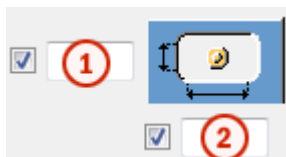
	Description
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



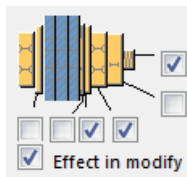
Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.

Option	Description	Default
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
Rotate Slots	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
Slots in	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### General tab

Click the link below to find out more:

[General tab](#)

## ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

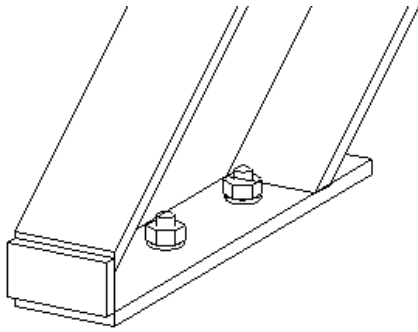
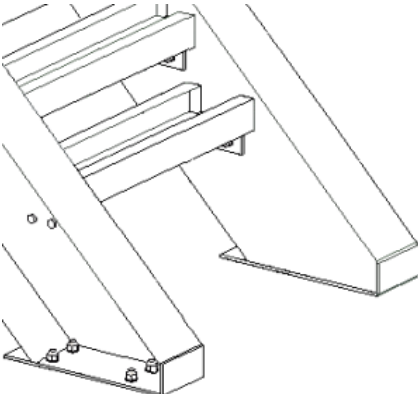
## **Stair base detail (1038)**

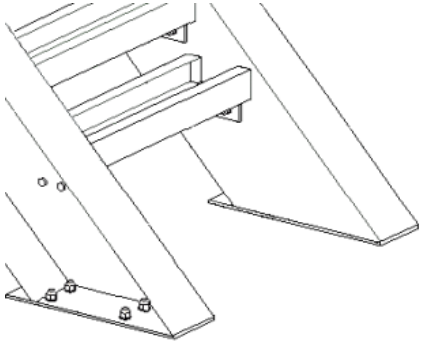
**Stair base detail (1038)** creates a bolted horizontal plate and an optional vertical plate at a picked point on a stringer. The plates are welded to the stringer.

### **Objects created**

- Horizontal plate
- Vertical plate (optional)
- Bolts
- Welds
- Cuts to shape the end of the stringer

### **Use for**

<b>Situation</b>	<b>Description</b>
	Stair base detail with horizontal and vertical plates.
	Stair base detail with horizontal and vertical plates.

Situation	Description
	Stair base detail with horizontal plates.

### Limitations

**Stair base detail (1038)** works only if the **Up direction** is set to **+z** on the **General** tab. It does not work if the **Up direction** is set to **auto**.

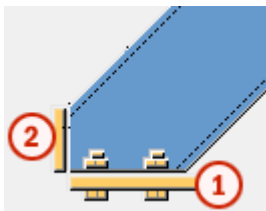
### Before you start

Create a stringer.

### Selection order

1. Select the stringer.
  2. Pick a point on the stringer.
- The detail is created automatically.

### Part identification key

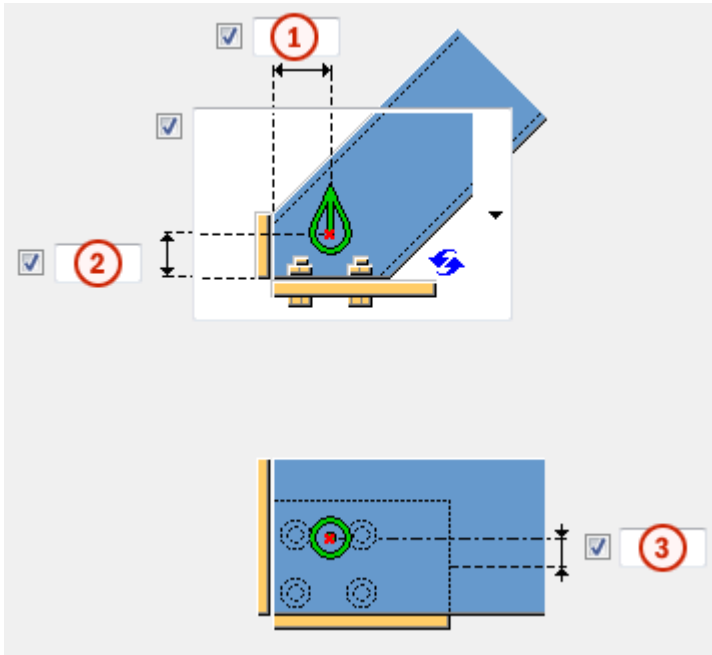


	Part
1	Horizontal plate
2	Vertical plate

### Picture tab

Use the **Picture** tab to control the horizontal and vertical plate positions.

## Plate positions

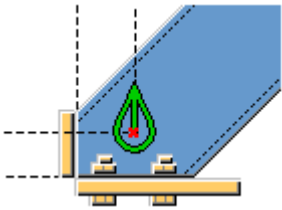
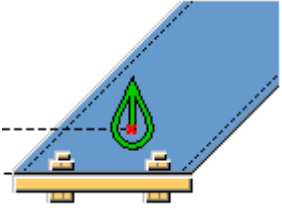


	Description	Default
<b>1</b>	Plate position. Define the horizontal distance from the picked point to the inner face of the vertical plate.	metric: 31 mm imperial: 1"1/4
<b>2</b>	Plate position. Define the vertical distance from the picked point to the top face of the horizontal plate.	0 mm
<b>3</b>	Horizontal plate offset relative to the component's up direction.	0 mm

## Vertical plate creation

Option	Description
	Default. Vertical plate is created.



Option	Description
	Vertical plate is created.
	No vertical plate is created.

### **Parts tab**

Use the **Parts** tab to control the horizontal and vertical plate properties.

#### **Horizontal plate/Vertical plate**

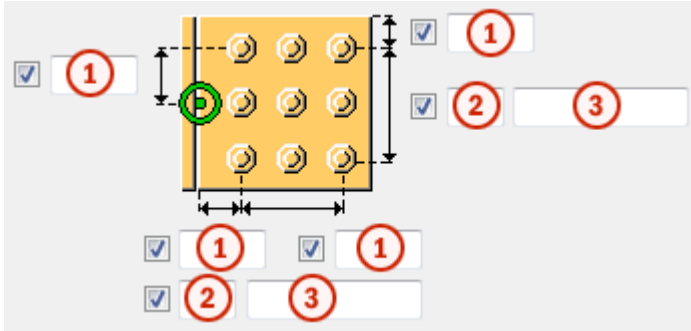
Option	Description
<b>Horizontal plate</b>	Plate thickness, width and height.
<b>Vertical plate</b>	The default name is PLATE.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Bolts tab

Use the **Bolts** tab to control the bolt properties in the horizontal plate. You can select to create bolts or studs. By default, bolts are created.

### Bolt group dimensions



	Description
1	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Number of bolts.
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

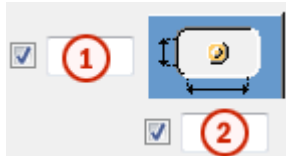
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

Option	Description	Default
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

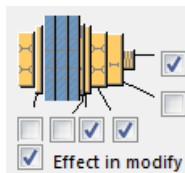


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

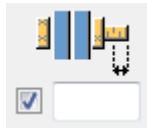
If you want to create a hole only, clear all the check boxes.






To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Bolting direction

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

### **Stair base detail (1039)**

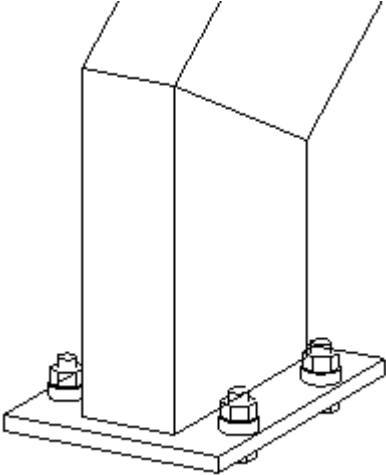
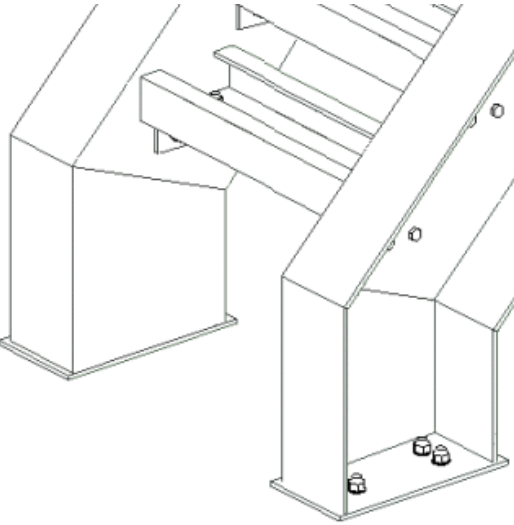
**Stair base detail (1039)** creates a bolted horizontal plate at the picked point on the stringer. The plate is welded to the stringer.

### **Objects created**

- Horizontal plate
- Bolts

- Welds
- Cuts to shape the end of the stringer

**Use for**

Situation	Description
	<p>Stair base detail with a horizontal plate.</p>
	<p>Stair base detail with a horizontal plate.</p>

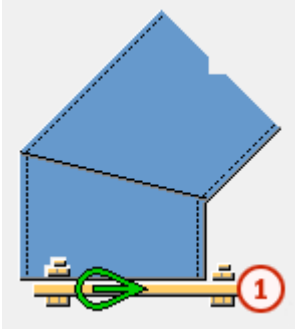
**Before you start**

Create a stringer.

**Selection order**

1. Select the stringer.
2. Pick a point on the stringer.  
The detail is created automatically.

## Part identification key

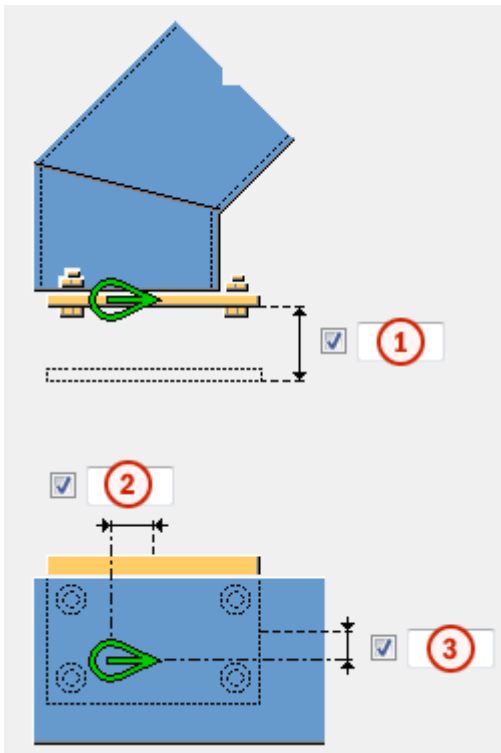


	Part
1	Horizontal plate

## Picture tab

Use the **Picture** tab to control the horizontal plate position.

## Horizontal plate position



	Description
<b>1</b>	Plate position. Define the vertical distance from the picked point to the top face of the horizontal plate.
<b>2</b>	Horizontal plate offset in the z direction, relative to the component's up-direction.
<b>3</b>	Horizontal plate offset in the y direction, relative to the component's up-direction.

### **Parts tab**

Use the **Parts** tab to control the horizontal plate properties.

### **Horizontal plate**

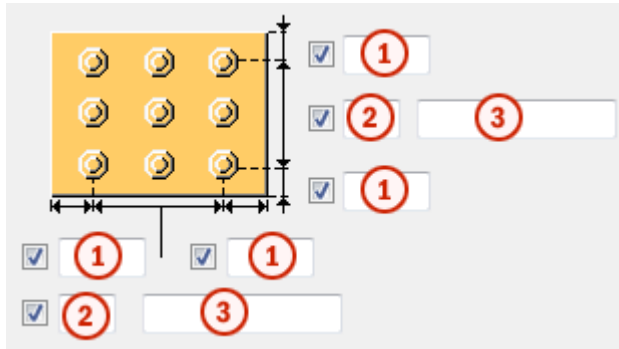
Option	Description
<b>Horizontal plate</b>	Plate thickness, width and height. The default name is PLATE.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### **Bolts tab**

Use the **Bolts** tab to control the bolt properties in the horizontal plate. You can select to create bolts or studs. By default, bolts are created.

## Bolt group dimensions



	Description
1	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Number of bolts.
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

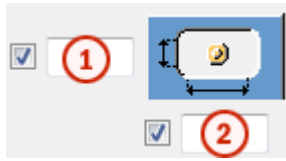
## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site



## Slotted holes

You can define slotted, oversized, or tapped holes.

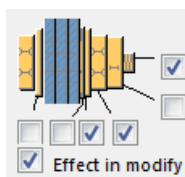


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

## Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### ***General tab***

Click the link below to find out more:

General tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

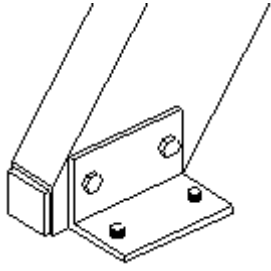
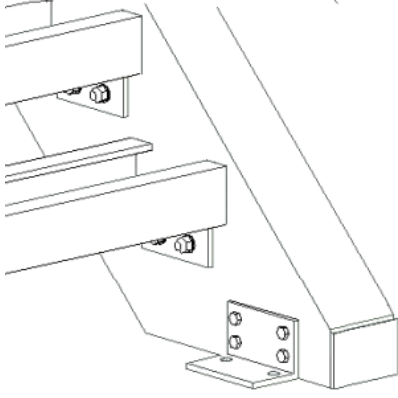
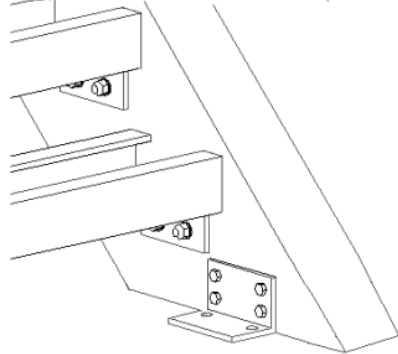
## **Stair base detail (1043)**

**Stair base detail (1043)** creates a bolted clip angle and an optional vertical plate (nose plate) at a picked point on a stringer. The clip angle is bolted and the vertical plate is welded to the stringer.

### **Objects created**

- Clip angle
- Vertical plate (optional)
- Bolts
- Welds
- Cuts to shape the end of the stringer

## Use for

Situation	Description
	Stair base detail with a clip angle and a vertical plate.
	Stair base detail with a clip angle and a vertical plate.
	Stair base detail with a clip angle.

## Limitations

**Stair base detail (1043)** works only if the **Up direction** is set to **+z** on the **General** tab. It does not work if the **Up direction** is set to **auto**.

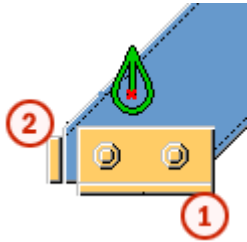
## Before you start

Create a stringer.

## Selection order

1. Select the stringer.
2. Pick a point on the stringer.  
The detail is created automatically.

## Part identification key

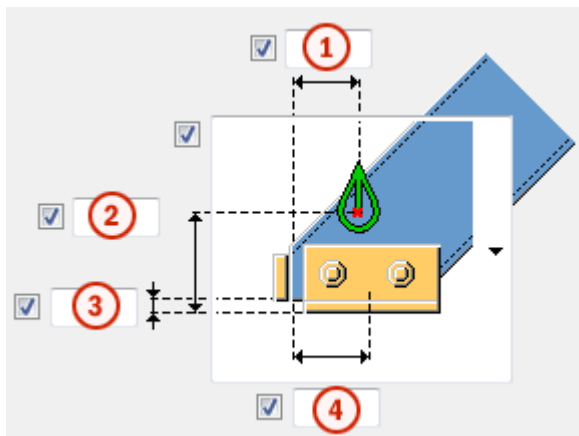


	Part
1	Clip angle
2	Vertical plate

## Picture tab

Use the **Picture** tab to control the clip angle and the vertical plate positions.

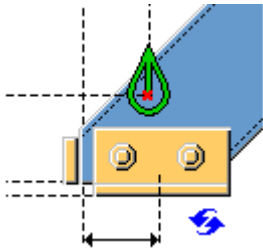
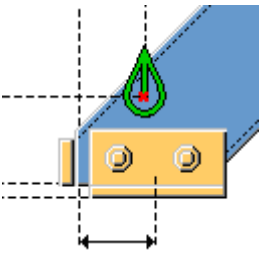
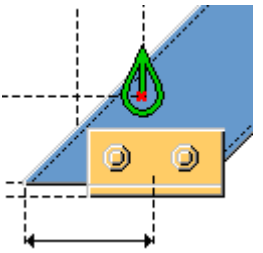
## Clip angle position



	Description	Default
1	Plate position. Define the horizontal distance from the picked point to the inner face of the vertical plate.	metric: 31 mm imperial: 1"1/4
2	Clip angle vertical position. Define the vertical distance from the picked point to the bottom of the clip angle.	metric: 170 mm imperial: 6"11/16
3	Height of the stringer cut.	metric: 12 mm imperial: 1/2"

	Description	Default
4	Clip angle horizontal position. Define the horizontal distance from the clip angle center line to the inner face of the vertical plate.	metric: 73 mm imperial: 2"7/8

### Vertical plate creation

Option	Description
	Default Vertical plate is created. AutoDefaults can change this option.
	Vertical plate is created.
	No vertical plate is created.

### Parts tab

Use the **Parts** tab to control the vertical plate and the clip angle properties.

### Vertical plate and angle cleat profile

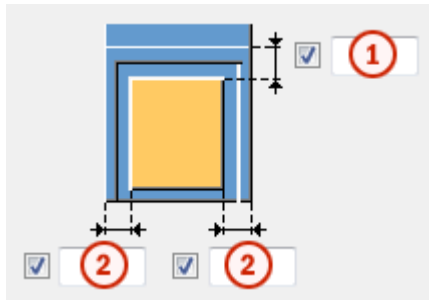
Option	Description
<b>Vertical plate</b>	Plate thickness, width and height. The default name is <code>PLATE</code> .
<b>Angle cleat profile</b>	Clip angle profile by selecting it from the profile catalog. The default name is <code>CLEAT</code> .

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### **Parameters tab**

Use the **Parameters** tab to control the vertical plate and the clip angle positions.




### **Vertical plate position**



	Description
<b>1</b>	Dimension from the top of the vertical plate to the front edge of the stringer.
<b>2</b>	Dimension from the edges of the vertical plate to the edges of the stringer.




### **Clip angle location**

Select on which side of the stringer the clip angle is created.

Option	Description
	<p>Default</p> <p>Clip angle is created on the left side of the stringer.</p> <p>AutoDefaults can change this option.</p>
	<p>Clip angle is created on the right side of the stringer.</p>
	<p>Clip angle is created on the left side of the stringer.</p>

### Clip angle position

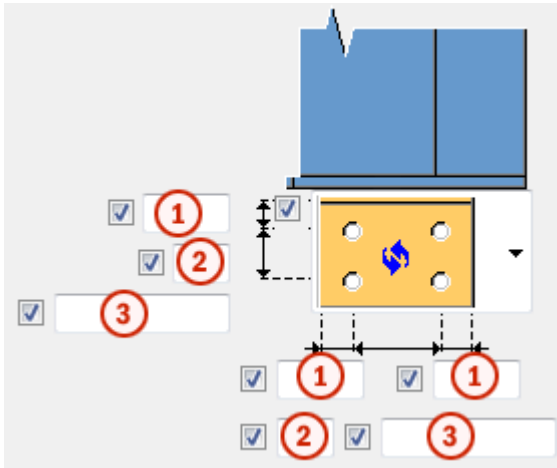
If the legs of the clip angle are of uneven length, you can switch their position.

Option	Description
	<p>Default</p> <p>The shorter leg of the clip angle is connected to the stringer.</p> <p>AutoDefaults can change this option.</p>
	<p>The shorter leg of the clip angle is connected to the stringer.</p>
	<p>The longer leg of the clip angle is connected to the stringer.</p>

### ***PBolts tab***

Use the **PBolts** tab to control how the clip angle is attached to the base.



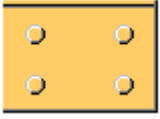

## Bolt group dimensions



	Description
1	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Number of bolts.
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

## Clip angle attachment

Select how the clip angle is attached to the base.

Option	Description
	Default Holes are created. AutoDefaults can change this option.
	Holes are created.
	Bolts and holes are created.
	No holes or bolts are created.



### Create as

Use this option to switch between holes and custom components. Note that you cannot use this option if you have selected that both bolts and holes are created, or that no holes or bolts are created.

Select the custom component from the **Applications & components** catalog and define the custom settings, up direction, rotation, and anchor length.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Cut length

Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

### Slotted holes

You can define slotted, oversized, or tapped holes.



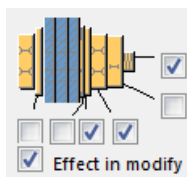
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.

Option	Description	Default
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
Rotate Slots	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
Slots in	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

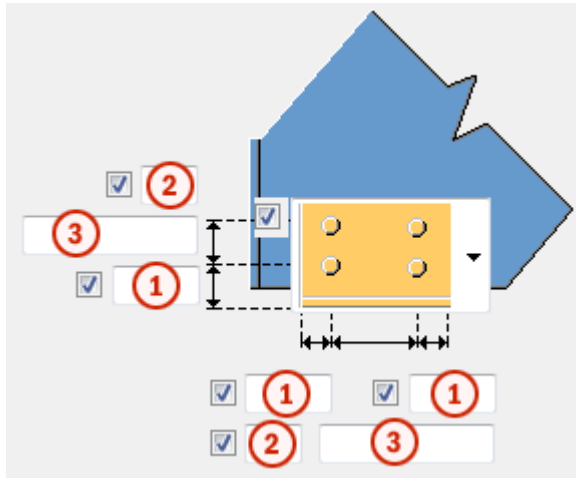
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### SBolts tab

Use the **SBolts** tab to control how the clip angle is attached to the stringer.




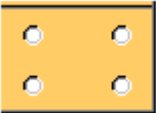
## Bolt group dimensions



	Description
1	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Number of bolts.
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

## Clip angle attachment

Select how the clip angle is attached to the stringer.

Option	Description
	Default No bolts are created. AutoDefaults can change this option.
	No bolts are created.
	Bolts are created.
	Holes are created.

## Bolt basic properties

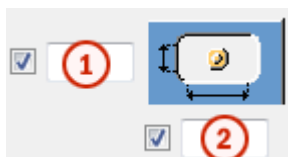
Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Cut length

Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

## Slotted holes

You can define slotted, oversized, or tapped holes.



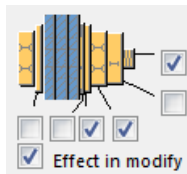
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.

Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

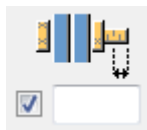
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Create as

Use this option to switch between holes and custom components. Note that you cannot use this option if you have selected that both bolts and holes are created, or that no holes or bolts are created.

Select the custom component from the **Applications & components** catalog and define the custom settings, up direction, rotation, and anchor length.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

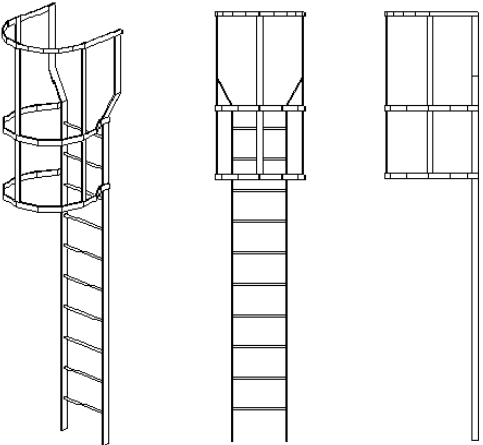
## **Ladder (S35)**

**Ladder (S35)** creates a vertical step-through ladder, with an option for a safety cage.

### **Objects created**

- Stringers
- Hoops
- Rungs
- Vertical bars

### **Use for**

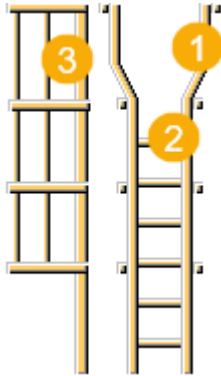
Situation	Description
	Ladder with safety cage and vertical step.

### Selection order

1. Pick a point to indicate the top point of the ladder.
2. Pick a point to indicate the elevation of the ladder.

The ladder is created automatically when you pick the second point.

### Part identification key

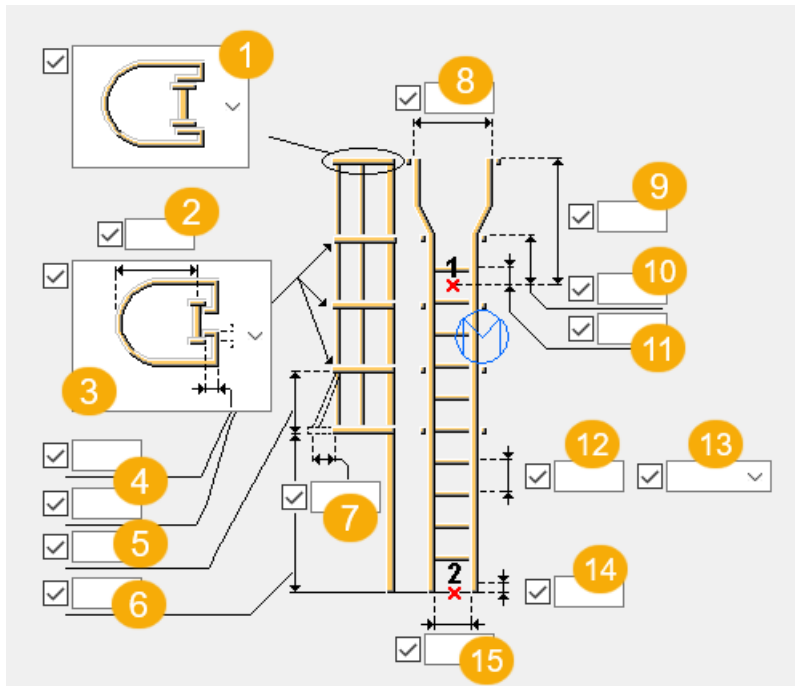


	Description
1	Stringer
2	Rung
3	Cage

### Picture tab

Use the **Picture** tab to define the ladder geometry and dimensions.

## Ladder dimensions



	Description	Default
1	Direction from which the ladder is accessed. The options are: left, right, or normal (default).	
2	Hoop circle offset from the stringer center line.	760 mm
3	Shape of the cage and how it connects to the ladder. The options are: U type 1 (default), U type 2, and O type.	
4	Cage connection options The first option is used only for U type 1. Both options are used for U type 2.	First option: 75 Second option: 40
5	Maximum spacing of hoops. The hoops are evenly spaced below the stringer flare. Only one hoop is placed on the flared stringer.	900 mm
6	Position (z-coordinate) of the lowest hoop bottom edge. If the value is greater than the floor to floor dimension, only the top hoop is	2500 mm



	<b>Description</b>	<b>Default</b>
	placed with no bars. If the value is greater than the floor to floor dimension plus stringer projection, then no hoops are placed.	
<b>7</b>	Lowest hoop extra diameter dimension.	
<b>8</b>	Inside diameter of the hoops. Stringer flare is taken from the diameter of the hoops.	750 mm
<b>9</b>	Stringer projection Height from the upper top of steel to the flared stringer top edge.	1100
<b>10</b>	Kicker height above the upper top of steel at which the ladder stringer flare.	200
<b>11</b>	Thickness of the top floor above the top of steel. The top rung is placed level with the top of flooring thickness.	0
<b>12</b>	Maximum spacing of rungs. Rungs are evenly spaced between the top and bottom floors.	300 mm
<b>13</b>	Distance between the rungs. Select either equal or exact distance.	<b>Equal</b>
<b>14</b>	Thickness of the bottom floor above the lower top of steel. Bottom rung spacing is taken from the lower top of steel plus bottom floor.	0
<b>15</b>	Width of the ladder.	450 mm

### **Parts tab**

Use the **Parts** tab to define the part properties.

### **Parts**

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Stringers</b>	Select the stringer profile from the profile catalog.	The default value is flat 10*65 ("PLT10*65").
<b>Rungs</b>	Select the rung profile from the profile catalog.	The default value is round bar 20 ("D20").

Option	Description	Default
<b>Top Hoops</b>	Select the top hoop profile from the profile catalog.	The default value is flat 10*50 ("PLT10*50").
<b>Middle Hoops</b>	Select the middle hoop profile from the profile catalog.	The default value is flat 10*50 ("PLT10*50").
<b>Bottom Hoop</b>	Select the bottom hoop profile from the profile catalog.	The default value is flat 10*50 ("PLT10*50").
<b>Vertical Bars</b>	Select the vertical bar profile from the profile catalog.	The default value is flat 10*50 ("PLT10*50").

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tab**

Use the **Parameters** tab to define the ladder properties and position.

### **Ladder position**

Option	Description	Default
<b>Vertical position</b>	Vertical position of the ladder	<b>Middle</b>
<b>Vertical offset</b>	Vertical offset of the ladder	0.0
<b>Horizontal position</b>	Horizontal position of the ladder	<b>Middle</b>
<b>Horizontal offset</b>	Horizontal offset of the ladder	0.0

Option	Description	Default
<b>Class</b>	Class of the ladder	1
<b>Create assembly</b>	Select whether to create an assembly or not.	Assembly is created.

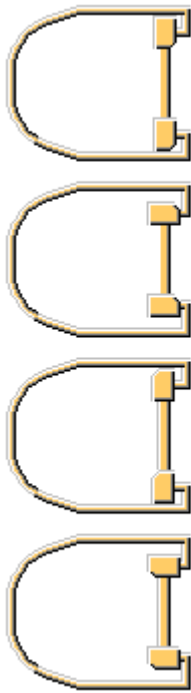
### Ladder rotation

Define how the ladder is rotated. The default value is front.





### Stringer rotation

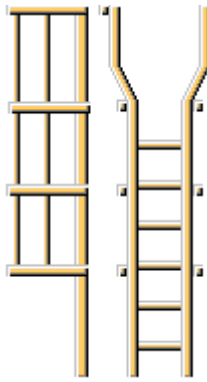
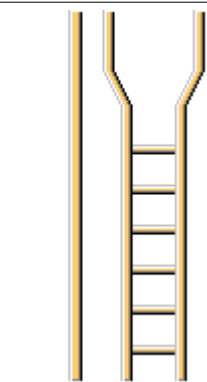
Define how the stringers are rotated. The default value is top.



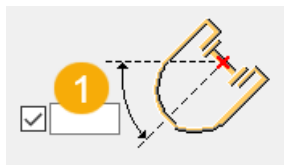
### Rung rotation

Option	Description
	<p>Rungs are rotated by 45 degrees. This is the default option.</p>
	<p>Rungs are not rotated.</p>

## Cage creation

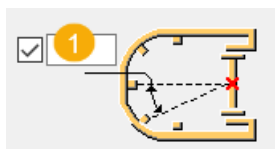
Option	Description
	<p>Cage is created. This is the default option.</p>
	<p>Cage is not created.</p>

## Hoop angle



1	Define the hoop angle.

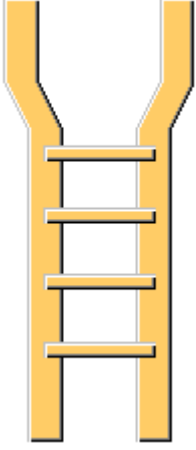
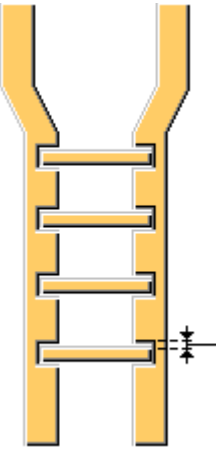
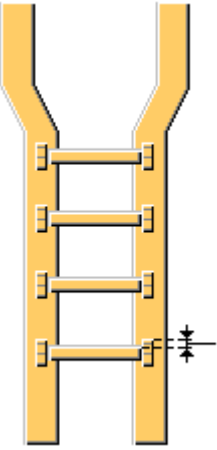
## Vertical bar spacing angle

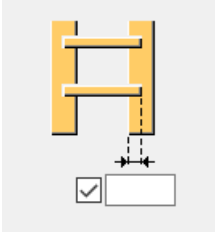


	Description	Default
1	Define the angle between the vertical bars in the round section of the hoop.	30 degrees

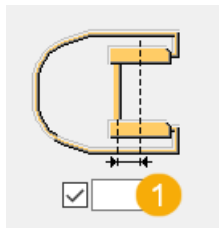
## Rung stringer part cut

Select whether stringers are cut to avoid clashing.

Option	Description
 A technical diagram of a staircase section showing two vertical stringers and four horizontal rungs. The rungs are positioned between the stringers, and the stringers are not cut to accommodate them. The stringers have a slight outward flare at the top.	Stringers are not cut. This is the default option.
 A technical diagram of a staircase section showing two vertical stringers and four horizontal rungs. The stringers are cut to allow the rungs to pass through. A dimension line on the right side of the stringer indicates the clearance between the rung and the stringer.	Stringers are cut. Define the clearance value for the cut.
 A technical diagram of a staircase section showing two vertical stringers and four horizontal rungs. The stringers are cut to allow the rungs to pass through. The rungs are bolted to the stringers. A dimension line on the right side of the stringer indicates the clearance between the rung and the stringer.	Stringers are cut. Rungs are bolted to the stringers. Define the clearance value for the cut.

Option	Description
	Define the depth of the cut into the stringer.

### Rung offset



	Description
1	Define the horizontal offset of rungs from the stringer center line.

## Cage ladder (S60)

**Cage ladder (S60)** creates a vertical step-through ladder with an option to create a safety cage.

### Objects created

- Rail bars
- Rungs
- Backer channel
- Backer plates
- Supports
- Hoops
- Vertical bars
- Welds

### Selection order

1. Pick a point to indicate the top point of the ladder.

- Pick a point to indicate the elevation of the ladder.

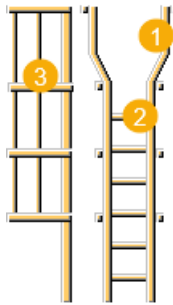
The second point can be anywhere on the top of the bottom platform. The second point does not need to be directly below the first point but the two points should define a line that is nearly parallel to the current Z axis.

The ladder is created automatically when you pick the second point.

If the line between the two points is not nearly parallel to the Z axis, the ladder is not created. If the two points are suitable for creating the ladder, the second point is adjusted, if needed, to define a line that is perfectly parallel to the Z axis. The ladder is positioned relative to this reference line.

Before creating the component, we recommend that you set the user coordinate system so that the X axis and Y axis lie in a horizontal plane with the Z axis pointing straight up. The component works with other orientations as well, but regardless of the orientation, the ladder is always positioned exactly parallel to the Z axis.

### Part identification key



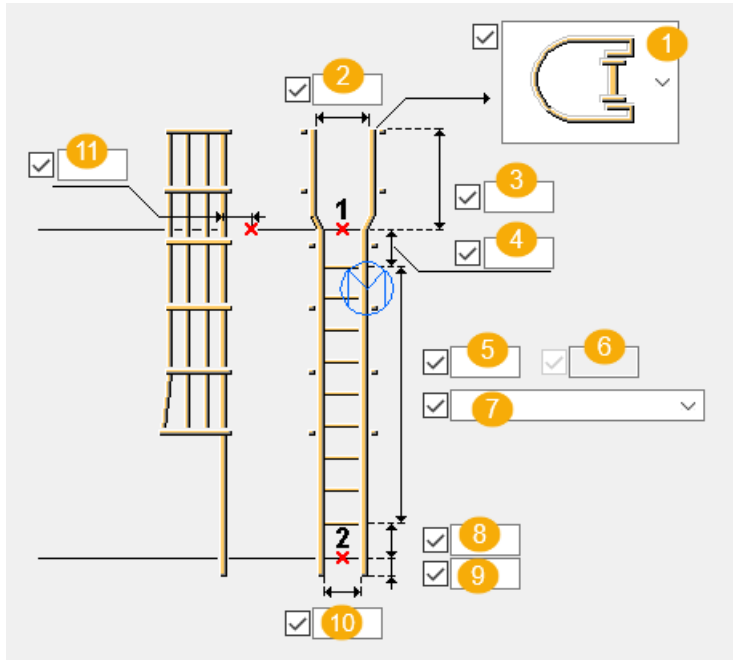
	Description
1	Rail bar
2	Rung
3	Cage

### Picture tab

Use the **Picture** tab to define the ladder geometry and dimensions.



## Dimensions



	Description
<b>1</b>	<p>Step type</p> <p>Direction from which the ladder is accessed: left side, right side, or step through (default).</p>
<b>2</b>	<p>Inside width of the ladder from the inner edge of one rail to the other</p> <p>The flared width is taken from the inner diameter of the hoops.</p> <p>Flared width is always set to more than the ladder width (<b>10</b>). If you set the flared width to less than or equal to the ladder width, the flared width is automatically reset to the ladder width plus 4 inches.</p> <p>If side steps are used, the ladder width is used as the width.</p>
<b>3</b>	Ladder top offset from the upper top of steel to the flared rail bar top edge
<b>4</b>	<p>Top rung offset</p> <p>Defines the distance from the first input point to the center line of the topmost ladder rung.</p>

	Description
<b>5</b>	<p>Number of rungs</p> <p>To define the number of rungs, select either <b>Default</b> or <b>Number of rungs</b> from the list below the box (7).</p> <p>If side steps are used, four additional rungs are automatically added above the top platform at a spacing of 12 inches.</p>
<b>6</b>	Distance between the rungs
<b>7</b>	Select to set either the maximum distance between the rungs, or the exact spacing from the bottom or top rung.
<b>8</b>	<p>Bottom rung offset</p> <p>Defines the distance from the second input point to the center line of the lowest ladder rung.</p>
<b>9</b>	<p>Ladder bottom offset</p> <p>Defines the distance from the bottom platform to the bottom of the ladder rails. A positive value places the bottom of the ladder below the bottom platform.</p>
<b>10</b>	<p>Ladder width</p> <p>Defines the inside width of the ladder from the inner edge of one rail to the other.</p> <p>If you select the step through option (1), the portion of the ladder above the top platform will be flared. If you do not define the ladder width, the default value in the applicable <code>jobdefs.lis</code> file is used.</p>
<b>11</b>	<p>Toe offset</p> <p>Defines the distance from the center line of the ladder rail to the toe of the top platform.</p> <p>If you do not define this offset, the default value in the applicable <code>jobdefs.lis</code> file is used.</p>

### **Parts tab**

Use the **Parts** tab to define the part profiles and properties.

### **Parts**

Option	Description
<b>Rail bars</b>	<p>The bar profile used to form the ladder rails</p> <p>Select the profile from the profile catalog.</p>

Option	Description
<b>Rungs</b>	The rod profile used to form the ladder rungs Select the profile from the profile catalog.
<b>Backer channel</b>	The channel profile used for the backer support channel Select the profile from the profile catalog.
<b>Backer plates</b>	The plate profile used for the bent plates that attach the ladder rails to the backer support channel Select the profile from the profile catalog.
<b>Ladder supports</b>	Select the profile from the profile catalog.
<b>Backside supports</b>	Select the profile from the profile catalog.
<b>Top hoops</b> <b>Bottom hoop</b> <b>Middle hoops</b>	The bar profile used to form the safety cage hoops Select the profile from the profile catalog.
<b>Vertical bars</b>	The bar profile used to form the vertical cage bars Select the profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

### ***Parameters tab***

Use the **Parameters** tab to define the ladder properties and position.

#### **Horizontal position and offset**

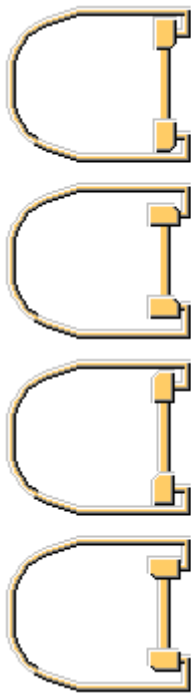
Picture above	Description	Default
<b>Horizontal position</b>	<p>Position of the ladder in the plane of the ladder</p> <ul style="list-style-type: none"> <li>• <b>Middle</b> : the center line of the ladder coincides with the reference line.</li> <li>• <b>Left</b> and <b>Right</b>: the outside face of the corresponding rail coincides with the reference line.</li> </ul>	<b>Middle</b>
<b>Horizontal offset</b>	<p>Lateral offset of the ladder in the plane of the ladder</p> <p>For example, an offset of 6" coupled with <b>Horizontal position</b> set to <b>Middle</b> places the center line of the ladder 6" to the right of the reference line.</p> <p>An offset of -8" with <b>Horizontal position</b> set to <b>Right</b>, for example, places the outside face of the right-hand rail 8" to the left of the reference line.</p>	0

## Side rail cuts

<b>Stringer cuts</b>	Select how the side rails are cut.
<b>Stringer max. length</b>	If you have selected to cut the side rails <b>At max. length</b> , define the maximum stringer length.

## Stringer rotation

Define how the stringers are rotated. The default value is top.



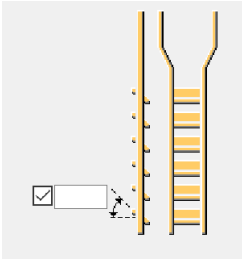
## Ladder rotation

Define how the ladder is rotated. The default value is front.



### Rung rotation

Define the rung rotation.




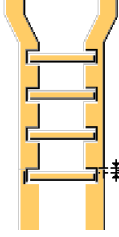

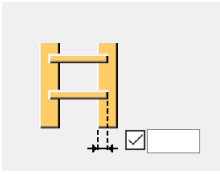
### Cage creation

	<p>Default Cage is not created. AutoDefaults can change this option.</p>
	<p>Cage is not created.</p>
	<p>Cage is created.</p>

### Rung stringer part cut

Select whether stringers are cut to avoid clashing.

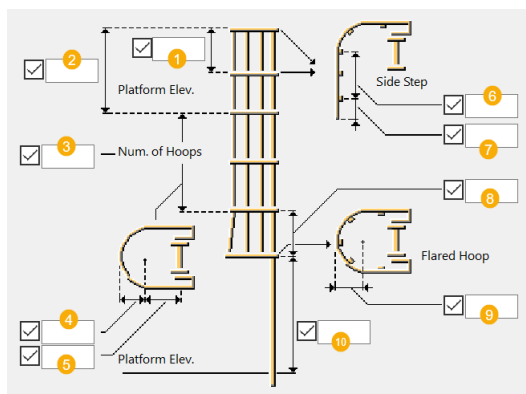
Option	Description
	<p>Stringers are not cut.</p>

Option	Description
	Stringers are not cut.
	Stringers are cut. Define the clearance value for the cut.
	Stringers are cut. Rungs are bolted to the stringers. Define the clearance value for the cut.
	Define the depth of the cut into the stringer.

### Cage tab

Use the **Cage** tab to define the size and position of the ladder's safety cage.

### Cage dimensions






	<b>Description</b>
<b>1</b>	Distance from the center of the top flared hoop to the next higher hoop in the safety cage
<b>2</b>	Distance from the top platform to the center of the top safety cage hoop
<b>3</b>	<p>Number of hoops (in addition to the required bottom flared hoop). The default number of hoops is 2.</p> <p>When you have selected that the ladder is accessed from the side, three additional hoops above the top platform are added at a spacing of 1'-10".</p> <p>When you have selected that the ladder has step-through access, two additional hoops are added at 12 inches and 3'-6" above the platform.</p>
<b>4</b>	<p>Hoop radius</p> <p>Defines the outside radius of each safety cage hoop above the flared hoop at the bottom of the cage. The hoop radius at the bottom of the cage is determined by the flared radius. If you do not define the radius, the applicable <code>jobdefs.lis</code> file determines the default value.</p> <p>You can define a combination of dimensions, including the hoop radius and ladder width, that will make it impossible to bend and attach the hoops to the outside face of each rail. This applies especially to the top of a step-through ladder where the ladder rails are flared out for improved accessibility.</p>
<b>5</b>	<p>Cage depth</p> <p>Defines the distance from the center line of the ladder rails to the curvature point for all safety cage hoops. If you do not define the depth, the applicable <code>jobdefs.lis</code> file determines the default value.</p>
<b>6</b>	<p>Side step dimension</p> <p>Defines the distance from the ladder's center line to the center line of the outermost vertical cage bar in the side step portion of the cage.</p> <p>When the step type is step through, this dimension is not used.</p>
<b>7</b>	<p>Side step dimension</p> <p>Defines the distance from the center line of the outermost vertical cage bar to the end of the modified safety cage hoops.</p> <p>When the step type is step through, this dimension is not used.</p>

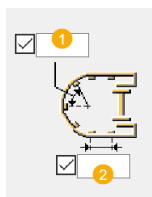


	Description
<b>8</b>	<p>Flared hoop space</p> <p>Defines the distance from the center of the bottom flared hoop to the next higher hoop in the safety cage.</p>
<b>9</b>	<p>Flared radius</p> <p>Defines the outside radius of the flared safety cage hoop at the bottom of the cage. The radius is equal to the hoop radius plus 1.75 inches. The radius of all other hoops is determined in the hoop radius <b>(4)</b>.</p>
<b>10</b>	<p>Flared hoop offset</p> <p>Defines the distance from the bottom platform to the center of the bottom flared safety cage hoop.</p> <p>If you do not define the offset, the applicable <code>jobdefs.lis</code> file determines the default value.</p>

### Hoop shape

Option	Description
	U type hoop
	U type hoop
	O type hoop

### Vertical bar spacing



	Description
<b>1</b>	Define the angle between the vertical bars in the round section of the hoop.
<b>2</b>	Define the distance between the vertical bars in the straight section of the hoop.

### **Bolts tab**

Use the **Bolts** tab to define the bolt properties of the bolts used for backer, ladder, and backside support plates. If a backer channel is not created, the bolt settings are not used.

### **Bolt basic properties**

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

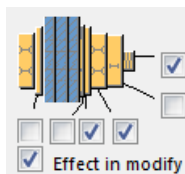
### **Cut length**

Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

### **Bolt assembly**

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

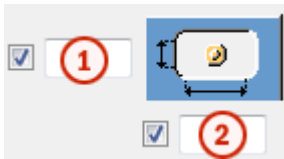
### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Slotted holes

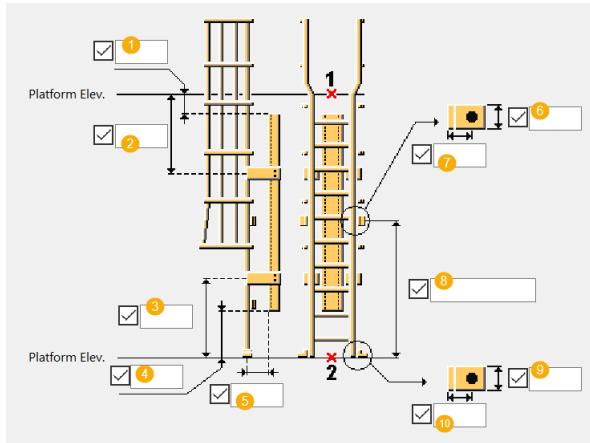
You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	




### Supports tab

Use the **Supports** tab to define the backer channel settings.






	<b>Description</b>
<b>1</b>	Top of the channel Top platform elevation distance from the top of the backer channel
<b>2</b>	Top support offset Top platform elevation distance to the center line of the upper bent plate used to attach the ladder to the backer channel. If one backer channel support is created, the bottom support offset is used to control the position of the single bent plate.
<b>3</b>	Bottom support offset Bottom platform elevation distance to the center line of the lowest bent plate used to attach the ladder to the backer support channel. If one backer channel support is created, this setting is used to control the position of the single bent plate.
<b>4</b>	Bottom of channel Bottom platform elevation distance from the bottom of the backer channel.
<b>5</b>	Backer offset Distance from the center line of the ladder rail to the nearest face of the backer channel.
<b>6</b>	Vertical top backer support dimension
<b>7</b>	Horizontal top backer support dimension
<b>8</b>	Bottom offset to the middle backer support
<b>9</b>	Vertical bottom backer support dimension
<b>10</b>	Horizontal bottom backer support dimension

## Backer channel

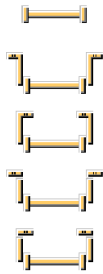
Option	Description
	<p>Default</p> <p>Backer channel is not created.</p> <p>AutoDefaults can change this option.</p>
	<p>Backer channel is not created.</p>
	<p>Backer channel is created to stiffen and support the ladder.</p>

## Backer channel supports

Option	Description
	<p>Default</p> <p>Two backer channel supports are created.</p> <p>The bent plate backer supports attach the ladder rails to the backer bar support channel.</p> <p>AutoDefaults can change this option.</p>
	<p>One backer support is created.</p>
	<p>Two backer supports are created.</p>

## Top backer support position

Select how the top backer supports are positioned.



## Bottom backer supports

Option	Description
	Bottom backer supports are not created.
	Bottom backer supports are created at the outer edges. You can define the vertical and horizontal offset.
	Bottom backer supports are created at the inner edges. You can define the vertical and horizontal offset.

## Welds

Click the link below to find out more:

## Ship Ladder

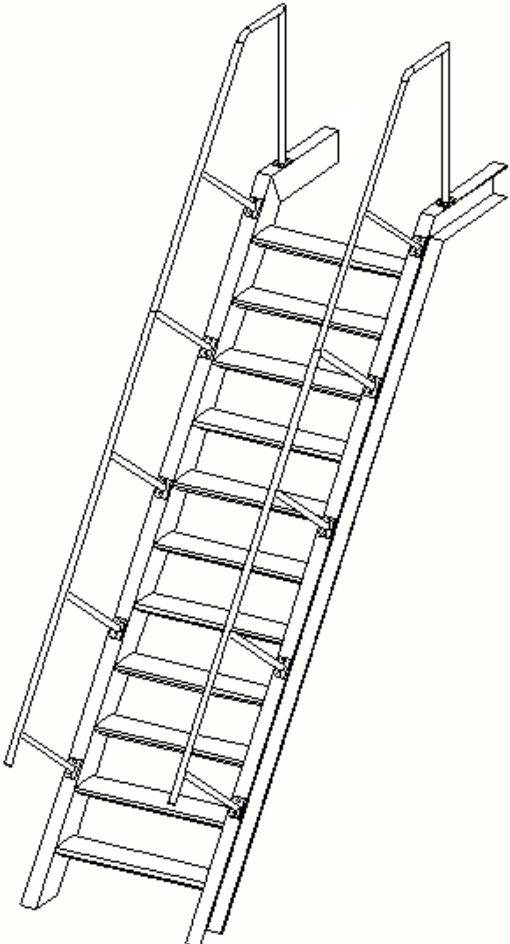
**Ship Ladder** creates stairs for ships and oil platforms.

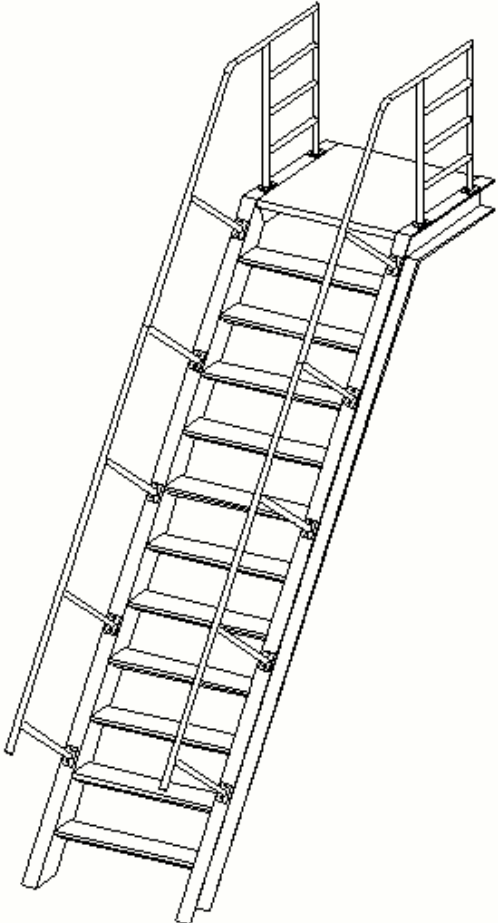
### Objects created

- Stanchions
- Stringers
- Steps
- Handrails and elbows
- Middle rails
- Platform
- Platform support


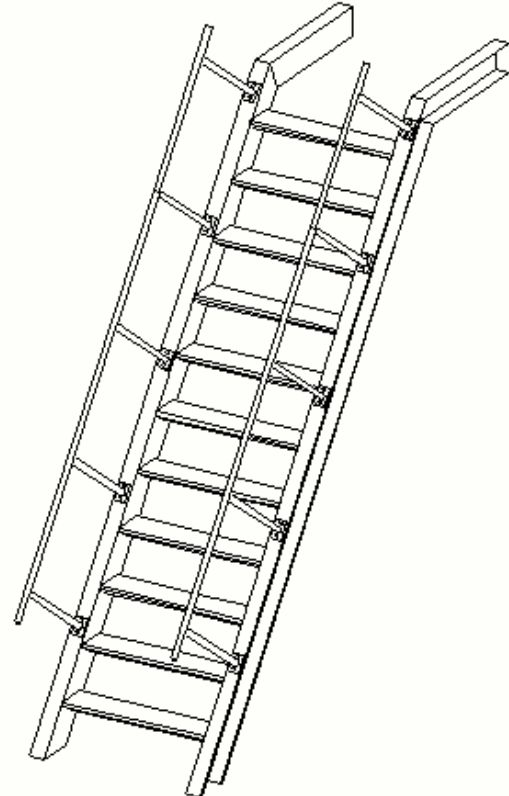
- Bolts
- Welds
- Additional component (optional)

**Use for**

Situation	Description
	<p>Type 1 Ship ladder with stringers, steps, stanchions, and handrails.</p>

Situation	Description
	<p>Type 2</p> <p>Ship ladder with stringers, steps, stanchions, platform, and handrails with middle rails.</p>



Situation	Description
	<p>Type 3</p> <p>Ship ladder with stringers, steps, stanchions, platform, handrails with middle rails.</p>
	<p>Type 4</p> <p>Ship ladder with stringers, steps, stanchions, and handrails.</p>

## Limitations

**Ship Ladder** uses catalog step profiles to define the step type on the **Parts** tab.

To have an updated step profile list on the **Parts** tab, you need to run the `Steps.exe` program when you use the **Ship Ladder** modeling tool for the first time in your environment, or when you change your Tekla Structures environment.

---

**WARNING** With standard settings Tekla Structures overwrites the step profile settings and replaces them with the default values every time when Tekla Structures is started. To prevent Tekla Structures losing the step profile settings, set `XS_DO_NOT_OVERWRITE_PLUGIN_INP_FILE = TRUE` in `teklastructures.ini` file.

If you are using catalog step profiles and have set `XS_DO_NOT_OVERWRITE_PLUGIN_INP_FILE = TRUE` and you update Tekla Structures, do the following:

1. Set `XS_DO_NOT_OVERWRITE_PLUGIN_INP_FILE = FALSE` in `teklastructures.ini` file.
2. Update Tekla Structures.
3. Start Tekla Structures.
4. Set `XS_DO_NOT_OVERWRITE_PLUGIN_INP_FILE = TRUE` in `teklastructures.ini` file.
5. Run `Steps.exe`.
6. Restart Tekla Structures

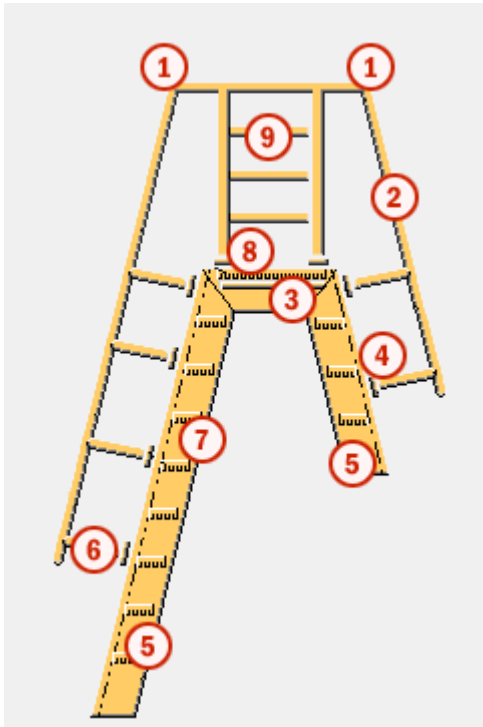
---

## Selection order

1. Pick a point to indicate the bottom level of the stairs.
2. Pick a point to indicate the top level of the stairs.
3. Click the middle mouse button to create the component.

Points that indicate the bottom level and top level are usually nosing line start/end points.

## Part identification key

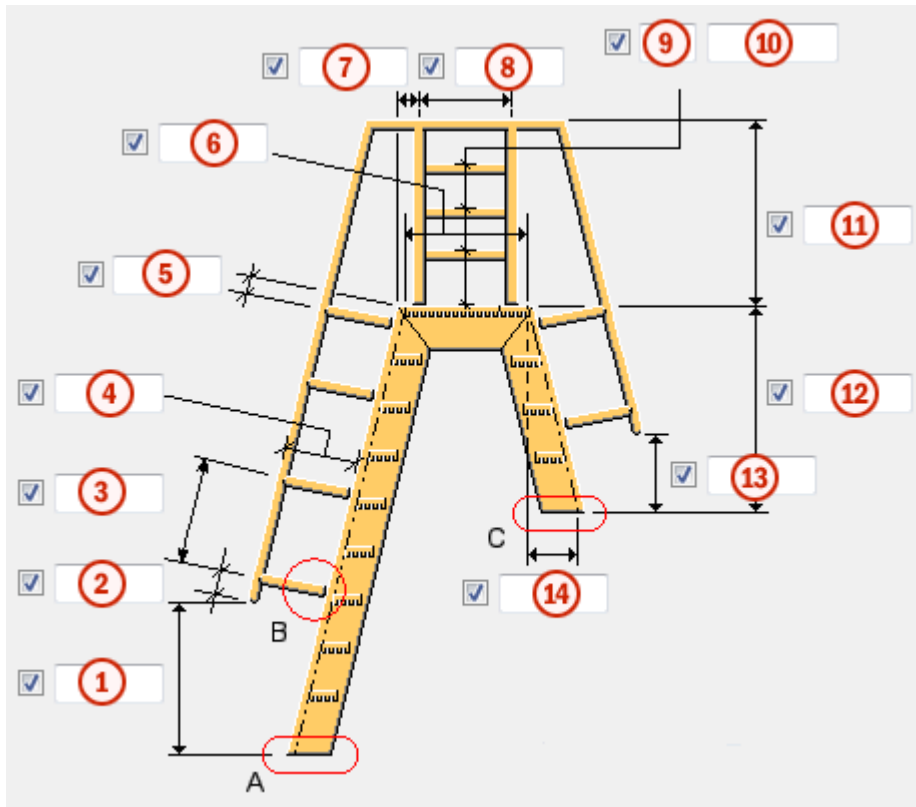


	Part
1	Elbow
2	Handrail
3	Platform support
4	Plate
5	Stringer
6	Stanchion
7	Step
8	Platform
9	Middle rail

### **Picture tab**

Use the **Picture** tab to control the type of the stairs, the dimensions of the parts created, horizontal offset, and horizontal distance between stringers.

## Dimensions



	Description	Default
1	Vertical distance between up stringer bottom and handrail bottom.	1000 mm
2	First stanchion offset along handrail, measured from the handrail bottom.	200 mm
3	Maximum distance between middle stanchions.	1000 mm
4	Distance between stringer and handrail.	800 mm
5	Last stanchion offset along handrail, measured from the stringer top.	200 mm
6	<ul style="list-style-type: none"> <li>For <b>Type 1, 2</b> and <b>4</b>: Define the distance between up nosing line top point and horizontal stringer end.</li> <li>For <b>Type 3</b>: Define the distance between up nosing line top points.</li> </ul>	1000 mm

	Description	Default
7	Horizontal offset for the first stanchion, measured from horizontal stringer start. This option is not active for <b>Type 4</b> .	200 mm
8	Distance between the first and the last horizontal stanchions. This option is not active for <b>Type 1</b> or <b>Type 4</b> .	600 mm
9	Number of middle rails. This option is not active for <b>Type 1</b> or <b>Type 4</b> .	3
10	Middle rail spacing. Use a space to separate middle rail spacing values. Enter a value for each space between middle rails. For example, if there are 3 middle rails, enter 2 values. This option is not active for <b>Type 1</b> or <b>Type 4</b> .	Value of option <b>3</b> divided by number of spaces.
11	Vertical distance between handrail top and platform top. This option is not active if for <b>Type 4</b> .	1000 mm
12	Vertical distance between platform top and down stringer bottom. This option is active only for <b>Type 3</b> .	2000 mm
13	Vertical distance between handrail bottom and down stringer bottom. This option is active only for <b>Type 3</b> .	1000 mm
14	Horizontal distance between up nosing line end and down nosing line end. This option is active only for <b>Type 3</b> .	The up stringer and down stringers have the same inclination.

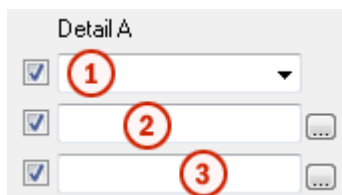
### Step and assembly creation

Option	Description
<b>Create top step</b>	Define whether the top step is created.
<b>Create assembly</b>	Define which parts form an assembly. The options are: <ul style="list-style-type: none"> <li>• <b>No</b> No assembly is created.</li> </ul>

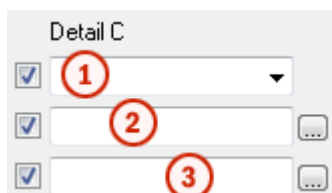
Option	Description
	<ul style="list-style-type: none"> <li>• <b>All</b> All parts are included in an assembly.</li> <li>• <b>Stingers/Rails</b> Parts form several assemblies: <ul style="list-style-type: none"> <li>• Each of the stringer assemblies includes up, horizontal and down stringers.</li> <li>• Each of the rail assemblies includes up, horizontal and down handrails, middle rails, stanchions and plates.</li> <li>• The platform, each platform support and each step form its own assembly.</li> </ul> </li> </ul>

### Detail A and Detail C

Use **Detail A** to connect the up stringer end to an end detail.

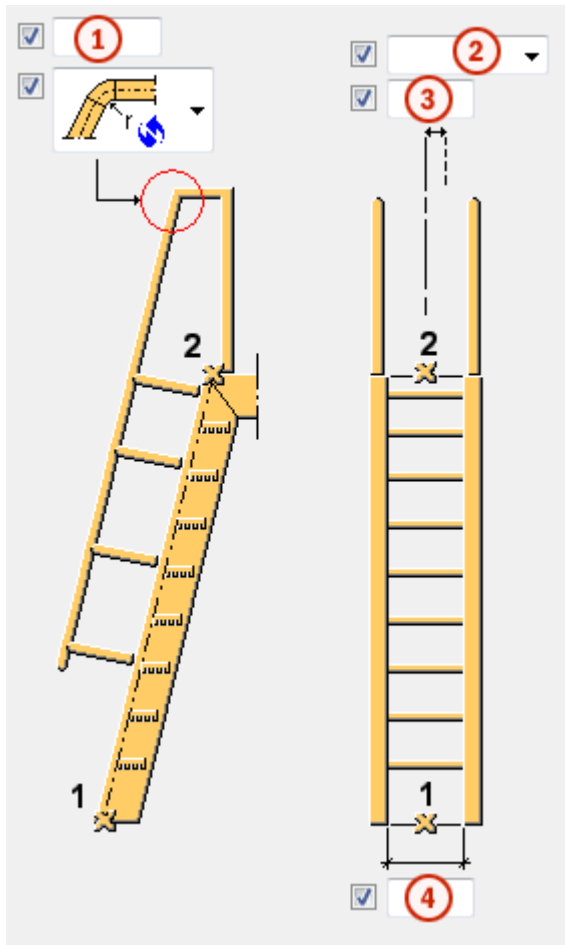


Use **Detail C** to connect the down stringer end to an end detail.



	Description	Default
1	Define whether the stringers are connected to an end detail.	None
2	Define the detail by selecting it from the component catalog.	
3	Select an attribute file for the detail.	standard

## Ship ladder options


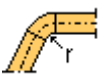

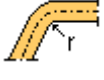



	Description	Default
1	Handrail elbow radius. This option is not active for <b>Type 4</b> .	100 mm
2	Define how to measure the dimension for the horizontal offset of the ship ladder. The options are: <ul style="list-style-type: none"> <li>• <b>Left</b> To the left from the line defined by the picked points.</li> <li>• <b>Middle</b> The line defined by the picked points is the center line.</li> <li>• <b>Right</b> To the right from the line defined by the picked points.</li> </ul>	Middle

	Description	Default
3	Horizontal offset. This option is not active for <b>Default</b> or <b>Middle</b> .	0 mm
4	Horizontal distance between stringers.	1000 mm

### Handrail elbow bending cuts

This option is not active for **Type 4**.

Option	Description
	Default Bent elbow AutoDefaults can change this option.
	Bent elbow Separate elbow part is between rails.
	Fitting Rails are fitted.
	Bent rail Rail is bent.
	Separate rails Rails are not fitted.

### Parts tab

Use the **Parts** tab to control the properties of the created parts.

### Part properties

Option	Description	Default
<b>Elbow</b> <b>Handrail</b> <b>Middle rail</b> <b>Stanchion</b>	Define the elbow profile by selecting it from the profile catalog.	PD40*2
<b>Plate in Detail B</b>	Thickness of the plate.	5 mm
<b>Support</b>	Thickness of the platform support.	5 mm
<b>Step</b>	Select whether to use catalogue steps or	



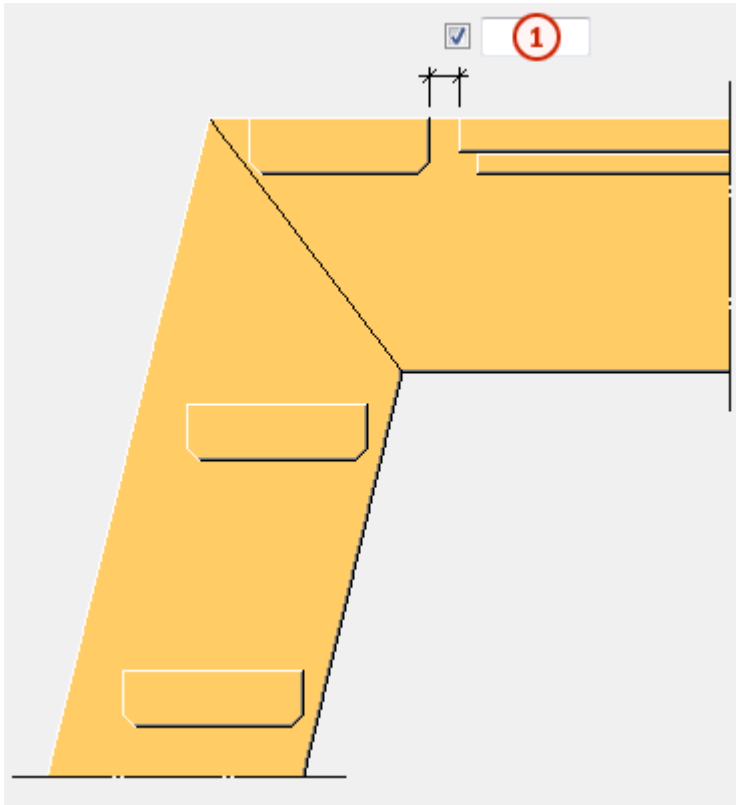
Option	Description	Default
	profiles or to create the steps. Select the step from the list of catalogue steps or from the profile catalog. If you change your Tekla Structures environment, update the step list.	
<b>Stringer</b>	Define the stringer profile by selecting it from the profile catalog.	C200*100*5
<b>Platform</b>	Thickness of the platform.	50 mm
<b>Bracket</b>	Define the bracket profile by selecting it from the profile catalog.	

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

### ***Platform tab***

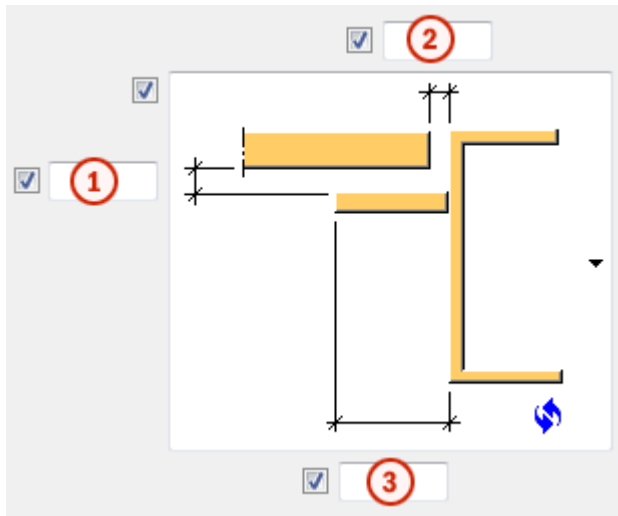
Use the **Platform** tab to control the platform offset and support.

## Platform offset



	Description	Default
<b>1</b>	Platform horizontal offset from the top step. If the top step is not created, the platform horizontal offset is defined from the up nosing line top point.	0 mm

## Platform offset and support

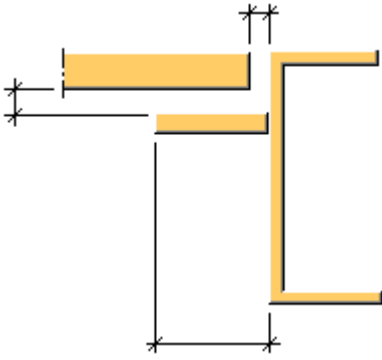
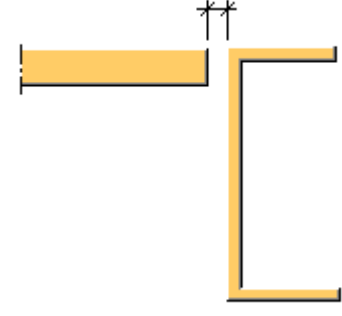


	Description	Default
1	Platform support vertical offset from the platform bottom.	0 mm
2	Platform horizontal offset from the stringer.	0 mm
3	Width of the platform support.	50 mm

## Platform support creation

**NOTE** The top of the platform is always on the same level as the top of the stringer.

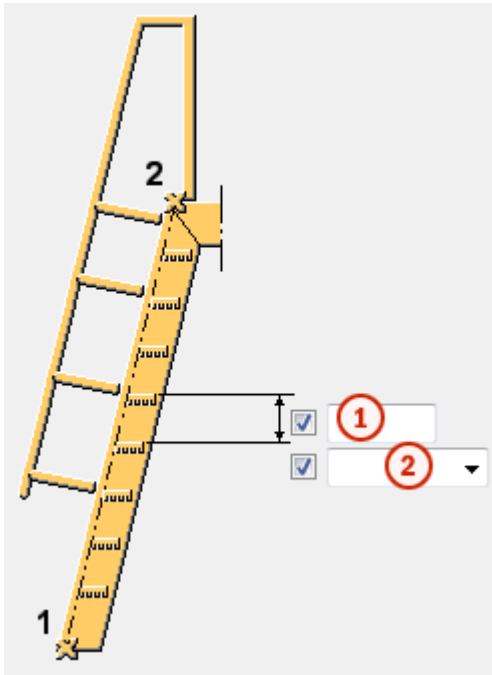
Option	Description
	<p>Default</p> <p>Platform support is created.</p> <p>AutoDefaults can change this option.</p>

Option	Description
	Platform support is created.
	Platform support is not created.

### Steps tab

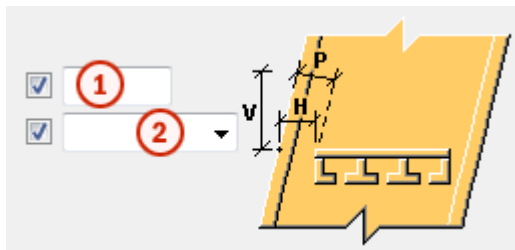
Use the **Steps** tab to control the step spacing and offset.

### Step spacing



	Description	Default
1	Vertical spacing between the steps. The spacing depends on the step spacing type.	300 mm
1	Step spacing type. The steps are spaced from the second picked point to the first picked point <b>Equal</b> represents the maximum distance between the steps. <b>Exact</b> represents the exact distance between the steps.	Equal

### Step offset



	Description	Default
1	Step offset from the stringers.	0 mm
2	Type of the step offset.	Horizontal (H)

### Rails tab

Use the **Rails** tab to control the handrail and middle rail properties.

#### Middle rail and Handrail

Option	Description	Default
<b>Middle rail to stanchion</b> <b>Handrail to stanchion</b>	Define how the middle rails or handrails are connected to the stanchions.	Middle rails = Connection Handrails = Weld
<b>Connection number</b>	Define a connection that connects the rails to stanchion by selecting it from the component catalog.	Round tube (23)
<b>Connection properties</b>	Select an attribute file for the connection.	standard

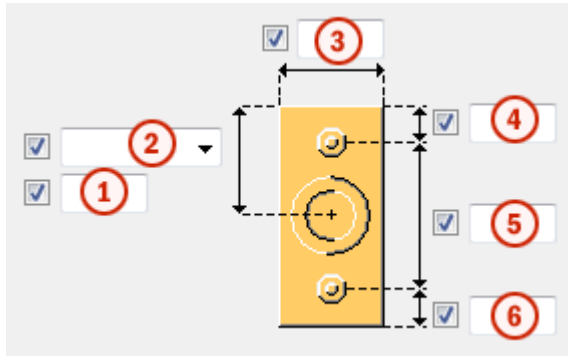
## Handrail options

Option	Description	Default
<b>Handrail max. length</b>	Maximum length of the handrail.	3000 mm
<b>Handrail cuts</b>	<p>Define how the handrails are cut.</p> <ul style="list-style-type: none"> <li>• <b>At max. stanchion</b> Starting from the handrail end, the <b>Handrail max. length</b> is measured along the handrail and the cut is made at the last stanchion included in the measured distance.</li> <li>• <b>At max. length</b> Starting from the handrail end, the <b>Handrail max. length</b> is measured along the rail and the cut is made at the maximum length.</li> <li>• <b>Every stanchion</b> A cut is made to the handrail at each stanchion.</li> </ul>	At max. stanchion

### **Detail B tab**

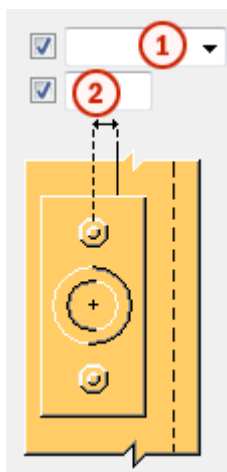
Use the **Detail B** tab to control the bolt properties on a plate that connects stanchions to stringers.

## Vertical offset



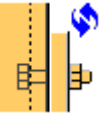
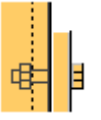
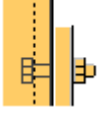
	Description
1	Plate vertical offset.
2	Define how to measure the dimension for the plate vertical offset. <ul style="list-style-type: none"> <li>• <b>Top</b> From the top of the plate to the stanchion center.</li> <li>• <b>Middle</b> From the horizontal center line of the plate to the stanchion center.</li> <li>• <b>Below</b> From the bottom of the plate to the stanchion center.</li> </ul>
3	Plate width.
4	Distance between top bolt and plate top.
5	Distance between the bolts.
6	Distance between bottom bolt and plate bottom.

## Horizontal offset



	Description
1	<p>Define how to measure the dimension for the horizontal plate offset.</p> <ul style="list-style-type: none"> <li>• <b>Left</b></li> <li>• From the left of the plate to the stanchion center.</li> <li>• <b>Middle</b></li> <li>• From the horizontal center line of the plate to the stanchion center.</li> <li>• <b>Right</b></li> <li>• From the right of the plate to the stanchion center.</li> </ul>
2	Horizontal plate offset.

### Bolting direction

Option	Description
	<p>Default</p> <p>From plate to stringer</p> <p>AutoDefaults can change this option.</p>
	From stringer to plate
	From plate to stringer

### Bolt basic properties

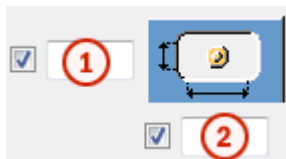
Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes



Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

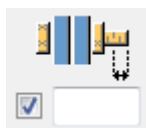
You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt length increase

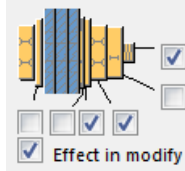
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## Welds tab

Click the link below to find out more:

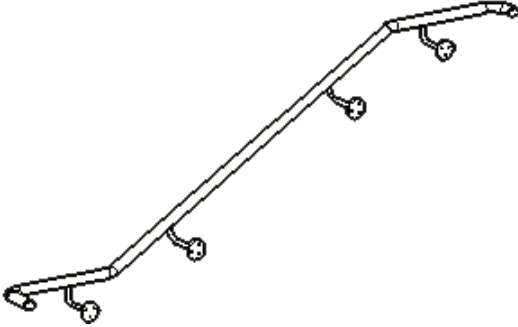
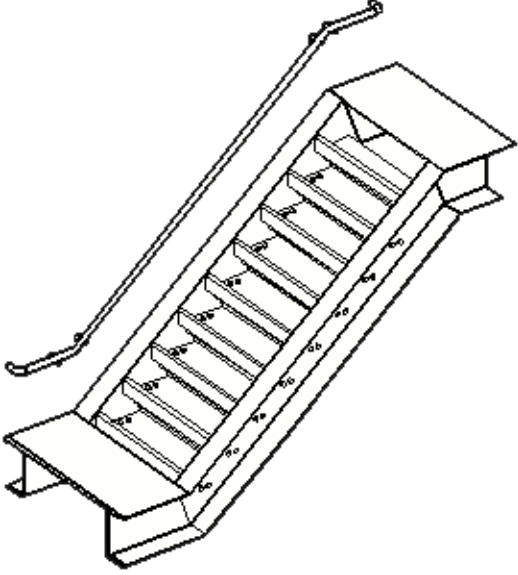
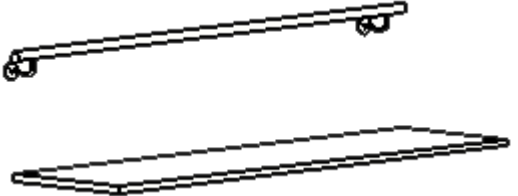
## Wall Rails

**Wall rails** creates a horizontal or a sloped handrail with supporting elements. The handrail is connected to a wall.

### Objects created

- Rail
- Elbows
- Endings
- Bracket arm
- Bracket base
- Bolts
- Welds

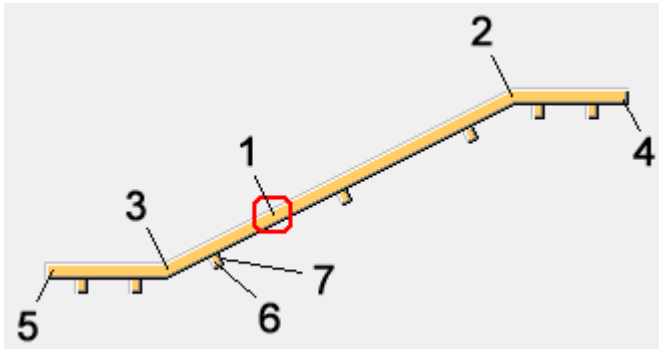
## Use for

Situation	Description
	Rail with elbows, endings, and brackets.
	Rail on one side of a ladder, with elbows, endings, and brackets.
	Straight rail with brackets.

## Selection order

1. Pick the start point
2. Pick the end point.  
The rail is created automatically.

## Part identification key



	Part
1	Rail
2	Right elbow
3	Left elbow
4	Right ending
5	Left ending
6	Bracket arm
7	Bracket base

### **General tab**

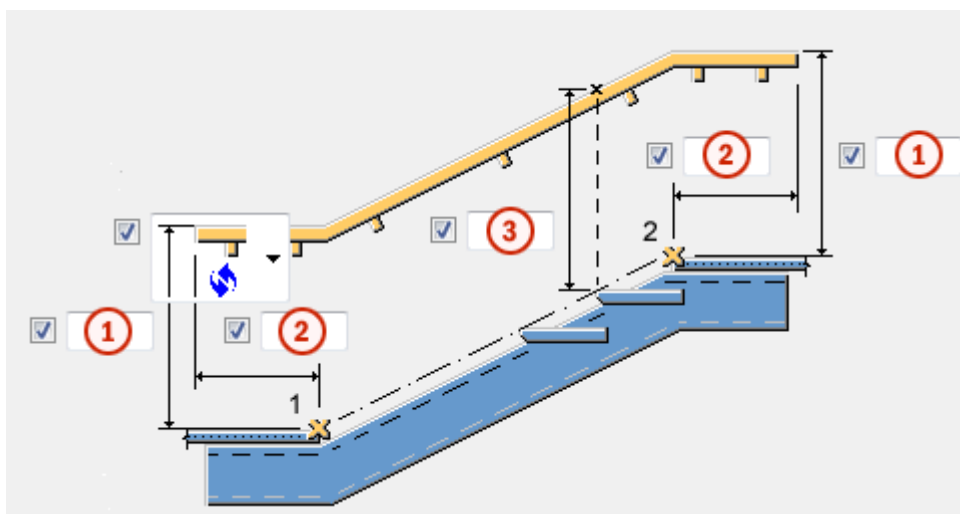
Use the **General** tab to control the assembly creation, rail dimensions and the rail offset.

### **Assembly creation**

Option	Description	Default
<b>Create Assembly</b>	<p>Define which parts form an assembly.</p> <p>The options are:</p> <ul style="list-style-type: none"> <li>• <b>All</b></li> </ul> <p>All parts are included in an assembly, including brackets.</p> <p>Rail is the assembly main part.</p>	All

Option	Description	Default
	<ul style="list-style-type: none"> <li>• <b>Rail</b> Rail and elbows form an assembly. The sloped part of the rail is the assembly main part.</li> <li>• <b>No</b> No assembly is created.</li> </ul>	




### Rail dimensions



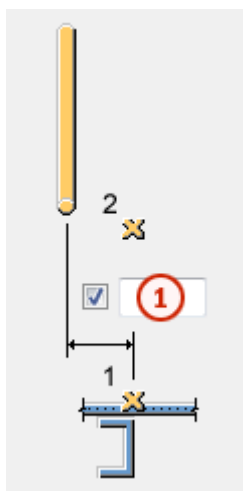
	Description	Default
<b>1</b>	Vertical distance between the rail and the start/end point.	0 mm
<b>2</b>	Horizontal distance from the rail's rightmost/leftmost edge to the start/end point. If you have created endings, the distance is measured from the endings' outmost edge.	0 mm
<b>3</b>	Vertical distance between the rail and the noseline.	0 mm

### Rail ending dimensions

Define whether the vertical distance between the start/end point and the rail is measured from the top or the middle of the rail.

Option	Description
	Default From top AutoDefaults can change this option.
	From top
	From middle

### Rail offset

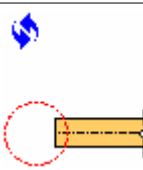
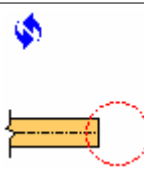
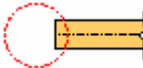
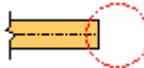


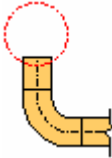
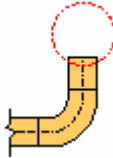
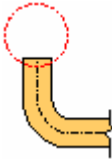
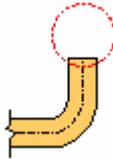
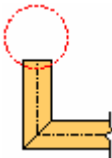
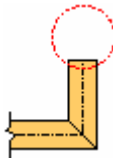
	Description	Default
1	Rail horizontal offset from the start/end point.	0 mm

### Endings tab

Use the **Endings** tab to control the rail ending types and dimensions.

### Ending types

Option	Option	Description
		Default No ending AutoDefaults can change this option.
		No ending

Option	Option	Description
		Separate bent elbow part between rails.
		Rail is bent.
		Rail and ending are fitted.

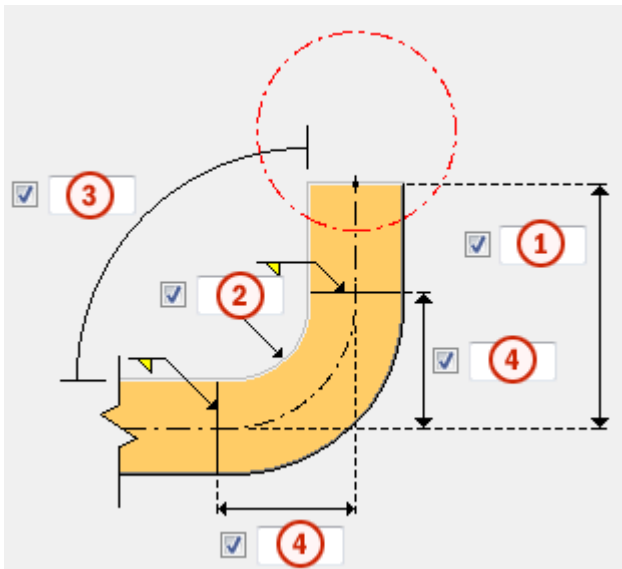
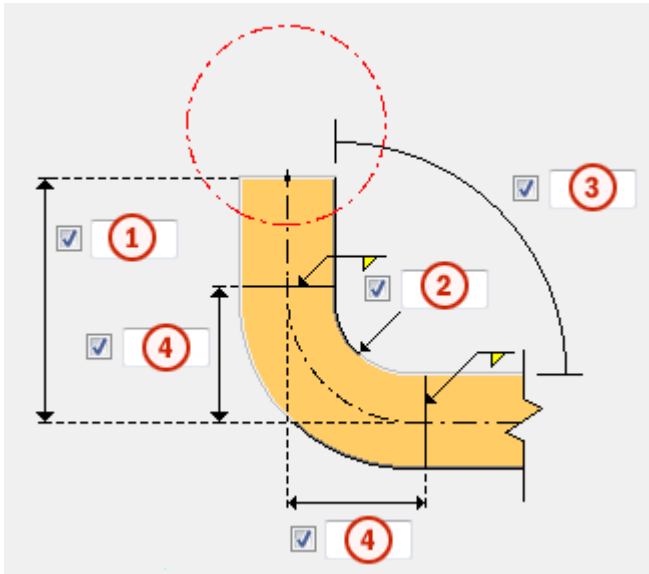
### End detail

Option	Description	Default
<b>End detail</b>	Define a detail that is created to the ending by selecting it from the component catalog.	None
<b>Attribute</b>	Select an attribute file for the end detail.	standard

**NOTE** Some details do not work correctly with the bent rail. In that case you need to

- select another type of detail
- use some other elbow or ending type than bent rail.
- select the **Internal** bracket type.

## Ending dimensions



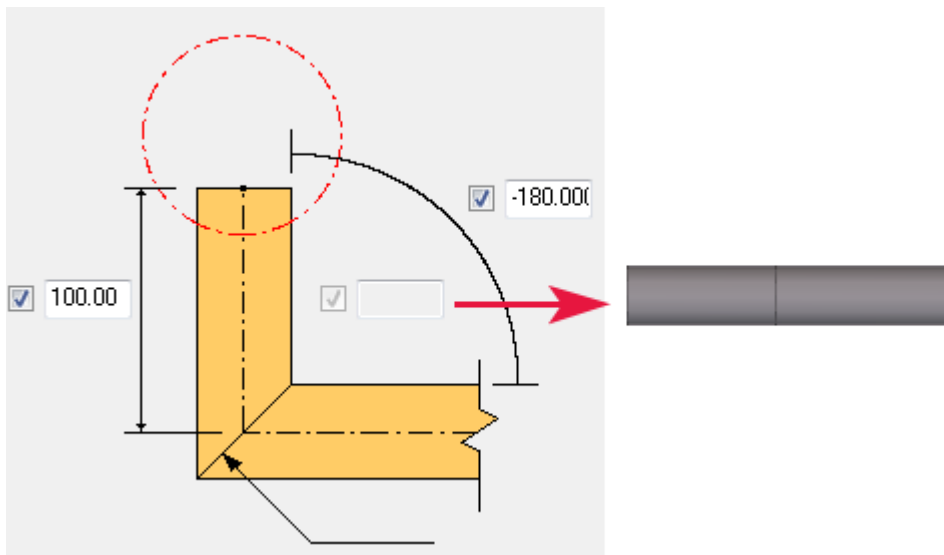
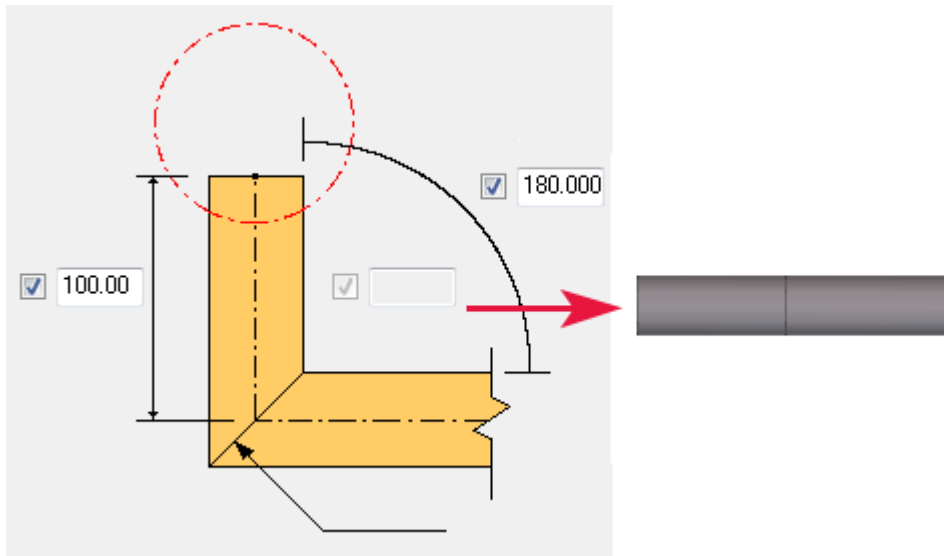
	Description	Default
1	Length of the straight part of the ending.	100 mm
2	Inner radius of the bent ending.	30 mm
3	Bent angle by entering a value between +90 and +180 degrees or -90 and -180 degrees.	90 degrees
4	Length of the bending.	

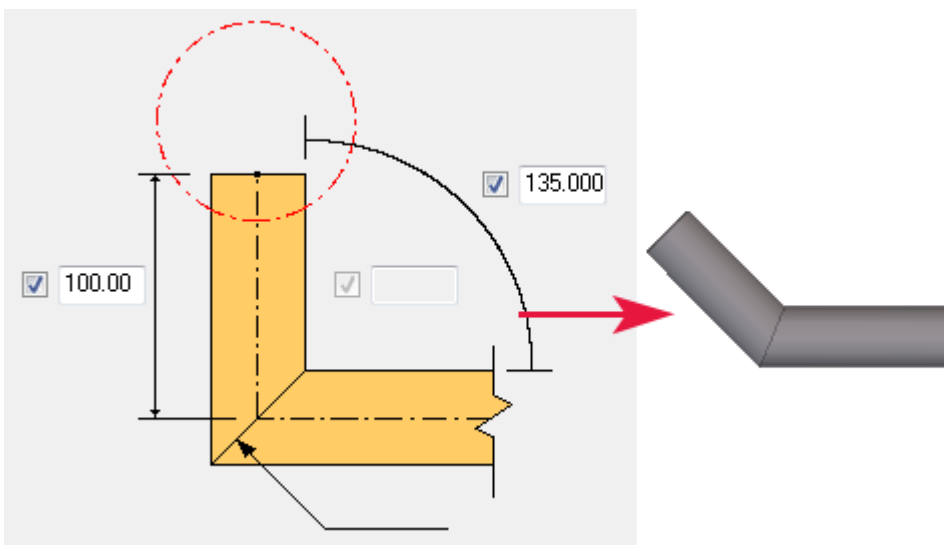
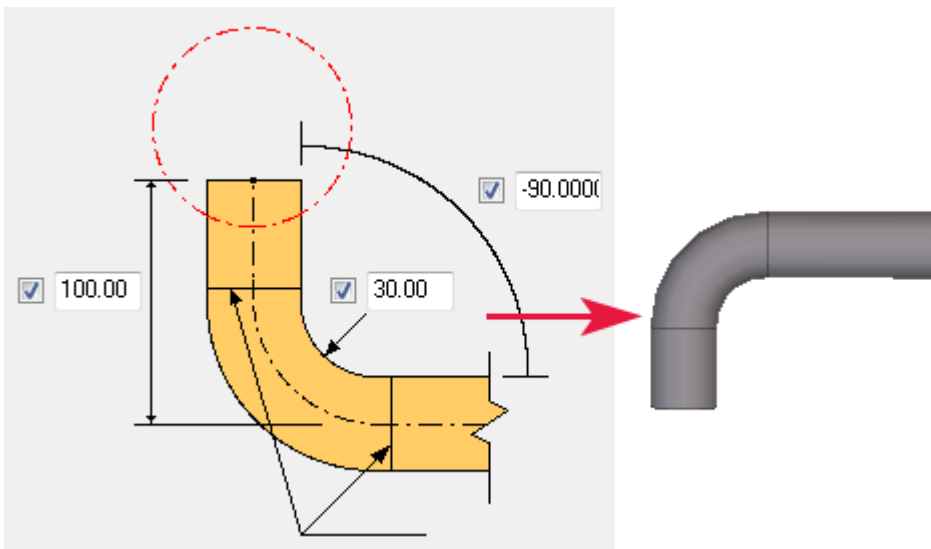
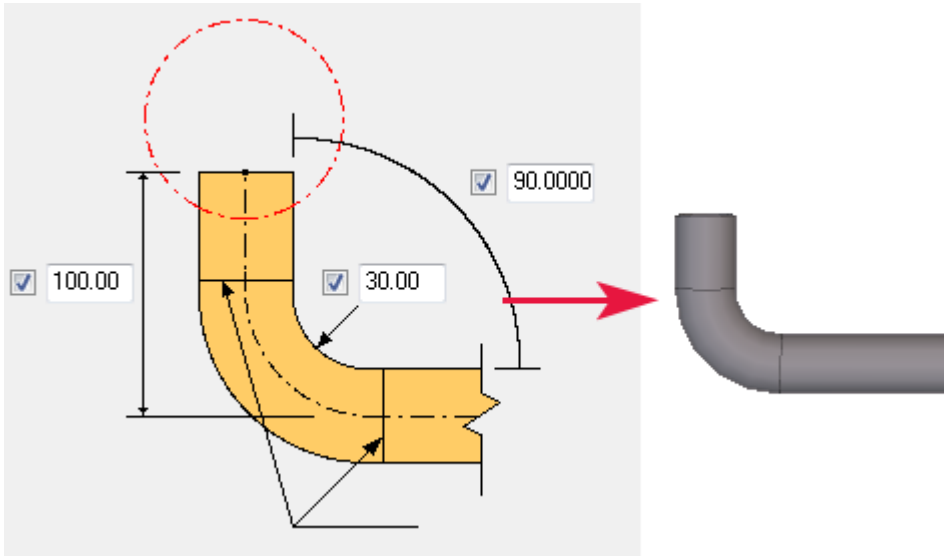
## Rail orientation

Define the orientation of the handrail.



## Bent angle examples



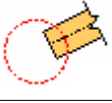
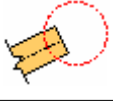
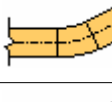
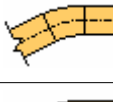




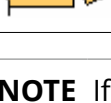
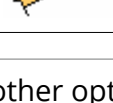




### Elbows tab

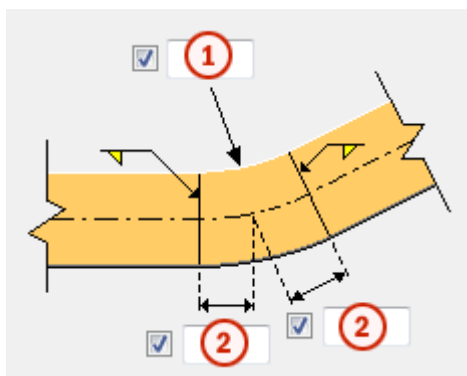
Use the **Elbows** tab to control the elbow types and dimensions.

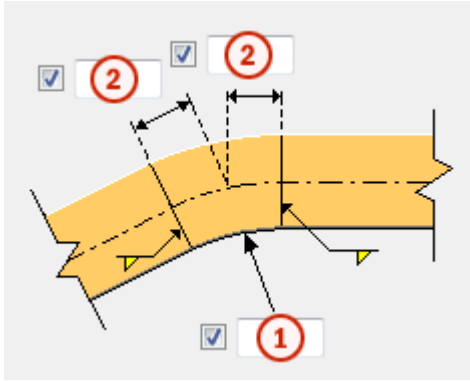
#### Elbow types

Option	Option	Description
		Default No elbow AutoDefaults can change this option.
		No elbow
		Separate bent elbow part between rails.
		Rail is bent.
		Rails are fitted.
		Rails are not fitted.

**NOTE** If you select some other option than **No elbow**, you need to enter a value for the horizontal distance from the rail's rightmost/leftmost edge to the start/end point on the **General** tab. Otherwise the rail is not created correctly.

#### Radius and length of bending





	Description	Default
1	Inner radius of the bent elbow.	30 mm
2	Length of the bending.	

### **Brackets tab**




Use the **Brackets** tab to control the bracket types and dimensions.

#### **Bracket options**

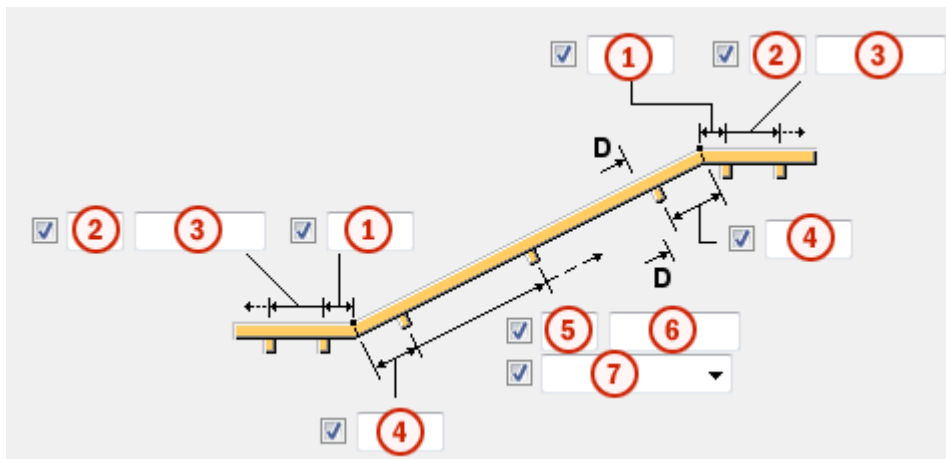
Option	Description	Default
<b>Bracket type</b>	<p>Define how brackets are created.</p> <p>The options are:</p> <ul style="list-style-type: none"> <li>• <b>Internal</b> Brackets are created according to the profile selected on the <b>Parts</b> tab.</li> <li>• <b>Detail</b> Brackets are created according to the selected bracket detail.</li> <li>• <b>No</b> No brackets are created.</li> </ul>	Internal
<b>Bracket base</b>	Define whether the bracket base is created or not.	Yes
<b>Bracket detail</b>	Define a system or a custom detail that is	

Option	Description	Default
	used as a bracket by selecting it from the component catalog.  This field is active only if you have set the <b>Bracket type</b> to <b>Detail</b> .	
<b>Attribute</b>	Select an attribute file for the detail.	standard
<b>Connect bracket detail to</b>	Define the part to which the bracket detail is connected.	Bracket arm

### Bracket direction

Option	Description
	Default Brackets on the left side AutoDefaults can change this option.
	Brackets on the left side
	Brackets on the right side

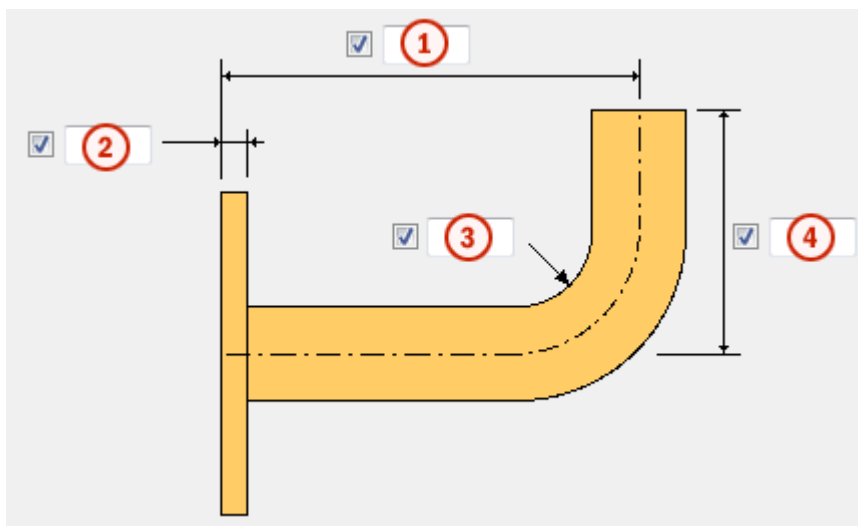
### Bracket positioning



	Description	Default
<b>1</b>	Distance between the start/end point of the rail and the bracket.	100 mm
<b>2</b>	Number of brackets.	0

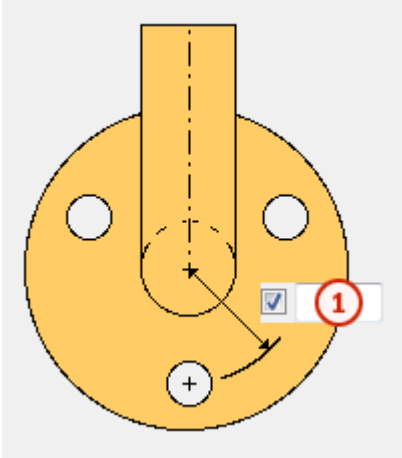
	Description	Default
3	Bracket spacing. Use a space to separate bracket spacing values.	0 mm
4	Distance between the start/end point of the rail and the bracket.	100 mm
5	Number of brackets.	0
6	Bracket spacing. Spacing depends on the selected bracket spacing type.	0 mm
7	Spacing type. If you select <b>Maximum</b> , the component creates the minimum amount of brackets needed without exceeding the entered spacing value. The amount of brackets is then equally distributed along the rail.	Exact

### Bracket dimensions



	Description	Default
1	Bracket arm width. The dimension is measured from the bracket base.	120 mm
2	Bracket base thickness.	50 mm
3	Bent inner radius of the bracket arm.	10 mm
4	Bracket arm vertical length. The dimension is measured from the bent radius.	5 mm

## Hole placement in bracket base



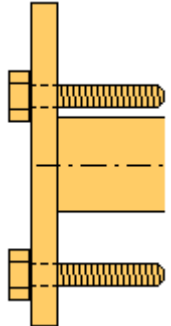
	Description	Default
1	Radius of the circle on which the bracket holes are placed.	17 mm

## Bolts tab

Use the **Bolts** tab to control the bolts that connect the bracket base to a wall.

### Bolting direction

Option	Description
	Default From bracket to wall AutoDefaults can change this option.
	From bracket to wall

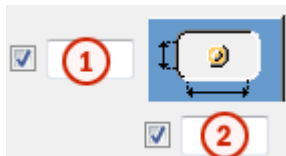
Option	Description
	From wall to bracket

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.



Option	Description	Default
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
Rotate Slots	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
Slots in	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt length increase

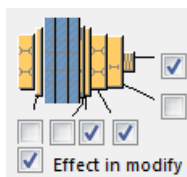
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Parts tab

Use the **Parts** tab to control dimensions of the created parts.

### Part guide

Select a part from the list. The selected part is displayed.

## Part dimensions

Option	Description	Default
<b>Rail</b>	Define a profile by selecting it from the profile catalog.	CHS40*3
<b>Right elbow</b>	Define a profile by selecting it from the profile catalog.	Not created
<b>Left elbow</b>	Define a profile by selecting it from the profile catalog.	Not created
<b>Right ending</b>	Define a profile by selecting it from the profile catalog.	Not created
<b>Left ending</b>	Define a profile by selecting it from the profile catalog.	Not created
<b>Bracket arm</b>	Define a profile by selecting it from the profile catalog.	D12
<b>Bracket base</b>	Define a profile by selecting it from the profile catalog.	D60

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

## ***Welds tab***

Click the link below to find out more:

## **2.15 Stiffeners and gussets**

This section introduces components that can be used in steel stiffeners and gussets.

- [Beam with stiffener \(129\) \(page 1747\)](#)
- [Gusset stiffeners \(171\) \(page 1771\)](#)
- [Column with stiffeners W \(182\) \(page 1775\)](#)
- [Column with stiffeners \(186\) \(page 1807\)](#)
- [Column with stiffeners S \(187\) \(page 1836\)](#)
- [Column with stiffeners \(188\) \(page 1863\)](#)
- [Stiffeners \(1003\) \(page 1894\)](#)
- [Column stiffeners \(1030\) \(page 1898\)](#)
- [Stiffeners \(1041\) \(page 1902\)](#)
- [Multiple stiffeners \(1064\) \(page 1905\)](#)
- [Standard gusset \(1065\) \(page 1911\)](#)

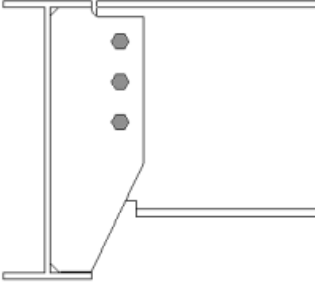
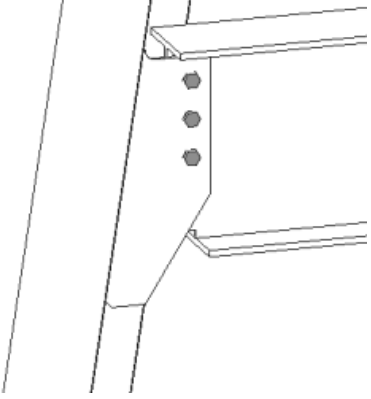
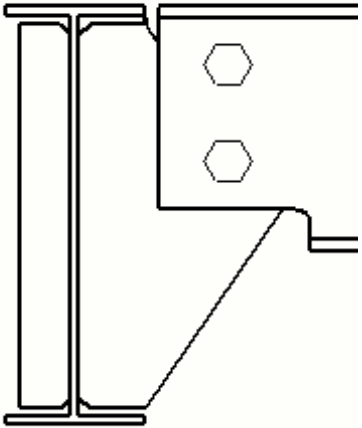
### **Beam with stiffener (129)**

**Beam with stiffener (129)** connects a beam to another beam with a bolted and welded shear tab. The connection can be used at the back of a U-profile. The secondary beam can be leveled or sloped and/or skewed.

#### **Objects created**

- Shear tabs (1 or 2)
- Stiffener (optional)
- Haunch plates (optional)
- Welds
- Bolts
- Cuts

**Use for**

<b>Situation</b>	<b>Description</b>
 A technical drawing showing a cross-section of a beam with a full depth shear tab attached to its flange. The tab is a vertical plate with three circular bolt holes. The top edge of the tab is flush with the top flange, and the bottom edge is flush with the bottom flange.	Full depth shear tab.
 A technical drawing showing a cross-section of a beam with a full depth shear tab. The tab has three circular bolt holes. The top edge of the tab is sloped downwards from the beam flange. The bottom edge of the tab is horizontal and flush with the bottom flange.	Full depth shear tab. The secondary part is sloped and/or skewed.
 A technical drawing showing a cross-section of a beam with a shear tab and a beam stiffener. The beam stiffener is a vertical plate attached to the web of the beam. The shear tab is attached to the flange of the beam stiffener and has two circular bolt holes. The top edge of the tab is flush with the top flange of the stiffener, and the bottom edge is flush with the bottom flange of the stiffener.	Shear tab with a beam stiffener.

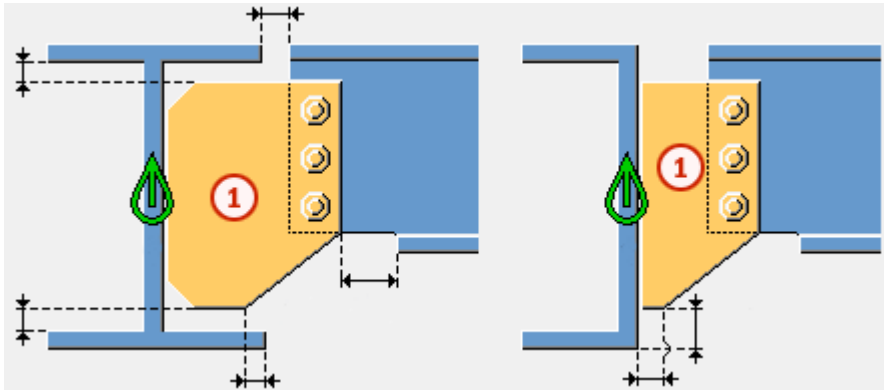
**Selection order**

1. Select the main part (beam).

- Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key



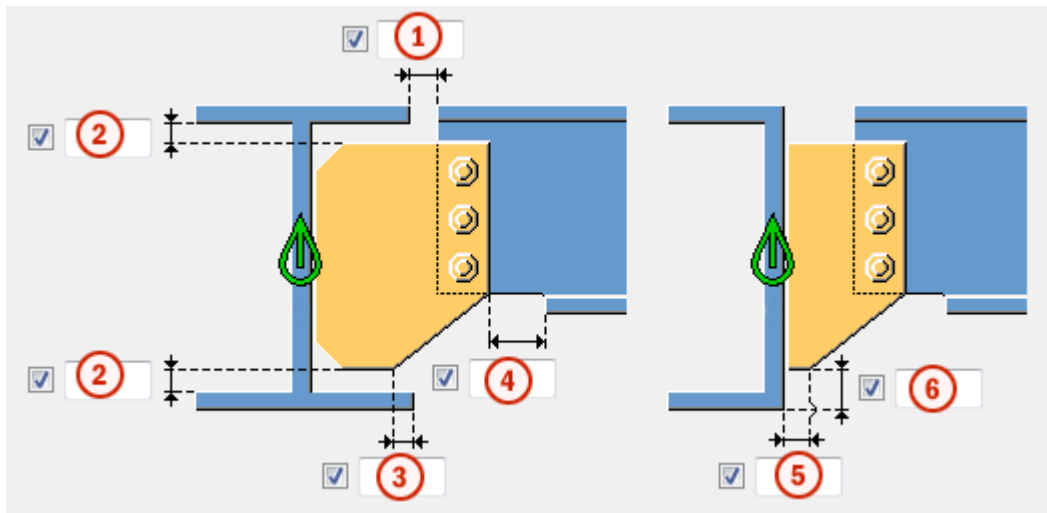
	Part
1	Shear tab

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

### Picture tab

Use the **Picture** tab to control the position of the shear tab, and the beam flange and the web cuts.

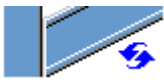



### Dimensions





	<b>Description</b>	<b>Default</b>
<b>1</b>	Cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	10 mm
<b>2</b>	Shear tab edge distance from the main part flange edge.	0
<b>3</b>	Distance from the corner of the shear tab to the edge of the main part flange.	
<b>4</b>	Size of the strip made to the secondary part flange. The cut of the flange is defined from the shear tab edge.	The flange is automatically stripped when the shear tab crosses the flange. 20 mm
<b>5</b>	Distance from the edge of the main part to the corner of the shear tab.	20 mm
<b>6</b>	Distance from the bottom edge of the main part to the bottom edge of the shear tab.	10 mm

### Beam end cut




Define how the secondary beam end is cut. The beam is viewed from the side.

<b>Option</b>	<b>Description</b>
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.
	Square Cuts the end of the secondary beam square.
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.

Option	Description
	<p>Square cut closer to the main part web</p> <p>Cuts the end of the secondary beam square and places the beam closer to the main part web.</p>
	<p>Clipped flange</p> <p>Cuts the corner of the flange at the end of the secondary beam.</p>




### Beam flange cut

Define how the secondary beam flange end is cut. The beam is viewed from the top.




Option	Description
	<p>Default Bevel AutoDefaults can change this option.</p>
	<p>Bevel Cuts the end of the flange bevel.</p>
	<p>Square Cuts a part of the flange square and leaves a part of it bevel.</p>

### Beam web cut

Define how the secondary beam web end is cut. The beam is viewed from the top.

Option	Description
	<p>Default Bevel AutoDefaults can change this option.</p>
	<p>Bevel Cuts the end of the web bevel when the end of the secondary beam is cut bevel.</p>
	<p>Square Cuts the end of the web square even if the end of the secondary beam is cut bevel.</p>

## Beam bottom flange cut

Option	Description
	<p>Default</p> <p>Notch</p> <p>Define the notch dimensions.</p> <p>AutoDefaults can change this option.</p>
	<p>Notch</p> <p>Define the notch dimensions.</p> <p>The bottom of the secondary beam is notched if the shear tab crosses the flange.</p>
	<p>Flange cut</p> <p>The secondary beam flange is cut on the same side as the shear tab if the shear tab crosses the flange.</p>

## Plates tab

Use the **Plates** tab to control the size, position, number, and shape of the shear tab.

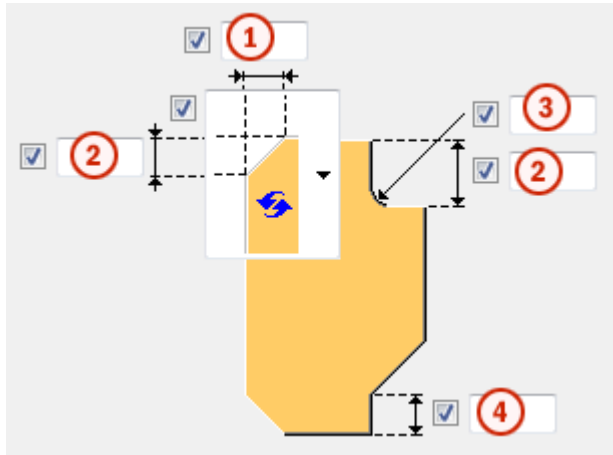
## Shear tab

Option	Description
<b>Tab plate</b>	Shear plate tab thickness and width.

Option	Description	Default
<b>Pos_No</b>	<p>Prefix and start number for the part position number.</p> <p>Some components have a second row of fields where you can enter the assembly position number.</p>	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

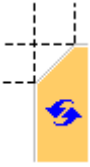






## Shear tab chamfers



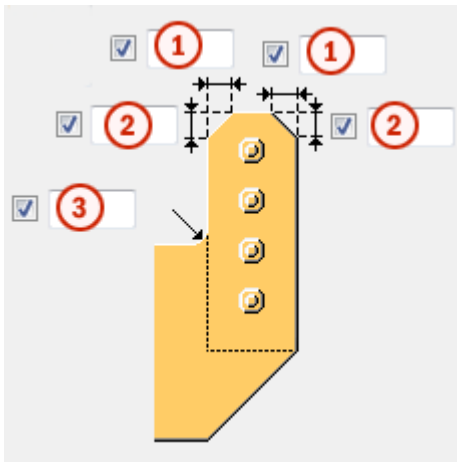
	Description
1	Horizontal dimension of the shear tab chamfer.
2	Vertical dimension of the shear tab chamfer.
3	Vertical and the horizontal dimension of the shear tab chamfer.
4	Vertical dimension from the bottom edge of the shear tab to the lower shear tab corner.

## Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer









Option	Description
	Concave arc chamfer



**Inner shear tab chamfers**








	Description
1	Horizontal dimension of the shear tab chamfer.
2	Vertical dimension of the shear tab chamfer.
3	Radius and the vertical dimensions of the shear tab inner chamfer.

**Chamfer type**

Option	Option	Description
		Default No chamfer AutoDefaults can change this option.
		No chamfer
		Line chamfer
		Convex arc chamfer




Option	Option	Description
		Concave arc chamfer



### Inner chamfer type

Option	Description
	Default Concave arc chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

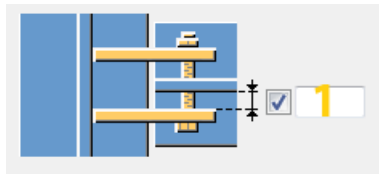
### Shear tab position

Define the number and the side of shear tabs in single shear tab connections.

Option	Description
	Default Far side shear tab AutoDefaults can change this option.
	Automatic The component automatically selects either the near side or the far side shear tab. The tab is created to the side of the secondary part when the angle between the main part and the secondary part is less than 90 degrees.
	Far side shear tab





Option	Description
	Near side and far side shear tab
	Near side shear tab

### Gap between shear tabs



	Description	Default
<b>1</b>	Gap between the secondary part web and shear tab. This only affects connections with two shear tabs.	0

### Shear tab orientation

Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Sloped The shear tab is sloped in the direction of the secondary beam. Both vertical edges of the shear tab are cut parallel to the end of the secondary beam.
	Square

### Stiffeners tab


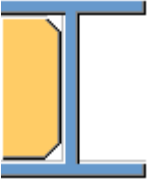
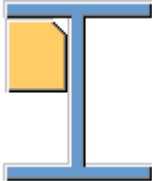
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position, and type.



#### Opposite web stiffener plate dimensions

Option	Description
<b>Opposite web stiffener</b>	Opposite web stiffener plate thickness, width and height.

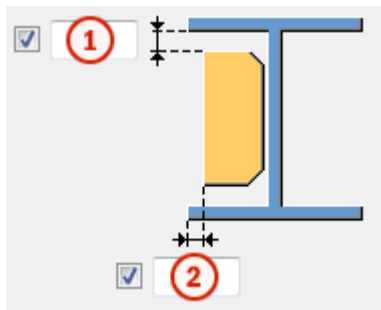
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

#### Stiffener creation

Option	Description
	Default No stiffeners are created. AutoDefaults can change this option.
	Full Creates a full stiffener of the same height as the web of the main part.
	Determined by shear tab Tekla Structures determines the size of the stiffener based on the shear tab size. Tekla Structures attempts to keep the bottom edges of the stiffener plate and shear tab level, if possible.




Option	Description
	Partial Leaves a gap between the stiffener plate and the bottom flange of the main part.
	No stiffeners are created.

### Stiffener gap

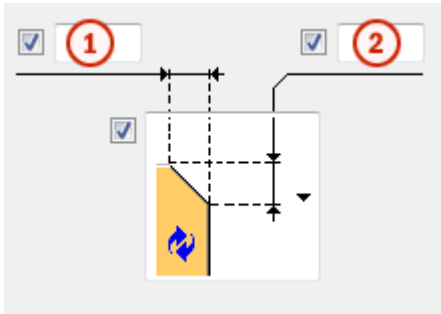


	Description
1	Size of the gap between the main part flange and the stiffener.
2	Distance from the edge of the main part flange to the edge of the stiffener.

### Stiffener orientation

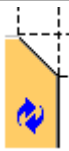




Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are perpendicular to the main part.
	Stiffeners are parallel to the secondary part.

## Chamfer dimensions



	Description
1	Horizontal dimension of the chamfer.
2	Vertical dimension of the chamfer.

## Chamfer type

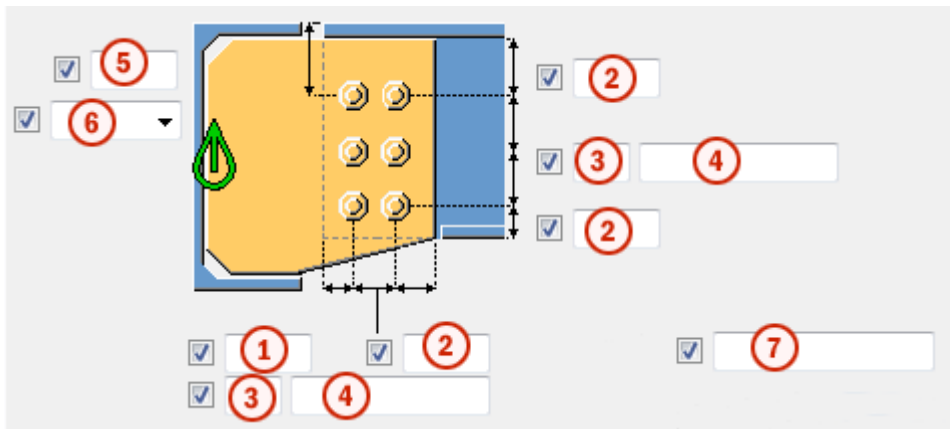
Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

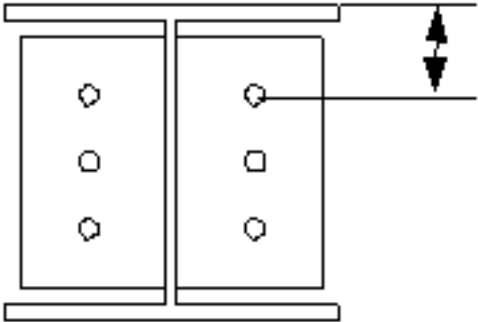
## **Bolts tab**

Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part.

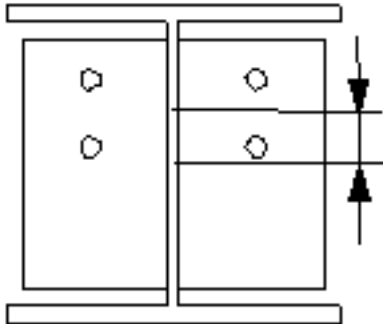
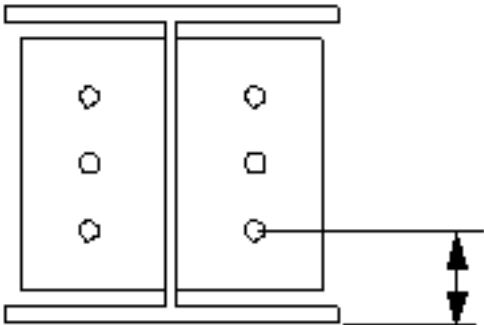
## Bolt group dimensions

Bolt group dimensions affect the size and shape of the shear tab.









	Description
1	Dimension for horizontal bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Dimension for vertical bolt group position.
6	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li><b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 








	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
<b>7</b>	<p>Define which bolts are deleted from the bolt group.</p> <p>Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.</p>

### Staggering of bolts

<b>Option</b>	<b>Description</b>
	<p>Default</p> <p>Not staggered</p> <p>AutoDefaults can change this option.</p>
	<p>Not staggered</p>
	<p>Staggered type 1</p>

Option	Description
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt group orientation

Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

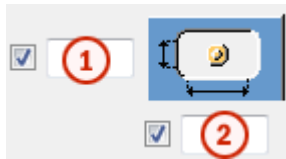
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

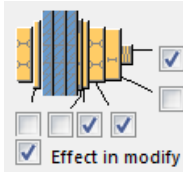


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Notch tab

Use the **Notch** tab to automatically create notches for the secondary beams and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

### Automatic notching

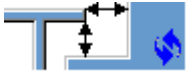
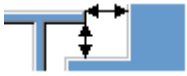
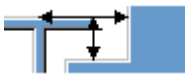
Automatic notching options affect both the top and the bottom flange.

### Notch shape

Automatic notching is switched on when you select a notch shape.

Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.
	Turns off automatic notching.




## Notch size

Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.






## Flange cut shape

Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

## Notch dimension rounding

Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

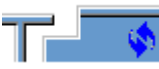


Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.

Option	Description
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.


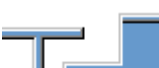


The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



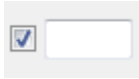
### Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

### Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.








### Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.



### Side of flange notch

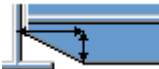



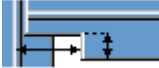
The side of flange notch defines on which side of the beam the notches are created.

Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

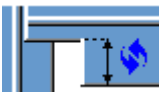
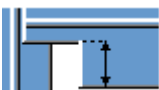

### Flange notch shape

The flange notch shape defines the notch shape in the beam flange.

Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.

Option	Description
	Creates chamfers in the flange. If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.
	Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b> .
	The flange is not cut.
	Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.
	Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b> .

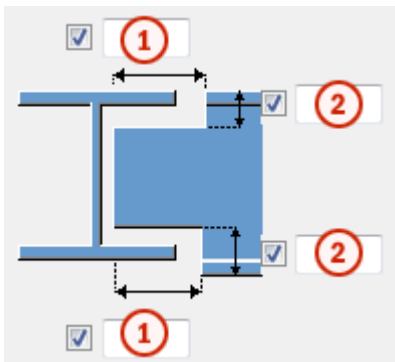
### Flange notch depth

Option	Description
	Default Flange notch depth. AutoDefaults can change this option.
	Flange notch depth.
	Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.

Enter the value for flange notch depth.

### Cut dimensions





	<b>Description</b>	<b>Default</b>
<b>1</b>	Dimensions for the horizontal flange cuts.	10 mm
<b>2</b>	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### ***Haunch tab***

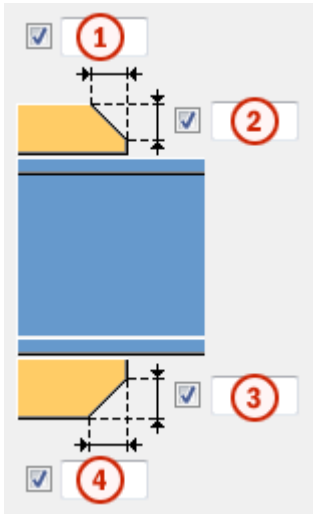
Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges.

### **Haunch plates**

<b>Option</b>	<b>Description</b>
<b>Top plate</b>	Top haunch plate thickness, width and height.
<b>Bottom plate</b>	Bottom haunch plate thickness, width and height.

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	


## Haunch plate chamfers



	Description
1	Width of the top haunch plate chamfer.
2	Height of the top haunch plate chamfer.
3	Height of the bottom haunch plate chamfer.
4	Width of the bottom haunch plate chamfer.

## Haunch plate creation

Option	Description
	<p>Default</p> <p>Top and bottom haunch plates are created, if needed.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>Top or bottom haunch plate or both are created, if needed.</p>
	<p>Top and bottom haunch plates are created.</p> <p>To create a single plate, enter 0 in the thickness (<b>t</b>) field for the plate you do not need (top or bottom plate).</p>

Option	Description
	Haunch plates are not created.

### ***General tab***

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

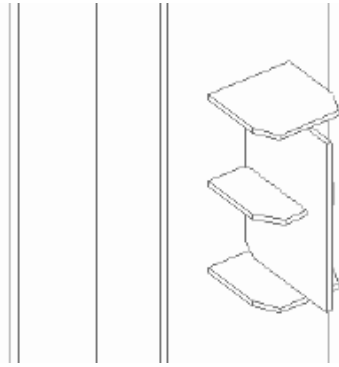
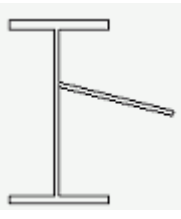
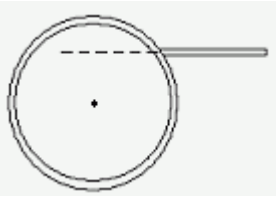
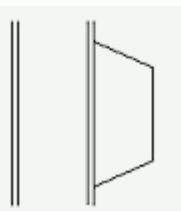
## **Gusset stiffeners (171)**

**Gusset stiffeners (171)** creates 2 or 3 (default) stiffener plates and welds them to an existing gusset plate and a beam or a column. You can also create chamfers to the gusset plate and stiffeners.

### **Objects created**

- Stiffener plates
- Welds
- Cuts

## Use for

Situation	Description
	3 stiffeners welded to column flange and gusset plate.
	Gusset stiffener that is not perpendicular to an I-beam.
	Gusset stiffener for a pipe or bar. Notice that the stiffener does not have to be located on the centerline of the pipe or bar.
	Chamfered gusset stiffener.

### Before you start

Create a gusset plate, and a beam or a column. Use I, C, tube, or RHS profiles.

---

**TIP** To create a gusset plate, use the **Standard gusset (1065)** component or the plate command that creates a contour plate.

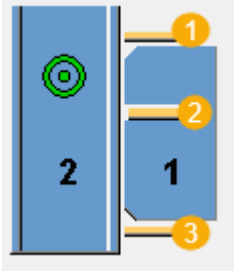
---

### Selection order

1. Select the main part (gusset plate).
2. Select the secondary part (beam or column).

The connection is created automatically when the secondary part is selected.

## Part identification key



	Description
1	Upper stiffener
2	Middle stiffener
3	Lower stiffener

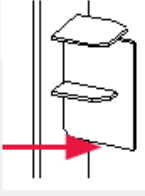
## Picture tab

Use the **Picture** tab to define the location, shape, and dimensions of the stiffener plates.

Option	Description
	Define the horizontal and vertical dimensions of the stiffener plates.
	Define the middle stiffener offset from the gusset center line.
<b>Stiffener shapes</b>	Select the stiffener shape.
<b>Flip stiffener directions</b>	Select <b>Yes</b> to flip the stiffener direction.

## Parts tab

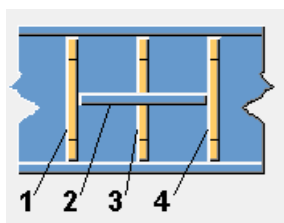
Use the **Parts** tab to define the stiffener properties.

	Description																
<b>Upper stiffener, Lower stiffener, Middle stiffener</b>	<p>Define the thickness, width and height of the stiffener.</p> <p>By default, 3 stiffeners are created. To remove a stiffener, enter 0 as the thickness for that stiffener.</p> <div style="display: flex; align-items: center;"> <table border="1" style="margin-right: 20px;"> <thead> <tr> <th></th> <th>t</th> <th>b</th> <th>h</th> </tr> </thead> <tbody> <tr> <td>Upper stiffener</td> <td><input type="checkbox"/></td> <td><input type="text"/></td> <td>150.00</td> </tr> <tr> <td>Lower stiffener</td> <td><input checked="" type="checkbox"/></td> <td>0.00</td> <td><input type="text"/></td> </tr> <tr> <td>Middle stiffener</td> <td><input checked="" type="checkbox"/></td> <td><input type="text"/></td> <td>150.00</td> </tr> </tbody> </table>  </div>		t	b	h	Upper stiffener	<input type="checkbox"/>	<input type="text"/>	150.00	Lower stiffener	<input checked="" type="checkbox"/>	0.00	<input type="text"/>	Middle stiffener	<input checked="" type="checkbox"/>	<input type="text"/>	150.00
	t	b	h														
Upper stiffener	<input type="checkbox"/>	<input type="text"/>	150.00														
Lower stiffener	<input checked="" type="checkbox"/>	0.00	<input type="text"/>														
Middle stiffener	<input checked="" type="checkbox"/>	<input type="text"/>	150.00														

Option	Description	Default
<b>Pos_No</b>	<p>Prefix and start number for the part position number.</p> <p>Some components have a second row of fields where you can enter the assembly position number.</p>	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Chamfer tab**

Use the **Chamfer** tab to define the chamfer shapes and dimensions for the stiffeners and gusset plate.



### ***General tab***

Click the link below to find out more:

General tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

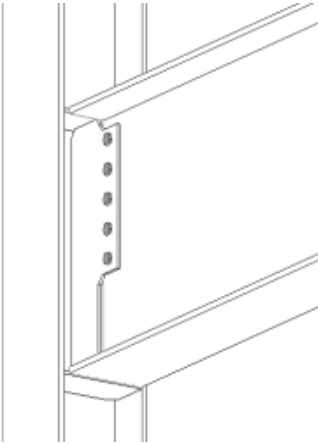
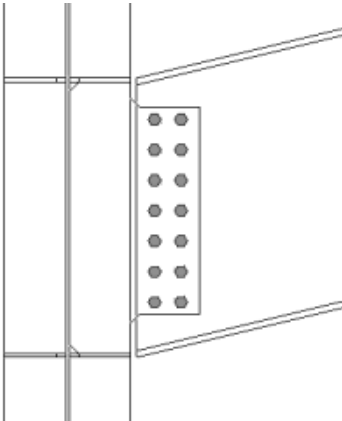
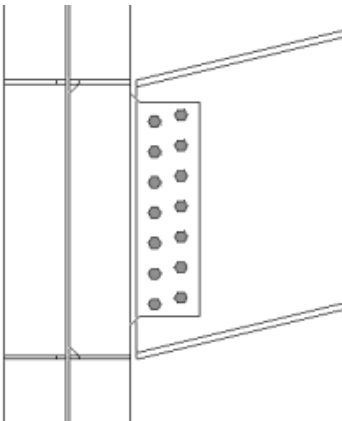
## **Column with stiffeners W (182)**

**Column with stiffeners W (182)** connects a column to a beam with a shear tab. The shear tab is welded to the main part and bolted to the secondary part web. The secondary beam can be leveled or sloped.

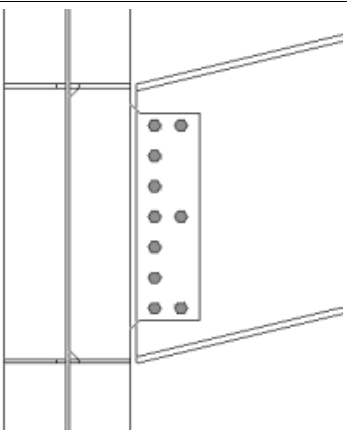
### **Objects created**

- Shear tabs (1 or 2)
- Stiffeners (optional)
- Haunch plates (optional)
- Web doubler plate (optional)
- Weld backing bars (optional)
- Bolts
- Welds
- Cuts

**Use for**

<b>Situation</b>	<b>Description</b>
	Shaped shear tab with column stiffeners.
	Shaped shear tab with column stiffeners. The secondary part is sloped.
	Shaped shear tab with column stiffeners. Bolts are aligned with the secondary part.



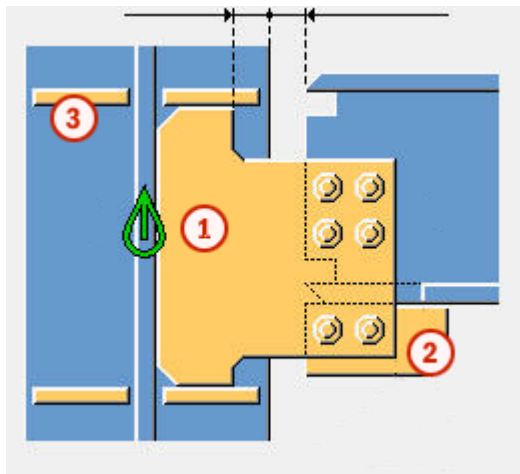
Situation	Description
	Shaped shear tab with column stiffeners. Bolts can be deleted.

### Selection order

1. Select the main part (column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key



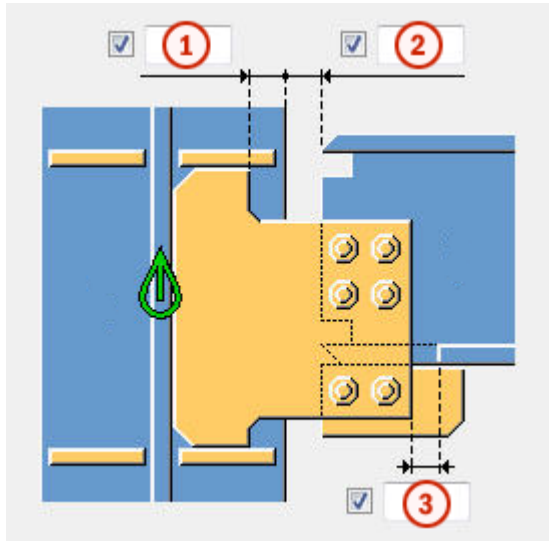
	Part
1	Shear tab
2	Haunch plate
3	Stiffener

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

### Picture tab

Use the **Picture** tab to control the position of the shear tab corner and to define how the beam end is cut.


### Dimensions






	Description	Default
1	Shear tab edge distance from the main part flange edge.	
2	Cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	20 mm
3	Size of the strip made to the secondary part flange. The cut of the flange is defined from the shear tab edge.	The flange is automatically stripped when the shear tab crosses the flange. 20 mm

### Beam end cut

Define how the secondary beam end is cut. The beam is viewed from the side.

Option	Description
	Default Bevel AutoDefaults can change this option.

Option	Description
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.
	Square Cuts the end of the secondary beam square.
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.

### **Plates tab**

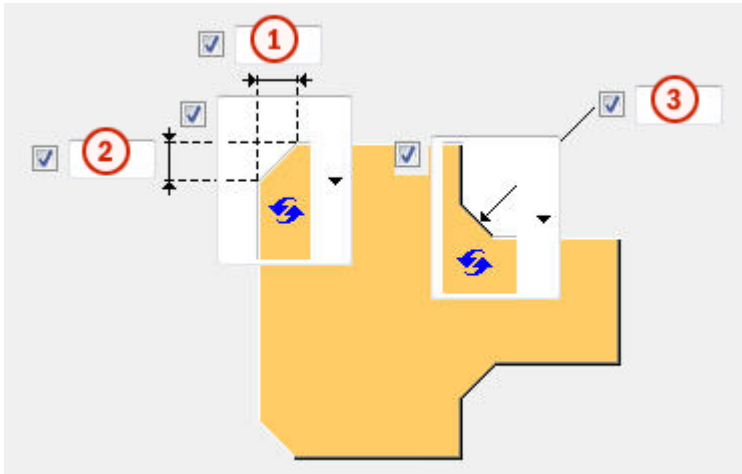
Use the **Plates** tab to control the size, position, number, orientation and shape of the shear tab.

### **Shear tab plate**

Option	Description
<b>Tab plate</b>	Shear tab plate thickness, width and height.

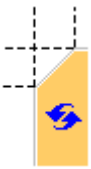



Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	


## Shear tab chamfers







	Description
<b>1</b>	Horizontal dimension of the shear tab chamfer.
<b>2</b>	Vertical dimension of the shear tab chamfer.
<b>3</b>	Vertical and the horizontal dimension of the shear tab chamfer.

## Chamfer type




Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer


Option	Description
	Concave arc chamfer

### Chamfer type dimensions

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Concave arc chamfer






### Shear tab orientation

Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Sloped The shear tab is sloped in the direction of the secondary beam.

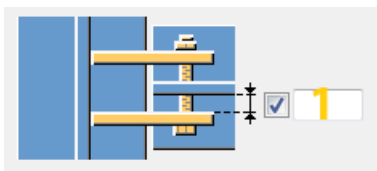
Option	Description
	Both vertical edges of the shear tab are cut parallel to the end of the secondary beam.
	Square

### Shear tab position

Define the number and the side of shear tabs in single shear tab connections.

Option	Description
	Default Far side shear tab AutoDefaults can change this option.
	Automatic The component automatically selects either the near side or the far side shear tab. The tab is created to the side of the secondary part when the angle between the main part and the secondary part is less than 90 degrees.
	Far side shear tab
	Near side and far side shear tab
	Near side shear tab

### Gap between shear tabs



	Description	Default
1	Gap between the secondary part web and shear tab.  This only affects connections with two shear tabs.	0

### ***Stiffeners tab***

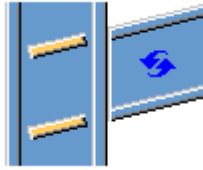
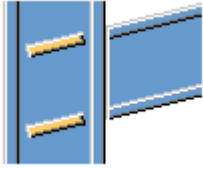
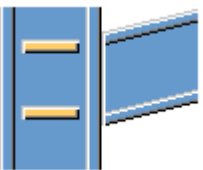
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type.

#### **Stiffener plate dimensions**



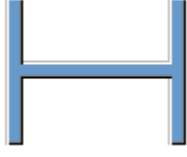

Option	Description
<b>Top NS</b>	Top near side stiffener thickness, width and height.
<b>Top FS</b>	Top far side stiffener thickness, width and height.
<b>Bottom NS</b>	Bottom near side stiffener thickness, width and height.
<b>Bottom FS</b>	Bottom far side stiffener thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Stiffener orientation



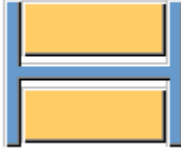

Option	Description
	<p>Default</p> <p>Stiffeners are parallel to the secondary part.</p> <p>AutoDefaults can change this option.</p>
	<p>Stiffeners are parallel to the secondary part.</p>
	<p>Stiffeners are perpendicular to the main part.</p>

### Stiffener creation

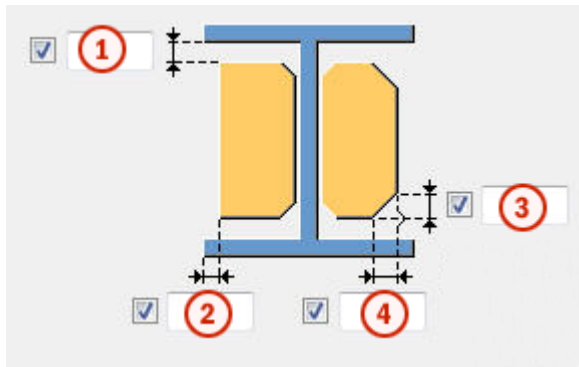
Option	Description
	<p>Default</p> <p>Stiffeners are created.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>Stiffeners are created when necessary.</p>
	<p>No stiffeners are created.</p>
	<p>Stiffeners are created.</p>



## Stiffener shape






Option	Description
	Default Line chamfered stiffener plates AutoDefaults can change this option.
	Automatic Line chamfered stiffener plates
	Square stiffener plates Stiffener plates with a gap for the main part web rounding
	Line chamfered stiffener plates

## Stiffener gap and chamfer size

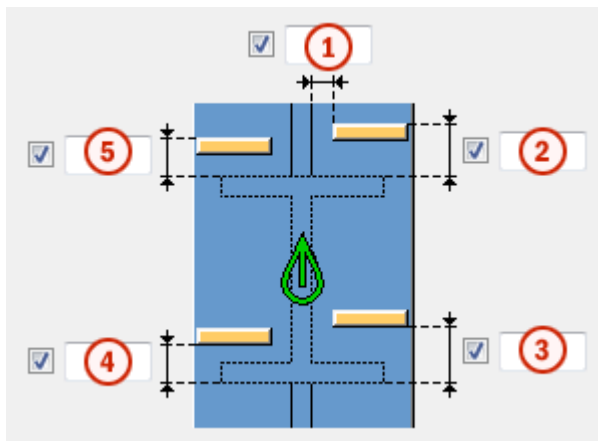


	Description
<b>1</b>	Size of the gap between the flanges and the stiffener.
<b>2</b>	Distance from the edge of the flange to the edge of the stiffener.
<b>3</b>	Vertical dimension of the stiffener line chamfer.
<b>4</b>	Horizontal dimension of the stiffener chamfer or radius of arc type chamfer.

Define the chamfer shape.

Option	Description
	Default No chamfers AutoDefaults can change this option.
	No chamfers
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

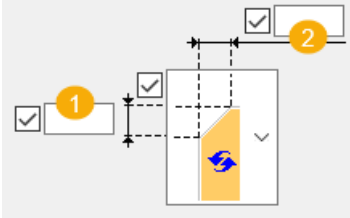
### Stiffener positions



	Description
1	Size of the gap between the stiffener and the beam web edge.
2	Size of the gap between the top near side stiffener and the beam flange edge.
3	Size of the gap between the bottom near side stiffener and the beam flange edge.
4	Size of the gap between the bottom far side stiffener and the beam flange edge.

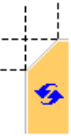

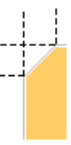


	Description
5	Size of the gap between the top far side stiffener and the beam flange edge.


### Chamfer dimensions



	Description	Default
1	Vertical dimension of the chamfer.	10 mm
2	Horizontal dimension of the chamfer.	10 mm

### Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

Option	Description
	Line and arc chamfer

### **Haunch**

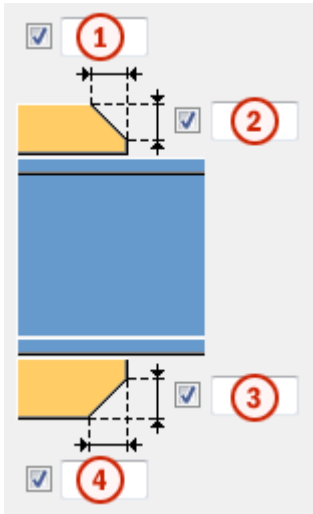
Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges.

### **Haunch plates**

Option	Description
<b>Top plate</b>	Top haunch plate thickness, width and height.
<b>Bottom plate</b>	Bottom haunch plate thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	


## Haunch plate chamfers



	Description
1	Width of the top haunch plate chamfer.
2	Height of the top haunch plate chamfer.
3	Height of the bottom haunch plate chamfer.
4	Width of the bottom haunch plate chamfer.

## Haunch plate creation

Option	Description
	<p>Default</p> <p>Top and bottom haunch plates are created, if needed.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>Top or bottom haunch plate or both are created, if needed.</p>
	<p>Top and bottom haunch plates are created.</p> <p>To create a single plate, enter 0 in the thickness (<b>t</b>) field for the plate you do not need (top or bottom plate).</p>

Option	Description
	Haunch plates are not created.

### **Notch tab**






Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

### **Automatic notching**

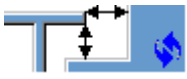
Automatic notching options affect both the top and the bottom flange.

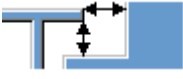
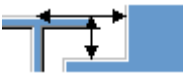
### **Notch shape**

Automatic notching is switched on when you select a notch shape.

Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.
	Turns off automatic notching.

### **Notch size**



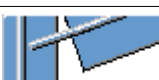
Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.

Option	Description
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.



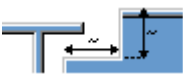


### Flange cut shape

Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

### Notch dimension rounding




Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.





The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



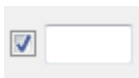
### Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

### Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.








### Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.

### Side of flange notch

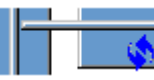

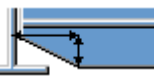
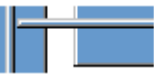


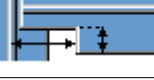
The side of flange notch defines on which side of the beam the notches are created.



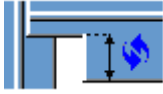
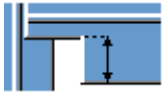
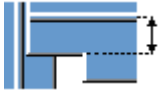
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

### Flange notch shape

The flange notch shape defines the notch shape in the beam flange.

Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.
	Creates chamfers in the flange. If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.
	Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b> .
	The flange is not cut.
	Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.
	Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b> .

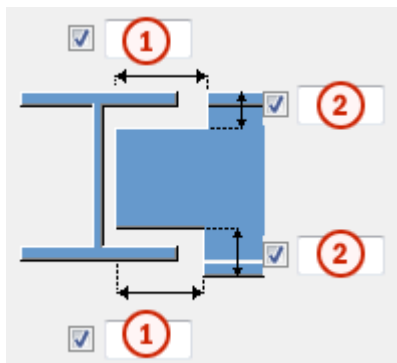
## Flange notch depth

Option	Description
	Default Flange notch depth. AutoDefaults can change this option.
	Flange notch depth.
	Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.

Enter the value for flange notch depth.

## Cut dimensions



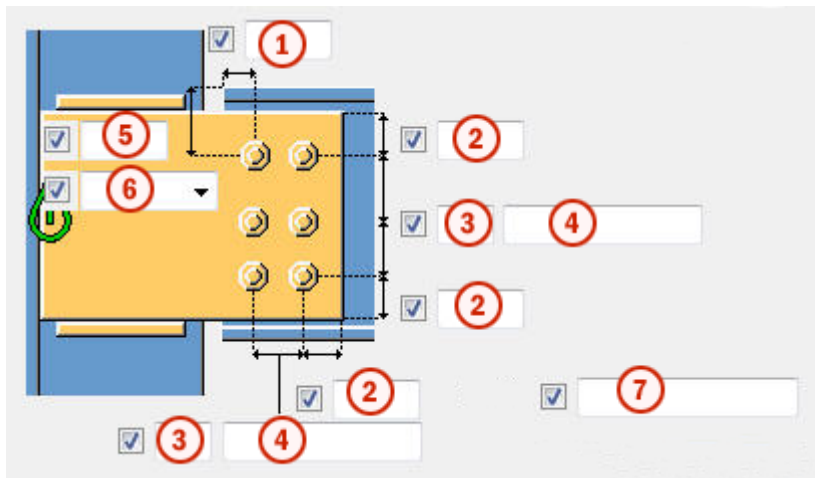
	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

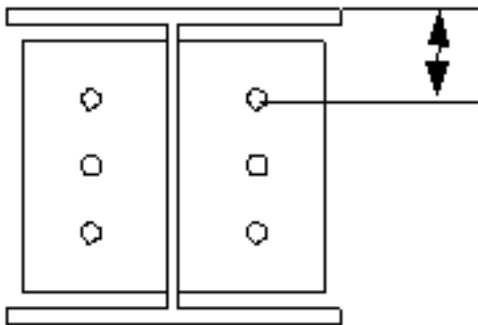
## **Bolts tab**

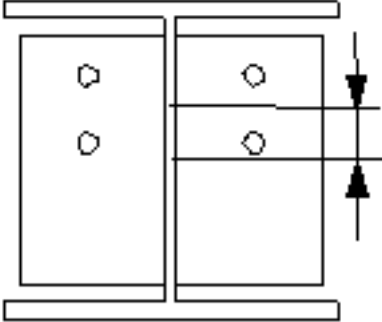
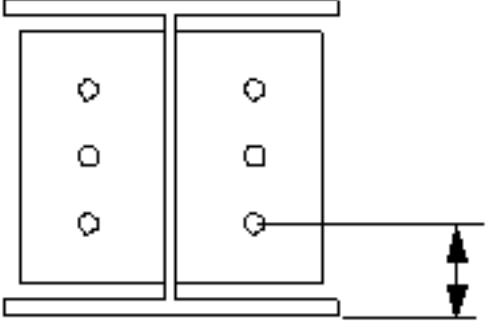
Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part.

## Bolt group dimensions




Bolt group dimensions affect the size and shape of the shear tab.






	Description
1	Dimension for horizontal bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Dimension for vertical bolt group position.
6	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li><b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 






	Description
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>
7	<p>Define which bolts are deleted from the bolt group.</p> <p>Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.</p>

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1

Option	Description
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt group orientation

Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

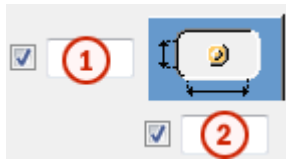
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

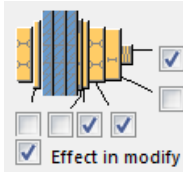


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Beam cut tab

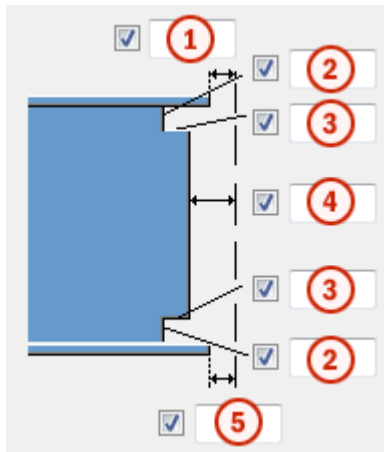
Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts.

### Weld backing bar

Option	Description
<b>Weld backing bar</b>	Weld backing bar thickness and width.





Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

## Weld access hole dimensions






	Description
1	Gap between the secondary part top flange and the main part.
2	Vertical dimensions for the top and the bottom weld access holes.
3	Horizontal dimensions for the top and the bottom weld access holes.
4	Gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.
5	Gap between the secondary part bottom flange and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.





## Weld access holes

Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	









Option	Description	Default
	Round weld access hole with a radius that you can define in r <input checked="" type="checkbox"/> <input type="text"/>	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and Top Prep x <input checked="" type="checkbox"/> <input type="text"/> Bottom Prep x <input checked="" type="checkbox"/> <input type="text"/>	
	Cone-shaped weld access hole with radiuses that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and r <input checked="" type="checkbox"/> <input type="text"/> Capital <b>R</b> defines the large radius (height). Small <b>r</b> defines the small radius.	R = 35 r = 10









### Beam end preparation

Option	Description
	Default Top and bottom flange are prepared. AutoDefaults can change this option.
	Automatic Top and bottom flange are prepared.
	Beam end is not prepared.
	Top and bottom flange are prepared.

## Flange cut



Option for top flange	Option for bottom flange	Description
		Default Flange is not cut. AutoDefaults can change this option.
		Flange is not cut.
		Flange is cut.


## Weld backing bars

Option	Option	Description
		Default No backing bars are created. AutoDefaults can change this option.
		No backing bars are created.
		Backing bars are created inside the flanges.
		Backing bars are created outside the flanges.

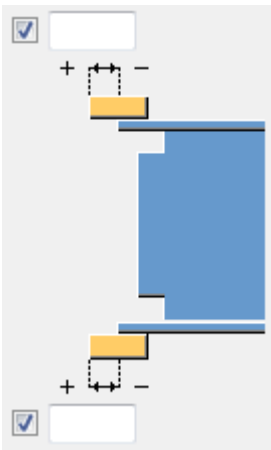
## Weld backing bar length

Enter the length of the weld backing bar in the box below the options.

Option	Description
	Default Absolute length of the backing bar AutoDefaults can change this option.
	Absolute length of the backing bar

Option	Description
	Extension beyond the edge of the flange

### Weld backing bar position

Option	Description
	Enter a positive or a negative value to move the front end of the backing bar relative to the end of the flange.

### Assembly type

Define the location where the weld backing bar welds are made. When you select the **Workshop** option, Tekla Structures includes the backing bars in the assembly.

### Doubler plate

Use the **Doubler plate** tab to create doubler plates to strengthen the web of the main part.



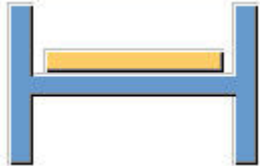


### Web plate

Option	Description
<b>Web plate</b>	Web plate thickness and height.

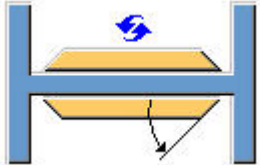
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in

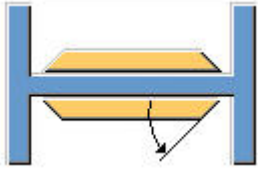

Option	Description	Default
		<b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	

### Doubler plates

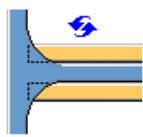
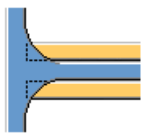

Option	Description
	Default Doubler plates are not created. AutoDefaults can change this option.
	Doubler plates are not created.
	Doubler plate is created on the far side.
	Doubler plate is created on the near side.
	Doubler plates are created on both sides.

### Doubler plate edge shape

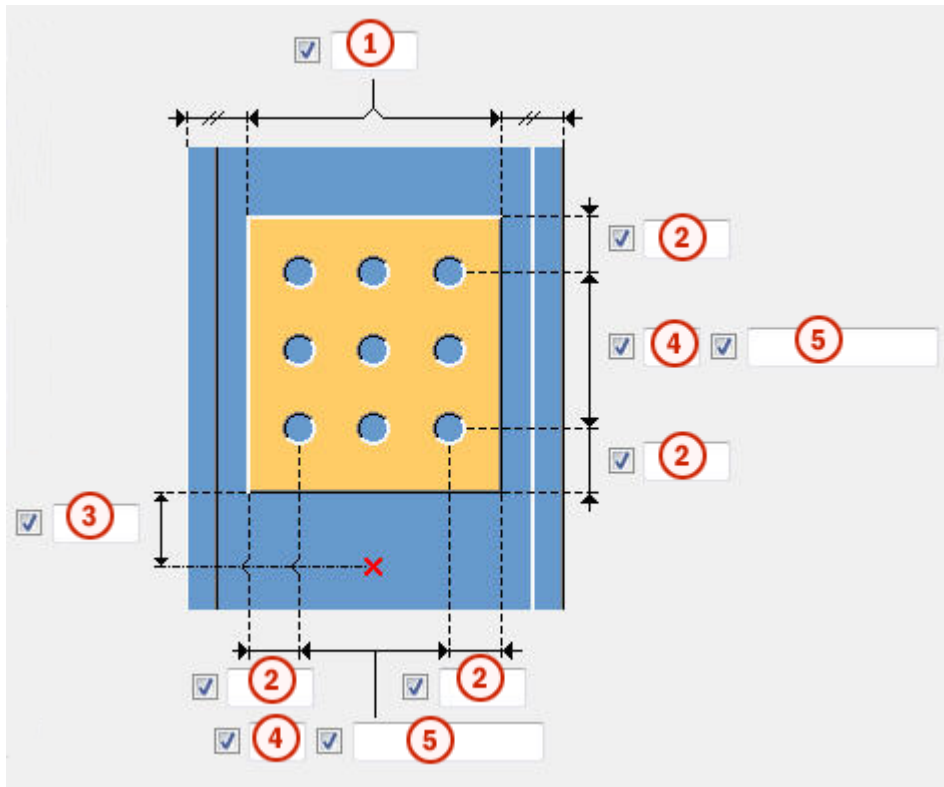
Option	Description
	Default Bevel doubler plates AutoDefaults can change this option.

Option	Description
	Bevel doubler plates Enter the angle in <input checked="" type="checkbox"/> <input type="text"/> (0 - 90)
	Square doubler plates

### Doubler plate cuts

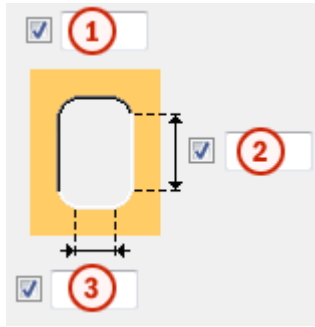
Option	Description
	Default Doubler plates are not cut. AutoDefaults can change this option.
	Doubler plates are not cut.
	Doubler plates are cut in the area that connects the main part web and flange.

## General settings



	Description
1	Edge distance from the column flange.
2	Doubler plate edge distance. Edge distance is the distance from the center of a hole to the edge of the part.
3	Edge distance of the doubler plate in relation to the bottom of the secondary part.
4	Number of holes.
5	Hole spacing. Use a space to separate hole spacing values. Enter a value for each space between holes. For example, if there are 3 holes, enter 2 values.

## Weld hole size



	Description
1	Hole diameter.
2	Slot length.
3	Slot width.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design type tab**

Click the link below to find out more:

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

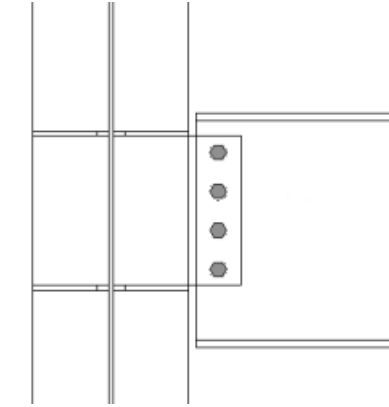
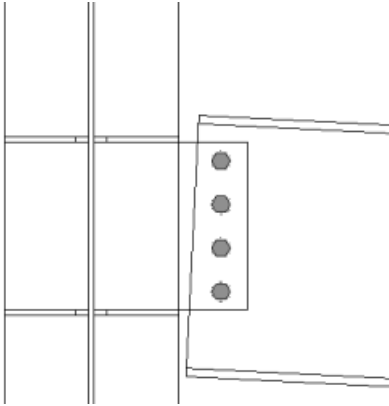
## **Column with stiffeners (186)**

**Column with stiffeners (186)** connects a beam to a column with a square shear tab. The shear tab is welded to the main part web and stiffeners, and bolted to the secondary part web. The secondary beam can be leveled or sloped.

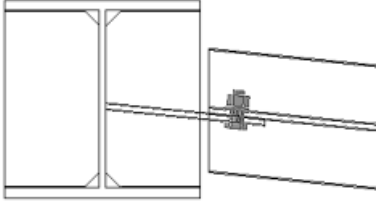
### Objects created

- Shear tabs (1 or 2)
- Stiffeners (optional)
- Haunch plates (optional)
- Web doubler plate (optional)
- Bolts
- Welds
- Cuts

### Use for

Situation	Description
	Shear tab with column stiffeners.
	Shear tab with column stiffeners. The secondary part is sloped.



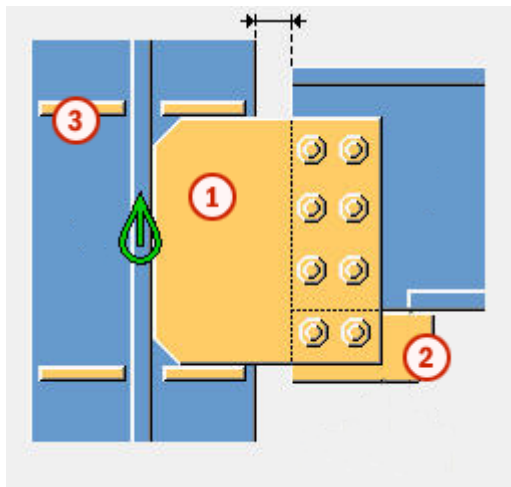
Situation	Description
	<p>Shear tab with column stiffeners. The secondary part is skewed.</p>

### Selection order

1. Select the main part (column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

### Part identification key




	Part
1	Shear tab
2	Haunch plate
3	Stiffener

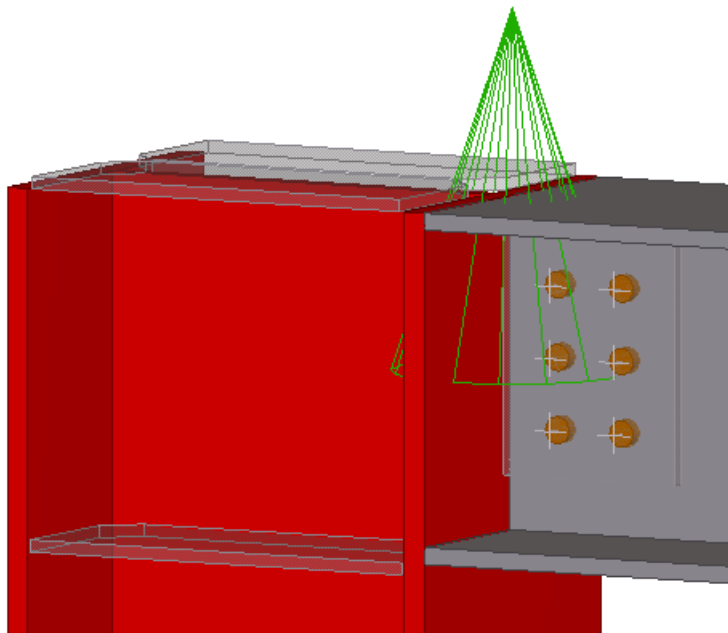
**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

**Example: Add a beam-to-column connection using the Column with stiffeners (186) connection**

In this example, you will connect a beam to a column using a beam-to-column connection.

1. Click the **Applications & components** button  in the side pane to open the **Applications & components** catalog.
2. Enter 186 in the search box.
3. Select **Column with stiffeners (186)**.
4. Select the main part (column).
5. Select the secondary part (beam).

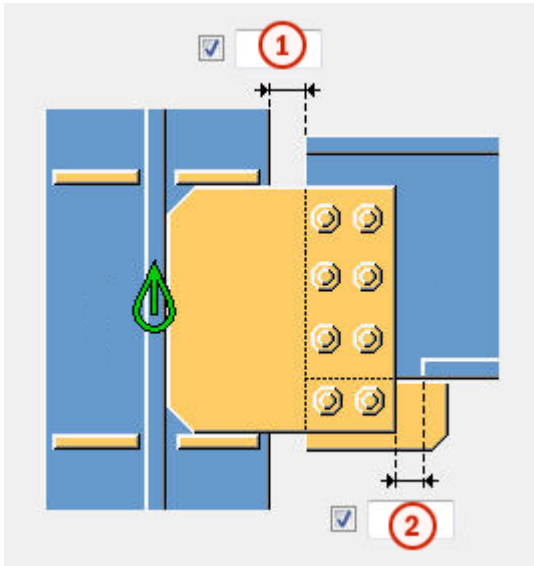
Tekla Structures automatically adds the connection when you select the beam.



**Picture tab**

Use the **Picture** tab to control how the secondary beam end is cut.

## Dimensions





	Description	Default
1	Cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	20
2	Size of the strip made to the secondary part flange. The cut of the flange is defined from the shear tab edge.	The flange is automatically stripped when the shear tab crosses the flange. 20

## Beam end cut




Define how the secondary beam end is cut. The beam is viewed from the side.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.

Option	Description
	Square Cuts the end of the secondary beam square.
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.

### Beam flange cut

Define how the secondary beam flange end is cut. The beam is viewed from the top.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Bevel Cuts the end of the flange bevel.
	Square Cuts a part of the flange square and leaves a part of it bevel.

### Plates tab

Use the **Plates** tab to control the size, position, number, orientation and shape of the shear tab.

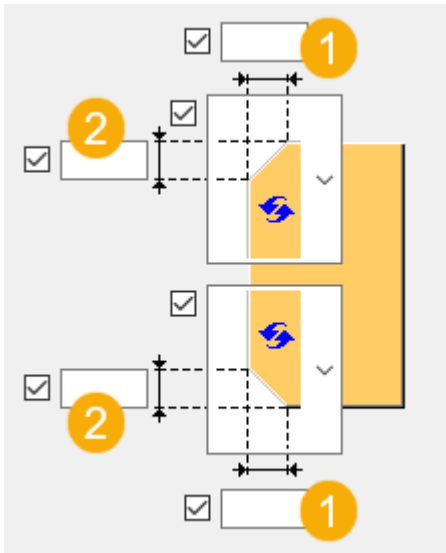
### Shear tab plate

Option	Description
<b>Tab plate</b>	Shear tab plate thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	



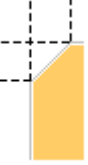





### Shear tab chamfers



	Description
<b>1</b>	Horizontal dimension of the shear tab chamfer.
<b>2</b>	Vertical dimension of the shear tab chamfer.




### Chamfer type



Option	Option	Description
		Default Line chamfer AutoDefaults can change this option.

Option	Option	Description
		No chamfer
		Line chamfer
		Convex arc chamfer
		Concave arc chamfer

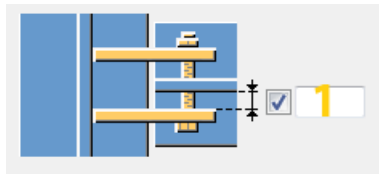
### Shear tab position

Define the number and the side of shear tabs in single shear tab connections.

Option	Description
	Default Far side shear tab AutoDefaults can change this option.
	Automatic The component automatically selects either the near side or the far side shear tab. The tab is created to the side of the secondary part when the angle between the main part and the secondary part is less than 90 degrees.
	Far side shear tab

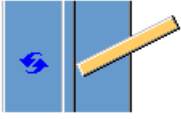


Option	Description
	Near side and far side shear tab
	Near side shear tab

### Gap between shear tabs








	Description	Default
<b>1</b>	Gap between the secondary part web and shear tab. This only affects connections with two shear tabs.	0

### Shear tab end cut

Option	Description
	Default The shear tab end is not cut. AutoDefaults can change this option.
	Square The shear tab end is not cut.
	Bevel The shear tab end is cut parallel to the main part web.

### Shear tab orientation

Option	Description
	Default Sloped AutoDefaults can change this option.

Option	Description
	<p>Automatic</p> <p>The shear tab is sloped in the direction of the secondary beam. Both vertical edges of the shear tab are cut parallel to the end of the secondary beam.</p>
	<p>Sloped</p> <p>The shear tab is sloped in the direction of the secondary beam. Both vertical edges of the shear tab are cut parallel to the end of the secondary beam.</p>
	<p>Square</p>
	<p>Modified sloped</p> <p>Same as the <b>Sloped</b> option, but the vertical edge of the shear tab connected to the secondary beam is cut perpendicular to the secondary beam flange.</p>

### ***Stiffeners tab***

Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type.

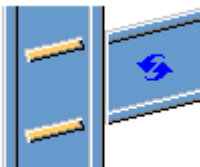
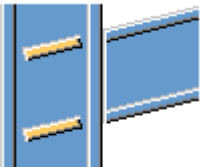
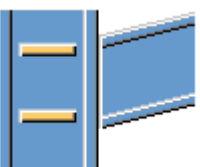
#### **Stiffener plate dimensions**

Option	Description
<b>Top NS</b>	Top near side stiffener thickness, width and height.
<b>Top FS</b>	Top far side stiffener thickness, width and height.
<b>Bottom NS</b>	Bottom near side stiffener thickness, width and height.
<b>Bottom FS</b>	Bottom far side stiffener thickness, width and height.




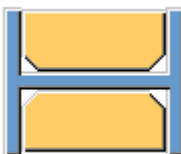


Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	



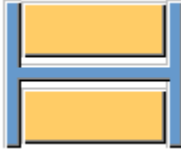
### Stiffener orientation


Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are parallel to the secondary part.
	Stiffeners are perpendicular to the main part.

## Stiffener creation

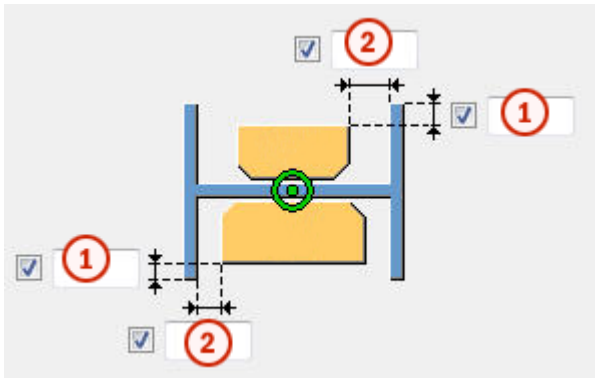
Option	Description
	Default Stiffeners are created. AutoDefaults can change this option.
	Automatic Stiffeners are created when necessary.
	No stiffeners are created.
	Stiffeners are created.

## Stiffener shape

Option	Description
	Default Line chamfered stiffener plates AutoDefaults can change this option.
	Automatic Line chamfered stiffener plates
	Square stiffener plates Stiffener plates with a gap for the main part web rounding

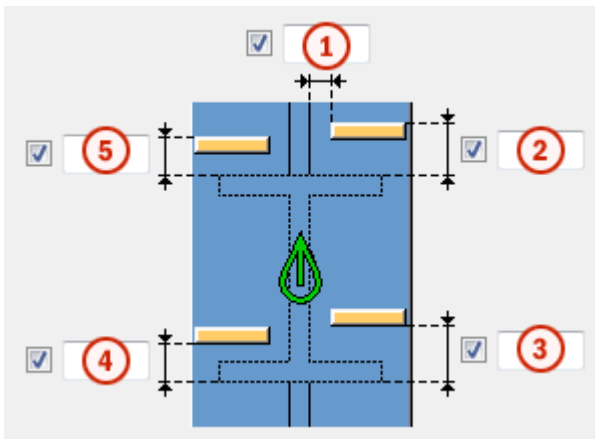
Option	Description
	Line chamfered stiffener plates

### Stiffener gap



	Description
1	Distance from the edge of the flange to the edge of the stiffener.
2	Size of the gap between the flanges and the stiffener.

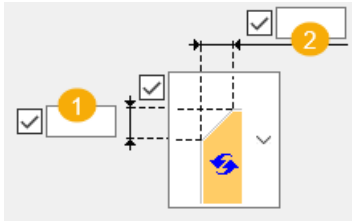
### Stiffener positions



	Description
1	Size of the gap between the stiffener and the beam web edge.
2	Size of the gap between the top near side stiffener and the beam flange edge.
3	Size of the gap between the bottom near side stiffener and the beam flange edge.



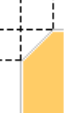


	Description
4	Size of the gap between the bottom far side stiffener and the beam flange edge.
5	Size of the gap between the top far side stiffener and the beam flange edge.


### Chamfer dimensions



	Description	Default
1	Vertical dimension of the chamfer.	10 mm
2	Horizontal dimension of the chamfer.	10 mm

### Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

Option	Description
	Line and arc chamfer

### **Haunch tab**

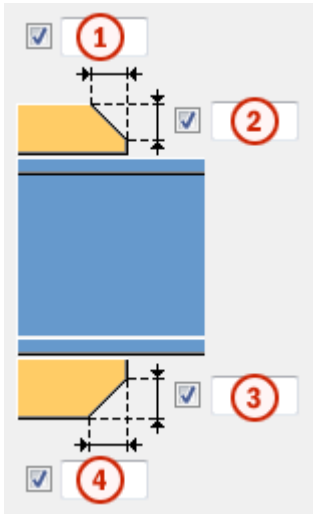
Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges.

### **Haunch plates**

Option	Description
<b>Top plate</b>	Top haunch plate thickness, width and height.
<b>Bottom plate</b>	Bottom haunch plate thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	


## Haunch plate chamfers



	Description
1	Width of the top haunch plate chamfer.
2	Height of the top haunch plate chamfer.
3	Height of the bottom haunch plate chamfer.
4	Width of the bottom haunch plate chamfer.

## Haunch plate creation

Option	Description
	<p>Default</p> <p>Top and bottom haunch plates are created, if needed.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>Top or bottom haunch plate or both are created, if needed.</p>
	<p>Top and bottom haunch plates are created.</p> <p>To create a single plate, enter 0 in the thickness (<b>t</b>) field for the plate you do not need (top or bottom plate).</p>

Option	Description
	Haunch plates are not created.

### **Notch tab**






Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

### **Automatic notching**

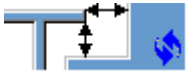
Automatic notching options affect both the top and the bottom flange.

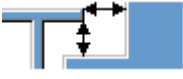
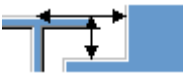
### **Notch shape**

Automatic notching is switched on when you select a notch shape.

Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.
	Turns off automatic notching.

### **Notch size**



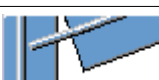
Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.

Option	Description
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.



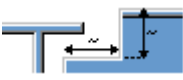


### Flange cut shape

Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

### Notch dimension rounding

Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.

The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.





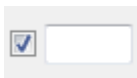
### Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

### Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.








### Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.



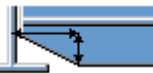



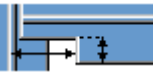
### Side of flange notch

The side of flange notch defines on which side of the beam the notches are created.

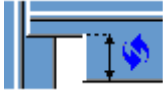
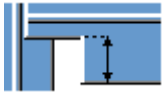
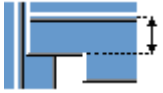
Option	Description
	<p>Default</p> <p>Creates notches on both sides of the flange.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>Creates notches on both sides of the flange.</p>
	<p>Creates notches on both sides of the flange.</p>
	<p>Creates notches on the near side of the flange.</p>
	<p>Creates notches on the far side of the flange.</p>

### Flange notch shape

The flange notch shape defines the notch shape in the beam flange.

Option	Description
	<p>Default</p> <p>The entire flange of the secondary beam is cut as far back as you define.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.</p>
	<p>Creates chamfers in the flange.</p> <p>If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.</p>
	<p>Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b>.</p>
	<p>The flange is not cut.</p>
	<p>Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.</p>
	<p>Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b>.</p>

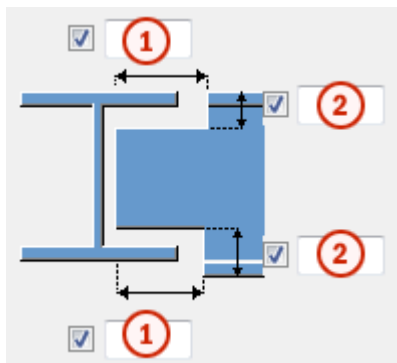
## Flange notch depth

Option	Description
	Default Flange notch depth. AutoDefaults can change this option.
	Flange notch depth.
	Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.

Enter the value for flange notch depth.

## Cut dimensions



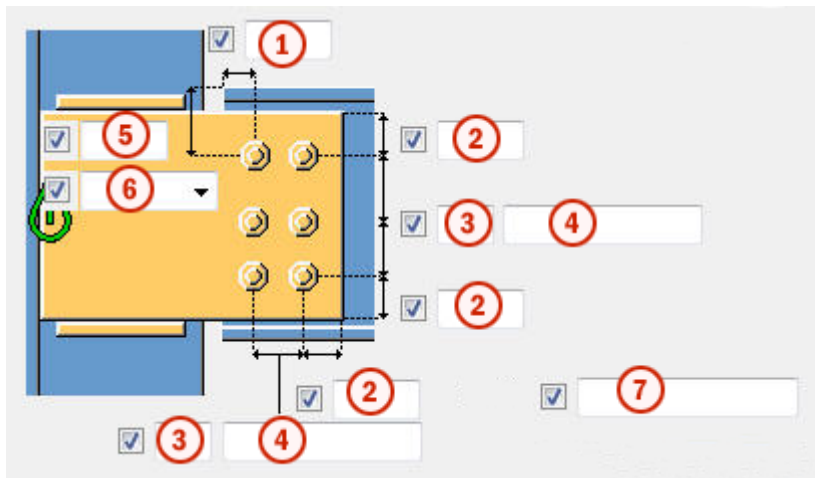
	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

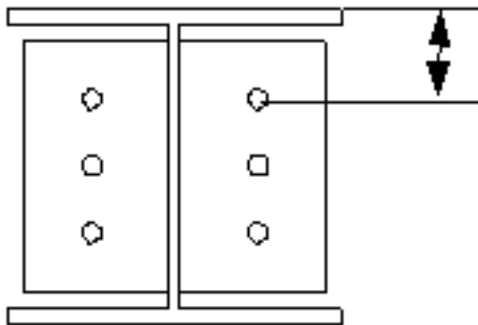
## **Bolts tab**

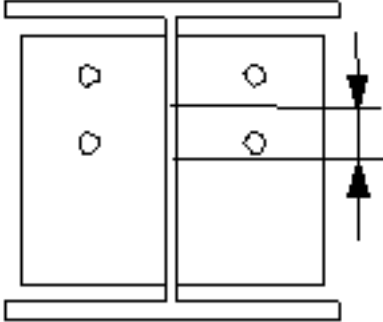
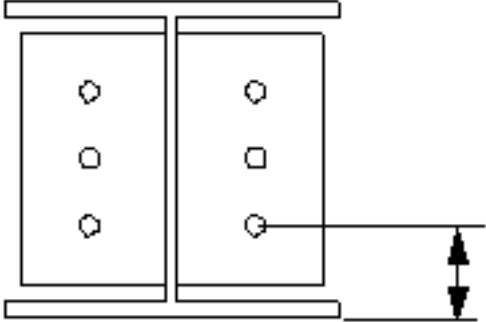
Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part.

## Bolt group dimensions




Bolt group dimensions affect the size and shape of the shear tab.






	Description
1	Dimension for horizontal bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Dimension for vertical bolt group position.
6	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li><b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 






	Description
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part. </li> </ul>  <ul style="list-style-type: none"> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt. </li> </ul> 
7	<p>Define which bolts are deleted from the bolt group.</p> <p>Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.</p>

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1

Option	Description
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt group orientation

Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

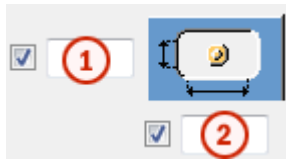
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

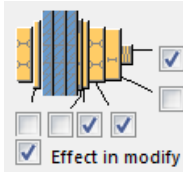


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Doubler plate tab

Use the **Doubler plate** tab to create doubler plates to strengthen the web of the main part.



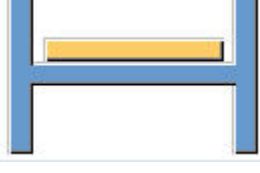

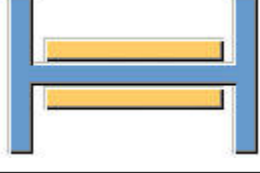
### Web plate

Option	Description
Web plate	Web plate thickness and height.

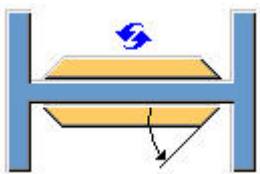

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

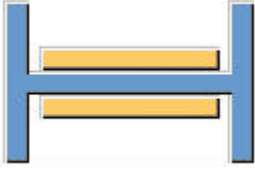


## Doubler plates

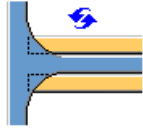
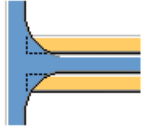

Option	Description
	Default Doubler plates are not created. AutoDefaults can change this option.
	Doubler plates are not created.
	Doubler plate is created on the far side.
	Doubler plate is created on the near side.
	Doubler plates are created on both sides.

## Doubler plate edge shape

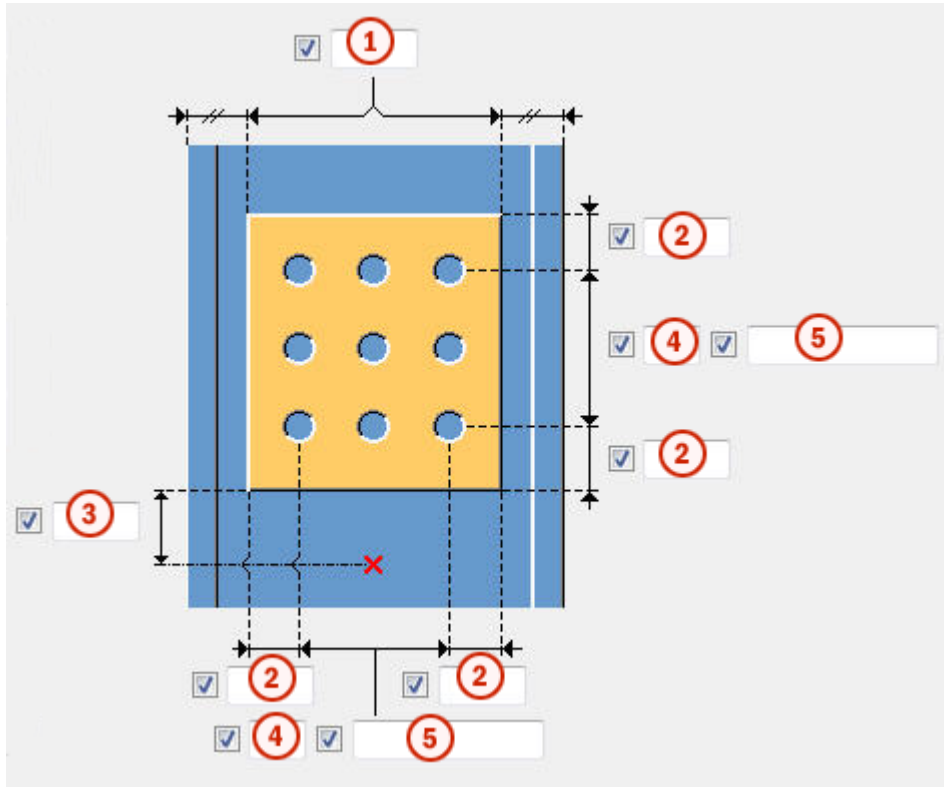
Option	Description
	Default Bevel doubler plates AutoDefaults can change this option.
	Bevel doubler plates Enter the angle in <input checked="" type="checkbox"/> <input type="text"/> (0 - 90)

Option	Description
	Square doubler plates

### Doubler plate cuts

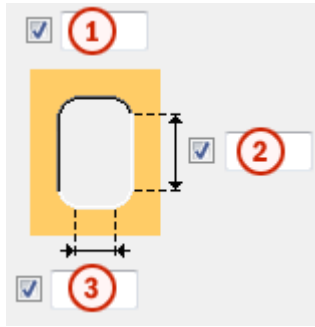
Option	Description
	Default Doubler plates are not cut. AutoDefaults can change this option.
	Doubler plates are not cut.
	Doubler plates are cut in the area that connects the main part web and flange.

## General settings



	Description
1	Edge distance from the column flange.
2	Doubler plate edge distance. Edge distance is the distance from the center of a hole to the edge of the part.
3	Edge distance of the doubler plate in relation to the bottom of the secondary part.
4	Number of holes.
5	Hole spacing. Use a space to separate hole spacing values. Enter a value for each space between holes. For example, if there are 3 holes, enter 2 values.

## Weld hole size



	Description
1	Hole diameter.
2	Slot length.
3	Slot width.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

[Design tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

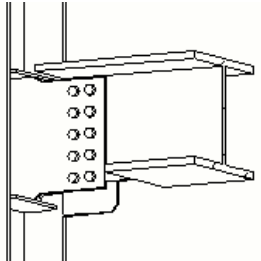
## **Column with stiffeners S (187)**

**Column with stiffeners S (187)** connects a column to a beam with a shaped shear tab. The shear tab is welded to the main part web and stiffeners, and bolted to the secondary part web. The secondary beam can be leveled or sloped.

### Objects created

- Shear tabs (1 or 2)
- Stiffeners (optional)
- Haunch plates (optional)
- Web doubler plate (optional)
- Bolts
- Welds
- Cuts

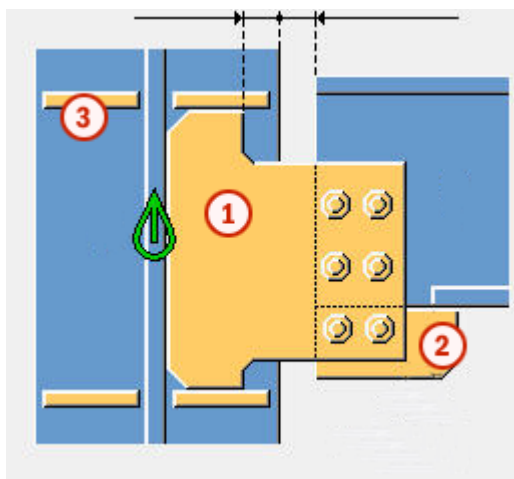
### Use for

Situation	Description
	Beam connected to column web. Shear tab with bottom haunch plate and four stiffeners.

### Selection order

1. Select the main part (column).
2. Select the secondary part (beam).  
The connection is created automatically when the secondary part is selected.

### Part identification key



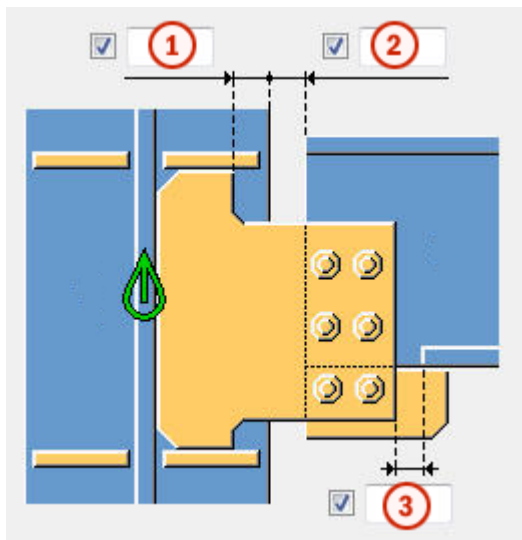
	Part
1	Shear tab
2	Haunch plate
3	Stiffener

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

### Picture tab

Use the **Picture** tab to control the position of the shear tab corner and to define how the beam end is cut.





### Dimensions



	Description	Default
1	Shear tab edge distance from the main part flange edge.	0
2	Cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	20 mm
3	Size of the strip made to the secondary part flange. The cut of the flange is defined from the shear tab edge.	The flange is automatically stripped when the shear tab crosses the flange. 20 mm




### Beam end cut

Define how the secondary beam end is cut. The beam is viewed from the side.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.
	Square Cuts the end of the secondary beam square.
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.

### Beam flange cut

Define how the secondary beam flange end is cut. The beam is viewed from the top.

Option	Description
	Default Bevel AutoDefaults can change this option.
	Bevel Cuts the end of the flange bevel.
	Square Cuts a part of the flange square and leaves a part of it bevel.

### **Plates tab**

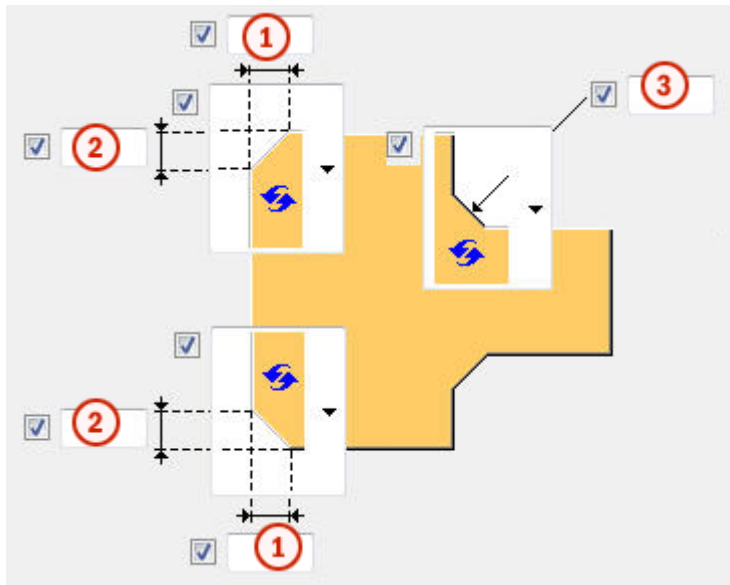
Use the **Plates** tab to control the size, position, number, orientation and shape of the shear tab.

## Shear tab plate

Option	Description
Tab plate	Shear tab plate thickness, width and height.

Option	Description	Default
Pos_No	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
Material	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
Name	Name that is shown in drawings and reports.	

## Shear tab chamfers

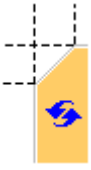
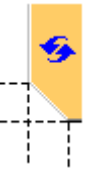










	Description
1	Horizontal dimension of the shear tab chamfer.
2	Vertical dimension of the shear tab chamfer.







	Description
3	Vertical and the horizontal dimension of the shear tab chamfer.

### Chamfer type





Option	Option	Description
		Default Line chamfer AutoDefaults can change this option.
		No chamfer
		Line chamfer
		Convex arc chamfer
		Concave arc chamfer

### Chamfer type dimensions

Option	Description
	Default Line chamfer AutoDefaults can change this option.


Option	Description
	No chamfer
	Line chamfer
	Concave arc chamfer





### Shear tab orientation

Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Sloped The shear tab is sloped in the direction of the secondary beam. Both vertical edges of the shear tab are cut parallel to the end of the secondary beam.
	Square

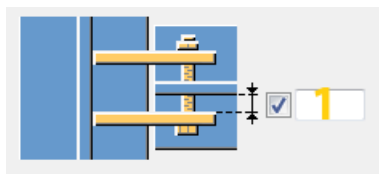
### Shear tab position

Define the number and the side of shear tabs in single shear tab connections.

Option	Description
	Default Far side shear tab AutoDefaults can change this option.

Option	Description
	Automatic The component automatically selects either the near side or the far side shear tab. The tab is created to the side of the secondary part when the angle between the main part and the secondary part is less than 90 degrees.
	Far side shear tab
	Near side and far side shear tab
	Near side shear tab

### Gap between shear tabs



	Description	Default
1	Gap between the secondary part web and shear tab. This only affects connections with two shear tabs.	0

### **Stiffeners tab**

Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type.

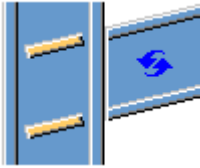
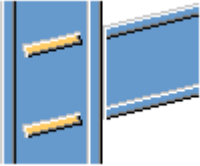
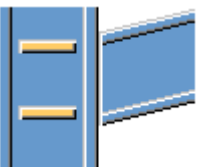
#### Stiffener plate dimensions

Option	Description
Top NS	Top near side stiffener thickness, width and height.





Option	Description
<b>Top FS</b>	Top far side stiffener thickness, width and height.
<b>Bottom NS</b>	Bottom near side stiffener thickness, width and height.
<b>Bottom FS</b>	Bottom far side stiffener thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	




### Stiffener orientation


Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are parallel to the secondary part.
	Stiffeners are perpendicular to the main part.

### Stiffener creation

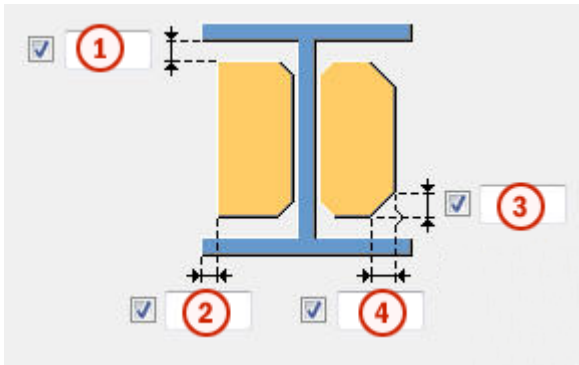
Option	Description
	Default Stiffeners are created. AutoDefaults can change this option.
	Automatic Stiffeners are created when necessary.
	No stiffeners are created.
	Stiffeners are created.

### Stiffener shape

Option	Description
	Default Line chamfered stiffener plates AutoDefaults can change this option.
	Automatic Line chamfered stiffener plates
	Square stiffener plates Stiffener plates with a gap for the main part web rounding





Option	Description
	Line chamfered stiffener plates


### Stiffener gap and chamfer size



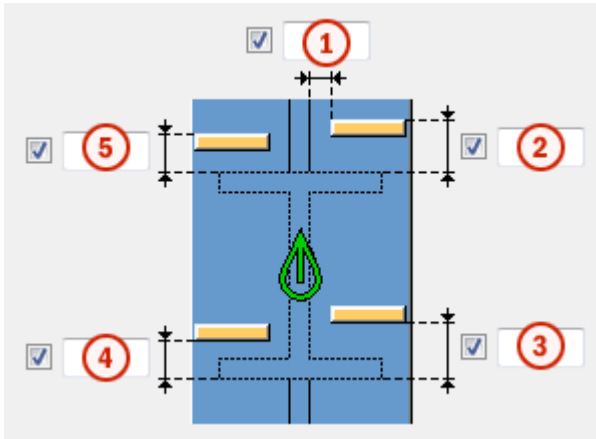
	Description
1	Size of the gap between the flanges and the stiffener.
2	Distance from the edge of the flange to the edge of the stiffener.
3	Vertical dimension of the stiffener line chamfer.
4	Horizontal dimension of the stiffener chamfer or radius of arc type chamfer.

Define the chamfer shape.

Option	Description
	Default No chamfers AutoDefaults can change this option.
	No chamfers
	Line chamfer
	Convex arc chamfer

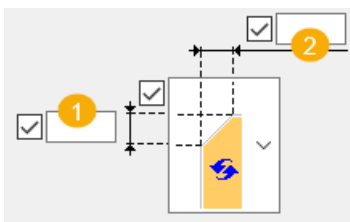
Option	Description
	Concave arc chamfer

### Stiffener positions





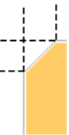


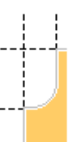
	Description
1	Size of the gap between the stiffener and the beam web edge.
2	Size of the gap between the top near side stiffener and the beam flange edge.
3	Size of the gap between the bottom near side stiffener and the beam flange edge.
4	Size of the gap between the bottom far side stiffener and the beam flange edge.
5	Size of the gap between the top far side stiffener and the beam flange edge.

### Chamfer dimensions



	Description	Default
1	Vertical dimension of the chamfer.	10 mm
2	Horizontal dimension of the chamfer.	10 mm

## Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer
	Line and arc chamfer

### ***Haunch tab***

Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges.

### **Haunch plates**

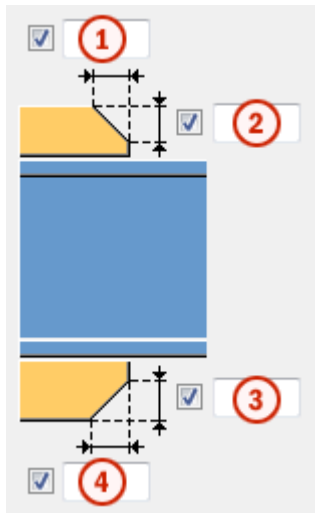
Option	Description
<b>Top plate</b>	Top haunch plate thickness, width and height.
<b>Bottom plate</b>	Bottom haunch plate thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b>



Option	Description	Default
		settings in <b>File menu --&gt; Settings --&gt; Options.</b>
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	

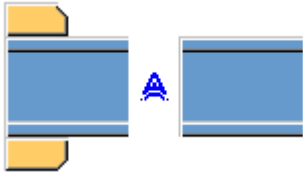


### Haunch plate chamfers



	Description
<b>1</b>	Width of the top haunch plate chamfer.
<b>2</b>	Height of the top haunch plate chamfer.
<b>3</b>	Height of the bottom haunch plate chamfer.
<b>4</b>	Width of the bottom haunch plate chamfer.

### Haunch plate creation

Option	Description
	<p>Default</p> <p>Top and bottom haunch plates are created, if needed.</p> <p>AutoDefaults can change this option.</p>

Option	Description
	<p>Automatic</p> <p>Top or bottom haunch plate or both are created, if needed.</p>
	<p>Top and bottom haunch plates are created.</p> <p>To create a single plate, enter 0 in the thickness (<b>t</b>) field for the plate you do not need (top or bottom plate).</p>
	<p>Haunch plates are not created.</p>

### **Notch tab**





Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.


### **Automatic notching**

Automatic notching options affect both the top and the bottom flange.


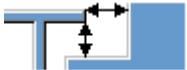
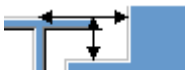
### **Notch shape**

Automatic notching is switched on when you select a notch shape.

Option	Description
	<p>Default</p> <p>Creates notches to the secondary beam.</p> <p>AutoDefaults can change this option.</p>
	<p>Creates notches to the secondary beam. The cuts are square to the main beam web.</p>
	<p>Creates notches to the secondary beam. The cuts are square to the secondary beam web.</p>
	<p>Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.</p>

Option	Description
	Turns off automatic notching.




### Notch size

Option	Description
	<p>Default</p> <p>The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.</p> <p>AutoDefaults can change this option.</p>
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.



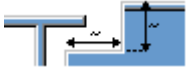


### Flange cut shape

Option	Description
	<p>Default</p> <p>Secondary beam flange is cut parallel to the main beam.</p> <p>AutoDefaults can change this option.</p>
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

### Notch dimension rounding




Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.





The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



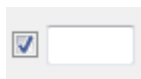
### Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

### Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.








### Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.



### Side of flange notch

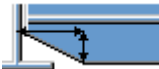



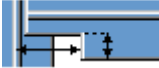
The side of flange notch defines on which side of the beam the notches are created.

Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

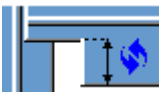
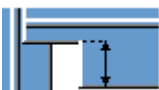

### Flange notch shape

The flange notch shape defines the notch shape in the beam flange.

Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.

Option	Description
	Creates chamfers in the flange. If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.
	Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b> .
	The flange is not cut.
	Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.
	Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b> .

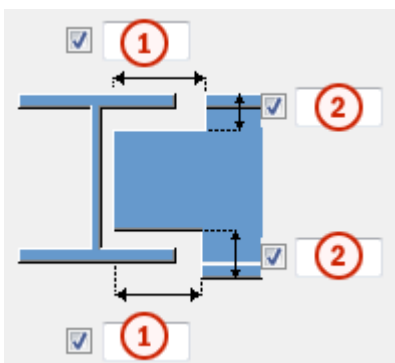
### Flange notch depth

Option	Description
	Default Flange notch depth. AutoDefaults can change this option.
	Flange notch depth.
	Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.

Enter the value for flange notch depth.

### Cut dimensions



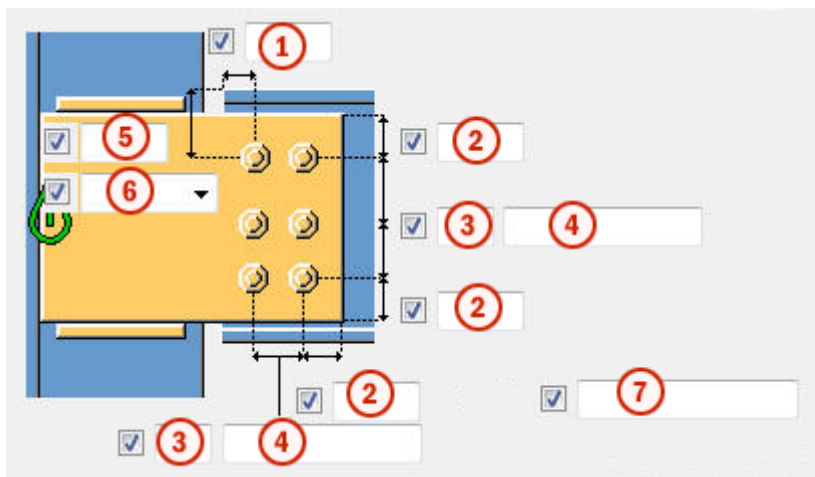
	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### **Bolts tab**

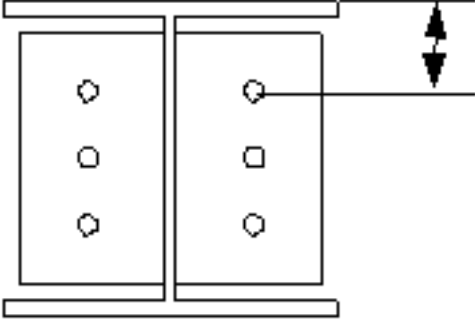
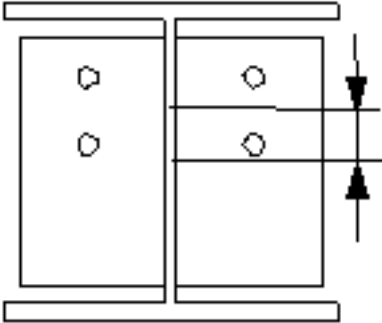
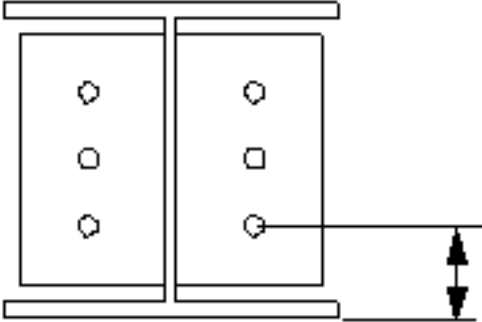
Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part.

### **Bolt group dimensions**

Bolt group dimensions affect the size and shape of the shear tab.









	Description
1	Dimension for horizontal bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Dimension for vertical bolt group position.

	<b>Description</b>
<b>6</b>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 








	Description
7	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt group orientation

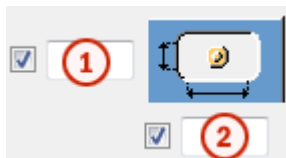
Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



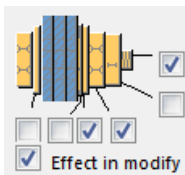
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

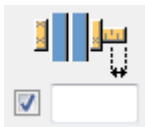
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Doubler plate tab

Use the **Doubler plate** tab to create doubler plates to strengthen the web of the main part.



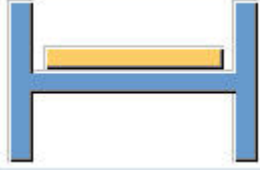
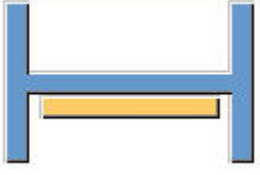
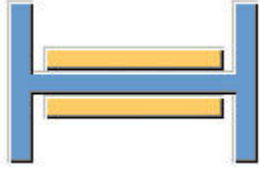
### Web plate

Option	Description
<b>Web plate</b>	Web plate thickness and height.

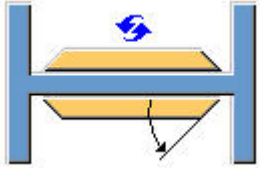
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the

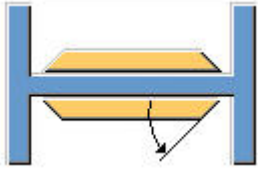

Option	Description	Default
		<b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	

### Doubler plates

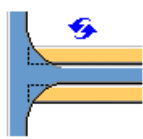
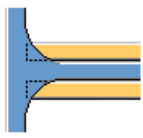

Option	Description
	Default Doubler plates are not created. AutoDefaults can change this option.
	Doubler plates are not created.
	Doubler plate is created on the far side.
	Doubler plate is created on the near side.
	Doubler plates are created on both sides.

### Doubler plate edge shape

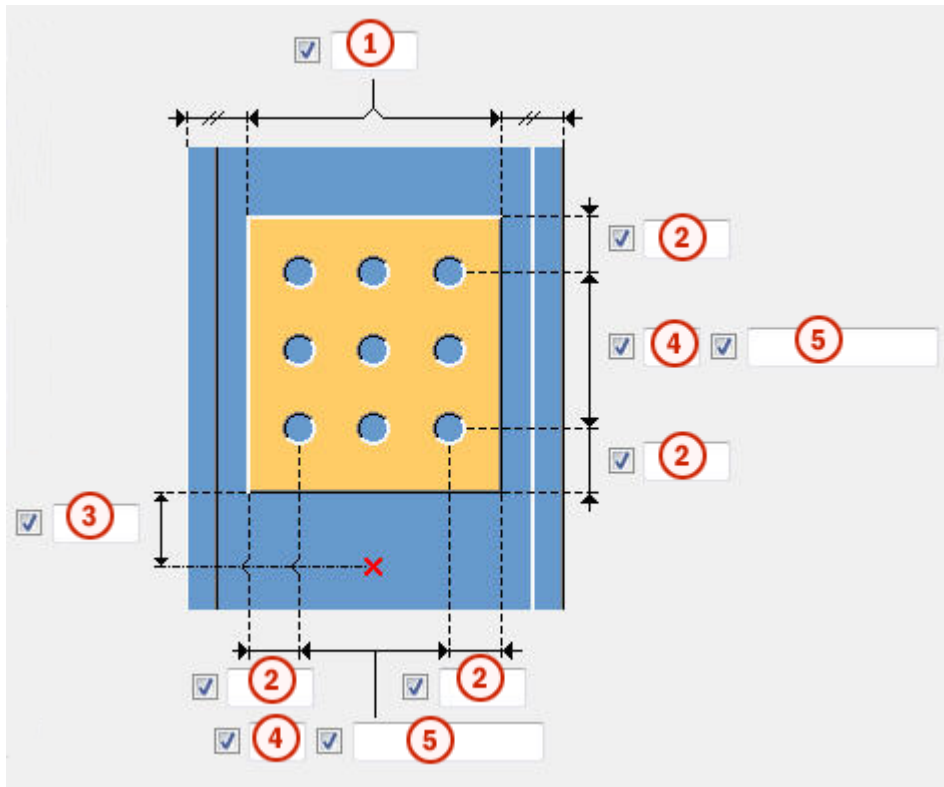
Option	Description
	Default Bevel doubler plates AutoDefaults can change this option.

Option	Description
	Bevel doubler plates Enter the angle in <input checked="" type="checkbox"/> <input type="text"/> (0 - 90)
	Square doubler plates

### Doubler plate cuts

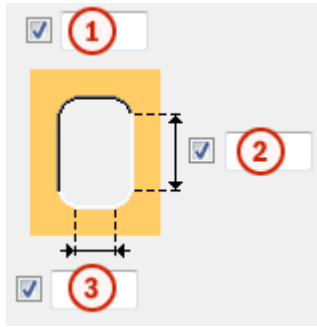
Option	Description
	Default Doubler plates are not cut. AutoDefaults can change this option.
	Doubler plates are not cut.
	Doubler plates are cut in the area that connects the main part web and flange.

## General settings



	Description
<b>1</b>	Edge distance from the column flange.
<b>2</b>	Doubler plate edge distance. Edge distance is the distance from the center of a hole to the edge of the part.
<b>3</b>	Edge distance of the doubler plate in relation to the bottom of the secondary part.
<b>4</b>	Number of holes.
<b>5</b>	Hole spacing. Use a space to separate hole spacing values. Enter a value for each space between holes. For example, if there are 3 holes, enter 2 values.

## Weld hole size



	Description
1	Hole diameter.
2	Slot length.
3	Slot width.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

[Design tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

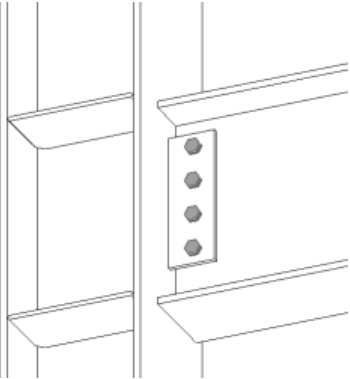
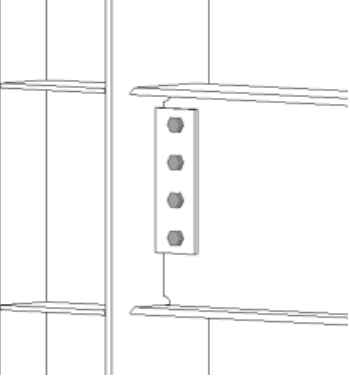
## **Column with stiffeners (188)**

**Column with stiffeners (188)** connects a column to a beam with a square shear tab. The shear tab is welded to the main part web and stiffeners, and bolted to the secondary part web. The secondary beam can be level or sloped.

### Objects created

- Shear tabs (1 or 2)
- Stiffeners (optional)
- Haunch plates (optional)
- Weld backing bars (optional)
- Web doubler plate (optional)
- Bolts
- Welds
- Cuts

### Use for

Situation	Description
	Shear tab to column flange with column stiffeners.
	Shear tab to column flange with column stiffeners. Weld preparation and weld access holes for moment connection.

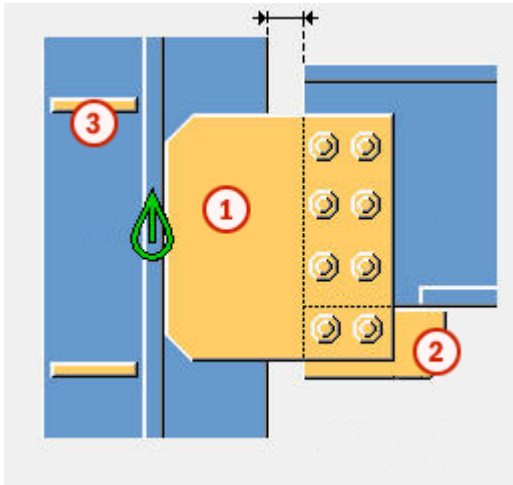
### Selection order

1. Select the main part (column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.



## Part identification key



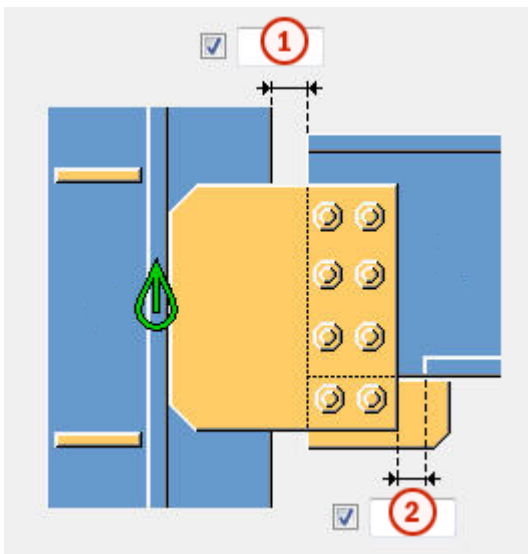
	Part
1	Shear tab
2	Haunch plate
3	Stiffener

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

## Picture tab

Use the **Picture** tab to control how the beam end is cut.

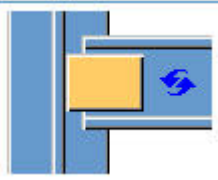
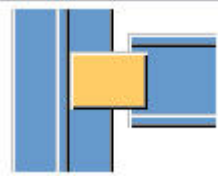
## Dimensions



	Description	Default
1	<p>Cut of the secondary part.</p> <p>Cutting the secondary part creates a gap between the main part and the secondary part.</p> <p>The cut is defined from the main part web or the main part flange.</p>	20 mm
2	<p>Size of the strip made to the secondary part flange.</p> <p>The cut of the flange is defined from the shear tab edge.</p>	<p>The flange is automatically stripped when the shear tab crosses the flange.</p> <p>20 mm</p>

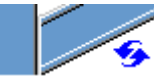
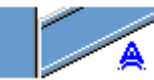
### Secondary part cut



Define whether the secondary part cut is calculated from the main part web or main part flange.

Option	Description
	<p>Default</p> <p>From the main part web</p> <p>AutoDefaults can change this option.</p>
	<p>From the main part flange</p>

### Beam end cut

Define how the secondary beam end is cut. The beam is viewed from the side.

Option	Description
	<p>Default</p> <p>Bevel</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.</p>

Option	Description
	Square Cuts the end of the secondary beam square.
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.

### **Plates tab**

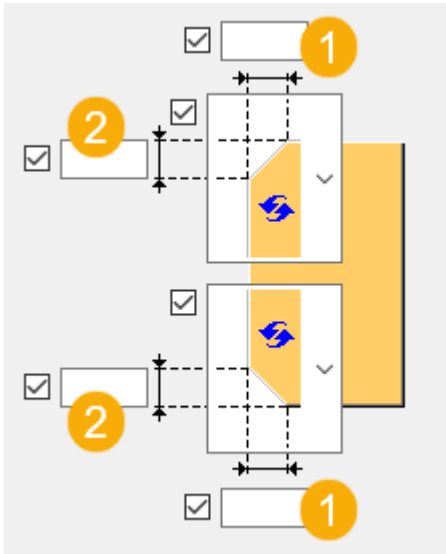
Use the **Plates** tab to control the size, position, number, orientation and shape of the shear tab.

### **Shear tab plate**

Option	Description
<b>Tab plate</b>	Shear tab plate thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	



## Shear tab chamfers








	Description
1	Horizontal dimension of the shear tab chamfer.
2	Vertical dimension of the shear tab chamfer.

## Chamfer type

Option	Option	Description
		Default Line chamfer AutoDefaults can change this option.
		No chamfer
		Line chamfer
		Convex arc chamfer






Option	Option	Description
		Concave arc chamfer

### Shear tab orientation

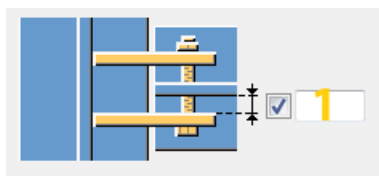
Option	Description
	Default Sloped AutoDefaults can change this option.
	Automatic The shear tab is sloped in the direction of the secondary beam. Both vertical edges of the shear tab are cut parallel to the end of the secondary beam.
	Sloped The shear tab is sloped in the direction of the secondary beam. Both vertical edges of the shear tab are cut parallel to the end of the secondary beam.
	Square
	Modified sloped Same as the <b>Sloped</b> option, but the vertical edge of the shear tab connected to the secondary beam is cut perpendicular to the secondary beam flange.

### Shear tab position

Define the number and the side of shear tabs in single shear tab connections.

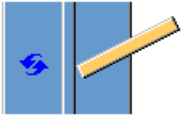


Option	Description
	<p>Default Far side shear tab AutoDefaults can change this option.</p>
	<p>Automatic The component automatically selects either the near side or the far side shear tab. The tab is created to the side of the secondary part when the angle between the main part and the secondary part is less than 90 degrees.</p>
	<p>Far side shear tab</p>
	<p>Near side and far side shear tab</p>
	<p>Near side shear tab</p>

### Gap between shear tabs



	Description	Default
<p><b>1</b></p>	<p>Gap between the secondary part web and shear tab. This only affects connections with two shear tabs.</p>	<p>0</p>

## Shear tab end cut

Option	Description
	Default The shear tab end is not cut. AutoDefaults can change this option.
	Square The shear tab end is not cut.
	Bevel The shear tab end is cut parallel to the main part web.

## Stiffeners tab

Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type.

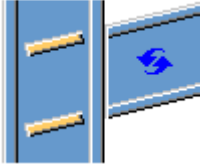
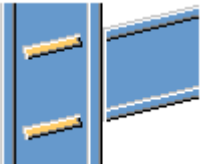
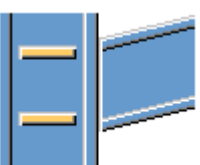
### Stiffener plate dimensions

Option	Description
<b>Top NS</b>	Top near side stiffener thickness, width and height.
<b>Top FS</b>	Top far side stiffener thickness, width and height.
<b>Bottom NS</b>	Bottom near side stiffener thickness, width and height.
<b>Bottom FS</b>	Bottom far side stiffener thickness, width and height.




Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
<b>Name</b>	Name that is shown in drawings and reports.	


### Stiffener orientation

Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are parallel to the secondary part.
	Stiffeners are perpendicular to the main part.





### Stiffener creation

Option	Description
	Default Stiffeners are created. AutoDefaults can change this option.
	Automatic Stiffeners are created when necessary.
	No stiffeners are created.

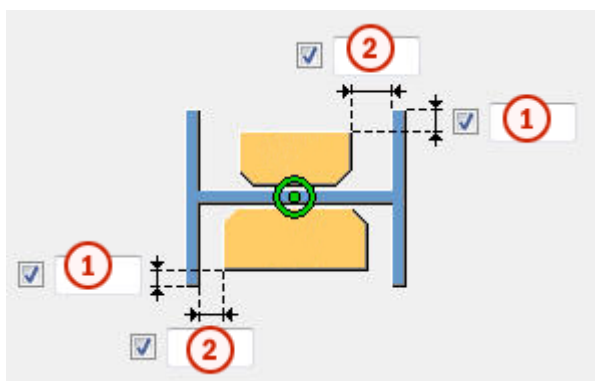


Option	Description
	Stiffeners are created.

### Stiffener shape

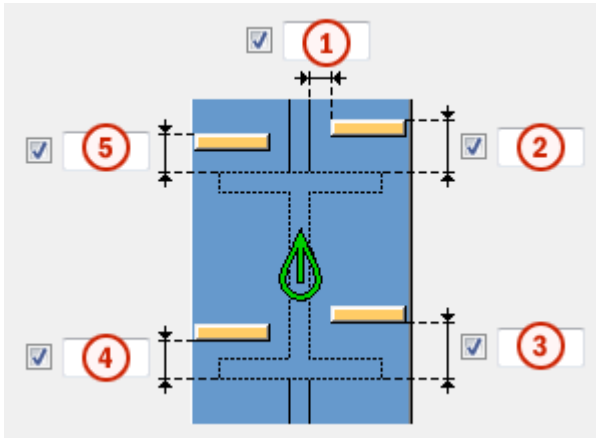
Option	Description
	Default Line chamfered stiffener plates AutoDefaults can change this option.
	Automatic Line chamfered stiffener plates
	Square stiffener plates Stiffener plates with a gap for the main part web rounding
	Line chamfered stiffener plates

### Stiffener gap



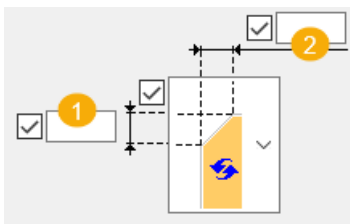
	Description
1	Distance from the edge of the flange to the edge of the stiffener.
2	Size of the gap between the flanges and the stiffener.

### Stiffener positions





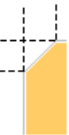



	Description
1	Size of the gap between the stiffener and the beam web edge.
2	Size of the gap between the top near side stiffener and the beam flange edge.
3	Size of the gap between the bottom near side stiffener and the beam flange edge.
4	Size of the gap between the bottom far side stiffener and the beam flange edge.
5	Size of the gap between the top far side stiffener and the beam flange edge.

### Chamfer dimensions



	Description	Default
1	Vertical dimension of the chamfer.	10 mm
2	Horizontal dimension of the chamfer.	10 mm

## Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer
	Line and arc chamfer

### ***Haunch tab***

Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges.

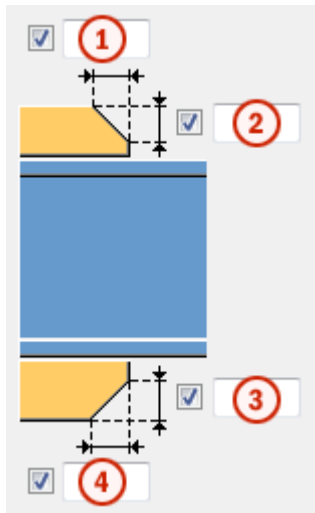
### **Haunch plates**

Option	Description
<b>Top plate</b>	Top haunch plate thickness, width and height.
<b>Bottom plate</b>	Bottom haunch plate thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b>

Option	Description	Default
		settings in <b>File menu --&gt; Settings --&gt; Options.</b>
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	

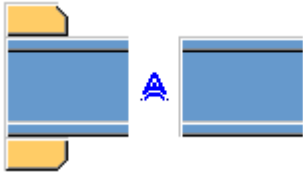
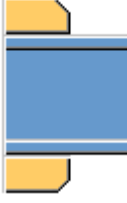

### Haunch plate chamfers



	Description
<b>1</b>	Width of the top haunch plate chamfer.
<b>2</b>	Height of the top haunch plate chamfer.
<b>3</b>	Height of the bottom haunch plate chamfer.
<b>4</b>	Width of the bottom haunch plate chamfer.

### Haunch plate creation

Option	Description
	<p>Default</p> <p>Top and bottom haunch plates are created, if needed.</p> <p>AutoDefaults can change this option.</p>

Option	Description
	<p>Automatic</p> <p>Top or bottom haunch plate or both are created, if needed.</p>
	<p>Top and bottom haunch plates are created.</p> <p>To create a single plate, enter 0 in the thickness (<b>t</b>) field for the plate you do not need (top or bottom plate).</p>
	<p>Haunch plates are not created.</p>

### **Notch tab**





Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.


### **Automatic notching**

Automatic notching options affect both the top and the bottom flange.

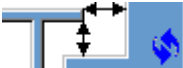

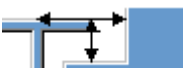
### **Notch shape**

Automatic notching is switched on when you select a notch shape.

Option	Description
	<p>Default</p> <p>Creates notches to the secondary beam.</p> <p>AutoDefaults can change this option.</p>
	<p>Creates notches to the secondary beam. The cuts are square to the main beam web.</p>
	<p>Creates notches to the secondary beam. The cuts are square to the secondary beam web.</p>
	<p>Creates notches to the secondary beam. The vertical cut is square to the main beam, and the horizontal cut is square to the secondary beam.</p>

Option	Description
	Turns off automatic notching.




### Notch size

Option	Description
	<p>Default</p> <p>The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.</p> <p>AutoDefaults can change this option.</p>
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.
	The notch size is measured from the center line of the main beam and from the top flange of the main beam.

Enter the horizontal and vertical values for the cuts.






### Flange cut shape

Option	Description
	<p>Default</p> <p>Secondary beam flange is cut parallel to the main beam.</p> <p>AutoDefaults can change this option.</p>
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

### Notch dimension rounding


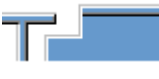

Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.



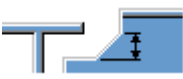

The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



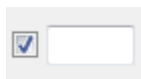
### Notch position

Option	Description
	Default Creates the cut below the main beam flange. AutoDefaults can change this option.
	Creates the cut below the main beam flange.
	Creates the cut above the main beam flange.

### Notch chamfer

Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

Enter a radius for the chamfer.








### Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.



### Side of flange notch

The side of flange notch defines on which side of the beam the notches are created.

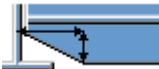



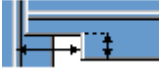
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

### Flange notch shape

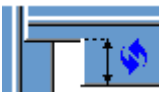
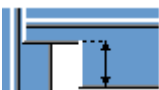

The flange notch shape defines the notch shape in the beam flange.

Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange.



Option	Description
	Creates chamfers in the flange. If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.
	Creates cuts to the flange with default values unless you enter values in the fields <b>1</b> and <b>2</b> .
	The flange is not cut.
	Creates cuts to the flange according to the value in the field <b>1</b> to make it flush with the web.
	Creates cuts to the flange according to the values in the fields <b>1</b> and <b>2</b> .

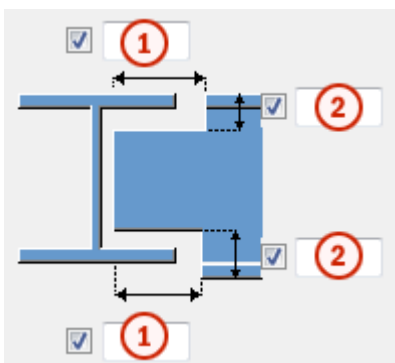
### Flange notch depth

Option	Description
	Default Flange notch depth. AutoDefaults can change this option.
	Flange notch depth.
	Flange notch depth with a dimension from the secondary beam web center line to the edge of the notch.

Enter the value for flange notch depth.

### Cut dimensions



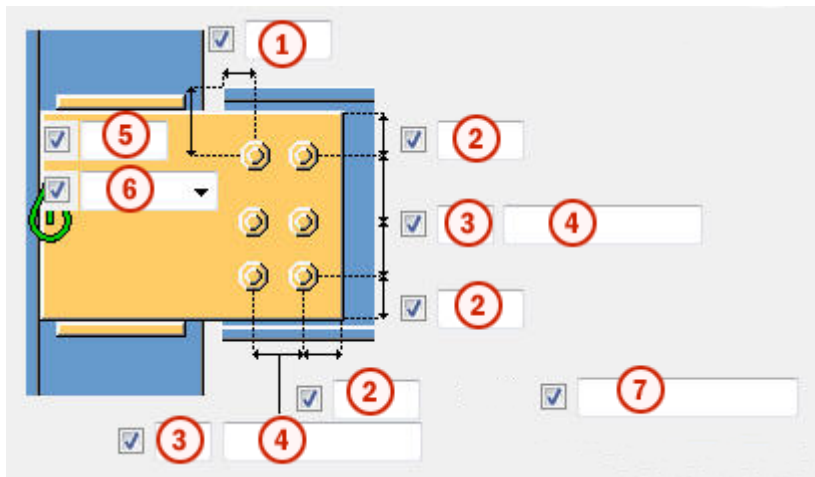
	Description	Default
1	Dimensions for the horizontal flange cuts.	10 mm
2	Dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

### **Bolts tab**

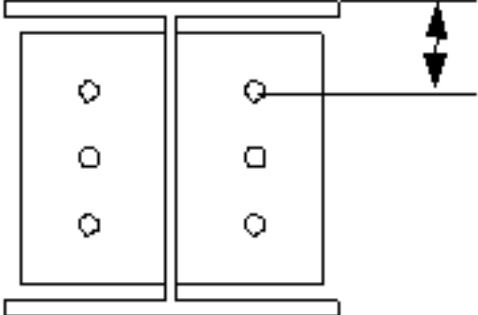
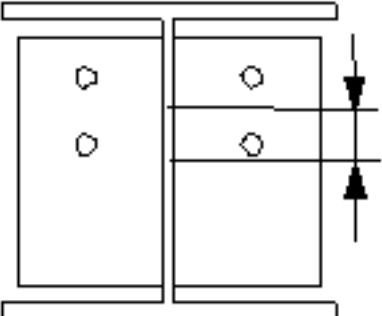
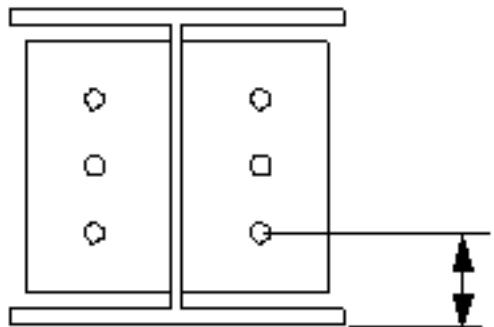
Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part.

### **Bolt group dimensions**

Bolt group dimensions affect the size and shape of the shear tab.









	Description
1	Dimension for horizontal bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Dimension for vertical bolt group position.






	Description
6	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.              </li> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>

	Description
7	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt group orientation

Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



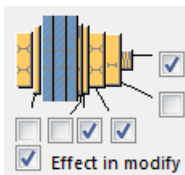
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

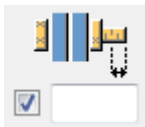
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Beam cut tab

Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts.

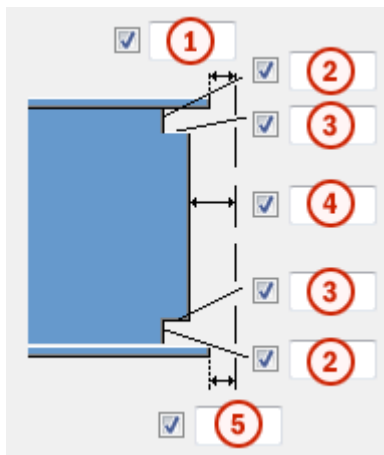
### Weld backing bar

Option	Description
<b>Weld backing bar</b>	Weld backing bar thickness and width.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .







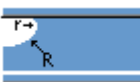
Option	Description	Default
	assembly position number.	
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Weld access hole dimensions







	Description
<b>1</b>	Gap between the secondary part top flange and the main part.
<b>2</b>	Vertical dimensions for the top and the bottom weld access holes.
<b>3</b>	Horizontal dimensions for the top and the bottom weld access holes.
<b>4</b>	Gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.
<b>5</b>	Gap between the secondary part bottom flange and the main part. Tekla Structures adds the value you enter here to the gap you enter on the <b>Picture</b> tab.

## Weld access holes







Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	
	Round weld access hole with a radius that you can define in r <input checked="" type="checkbox"/> <input type="text"/>	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and Top Prep x <input checked="" type="checkbox"/> <input type="text"/> Bottom Prep x <input checked="" type="checkbox"/> <input type="text"/>	
	Cone-shaped weld access hole with radiuses that you can define in R <input checked="" type="checkbox"/> <input type="text"/> and r <input checked="" type="checkbox"/> <input type="text"/> Capital <b>R</b> defines the large radius (height). Small <b>r</b> defines the small radius.	R = 35 r = 10







### Beam end preparation

Option	Description
	Default Top and bottom flange are prepared. AutoDefaults can change this option.
	Automatic Top and bottom flange are prepared.
	Beam end is not prepared.
	Top and bottom flange are prepared.

### Flange cut

Option for top flange	Option for bottom flange	Description
		Default Flange is not cut. AutoDefaults can change this option.
		Flange is not cut.
		Flange is cut.

### Weld backing bars

Option for top backing bar	Option for bottom backing bar	Description
		Default Backing bars are created inside the flanges. AutoDefaults can change this option.
		No backing bars are created.

Option for top backing bar	Option for bottom backing bar	Description
		Backing bars are created inside the flanges.
		Backing bars are created outside the flanges.

### Weld backing bar length

Enter the length of the weld backing bar in the box below the options.

Option	Description
	Default Absolute length of the backing bar AutoDefaults can change this option.
	Absolute length of the backing bar
	Extension beyond the edge of the flange

### Weld backing bar position

Option	Description
	Enter a positive or a negative value to move the front end of the backing bar relative to the end of the flange.

### Assembly type

Define the location where the weld backing bar welds are made. When you select the **Workshop** option, Tekla Structures includes the backing bars in the assembly.

### **Doubler plate tab**


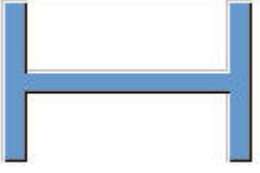
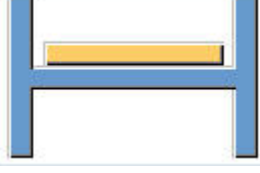
Use the **Doubler plate** tab to create doubler plates to strengthen the web of the main part.


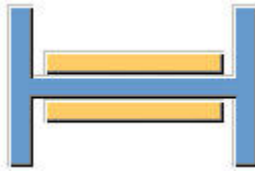
### **Web plate**

<b>Option</b>	<b>Description</b>
<b>Web plate</b>	Web plate thickness and height.

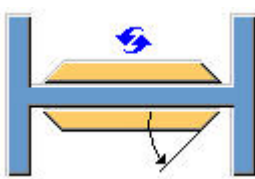
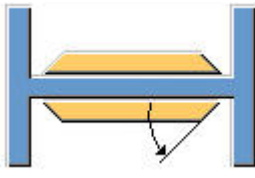

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Doubler plates**

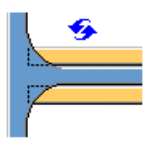
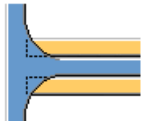
<b>Option</b>	<b>Description</b>
	Default Doubler plates are not created. AutoDefaults can change this option.
	Doubler plates are not created.
	Doubler plate is created on the far side.


Option	Description
	Doubler plate is created on the near side.
	Doubler plates are created on both sides.

### Doubler plate edge shape

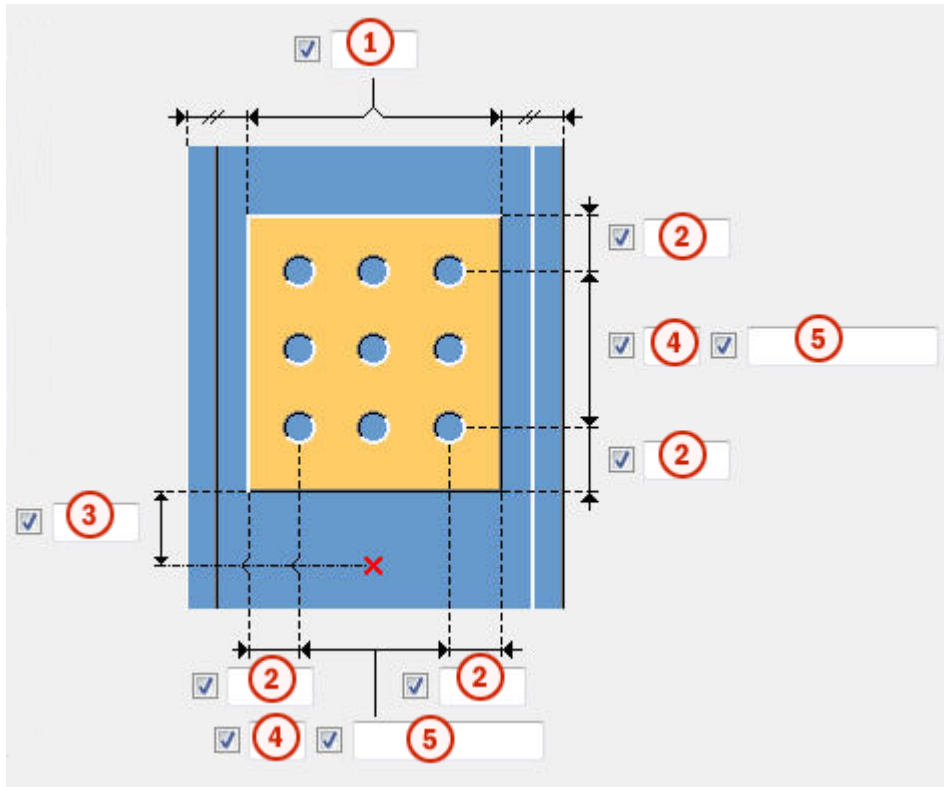
Option	Description
	Default Bevel doubler plates AutoDefaults can change this option.
	Bevel doubler plates Enter the angle in <input checked="" type="checkbox"/> <input type="text"/> (0 - 90)
	Square doubler plates

### Doubler plate cuts

Option	Description
	Default Doubler plates are not cut. AutoDefaults can change this option.
	Doubler plates are not cut.

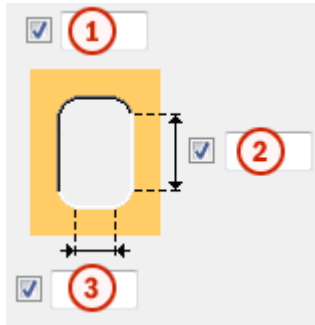
Option	Description
	Doubler plates are cut in the area that connects the main part web and flange.

### General settings



	Description
1	Edge distance from the column flange.
2	Doubler plate edge distance. Edge distance is the distance from the center of a hole to the edge of the part.
3	Edge distance of the doubler plate in relation to the bottom of the secondary part.
4	Number of holes.
5	Hole spacing. Use a space to separate hole spacing values. Enter a value for each space between holes. For example, if there are 3 holes, enter 2 values.

## Weld hole size



	Description
1	Hole diameter.
2	Slot length.
3	Slot width.

### ***General tab***

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

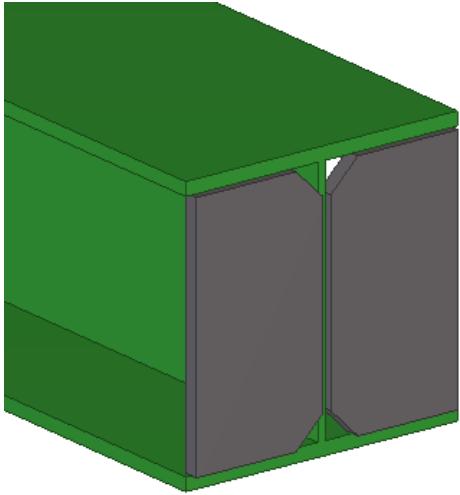
## **Stiffeners (1003)**

**Stiffeners (1003)** creates stiffeners to I-profiles.

### **Objects created**

- Stiffeners

## Use for

Situation	Description
	Stiffeners at a beam end.

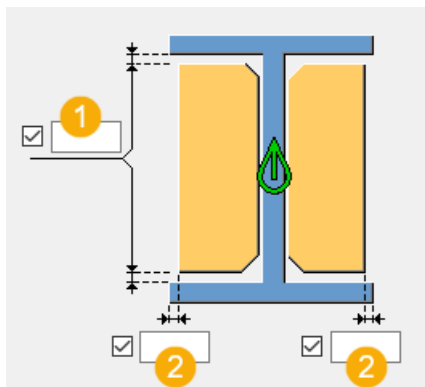
## Selection order

1. Select the main part (beam).
2. Pick a position.

The detail is created automatically when the position is picked.

## Picture tab

Use the **Picture** tab to control the stiffener plate position.



	Description
<b>1</b>	Define the gap between the stiffener plates and beam flanges. The default size of the gap between the stiffener plates and beam flanges is 0 mm.

	Description
2	Define the stiffener plate distance from the beam flange.

### **Parts tab**

Use the **Parts** tab to control the stiffener properties.

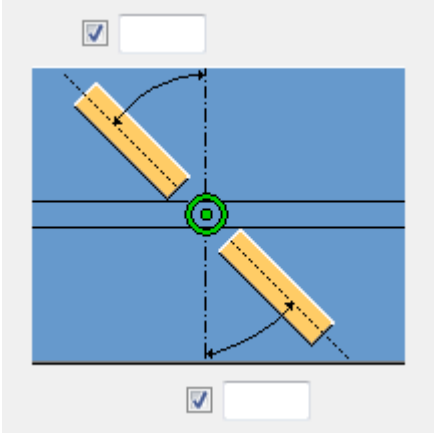
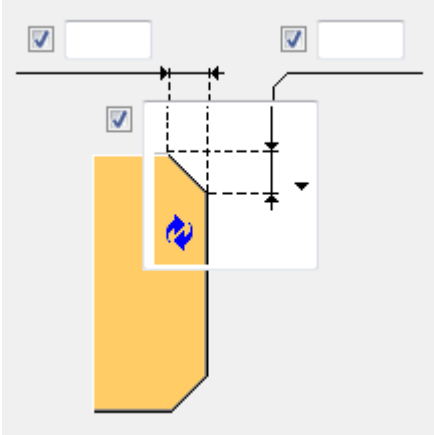

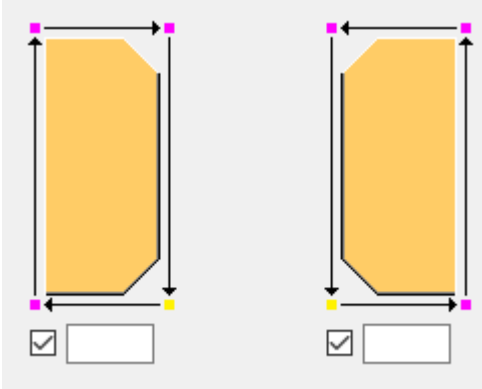
Option	Description
<b>Left stiffener</b> <b>Right stiffener</b>	Define the stiffener thickness, width and height.  By default, the thickness is $1.5 * \text{beam web thickness}$ rounded up to the next plate thickness.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

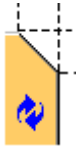




### **Parameters tab**

Use the **Parameters** tab to control the stiffener angle and chamfers.



Option	Description
 <p>The diagram shows a top-down view of a stiffener assembly. Two orange stiffeners are positioned symmetrically around a central vertical axis. A green circle highlights the center of the assembly. Dashed lines and arrows indicate the angular orientation of the stiffeners. There are two checkboxes, each followed by an empty input field, one at the top and one at the bottom of the diagram.</p>	<p>Position of the stiffeners.</p> <p>You can enter horizontal angles in degrees for the right and the left stiffener.</p>
 <p>The diagram shows a cross-section of a stiffener with a chamfered top edge. A white box highlights the chamfered area, with dashed lines and arrows indicating the chamfer dimensions. There are three checkboxes, each followed by an empty input field, arranged around the diagram.</p>	<p>Chamfer type and dimensions.</p> <p>If you select the <b>No Chamfer</b>  option, a clash can occur between the stiffener and the I-profile rounding.</p> <p>Additionally, you can define the chamfer dimensions vertically and horizontally. If you select an arc chamfer, the horizontal dimension is the radius and the vertical dimension has no effect.</p>
 <p>The diagram shows two side views of a stiffener with chamfered corners. The left view shows the chamfered corner with a pink arrow pointing outwards and a yellow arrow pointing inwards. The right view shows the chamfered corner with a pink arrow pointing inwards and a yellow arrow pointing outwards. There are two checkboxes, each followed by an empty input field, one at the bottom left and one at the bottom right.</p>	<p>Set the stiffener polygon rotation of the right and the left stiffener.</p> <p>The value you enter determines the number of points by which the start point of the polygon is moved in the direction shown by the arrows.</p>

## Chamfer type

Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### ***General tab***

Click the link below to find out more:

### ***Design tab***

Click the link below to find out more:

[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

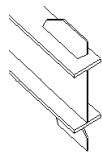
## Column stiffeners (1030)

**Column stiffeners (1030)** creates stiffeners to a point you pick on a beam.

### Objects created

- Stiffeners
- Welds

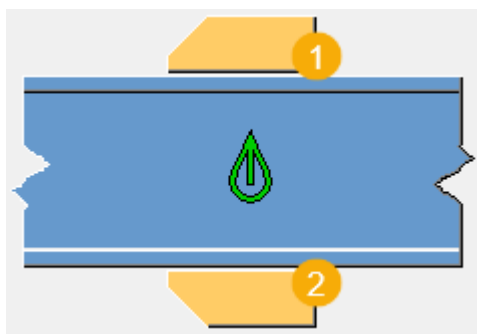
### Use for

Situation	Description
	Upper and lower stiffeners created on a beam

### Selection order

1. Select the beam.
2. Pick a point on the beam to indicate the stiffener position.  
The stiffeners are created automatically when you pick the point.

### Part identification key

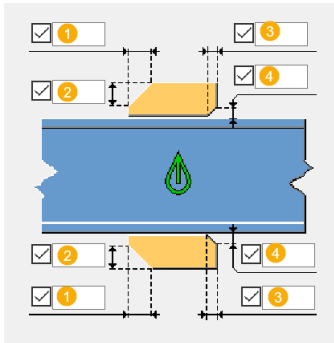


	Description
<b>1</b>	Upper stiffener
<b>2</b>	Lower stiffener

### **Picture tab**

Use the **Picture** tab to define the stiffener chamfer dimensions.

## Dimensions



	Description
1	Horizontal chamfer dimension
2	Vertical chamfer dimension
3	Horizontal chamfer dimension
4	Vertical position of the stiffener Stiffeners are by default created in the vertical direction in the middle of the beam.

## Parts tab

Use the **Parts** tab to define the part properties.

## Parts

Option	Description	Default
<b>Upper stiffener</b>	Thickness, width, and height of the stiffener	Thickness = 10 mm Width = 100 mm Height = 200 mm
<b>Lower stiffener</b>	Thickness, width, and height of the stiffener	Equal to the dimensions of the upper stiffener

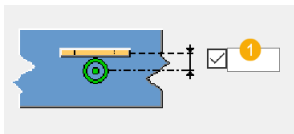
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part</b>

Option	Description	Default
		<b>material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tab**




Use the **Parameters** tab to define the stiffener position and beam fitting.

#### **Stiffener position**



	Description
<b>1</b>	Stiffener offset from the beam center line

#### **Beam fitting**

Option	Description
	Default Beam is not cut. AutoDefaults can change this option.
	Beam is not cut.
	Beam is cut at the point where the stiffeners are created.

### **General tab**

Click the link below to find out more:

[General tab](#)

## ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

## ***Welds***

Click the link below to find out more:

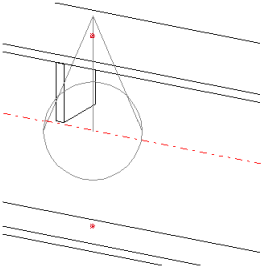
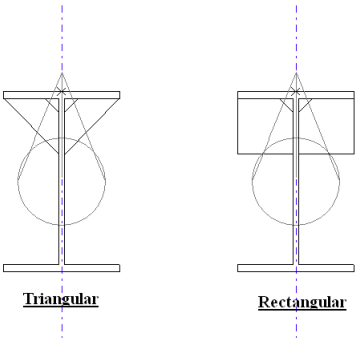
## **Stiffeners (1041)**

**Stiffeners (1041)** creates rectangular or triangular stiffener plates on one or both sides of a beam or a column.

### **Objects created**

- Stiffeners
- Welds

### **Use for**

<b>Situation</b>	<b>Description</b>
	Rectangular stiffener
 <p><u>Triangular</u>                      <u>Rectangular</u></p>	Triangular and rectangular stiffeners

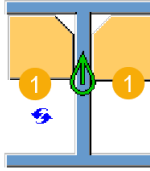
### **Selection order**

1. Select the main part (beam or column).

2. Pick a position for the stiffeners.

The stiffeners are automatically created when you pick the position.

### Part identification key

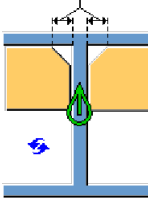
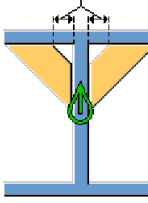
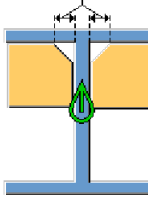


	Description
1	Rectangular stiffeners

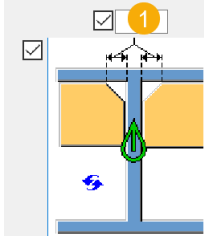
### Picture tab

Use the **Picture** tab to define the stiffener shape and chamfer dimension.

### Stiffener shape

Option	Description
	Default Rectangular stiffeners AutoDefaults can change this option.
	Triangular stiffeners
	Rectangular stiffeners

## Stiffener chamfer



	Description
1	Define the chamfer dimension.

## Parts tab

Use the **Parts** tab to define the part properties.

### Parts

Part	Description
<b>Right stiffener</b>	Thickness, width, and height of the right stiffener
<b>Left stiffener</b>	Thickness, width, and height of the left stiffener

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	



### **General tab**

Click the link below to find out more:

General tab

### **Analysis tab**

Click the link below to find out more:

Analysis tab

### **Welds**

Click the link below to find out more:

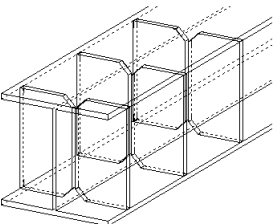
## **Multiple stiffeners (1064)**

**Multiple stiffeners (1064)** creates multiple stiffeners to I, C, and U profiles.

### **Objects created**

- Stiffeners
- Welds

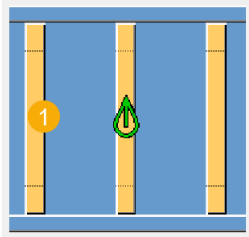
### **Use for**

<b>Situation</b>	<b>Description</b>
	Multiple stiffeners created to an I beam.

### **Selection order**

1. Select the main part (beam or column).
2. Pick a position for the stiffeners.  
The stiffeners are created automatically when you pick the position.

## Part identification key

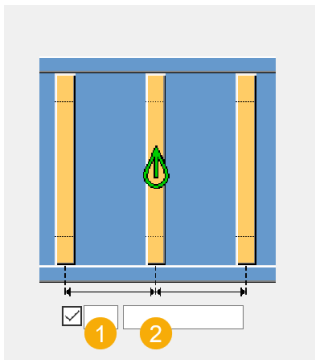


	Description
1	Stiffener

## Picture tab



Use the **Picture** tab to define the number and spacing of the stiffeners.



## Stiffeners







	Description
1	Number of stiffeners.
2	Stiffener spacing. Use a space to separate stiffener spacing values. Enter a value for each space between stiffeners. For example, if there are 3 stiffeners, enter 2 values.

## Stiffener creation direction

Option	Description
	Default Middle AutoDefaults can change this option.
	Middle Creates stiffeners symmetrically.

Option	Description
	Right Creates stiffeners to the right of the up direction symbol.
	Left Creates stiffeners to the left of the up direction symbol.

### Stiffener offset location

Option	Description
	Default Middle AutoDefaults can change this option.
	Middle Sets the offset to the middle of the stiffener.
	Left Sets the offset to the left side of the stiffener.
	Right Sets the offset to the right side of the stiffener.

### Parts tab

Use the **Parts** tab to define the part properties.

### Parts

Part	Description
<b>Left stiffener</b>	Thickness and width of the left stiffener.
<b>Right stiffener</b>	Thickness and width of the right stiffener.

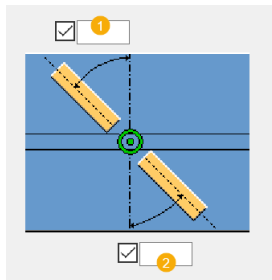
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
	where you can enter the assembly position number.	
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### **Parameters tab**

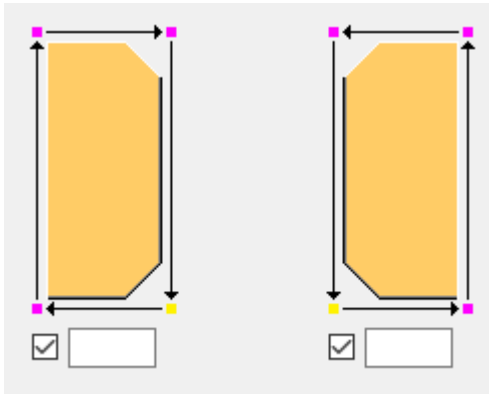
Use the **Parameters** tab to define the stiffener angles, creation direction, and offset.

### **Stiffener angles**



	Description	Default
<b>1</b>	Angle of the right stiffener.	0 degrees
<b>2</b>	Angle of the left stiffener.	0 degrees

### Rotate stiffener polygon



Set the stiffener polygon rotation of the right and the left stiffener.

The value you enter determines the number of points by which the start point of the polygon is moved in the direction shown by the arrows.

### Fit stiffeners with flanges

Select whether sloped stiffeners are fitted with the main part flanges.


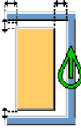
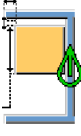
### Apply gaps in the coordinate system of

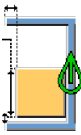
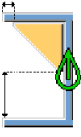

Select whether gaps are applied in the stiffeners or in the main part.

### *Stiffeners tab*

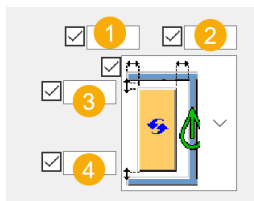
Use the **Stiffeners** tab to define stiffener creation, dimensions, and chamfers on both sides of the part.

### Stiffener creation

Option	Description
	Default Full stiffener AutoDefaults can change this option.
	Full stiffener
	Partial stiffener, upper end

Option	Description
	Partial stiffener, lower end
	Partial stiffener, bevel
	No stiffeners are created.




### Stiffener dimensions






	Option	Default
1	Stiffener edge distance from the beam edge.	0.0 mm
2	Stiffener edge distance from the beam web.	Beam rounding radius 1
3	Stiffener edge distance from the beam upper flange.	0 mm
4	Stiffener edge distance from the beam lower flange.	0 mm

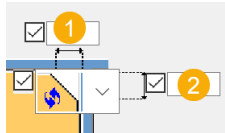
### Chamfer type

You can select the chamfer type in each stiffener corner. The default type depends on the stiffener corner.

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer

Option	Description
	Convex chamfer
	Concave chamfer
	Square chamfer

### Chamfer dimensions



	Description
1	Horizontal chamfer dimension.
2	Vertical chamfer dimension.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design type tab**

Click the link below to find out more:

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

### **Standard gusset (1065)**

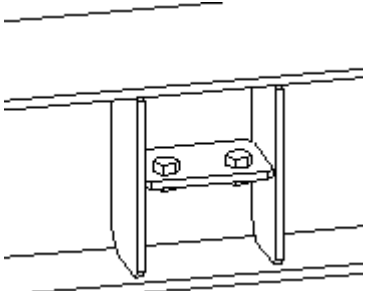
**Standard gusset (1065)** creates a gusset plate and welds it to the beam or column web. A stiffener is automatically created on each end of the gusset plate.

## Objects created

- Gusset plate
- Stiffener plates (2)
- Bolts

To create braces and connect them to the gusset plate, use **Gusset tube in points (S47)**, **Crushed tube in bolts (S48)**, or **Gusset tube in bolts (S49)**.

## Use for

Situation	Description
	Gusset plate welded to the beam web

## Before you start

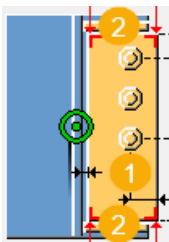
Create a beam or a column (H, W, or C profile).

Note that the gusset plate is created using the properties you define on the **Parts** tab.

## Selection order

1. Select the main part (beam or column).
2. Pick a point on the main part to indicate the location of the connection.  
The connection is created automatically when the you pick the point.

## Part identification key



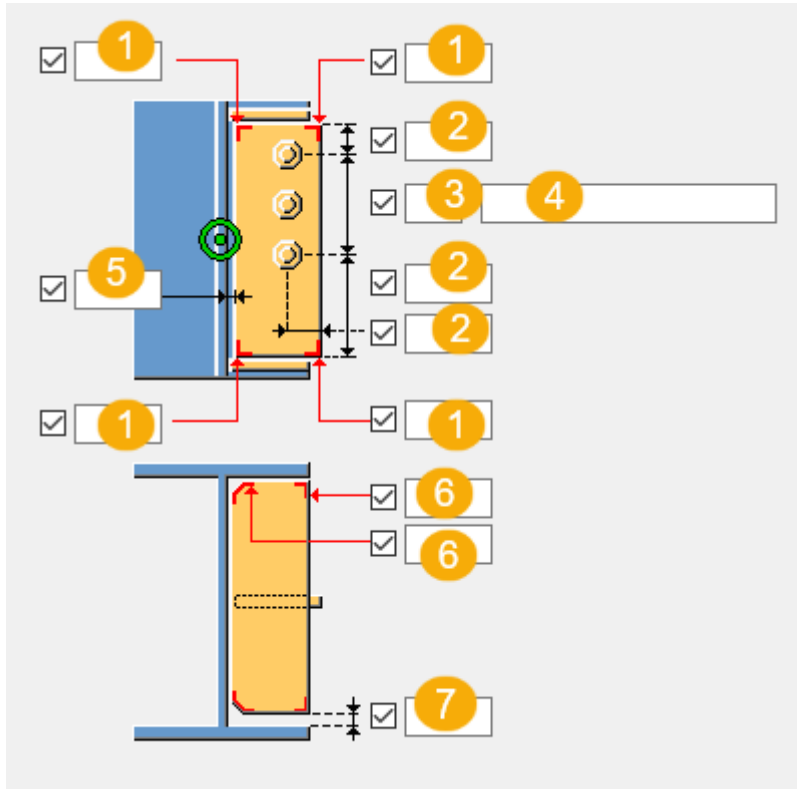
1	Gusset plate
2	Stiffener



### Picture tab

Use the **Picture** tab to define the gusset plate and stiffener dimensions.

### Part dimensions



	Description
1	Define the corner cut size of the gusset plate.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Define the gusset plate offset from the beam or column web.
6	Define the corner cut size of the stiffener.
7	Define the stiffener offset from the beam or column web.

### Parts tab

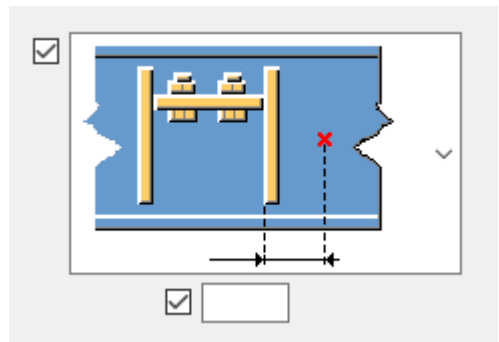
Use the **Parts** tab define the gusset plate and stiffener properties.

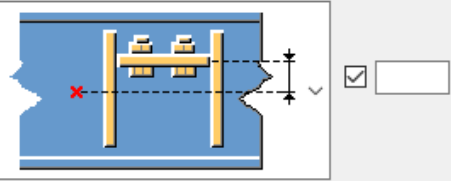
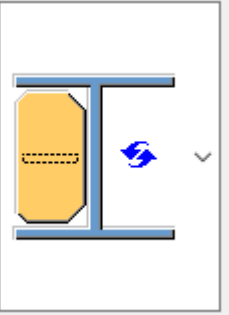
Part	Description
<b>Gusset plate, Front stiffener, Back stiffener</b>	Define the thickness, width and height of the gusset plate and the stiffeners.  This component automatically creates stiffener plates at each end of the gusset plate. To remove one or both stiffener plates, delete the values in the <b>Front stiffener</b> or <b>Back stiffener</b> .

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Parameters tab

Use the **Parts** tab to define the position of the gusset.

Option	Description
	Define the horizontal gusset location using a reference point.

Option	Description
<input checked="" type="checkbox"/> 	Define the vertical gusset location using a reference point.
<input checked="" type="checkbox"/> 	Select the gusset location.

### **Bolts tab**

Use the **Bolts** tab to define the bolt properties.

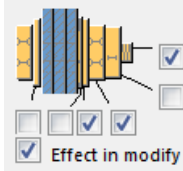
#### **Bolt basic properties**

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	<p>Defines whether the thread may be within the bolted parts when bolts are used with a shaft.</p> <p>This has no effect when full-threaded bolts are used.</p>	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### **Bolt assembly**

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

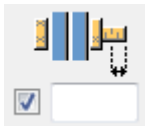
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### **Bolt group**

Select whether several or a single bolt group is created.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

## **2.16 Base plates**

This section introduces base plate components available in Tekla Structures.

Click the links below to find out more:

- [U.S. Base plate connection \(71\) \(page 1917\)](#)
- [Round joining plates \(124\) \(page 1939\)](#)
- [Base plate \(1004\) \(page 1946\)](#)

- [Stiffened base plate \(1014\) \(page 1972\)](#)
- [Web stiffened base plate \(1016\) \(page 2000\)](#)
- [Simple base plate 2 \(1031\) \(page 2024\)](#)
- [Base plate \(1042\) \(page 2039\)](#)
- [U.S. Bearing plate \(1044\) \(page 2065\)](#)
- [U.S. Base plate \(1047\) \(page 2075\)](#)
- [Circular base plates \(1052\) \(page 2105\)](#)
- [Base plate \(1053\) \(page 2124\)](#)
- [Box column base plate \(1066\) \(page 2132\)](#)

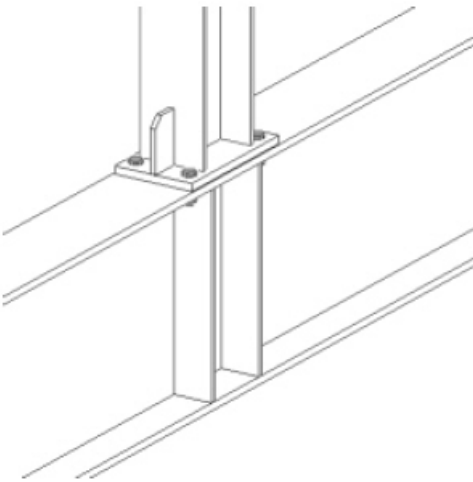
## U.S. Base plate connection (71)

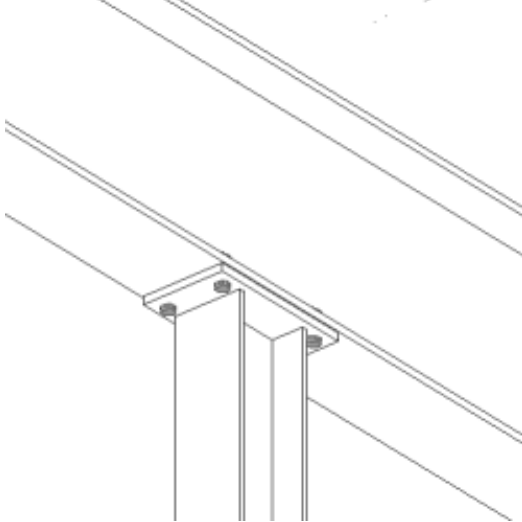
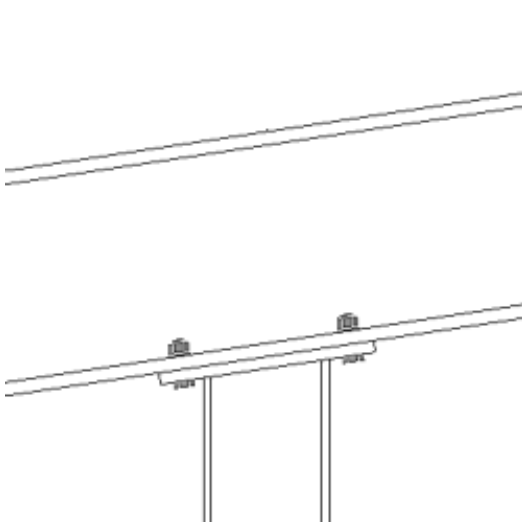
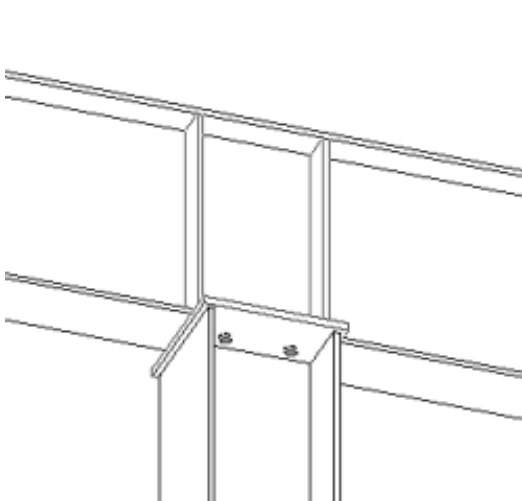
**U.S. Base plate connection (71)** creates a base plate that connects a column to a beam.

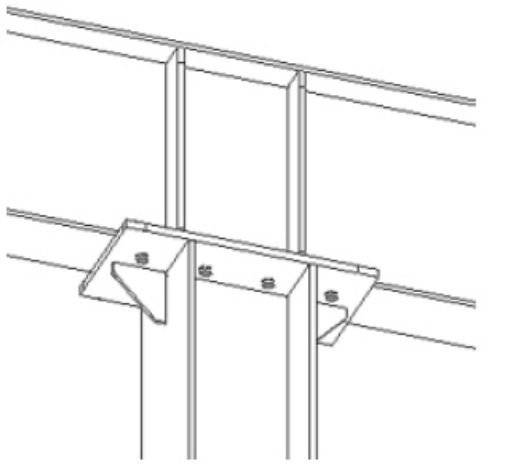
### Objects created

- Base plate
- Stiffeners (can only be added if the column has a W, I, or a TS profile)
- Beam stiffener
- Bolts
- Welds

### Use for

Situation	Description
	<p>Base plate is connected to the beam. Beam and column stiffeners are used.</p>

Situation	Description
	<p>Beam cantilever is connected to a column with a base plate.</p>
	<p>Beam cantilever is connected to a sloped column with a base plate.</p>
	<p>Beam cantilever is connected to a column with a base plate. Beam stiffeners are used.</p>

Situation	Description
	<p>Beam cantilever is connected to the column with a base plate.</p> <p>Beam and column stiffener are used.</p>

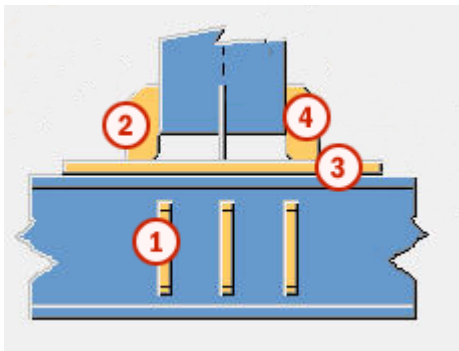
### Before you start

Create a beam and a column.

### Selection order

1. Select the main part (beam).
  2. Select the secondary part (column).
- The connection is created automatically.

### Part identification key

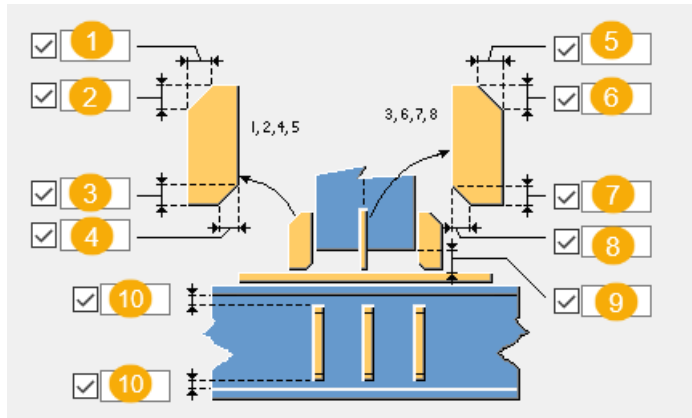


	Part
1	Beam stiffener
2	Stiffeners 1, 2, 4, 5
3	Base plate
4	Stiffeners 3, 6, 7, 8

### Picture tab

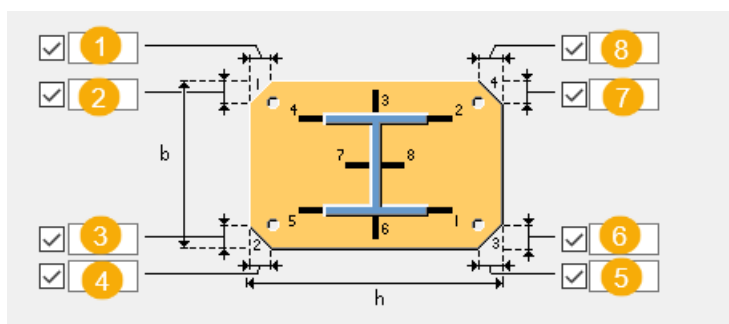
Use the **Picture** tab to control the stiffener chamfering and the base plate chamfers.

### Stiffener chamfering



	Description
1	Top chamfer width for stiffeners 1, 2, 4, 5.
2	Top chamfer height for stiffeners 1, 2, 4, 5.
3	Bottom chamfer height for stiffeners 1, 2, 4, 5.
4	Bottom chamfer width for stiffeners 1, 2, 4, 5.
5	Top chamfer width for stiffeners 3, 6, 7, 8.
6	Top chamfer height for stiffeners 3, 6, 7, 8.
7	Bottom chamfer height for stiffeners 3, 6, 7, 8.
8	Bottom chamfer width for stiffeners 3, 6, 7, 8.
9	Weld gap.
10	Gap between the beam stiffeners and the beam top and bottom flange.

### Base plate chamfering



	Description
1	Width of base plate chamfer 1.



	Description
2	Height of base plate chamfer 1.
3	Height of base plate chamfer 2.
4	Width of base plate chamfer 2.
5	Width of base plate chamfer 3.
6	Height of base plate chamfer 3.
7	Height of base plate chamfer 4.
8	Width of base plate chamfer 4.

### **Parts tab**

Use the **Parts** tab to control the dimensions of the base plate, stiffeners, and beam stiffener.

### **Plate**

Option	Description	Default
<b>Plate</b>	Base plate thickness, width and height.	Thickness = 20 mm Width depends on the column profile. Height depends on the column profile. The default name is BASEPLATE.
<b>Stiffeners 1,2,4,5</b>	Stiffener 1, 2, 4, 5 thickness, width and height.	
<b>Stiffeners 3, 6</b>	Stiffener 3, 6 thickness, width and height.	
<b>Stiffeners 7,8</b>	Stiffener 7, 8 thickness, width and height.	
<b>Beam Stiff</b>	Beam stiffener thickness, width and height.	

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
	assembly position number.	
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### **Parameters tab**

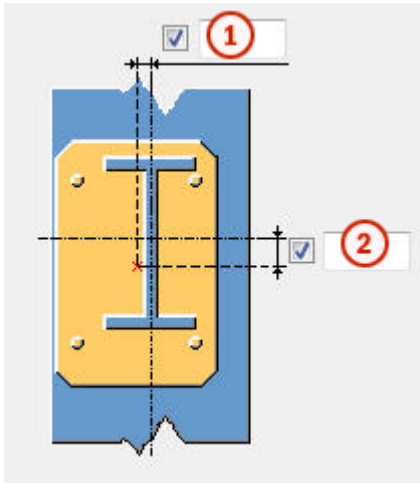
Use the **Parameters** tab to control the square cut corners, plate offset and bolt properties.

### **Plate properties**




Option	Description
<b>Square cut corners (1-4)</b>	Cuts made on the corners of the base plate.  If you enter a number corresponding to one of the corners of the base plate, the corner has a square cut instead of a diagonal chamfer. You can enter the numbers for one or all the corners.
<b>Plate aligned with</b>	Define whether the plate is aligned with the column or the connection symbol.



## Base plate offset



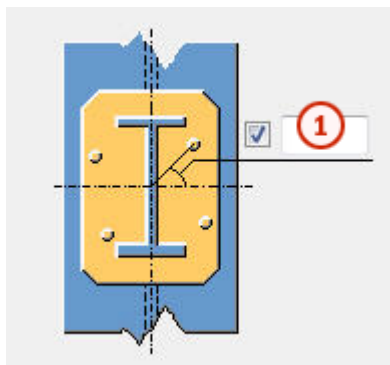
	Description
1	Base plate horizontal offset from the column center.
2	Base plate vertical offset from the column center.

## Base plate with holes or bolts

Option	Description
 A technical diagram of a yellow T-shaped base plate mounted on a blue I-beam column. The base plate has four circular holes, one in each of the four corners. A blue lightning bolt icon is located on the left side of the base plate, indicating a bolt or hole feature.	Default Bolts are created. AutoDefaults can change this option.

Option	Description
	Bolts are created.
	Holes are created.

### Bolt group rotation



You can define the bolt group rotation around its center. To rotate the bolt group, enter the rotation angle (in degrees).

Positive angle rotates the bolts in a counter-clockwise direction and negative angle in a clockwise direction.

	Description
1	Bolt group rotation angle.

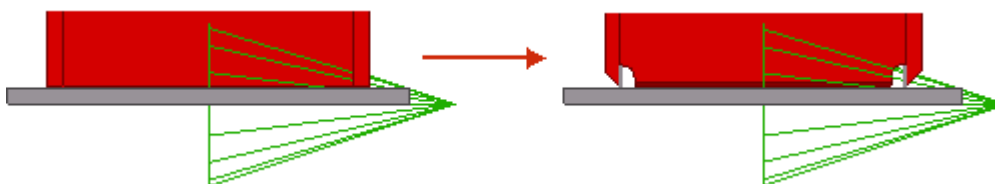
## Bolt properties

Option	Description
<b>Eliminate bolt numbers</b>	Define which bolts are deleted from the bolt group.  Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to down.
<b>Eliminate external bolts</b>	Define whether external bolts are deleted.

## Using additional components

You can use additional system or custom components to modify the column end or the base plate. For example, you can create special backing plates, weld preparations, and weld access holes for the column end.

If you use additional system or custom components, you need to manage the column end or the base plate properties in the additional component in question. When using several components, there may be multiple welds and cuts.



Option	Description
<b>Component</b>	Select a system or a custom component from the <b>Applications &amp; components</b> catalog.
<b>Attributes</b>	Select an attribute file for the component.
<b>Input</b>	Define to which parts the selected component is applied. <ul style="list-style-type: none"> <li>• <b>Default</b> is same as <b>Base + Column</b>.</li> <li>• <b>Column</b> sets the column as the main part. Use this option for details.</li> <li>• <b>Column + Base</b> sets the column as the main part and the base plate as the secondary part.</li> </ul>

Option	Description
	<ul style="list-style-type: none"> <li>• <b>Base + Column</b> sets the base plate as the main part and the column as the secondary part.</li> <li>• <b>Base</b> sets the base plate as the main part.</li> </ul>

### Stiffeners tab

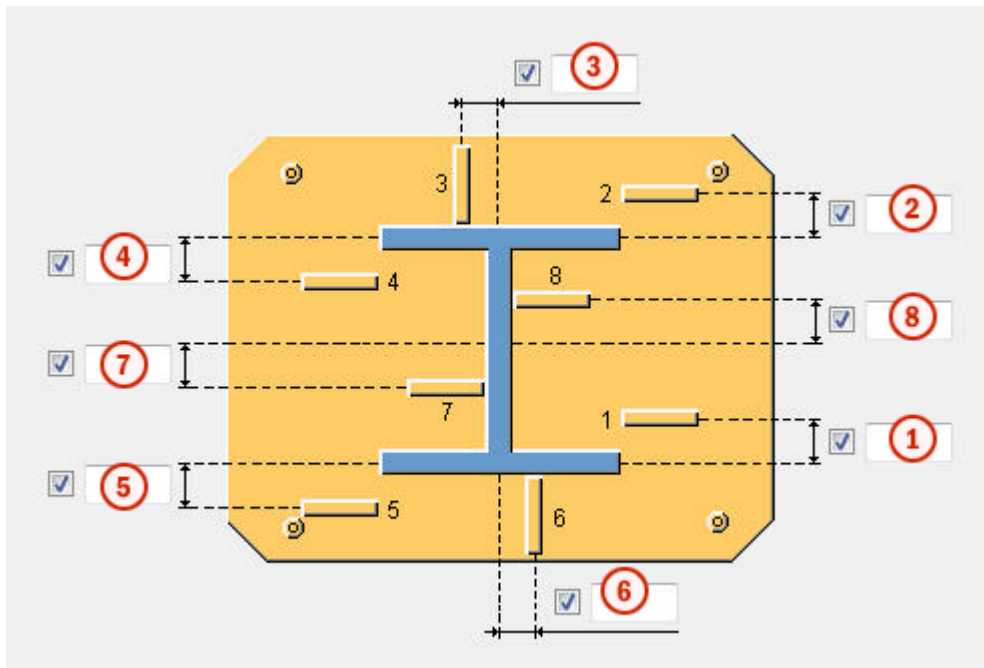
Use the **Stiffeners** tab to control stiffener positions and offsets.

#### Stiffener positions (1-8)

Option	Description
<b>Stiffener Positions (1-8)</b>	Placement of the stiffeners. Only the stiffeners whose numbers are entered in the field are attached to the column.

#### Stiffener offset

Stiffener offset allows the stiffeners to be moved. Enter a negative value to move the stiffener in the opposite direction.






	Description
<b>1</b>	Stiffener 1 offset.
<b>2</b>	Stiffener 2 offset.

	Description
<b>3</b>	Stiffener 3 offset.
<b>4</b>	Stiffener 4 offset.
<b>5</b>	Stiffener 5 offset.
<b>6</b>	Stiffener 6 offset.
<b>7</b>	Stiffener 7 offset.
<b>8</b>	Stiffener 8 offset.




### **Beam Stiff tab**

Use the **Beam Stiff** tab to control the beam stiffener alignment, stiffener side, chamfer dimensions and types.


#### **Left stiffener**

Option	Description
	Default Left stiffeners are created. AutoDefaults can change this option.
	Left stiffeners are created.
	Left stiffeners are not created.



### Center stiffener

Option	Description
	Default Center stiffeners are created. AutoDefaults can change this option.
	Center stiffeners are created.
	Center stiffeners are not created.



### Right stiffener


Option	Description
	Default Right stiffeners are created. AutoDefaults can change this option.



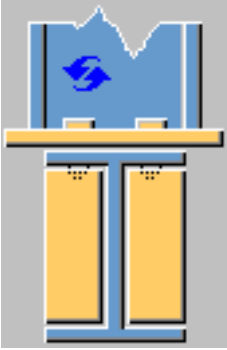
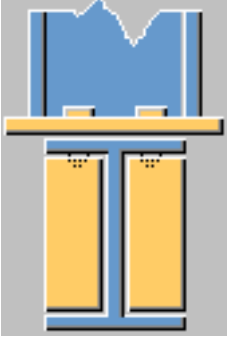
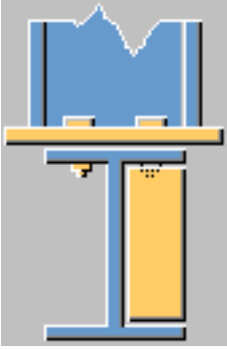
Option	Description
	Right stiffeners are created.
	Right stiffeners are not created.

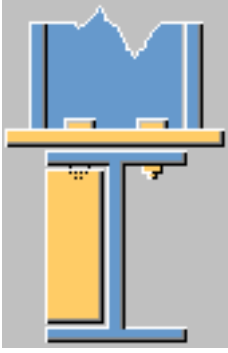
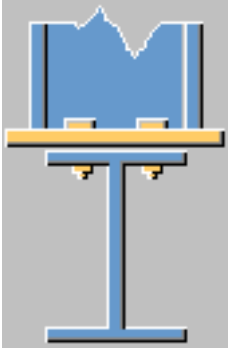
### Stiffener alignment

Options	Description
	Default Stiffeners are aligned with the beam. AutoDefaults can change this option.
	Stiffeners are aligned with the beam.

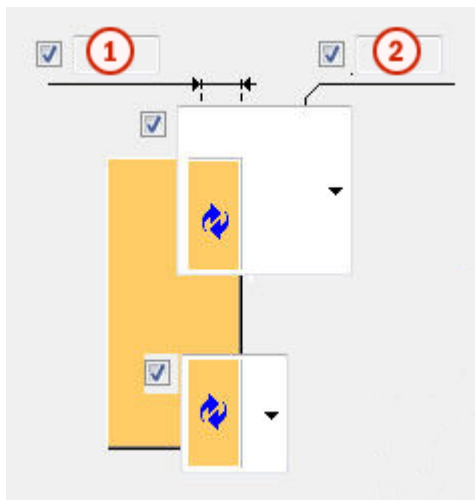
Options	Description
	<p>Stiffeners are aligned with the column.</p>

### Stiffener creation

Option	Description
	<p>Default Stiffeners are created on both sides. AutoDefaults can change this option.</p>
	<p>Stiffeners are created on both sides.</p>
	<p>Stiffeners are created on far side.</p>











Option	Description
	Stiffeners are created on near side.
	Stiffeners are not created.

### Chamfer dimensions



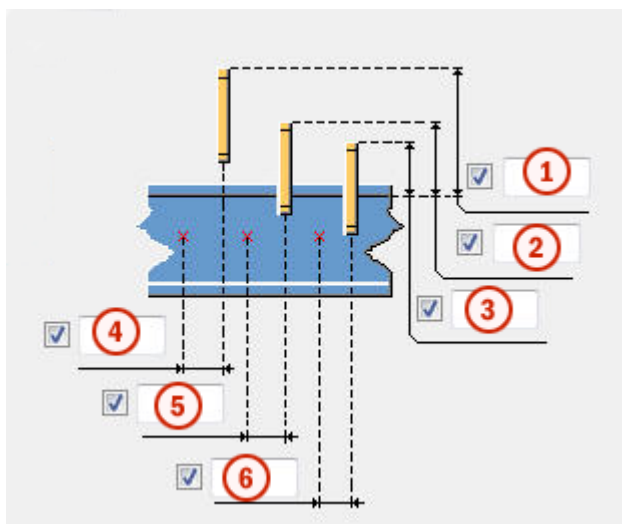
	Description
1	Horizontal dimension of the chamfer.
2	Vertical dimension of the chamfer.

### Top and bottom chamfer type

Option for top chamfer	Option for bottom chamfer	Description
		Default No chamfer AutoDefaults can change this option.
		No chamfer
		Line chamfer
		Convex arc chamfer
		Concave arc chamfer

### Stiffener offset

Stiffeners can be moved from the center of the beam horizontally or vertically. Enter a negative value to move the stiffeners in the opposite direction.

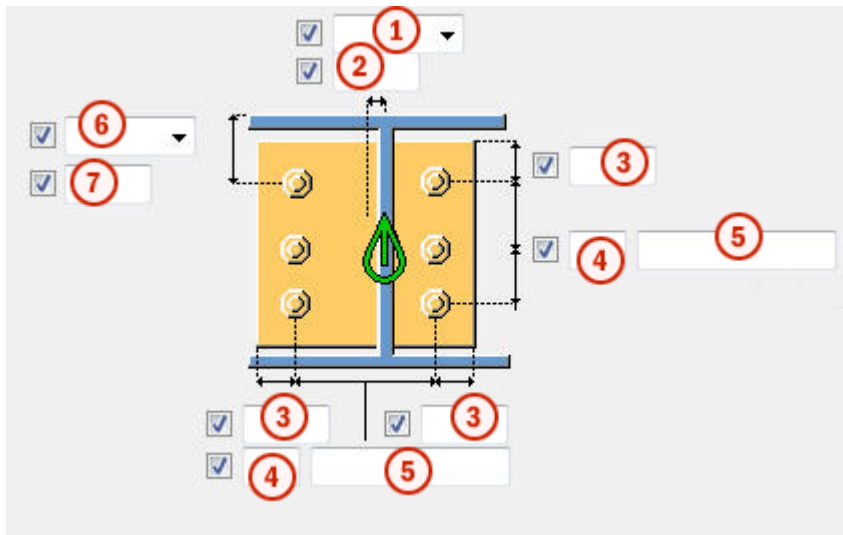


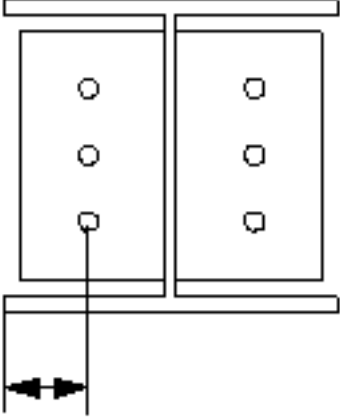
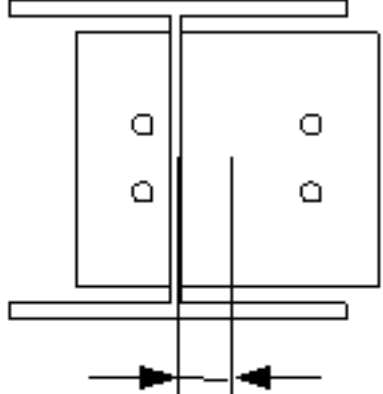
	Description
1	Left stiffener vertical offset.
2	Center stiffener vertical offset.
3	Right stiffener vertical offset.
4	Left stiffener horizontal offset.
5	Center stiffener horizontal offset.
6	Right stiffener horizontal offset.

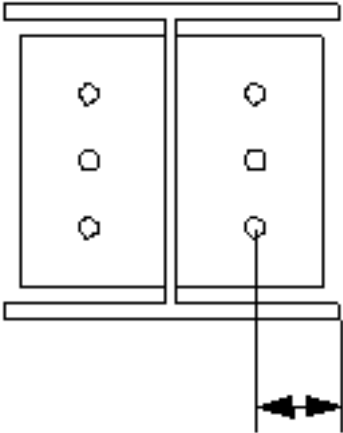
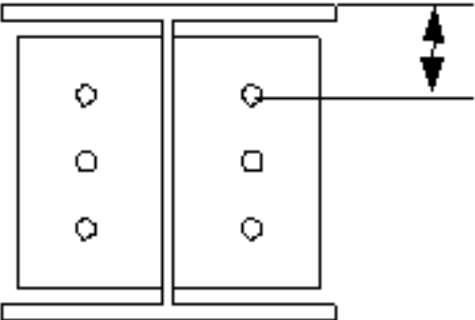
### ***Bolts tab***

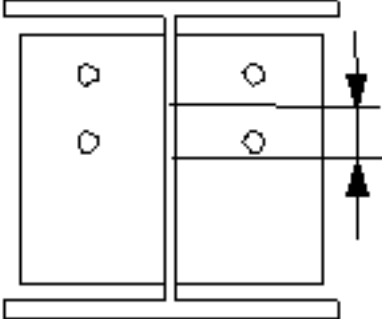
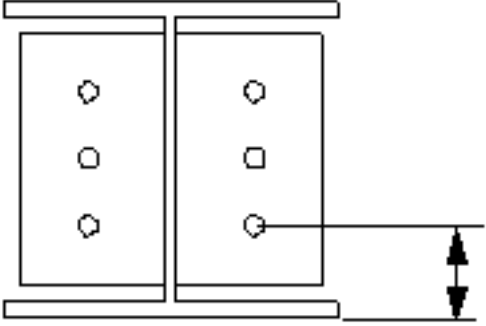
Use the **Bolts** tab to control the bolt properties.

### **Bolt group dimensions**



	Description
1	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.              </li> <li> <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.              </li> </ul>

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
2	Dimension for horizontal bolt group position.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Number of bolts.
5	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
6	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part. </li> </ul>  <ul style="list-style-type: none"> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt. </li> </ul> 
<b>7</b>	Dimension for vertical bolt group position.

### Bolt basic properties

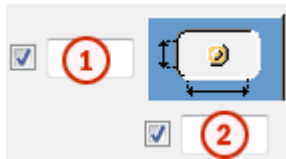
<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes



Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

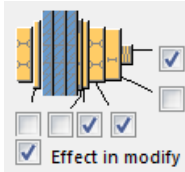


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.









To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### **General tab**

Click the link below to find out more:

[General tab](#)

### ***Design tab***

Click the link below to find out more:

[Design tab](#)

### ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

### ***Welds***

Click the link below to find out more:

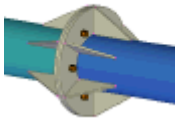
## **Round joining plates (124)**

**Round joining plates (124)** connects two beams or two columns with bolted base plates. Stiffeners can also be created.

### **Objects created**

- Base plates
- Stiffeners
- Bolts
- Welds

### **Use for**

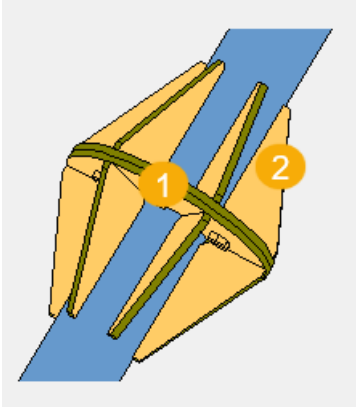
<b>Situation</b>	<b>Description</b>
	Round end plates connecting two beams. Stiffeners are created.

### **Selection order**

1. Select the main part.
2. Select the secondary part.

The connection is created automatically when the secondary part is selected.

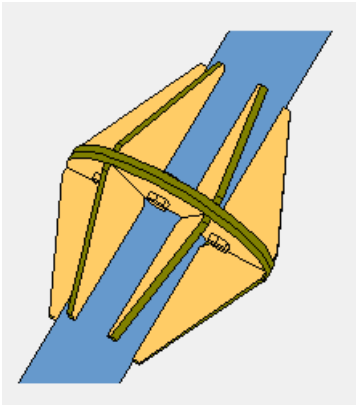
### Part identification key



	Description
1	Base plate
2	Tube stiffener

### Picture tab

#### Joining plates



### Parts tab

Use the **Parts** tab to control the base plate and stiffener properties.

#### Parts

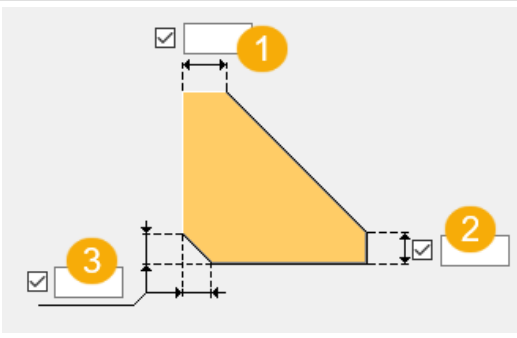
Option	Description
<b>Base plate</b>	Thickness and width of the base plate.
<b>Tube stiffeners 1, Tube stiffeners 2</b>	Thickness, width and height of the tube stiffeners.

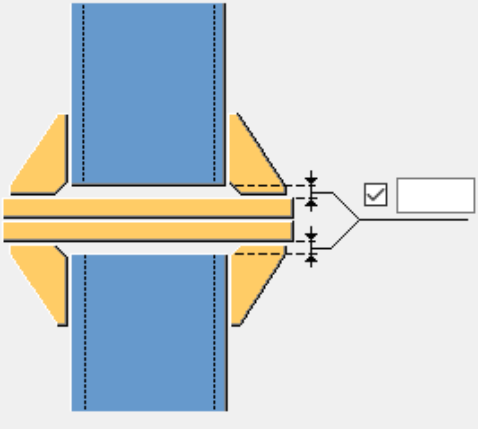
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### **Parameters tab**

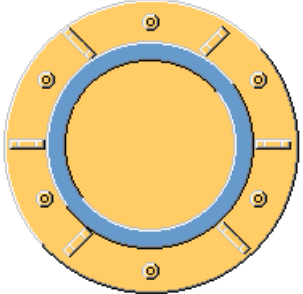
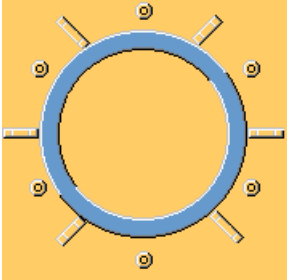
Use the **Parameters** tab to control the shape and position of the base plate, the number of stiffeners, and the chamfer dimensions.

### **Stiffeners**

Option	Description
<b>Quantity of stiffeners</b>	Define how many stiffeners are created.
	Define the stiffener chamfer dimensions: <ol style="list-style-type: none"> <li>1. Chamfers the stiffener corner where it meets only the column.</li> <li>2. Chamfers the stiffener corner at the outer edge of the base plate.</li> <li>3. Chamfers the stiffener corner at the intersection of the column and the base plate.</li> </ol>

Option	Description
	<p>Define the weld gap between the parts and the base plates.</p>

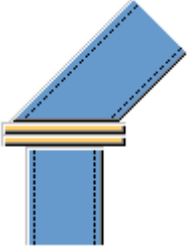
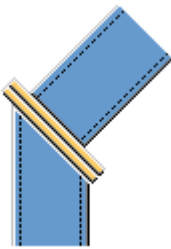
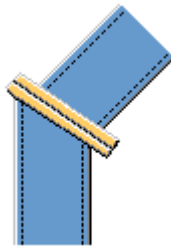
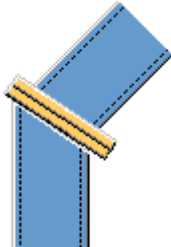
### Base plate shape

Option	Description
	<p>Round base plate</p>
	<p>Square base plate</p>

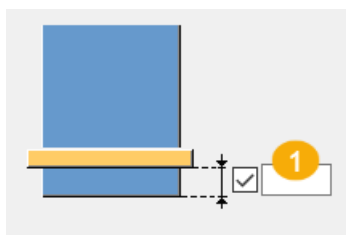
### Plate type

Select the plate type.

## Base plate direction

Option	Description
	Creates the base plates perpendicular to the main part.
	Creates the base plates perpendicular to the secondary part.
	Creates the base plates at an angle which bisects the angle of the main and secondary parts.
	Creates the base plates parallel with the connection symbol.

## Overlap

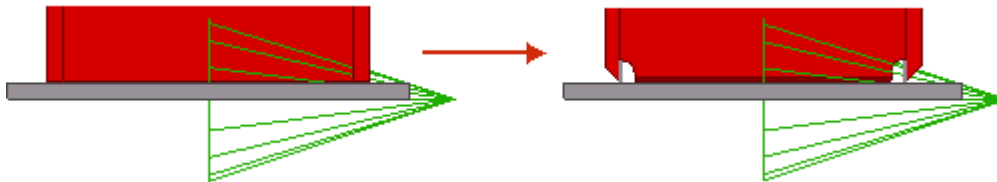


	Description
1	Distance between the part flange and the plate flange.

## Using additional components

You can use additional system or custom components to modify the column end or the base plate. For example, you can create special backing plates, weld preparations, and weld access holes for the column end.

If you use additional system or custom components, you need to manage the column end or the base plate properties in the additional component in question. When using several components, there may be multiple welds and cuts.

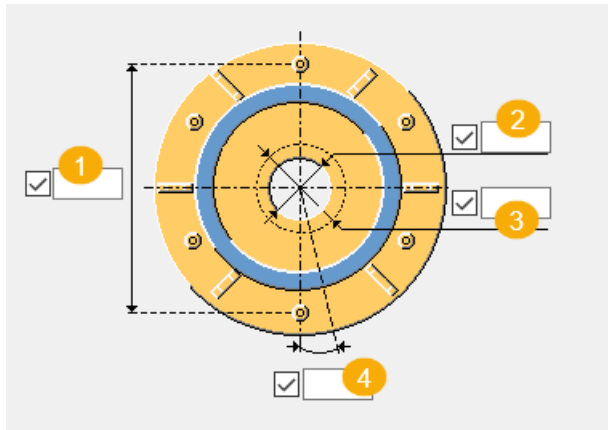


Option	Description
<b>Component</b>	Select a system or a custom component from the <b>Applications &amp; components</b> catalog.
<b>Attributes</b>	Select an attribute file for the component.
<b>Input</b>	Define to which parts the selected component is applied. <ul style="list-style-type: none"><li>• <b>Default</b> is the same as <b>Base + Column</b>.</li><li>• <b>Column</b> sets the column as the main part. Use this option for details.</li><li>• <b>Column + Base</b> sets the column as the main part and the base plate as the secondary part.</li><li>• <b>Base + Column</b> sets the base plate as the main part and the column as the secondary part.</li><li>• <b>Base</b> sets the base plate as the main part.</li></ul>

### **Bolts tab**

Use the **Bolts** tab to control the bolt properties, the diameter of the inner plate, and the bolt angle.





	Description	Default
1	Diameter of the bolt circle	
2	Base plate 1 inner diameter Creates a centered hole in base plate 1	Main part diameter plus tolerance
3	Base plate 2 inner diameter Creates a centered hole in base plate 2	Secondary part diameter plus tolerance
4	Bolt angle (in degrees)	

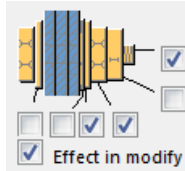
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## **Bolt assembly**

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## ***General tab***

Click the link below to find out more:

[General tab](#)

## ***Design tab***

Click the link below to find out more:

## ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

## ***Welds***

Click the link below to find out more:

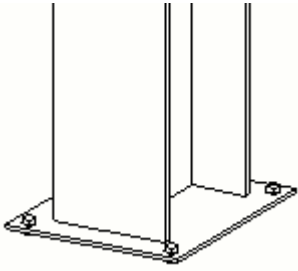
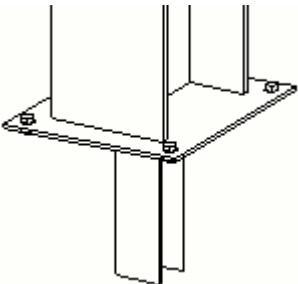
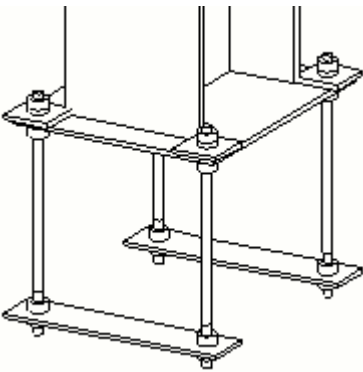
## **Base plate (1004)**

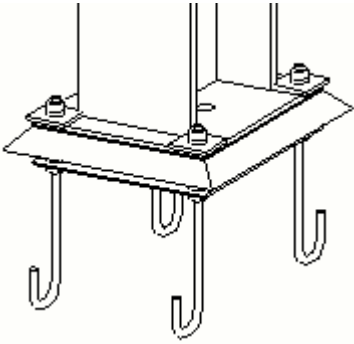
**Base plate (1004)** creates a base plate that is connected to a column end.

## Objects created

- Base plate
- Shim plates (optional)
- Leveling plate (optional)
- Grout (optional)
- Shear key (optional)
- Extra plates connecting the anchor rods
- Anchor rods
- Bolts
- Additional component (optional)
- Welds

## Use for

Situation	Description
 A technical drawing showing a simple base plate. It consists of a flat rectangular plate with four anchor rods extending downwards from its corners. The anchor rods are secured with nuts and washers at the top of the plate.	Simple base plate detail
 A technical drawing showing a base plate with a shear key. The base plate is rectangular and has four anchor rods. A vertical shear key is attached to the bottom edge of the plate, extending downwards. The anchor rods are secured with nuts and washers.	Base plate detail with a shear key
 A technical drawing showing a complex base plate assembly. It features a main rectangular base plate with four straight anchor rods extending downwards. Additional plates are connected to the anchor rods, providing extra support and stability. The anchor rods are secured with nuts and washers.	Base plate detail with <ul style="list-style-type: none"><li>• Straight anchor rods</li><li>• Extra plates connecting the anchors</li></ul>

Situation	Description
	<p>Base plate detail with</p> <ul style="list-style-type: none"> <li>• Anchor rods with hooks</li> <li>• Leveling plate below the base plate</li> <li>• Grout and hole for grouting</li> <li>• Cast plate</li> </ul>

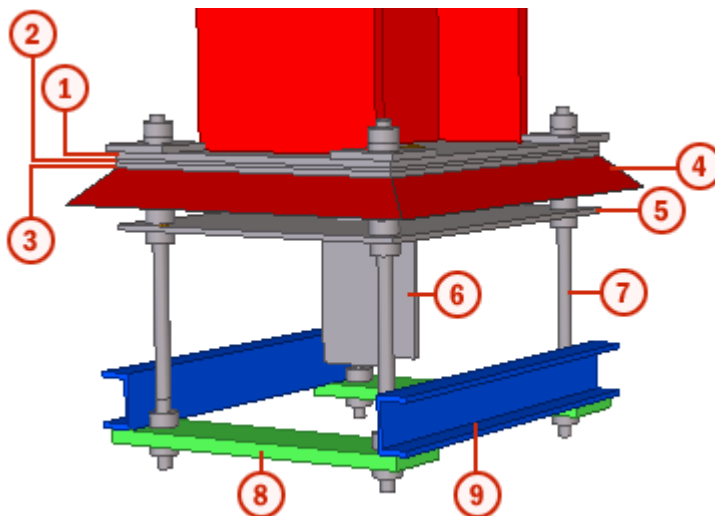
### Before you start

Create a column.

### Selection order

1. Select the main part (column).
2. Pick a position.  
The detail is created automatically.

### Part identification key






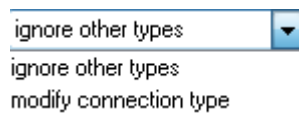
	Part
1	Base plate
2	Shim plate
3	Leveling plate
4	Grout
5	Cast plate
6	Shear key

	Part
7	Anchor rod
8	Extra plate 1
9	Extra plate 2

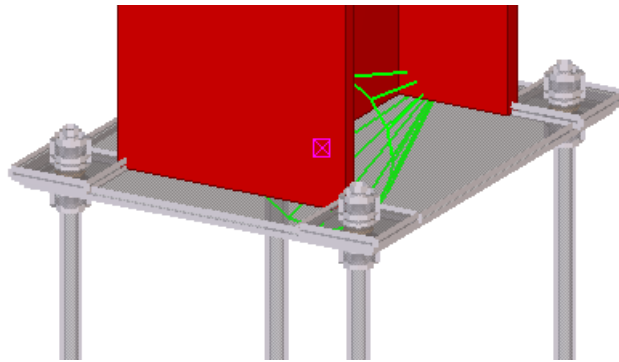
**Example: Add a base plate and anchor rods using Base plate (1004)**

In this example, you will add a base plate detail and anchor rods to a column.

1. Click the **Applications & components** button  in the side pane to open the **Applications & components** catalog.
2. Enter `base plate` in the search box.  
To view the thumbnail images of the components in the search results click .
3. Select **Base plate (1004)**.
4. Select the column.
5. Pick a position at the base of the column.  
Tekla Structures automatically adds the base plate when you pick the position.
6. Next, modify the anchor rod dimensions.
  - a. Switch on the **Select components** switch  to more easily select components.
  - b. Double-click the component symbol in the model to open the **Base plate (1004)** component dialog box.
  - c. Go to the **Anchor rods** tab.
  - d. Change the dimensions of the anchor rods.
  - e. To change only this base plate, select **ignore other types** from the list in the top part of the dialog box.



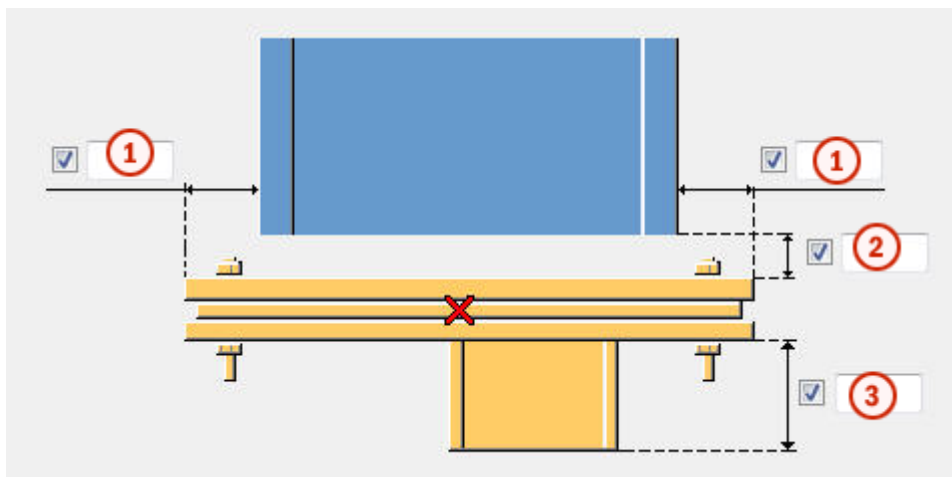
- f. Click **Modify**.



### Picture tab

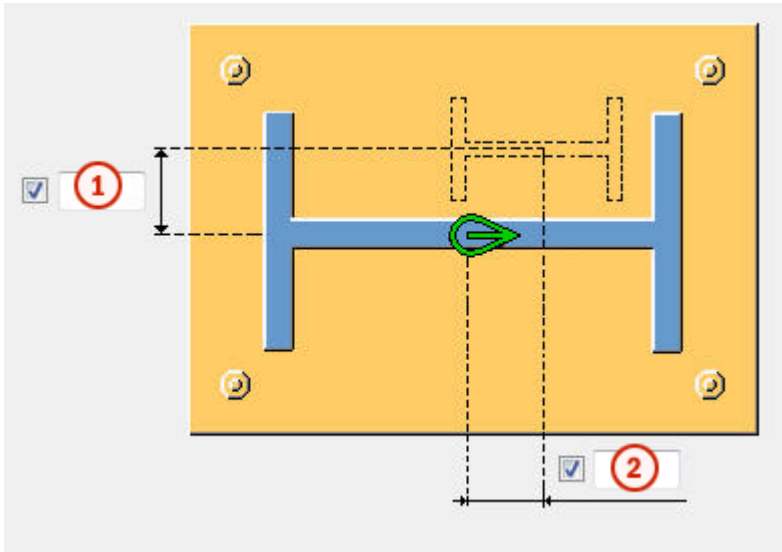
Use the **Picture** tab to control the position of the base plate and the length and position of the shear key.

### Dimensions



	Description
1	Distance from the flange to the edge of the base plate. Enter a negative value to make the base plate larger.
2	Weld gap.
3	Height of the shear key.

## Shear key offset



	Description
1	Shear key vertical offset from the column center.
2	Shear key horizontal offset from the column center.

### Parts tab

Use the **Parts** tab to control the dimensions of the base plate, shear key, leveling plate, and shim plates.

### Plate

Option	Description	Default
<b>Plate</b>	Base plate thickness.	thickness = 0.5*bolt diameter rounded up to the next plate thickness  The default name is BASEPLATE.
<b>Leveling Plate</b>	Leveling plate thickness, width and height.	thickness = 1/4
<b>Leveling plate hole diameter</b>	Leveling plate hole diameter.	
<b>Leveling plate hole tolerance</b>	Leveling plate hole tolerance.	

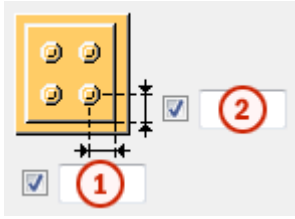
Option	Description	Default
<b>Fitting plate</b>	Shim plate thickness, width and height. Define up to three different shim plates.	
<b>Number of fitting pl.</b>	Number of shim plates for each thickness.	1
<b>Additional beam</b>	Shear key profile by selecting it from the profile catalog.	HEA 300 (in Default environment)
<b>Additional beam rotation</b>	Select the shear key rotation type and define the rotation angle.	
<b>Additional beam welded to</b>	Define to which plate the shear key is welded.	

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

### **Bolt edge distances in shim plate**

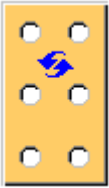
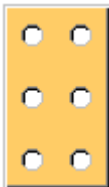


Define the bolt edge distances for shim plates. When these fields are empty, shim plates are of the same size as the base plate.


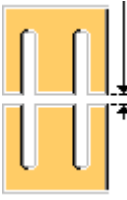




	Description	Default
1	Horizontal bolt edge distance in the shim plate.	30 mm
2	Vertical bolt edge distance in the shim plate.	30 mm

### Shim plate shape

Option	Description
	Default Holes are based on the bolt group of the connection. AutoDefaults can change this option.
	Holes are based on the bolt group of the connection.
	Finger shim plate with horizontal slots. The plate can be installed from the right or the left side of the connection.
	Finger shim plate with vertical slots. The plate can be installed from the top of the connection.

Option	Description
	Two separate finger shim plates with horizontal slots.
	Two separate finger shim plates with vertical slots.

### Tolerance

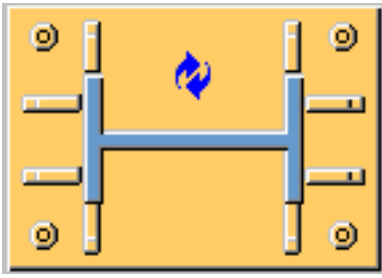
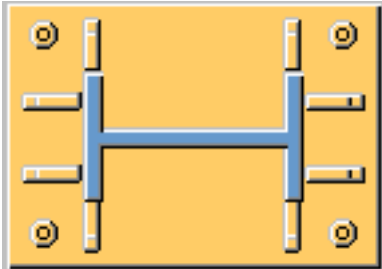
Define the tolerance for the slots in finger shim plates. The width of the slot is the bolt diameter + the tolerance.


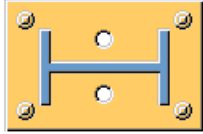
### Parameters tab

Use the **Parameters** tab to control the component and the grout hole.

### Grout hole

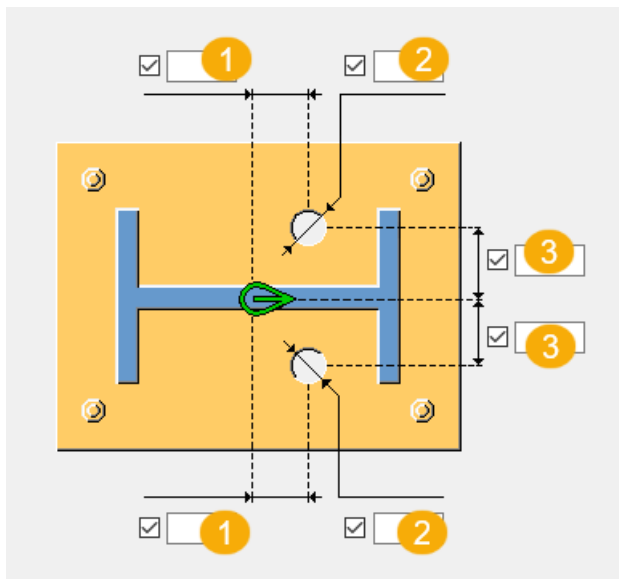
Define whether a grout hole is created in the base plate. The hole is also created in the leveling plate and shim plates, if they exist in the detail.

Option	Description
	Default Grout hole is not created. AutoDefaults can change this option.
	Grout hole is not created.

Option	Description
	Grout hole is created.
	Two grout holes are created.

### Grout hole dimensions

If the base plate has two grout holes, define the dimensions for both holes.



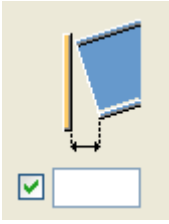
	Description
<b>1</b>	Location of the grout hole from the center of the column in the direction of the web.
<b>2</b>	Grout hole diameter.
<b>3</b>	Location of the grout hole from the center of the column in the direction of the flange.

### Gap size

Define the limit value for the gap between the base plate and the column. Use this when the column is slightly inclined.

If the actual gap is smaller than this value, the end of the column is left straight.

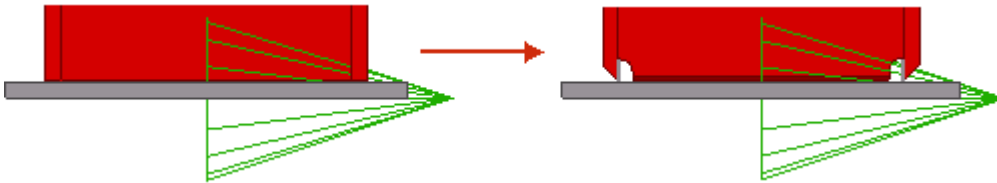
If the actual gap is larger than this value, the end of the column is fitted to the base plate.



### Using additional components

You can use additional system or custom components to modify the column end or the base plate. For example, you can create special backing plates, weld preparations, and weld access holes for the column end.

If you use additional system or custom components, you need to manage the column end or the base plate properties in the additional component in question. When using several components, there may be multiple welds and cuts.

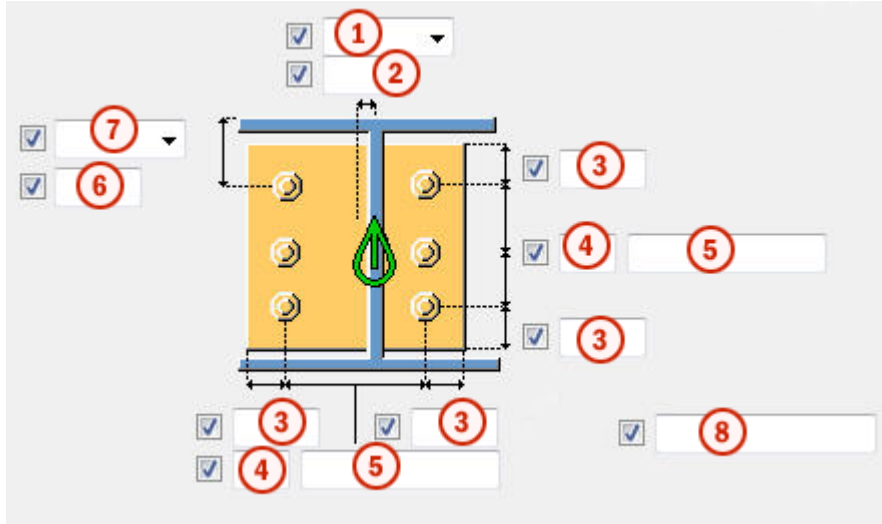


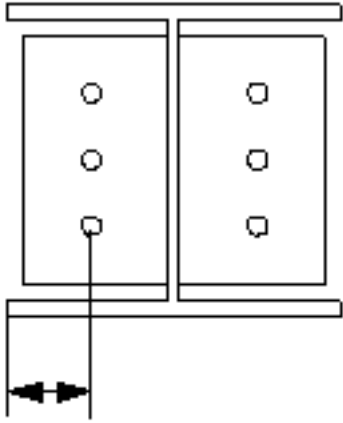
Option	Description
<b>Component</b>	Select a system or a custom component from the <b>Applications &amp; components</b> catalog.
<b>Attributes</b>	Select an attribute file for the component.
<b>Input</b>	Define to which parts the selected component is applied. <ul style="list-style-type: none"> <li>• <b>Default</b> is same as <b>Base + Column</b>.</li> <li>• <b>Column</b> sets the column as the main part. Use this option for details.</li> <li>• <b>Column + Base</b> sets the column as the main part and the base plate as the secondary part.</li> <li>• <b>Base + Column</b> sets the base plate as the main part and the column as the secondary part.</li> <li>• <b>Base</b> sets the base plate as the main part.</li> </ul>

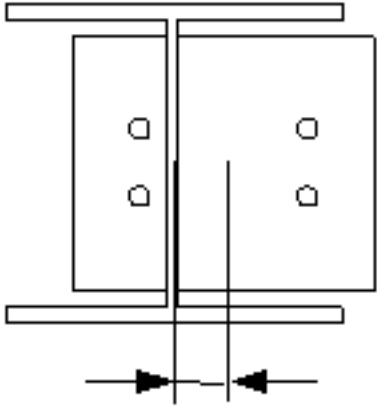
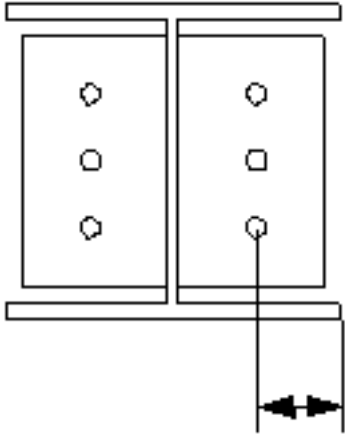
## Bolts tab

Use the **Bolts** tab to control the bolt properties.

### Bolt group dimensions



	Description
1	Select how to measure the dimensions for horizontal bolt group position. <ul style="list-style-type: none"><li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li></ul>  <p>The diagram shows two vertical rectangular panels, each with three circular bolt holes. A horizontal line is drawn across the top of both panels. A vertical dimension line with arrows at both ends is shown below the panels, extending from the left edge of the left panel to the center of the leftmost bolt hole in the left panel.</p>

	Description
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.            </li> <li> <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.            </li> </ul>
2	Dimension for horizontal bolt group position.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Number of bolts.
5	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
6	Dimension for vertical bolt group position.

	Description
7	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.           <div> </div> </li> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.           <div> </div> </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.           <div> </div> </li> </ul>

	Description
8	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Cut length

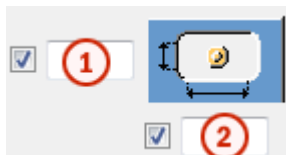
Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

### Bolt comment

You can define a bolt comment.

### Slotted holes

You can define slotted, oversized, or tapped holes.



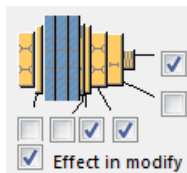


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

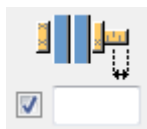
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Anchor rods tab

Use the **Anchor rods** tab to control the creation of different types of anchor rods.

## Anchor rod dimensions

Option	Description
<b>Rod profile</b>	Anchor rod profile. You can add a comment about the part.
<b>Nut profile</b>	Nut profile.
<b>Washer profile</b>	Washer profile.
<b>Plate washer</b>	Plate washer thickness, width and height.
<b>Cast plate</b>	Cast plate thickness, width and height.
<b>Grout</b>	Grout thickness. Grouting helps you to model columns to the top of concrete parts and place the base plate correctly. It also makes it easier to dimension the detail in GA drawings. By default, no grouting is created. Select whether the grouting is created with or without slopes above or below the detail creation point. This also affects the shim plates.

## Anchor rod part properties

Option	Description	Default
<b>Pos_no</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

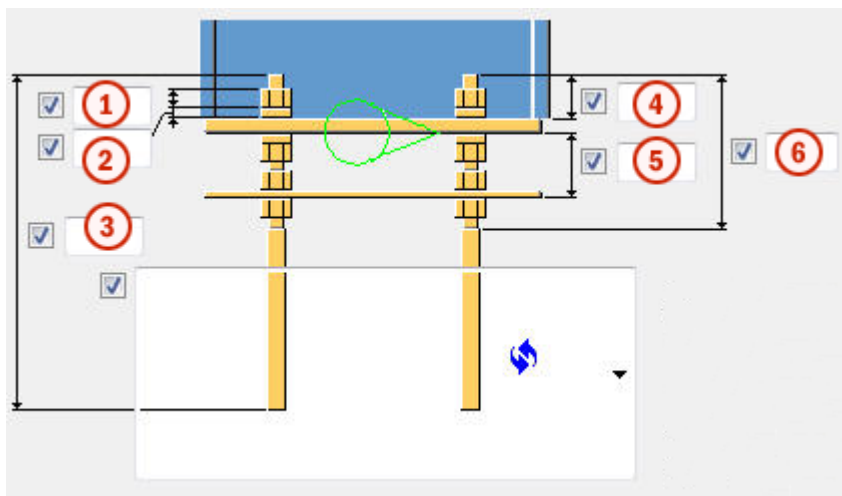
Option	Description	Default
<b>Finish</b>	Describes how the part surface has been treated.	
<b>Comment</b>	Add a comment about the part.	

### Base plate with

Select whether to create the base plate with bolts, anchor rods, or a custom component.




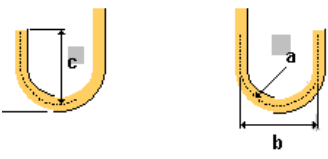
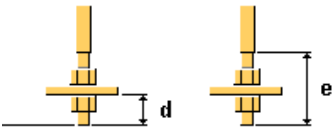
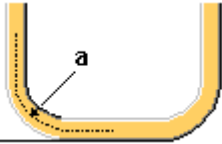
By default, the base plate is created with **Bolts**.

### Anchor rod dimensions








	Description	Default
<b>1</b>	Size or the length of the nut.	anchor rod diameter
<b>2</b>	Size or the thickness of the washer.	half of nut size
<b>3</b>	Length of the anchor rod.	500 mm
<b>4</b>	Length of the anchor rod above the base plate.	50 mm
<b>5</b>	Distance between the cast plate and the base plate.	60 mm
<b>6</b>	Length of the upper thread.	0 mm

## Anchor rods types




Option	Description	
	Default Type 1 AutoDefaults can change this option.	
	Type 1	
	<b>a</b> Radius of the hook <b>b</b> Width of the hook	<b>a</b> = 2*anchor bar diameter <b>b</b> = 1/5 of anchor bar length
	<b>a</b> Radius of the hook <b>b</b> Width of the hook <b>c</b> Height of the hook	<b>c</b> = same as width of the hook
	<b>d</b> Length of the anchor rod below the extra plate <b>e</b> Length of the lower thread	<b>d</b> = 2*nut size <b>e</b> = 4*nut size plus thickness of extra plate
	<b>a</b> U-shape anchor rod Radius of the hook	

## Hook direction

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2
	Type 3
	Type 4

## Bolting direction

**NOTE** You can define the bolting direction if you have created the base plate with bolts.

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

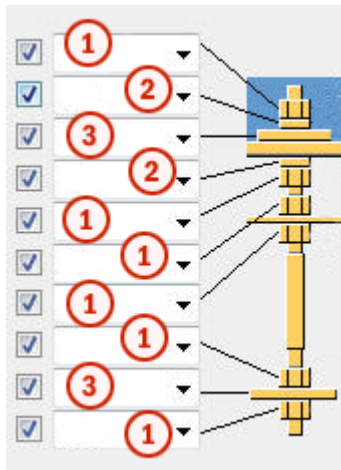
### Cast plate holes tolerance

Option	Description	Default
<b>Cast plate holes tolerance</b>	Tolerance of the cast plate holes.	same as bolt tolerance

### Washer hole tolerance

Option	Description
<b>Create hole in washer</b>	By default, a hole is not created in the washer. Tolerance of the washer hole.

### Create



	Description
<b>1</b>	Create the nut profile.
<b>2</b>	Create the washer profile.
<b>3</b>	Create the washer plate.

### Anchor rod assembly

Define which parts of the anchor rod are included in the anchor rod assembly. You can weld the washer plates above and below the base plate.

### **Extra plates tab**

Use the **Extra plates** tab to control the placement, rotation, and type of the profiles (extra profile 1) created at the bottom of each anchor bar and the profiles (extra profile 2) that connect rows of anchor bars.

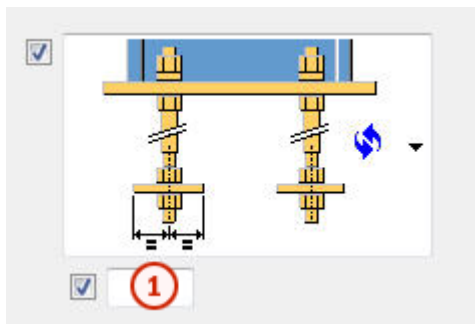
## Part dimensions

Option	Description	Default
<b>Extra profile 1</b>	Define the first extra profile by selecting it from the profile catalog.	PL10*100
<b>Extra profile 2</b>	Define the second extra profile by selecting it from the profile catalog.	

## Part properties

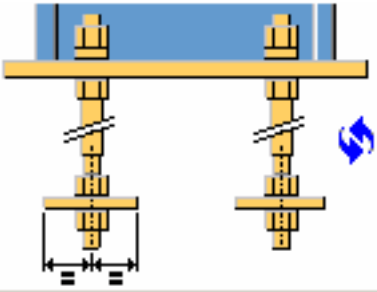
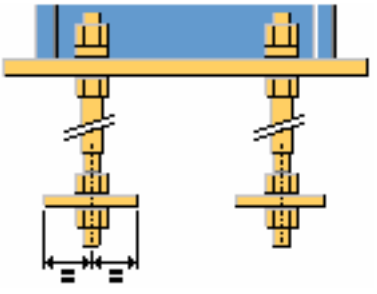
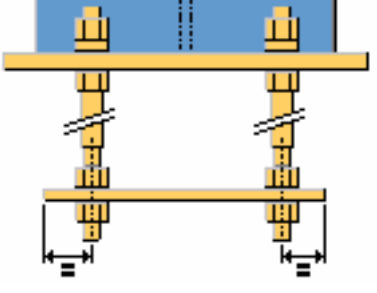
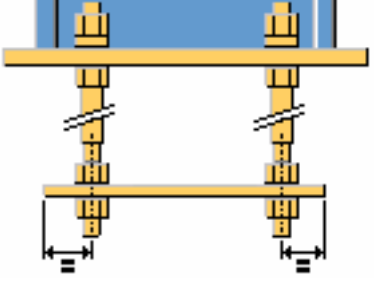
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

## Edge distance of extra profile 1



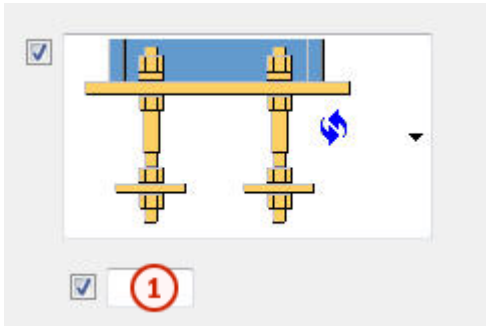
	Description	Default
1	Edge distance of extra profile 1.	50 mm

### Type and direction of extra profile 1

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2
	Type 3



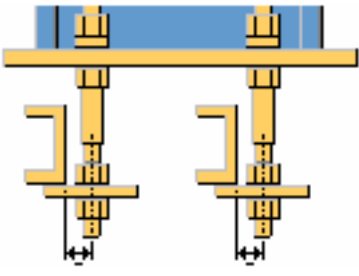
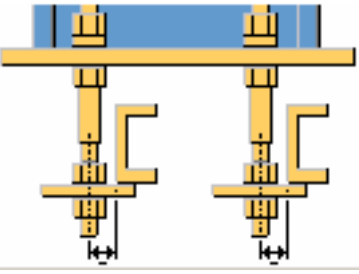
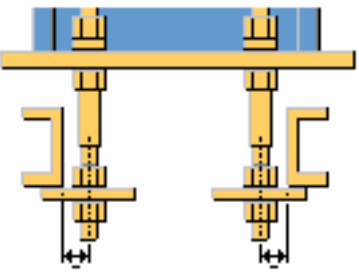
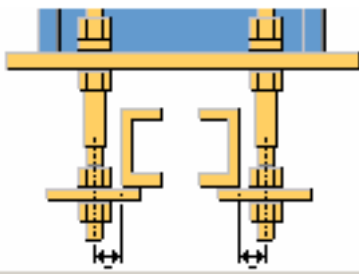
## Edge distance of extra profile 2



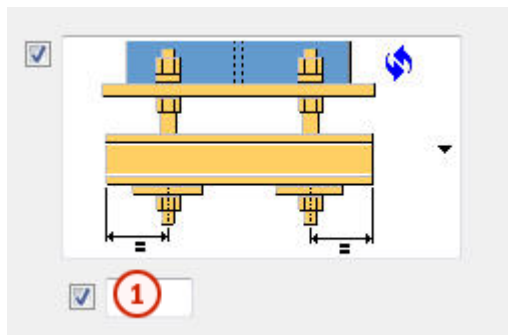
	Description	Default
1	Distance of extra profile 2 from the axis of the anchor bar.	Half of the nut size or anchor bar diameter

## Extra profile 2 type

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2

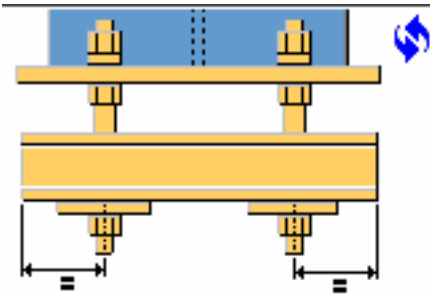
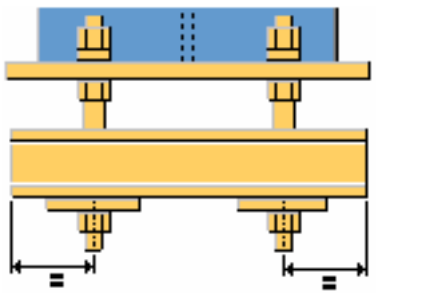
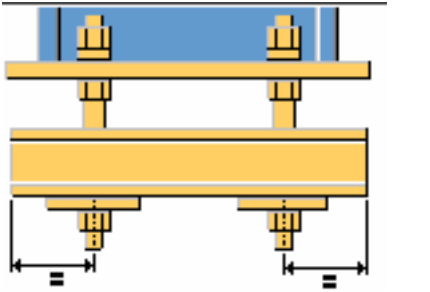
Option	Description
	Type 3
	Type 4
	Type 5
	Type 6

**Length of extra profile 2**



	Description	Default
1	Length of extra profile 2 from the axis of the anchor bar.	50 mm

### Direction of extra profile 2

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2

### Extra profile 1 properties

Option	Description	Default
<b>Hole tolerance</b>	Hole tolerance of extra profile 1.	Same as bolt tolerance
<b>Circular profile height</b>	Enter the height of a circular extra profile 1.	
<b>Profile rotation</b>	Profile rotation of extra profile 1.	Front

## Extra profile 2 rotation

Option	Description	Default
<b>Extra profile 2 rotation</b>	Profile rotation of extra profile 2.	Front

### ***General tab***

Click the link below to find out more:

General tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

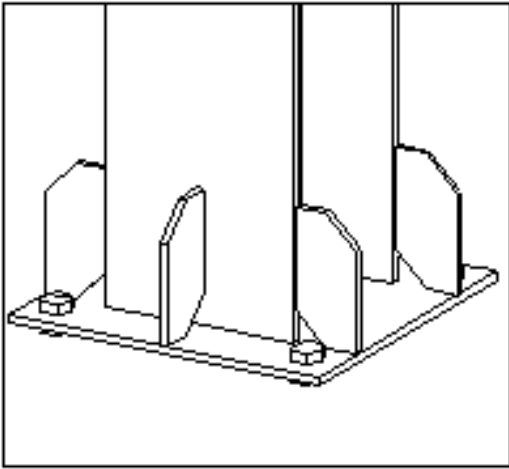
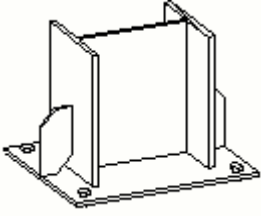
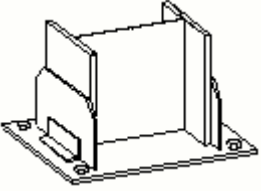
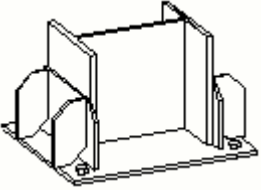
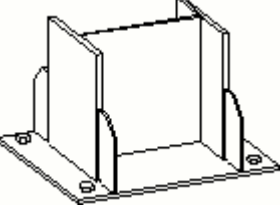
## **Stiffened base plate (1014)**

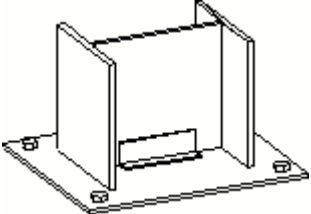
**Stiffened base plate (1014)** creates a base plate that is connected to a column end.

### **Objects created**

- Base plate
- Stiffeners
- Shim plates (optional)
- Leveling plate (optional)
- Shear key (optional)
- Extra plates connecting the anchor rods
- Anchor rods
- Bolts
- Welds
- Additional component (optional)

**Use for**

Situation	Description
	<p>Base plate with stiffeners</p>
	<p>Base plate with stiffeners on the flange</p>
	<p>Base plate with stiffeners on the flange</p>
	<p>Base plate with stiffeners on the flange</p>
	<p>Base plate with stiffeners on the flange</p>

Situation	Description
	Base plate with stiffeners on the web

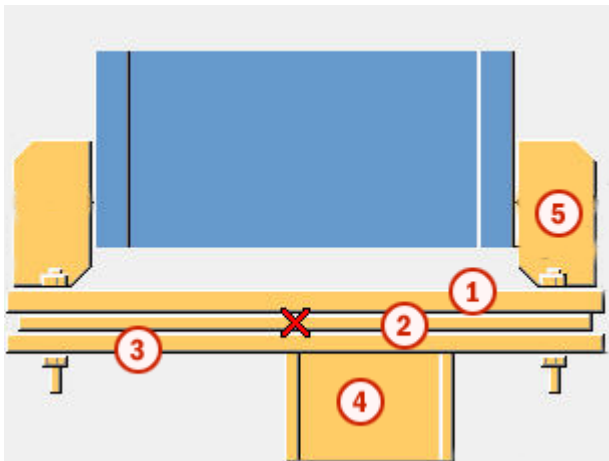
### Before you start

Create a column.

### Selection order

1. Select the main part (column).
2. Pick a position.  
The detail is created automatically.

### Part identification key

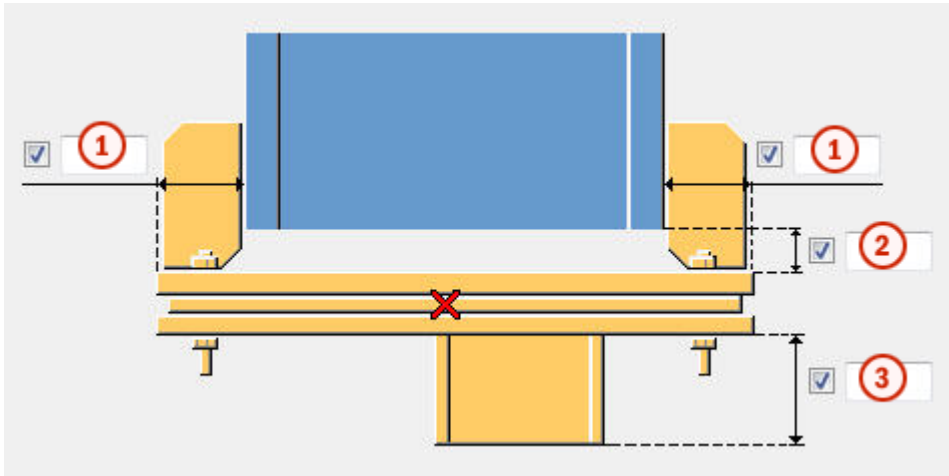


	Part
1	Base plate
2	Shim plate
3	Leveling plate
4	Shear key
5	Stiffener

### Picture tab

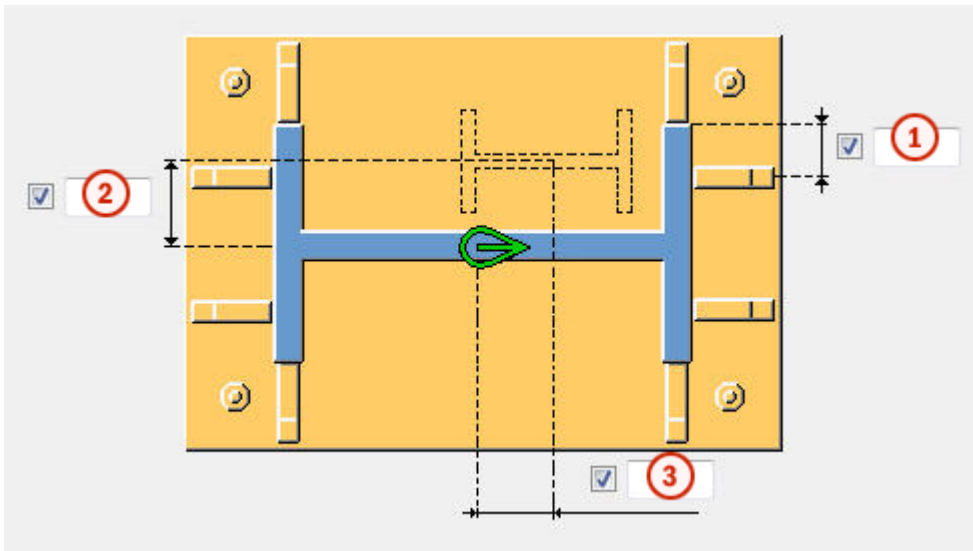
Use the **Picture** tab to control the position of the base plate and the length and position of the shear key.

## Dimensions



	Description	Default
1	Distance from the flange to the edge of the base plate. Enter a negative value to make the base plate larger.	
2	Weld gap.	
3	Height of the shear key.	Equal to the column width

## Shear key offset



	Description
1	Distance of the stiffener from the edge of the column flange.
2	Shear key vertical offset from the column center.

	Description
3	Shear key horizontal offset from the column center.

### **Parts tab**

Use the **Parts** tab to control the dimensions of the base plate, web plates, flange plates, shear key, leveling plate, and shim plates.

### **Plate**

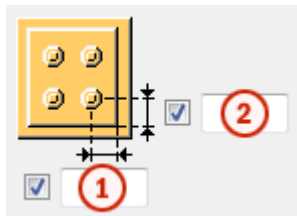
Option	Description	Default
<b>Plate</b>	Base plate thickness.	BASEPLATE
<b>Web plates</b>	Web plate thickness.	10 mm
<b>Flange plate 4</b>	Flange plate thickness.	10 mm
<b>Leveling plate</b>	Leveling plate thickness, width and height.	
<b>Leveling plate hole diameter</b>	Leveling plate hole diameter.	
<b>Fitting plate</b>	Shim plate thickness, width and height.  Define up to three different shim plates.	
<b>Number of fitting pl.</b>	Number of shim plates for each thickness.	1
<b>Additional beam</b>	Shear key profile by selecting it from the profile catalog.	HEA 300 (in Default environment)
<b>Additional beam rotation</b>	Select the shear key rotation type and define the rotation angle.	
<b>Horizontal plates</b>	Horizontal plate thickness.	
<b>L profile, flange</b>	Profile for L profile, flange by selecting it from the profile catalog.	
<b>L profile, web</b>	Profile for L profile, web by selecting it from the profile catalog.	



Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

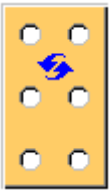





### Bolt edge distances in shim plate

Define the bolt edge distances for shim plates. If you do not enter any distance, the shim plates are of the same size as the base plate.



	Description	Default
<b>1</b>	Horizontal bolt edge distance in the shim plate.	30 mm
<b>2</b>	Vertical bolt edge distance in the shim plate.	30 mm

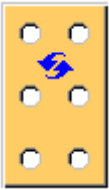



## Shim plate shape

Option	Description
	<p>Default</p> <p>Holes are based on the bolt group of the connection.</p> <p>AutoDefaults can change this option.</p>
	<p>Holes are based on the bolt group of the connection.</p>
	<p>Finger shim plate with horizontal slots.</p> <p>The plate can be installed from the right or the left side of the connection.</p>
	<p>Finger shim plate with vertical slots.</p> <p>The plate can be installed from the top of the connection.</p>
	<p>Two separate finger shim plates with horizontal slots.</p>
	<p>Two separate finger shim plates with vertical slots.</p>

### Tolerance for slots

Define the tolerance for the slots in finger shim plates. The width of the slot is the bolt diameter + the tolerance.

## Base plate mounting grooves

Option	Description
	Default Mounting grooves are not created. AutoDefaults can change this option.
	Mounting grooves are not created.
	Mounting grooves are created horizontally.
	Mounting grooves are created vertically for the first and last row of the bolts. For other rows of bolts, the mounting grooves are created horizontally.

## Tolerance for mounting grooves


Define the tolerance for the mounting grooves in the base plates. The width of the groove is the bolt diameter + the tolerance. If you do not enter a value, the bolt tolerance value is used.

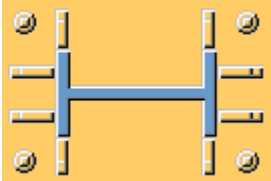
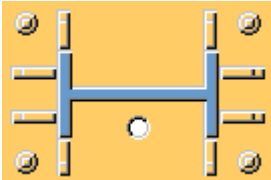
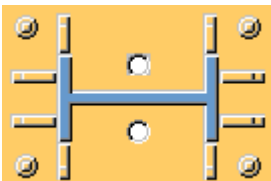
## Parameters tab

Use the **Parameters** tab to control the component and the grout hole.

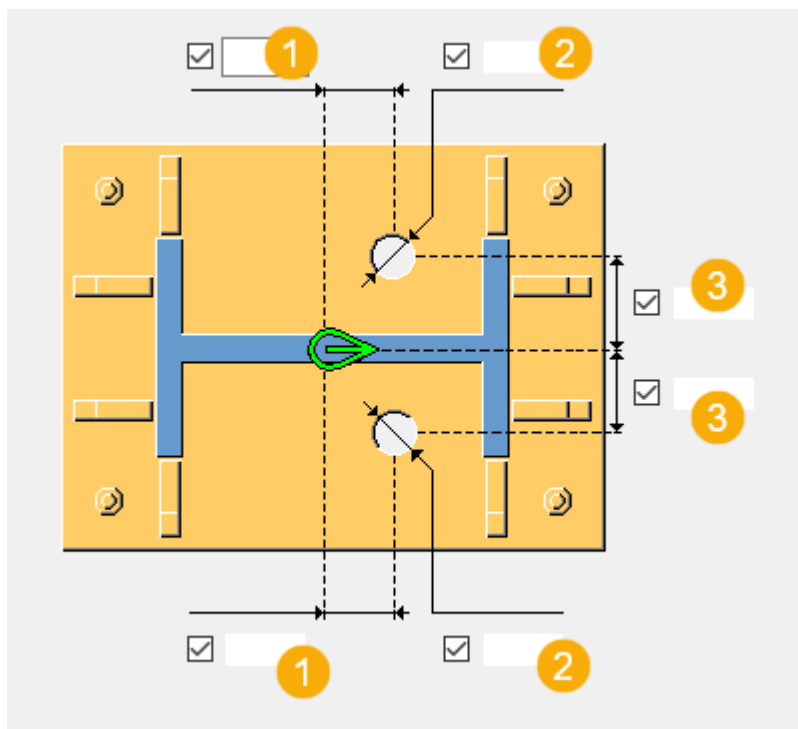
## Grout hole

Define whether a grout hole is created in the base plate. The hole is also created in the leveling plate and shim plates, if they exist in the detail.

Option	Description
	Default Grout hole is not created. AutoDefaults can change this option.

Option	Description
	Grout hole is not created.
	Grout hole is created.
	Two grout holes are created.

### Grout hole dimensions



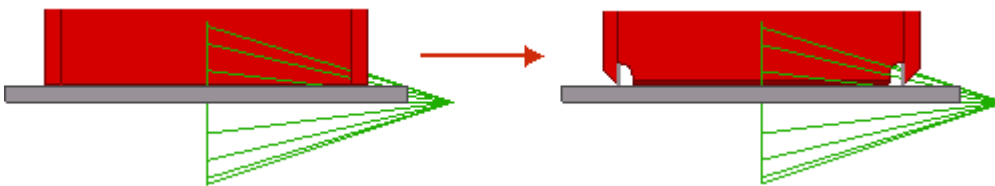
	Description
1	Location of the grout hole from the center of the column in the direction of the web.
2	Grout hole diameter.

	Description
3	Location of the grout hole from the center of the column in the direction of the flange.

### Using additional components

You can use additional system or custom components to modify the column end or the base plate. For example, you can create special backing plates, weld preparations, and weld access holes for the column end.

If you use additional system or custom components, you need to manage the column end or the base plate properties in the additional component in question. When using several components, there may be multiple welds and cuts.

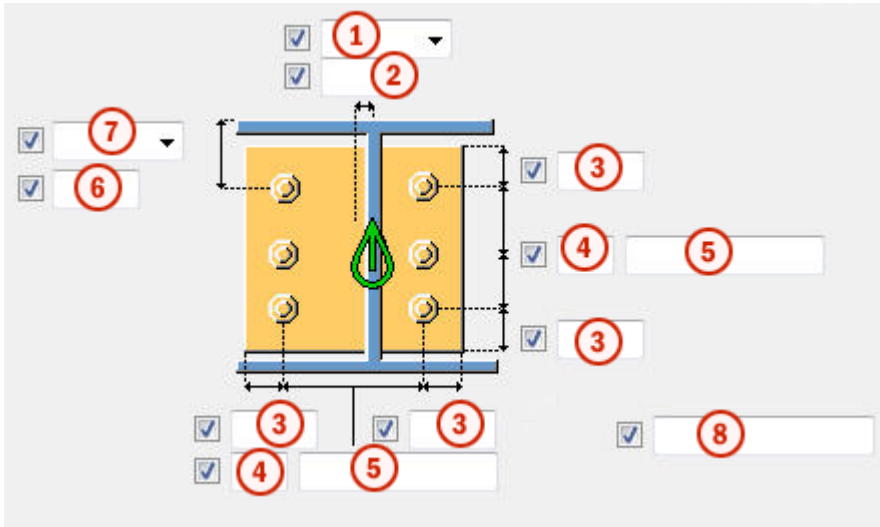


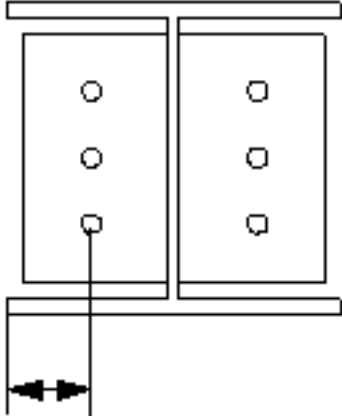
Option	Description
<b>Component</b>	Select a system or a custom component from the <b>Applications &amp; components</b> catalog.
<b>Attributes</b>	Select an attribute file for the component.
<b>Input</b>	Define to which parts the selected component is applied. <ul style="list-style-type: none"> <li>• <b>Default</b> is same as <b>Base + Column</b>.</li> <li>• <b>Column</b> sets the column as the main part. Use this option for details.</li> <li>• <b>Column + Base</b> sets the column as the main part and the base plate as the secondary part.</li> <li>• <b>Base + Column</b> sets the base plate as the main part and the column as the secondary part.</li> <li>• <b>Base</b> sets the base plate as the main part.</li> </ul>

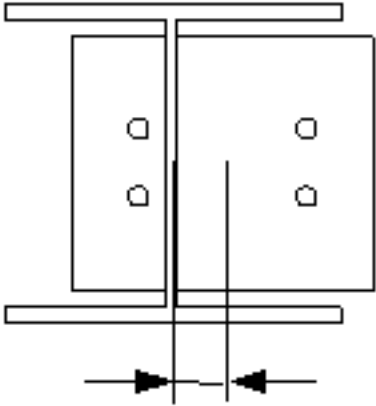
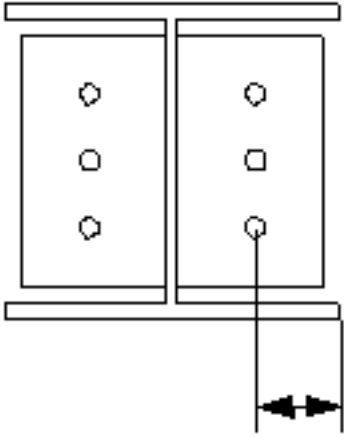
### **Bolts**

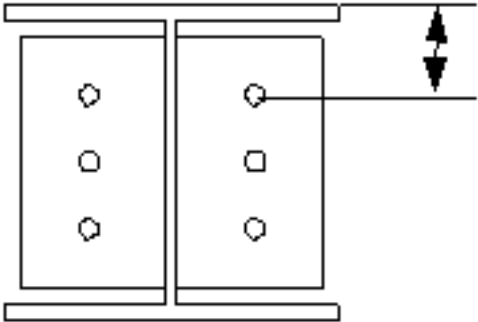
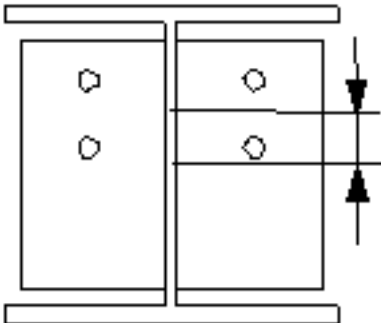
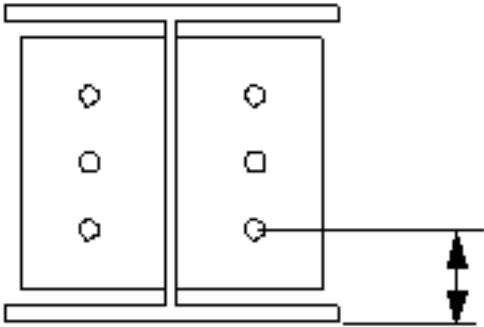
Use the **Bolts** tab to control the bolt properties.

## Bolt group dimensions



	Description
1	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Left:</b> From the left edge of the secondary part to the leftmost bolt. </li> </ul> 

	Description
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.            </li> <li> <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.            </li> </ul>
2	Dimension for horizontal bolt group position.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Number of bolts.
5	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
6	Dimension for vertical bolt group position.

	Description
7	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.              </li> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>



	Description
8	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

### Bolt basic properties

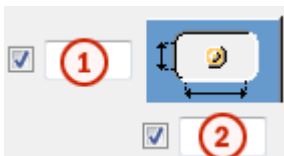
Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Cut length

Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

### Slotted holes

You can define slotted, oversized, or tapped holes.



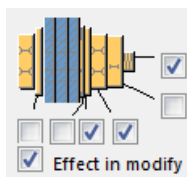
Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.

Option	Description	Default
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
Rotate Slots	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
Slots in	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

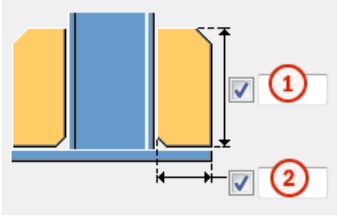
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Stiffeners

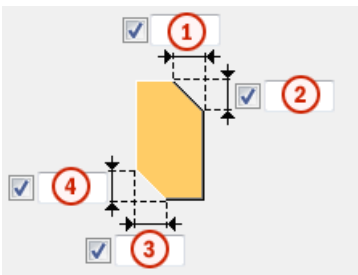
Use the **Stiffeners** tab to control the web plate stiffeners and the flange plate stiffeners.

## Web plate stiffener dimensions



	Description	Default
1	Height of the web plate stiffener.	200 mm
2	Bottom width of the web plate stiffener.	100 mm

## Web plate stiffener chamfer dimensions








	Description
1	Top horizontal chamfer dimension.
2	Top vertical chamfer dimension.
3	Bottom horizontal chamfer dimension.
4	Bottom vertical chamfer dimension.

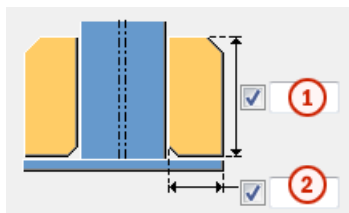
## Web plate stiffener position

You can create stiffeners to different positions using the web plate stiffener position options.

Option	Description
	Default Type 2 AutoDefaults can change this option.
	Type 1
	Type 2

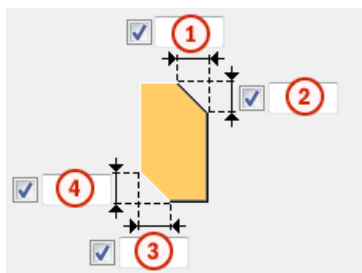
Option	Description
	Type 3
	Type 4
	Type 5
	Type 6
	Type 7

### Flange plate stiffener dimensions



	Description	Default
1	Height of the flange plate stiffener.	200 mm
2	Bottom width of the flange plate stiffener.	100 mm

### Flange plate stiffener chamfer dimensions








	Description
1	Top horizontal chamfer dimension.

	Description
2	The top vertical chamfer dimension.
3	Bottom horizontal chamfer dimension.
4	Bottom vertical chamfer dimension.

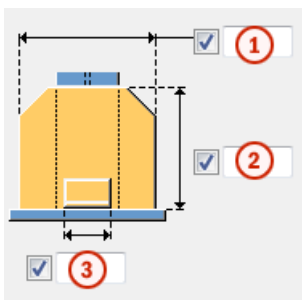
### Flange plate stiffener position

You can create stiffeners to different positions using the flange plate stiffener position options.

Option	Description
	Default Type 2 AutoDefaults can change this option.
	Type 1
	Type 2
	Type 3
	Type 4

### Stiffener dimensions

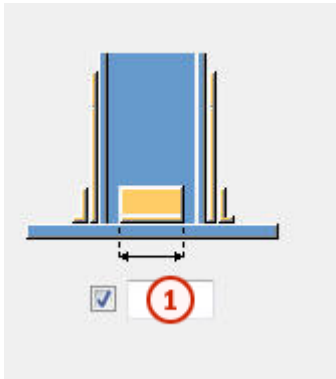
If you have created the stiffeners using other than the default stiffener position options, you can separately define the plate dimensions for different positions.



	Description
1	Width of the stiffener.
2	Height of the stiffener.
3	Width of the stiffener.

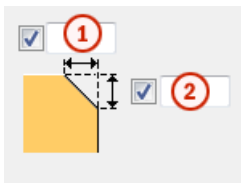
### Stiffener plate width

If you have selected type 5 as the web plate stiffener position or type 4 as the flange plate stiffener position, you can define the stiffener width.



	Description	Default
1	Width of the stiffener.	200 mm

### Stiffener chamfer dimensions



	Description
1	Horizontal chamfer dimension.
2	Vertical chamfer dimension.

### Anchor rods tab

Use the **Anchor rods** tab to control the creation of different types of anchor rods.

### Anchor rod dimensions

Option	Description
<b>Rod profile</b>	Anchor rod profile. You can add a comment about the part.
<b>Nut profile</b>	Nut profile.
<b>Washer profile</b>	Washer profile.
<b>Plate washer</b>	Plate washer thickness, width and height.

Option	Description
<b>Cast plate</b>	Cast plate thickness, width and height.
<b>Grout</b>	<p>Grout thickness.</p> <p>Grouting helps you to model columns to the top of concrete parts and place the base plate correctly. It also makes it easier to dimension the detail in GA drawings.</p> <p>By default, no grouting is created.</p> <p>Select whether the grouting is created with or without slopes above or below the detail creation point. This also affects the shim plates.</p>

### Anchor rod part properties

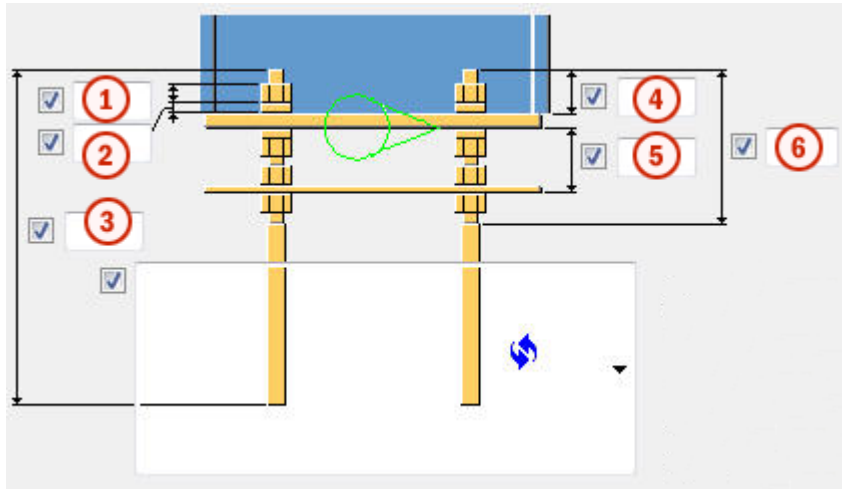
Option	Description	Default
<b>Pos_No</b>	<p>Prefix and start number for the part position number.</p> <p>Some components have a second row of fields where you can enter the assembly position number.</p>	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Base plate with

Select whether to create the base plate with bolts, anchor rods, or a custom component.

By default, the base plate is created with **Bolts**.

## Anchor rod dimensions


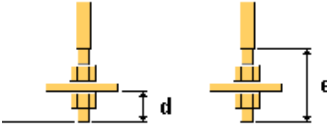


	Description	Default
1	Size or the length of the nut.	anchor rod diameter
2	Size or the thickness of the washer.	half of nut size
3	Length of the anchor rod.	500 mm
4	Length of the anchor rod above the base plate.	50 mm
5	Distance between the cast plate and the base plate.	60 mm
6	Length of the upper thread.	0 mm






## Anchor rods types

Option	Description	
	Default Type 1 AutoDefaults can change this option.	
	Type 1	
	<b>a</b> Radius of the hook <b>b</b> Width of the hook	<b>a</b> = 2*anchor bar diameter <b>b</b> = 1/5 of anchor bar length






Option	Description	
	<p><b>a</b> Radius of the hook</p> <p><b>b</b> Width of the hook</p> <p><b>c</b> Height of the hook</p>	<p><b>c</b> = same as width of the hook</p>
	<p><b>d</b> Length of the anchor rod below the extra plate</p> <p><b>e</b> Length of the lower thread</p>	<p><b>d</b> = 2*nut size</p> <p><b>e</b> = 4*nut size plus thickness of extra plate</p>

### Hook direction

Option	Description
	<p>Default Type 1 AutoDefaults can change this option.</p>
	<p>Type 1</p>
	<p>Type 2</p>
	<p>Type 3</p>
	<p>Type 4</p>

### Bolting direction

**NOTE** You can define the bolting direction if you have created the base plate with bolts.

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

### Cast plate holes tolerance

Option	Description	Default
<b>Cast plate holes tolerance</b>	Tolerance of the cast plate holes.	same as bolt tolerance

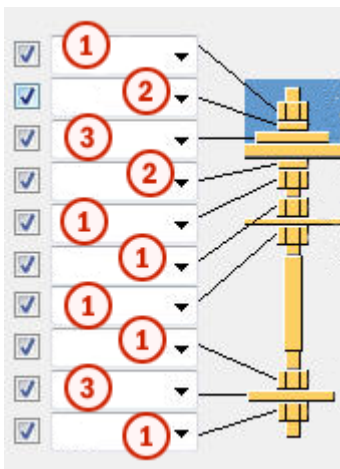
### Washer hole tolerance

Option	Description
<b>Create hole in washer</b>	By default, a hole is not created in the washer.  Tolerance of the washer hole.

### Create assembly from all anchors

Define whether anchors are included in an anchor rod assembly. You can also include leveling plates into the assembly.

### Create



	Description
1	Create the nut profile. You can select to create two nuts at the top of the anchor rods.
2	Create the washer profile.
3	Create the washer plate.

### Anchor rod assembly

Define which parts of the anchor rod are included in the anchor rod assembly. You can weld the washer plates above and below the base plate.

### Extra plates tab

Use the **Extra plates** tab to control the placement, rotation, and type of the profiles (extra profile 1) created at the bottom of each anchor bar and the profiles (extra profile 2) that connect rows of anchor bars.

### Part dimensions

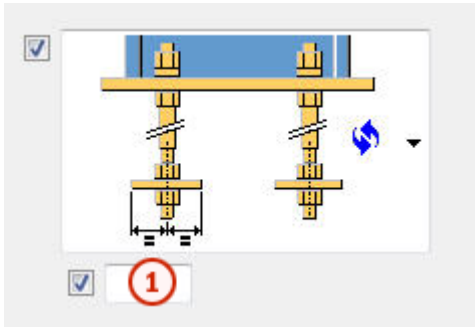
Option	Description	Default
Extra profile 1	First extra profile by selecting it from the profile catalog.	PL10*100
Extra profile 2	Second extra profile by selecting it from the profile catalog.	

### Part properties

Option	Description	Default
Pos_No	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
Material	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

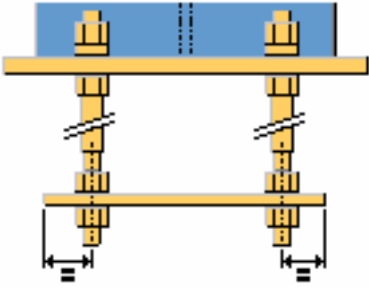
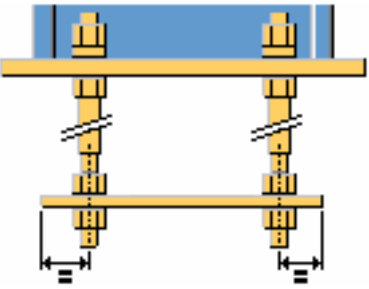
### Edge distance of extra profile 1



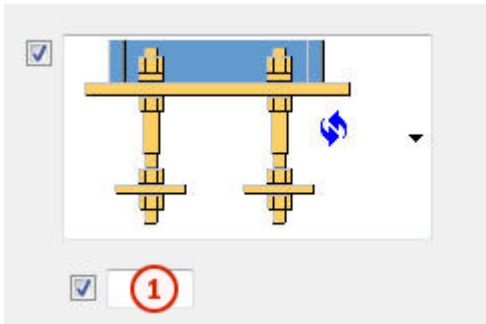
	Description	Default
<b>1</b>	Edge distance of extra profile 1.	50 mm

### Type and direction of extra profile 1

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1

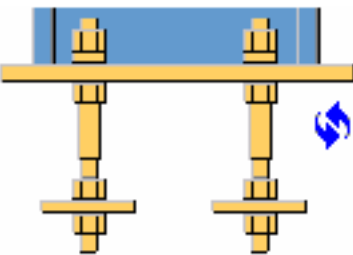
Option	Description
	Type 2
	Type 3

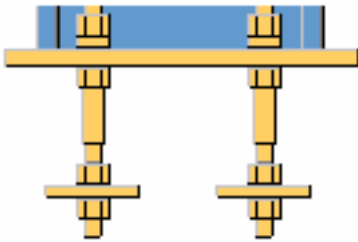
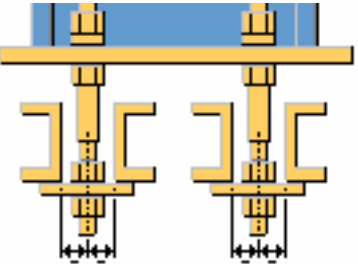
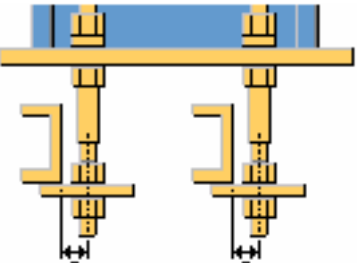
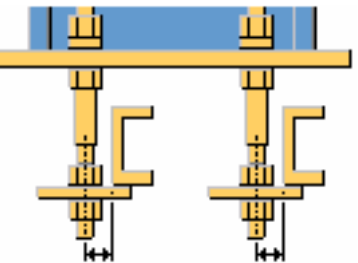
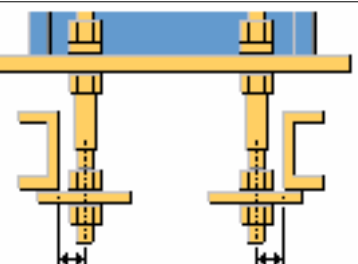
### Edge distance of extra profile 2

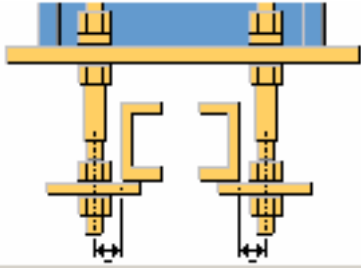


	Description	Default
1	Distance of extra profile 2 from the axis of the anchor bar.	Half of the nut size or anchor bar diameter

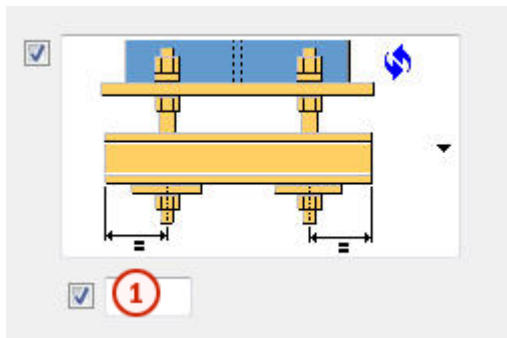
### Extra profile 2 type

Option	Description
	Default Type 1 AutoDefaults can change this option.

Option	Description
	Type 1
	Type 2
	Type 3
	Type 4
	Type 5

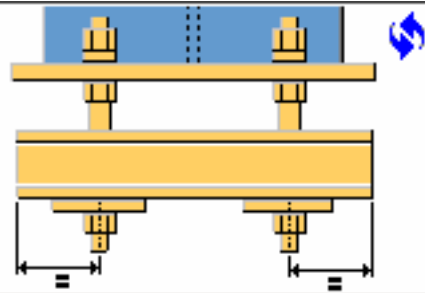
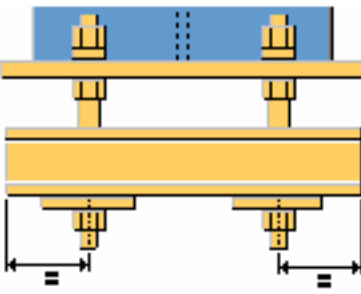
Option	Description
	Type 6

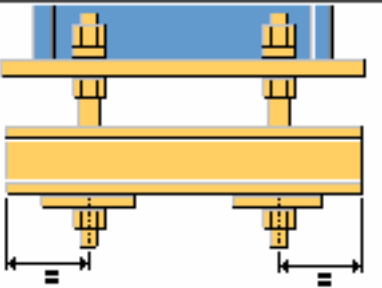
### Length of extra profile 2



	Description	Default
1	Length of extra profile 2 from the axis of the anchor bar.	50 mm

### Direction of extra profile 2

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1

Option	Description
	Type 2

### Extra profile 1 properties

Option	Description	Default
<b>Hole tolerance</b>	Hole tolerance of extra profile 1.	Same as bolt tolerance
<b>Circular profile height</b>	Height of circular extra profile 1.	
<b>Profile rotation</b>	Profile rotation of extra profile 1.	Front

### Extra profile 2 rotation

Option	Description	Default
<b>Extra profile 2 rotation</b>	Profile rotation of extra profile 2.	Front

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:



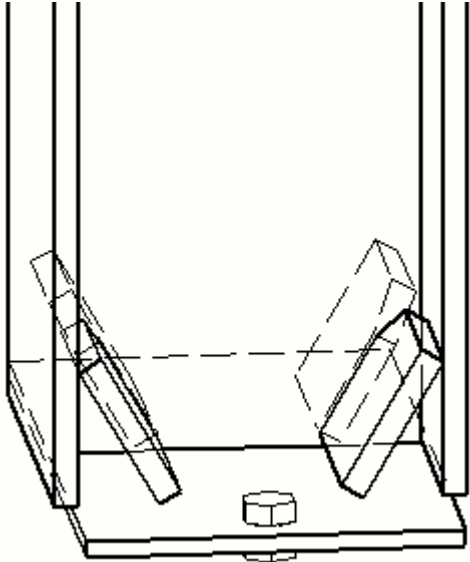
## Web stiffened base plate (1016)

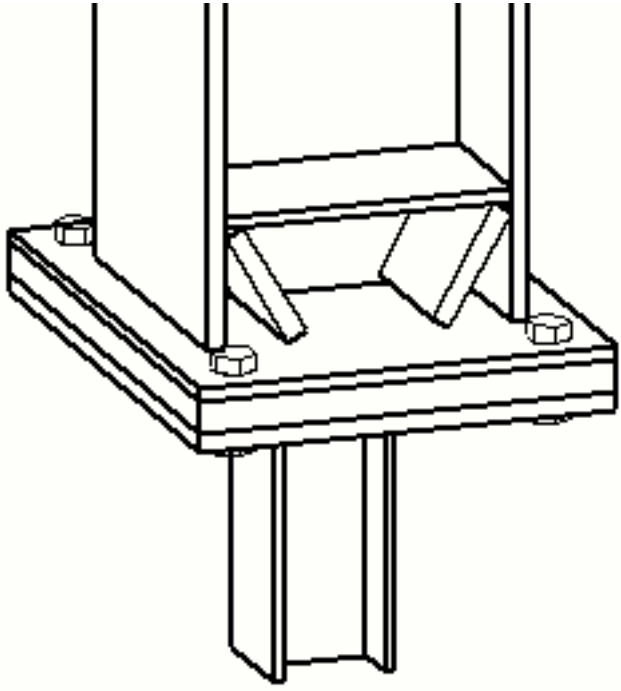
**Web stiffened base plate (1016)** creates a base plate with vertical, horizontal, and sloping web stiffeners.

### Objects created

- Base plate
- Stiffeners
- Shim plates (optional)
- Leveling plate (optional)
- Shear key (optional)
- Extra plates connecting the anchor rods
- Anchor rods
- Bolts
- Welds
- Additional component (optional)

### Use for

Situation	Description
	Web stiffened base plate

Situation	Description
	<p>Web stiffened base plate with a leveling plate, a shim plate, horizontal stiffener and a shear key</p>

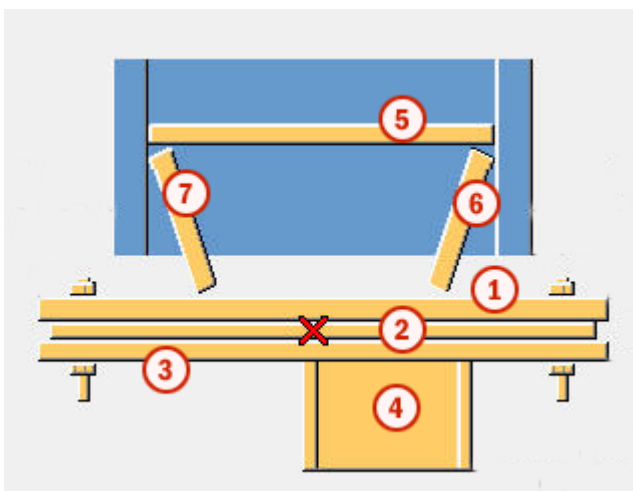
### Before you start

Create a column or a beam.

### Selection order

1. Select the main part (column or beam).
2. Pick a position.  
The detail is created automatically.

### Part identification key

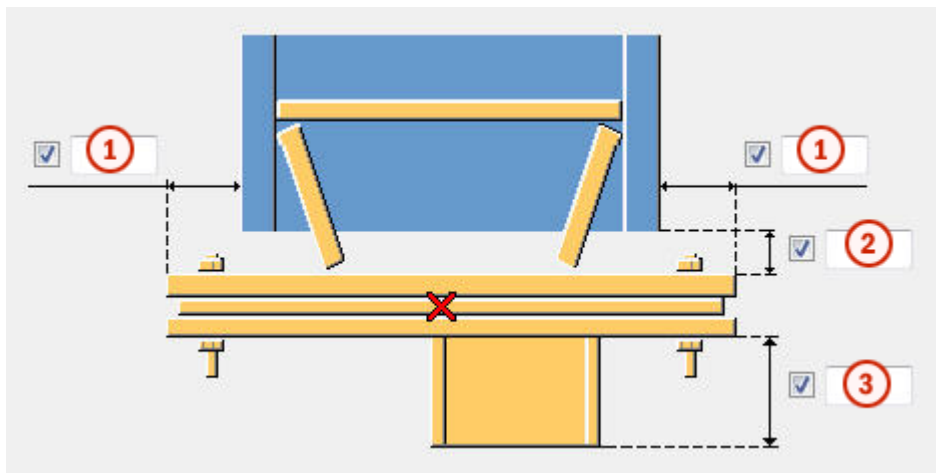


	Part
1	Base plate
2	Shim plate
3	Leveling plate
4	Shear key
5	Upper horizontal stiffener
6	Upper flange stiffener
7	Lower flange stiffener

### Picture tab

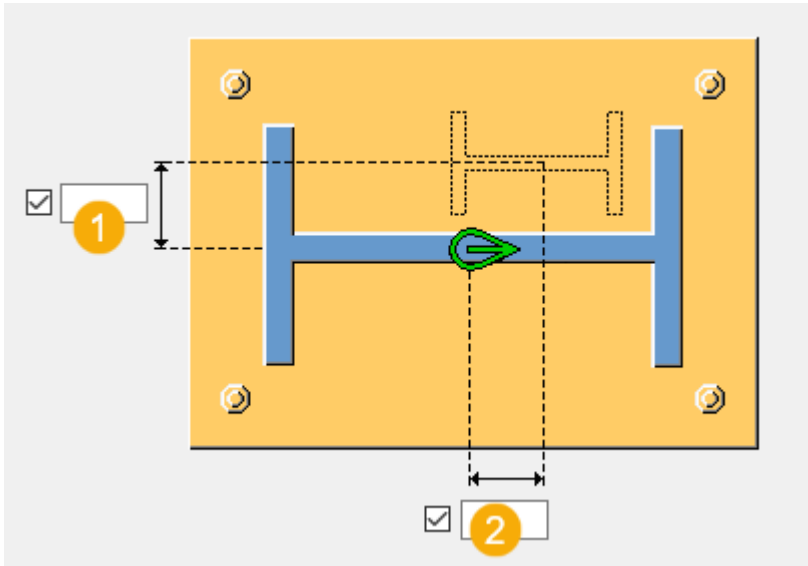
Use the **Picture** tab to control the position of the base plate and the shear key offset.

### Dimensions



	Description
1	Distance from the flange to the edge of the base plate.
2	Weld gap.
3	Height of the shear key.

## Shear key offset



	Description
1	Shear key vertical offset from the main part center.
2	Shear key horizontal offset from the main part center.

### Parts tab

Use the **Parts** tab to control the dimensions of the base plate, upper and lower flange stiffener, shear key, leveling plate, upper horizontal stiffener, and shim plates.

### Plate

	Description	Default
<b>Plate</b>	Base plate thickness. The dimensions on the <b>Picture</b> and <b>Bolts</b> tab determine the base plate width and length.	
<b>Upper fl. stiffener</b>	Upper flange stiffener thickness, width and height.	Thickness = thickness of the main part flange Height = determined by the size of the main part Width = inner side flange distance

	<b>Description</b>	<b>Default</b>
<b>Lower fl. stiffener</b>	Lower flange stiffener thickness, width and height.	Thickness = thickness of the main part flange  Height = determined by the size of the main part  Width = inner side flange distance
<b>Additional beam</b>	Select the shear key profile from the profile catalog.	
<b>Additional beam rotation</b>	Select the shear key rotation type and define the rotation angle.	
<b>Additional beam welded to</b>	Define to which plate the shear key is welded.	
<b>Leveling plate</b>	Leveling plate thickness, width and height.	
<b>Leveling plate hole diameter</b>	Leveling plate hole diameter.	
<b>Upper horizontal stiff</b>	Upper horizontal stiffener thickness, width and height.	Thickness = 0 mm
<b>Fitting plate</b>	Shim plate thickness, width and height.  Define up to three different shim plates.	
<b>Number of fitting pl.</b>	Number of shim plates for each thickness.	1

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the

Option	Description	Default
		<b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

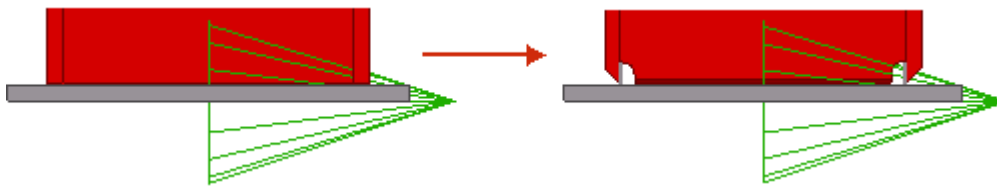
### **Parameters tab**

Use the **Parameters** tab to control the component used inside **Web stiffened base plate (1016)**.

### **Using additional components**

You can use additional system or custom components to modify the column end or the base plate. For example, you can create special backing plates, weld preparations, and weld access holes for the column end.

If you use additional system or custom components, you need to manage the column end or the base plate properties in the additional component in question. When using several components, there may be multiple welds and cuts.



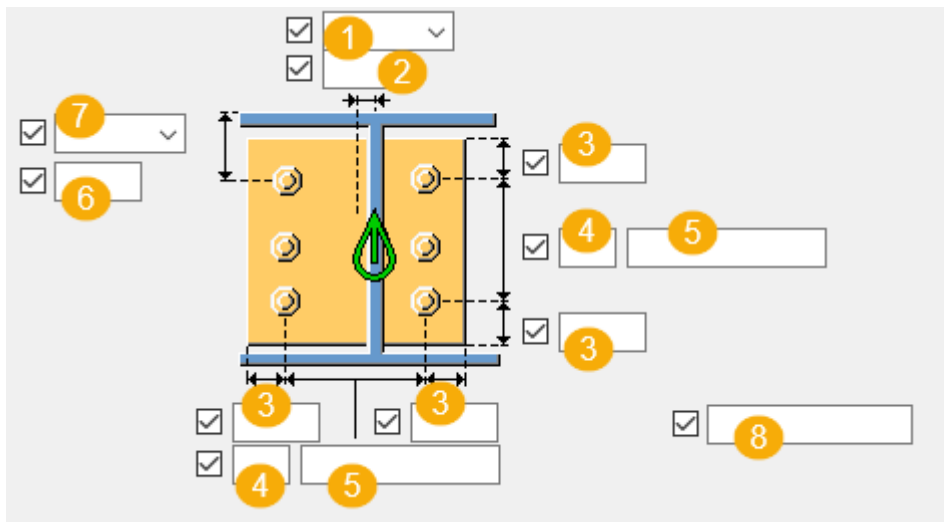
Part	Description
<b>Component</b>	Select a system or a custom component from the <b>Applications &amp; components</b> catalog.
<b>Attributes</b>	Select an attribute file for the component.
<b>Input</b>	Define to which parts the selected component is applied. <ul style="list-style-type: none"> <li>• <b>Default</b> is same as <b>Base + Column</b>.</li> <li>• <b>Column</b> sets the column as the main part. Use this option for details.</li> </ul>

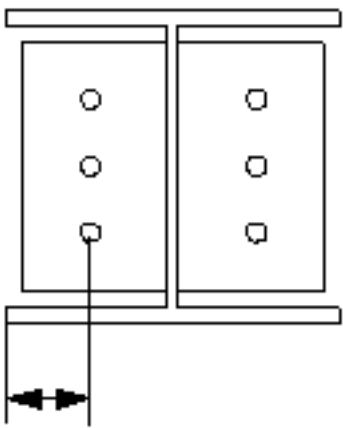
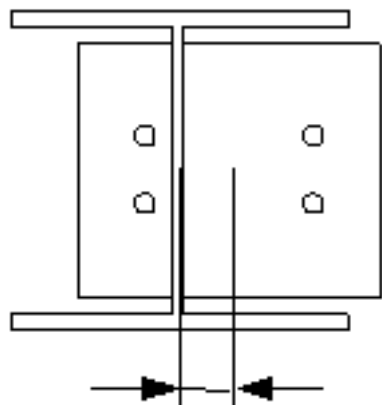
Part	Description
	<ul style="list-style-type: none"> <li>• <b>Column + Base</b> sets the column as the main part and the base plate as the secondary part.</li> <li>• <b>Base + Column</b> sets the base plate as the main part and the column as the secondary part.</li> <li>• <b>Base</b> set the base plate as the main part.</li> </ul>

### ***Bolts tab***

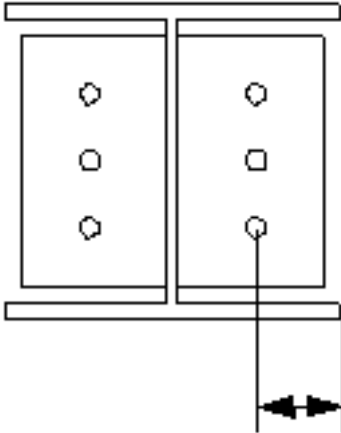
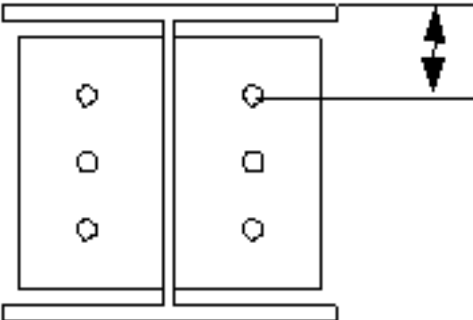
Use the **Bolts** tab to control the bolt properties.

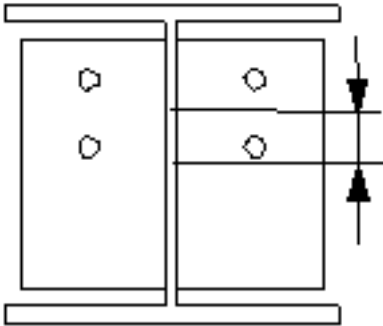
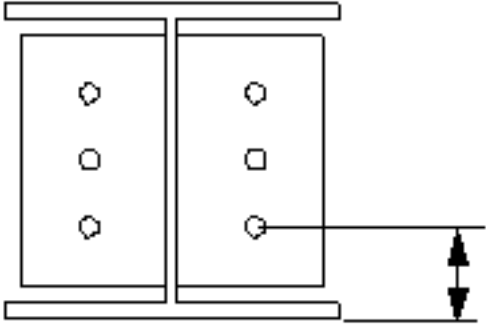
### **Bolt group dimensions**



	Description
1	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.              </li> <li> <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.              </li> </ul>



	Description
	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
2	Dimension for horizontal bolt group position.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Number of bolts.
5	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
6	Dimension for vertical bolt group position.
7	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	Description
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part. </li> </ul>  <ul style="list-style-type: none"> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt. </li> </ul> 
8	<p>Define which bolts are deleted from the bolt group.</p> <p>Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.</p>

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

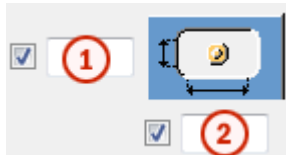
Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Cut length

Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

### Slotted holes

You can define slotted, oversized, or tapped holes.

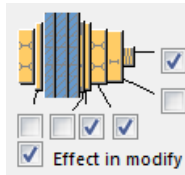


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

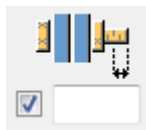
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



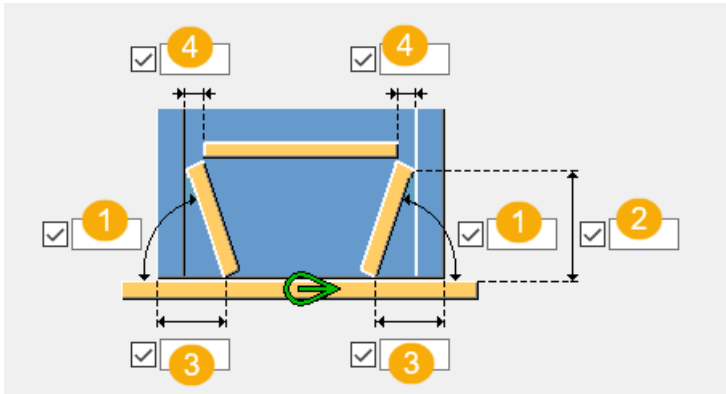
### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### ***Stiffeners tab***

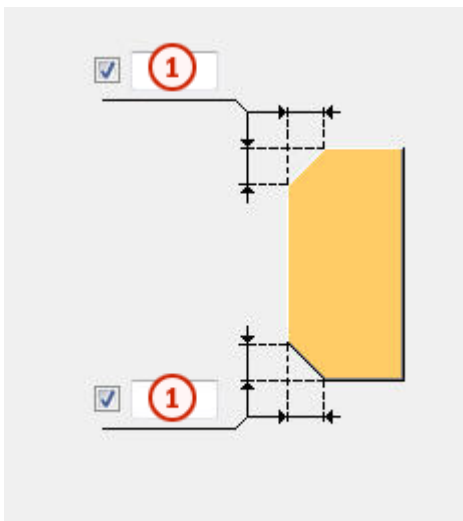
Use the **Stiffeners** tab to control the stiffener angle, position and selection.

## Stiffener angle and position






	Description	Default
1	Stiffener angle.	60 degrees
2	Height of the stiffener.	
3	Distance of the stiffener from the column edge.	
4	Gap between the upper horizontal stiffener and the main part flange.	

## Stiffener plate dimension






	Description
1	Size of the chamfer.

### Stiffener selection 1

Option	Description
	Default Stiffeners are sloped. AutoDefaults can change this option.
	Stiffeners are sloped.
	Stiffeners are vertical.

### Stiffener selection 2

Option	Description
	Default Stiffeners are sloped. AutoDefaults can change this option.
	Stiffeners are sloped.
	Flanges are cut and stiffeners are created.  If you have selected the vertical stiffeners, you cannot create sloped stiffeners or cut flanges.

### ***Anchor rods tab***

Use the **Anchor rods** tab to control the creation of different types of anchor rods.

### **Anchor rod dimensions**

Option	Description
<b>Rod profile</b>	Anchor rod profile.
<b>Nut profile</b>	Nut profile.
<b>Washer profile</b>	Washer profile.
<b>Plate washer</b>	Plate washer thickness, width and height.
<b>Cast plate</b>	Cast plate thickness, width and height.

Option	Description
<b>Grout</b>	<p>Grout thickness.</p> <p>Grouting helps you to model columns to the top of concrete parts and place the base plate correctly. It also makes it easier to dimension the detail in GA drawings.</p> <p>By default, no grouting is created.</p> <p>Select whether the grouting is created with or without slopes above or below the detail creation point. This also affects the shim plates.</p>

### Anchor rod part properties

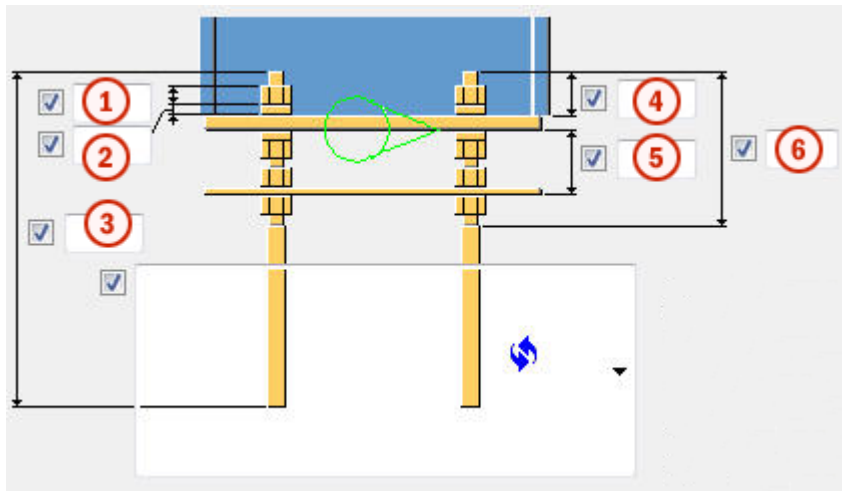
Option	Description	Default
<b>Pos_no</b>	<p>Prefix and start number for the part position number.</p> <p>Some components have a second row of fields where you can enter the assembly position number.</p>	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	
<b>Comment</b>	Add a comment about the part.	

### Base plate with

Select whether to create the base plate with bolts, anchor rods, or a custom component.

By default, the base plate is created with **Bolts**.

## Anchor rod dimensions

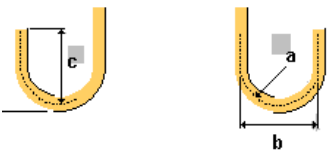
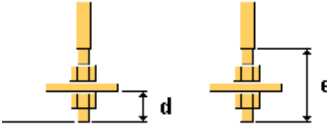


	Description	Default
1	Size or the length of the nut.	anchor rod diameter
2	Size or the thickness of the washer.	half of nut size
3	Length of the anchor rod.	500 mm
4	Length of the anchor rod above the base plate.	50 mm
5	Distance between the cast plate and the base plate.	60 mm
6	Length of the upper thread.	0 mm






## Anchor rods types

Option	Description	
	Default Type 1 AutoDefaults can change this option.	
	Type 1	
	<b>a</b> Radius of the hook <b>b</b> Width of the hook	<b>a</b> = 2*anchor bar diameter <b>b</b> = 1/5 of anchor bar length






Option	Description	
	<p><b>a</b> Radius of the hook</p> <p><b>b</b> Width of the hook</p> <p><b>c</b> Height of the hook</p>	<p><b>c</b> = same as width of the hook</p>
	<p><b>d</b> Length of the anchor rod below the extra plate</p> <p><b>e</b> Length of the lower thread</p>	<p><b>d</b> = 2*nut size</p> <p><b>e</b> = 4*nut size plus thickness of extra plate</p>

### Hook direction

Option	Description
	<p>Default Type 1 AutoDefaults can change this option.</p>
	<p>Type 1</p>
	<p>Type 2</p>
	<p>Type 3</p>
	<p>Type 4</p>

### Bolting direction

**NOTE** You can define the bolting direction if you have created the base plate with bolts.

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

### Cast plate holes tolerance

Option	Description	Default
<b>Cast plate holes tolerance</b>	Tolerance of the cast plate holes.	same as bolt tolerance

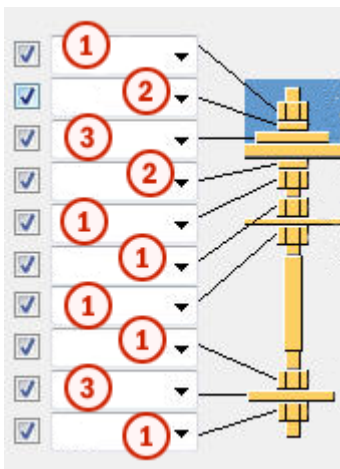
### Washer hole tolerance

Option	Description
<b>Create hole in washer</b>	By default, a hole is not created in the washer.  Tolerance of the washer hole.

### Create assembly from all anchors

Define whether anchors are included in an anchor rod assembly. You can also include leveling plates into the assembly.

### Create



	Description
1	Create the nut profile.
2	Create the washer profile.
3	Create the washer plate.

### Anchor rod assembly

Define which parts of the anchor rod are included in the anchor rod assembly. You can weld the washer plates above and below the base plate.

### Extra plates tab

Use the **Extra plates** tab to control the placement, rotation, and type of the profiles (extra profile 1) created at the bottom of each anchor bar and the profiles (extra profile 2) that connect rows of anchor bars.

### Part dimensions

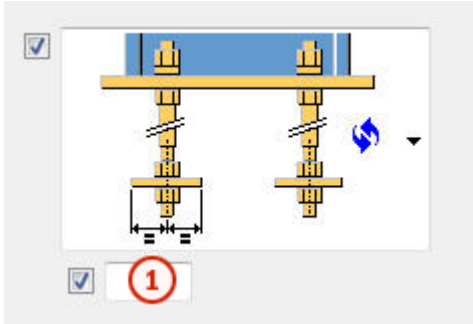
Option	Description	Default
Extra profile 1	First extra profile by selecting it from the profile catalog.	PL10*100
Extra profile 2	Second extra profile by selecting it from the profile catalog.	

### Part properties

Option	Description	Default
Pos_No	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
Material	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
Name	Name that is shown in drawings and reports.	

Option	Description	Default
<b>Finish</b>	Describes how the part surface has been treated.	

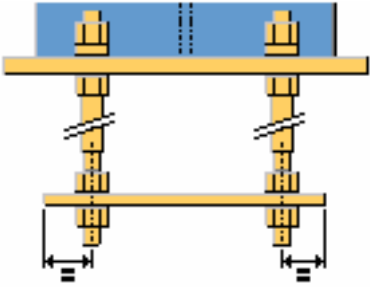
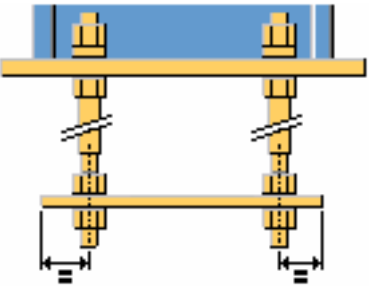
### Edge distance of extra profile 1



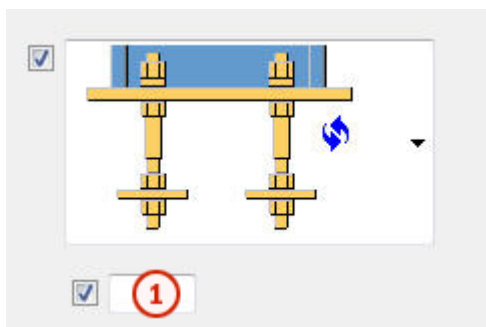
	Description	Default
<b>1</b>	Edge distance of extra profile 1.	50 mm

### Type and direction of extra profile 1

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1

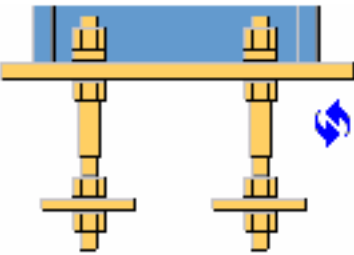
Option	Description
	Type 2
	Type 3

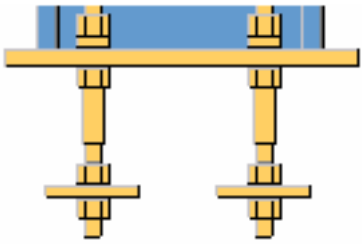
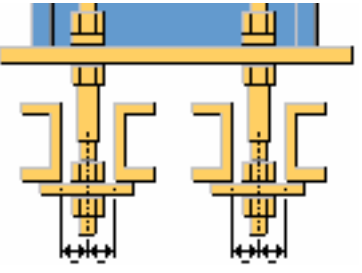
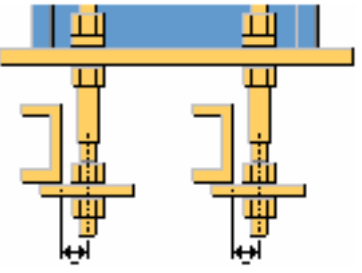
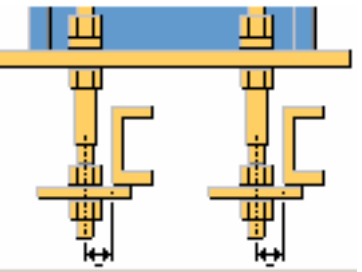
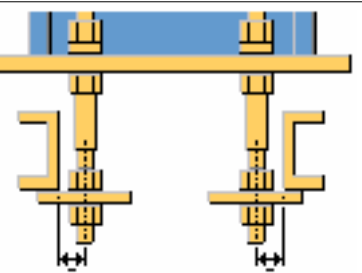
### Edge distance of extra profile 2

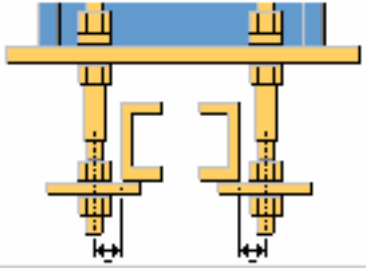


	Description	Default
1	Distance of extra profile 2 from the axis of the anchor bar.	Half of the nut size or anchor bar diameter

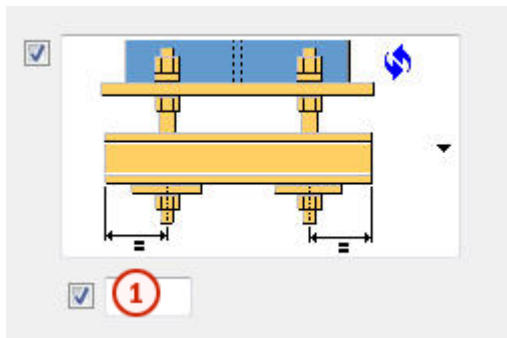
### Extra profile 2 type

Option	Description
	Default Type 1 AutoDefaults can change this option.

Option	Description
	Type 1
	Type 2
	Type 3
	Type 4
	Type 5

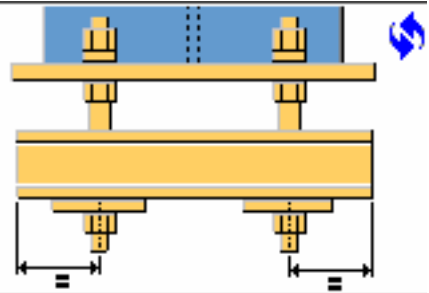
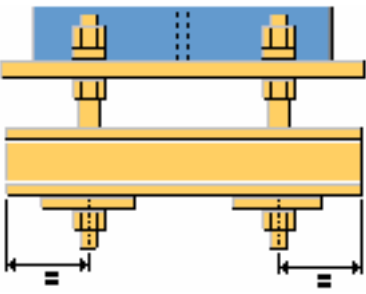
Option	Description
	Type 6

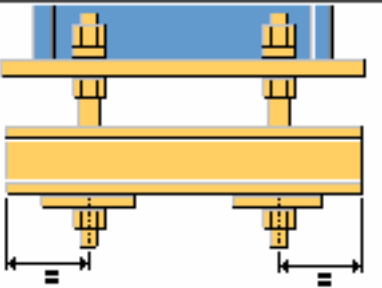
### Length of extra profile 2



	Description	Default
1	Length of extra profile 2 from the axis of the anchor bar.	50 mm

### Direction of extra profile2

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1

Option	Description
	Type 2

### Extra profile 1 properties

Option	Description	Default
<b>Hole tolerance</b>	Hole tolerance of extra profile 1.	Same as bolt tolerance
<b>Profile rotation</b>	Profile rotation of extra profile 1.	Front

### Extra profile 2 rotation

Option	Description	Default
<b>Extra profile 2 rotation</b>	Profile rotation of extra profile 2.	Front

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

## **Simple base plate 2 (1031)**

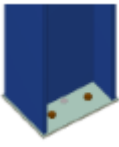
**Simple base plate 2 (1031)** creates a base plate that is connected to a column or beam end.



### Objects created

- Base plate
- Stiffeners (for W profiles only)
- Shear key
- Leveling plate
- Welds

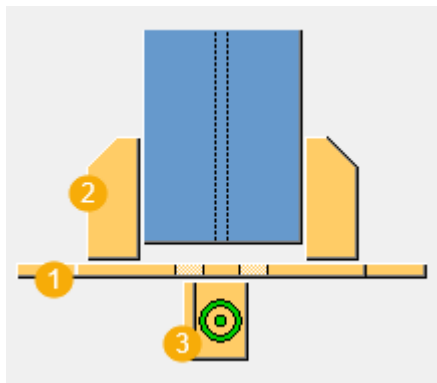
### Use for

Situation	Description
	<ul style="list-style-type: none"><li>• Base plate created at column end</li></ul>

### Selection order

1. Select the main part (column or beam).
2. Pick a position.  
The detail is created automatically.

### Part identification key

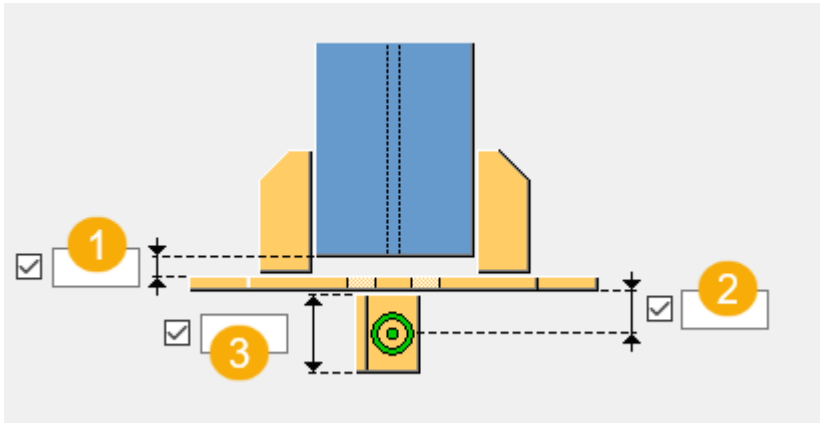


	Description
1	Base plate
2	Stiffeners
3	Shear key

### Picture tab

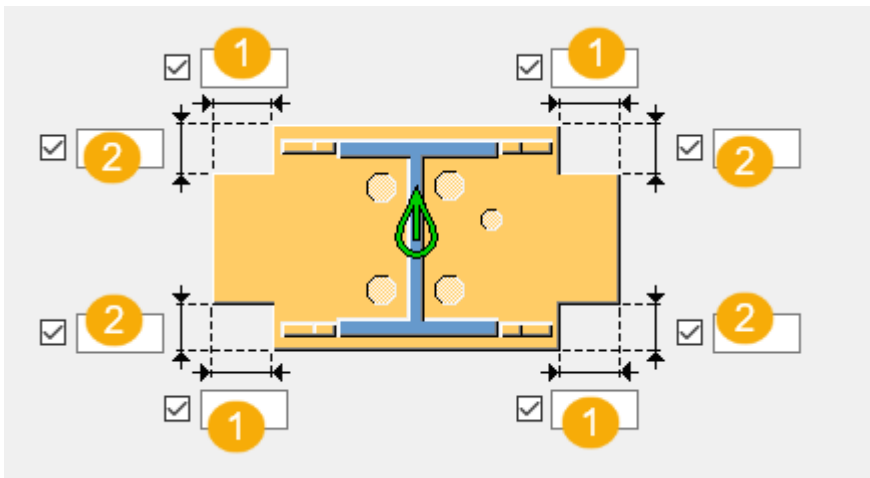
Use the **Picture** tab to define the plate position and corner cuts.

## Dimensions



	Description
1	Base plate offset from the bottom edge of the column.
2	Distance from the component input point to the base plate bottom. You can offset the base plate from the point picked for creating the component.
3	Shear key height

## Base plate corner cut



	Description
1	Horizontal corner cut dimension.
2	Vertical corner cut dimension.

## Parts tab

Use the **Parts** tab to define the plate properties.

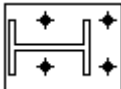
## Parts

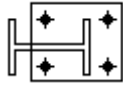

Option	Description
<b>Base plate</b>	Thickness, width, and height of the base plate.
<b>Stiffeners</b>	Thickness, width, and height of the stiffeners.
<b>Key profile</b>	Select the shear key profile from the profile catalog.
<b>Leveling plate</b>	Thickness of the leveling plate.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

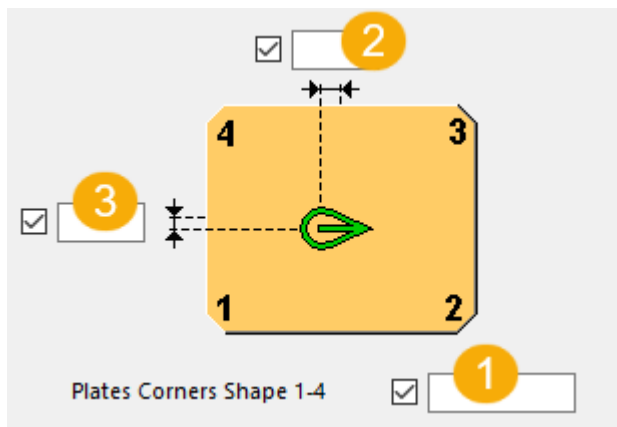
### **Parameters tab**

Use the **Parameters** tab to define the base plate corner shape, condensation holes, shear key creation, and leveling plate extra length.

Option	Description
<b>Plate wrap around</b>	Define whether the base plate is automatically wrapped around the column and bolts, bolts, or column. <ul style="list-style-type: none"> <li>Around bolts and column</li> </ul> 

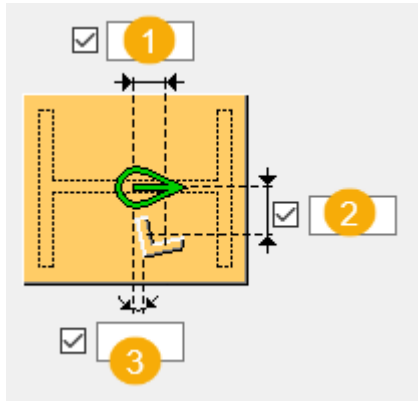
Option	Description
	<ul style="list-style-type: none"> <li>Around bolts</li> </ul>  <ul style="list-style-type: none"> <li>Around column</li> </ul> 
<b>Condensation holes sides 1-4</b>	<p>Define where the condensation holes are located by entering the corner numbers.</p> <p>Semi-circular holes are placed at the bottom of columns and some circular profiles.</p>
<b>Condensation holes diameter</b>	Define the diameter of the condensation holes.

### Base plate corner shape



	Description
<b>1</b>	<p>Define which plate corners are reshaped.</p> <p>You can enter the corner numbers in any order. Corners are not reshaped if you do not enter any numbers.</p>
<b>2</b>	<p>Define the horizontal offset of the plate from the bolt center line.</p> <p>This offset works when <b>Plate wrap around</b> is set to <b>Automatic</b>.</p>
<b>3</b>	<p>Define the vertical offset of the plate from the bolt center line.</p> <p>This offset works when <b>Plate wrap around</b> is set to <b>Automatic</b>.</p>

## Shear key offset and rotation

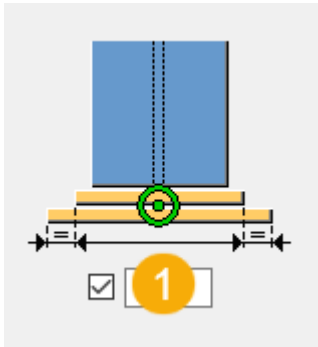


	Description
1	Define the horizontal offset of the shear key.
2	Define the vertical offset of the shear key.
3	Define the rotation of the shear key around the column center line.

## Shear key creation

Option	Description
	Default Shear key is not created. AutoDefaults can change this option.
	Shear key is created.
	Shear key is not created.

## Leveling plate size

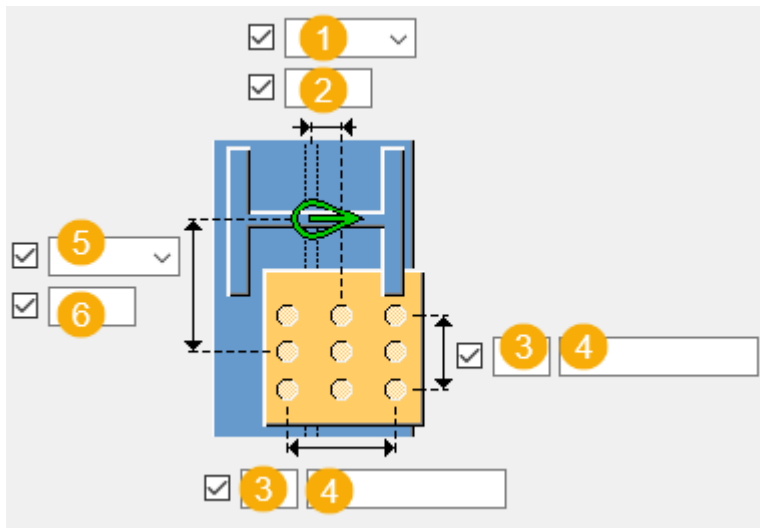


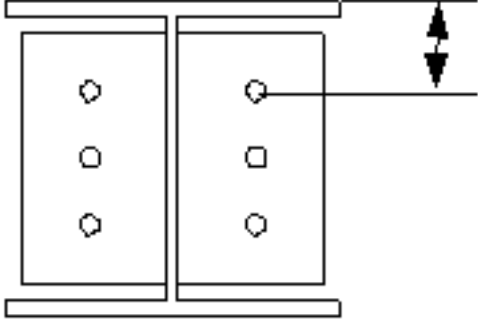
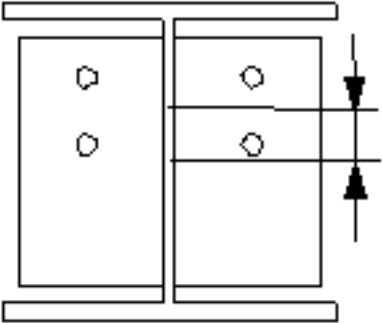
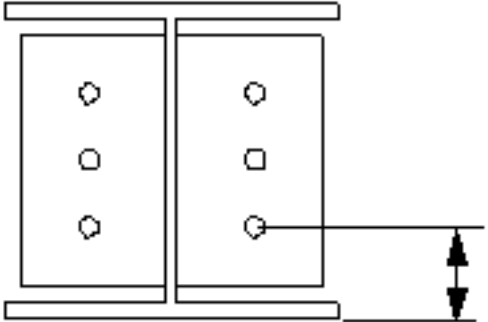
	Description
1	Define the leveling plate extra length.

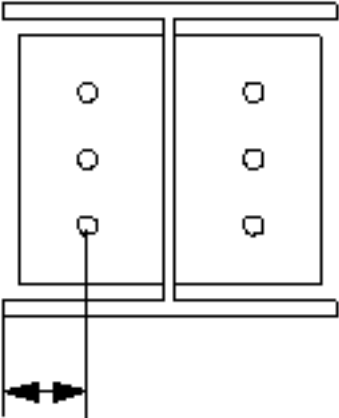
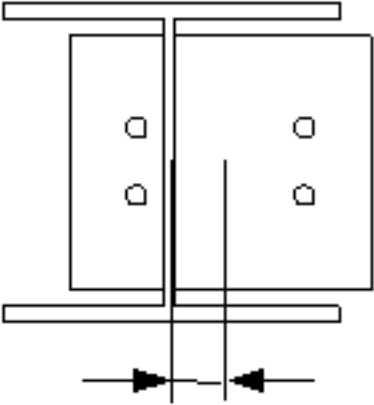
## **Bolts tab**

Use the **Bolts** tab to control the bolt properties.

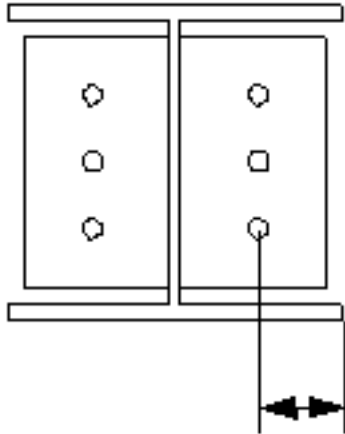
## Bolt group dimensions



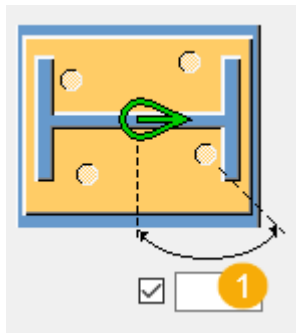
	Description
<p><b>1</b></p>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li> <p><b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</p>  </li> <li> <p><b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</p>  </li> <li> <p><b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</p>  </li> </ul>
<p><b>2</b></p>	<p>Dimension for vertical bolt group position.</p>

	Description
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Select how to measure the dimensions for horizontal bolt group position. <ul style="list-style-type: none"> <li>• <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> 



	Description
	<ul style="list-style-type: none"> <li><b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
6	Dimension for horizontal bolt group position.

### Bolt group rotation



	Description
1	Define the bolt group rotation around the column center line, measured from the column web.

### Bolt deletion

Option	Description
<b>Edge tolerance for deleting bolts</b>	Define the minimum bolt edge distance for deleting bolts. The distance is measured from the bolt center to the edge of the plate.
<b>Eliminate bolts</b>	Define which bolts are deleted. Enter the bolt numbers from the first bolt in the first row to the last bolt in the last row, for example, 1 3 10. Enter A or a to delete all bolts.

## Bolt basic properties

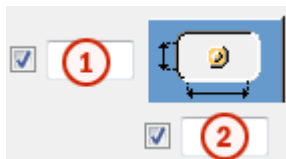
Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Cut length

Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

## Slotted holes

You can define slotted, oversized, or tapped holes.



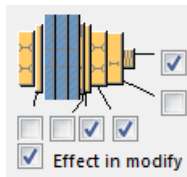
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.

Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

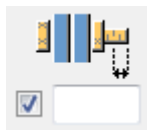
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

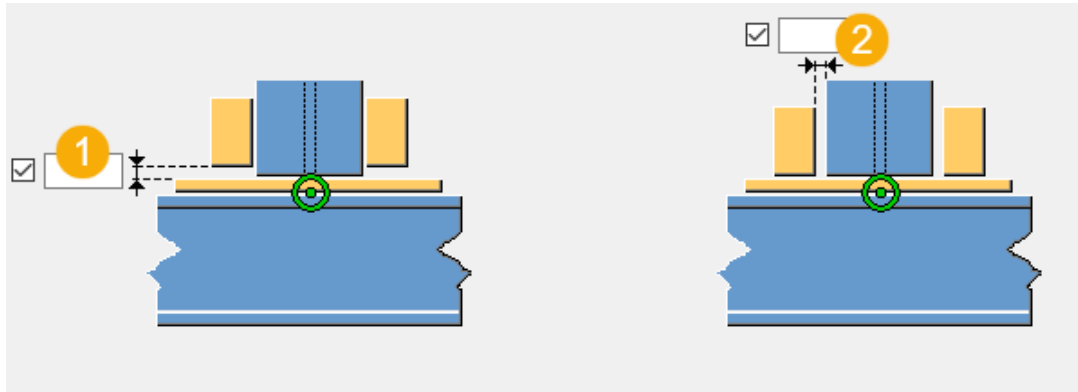
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Stiffeners tab

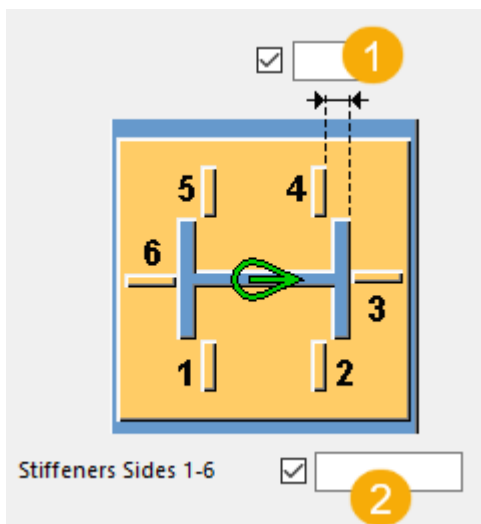
Use the **Stiffeners** tab to define the stiffener dimensions and chamfering.

## Stiffener offset



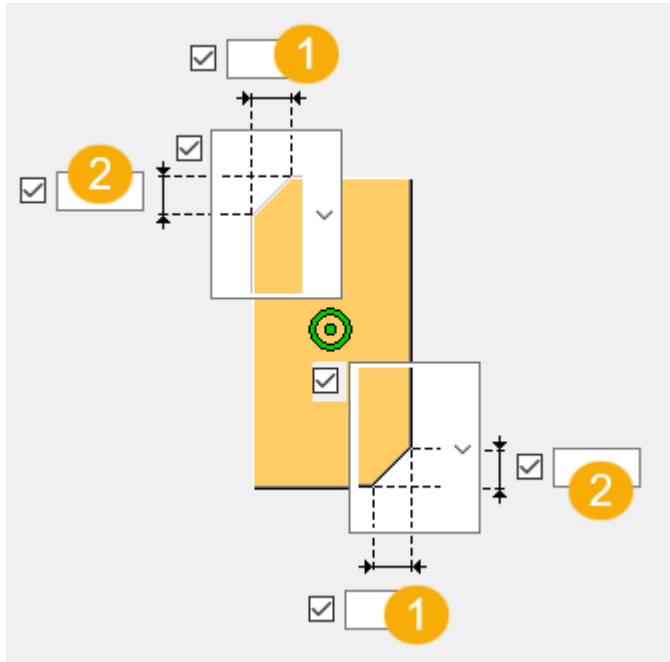
1	Stiffener offset from the base plate.
2	Stiffener offset from the column.

## Stiffener positions






	Description
1	Stiffener position on the base plate edge.
2	Define on which sides the stiffeners are created.



## Chamfer dimensions



	Description
1	Horizontal dimension of the chamfer.
2	Vertical dimension of the chamfer.

## Chamfer type

Option	Description
	Default No chamfer AutoDefaults can change this option.
	Line chamfer
	Convex chamfer

Option	Description
	Concave chamfer
	No chamfer

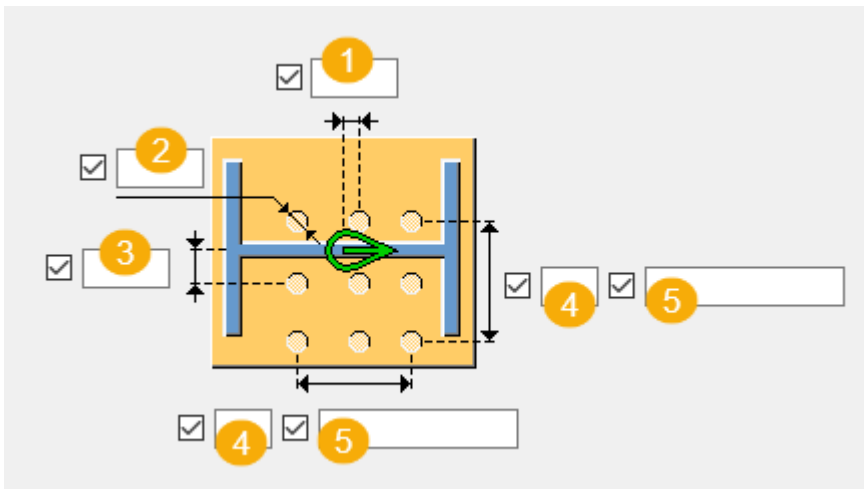
### **Grouting holes tab**

Use the **Grouting holes** tab to define the grout hole dimensions.

### **Grout holes**

You can define whether to delete some or all of the grout holes in **Elim holes**.

### **Grout hole dimensions**



	Description
<b>1</b>	Location of the grout hole from the center of the column in the direction of the web.
<b>2</b>	Grout hole diameter.
<b>3</b>	Location of the grout hole from the center of the column in the direction of the flange.
<b>4</b>	Number of grout holes

	<b>Description</b>
<b>5</b>	Grout hole spacing Use a space to separate the spacing values. Enter a value for each space between holes. For example, if there are 3 bolts, enter 2 values.

### ***General tab***

Click the link below to find out more:

General tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

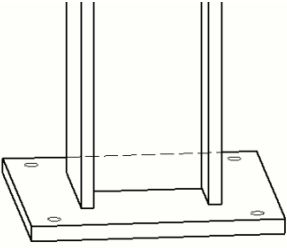
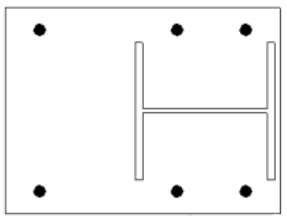
## **Base plate (1042)**

**Base plate (1042)** creates a base plate that is connected to a column end.

### **Objects created**

- Base plate
- Bolts
- Extra plates connecting the anchor rods
- Anchor rods
- Bolts
- Welds
- Additional component (optional)

## Use for

Situation	Description
	Column base detail
	Column base plate at the face of the flange

## Before you start

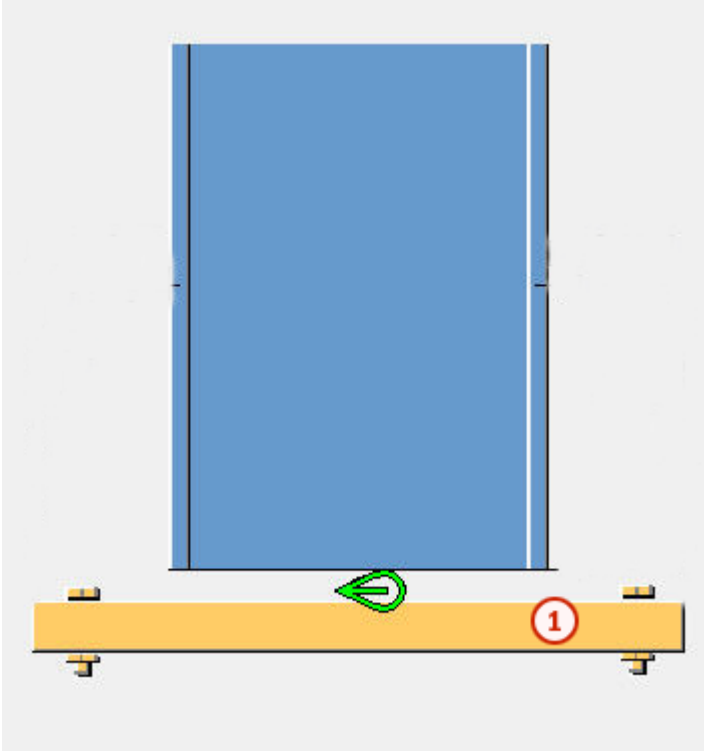
Create a column.

## Selection order

1. Select the main part (column).
2. Pick a position.  
The detail is created automatically.



### Part identification key

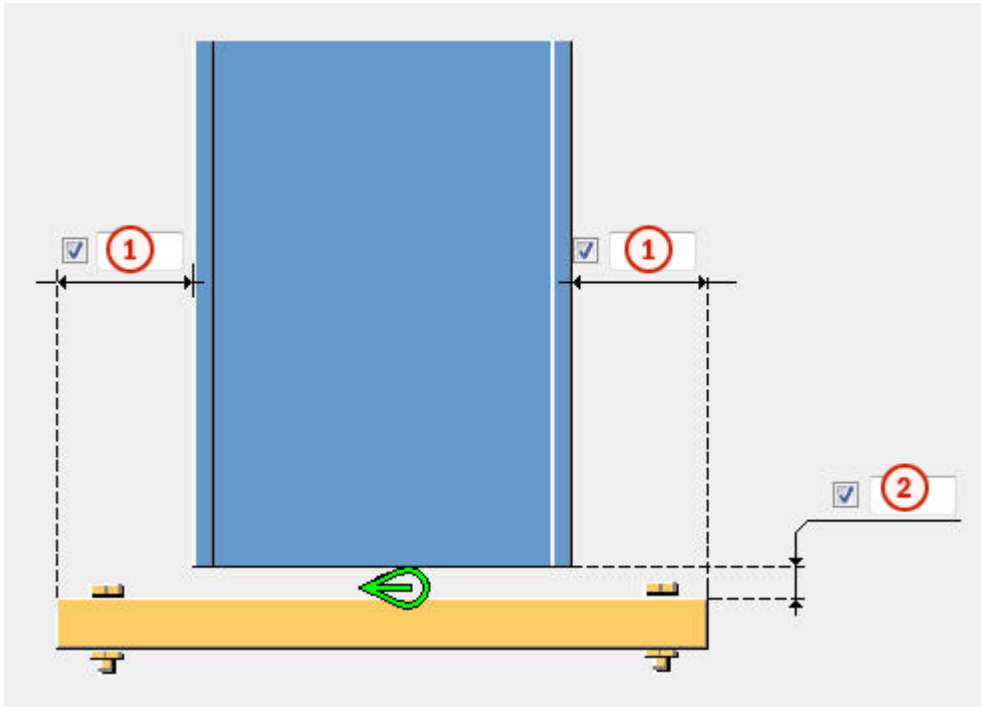


	Part
1	Base plate

### **Picture tab**

Use the **Picture** tab to control the position of the base plate.

## Dimensions



	Description
1	Distance from the flange of the main part to the edge of the base plate.
2	Weld gap.

### Parts tab

Use the **Parts** tab to control the dimensions of the base plate.

### Plate

Option	Description	Default
<b>Plate</b>	Thickness, width, and height of the base plate.	Thickness = 30 mm Width = 500 mm Height = 500 mm

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
	assembly position number.	
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

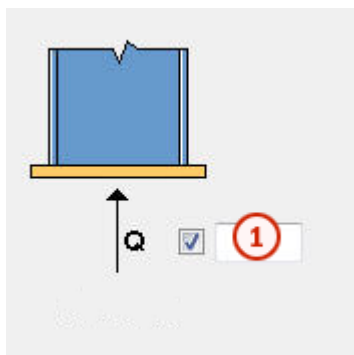
### **Parameters tab**

Use the **Parameters** tab to control the weld dimensions, grout hole diameter and position, plate type, design check and shear force value.

### **Design check**

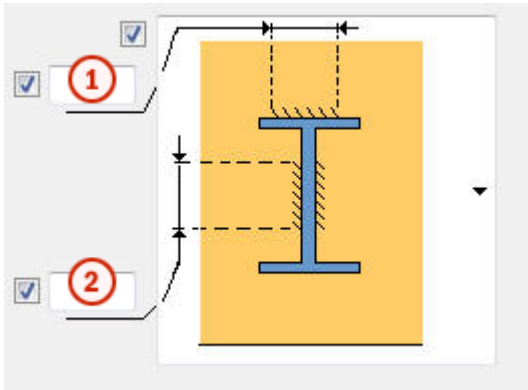
Option	Description
<b>Design</b>	Define whether design check is turned on or off.
<b>Bearing</b>	Define whether the detail and its components bear the entered shear force.
<b>Factored Axial Dead Load (kN)</b>	Define the factored axial dead load, if design check is turned on.
<b>Minimum Fcu (N/mm<sup>2</sup>)</b>	Define the minimum Fcu, if design check is turned on.

### **Shear force**



	Description
1	Shear force value. If the design check is turned on, enter a positive value. If there is no shear force, enter 0.

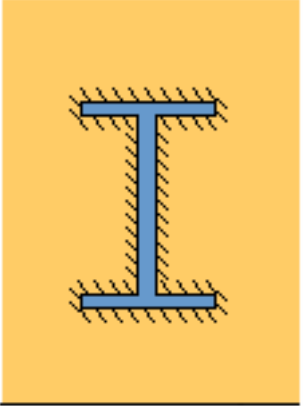
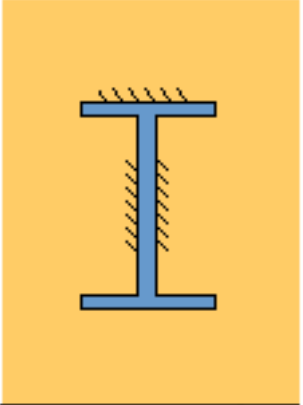
### Weld dimensions



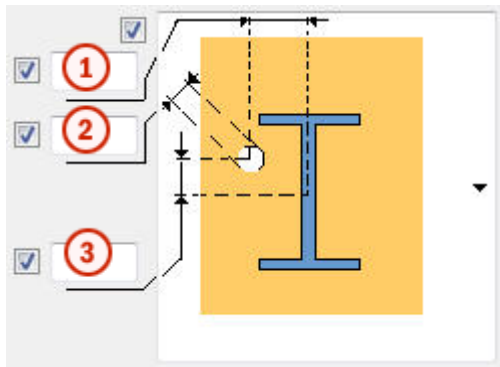
	Description
1	Weld dimension on the column flange.
2	Weld dimension on the column web.

### Weld types

Option	Description
	Default Fully welded AutoDefaults can change this option.

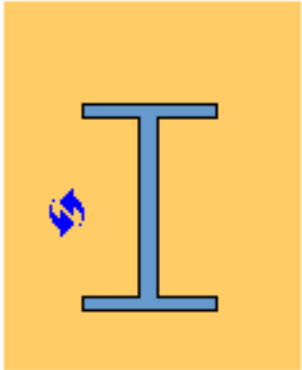
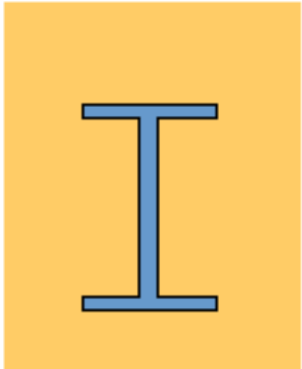
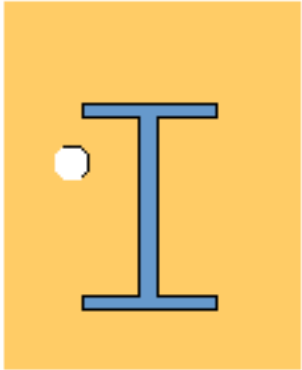
Option	Description
	Fully welded
	Partially welded

### Grout hole diameter and offset

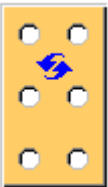


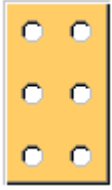

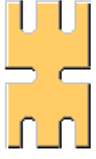
	Description
1	Grout hole horizontal offset from the column center.
2	Grout hole diameter.
3	Grout hole vertical offset from the column center.

### Base plate with grout hole

Option	Description
	<p>Default Grout hole is not created. AutoDefaults can change this option.</p>
	<p>Grout hole is not created.</p>
	<p>Grout hole is created.</p>

### Base plate mounting grooves

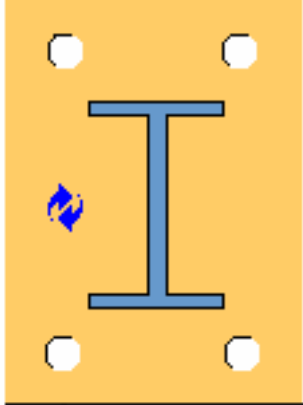
Option	Description
	<p>Default Mounting grooves are not created. AutoDefaults can change this option.</p>

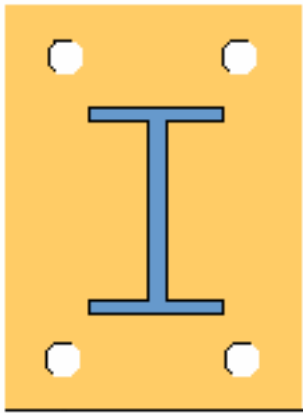
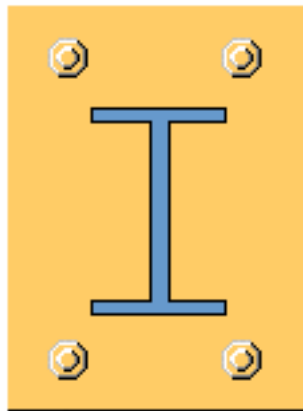
Option	Description
	Mounting grooves are not created.
	Mounting grooves are created horizontally.
	Mounting grooves are created vertically for the first and last row of the bolts. For other rows of bolts, the mounting grooves are created horizontally.

### Tolerance for mounting grooves

Define the tolerance for the mounting grooves in the base plates. The width of the groove is the bolt diameter + the tolerance. If you do not enter a value, the bolt tolerance value is used.

### Base plate with holes or bolts

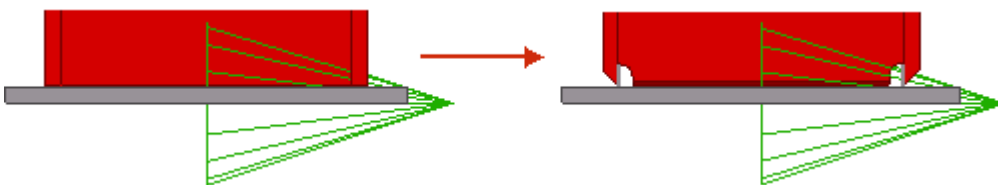
Option	Description
	<p>Default</p> <p>Holes are created.</p> <p>AutoDefaults can change this option.</p>

Option	Description
	Holes are created.
	Bolts are created.

### Using additional components

You can use additional system or custom components to modify the column end or the base plate. For example, you can create special backing plates, weld preparations, and weld access holes for the column end.

If you use additional system or custom components, you need to manage the column end or the base plate properties in the additional component in question. When using several components, there may be multiple welds and cuts.



Option	Description
<b>Component</b>	Select a system or a custom component from the <b>Applications &amp; components</b> catalog.



Option	Description
<b>Attributes</b>	Select an attribute file for the component.
<b>Input</b>	<p>Define to which parts the selected component is applied.</p> <ul style="list-style-type: none"> <li>• <b>Default</b> is same as <b>Base + Column</b>.</li> <li>• <b>Column</b> sets the column as the main part. Use this option for details.</li> <li>• <b>Column + Base</b> sets the column as the main part and the base plate as the secondary part.</li> <li>• <b>Base + Column</b> sets the base plate as the main part and the column as the secondary part.</li> <li>• <b>Base</b> sets the base plate as the main part.</li> </ul>

### ***Anchor rods tab***

Use the **Anchor rods** tab to control the creation of different types of anchor rods.

### **Anchor rod dimensions**

Option	Description
<b>Rod profile</b>	Anchor rod profile. You can add a comment about the part.
<b>Nut profile</b>	Nut profile.
<b>Washer profile</b>	Washer profile.
<b>Plate washer</b>	Plate washer thickness, width and height.
<b>Cast plate</b>	Cast plate thickness, width and height.
<b>Grout</b>	Grout thickness. Grouting helps you to model columns to the top of concrete parts and place the base plate correctly. It also makes it easier to dimension the detail in GA drawings.

Option	Description
	By default, no grouting is created. Select whether the grouting is created with or without slopes above or below the detail creation point. This also affects the shim plates.

### Anchor rod part properties

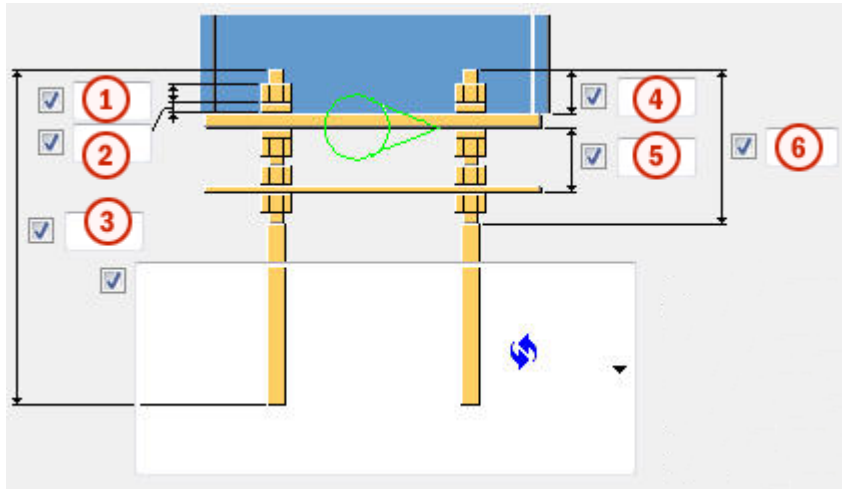
Option	Description	Default
<b>Pos_no</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	
<b>Comment</b>	Add a comment about the part.	

### Base plate with

Select whether to create the base plate with bolts, anchor rods, or a custom component.

By default, the base plate is created with **Bolts**.

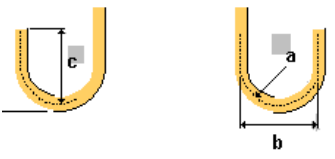
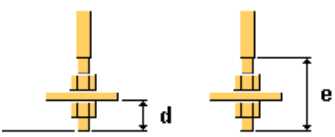
## Anchor rod dimensions








	Description	Default
1	Size or the length of the nut.	anchor rod diameter
2	Size or the thickness of the washer.	half of nut size
3	Length of the anchor rod.	500 mm
4	Length of the anchor rod above the base plate.	50 mm
5	Distance between the cast plate and the base plate.	60 mm
6	Length of the upper thread.	0 mm

## Anchor rod types

Option	Description	
	Default Type 1 AutoDefaults can change this option.	
	Type 1	
	<b>a</b> Radius of the hook <b>b</b> Width of the hook	<b>a</b> = 2 x anchorbar diameter <b>b</b> = 1/5 of anchorbar length




Option	Description	
	<p><b>a</b> Radius of the hook</p> <p><b>b</b> Width of the hook</p> <p><b>c</b> Height of the hook</p>	<p><b>c</b> = same as width of the hook</p>
	<p><b>d</b> Length of the anchor rod below the extra plate</p> <p><b>e</b> Length of the lower thread</p>	<p><b>d</b> = 2 x nut size</p> <p><b>e</b> = 4 x nut size plus thickness of extra plate</p>

### Hook direction

Option	Description
	<p>Default Type 1 AutoDefaults can change this option.</p>
	<p>Type 1</p>
	<p>Type 2</p>
	<p>Type 3</p>
	<p>Type 4</p>

### Bolting direction

**NOTE** You can define the bolting direction if you have created the base plate with bolts.

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

### Cast plate hole tolerance

Option	Description	Default
<b>Cast plate holes tolerance</b>	Define the tolerance of the cast plate holes.	same as bolt tolerance

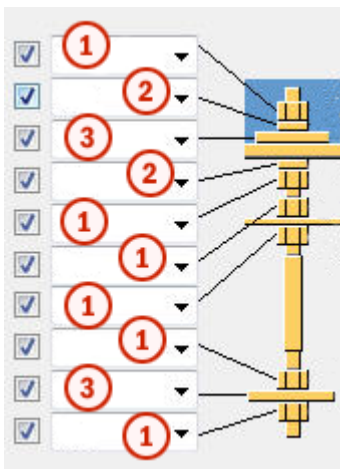
### Washer hole tolerance

Option	Description
<b>Create hole in washer</b>	By default, a hole is not created in the washer.  Tolerance of the washer hole.

### Create assembly from all anchors

Define whether anchors are included in an anchor rod assembly. You can also include leveling plates into the assembly.

### Create



	Description
1	Create the nut profile. You can select to create two nuts at the top of the anchor rods.
2	Create the washer profile.
3	Create the washer plate.

### Anchor rod assembly

Define which parts of the anchor rod are included in the anchor rod assembly.  
You can weld the washer plates above and below the base plate.

### Extra plates tab

Use the **Extra plates** tab to control the placement, rotation, and type of the profiles (extra profile 1) created at the bottom of each anchor bar and the profiles (extra profile 2) that connect rows of anchor bars.

### Part dimensions

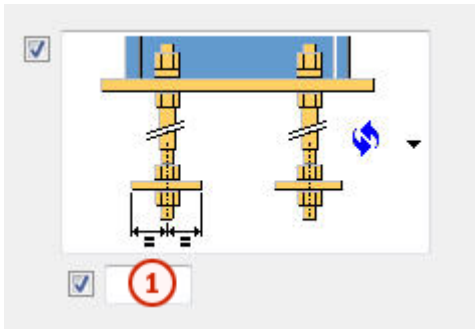
Option	Description	Default
<b>Extra profile 1</b>	First extra profile by selecting it from the profile catalog.	PL10 × 100
<b>Extra profile 2</b>	Second extra profile by selecting it from the profile catalog.	

### Part properties

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

Option	Description	Default
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

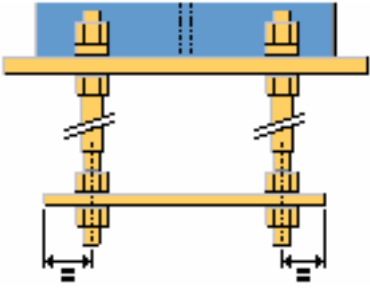
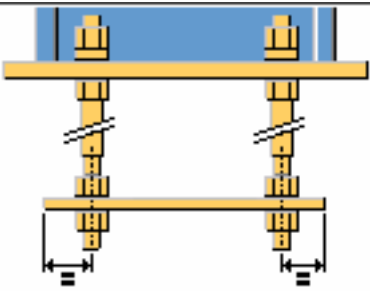
### Edge distance of extra profile 1



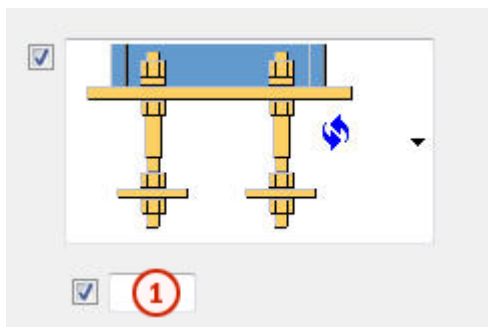
	Description	Default
<b>1</b>	Edge distance of extra profile 1.	50 mm

### Type and direction of extra profile 1

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1

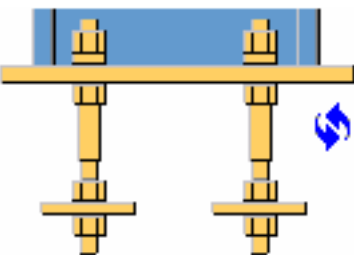
Option	Description
	Type 2
	Type 3

### Edge distance of extra profile 2

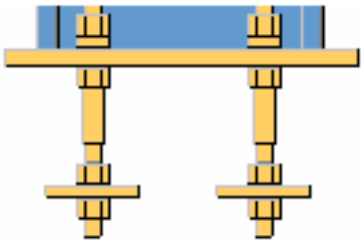
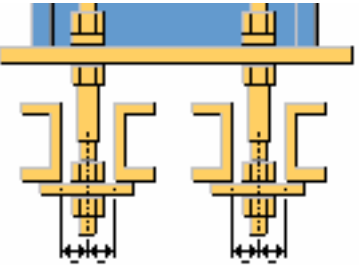
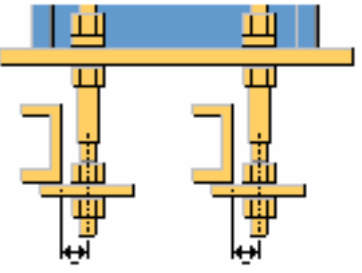
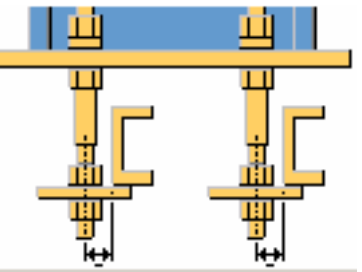
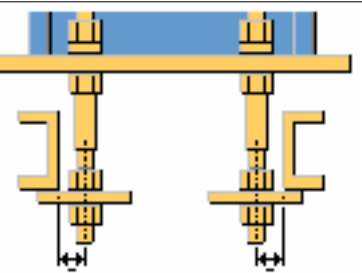


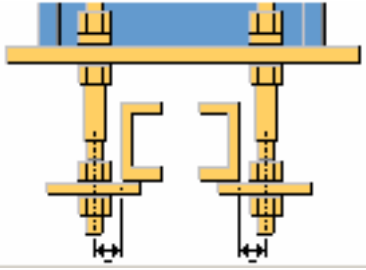
	Description	Default
1	Distance of extra profile 2 from the axis of the anchor bar.	Half of the nut size or anchorbar diameter

### Extra profile 2 type

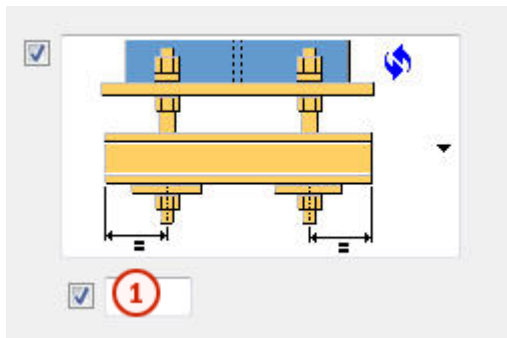
Option	Description
	Default Type 1 AutoDefaults can change this option.



Option	Description
	Type 1
	Type 2
	Type 3
	Type 4
	Type 5

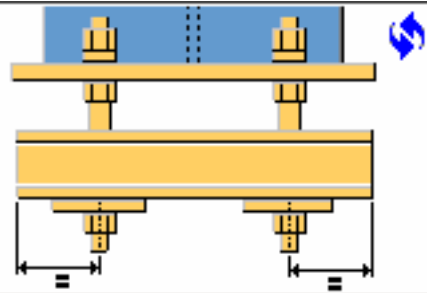
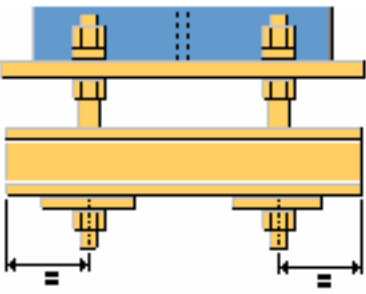
Option	Description
	Type 6

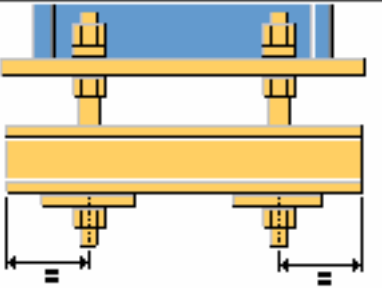
### Length of extra profile 2



	Description	Default
1	Length of extra profile 2 from the axis of the anchor bar.	50 mm

### Direction of extra profile 2

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1

Option	Description
	Type 2

### Extra profile 1 properties

Option	Description	Default
<b>Hole tolerance</b>	Hole tolerance of extra profile 1.	Same as bolt tolerance
<b>Circular profile height</b>	Enter the height of a circular extra profile 1.	
<b>Profile rotation</b>	Profile rotation of extra profile 1.	Front

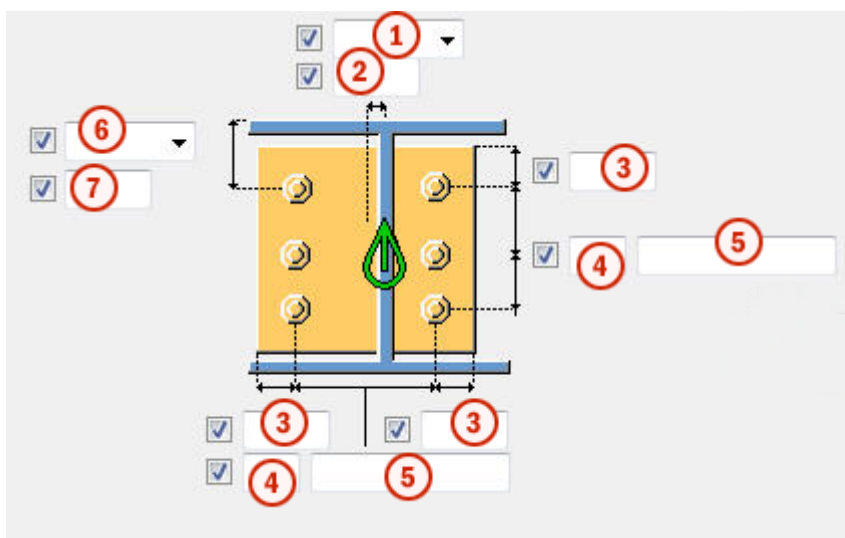
### Extra profile 2 rotation

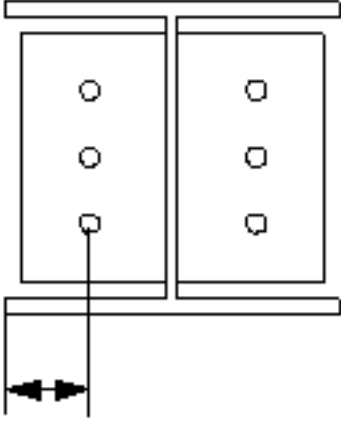
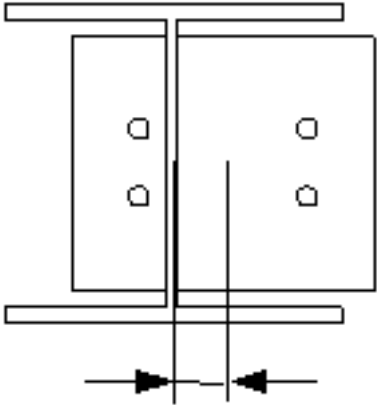
Option	Description	Default
<b>Extra profile 2 rotation</b>	Profile rotation of extra profile 2.	Front

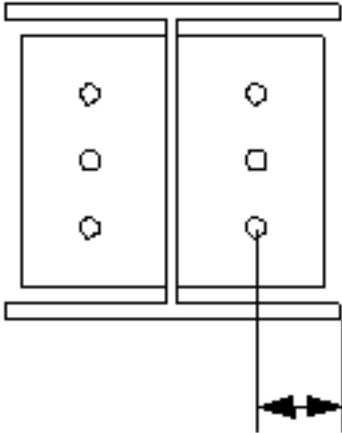
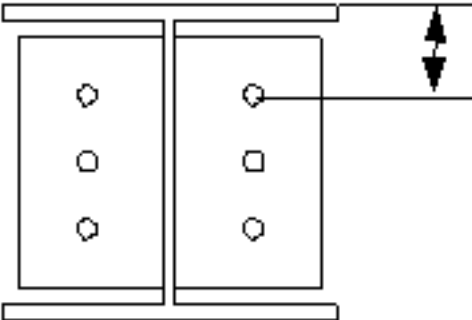
### **Bolts tab**

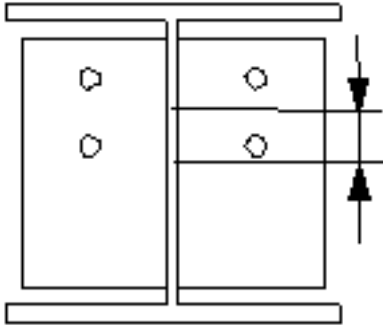
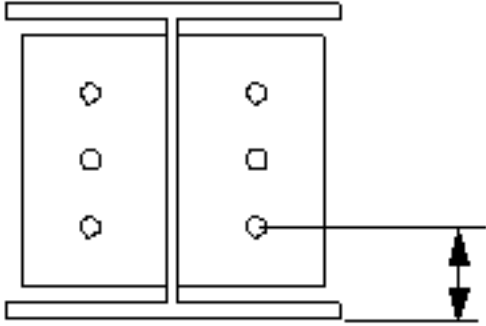
Use the **Bolts** tab to control the bolt properties.

### Bolt group dimensions



	Description
1	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.              </li> <li> <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.              </li> </ul>

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
2	Dimension for horizontal bolt group position.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Number of bolts.
5	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
6	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
7	Dimension for vertical bolt group position.

### Bolt basic properties

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

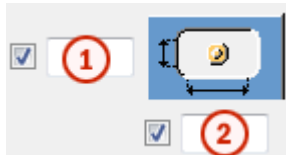
Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Cut length

Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

### Slotted holes

You can define slotted, oversized, or tapped holes.

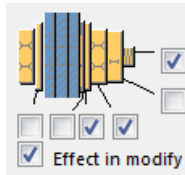


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

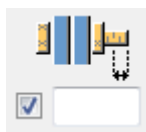
If you want to create a hole only, clear all the check boxes.









To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### General tab

Click the link below to find out more:

[General tab](#)



## ***Analysis tab***

Click the link below to find out more:

[Analysis tab](#)

## ***Welds***

Click the link below to find out more:


## **U.S. Bearing plate (1044)**

**U.S. Bearing plate (1044)** creates a bearing plate with web stiffeners for a beam, and either bolts or welded studs.

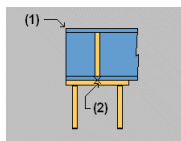
### **Objects created**

- Bearing plate
- Stiffeners
- Bolts
- Studs
- Anchor rods
- Welds

### **Use for**

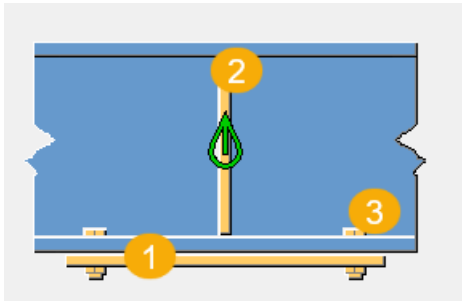
<b>Situation</b>	<b>Description</b>
	Bearing plate is bolted to a beam. Stiffener is created.

### **Selection order**



1. Select the beam.
2. Pick a position.  
The connection is created when you pick the position.

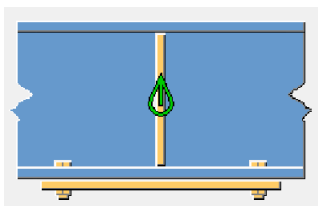
## Part identification key



	Description
1	Bearing plate
2	Web stiffener
3	Bolts or welded studs

## Picture tab

The **Picture** tab shows the bearing plate detail.



## Plates tab

Use the **Plates** tab to define the plate dimensions and properties.

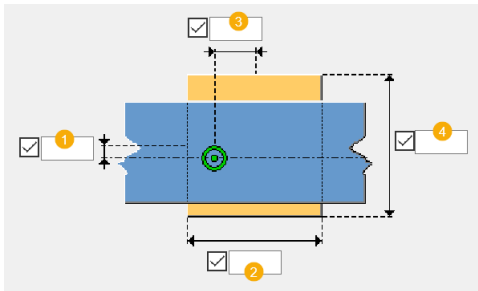
## Part

Option	Description
<b>Bearing plate</b>	Thickness of the bearing plate.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

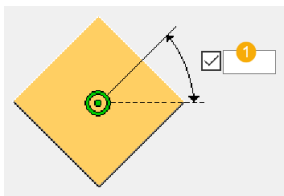
Option	Description	Default
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Dimensions



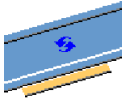
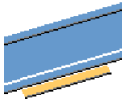
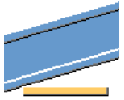
	Description
<b>1</b>	Vertical dimension to shift the bearing plate.
<b>2</b>	Length of the bearing plate. The length is calculated based on the size of the main part.
<b>3</b>	Horizontal dimension to shift the bearing plate.
<b>4</b>	Width of the bearing plate. The width is calculated based on the size of the main part.

### Bearing plate rotation



	Description
<b>1</b>	Bearing plate rotation in degrees, measured in the plane of the plate.

## Bearing plate position

Option	Description
	Default Sloped bearing plate is created. AutoDefaults can change this option.
	Sloped bearing plate is created.
	Horizontal bearing plate is created.

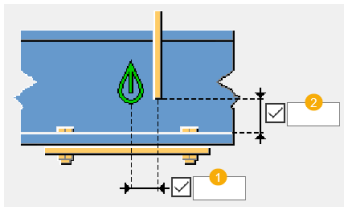
## Stiffeners tab

Use the **Stiffeners** tab to define the beam web stiffener positions and properties.

### Parts

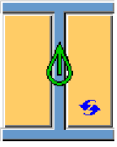
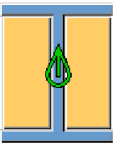
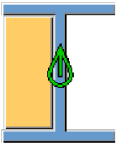
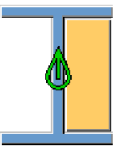
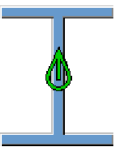
Option	Description
<b>Stiffeners</b>	Thickness, width and height of the stiffeners.

### Stiffener offsets

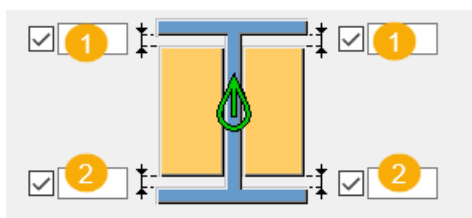


	Description
<b>1</b>	Stiffener horizontal offset from the point picked on the bearing plate.
<b>2</b>	Stiffener vertical offset from the beam web.

### Stiffener location

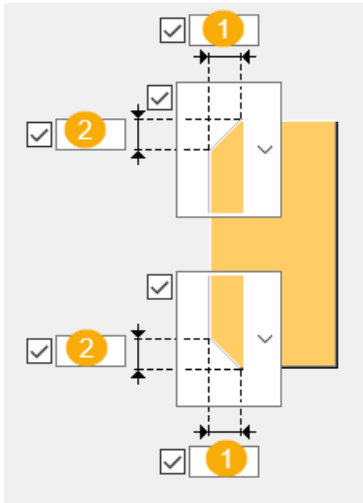
Option	Description
	Default Stiffener is created and welded to both sides of the beam. AutoDefaults can change this option.
	Stiffener is created and welded to both sides of the beam.
	Stiffener is created and welded to the far side of the beam web.
	Stiffener is created and welded to the near side of the beam web.
	Stiffeners are not created.

### Vertical stiffener offset



	Description
1	Stiffener offset from the main part top flange.
2	Stiffener offset from the main part bottom flange.

## Stiffener chamfer dimensions



	Description
1	Horizontal dimension of the chamfer.
2	Vertical dimension of the chamfer.

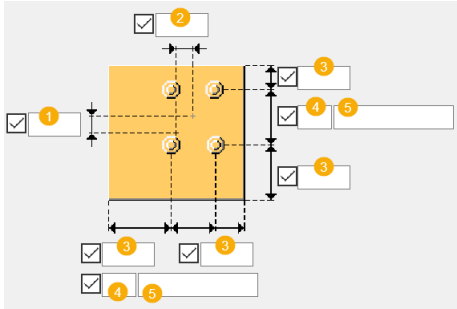
## Chamfer shape

Option	Option	Description
		Default No chamfer AutoDefaults can change this option.
		No chamfer
		Line chamfer
		Convex chamfer
		Concave chamfer

### **Bolts tab**

Use the **Bolts** tab to define the bolt group dimensions, and the bolt and stud properties.

### **Bolt group dimensions**



	<b>Description</b>
<b>1</b>	Dimension for vertical bolt group position.
<b>2</b>	Dimension for horizontal bolt group position.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### **Bolt basic properties**

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

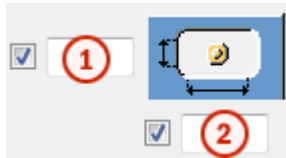
Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Stud basic properties

Option	Description
<b>Stud size</b>	Select the stud size.
<b>Stud standard</b>	Stud standard to be used inside the component.
<b>Stud length</b>	Select the stud length.
<b>Site/Workshop</b>	Location where the studs should be attached.

### Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options	

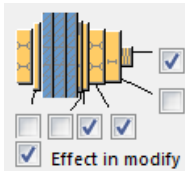


Option	Description	Default
	depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Anchor rods tab

Use the **Anchor rods** tab to define whether bolts, studs, anchor rods, or custom components are used, and their properties.





### Create as

Select whether to create the bearing plate with bolts, studs, anchor rods, or a custom component.

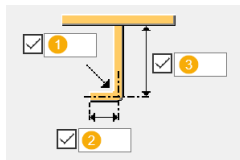
Option	Description
<b>Bolts</b>	Define the bolt group dimensions and bolt properties on the <b>Bolts</b> tab.
<b>Studs</b>	Define the stud properties on the <b>Bolts</b> tab.
<b>Anchors</b>	Select the anchor profile from the profile catalog.
<b>Custom component</b>	Select the component from the component catalog, and define the custom settings, up direction, and rotation.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Anchor bend direction

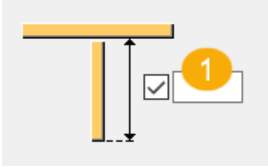
Option	Description
	Default Anchors are bent in. AutoDefaults can change this option.
	Anchors are bent in.
	Anchors are bent out.
	Anchors are not bent. Studs are created.

### Bent anchor bolt length



	Description
<b>1</b>	Radius of the bend.
<b>2</b>	Bent anchor bolt length.
<b>3</b>	Hook length.

## Stud length



	Description
1	Define the stud length.

### ***General tab***

Click the link below to find out more:  
General tab

### ***Design type tab***

Click the link below to find out more:

### ***Analysis tab***

Click the link below to find out more:  
Analysis tab

### ***Welds***

Click the link below to find out more:

## **U.S. Base plate (1047)**

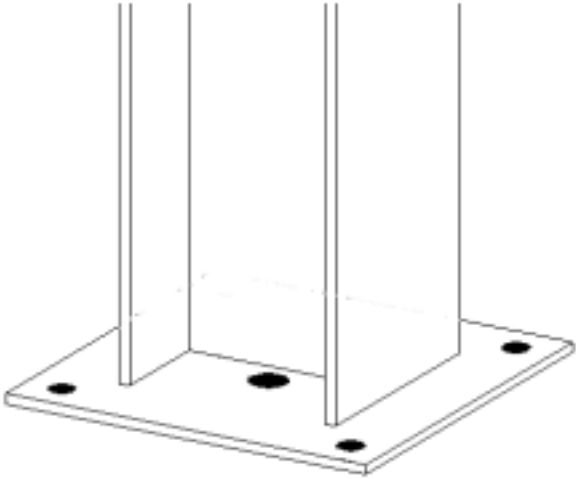
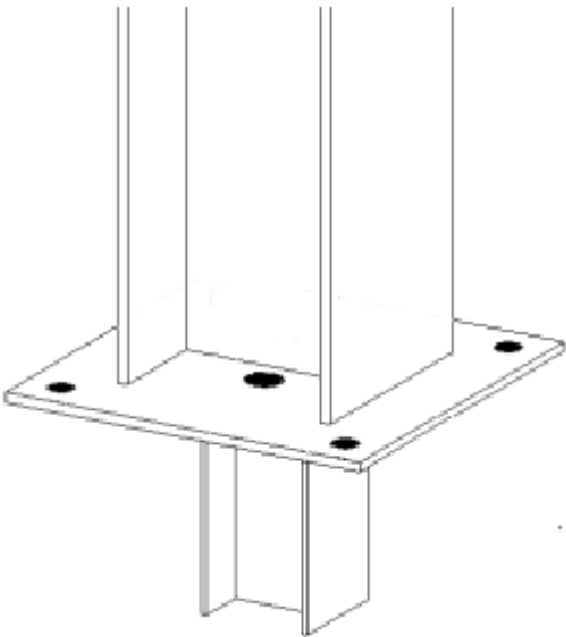
**U.S. Base plate (1047)** creates a base plate at the selected point on a column.

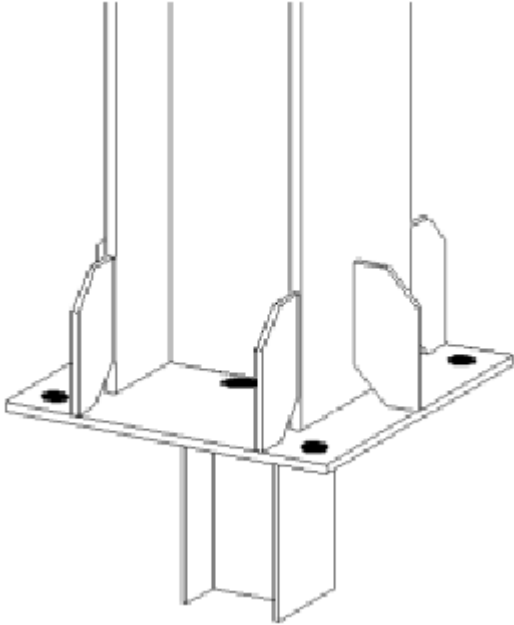
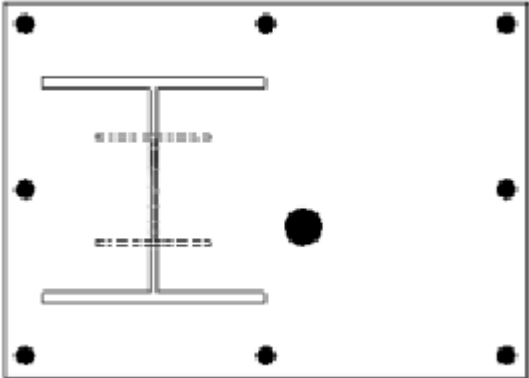
### **Objects created**

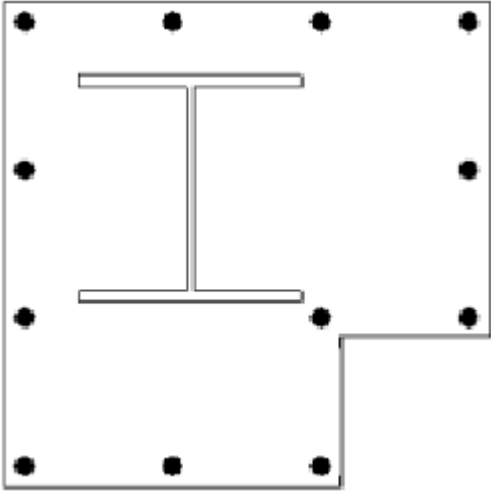
- Base plate
- Stiffeners (can only be added if the column has a W, I, or a TS profile)
- Shim plates (optional)
- Leveling plate (optional)
- Shear key (optional)
- Extra plates connecting the anchor rods

- Anchor rods
- Bolts
- Welds
- Additional component (optional)

**Use for**

Situation	Description
	<p>Column base plate with a grout hole.</p>
	<p>Column base plate with a grout hole and a shear key.</p>

Situation	Description
 <p>A 3D perspective drawing of a column base plate. The base plate is a flat rectangular plate with four circular bolt holes at the corners. It is attached to a column. Three vertical stiffeners are welded to the top surface of the plate. A shear key is also visible, which is a rectangular protrusion on the top surface of the plate, designed to fit into a corresponding slot in the column to prevent rotation.</p>	<p>Column base plate with a grout hole, a shear key and stiffeners .</p>
 <p>A 2D plan view of an offset column base plate. The plate is rectangular with eight circular bolt holes: four at the corners and four along the longer edges. A central I-beam column is shown with dashed lines indicating its position. A large solid black circle on the right side of the plate represents a grout hole. A shear key is also indicated on the right side of the plate.</p>	<p>Offset column base plate with a shear key and a grout hole.</p>

Situation	Description
	Column base plate with holes and chamfer.

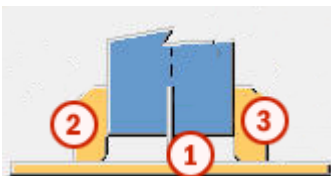
### Before you start

Create a column.

### Selection order

1. Select the main part (column).
2. Pick a position.  
The detail is created automatically.

### Part identification key

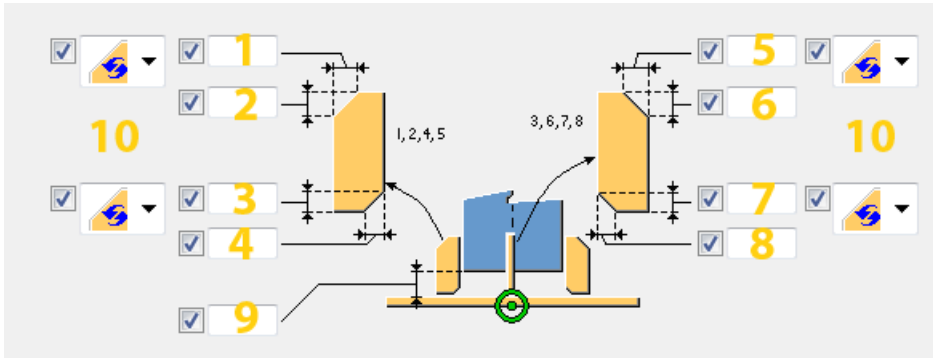


	Part
1	Base plate
2	Stiffeners 1, 2, 4, 5
3	Stiffeners 3, 6, 7, 8

### Picture tab

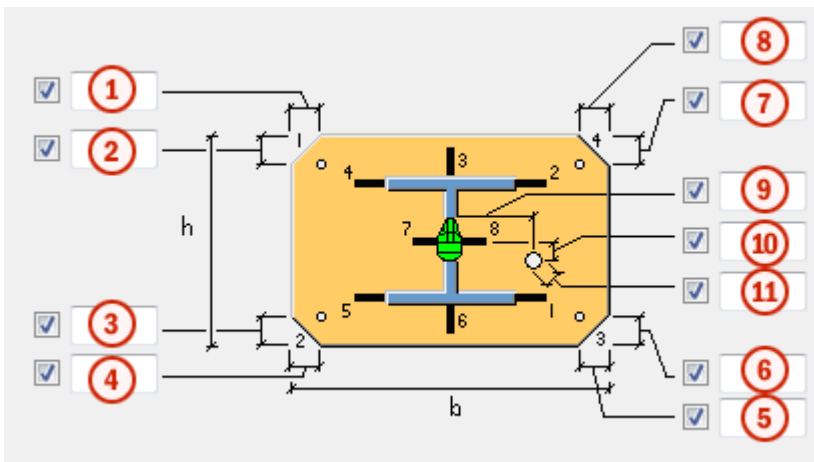
Use the **Picture** tab to control stiffener chamfering, base plate chamfers, and the location and size of the grout hole.

## Stiffener chamfering



	Description
1	Top chamfer width for stiffeners 1, 2, 4, 5.
2	Top chamfer height for stiffeners 1, 2, 4, 5.
3	Bottom chamfer height for stiffeners 1, 2, 4, 5
4	Bottom chamfer width for stiffeners 1, 2, 4, 5.
5	Top chamfer width for stiffeners 3, 6, 7, 8.
6	Top chamfer height for stiffeners 3, 6, 7, 8.
7	Bottom chamfer height for stiffeners 3, 6, 7, 8.
8	Bottom chamfer width for stiffeners 3, 6, 7, 8,
9	Weld gap.
10	Select the chamfer type.

## Base plate chamfering



	Description
1	Width of base plate chamfer 1.
2	Height of base plate chamfer 1.
3	Height of base plate chamfer 2.

	Description
<b>4</b>	Width of base plate chamfer 2.
<b>5</b>	Width of base plate chamfer 3.
<b>6</b>	Height of base plate chamfer 3.
<b>7</b>	Height of base plate chamfer 4.
<b>8</b>	Width of base plate chamfer 4.
<b>9</b>	Grout hole horizontal distance from the column center.
<b>10</b>	Grout hole vertical distance from the column center.
<b>11</b>	Diameter of the grout hole.

### **Parts tab**

Use the **Parts** tab to control the dimensions of the base plate, stiffeners, leveling plate, and shim plates.

### **Plate**

Option	Description	Default
<b>Plate</b>	Base plate thickness, width and height. You can add a comment about the part.	Thickness = 20 mm Width depends on the largest cross-sectional dimension of the column. Height depends on the largest cross-sectional dimension of the column.
<b>Stiffeners 1,2,4,5</b>	Stiffener 1, 2, 4, 5 thickness, width and height.	Thickness depends on the column flange thickness. Width depends on the distance between the edge of the plate and the edge of the column. Height = 1.75*width
<b>Stiffeners 3,6,7,8</b>	Stiffener 3, 6, 7, 8 thickness, width and height.	Thickness depends on the column flange thickness. Width depends on the distance between the



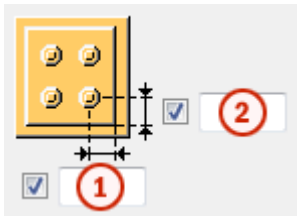
Option	Description	Default
		edge of the plate and the edge of the column. Height = 1.75*width
<b>Key profile</b>	Shear key profile by selecting it from the profile catalog.	
<b>Leveling plate</b>	Leveling plate thickness, width, and height. You can add a comment about the part.	
<b>Fitting plate</b>	Shim plate thickness, width and height. Define up to three different shim plates.	
<b>Number of fitting pl.</b>	Number of shim plates for each thickness.	1
<b>Leveling plate hole diameter</b>	Leveling plate hole diameter.	
<b>Key profile welded to</b>	Define to which plate the shear key is welded.	

Option	Description	Default
<b>Pos_no</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

Option	Description	Default
<b>Comment</b>	Add a comment about the part.	

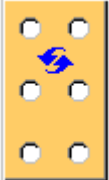
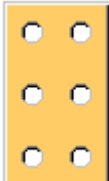

### Bolt edge distances in shim plate




Define the bolt edge distances for shim plates. When these fields are empty, shim plates are of the same size as the base plate.



	Description	Default
<b>1</b>	Horizontal bolt edge distance in the shim plate.	30 mm
<b>2</b>	Vertical bolt edge distance in the shim plate.	30 mm

### Shim plate shape

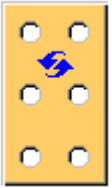
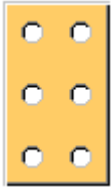

Option	Description
	Default Holes are based on the bolt group of the connection. AutoDefaults can change this option.
	Holes are based on the bolt group of the connection.
	Finger shim plate with horizontal slots. The plate can be installed from the right or the left side of the connection.

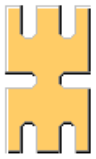
Option	Description
	<p>Finger shim plate with vertical slots. The plate can be installed from the top of the connection.</p>
	<p>Two separate finger shim plates with horizontal slots.</p>
	<p>Two separate finger shim plates with vertical slots.</p>

### Tolerance

Define the tolerance for the slots in finger shim plates. The width of the slot is the bolt diameter + the tolerance.

### Base plate mounting grooves

Option	Description
	<p>Default Mounting grooves are not created. AutoDefaults can change this option.</p>
	<p>Mounting grooves are not created.</p>
	<p>Mounting grooves are created horizontally.</p>

Option	Description
	Mounting grooves are created vertically for the first and last row of the bolts. For other rows of bolts, the mounting grooves are created horizontally.

### Tolerance for mounting grooves

Define the tolerance for the mounting grooves in the base plates. The width of the groove is the bolt diameter + the tolerance. If you do not enter a value, the bolt tolerance value is used.

### Parameters tab

Use the **Parameters** tab to control the plate properties and option, shear key offset, rotation and length, bolt properties and rotation of the base plate.

### Plate properties



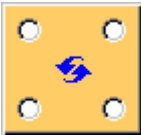


Option	Description
<b>Square cut corners (1-4)</b>	Cuts made on the corners of the base plate.  If you enter a number corresponding to one of the corners of the base plate, the corner has a square cut instead of a diagonal chamfer. You can enter the numbers for one or all the corners.
<b>Cut cast plate</b>	Define whether base plate corner cuts are applied to the cast plate.  Select <b>Yes</b> to apply the cuts.

### Bolt properties

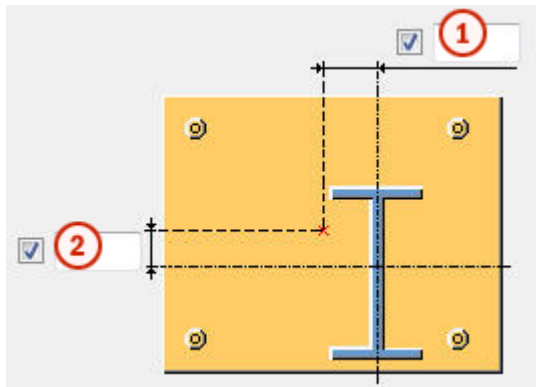
Option	Description
<b>Eliminate bolt numbers</b>	Define which bolts are deleted from the bolt group.  Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from

Option	Description
	left to right and from top to down. If there are more than 10 bolts, enclose the bolt numbers in quotes (for example, to delete bolt numbers 13 and 15, enter "13" "15").
<b>Eliminate external bolts</b>	Define whether external bolts are deleted.

### Base plate with holes or bolts

Option	Description
	Default Holes are created. AutoDefaults can change this option.
	Holes are created.
	Bolts are created.

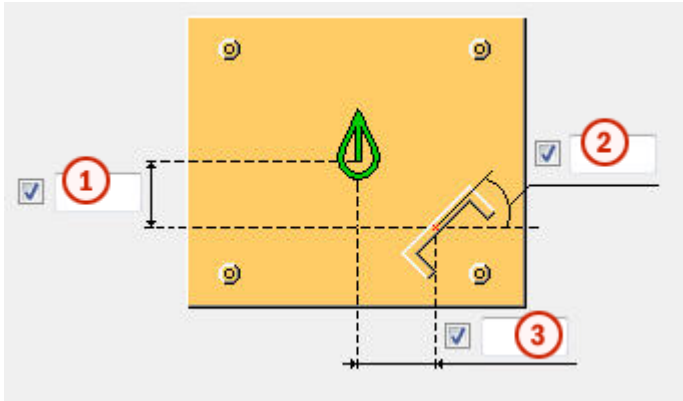
### Base plate offset



	Description
<b>1</b>	Base plate horizontal offset from the column center. Enter a negative value to move the base plate in the opposite direction

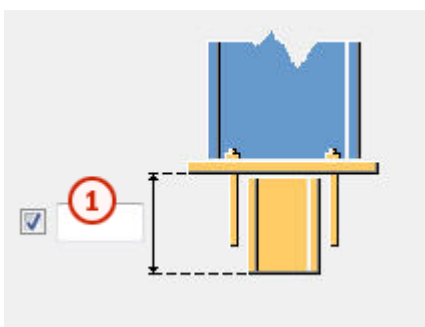
	Description
2	Base plate vertical offset from the column center. Enter a negative value to move the base plate in the opposite direction

### Shear key offset and rotation



	Description
1	Shear key vertical offset. Enter a negative value to move the shear key in the opposite direction.
2	Shear key rotation angle (in degrees). Positive angle rotates the shear key in a counter-clockwise direction and negative angle in a clockwise direction.
3	Shear key horizontal offset. Enter a negative value to move the shear key in the opposite direction.

### Shear key length

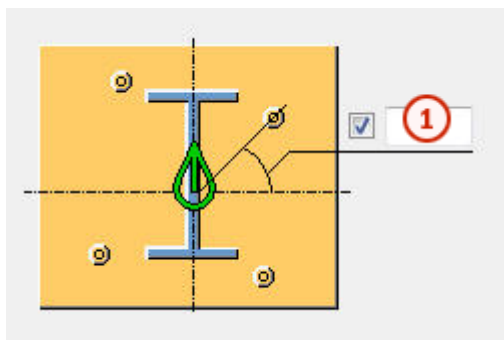


	Description
1	Shear key length to attach the shear key to the base plate. To attach a shear key to the base plate, define the shear key length and the key profile on the <b>Parts</b> tab.

## Bolt group rotation

You can define the bolt group rotation around its center. To rotate the bolt group, enter the rotation angle (in degrees).

Positive angle rotates the bolts in a counter-clockwise direction and negative angle in a clockwise direction.

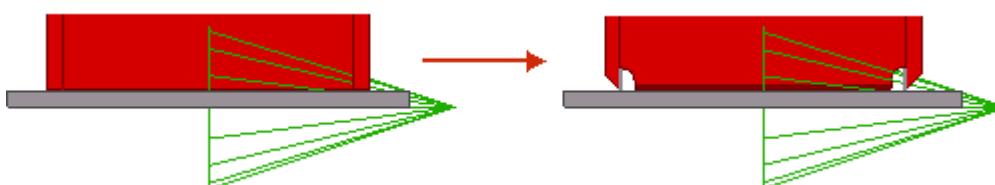


	Description
1	Bolt group rotation angle.

## Using additional components

You can use additional system or custom components to modify the column end or the base plate. For example, you can create special backing plates, weld preparations, and weld access holes for the column end.

If you use additional system or custom components, you need to manage the column end or the base plate properties in the additional component in question. When using several components, there may be multiple welds and cuts.



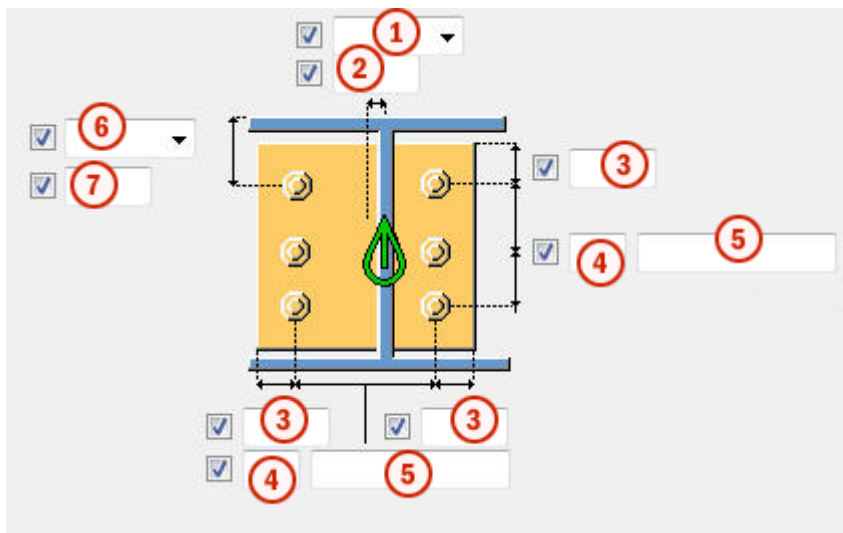
Option	Description
<b>Component</b>	Define a system or a custom component by selecting it from the component catalog.
<b>Attributes</b>	Enter the name of the attribute file for the selected component.
<b>Input</b>	Define to which parts the selected component is applied. <ul style="list-style-type: none"> <li><b>Default</b> is same as <b>Base + Column</b>.</li> </ul>

Option	Description
	<ul style="list-style-type: none"> <li>• <b>Column</b> sets the column as the main part. Use this option for details.</li> <li>• <b>Column + Base</b> sets the column as the main part and the base plate as the secondary part.</li> <li>• <b>Base + Column</b> sets the base plate as the main part and the column as the secondary part.</li> <li>• <b>Base</b> sets the base plate as the main part.</li> </ul>

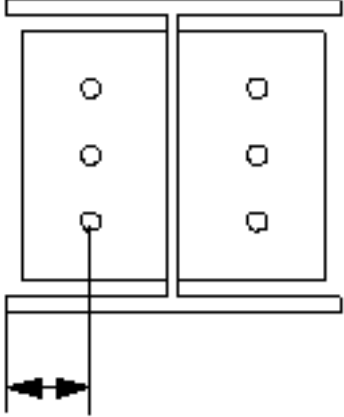
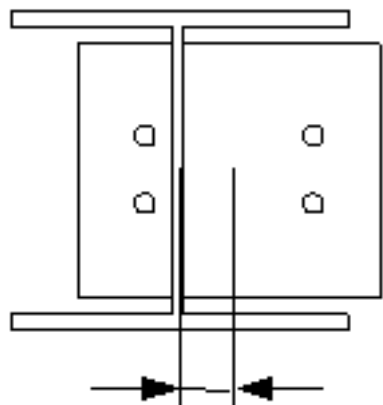
### ***Bolts tab***

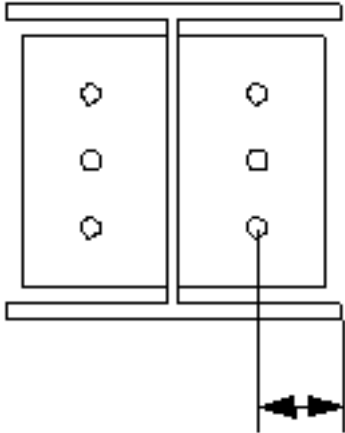
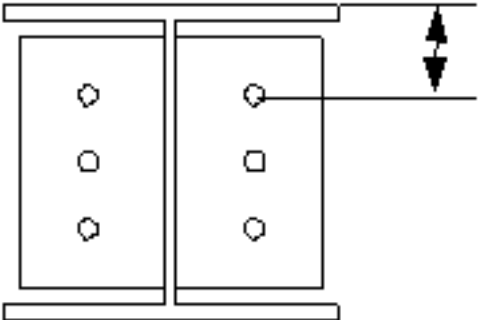
Use the **Bolts** tab to control the bolt properties.

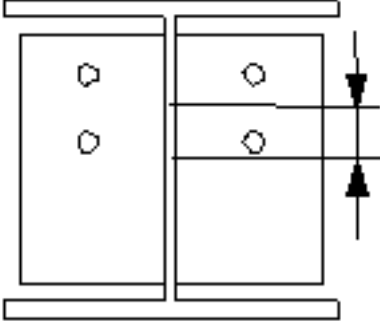
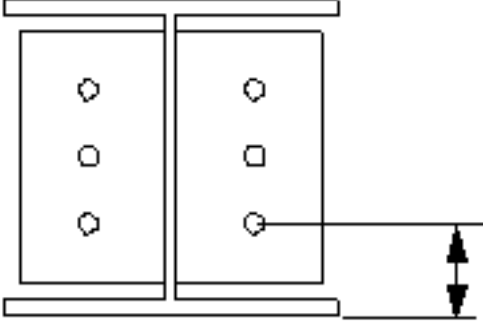
### **Bolt group dimensions**





	Description
1	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.              </li> <li> <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.              </li> </ul>

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
2	Dimension for horizontal bolt group position.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Number of bolts.
5	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
6	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part. </li> </ul>  <ul style="list-style-type: none"> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt. </li> </ul> 
<b>7</b>	Dimension for vertical bolt group position.

### Bolt basic properties

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

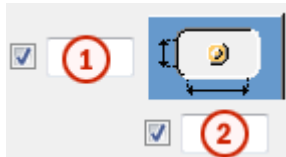
Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Cut length

Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

### Slotted holes

You can define slotted, oversized, or tapped holes.

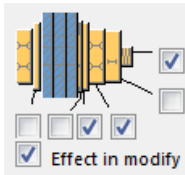


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

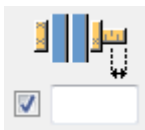
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### ***Stiffeners tab***

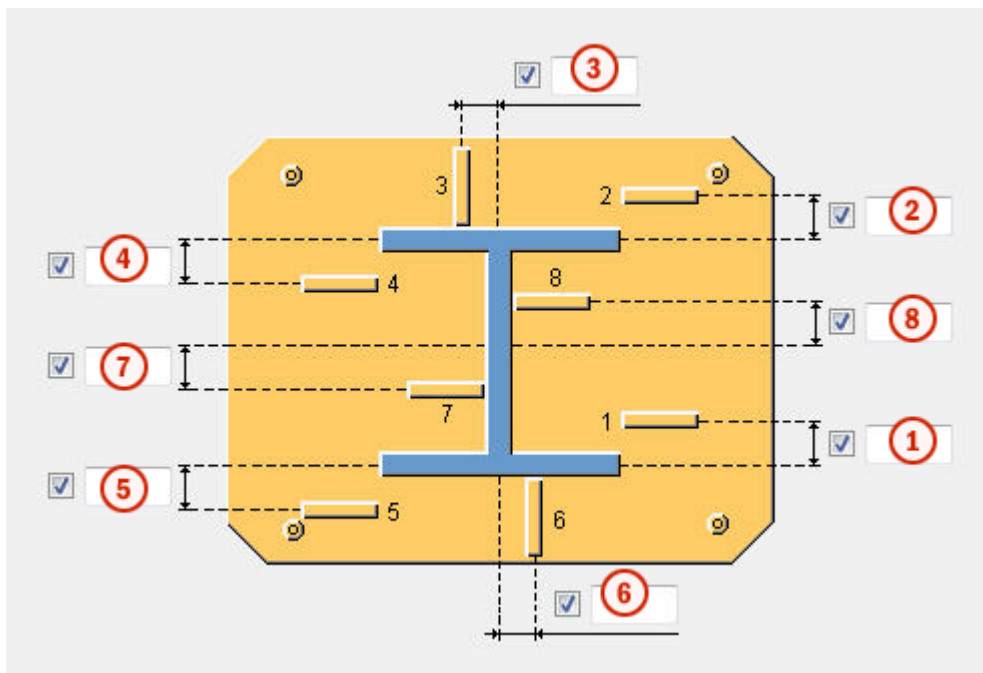
Use the **Stiffeners** tab to control stiffener positions and offsets.

### Stiffener positions (1-8)

Option	Description
<b>Stiffener Positions (1-8)</b>	Placement of the stiffeners. Only the stiffeners whose numbers are entered in the field are attached to the column.

### Stiffener offset

Stiffener offset allows the stiffeners to be moved. Enter a negative value to move the stiffener in the opposite direction.



	Description
<b>1</b>	Stiffener 1 offset.
<b>2</b>	Stiffener 2 offset.
<b>3</b>	Stiffener 3 offset.
<b>4</b>	Stiffener 4 offset.
<b>5</b>	Stiffener 5 offset.
<b>6</b>	Stiffener 6 offset.
<b>7</b>	Stiffener 7 offset.
<b>8</b>	Stiffener 8 offset.

### **Anchor rods tab**

Use the **Anchor rods** tab to control the creation of different types of anchor rods.

### **Anchor rod dimensions**

<b>Option</b>	<b>Description</b>
<b>Rod profile</b>	Anchor rod profile. You can add a comment about the part.
<b>Nut profile</b>	Nut profile.
<b>Washer profile</b>	Washer profile.
<b>Plate washer</b>	Plate washer thickness, width and height.
<b>Cast plate</b>	Cast plate thickness, width and height.
<b>Grout</b>	Grout thickness. Grouting helps you to model columns to the top of concrete parts and place the base plate correctly. It also makes it easier to dimension the detail in GA drawings. By default, no grouting is created. Select whether the grouting is created with or without slopes above or below the detail creation point. This also affects the shim plates.

### **Anchor rod part properties**

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_no</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in

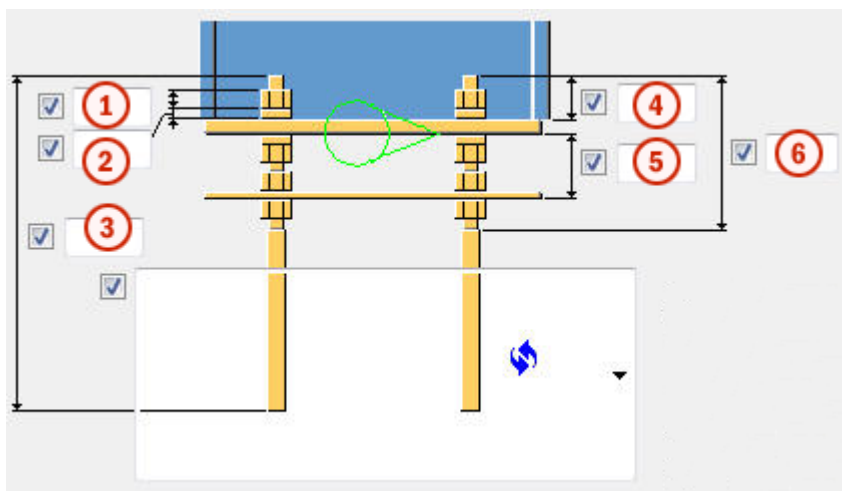
Option	Description	Default
		<b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	
<b>Comment</b>	Add a comment about the part.	

### Base plate with

Select whether to create the base plate with bolts, anchor rods, or a custom component.

By default, the base plate is created with **Bolts**.





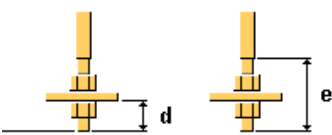
### Anchor rod dimensions



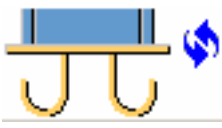

	Description	Default
<b>1</b>	Size or the length of the nut.	anchor rod diameter
<b>2</b>	Size or the thickness of the washer.	half of nut size
<b>3</b>	Length of the anchor rod.	500 mm
<b>4</b>	Length of the anchor rod above the base plate.	50 mm
<b>5</b>	Distance between the cast plate and the base plate.	60 mm
<b>6</b>	Length of the upper thread.	0 mm






## Anchor rod types

Option	Description	
	Default Type 1 AutoDefaults can change this option.	
	Type 1	
	<b>a</b> Radius of the hook <b>b</b> Width of the hook	<b>a</b> = 2*anchor bar diameter <b>b</b> = 1/5 of anchor bar length
	<b>a</b> Radius of the hook <b>b</b> Width of the hook <b>c</b> Height of the hook	<b>c</b> = same as width of the hook
	<b>d</b> Length of the anchor rod below the extra plate <b>e</b> Length of the lower thread	<b>d</b> = 2*nut size <b>e</b> = 4*nut size plus thickness of extra plate




## Hook direction

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1

Option	Description
	Type 2
	Type 3
	Type 4

### Bolting direction

**NOTE** You can define the bolting direction if you have created the base plate with bolts.

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

### Cast plate hole tolerance

Option	Description	Default
<b>Cast plate holes tolerance</b>	Tolerance of the cast plate holes.	same as bolt tolerance

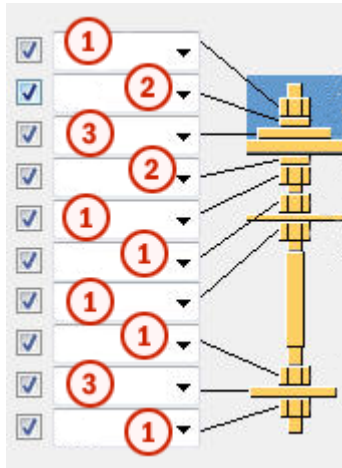
### Washer hole tolerance

Field	Description
<b>Create hole in washer</b>	By default, a hole is not created in the washer. Tolerance of the washer hole.

## Create assembly from all anchors

Define whether anchors are included in an anchor rod assembly. You can also include leveling plates into the assembly.

### Create



	Description
1	Create the nut profile. You can select to create two nuts at the top of the anchor rods.
2	Create the washer profile.
3	Create the washer plate.

### Anchor rod assembly

Define which parts of the anchor rod are included in the anchor rod assembly. You can weld the washer plates above and below the base plate.

### Extra plates tab

Use the **Extra plates** tab to control the placement, rotation, and type of the profiles (extra profile 1) created at the bottom of each anchor bar and the profiles (extra profile 2) that connect rows of anchor bars.

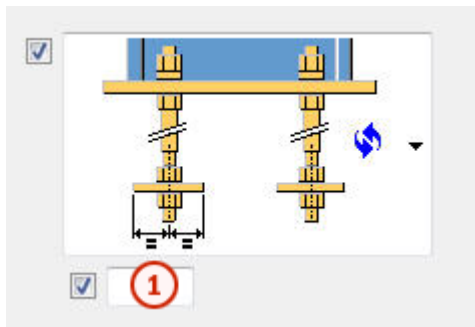
### Part dimensions

Option	Description	Default
<b>Extra profile 1</b>	Define the first extra profile by selecting it from the profile catalog.	PL10*100
<b>Extra profile 2</b>	Define the second extra profile by selecting it from the profile catalog.	

## Part properties

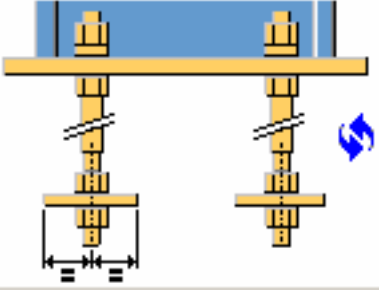
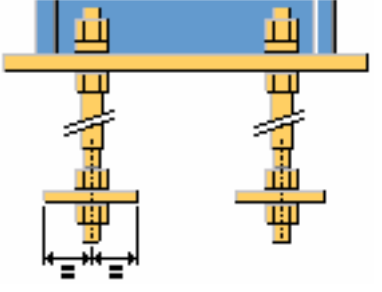
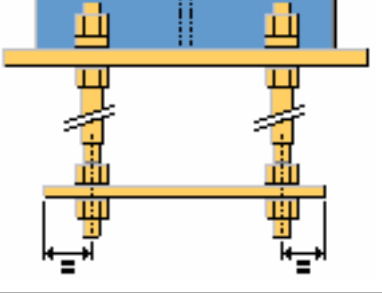
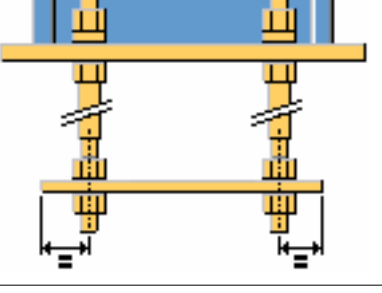
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

## Edge distance of extra profile 1

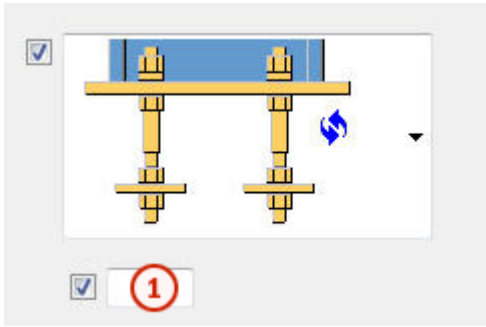


	Description	Default
<b>1</b>	Edge distance of extra profile 1.	50 mm

**Type and direction of extra profile 1**

Option	Description
	<p>Default Type 1 AutoDefaults can change this option.</p>
	<p>Type 1</p>
	<p>Type 2</p>
	<p>Type 3</p>

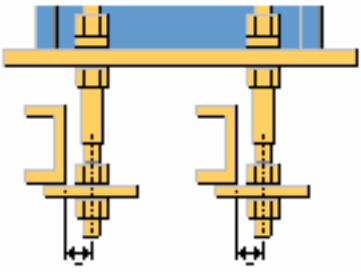
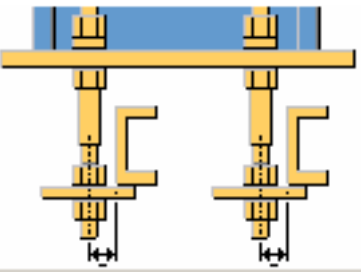
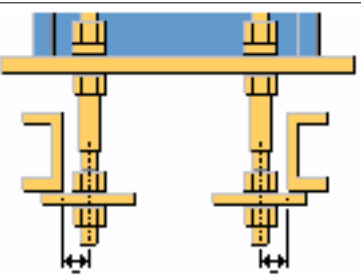
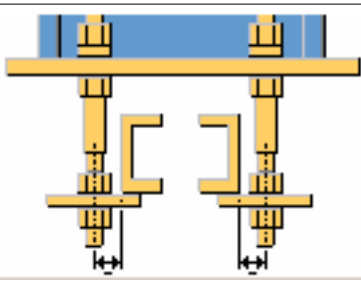
### Edge distance of extra profile 2



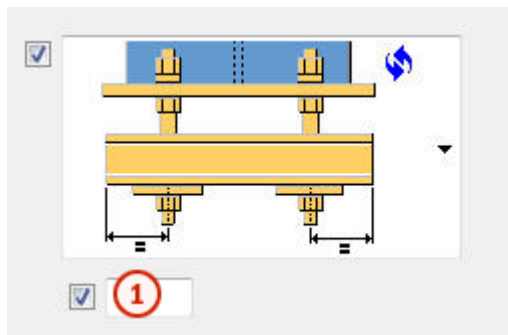
	Description	Default
1	Distance of extra profile 2 from the axis of the anchor bar.	Half of the nut size or anchor bar diameter

### Extra profile 2 type

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2

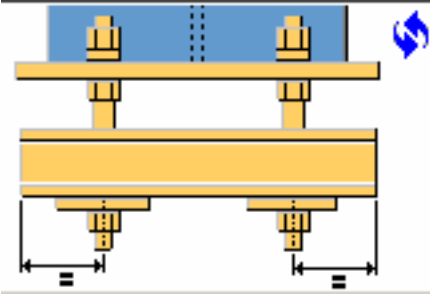
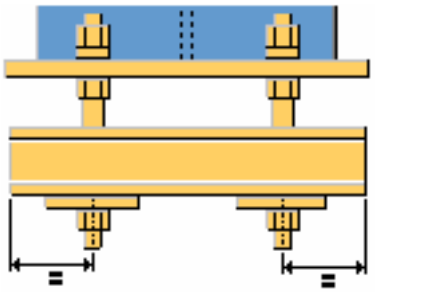
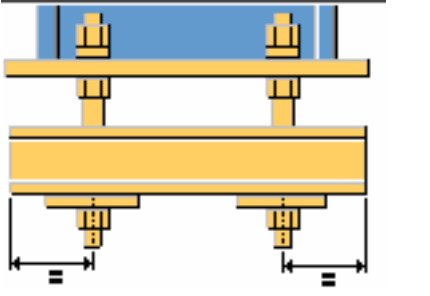
Option	Description
	Type 3
	Type 4
	Type 5
	Type 6

**Length of extra profile 2**



	Description	Default
1	Length of extra profile 2 from the axis of the anchor bar.	50 mm

### Direction of extra profile2

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2

### Extra profile 1 properties

Option	Description	Default
<b>Hole tolerance</b>	Hole tolerance of extra profile 1.	Same as bolt tolerance
<b>Circular profile height</b>	Enter the height of a circular extra profile 1.	
<b>Profile rotation</b>	Profile rotation of extra profile 1.	Front



## Extra profile 2 rotation

Option	Description	Default
<b>Extra profile 2 rotation</b>	Profile rotation of extra profile 2.	Front

### ***General tab***

Click the link below to find out more:

General tab

### ***Analysis tab***

Click the link below to find out more:

Analysis tab

### ***Welds***

Click the link below to find out more:

Create welds

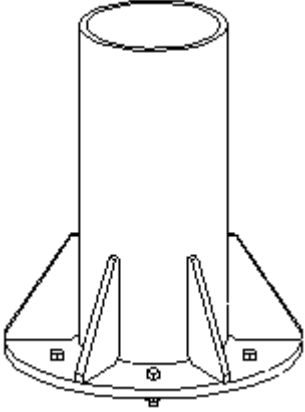
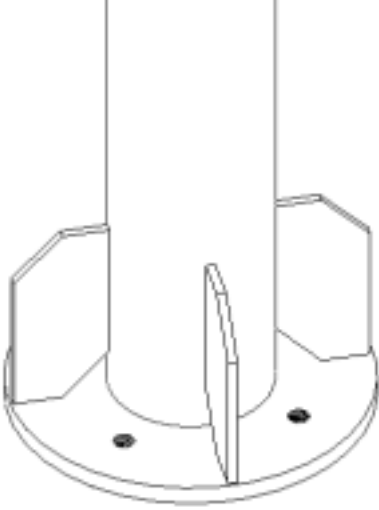
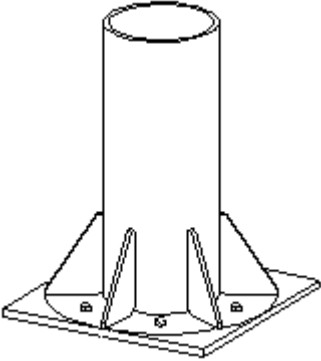
## **Circular base plates (1052)**

**Circular base plates (1052)** creates a base plate that is connected to a circular column.

### **Objects created**

- Circular base plate
- Tube stiffeners
- Extra plates connecting the anchor rods
- Anchor rods
- Bolts
- Welds
- Additional component (optional)

**Use for**

Situation	Description
	Circular base plate
	Circular base plate
	Square base plate

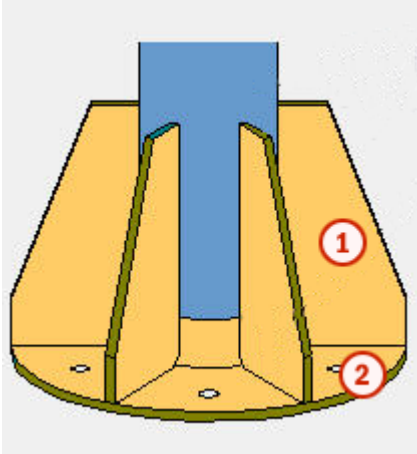
**Before you start**

Create a circular column.

### Selection order

1. Select the main part (column).
2. Pick a position.  
The detail is created automatically.

### Part identification key

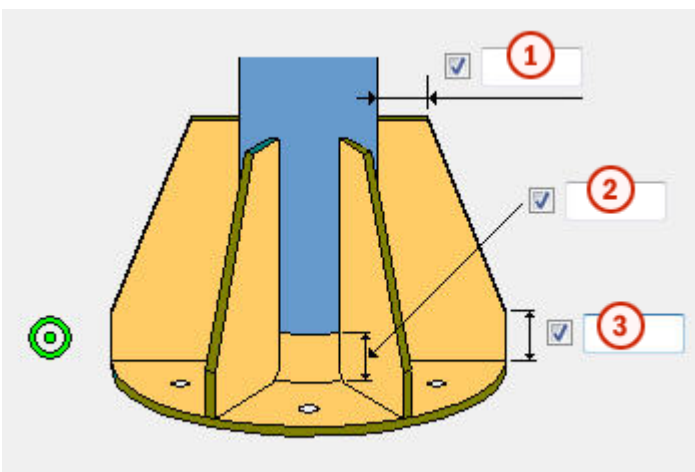


	Part
1	Stiffener
2	Base plate

### Picture tab

Use the **Picture** tab to control the geometry of **Circular base plates (1052)**.

### Dimensions



	<b>Description</b>	<b>Default</b>
<b>1</b>	Width of the top part of the tube stiffener.	20 mm
<b>2</b>	Weld gap.	0 mm
<b>3</b>	Height of the end part of the tube stiffener.	30 mm

### **Parts tab**

Use the **Parts** tab to control the dimensions of the circular base plate and the tube stiffeners.

### **Plate**

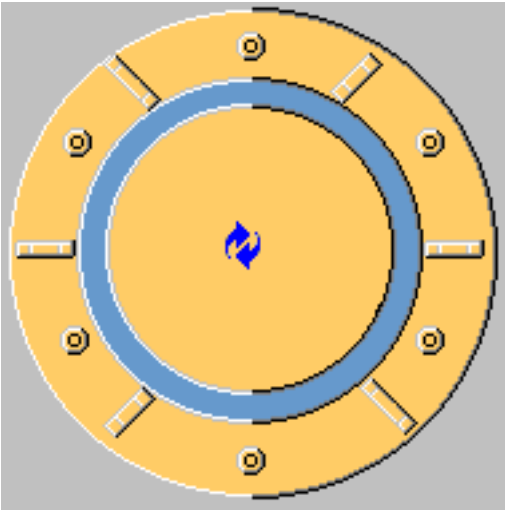
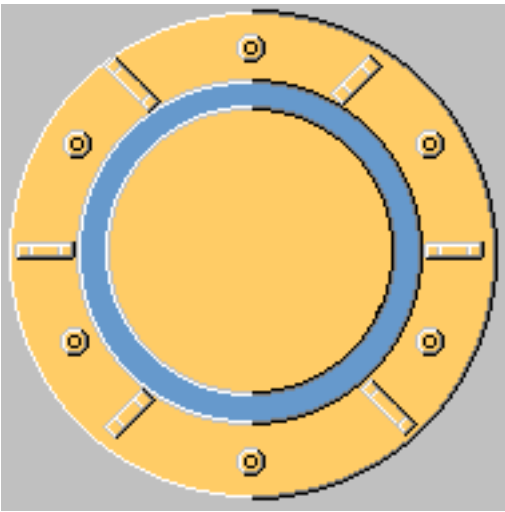
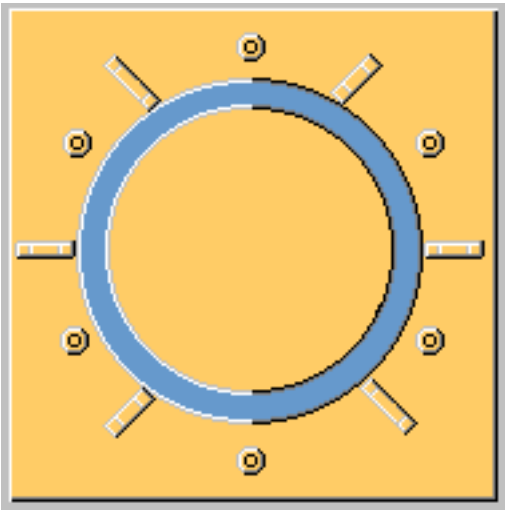
<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Circular base plate</b>	Circular base plate thickness and width.	Thickness = 30 mm Width depends on the tube diameter.
<b>Tube stiffeners</b>	Tube stiffener thickness, width and height.	Thickness = 10 mm Height = 200 mm

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

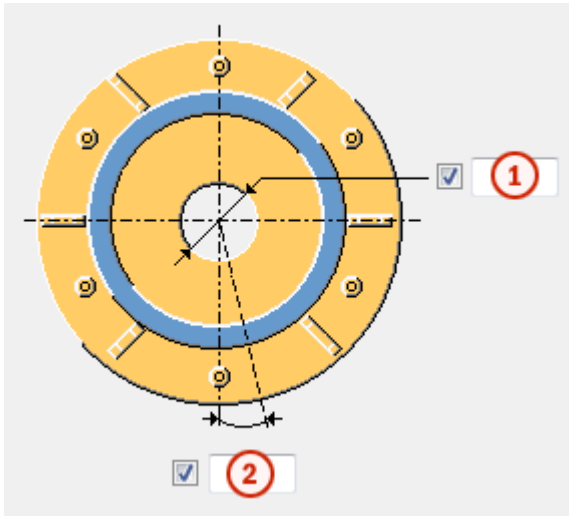
### **Parameters tab**

Use the **Parameters** tab to control the shape of the base plate, diameter of the inner plate, bolt angle, the overlap, and chamfer dimension.

## Base plate shape

Option	Description
	Default Round base plate AutoDefaults can change this option.
	Round base plate
	Square base plate

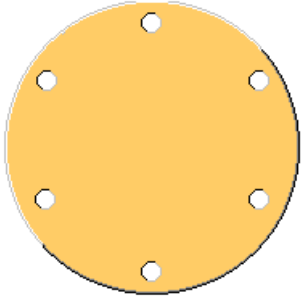
### Inner plate diameter and bolt angle



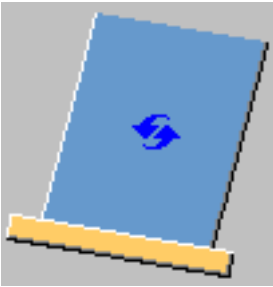
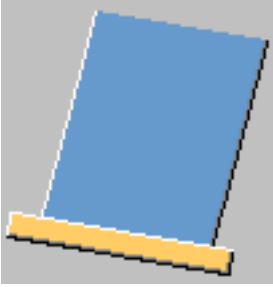
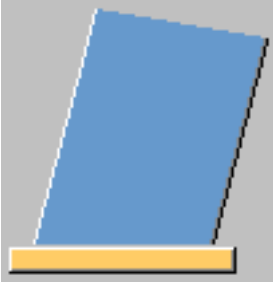
	Description
1	Base plate inner diameter.
2	Bolt angle (in degrees).

### Cast plate shape

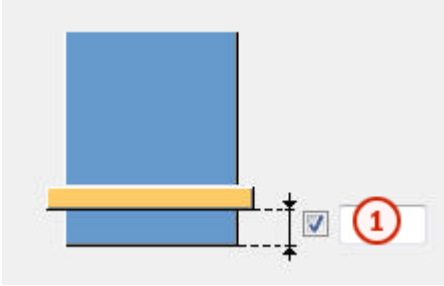
Option	Description
	Default Square cast plate AutoDefaults can change this option.
	Square cast plate

Option	Description
	Round cast plate

### Base plate position

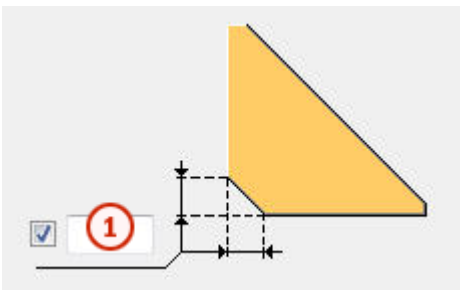
Option	Description
	Default Base plate is perpendicular to the column. AutoDefaults can change this option.
	Base plate is perpendicular to the column.
	Base plate is not perpendicular to the column.

## Overlap



	Description	Default
1	Distance between the column flange and the plate flange.	0 mm

## Chamfer dimension

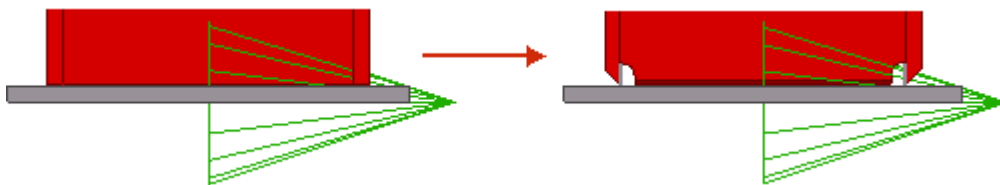


	Description	Default
1	Chamfer dimension.	10 mm

## Using additional components

You can use additional system or custom components to modify the column end or the base plate. For example, you can create special backing plates, weld preparations, and weld access holes for the column end.

If you use additional system or custom components, you need to manage the column end or the base plate properties in the additional component in question. When using several components, there may be multiple welds and cuts.



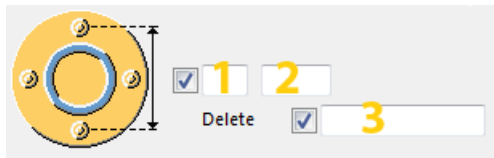


Option	Description
<b>Component</b>	Select a system or a custom component from the <b>Applications &amp; components</b> catalog.
<b>Attributes</b>	Select an attribute file for the component.
<b>Input</b>	<p>Define to which parts the selected component is applied.</p> <ul style="list-style-type: none"> <li>• <b>Default</b> is same as <b>Base + Column</b>.</li> <li>• <b>Column</b> sets the column as the main part. Use this option for details.</li> <li>• <b>Column + Base</b> sets the column as the main part and the base plate as the secondary part.</li> <li>• <b>Base + Column</b> sets the base plate as the main part and the column as the secondary part.</li> <li>• <b>Base</b> sets the base plate as the main part.</li> </ul>

### ***Bolts tab***

Use the **Bolts** tab to control the bolt properties.

### **Bolt positions**



	Description
<b>1</b>	Number of bolts.
<b>2</b>	Spacing between bolts.
<b>3</b>	<p>Define which bolts are deleted from the bolt group.</p> <p>Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to down.</p>

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Cut length

Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

## Slotted holes

You can define slotted, oversized, or tapped holes.



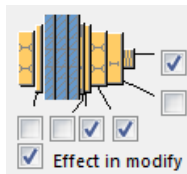
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.

Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Anchor rods tab

Use the **Anchor rods** tab to control the creation of different types of anchor rods.

## Anchor rod dimensions

Option	Description
<b>Rod profile</b>	Anchor rod profile. You can add a comment about the part.
<b>Nut profile</b>	Nut profile.
<b>Washer profile</b>	Washer profile.
<b>Plate washer</b>	Plate washer thickness, width and height.
<b>Cast plate</b>	Cast plate thickness, width and height.
<b>Grout</b>	Grout thickness. Grouting helps you to model columns to the top of concrete parts and place the base plate correctly. It also makes it easier to dimension the detail in GA drawings. By default, no grouting is created. Select whether the grouting is created with or without slopes above or below the detail creation point. This also affects the shim plates.

## Anchor rod part properties

Option	Description	Default
<b>Pos_no</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

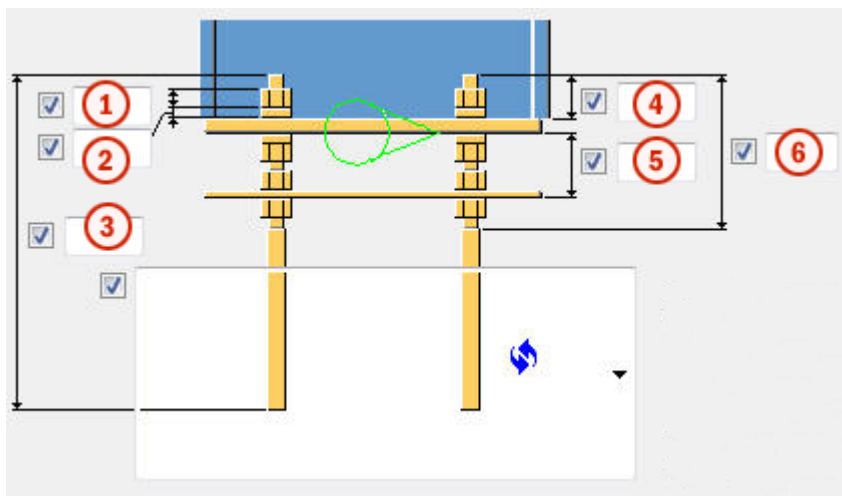
Option	Description	Default
<b>Finish</b>	Describes how the part surface has been treated.	
<b>Comment</b>	Add a comment about the part.	

### Base plate with

Select whether to create the base plate with bolts, anchor rods, or a custom component.





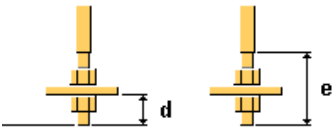
By default, the base plate is created with **Bolts**.

### Anchor rod dimensions








	Description	Default
<b>1</b>	Size or the length of the nut.	anchor rod diameter
<b>2</b>	Size or the thickness of the washer.	half of nut size
<b>3</b>	Length of the anchor rod.	500 mm
<b>4</b>	Length of the anchor rod above the base plate.	50 mm
<b>5</b>	Distance between the cast plate and the base plate.	60 mm
<b>6</b>	Length of the upper thread.	0 mm

## Anchor rod types

Option	Description	
	Default Type 1 AutoDefaults can change this option.	
	Type 1	
	<b>a</b> Radius of the hook <b>b</b> Width of the hook	<b>a</b> = 2*anchor bar diameter <b>b</b> = 1/5 of anchor bar length
	<b>a</b> Radius of the hook <b>b</b> Width of the hook <b>c</b> Height of the hook	<b>c</b> = same as width of the hook
	<b>d</b> Length of the anchor rod below the extra plate <b>e</b> Length of the lower thread	<b>d</b> = 2*nut size <b>e</b> = 4*nut size plus thickness of extra plate




## Hook direction

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1

Option	Description
	Type 2
	Type 3
	Type 4

### Bolting direction

**NOTE** You can define the bolting direction when you create the base plate with bolts.

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

### Cast plate hole tolerance

Option	Description	Default
<b>Cast plate holes tolerance</b>	Tolerance of the cast plate holes.	same as bolt tolerance

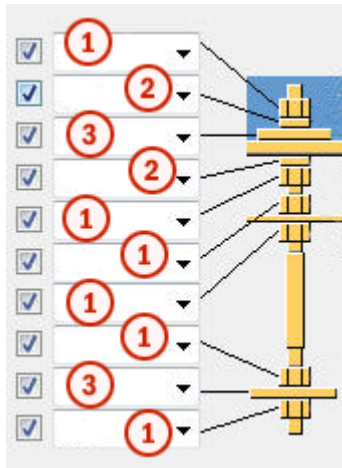
### Washer hole tolerance

Option	Description
<b>Create hole in washer</b>	By default, a hole is not created in the washer. Tolerance of the washer hole.

## Plate washer placing

Option	Description
<b>Plate washers placed along circle</b>	Select whether the plate washers are placed along the circle.  Placing the washers along the circle distributes the loads evenly.

## Create



	Description
<b>1</b>	Create the nut profile.
<b>2</b>	Create the washer profile.
<b>3</b>	Create the washer plate.

## Anchor rod assembly

Define which parts of the anchor rod are included in the anchor rod assembly.  
You can weld the washer plates above and below the base plate.

### **Extra plates tab**

Use the **Extra plates** tab to control the placement, rotation, and type of the profiles (extra profile 1) created at the bottom of each anchor bar and the profiles (extra profile 2) that connect rows of anchor bars.

## Part dimensions

Option	Description	Default
<b>Extra profile 1</b>	Select the first extra profile from the profile catalog.	PL10*100

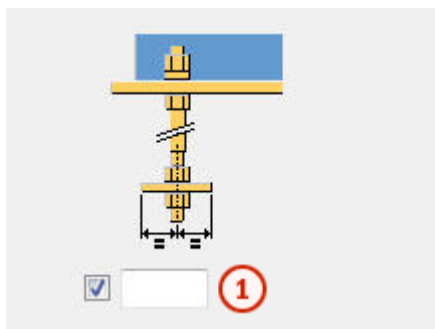


Option	Description	Default
<b>Extra profile 2</b>	Select the second extra profile from the profile catalog.	

### Part properties

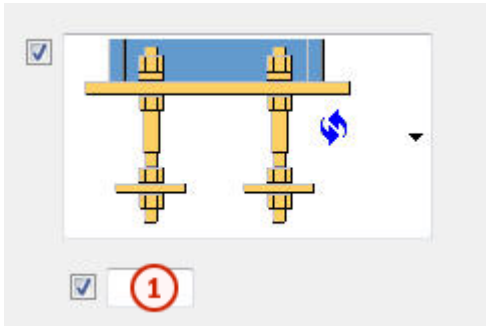
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Edge distance of extra profile 1



	Description	Default
<b>1</b>	Edge distance of extra profile 1.	50 mm

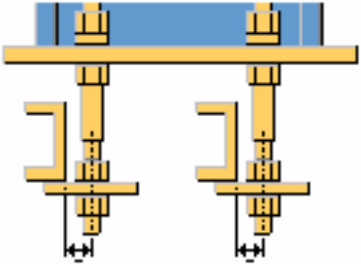
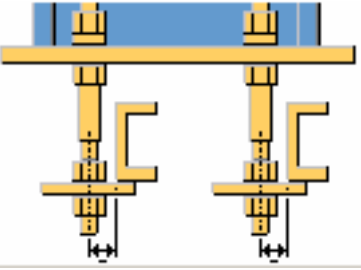
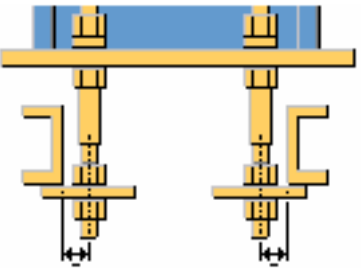
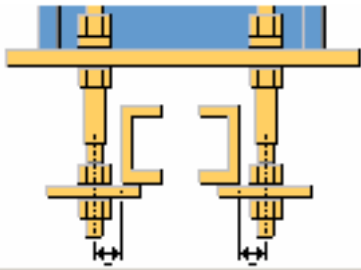
### Edge distance of extra profile 2



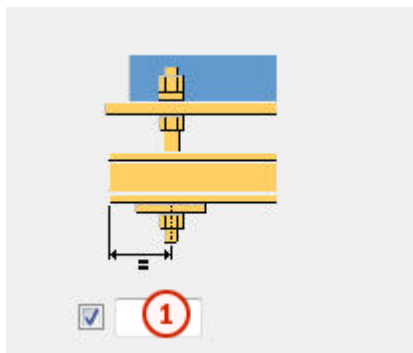
	Description	Default
1	Distance of extra profile 2 from the axis of the anchor bar.	Half of nut size or anchor bar diameter

### Extra profile 2 type

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2

Option	Description
	Type 3
	Type 4
	Type 5
	Type 6

**Length of extra profile 2**



	Description	Default
1	Length of extra profile 2 from the axis of the anchor bar.	50 mm

### Extra profile 1 properties

Option	Description	Default
Hole tolerance	Hole tolerance of extra profile 1.	Same as bolt tolerance
Circular profile height	Enter the height of a circular extra profile 1.	
Profile rotation	Profile rotation of extra profile 1.	Front

### Extra profile 2 rotation

Option	Description	Default
Extra profile 2 rotation	Profile rotation of extra profile 2.	Front

### **General tab**

Click the link below to find out more:

### **Analysis tab**

Click the link below to find out more:

### **Welds**

Click the link below to find out more:

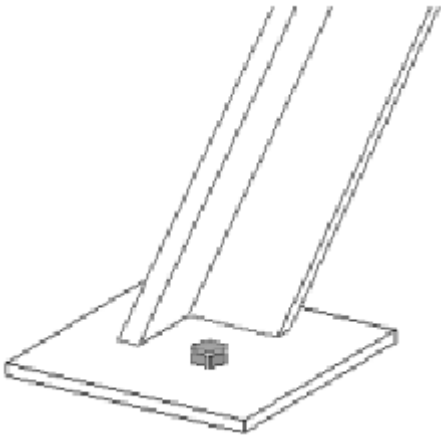
## **Base plate (1053)**

**Base plate (1053)** creates a base plate for tower legs. The base plate is horizontal even if the column is sloped.

### **Objects created**

- Base plate
- Bolts
- Welds
- Additional component (optional)

## Use for

Situation	Description
	Horizontal base plate connected to sloped tower leg

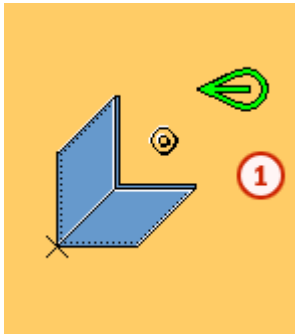
### Before you start

Create a column or a beam.

### Selection order

1. Select the main part (column or beam).
2. Pick a position.  
The detail is created automatically.

### Part identification key

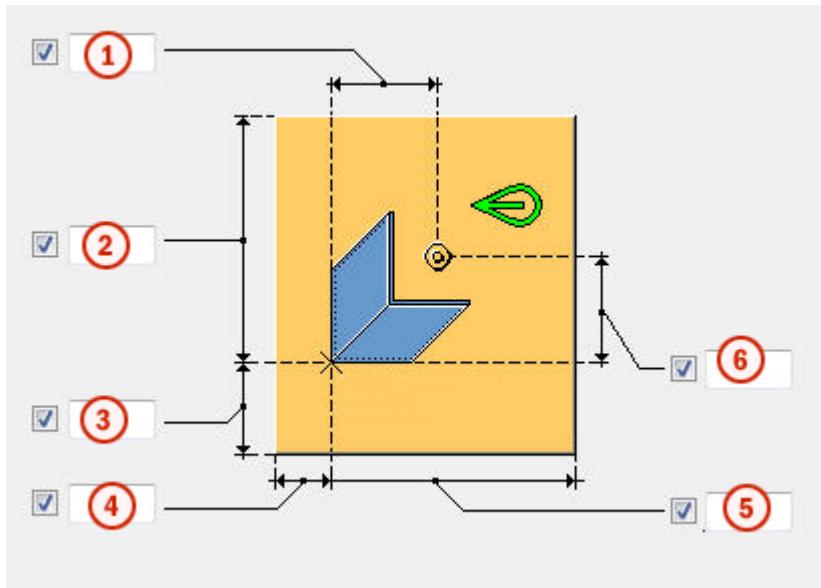


Number	Part
1	Base plate

### Picture tab

Use the **Picture** tab to control the position of the base plate.

## Dimensions



	Description	Default
1	Horizontal distance between the reference point and the bolt.	150 mm
2	Vertical distance between the reference point and upper edge of the base plate.	300 mm
3	Vertical distance between the reference point and the lower edge of the base plate.	200 mm
4	Horizontal distance between the reference point and the left edge of the base plate.	200 mm
5	Horizontal distance between the reference point and the right edge of the base plate.	300 mm
6	Vertical distance between the reference point and the bolt.	150 mm

### Parts tab

Use the **Parts** tab to control the dimensions of the base plate.

### Plate

Option	Description	Default
<b>Plate</b>	Thickness, width, and height of the base plate.	Thickness = 10 mm Width = 250 mm Height = 250 mm

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tab**

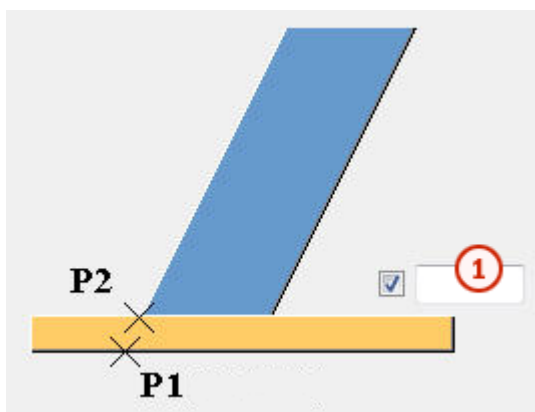
Use the **Parameters** tab to control the position of the reference point and the bolt locations.

### **Reference point**

Define the plate dimensions and bolt locations using a reference point. The point is located at the column end angle.

The picked point locates either on the top (**P2**) or the bottom of the base plate (**P1**).

### **Weld gap**

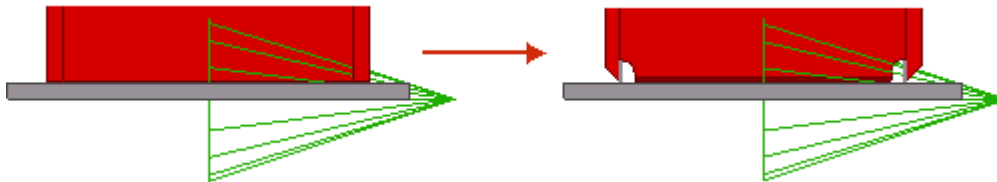


	Description
1	Gap between the base plate and the column.

## Using additional components

You can use additional system or custom components to modify the column end or the base plate. For example, you can create special backing plates, weld preparations, and weld access holes for the column end.

If you use additional system or custom components, you need to manage the column end or the base plate properties in the additional component in question. When using several components, there may be multiple welds and cuts.



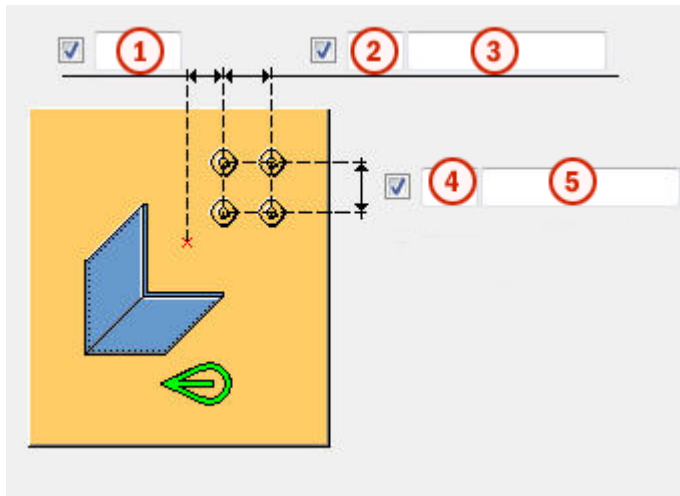
Option	Description
<b>Component</b>	Select a system or a custom component from the <b>Applications &amp; components</b> catalog.
<b>Attributes</b>	Select an attribute file for the component.
<b>Input</b>	Define to which parts the selected component is applied. <ul style="list-style-type: none"><li>• <b>Default</b> is same as <b>Base + Column</b>.</li><li>• <b>Column</b> sets the column as the main part. Use this option for details.</li><li>• <b>Column + Base</b> sets the column as the main part and the base plate as the secondary part.</li><li>• <b>Base + Column</b> sets the base plate as the main part and the column as the secondary part.</li><li>• <b>Base</b> sets the base plate as the main part.</li></ul>

### **Bolts tab**

Use the **Bolts** tab to control the bolt properties.



## Bolt group dimensions



	Description
1	Dimension for horizontal bolt group position.
2	Number of bolts in the horizontal dimension.
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
4	Number of bolts in the vertical dimension.
5	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

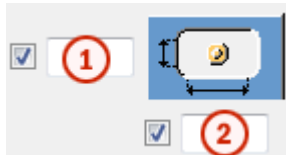
Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Cut length

Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

### Slotted holes

You can define slotted, oversized, or tapped holes.

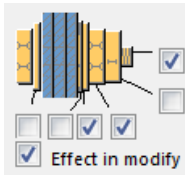


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Create as

Use this option to switch between bolts and custom components.

Select the custom component from the **Applications & components** catalog and define the custom settings, up direction, rotation, and anchor length.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

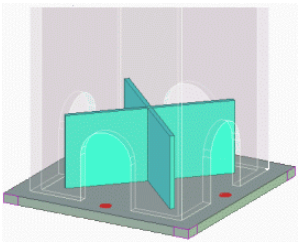
## **Box column base plate (1066)**

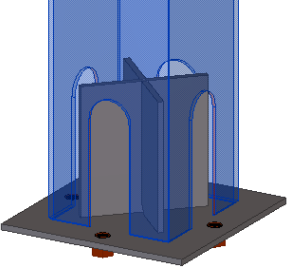
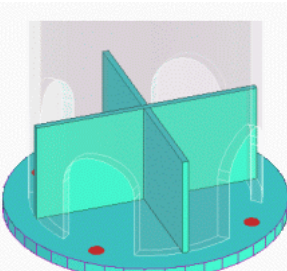
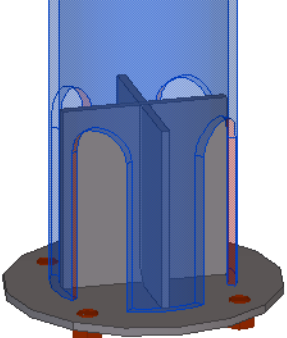
**Box column base plate (1066)** creates a base plate for a square or a circular column that is embedded in concrete.

### **Objects created**

- Base plate
- Ribs
- Flow holes
- Bolts
- Welds

### **Use for**

<b>Situation</b>	<b>Description</b>
 A 3D CAD rendering of a box column base plate. The base plate is a flat, rectangular plate with a square hole in the center. A square column is shown rising from the center of the hole. The column has a hollow, box-like structure with vertical ribs. The base plate has several circular holes, likely for bolts, and is shown sitting on a grey concrete surface. The column is highlighted in a light blue color.	Base plate with a square column

Situation	Description
	Base plate with a square column
	Base plate with a circular column
	Base plate with a circular column

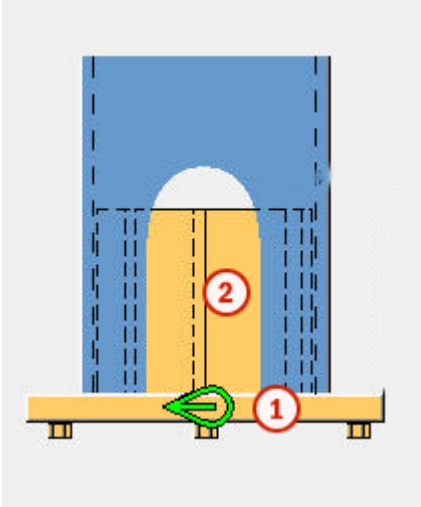
### Before you start

Create a column.

### Selection order

1. Select the main part (column).
2. Pick a position.  
The detail is created automatically.

## Part identification key

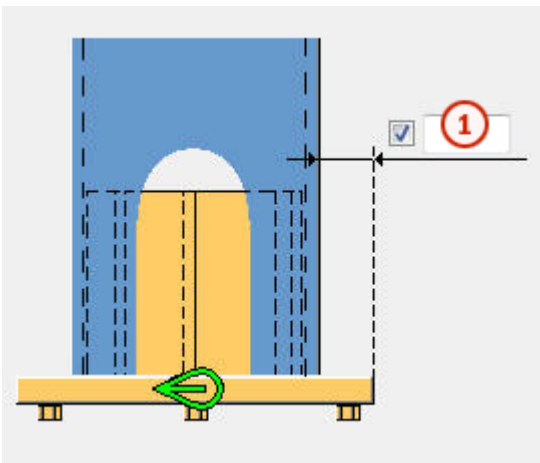


Number	Part
1	Base plate
2	Rib

## Picture tab

Use the **Picture** tab to control the position of the base plate.

## Dimensions



	Description	Default
1	Distance from the edge of the column to the edge of the base plate.	50 mm

### **Parts tab**

Use the **Parts** tab to control the dimensions of the base plate, long rib, and short rib.

#### **Plate**

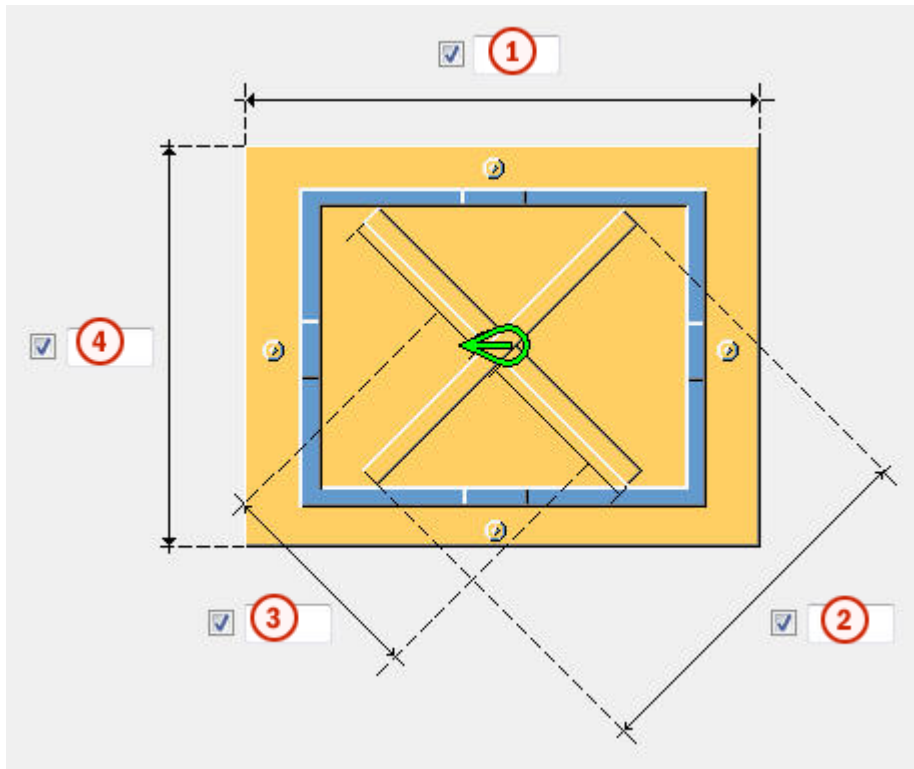
<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Base plate</b>	Base plate thickness.	
<b>Long rib</b>	Long rib thickness.	9 mm
<b>Short rib</b>	Short rib thickness.	9 mm

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### **Parameters tabs**

Use the **Parameters** tab to control the base plate and rib dimensions.

## Base plate and rib dimensions

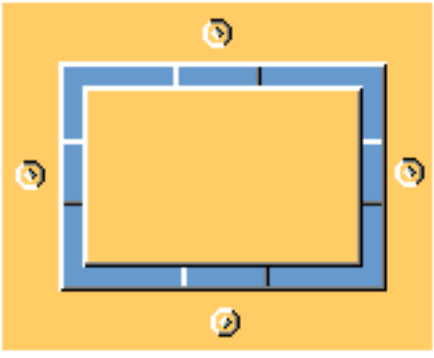
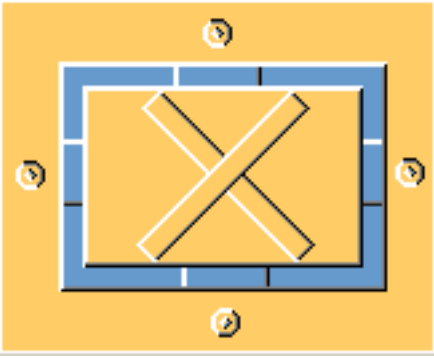


	Description
1	Width of base plate.
2	Length of long rib.
3	Length of short ribs.
4	Height of base plate.


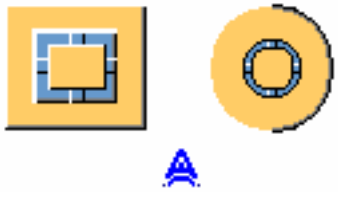
## Rib creation

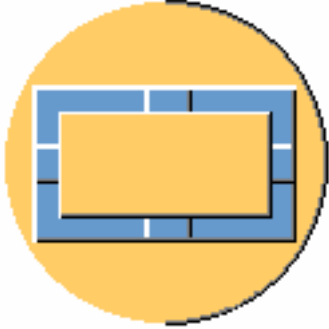
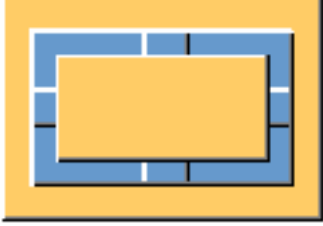
Option	Description
	<p>Default</p> <p>No ribs are created.</p> <p>AutoDefaults can change this option.</p>



Option	Description
	No ribs are created.
	Ribs are created.

**Base plate creation**

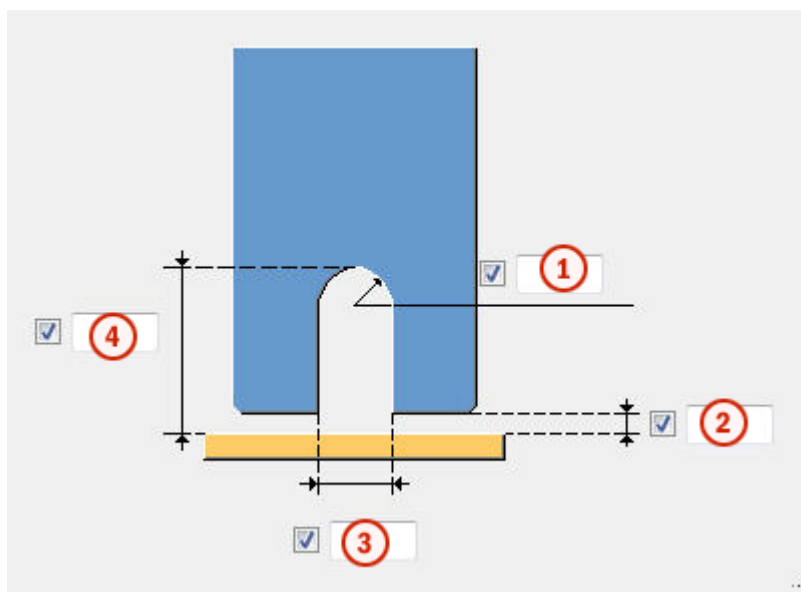
Option	Description
	Default Rectangular base plate AutoDefaults can change this option.
	Automatic

Option	Description
	Round base plate
	Rectangular base plate

### Flow holes tab

Use the **Flow holes** tab to control the distance between the base plate and the column.




### Flow hole properties



	Description
1	Rounding of the column flow hole.
2	Weld gap.

	Description
3	Width of the column flow hole.
4	Height of the column flow hole.

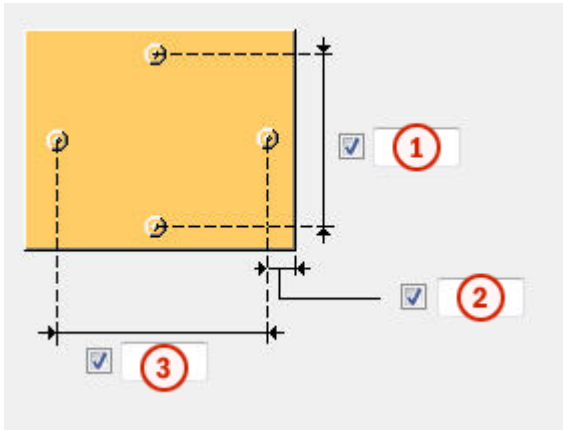
### Flow hole creation

Option	Description
	Default Flow holes are created. AutoDefaults can change this option.
	Flow holes are not created.
	Flow holes are created.

### **Bolts tab**

Use the **Bolts** tab to control the bolt properties.

## Bolt positions



	Description
1	Vertical bolt spacing dimension.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Horizontal bolt spacing dimension.

## Bolt basic properties

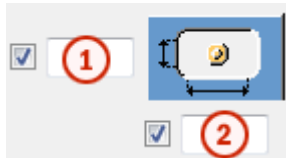
Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Cut length

Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

## Slotted holes

You can define slotted, oversized, or tapped holes.

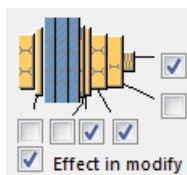


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

## Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## Create as

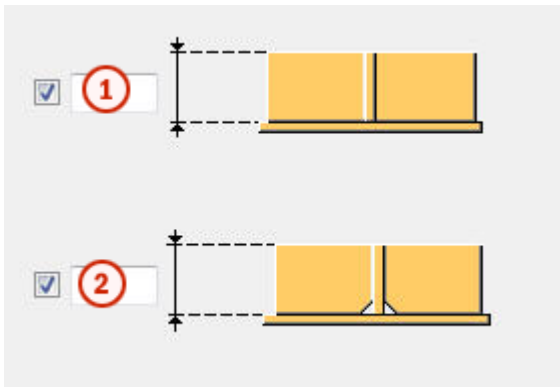
Use this option to switch between bolts and custom components.

Select the custom component from the **Applications & components** catalog and define the custom settings, up direction, rotation, and anchor length.

## Height of ribs tab

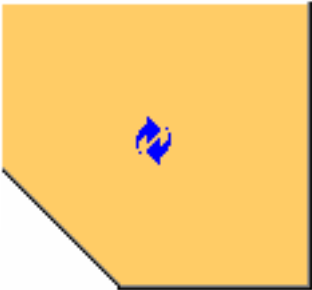
Use the **Height of ribs** tab to control the height of the short and the long ribs.


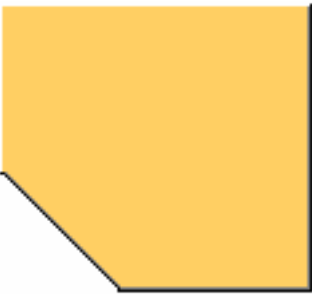

### Height of ribs



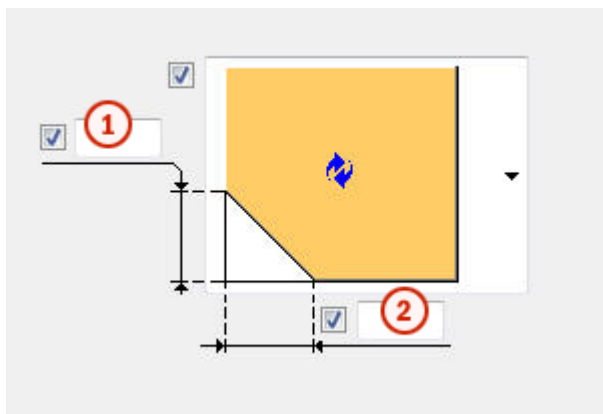
	Description	Default
1	Height of the long rib.	200 mm
2	Height of the short ribs.	200 mm

## Short rib chamfer

Option	Description
	Default Line chamfer is created. AutoDefaults can change this option.

Option	Description
	Chamfer is not created.
	Line chamfer is created.
	Arc chamfer is created.

### Chamfer dimensions



	Description	Default
1	Chamfer height.	15 mm
2	Chamfer width.	15 mm

### **General tab**

Click the link below to find out more:  
General tab

### **Analysis tab**

Click the link below to find out more:  
Analysis tab

### **Welds tab**

Click the link below to find out more:

## **2.17 Built-up Components**

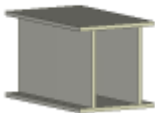
This section introduces built-up components available in Tekla Structures.

Click the links below to find out more:

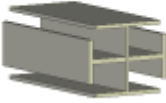



- [Beams \(page 2144\)](#)
- [Columns \(page 2171\)](#)
- [Frames \(page 2183\)](#)
- [Connections and details \(page 2210\)](#)

### **Beams**

Use these components to automatically create built-up beams:

<b>Component</b>	<b>Image</b>	<b>Description</b>
<a href="#">Box girder (S13) (page 2145)</a>		Creates a built-up beam using four plates welded together.



Component	Image	Description
<a href="#">Cross profile (S32)</a> (page 2149)		Creates a built-up beam using an I profile and two T profiles welded to the I profile web.
<a href="#">Cross plate profile (S33)</a> (page 2154)		Creates a built-up beam from seven plates welded together.
<a href="#">Tapered beam (S98)</a> (page 2158)		Creates a tapered or straight built-up beam with I shape.
<a href="#">Tapered beam 2 (S45)</a> (page 2163)		Creates a tapered or straight built-up beam with I shape. Flange and web plates can be spliced.
<a href="#">PEB Tapered section (S94)</a> (page 2168)		Creates a simple built-up beam or column between two picked points. The shape can be straight or tapered.

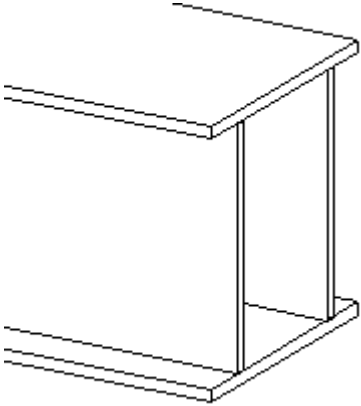
### **Box girder (S13)**

**Box girder (S13)** creates a built-up beam with a box cross section.

#### **Objects created**

- Built-up beam
- Welds

## Use for

Situation	Description
	Straight built-up beam with a cross section.

## Do not use for

Tapered built-up beams.

## Before you start

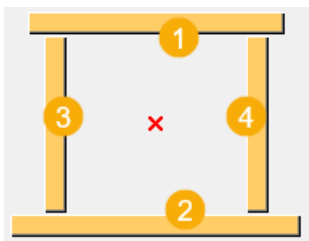
Ensure that you have two points to pick.

## Selection order

1. Pick the start point for the beam.
2. Pick the end point for the beam.

The beam is created automatically when you pick the end point.

## Part identification key

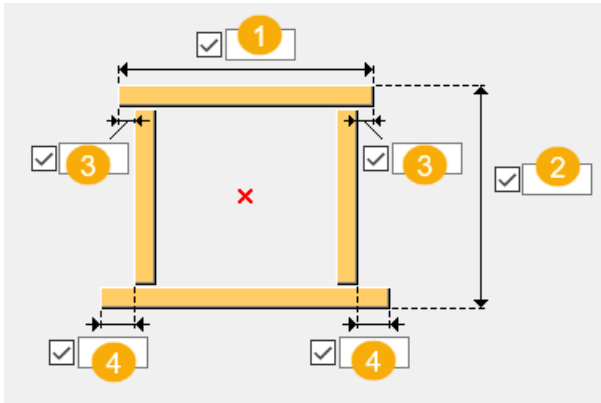


	Description
1	Top flange
2	Bottom flange
3	Left web
4	Right web

## Picture tab

Use the **Picture** tab to define the dimensions.

## Dimensions



	Description
1	Width of the beam
2	Height of the beam
3	Top flange extension dimension
4	Bottom flange extension dimension

### Parts tab

Use the **Parts** tab to define the part properties.

### Parts

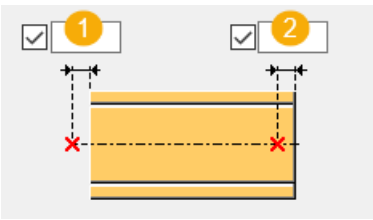
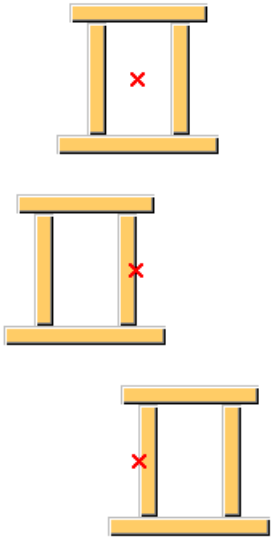
Option	Description
<b>Top flange</b>	Thickness of the top flange.
<b>Bottom flange</b>	Thickness of the bottom flange.
<b>Left web</b>	Thickness of the left web.
<b>Right web</b>	Thickness of the right web.

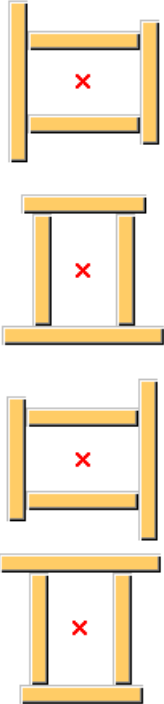

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in

Option	Description	Default
		<b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	

### Parameters tab

Use the **Parameters** tab to define the part name, class and finish, and the position, rotation, and length.

Option	Description
<b>Name</b>	Define the name, class, and finish of the beam.
<b>Class</b>	
<b>Finish</b>	
	<p>Negative values shorten the beam, positive values lengthen it.</p> <ol style="list-style-type: none"> <li>Moves the beam end that you pick first.</li> <li>Moves the beam end that you pick second.</li> </ol>
	<p>Select the position in plane and define the position in plane offset. See .</p>

Option	Description
	<p>Select a suitable rotation and define the rotation offset. See .</p>
	<p>Select the position in depth and define the position in depth offset. See .</p>

**Welds**

Click the link below to find out more:

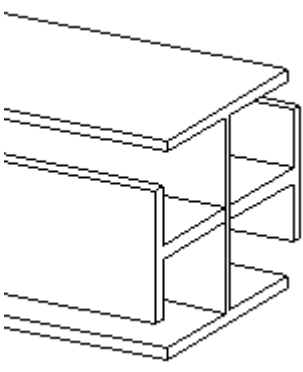
### **Cross profile (S32)**

**Cross profile (S32)** creates a built-up beam using an I profile and two T profiles welded to the I profile web.

#### **Objects created**

- I profile
- T profile (2)
- Welds

#### **Use for**

<b>Situation</b>	<b>Description</b>
	Straight built-up beam. Two T profiles welded to an I profile.

#### **Do not use for**

Tapered built-up beams.

#### **Before you start**

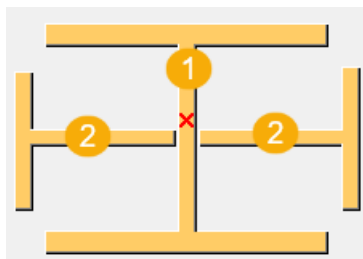
Check that you have two points to pick.

#### **Selection order**

1. Pick the start point for the beam.
2. Pick the end point for the beam.

The beam is created automatically when you pick the end point.

#### **Part identification key**

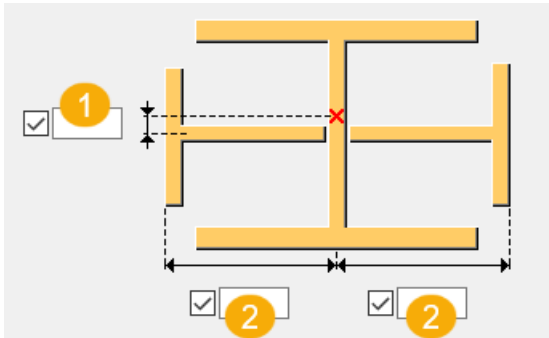


	Description
1	I profile
2	T profile

### Picture tab

Use the **Picture** tab to define the dimensions of the profiles.

### Dimensions



	Description
1	Adjust the location of the horizontal parts relative to the vertical parts. By default, the eccentricity is zero. T profiles are connected to the middle of the I profile web.
2	T profile dimension from the I profile center line.

### Parts tab

Use the **Parts** tab to define the I profile and the T profile properties.

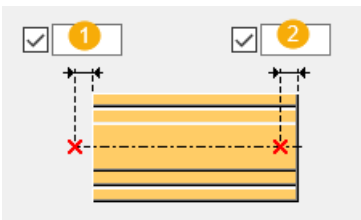
### Parts

Option	Description
<b>Main prof</b>	Select the profile from the profile catalog.
<b>Sec prof1</b>	Select the profile from the profile catalog.
<b>Sec prof2</b>	Select the profile from the profile catalog.

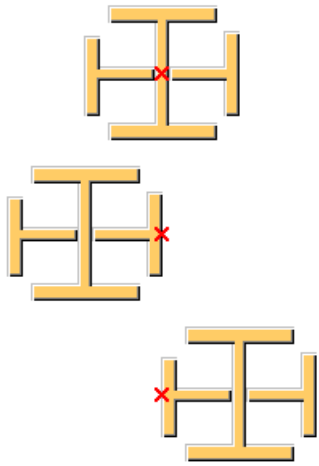
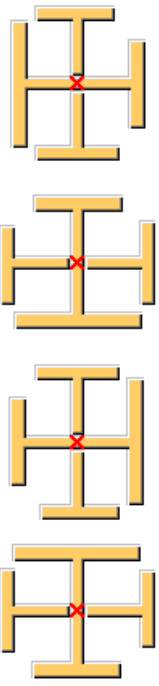
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	


#### Parameters tab

Use the **Parameters** tab to define the part name, class and finish, and the position, rotation, and length.

Option	Description
<b>Name</b>	Define the name, class, and finish of the profiles.
<b>Class</b>	
<b>Finish</b>	
	<p>Negative values shorten the beam, positive values lengthen it.</p> <ol style="list-style-type: none"> <li>Moves the beam end that you pick first.</li> <li>Moves the beam end that you pick second.</li> </ol>



Option	Description
	<p>Select the position in plane and define the position in plane offset. See .</p>
	<p>Select a suitable rotation and define the rotation offset. See .</p>

Option	Description
	<p>Select the position in depth and define the position in depth offset. See .</p>

### Welds

Click the link below to find out more:

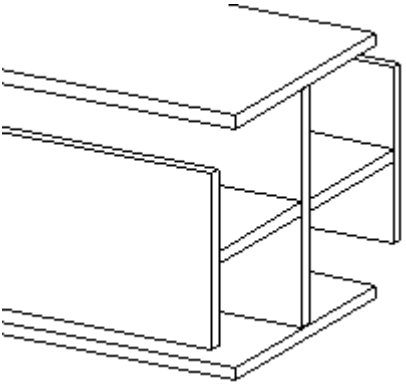
### ***Cross plate profile (S33)***

**Cross plate profile (S33)** creates a built-up beam using seven plates welded together.

### Objects created

- Plates (7)

### Use for

Situation	Description
	<p>Straight built-up beam, seven plates welded together.</p>

### Do not use for

Tapered built-up beams.

### Before you start

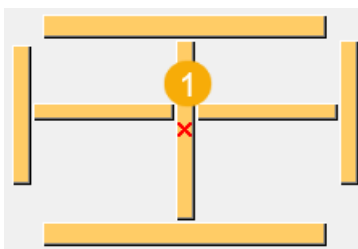
Ensure that you have two points to pick.

### Selection order

1. Pick the start point for the beam.
2. Pick the end point for the beam.

The beam is created automatically when you pick the end point.

### Part identification key

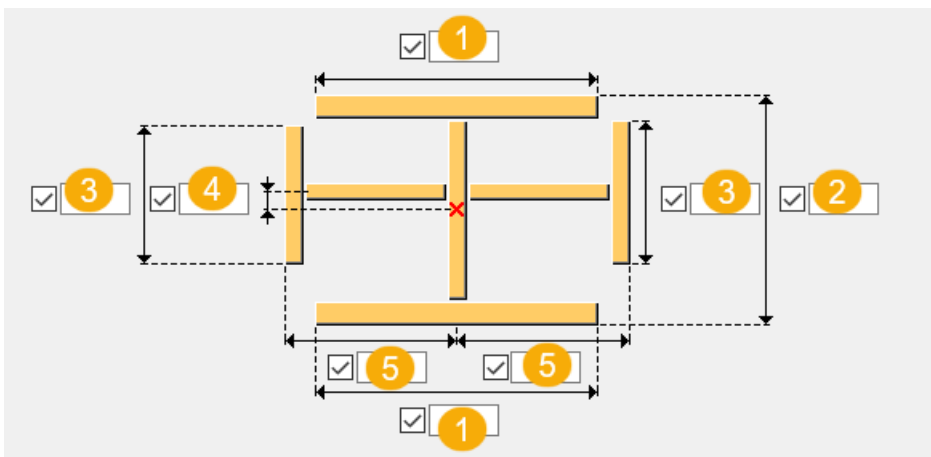


	Description
1	Cross plate. Seven plates are created.

### Picture tab

Use the **Picture** tab define the dimensions.

### Dimensions



	Description
1	Width of the beam
2	Height of the beam

	Description
3	Height of the plate
4	Adjust the location of the horizontal parts relative to the vertical parts.  By default, the eccentricity is zero. Plates are connected to the middle of the vertical plate.
5	Plate edge dimension to the vertical plate center line.

### Parts tab

Use the **Parts** tab to define the plate properties.

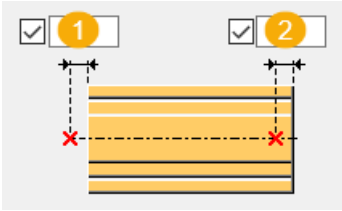
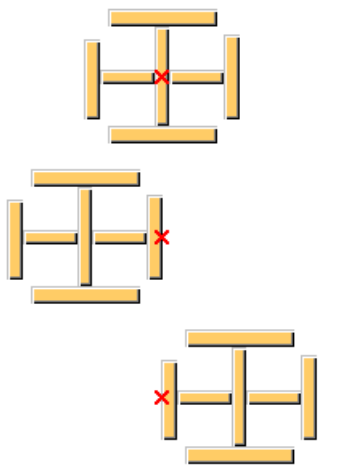
### Parts

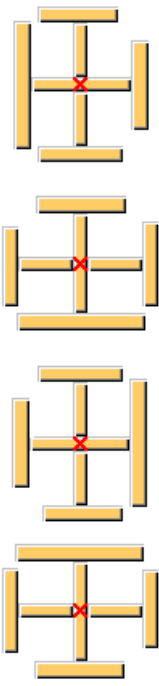

Option	Description
<b>Top flange</b>	Thickness of the top flange.
<b>Bottom flange</b>	Thickness of the bottom flange.
<b>Vertical web</b>	Thickness of the vertical web.
<b>Left flange</b>	Thickness of the left flange.
<b>Right flange</b>	Thickness of the right flange.
<b>Left web</b>	Thickness of the left web.
<b>Right web</b>	Thickness of the right web.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

**Parameters tab**

Use the **Parameters** tab to define the part name, class and finish, and the position, rotation, and length.

Option	Description
<b>Name</b>	Define the name, class, and finish of the plates.
<b>Class</b>	
<b>Finish</b>	
	<p>Negative values shorten the beam, positive values lengthen it.</p> <ol style="list-style-type: none"> <li>1. Moves the beam end that you pick first.</li> <li>2. Moves the beam end that you pick second.</li> </ol>
	<p>Select the position in plane and define the position in plane offset. See .</p>

Option	Description
	<p>Select a suitable rotation and define the rotation offset.</p> <p>See .</p>
	<p>Select the position in depth and define the position in depth offset.</p> <p>See .</p>

### Welds

Click the link below to find out more:

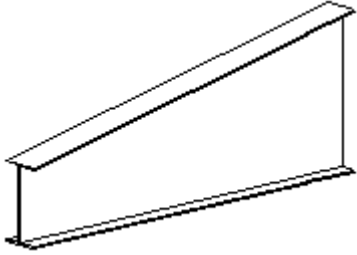
### ***Tapered beam (S98)***

**Tapered beam (S98)** creates a tapered or straight built-up beam with I shape.

### Objects created

- Web plate
- Top flange plate
- Bottom flange plate
- Welds

### Use for

Situation	Description
	Creates a simple built-up beam between two picked points.

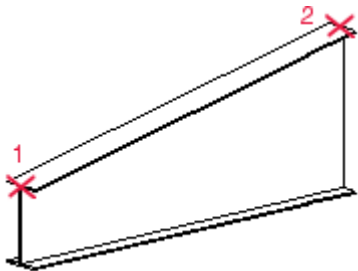
### Before you start

Ensure that you have two points to pick.

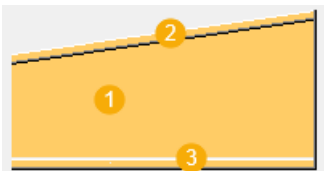
### Selection order

1. Pick the start point of the beam.
2. Pick the end point of the beam.

The beam is created automatically when you pick the end point.



### Part identification key



	Description
1	Web plate

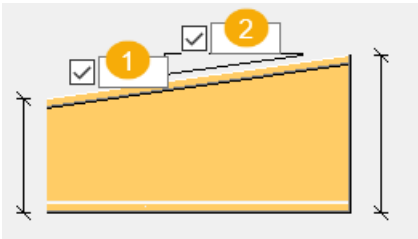
	Description
2	Top flange plate
3	Bottom flange plate

### Picture tab

Use the **Picture** tab to define the height of the web or the entire beam, sloping rise, and run values.

### Dimensions

Select the beam height type on the **Parameters** tab.



	Description
1	Length of the slope
2	Height of the slope

### Parts tab

Use the **Parts** tab to define the properties of the plates.

### Parts

Option	Description
<b>Web plate</b>	Thickness and width of the web plate.
<b>Top fl. profile</b>	Select the profile from the profile catalog.
<b>Bottom fl. profile</b>	Select the profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .



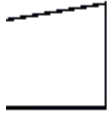

Option	Description	Default
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Parameters tab

Use the **Parameters** tab to define the beam end shape, height type, type of reference point, beam end setback distance, and the position of the web plate.



### Type of cut at beam end

Select the shape of the beam end at the beginning and end of the beam.

Option	Description
<b>Vertical in global system</b>	
<b>Perpendicular to top flange</b>	
<b>In Z of current plane</b>	Depends on the position of the work plane.






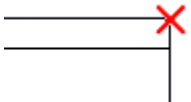





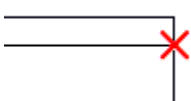
### Beam height type

Affects the height values entered on the **Picture** tab.

Option	Description
	Height of the web.
	Height of the entire beam.

### Type of reference point

Select the location of the end of the beam, relative to the point you pick.


Option	Option	Description
		Top profile, setback distance. 
		Top profile, end of the web plate. 
		Top web plate, setback distance. 
		Top web plate, end of the web plate. 

### Beam end setback distance



	Description
1	Define the the setback distance of beam ends.

## Position of web plate

Option	Description
	Select the location of the web plate. See also .

## Welds

Click the link below to find out more:


### ***Tapered beam 2 (S45)***

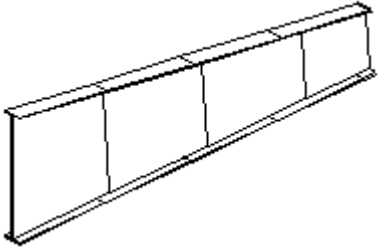
**Tapered beam 2 (S45)** creates a built-up beam with I shape. The beam can be tapered or straight. You can control the size of the spliced material.

## Objects created

- Web plates
- Top flange plates
- Bottom flange plates

## Use for

Situation	Description
	A simple, straight beam built up from two flange plates and a web plate.

Situation	Description
	<p>A tapered beam built-up from several spliced plates.</p> <p>The points you pick determine the beam length. You can adjust the length on the <b>Picture</b> tab.</p>

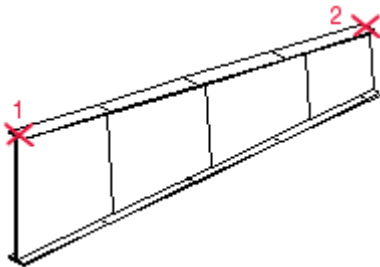
### Before you start

Ensure that you have two points to pick.

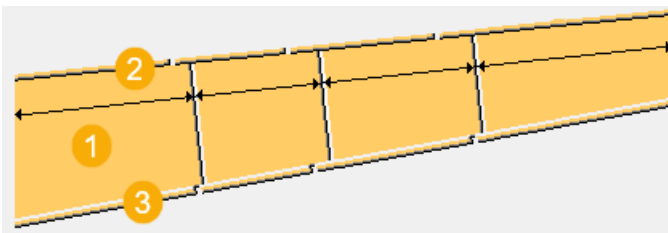
### Selection order

1. Pick the start point for the beam.
2. Pick the end point for the beam.

The beam is created automatically when you pick the end point.



### Part identification key

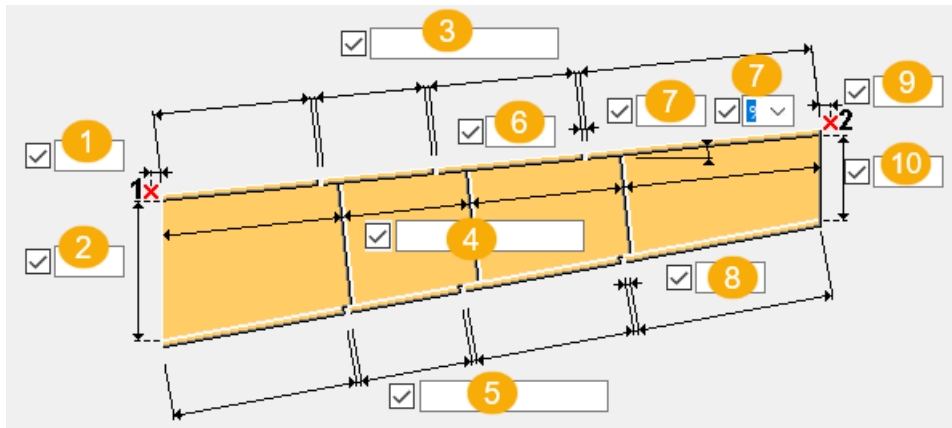


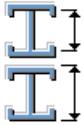
	Description
1	Web plate
2	Top flange plate
3	Bottom flange plate

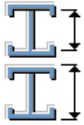
### Picture tab

Use the **Picture** tab to define the beam dimensions and location, relative to the points picked.




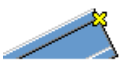


## Dimensions



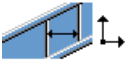

	Description
1	Distance from the first point picked to the end of the beam. A negative value lengthens the beam, a positive value shortens it.
2	Beam depth at the first end. This is either the height of the web or the entire beam, depending on what you select as the depth measure. 
3	Length of the top flange plates. For example, to have four one-meter sections, enter 4*1000. If you want to create the flange or web from a single plate, leave the box empty.
4	Length of the web plates. For example, to have four one-meter sections, enter 4*1000. If you want to create the flange or web from a single plate, leave the box empty.
5	Length of the bottom flange plates. For example, to have four one-meter sections, enter 4*1000. If you want to create the flange or web from a single plate, leave the box empty.
6	Gap between the top flange plates.
7	Horizontal sloping of the beam, either as a percentage or in degrees.
8	Gap between the bottom flange plates.

	Description
9	Distance from the last point picked to the end of the beam. A negative value lengthens the beam, a positive value shortens it.
10	Beam depth at the second end. This is either the height of the web or the entire beam, depending on what you select as the depth measure. 





### Beam position to picked point


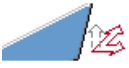
Option	Option	Description
		Moves the beam so that the point is located at the top of the top flange.
		Moves the beam so that the point is located at the bottom of the top flange.
		Moves the beam so that the point is located in the middle of the beam cross section.

### Web plate orientation



Option	Description
	Web plates are cut perpendicular to the top flange.
	Web plates are cut vertically.

### Beam end alignment

Option	Option	Description
		Cut is vertical or horizontal.
		Cut is perpendicular to the top flange.

Option	Option	Description
		Cut is relative to the current position of the work plane.

### Depth measure

Option	Description
	Depth is calculated from the outer surfaces of the top and bottom flanges.
	Depth is the depth of the web.

### Parts tab

Use the **Parts** tab to define the plate properties.

### Parts

Option	Description
<b>Top fl. profile</b>	Select the profile from the profile catalog.
<b>Bottom fl. profile</b>	Select the profile from the profile catalog.
<b>Web pl. thickness</b>	Thickness of the web plate.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

Option	Description	Default
<b>Finish</b>	Describes how the part surface has been treated.	

### Welds

Click the link below to find out more:

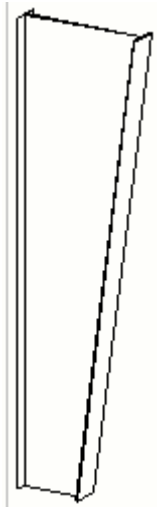
### ***PEB Tapered section (S94)***

**PEB Tapered section (S94)** creates a simple built-up beam or column between two picked points. The shape can be straight or tapered.

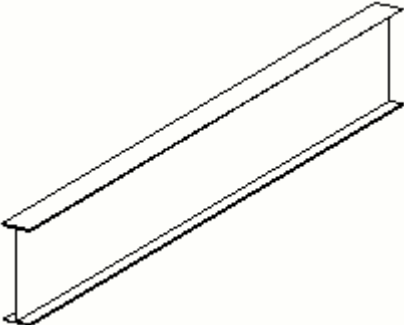
### Objects created

- Web plate
- Flange plates (2)
- Welds

### Use for

Situation	Description
	Tapered built-up column

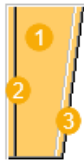


Situation	Description
	Straight built-up beam

### Selection order

1. Pick the start point for the beam or column.
  2. Pick the end point for the beam or column.
- The beam or column is created automatically when you pick the end point.

### Part identification key

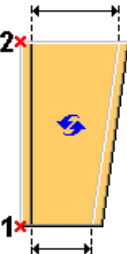


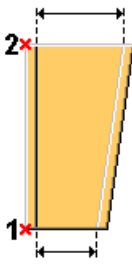
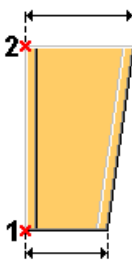
	Description
1	Web plate
2	Outer flange plate
3	Inner flange plate

### Picture tab

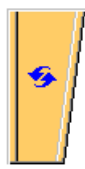

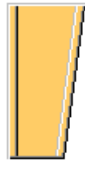
Use the **Picture** tab to define the dimensions and the rotation.

### Dimensions

Option	Description
	<p>Default</p> <p>Define the column web dimensions at the top and the bottom.</p> <p>AutoDefaults can change this option.</p>

Option	Description
	Define the column web dimensions at the top and the bottom.
	Define the column flange dimensions at the top and the bottom.

### Rotation

Option	Description
	Default Column is not rotated. AutoDefaults can change this option.
	Column is rotated.
	Column is not rotated.

### Parts tab

Use the **Parts** tab to define the part properties.

### Parts

Option	Description
<b>Web thickness</b>	Thickness of the web plate.

Option	Description
<b>Outer flange</b>	Thickness and width of the outer flange plate.
<b>Inner flange</b>	Thickness and width of the inner flange plate.

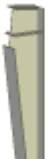

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

## Welds

Click the link below to find out more:

## Columns

Use these components to automatically create built-up columns:

Component	Image	Description
<a href="#">Tapered column (S99)</a> (page 2172)		Creates a single built-up column, which can be straight or tapered.
<a href="#">Tapered column 2 (S44)</a> (page 2177)		Creates a built-up column, which can be straight or tapered. Flange and web plates can be spliced.

Component	Image	Description
<a href="#">PEB Tapered section (S94)</a> (page 2168)		Creates a simple built-up beam or column between two picked points. The shape can be straight or tapered.

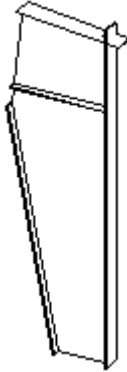
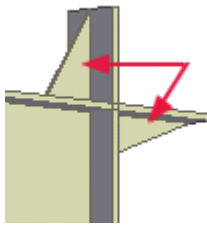
### ***Tapered column (S99)***


**Tapered column (S99)** creates a single built-up column, which can be straight or tapered.

#### **Objects created**

- Vertical web plate
- Vertical outer flange plate
- Inclined inner flange plate
- Top plate
- Flange stiffeners (2)
- Horizontal stiffeners (2)
- Welds

#### **Use for**

Situation	Description
	<p>A tapered built-up column with a stiffened corner.</p> <p>Flange stiffeners:</p> 

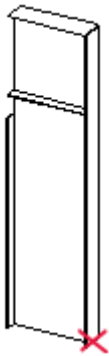
Situation	Description
	A straight built-up column.

### Before you start

Ensure that you have a point to pick.

### Selection order

1. Pick the position of the column:



The column is created automatically when you pick the position.

### Part identification key

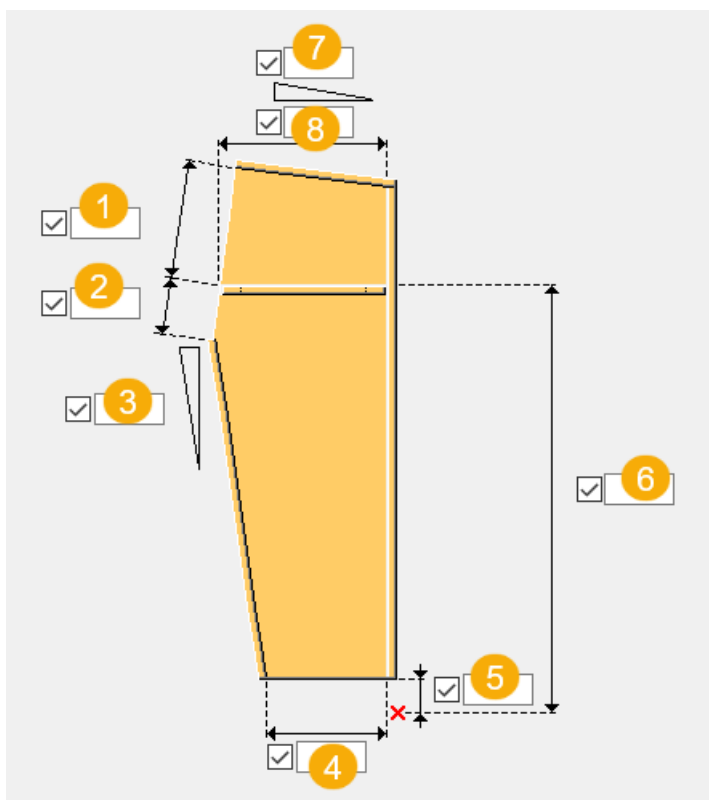


	Description
1	Web plate
2	Horizontal stiffener
3	Top plate
4	Inner flange plate
5	Outer flange plate

**Picture tab**

Use the **Picture** tab to define the column dimensions.

**Dimensions**



	Description
1	Dimension from the web plate top corner to the top of the stiffener
2	Dimension from the top of the stiffener to the inner corner of the web plate
3	Inner flange plate slope
4	Web plate width at the bottom
5	Web plate vertical offset from the input point

	Description
6	Web plate dimension from the input point to the top of the horizontal stiffener
7	Top plate slope as a percentage, for example, 10.
8	Horizontal stiffener length

#### Parts tab

Use the **Parts** tab to define the plate properties.

#### Parts

Option	Description
<b>Web</b>	Thickness of the web
<b>Outer flange, Inner flange, Top plate, Horiz stiffener</b>	Select the profiles on the <b>Parameters</b> tab.
<b>Flange stiffener</b>	Thickness of the flange stiffener

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

#### Parameters tab

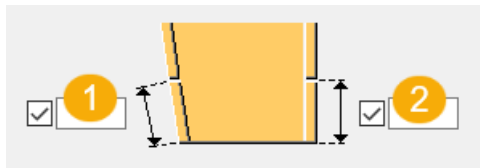
Use the **Parameters** tab to define the plate profiles, orientation, and dimensions.

## Profiles

Option	Description
<b>Outer flange profile, Inner flange profile, Top plate profile, Horizontal stiffener profile</b>	Profile size of the plates. The <code>std_flange_plates.dat</code> file defines the available plate profiles.

## Flange splice dimension

If the plate is longer than the maximum plate length defined in the `std_flange_plates.dat` file, Tekla Structures creates a splice.



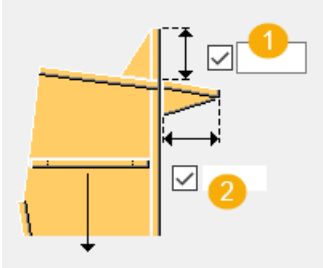
	Description
<b>1</b>	Inner flange splice dimension
<b>2</b>	Outer flange splice dimension

## Orientation

Option	Description
<p>The image shows four diagrams of a flange splice in different orientations. Each diagram has a red 'x' mark, indicating that these orientations are not recommended or are invalid. The orientations shown are: 1) vertical with the web on the left, 2) horizontal with the web on the top, 3) vertical with the web on the right, and 4) horizontal with the web on the bottom.</p>	Select a suitable rotation. The column web is rotated relative to the work plane.

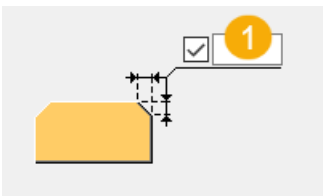


## Extra length



	Description
1	Outer flange extra length
2	Top plate extra length

## Horizontal stiffener chamfer



	Description
1	Internal chamfer dimension in the horizontal stiffener. The default value is 15.

## Welds

Click the link below to find out more:



### ***Tapered column 2 (S44)***

**Tapered column 2 (S44)** creates a welded built-up column, which can be tapered or straight. You can control the taper and the size of the spliced material.

### **Objects created**

- Web plates
- Top flange plates
- Bottom flange plates
- Welds

## Use for

Situation	Description
	A simple straight column built up from two flange plates and a web plate.
	A more complex tapered column, with several plates forming the web, and top and bottom flanges.

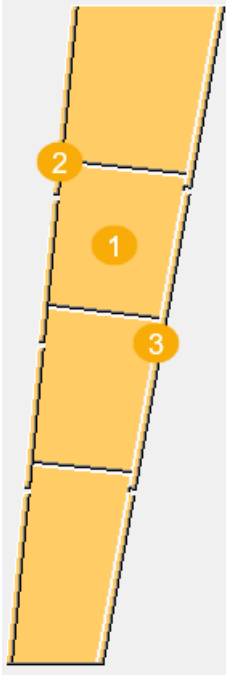
### Before you start

Ensure that you have a point to pick.

### Selection order

1. Pick the position of the column.  
The column is created automatically when you pick the position.

### Part identification key

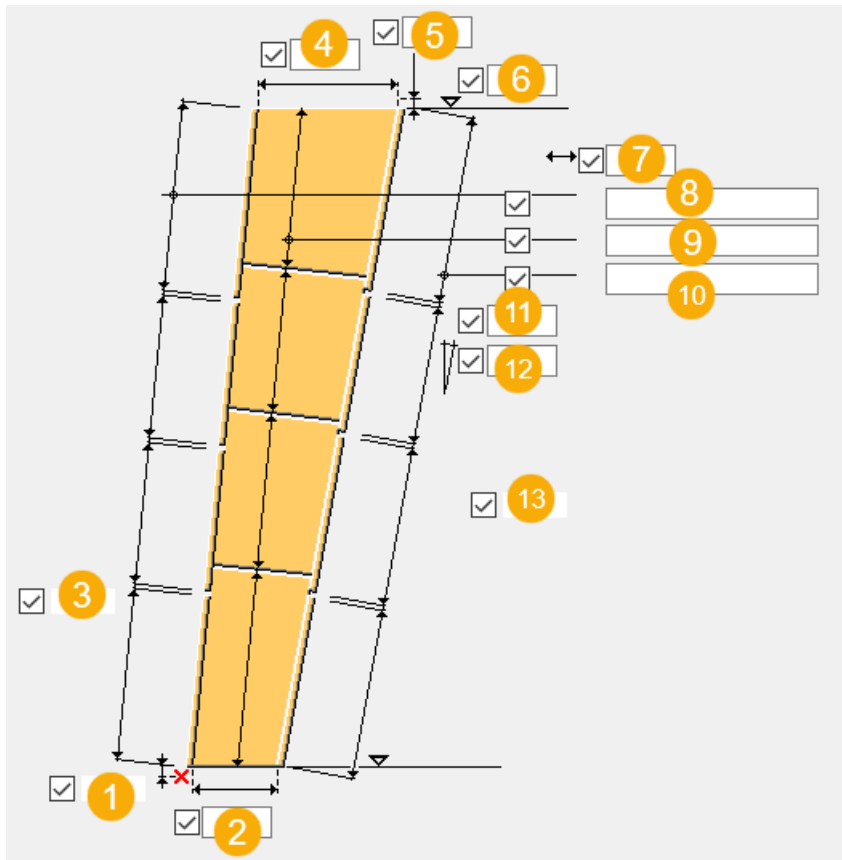


	Description
1	Web plate
2	Top flange plate
3	Bottom flange plate

### Picture tab

Use the **Picture** tab to define the column dimensions and location relative to the picked points.


## Dimensions








	Description
<b>1</b>	Distance from the first point picked to the end of the column.
<b>2</b>	Column width at the first end.
<b>3</b>	Gap between the top flange plates.
<b>4</b>	Column width at the second end.
<b>5</b>	Distance from the last point picked to the end of the column.
<b>6</b>	Column height.
<b>7</b>	Column end alignment dimension.
<b>8</b>	Length of the top flange plates. For example, to have four one-meter sections, enter 4*1000. If you want to create the flange or web from a single plate, leave the box empty.
<b>9</b>	Length of the web plates. For example, to have four one-meter sections, enter 4*1000. If you want to create the flange or web from a single plate, leave the box empty.

	Description
10	Length of the bottom flange plates. For example, to have four one-meter sections, enter 4*1000. If you want to create the flange or web from a single plate, leave the box empty.
11	Gap between the bottom flange plates.
12	Horizontal sloping of the beam, as a percentage.
13	Column rotation dimension.

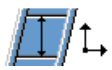

### Column rotation

Option	Description
	Select how the column is rotated and define the dimension for the rotation.




### Column position to picked point

Option	Description
	Moves the column so that the point is located at the column flange.
	Moves the column so that the point is located at the column web.
	Moves the column so that the point is located in the middle of the column cross section.
	Moves the column so that the point is located at the column web.
	Moves the column so that the point is located at the column flange.



### Web plate orientation

Option	Description
	Web plates are cut perpendicular to the top flange.
	Web plates are cut vertically.



### Column end alignment

Option	Description
	Cut is vertical or horizontal.
	Cut is perpendicular to the top flange.
	Cut is relative to the current position of the work plane.

### Depth measure

Option	Description
	Depth is calculated from the outer surfaces of the top and bottom flanges.
	Depth is the depth of the web.

### Column flange

Option	Description
	Column flange is perpendicularly fitted to the web.
	Column flange is aligned with the web.

### Parts tab

Use the **Parts** tab to define the plate properties.

### Parts

Option	Description
<b>Top fl. profile</b>	Select the profile from the profile catalog.
<b>Bottom fl. profile</b>	Select the profile from the profile catalog.
<b>Web pl. thickness</b>	Thickness of the web plate.


Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

## Welds

Click the link below to find out more:

## Frames

Use the following components to automatically create built-up frames, beams, and columns:

Component	Image	Description
<a href="#">Tapered frame comonor (S53) (page 2184)</a>		Creates a built-up frame or parts of it. You can control the taper and the size of the spliced material.
<a href="#">PEB Frame (S92) (page 2205)</a>		Creates a pre-engineered building frame to the selected point. This component uses existing components to create built-up columns and rafters, base plates, knee

Component	Image	Description
		connection, splice connections, and apex connection.

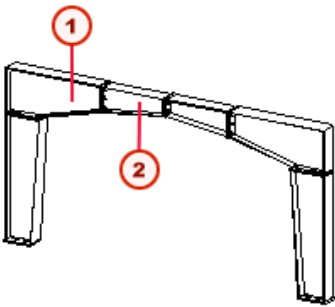
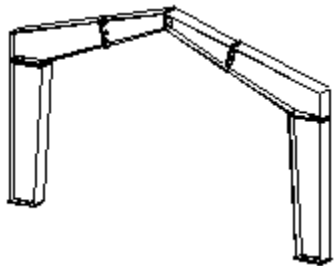
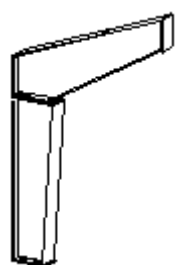
### ***Tapered frame comonor (S53)***

**Tapered frame comonor (S53)** creates a built-up frame or parts of it. You can control the taper and the size of the spliced material.



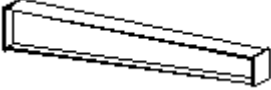
#### **Objects created**

- Built-up columns with base plate and end plate
- Built-up beams with end plates

#### **Use for**

Situation	Description
	<p>Built-up frame</p> <p><b>1</b> Beam 1</p> <p><b>2</b> Beam 2</p> <p>On the <b>Picture</b> tab, use the following options:</p> <ul style="list-style-type: none"> <li>• Frame type: Column, first beam, and second beam are created.</li> <li>• Symmetry type: Symmetrical frame is created.</li> </ul>
	<p>Sloped built-up frame</p> <p>On the <b>Picture</b> tab, use the following options:</p> <ul style="list-style-type: none"> <li>• Frame type: Column, first beam, and second beam are created.</li> <li>• Symmetry type: Symmetrical frame is created.</li> </ul>
	<p>Only half of the frame</p> <p>On the <b>Picture</b> tab, use the following options:</p> <ul style="list-style-type: none"> <li>• Frame type: Column and first beam are created.</li> <li>• Symmetry type: Symmetrical frame is not created.</li> </ul>



Situation	Description
	<p>Built-up column with base plate and end plate</p> <p>On the <b>Picture</b> tab, use the following options:</p> <ul style="list-style-type: none"> <li>• Frame type: Column is created.</li> <li>• Symmetry type: Symmetrical frame is not created.</li> </ul>
	<p>Built-up beam (1) with end plates</p> <p>On the <b>Picture</b> tab, use the following options:</p> <ul style="list-style-type: none"> <li>• Frame type: First beam is created.</li> <li>• Symmetry type: Symmetrical frame is not created.</li> </ul>
	<p>Built-up beam (2) with end plates</p> <p>On the <b>Picture</b> tab, use the following options:</p> <ul style="list-style-type: none"> <li>• Frame type: Second beam is created.</li> <li>• Symmetry type: Symmetrical frame is not created.</li> </ul>

### Limitations

Creates a frame only in the global X direction. Y direction is not possible.

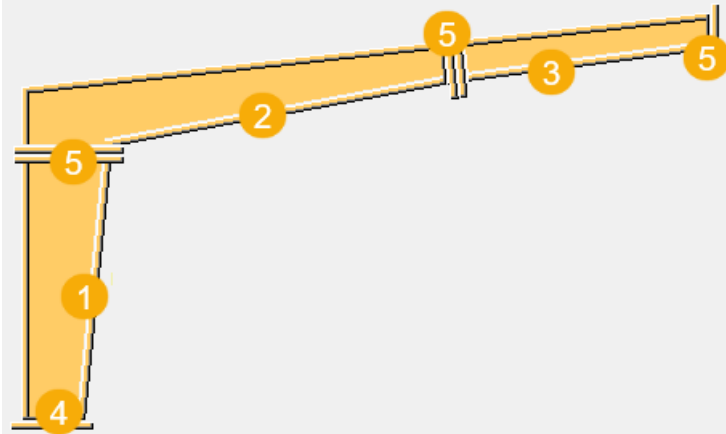
### Before you start

Ensure that you have a point to pick.

### Selection order

1. Pick the position of the column.  
The frame is created automatically when you pick the position.

### Part identification key

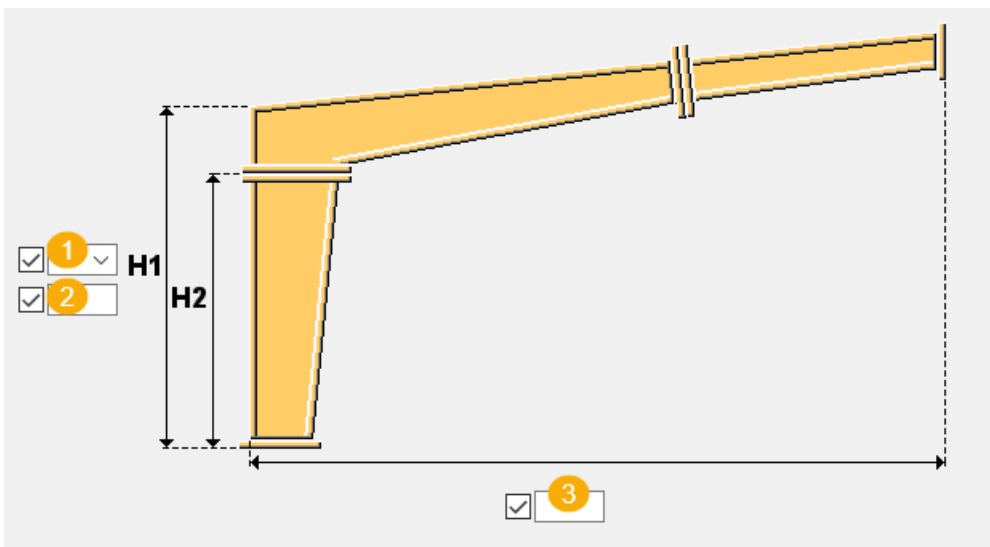


	Description
1	Column
2	First beam
3	Second beam
4	Base plate
5	End plate

### Picture tab

Use the **Picture** tab to define the frame dimensions and location relative to the picked points.

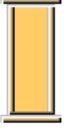



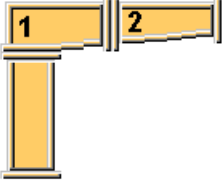
### Dimensions




	Description
1	Select the height dimension to be defined.

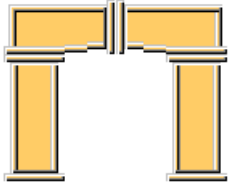
	Description
2	Define the height.
3	Dimension from the column outer edge to the frame center line.

### Frame type

Option	Description
	Column is created.
	First beam is created.
	Second beam is created.
	Column and first beam are created.
	Column, first beam, and second beam are created.

### Symmetry type

Option	Description
	Symmetrical frame is not created.

Option	Description
	Symmetrical frame is created.

### Part class

Define the class of the web and flange plates, base plates, and end plates.

### Parts tab

Use the **Parts** tab to define the plate properties.

### Parts

Column parts	Description
<b>Top fl. profile, Bottom fl. profile</b>	Select the profile from the profile catalog.
<b>Web thickness</b>	Thickness of the column web.
<b>Base plate</b>	Thickness and width of the base plate.
<b>Horiz end plate</b>	Thickness and width of the horizontal end plate.

1 Beam parts	Description
<b>Top fl. profile, Bottom fl. profile, Vertical fl. profile</b>	Select the profile from the profile catalog.
<b>Web thickness</b>	Thickness of the first beam web.
<b>Horiz end plate</b>	Thickness and width of the horizontal end plate.
<b>Lateral end plate</b>	Thickness and width of the lateral end plate.

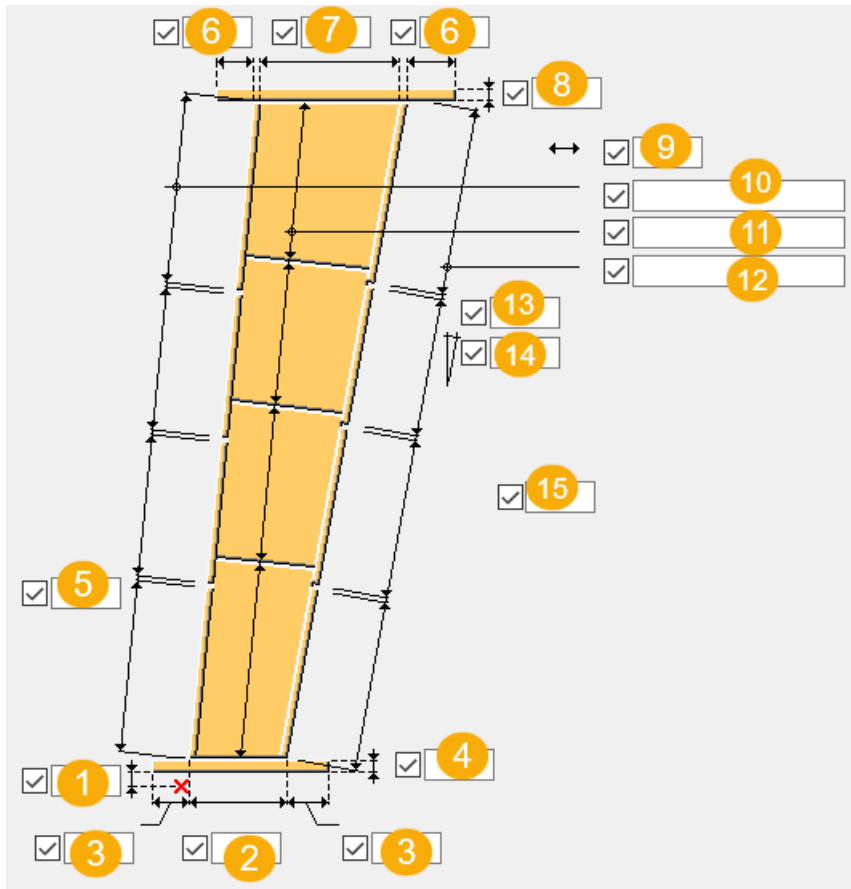
2 Beam parts	Description
<b>Top fl. profile, Bottom fl. profile</b>	Select the profile from the profile catalog.
<b>Web thickness</b>	Thickness of the second beam web.
<b>Left end plate</b>	Thickness and width of the left end plate.
<b>Right end plate</b>	Thickness and width of the right end plate.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

#### Column tab

Use the **Column** tab to define the column dimensions.




## Dimensions




	Description
1	Distance from the first point picked to the end of the column.
2	Column depth at the first end. This is either the height of the web or the entire column, depending on what you select as the depth measure.
3	Base plate extension dimension at the bottom of the column.
4	Base plate thickness.
5	Gap between the top flange plates.
6	End plate extension dimension at the top of the column.
7	Column depth at the second end. This is either the height of the web or the entire column, depending on what you select as the depth measure.
8	End plate thickness.
9	Column end alignment dimension.

	Description
10	Length of the top flange plates. For example, to have four one-meter sections, enter 4*1000. If you want to create the flange from a single plate, leave the box empty.
11	Length of the web plates. For example, to have four one-meter sections, enter 4*1000. If you want to create the web from a single plate, leave the box empty.
12	Length of the bottom flange plates. For example, to have four one-meter sections, enter 4*1000. If you want to create the flange from a single plate, leave the box empty.
13	Gap between the bottom flange plates.
14	Sloping of the column as a percentage.
15	Column rotation dimension.




### Column end alignment

Option	Description
	Cut is vertical or horizontal.
	Cut is perpendicular to the top flange.
	Cut is relative to the current position of the work plane.



### Column rotation

Option	Description
	Select how the column is rotated and define the dimension for the rotation.



### Column position to picked point

Option	Description
	Moves the column so that the point is located at the column flange.
	Moves the column so that the point is located at the column web.
	Moves the column so that the point is located in the middle of the column cross section.

### Web plate orientation

Option	Description
	Web plates are cut perpendicular to the top flange.
	Web plates are cut vertically.

### Depth measure

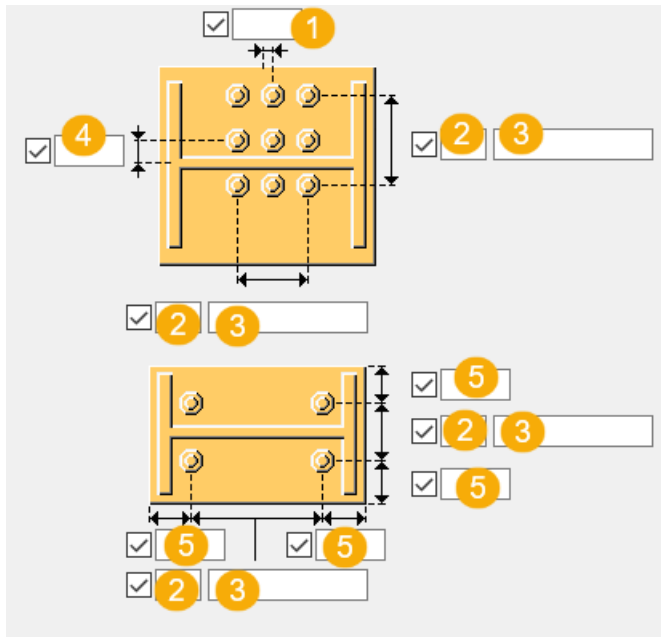
Option	Description
	Depth is the depth of the web.
	Depth is calculated from the outer surfaces of the top and bottom flanges.

### Column 2 tab

Use the **Column 2** tab to define the base plate bolt group dimensions and properties.

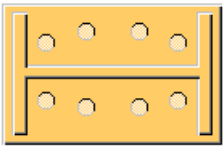



## Bolt group dimensions



	Description
1	Dimension for horizontal bolt group position.
2	Number of bolts.
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
4	Dimension for vertical bolt group position.
5	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.

## Bolt creation

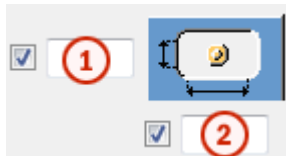
Option	Description
	Holes are created.
	Bolts are created.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



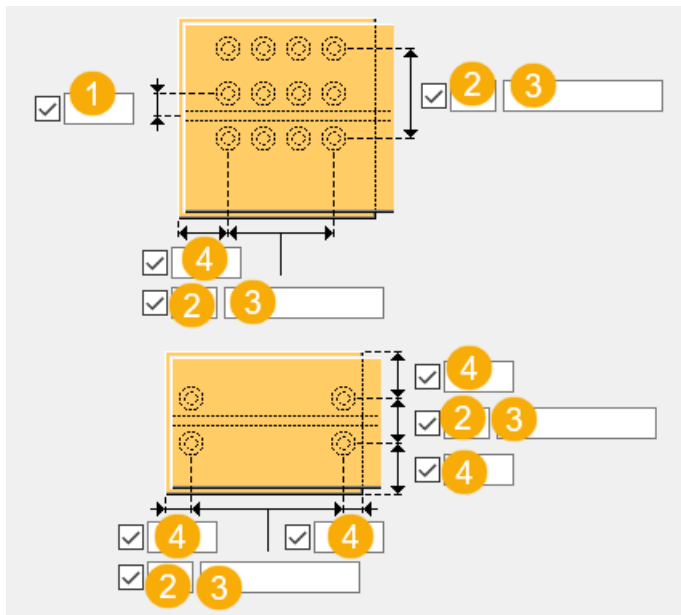
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
Slots in	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Column 3 tab

Use the **Column 3** tab to define the end plate bolt group dimensions and properties between the column and the first beam.

### Bolt group dimensions



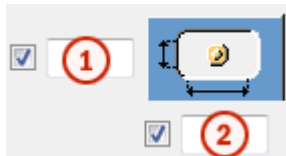
	Description
1	Dimension for vertical bolt group position.
2	Number of bolts.
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
4	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



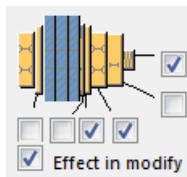
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

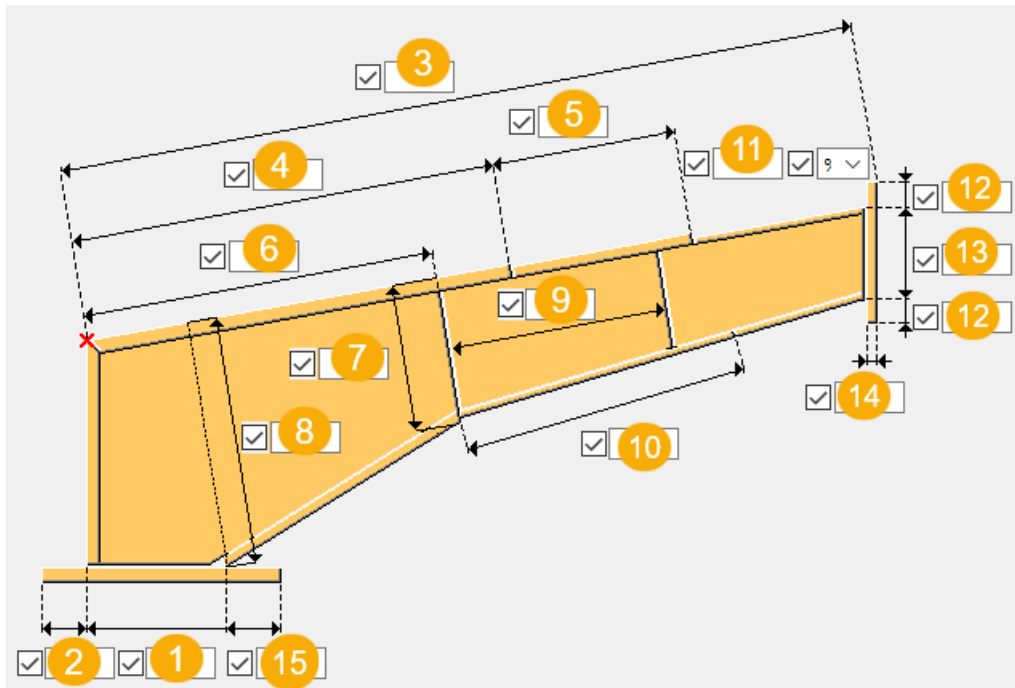
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Beam 1 tab

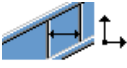

Use the **Beam 1** tab to define the dimensions of the first beam.

## Dimensions

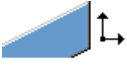



	Description
1	Beam depth at the first end.
2	Distance from the first point picked to the end of the beam.
3	Length of the top flange.
4	Length of the top flange plate to the first flange gap.
5	Length of the top flange plate to the second flange gap.
6	Length the top flange to the slope angle.
7	Beam web height at the slope angle.
8	Beam web height at the column end.
9	Length of the web plate.
10	Length of the bottom flange plate.
11	Horizontal sloping of the beam, either as a percentage or in degrees.
12	End plate extension dimension.
13	Beam depth at the second end.
14	End plate thickness.
15	End plate extension dimension.



### Web plate orientation

Option	Description
	Web plates are cut perpendicular to the top flange.
	Web plates are cut vertically.

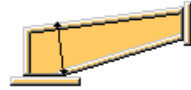

### Beam end alignment

Option	Description
	Cut is vertical or horizontal.
	Cut is perpendicular to the top flange.



### Beam length

Option	Description
	Sloped beam length
	Horizontal beam length

### Beam height

Option	Description
	Perpendicular beam height
	Vertical beam height

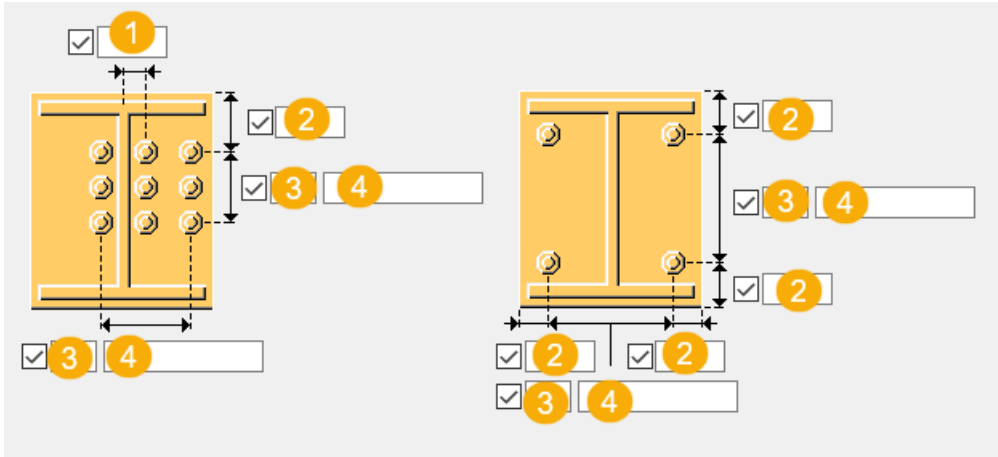
### Beam bottom cut

Option	Description
	Beam bottom web is cut.
	Beam bottom is fitted to the end plate.

### Beam 1\_2 tab

Use the **Beam 1\_2** tab to define the end plate bolt group dimensions and bolt properties between the first beam and the second beam.

### Bolt group dimensions



	Description
1	Dimension for horizontal bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### Bolt basic properties

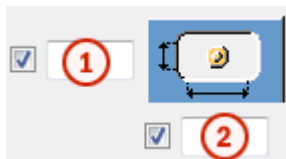
Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes



Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

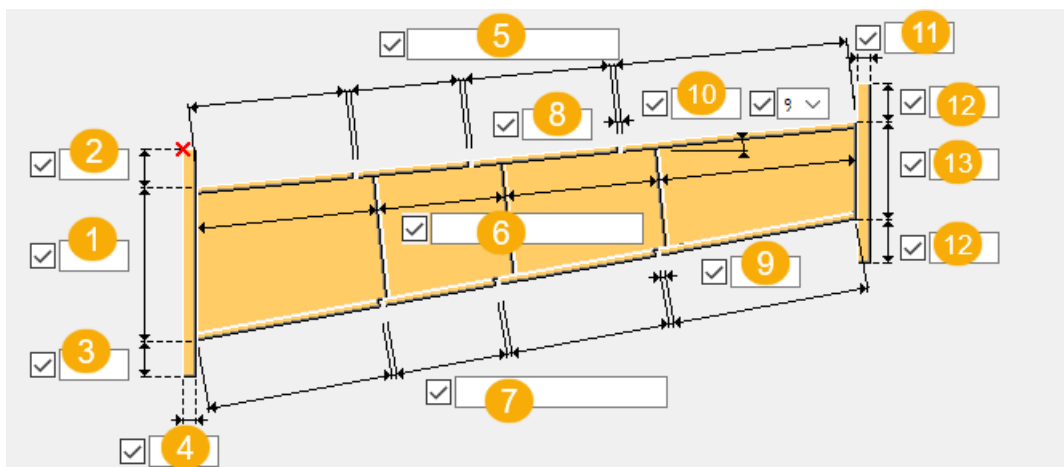


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Beam 2 tab


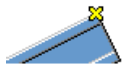

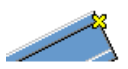

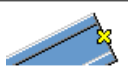
Use the **Beam 2** tab to define the dimensions of the second beam.

## Dimensions









	Description
<b>1</b>	Beam depth at the first end.
<b>2</b>	Distance from the first point picked to the end of the beam.
<b>3</b>	End plate extension at the first end.
<b>4</b>	End plate thickness at the first end.
<b>5</b>	Length of the top flange plates. For example, to have four one-meter sections, enter 4*1000. Leave blank to create the flange or web from a single plate.
<b>6</b>	Length of the web plates. For example, to have four one-meter sections, enter 4*1000. Leave blank to create the flange or web from a single plate.
<b>7</b>	Length of the bottom flange plates. For example, to have four one-meter sections, enter 4*1000. Leave blank to create the flange or web from a single plate.
<b>8</b>	Gap between the top flange plates.
<b>9</b>	Gap between the bottom flange plates.
<b>10</b>	Horizontal sloping of the beam, either as a percentage or in degrees.
<b>11</b>	End plate thickness at the second end.
<b>12</b>	End plate extension at the second end.
<b>13</b>	Beam depth at the second end. This is the height of the web or the entire beam, depending on what you select as the depth measure.

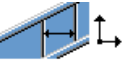

### Beam position to picked point

Option	Option	Description
		Moves the beam so that the point is located at the beam flange.
		Moves the beam so that the point is located at the beam web.
		Moves the beam so that the point is located in the middle of the beam cross section.



### Beam end alignment

Option	Option	Option
		Cut is vertical or horizontal.
		Cut is perpendicular to the top flange.
		Cut is relative to the current position of the work plane.

### Web plate orientation

Option	Description
	Web plates are cut perpendicular to the top flange.
	Web plates are cut vertically.

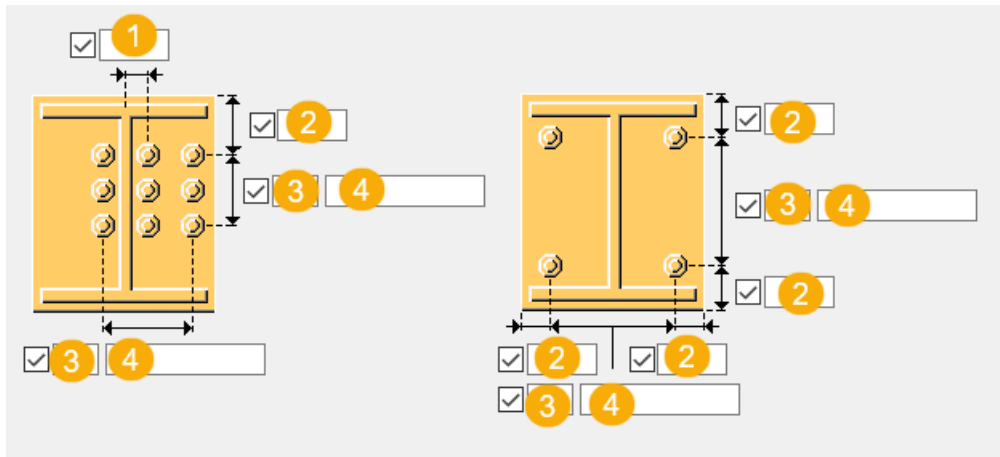
### Depth measure

Option	Description
	Depth is calculated from the outer surfaces of the top and bottom flanges.
	Depth is the depth of the web.

### Beam 2\_2 tab

Use the **Beam 2\_2** tab to define the end plate bolt group dimensions and bolt properties at the hip between the second beams.

## Bolt group dimensions



	Description
1	Dimension for horizontal bolt group position.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

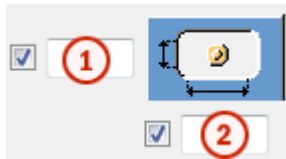
## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Welds

Click the link below to find out more:

#### **PEB Frame (S92)**

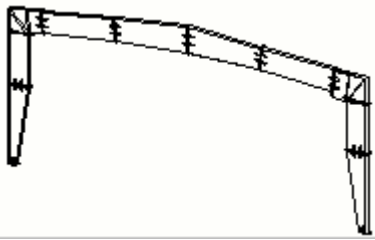
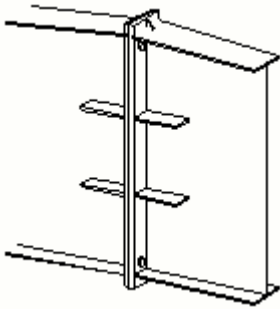
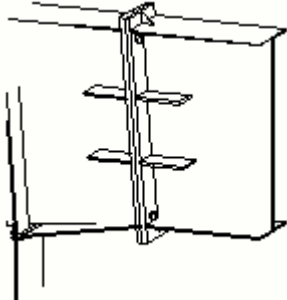
**PEB Frame (S92)** creates a pre-engineered building frame to the selected point. This component uses existing components to create built-up columns

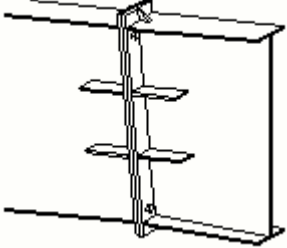
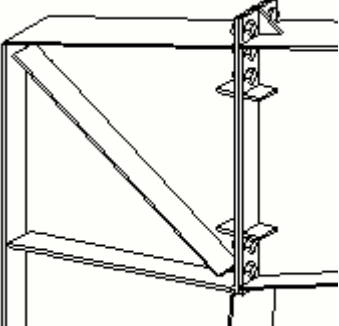
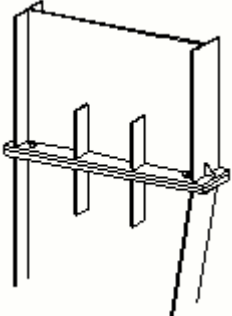
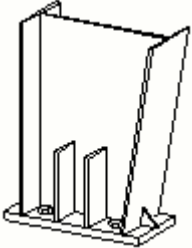
and rafters, base plates, knee connection, splice connections, and apex connection.

**Objects created**

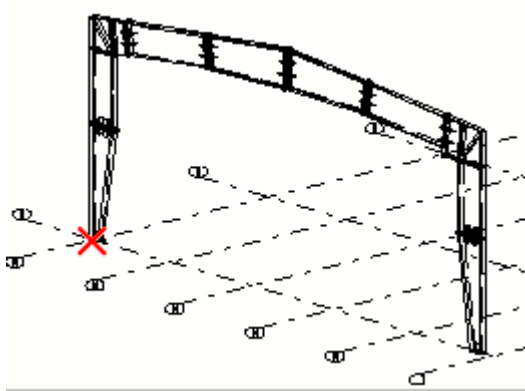
- Built-up rafter (1 to 4 segments)
- Apex connection
- Splice connections
- Knee connections (2)
- Built-up columns (1 to 4 segments)
- Base plate details (2)

**Use for**

Situation	Description
	<p>Frame consisting of spliced columns and spliced rafters.</p>
	<p>Apex connection between two rafters at the apex of the portal frame.</p>
	<p>The first splice between the first and the second segment of the rafter.</p>

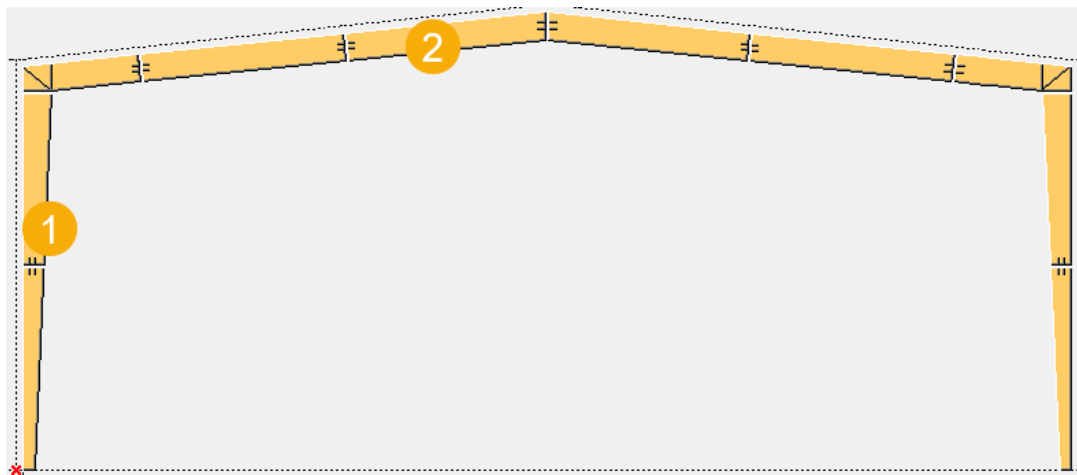
Situation	Description
	<p>The second splice between the second and the third segment of the rafter.</p>
	<p>Knee connection between the second segment of the column and the first segment of the rafter.</p>
	<p>Column splice between the first and the second segment of the column.</p>
	<p>Column base plate detail.</p>

## Selection order



1. Pick the point in which to insert the frame.  
The frame is created automatically when you pick the point.

## Part identification key



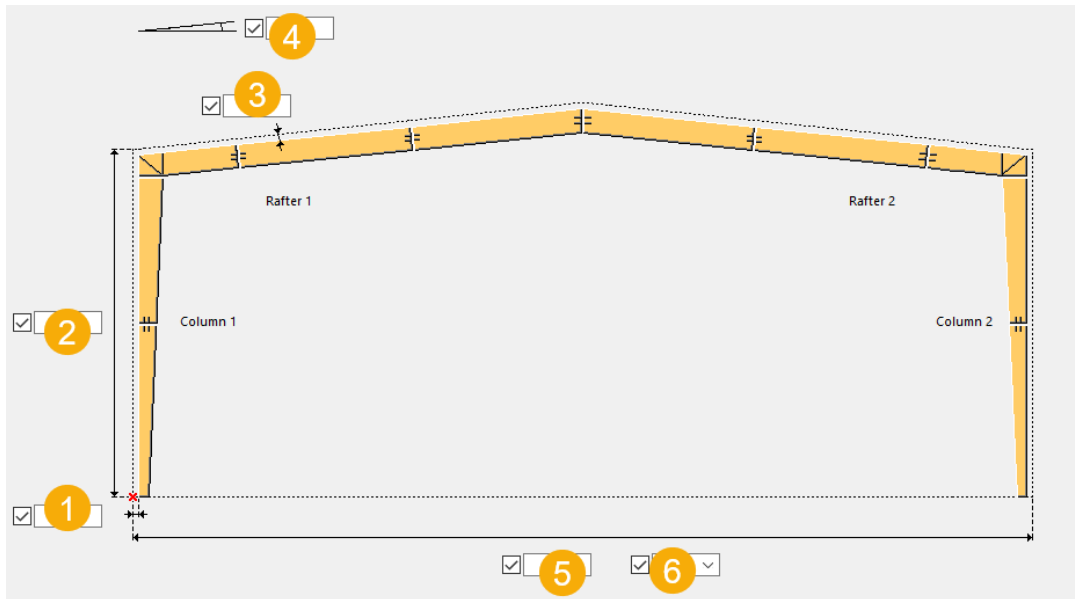
	Description
1	Column
2	Rafter

## Picture tab

Use the **Picture** tab to define the frame dimensions.



## Dimensions



	Description
1	Column horizontal distance from the input point
2	Column height
3	Rafter offset distance from the input frame
4	Rafter angle
5	Frame width
6	Orientation of the frame

### Parameters tab

Use the **Parameters** tab to define part properties. Select whether the components are exploded or not.

### Parts

Option	Description
<b>Column 1, Column 2</b>	Select a component from the <b>Applications &amp; components</b> catalog. Define the segments and lengths.
<b>Rafter 1, Rafter 3</b>	Select a component from the <b>Applications &amp; components</b> catalog. Define the segments and lengths.
<b>Column 1 base plate, Column 2 base plate</b>	Select a component from the <b>Applications &amp; components</b> catalog.

Option	Description
<b>Column 1 knee joint, Column 2 knee joint</b>	Select a component from the <b>Applications &amp; components</b> catalog.
<b>Apex splice joint</b>	Select a component from the <b>Applications &amp; components</b> catalog.

## Connections and details

Use the following components to automatically create connections and details for built-up beams and columns:

- [Pipe column and beam panel zone \(21\) \(page 2210\)](#)
- [Batten plates \(S85\) \(page 2223\)](#)
- [Tapered column \(136\) \(page 2230\)](#)
- [Tapered beam to tapered column \(197\) \(page 2239\)](#)
- [Tapered column to tapered beam \(199\) \(page 2244\)](#)
- [Tapered beam to beam \(200\) \(page 2250\)](#)
- [Tapered column base plate \(1068\) \(page 2258\)](#)
- [PEB Knee joint \(S93\) \(page 2276\)](#)

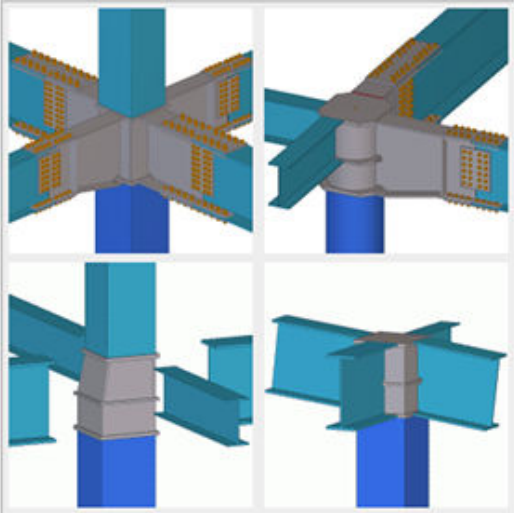
### ***Pipe column and beam panel zone (21)***

**Pipe column and beam panel zone (21)** connects a beam to a column with a diaphragm that goes through the column at the level of the beam flanges. You can use **Pipe column and beam panel zone (21)** both for square and round steel columns. H profile beams are used as secondary parts. The secondary part beams can be either horizontal or skewed.

### **Objects created**

- Diaphragm (penetrating, inner)
- Brackets
- Cantilevers
- Welds

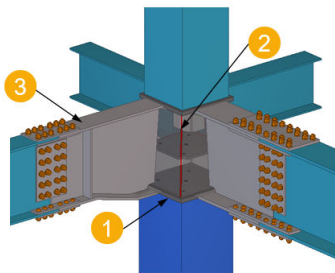
## Use for

Situation	Description
	<p>Beams connected to a column with brackets and cantilevers.</p>

## Selection order

1. Select the main part (lower column).
2. Select the secondary parts (a maximum of 4 beams).
3. Select the upper column as the fifth secondary part, if needed.
4. Click the middle mouse button to create the connection.

## Part identification key

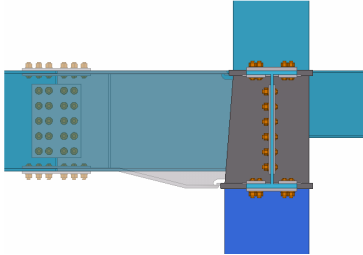
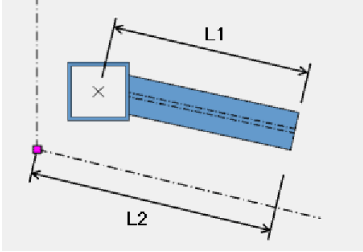


	Description
<b>1</b>	Diaphragm
<b>2</b>	Short column Short columns are created between penetrating diaphragms.
<b>3</b>	<b>Tapered column-beam stub (150)</b> connection

## Design dimensions tab

Use the **Design dimensions** tab to define the bracket type and length, and haunch height.

## Bracket and hauch

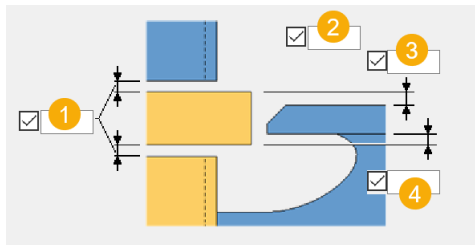
Option	Description	Default
<p><b>Bracket type</b></p>	<p>Select the bracket type.</p> <ul style="list-style-type: none"> <li>If you set the bracket type to <b>Bracket</b>, the <b>Tapered column-beam stub (150)</b> component is used for connecting the beam to the column.</li> <li>If you set the bracket type to <b>Cantilever</b>, the beam is connected directly to the column.</li> <li>If you set the bracket type to <b>Hypothetical</b>, the beam connection is created as diaphragm plates and short columns according to the beam size.</li> </ul>  <p>The diagram shows a 3D perspective view of a tapered column-beam stub connection. A blue horizontal beam is connected to a blue vertical column. The connection is made using a tapered, grey-colored stub that fits between the beam and the column. The stub has a wider base at the column end and tapers towards the beam end. The connection is secured with orange bolts around the perimeter of the stub.</p>	<p><b>Bracket</b></p>
<p><b>Bracket length</b></p>	<p>When you have set the bracket type to <b>Bracket</b>, select whether the bracket length is based on <b>Reference point (L2)</b> (this is the default) or <b>Center point (L1)</b>. The length is based on the lower column.</p>  <p>The diagram illustrates two methods for measuring the bracket length. A blue rectangular bracket is shown attached to a vertical dashed line representing a column. A horizontal dashed line represents the beam's centerline. L1 is the distance from the center point of the bracket to the end of the beam. L2 is the distance from the reference point (marked with a purple dot on the column) to the end of the beam.</p>	<p>1000 mm</p>

Option	Description	Default
<b>Haunch</b>	Select whether the haunch height is automatically determined.  You can use this option when the bracket type is <b>Bracket</b> .	<b>None</b>
<b>Haunch</b> height	Define the haunch height when the bracket type is not cantilever and you have set <b>Haunch</b> to <b>Specified</b> .	Straight bracket of the same size as the beam

### Fabrication dimensions tab

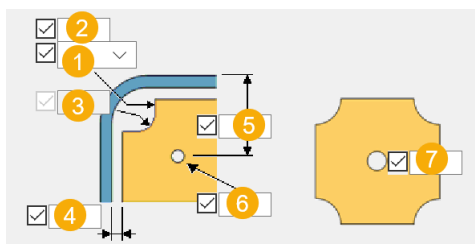
Use the **Fabrication dimensions** tab to define the diaphragm dimensions.

### Dimensions



	Description	Default
<b>1</b>	Gap between the column and the diaphragm	0 mm
<b>2</b>	Maximum diaphragm thickness	40 mm
<b>3</b>	Outer additional diaphragm thickness	0 mm
<b>5</b>	Inner additional diaphragm thickness	0mm

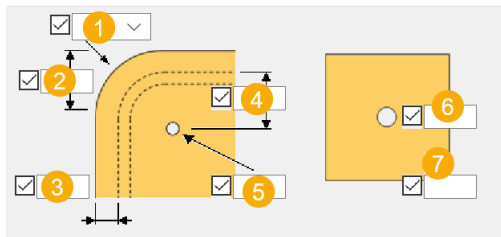
### Inner diaphragm dimensions



	Description	Default
<b>1</b>	Chamfer shape of the inner diaphragm corner	Inner diaphragm: Concave circle  Penetrating diaphragm: No chamfer

	Description	Default
<b>2</b>	Corner chamfer dimension	
<b>3</b>	Corner chamfer dimension for the extra arc	
<b>4</b>	Gap between the inner diaphragm and the inner surface of the column	0 mm
<b>5</b>	Spacing of the four corner holes of the inner diaphragm This option is used when the corner hole diameter defined in <b>6</b> is > 0 mm.	100 mm
<b>6</b>	Diameter of the corner hole that goes through the diaphragm There are four corner holes. You can define the diameter when the column is a square steel pipe.	0 mm
<b>7</b>	Diameter of the center hole that goes through the diaphragm	30 mm

### Penetrating diaphragm dimensions



	Description	Description
<b>1</b>	Corner chamfer shape of the penetrating diaphragm	Inner diaphragm: Concave circle Penetrating diaphragm: No chamfer
<b>2</b>	Corner chamfer dimension You can define the dimension when the chamfer shape is set to something else than <b>No</b> .	0 mm
<b>3</b>	Diaphragm protrusion dimensions	25 mm
<b>4</b>	Spacing of the four corner holes of the through diaphragm This option is used when the corner hole diameter defined in <b>5</b> is > 0 mm.	100 mm

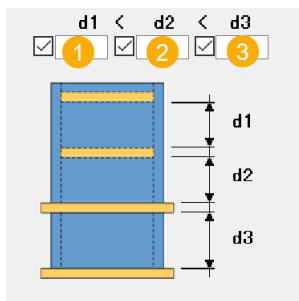
	Description	Description
5	Diameter of the corner hole that goes through the diaphragm  There are four corner holes. You can define the diameter when the column is a square steel pipe.	
6	Diameter of the center hole that goes through the diaphragm	30 mm
7	Top plate is a penetrating diaphragm, called a top plate if there is no upper column.	

### Weld access holes

You can define the weld access holes for the diaphragm plates.



### Clearance dimensions



	Description	Default
1	Clearance between the penetrating diaphragms	150 mm

	Description	Default
2	Clearance between the inner diaphragms	100 mm
3	Clearance between the penetrating diaphragm and inner diaphragm	100 mm

### Panel parts tab

Use the **Panel parts** tab to define the part properties.

### Parts

Option	Description
<b>Tapered plates</b>	Thickness of the four tapered plates that build the short column.  You can define the thickness when the taper type and straight short column type is <b>Buildup</b> .
<b>Straight plates</b>	Thickness of the four straight plates that build the short column.  You can define the thickness when the taper type and straight short column type is <b>Buildup</b> .
<b>Tapered profile</b>	Select the profile from the profile catalog.  Short column profile name can be used when the taper type and straight short column type is <b>Rolled</b> .
<b>Straight profile</b>	Select the profile from the profile catalog.  Short column profile name can be used when the taper type and straight short column type is <b>Rolled</b> .

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part</b>

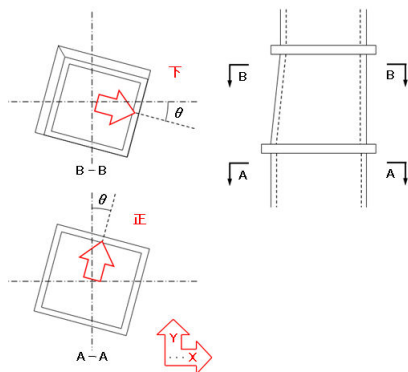


Option	Description	Default
		<b>material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Rotation of rolled steel

Rolled steel is placed at the center axis of the main part. If you use a rolled tapered profile, the taper may be eccentric. You then need to change the rotation by using the **Taper profile orientation** option.

Option	Description	Default
<b>Panel plate size up</b>	Increased panel thickness	0 increase
<b>Taper panel</b>	Select whether to taper the panel.  You can define an additional rotation angle to the main part rotation angle.	<b>Auto</b>
<b>Taper type</b>	Select the tapering type.	<b>Buildup</b>
<b>Taper profile orientation</b>	Select the rotation direction of the tapered profile.  The rotation follows the global coordinate system.	<b>Front</b>
<b>Straight short column type</b>	Select the short column type.	<b>Rolled</b>



## Diaphragm thickness increase

Option	Regular plate size up	Plate size up	Size up due to column
<b>Penetrating diaphragm</b> <b>Inner diaphragm</b>	The default values are: <ul style="list-style-type: none"> <li>• Penetrating diaphragm: 2</li> <li>• Inner diaphragm: 1</li> </ul>	To increase the size of a plate, set the size increase. You can define two size up values for each diaphragm plate, for a thin plate and a thick plate. For example, <ul style="list-style-type: none"> <li>• Size up value for thin plate = 2</li> <li>• Size up value for thick plate = 1</li> <li>• The default border value = 40 mm</li> </ul> If the required plate thickness is 34 mm, 2 size ups are applied and the result will be 45 mm.  If the required plate thickness is 44 mm, 1 size up is applied and the result will be 50 mm.	Increased plate size The default values are: <ul style="list-style-type: none"> <li>• Penetrating diaphragm: 1</li> <li>• Inner diaphragm: 0</li> </ul>

The table below shows an example of the calculation result.

Normal size up = 2	Specified plate thickness	Plate size up = 1
$t \leq 6$ $\rightarrow 12$  $6 < t$ $\leq 9$ $\rightarrow 16$	$< 40 \leq$	$t =$ $40 \rightarrow$ $45$  $40 <$ $t \leq$ $45 \rightarrow$ $48$

Normal size up = 2	Specified plate thickness	Plate size up = 1
$9 < t$ $\leq 12$ $\rightarrow 19$		$45 <$ $t \leq$ $48 \rightarrow$ $50$
$12 <$ $t \leq$ $16 \rightarrow$ $22$		$48 <$ $t \leq$ $50 \rightarrow$ $55$
$16 <$ $t \leq$ $19 \rightarrow$ $25$		$50 <$ $t \leq$ $55 \rightarrow$ $60$
...		...
$32 <$ $t \leq$ $36 \rightarrow$ $45$		

## Welds

Option	Description
<b>Weld prep</b>	Select whether to create welding cuts. The default is <b>No</b> .
<b>Weld prep. preset</b>	Select whether to use preset welding settings.

## Custom component to column

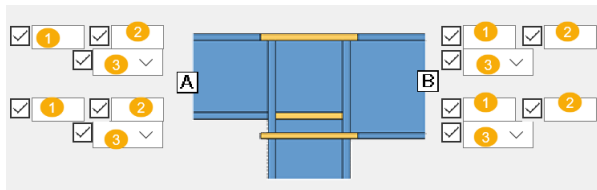
You can use custom components for welds, welding cuts, and weld backing bars.

Option	Description
<b>Component</b>	Custom component name You can use seam or connection type custom components.
<b>Parameters</b>	Property file name to be used for the custom component. You can define the name if you have specified a custom component.

## Diaphragm tab

Use the **Diaphragm** tab to define the diaphragm material, thickness, offset, and type.

## Diaphragm

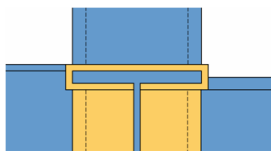


	Description
1	Diaphragm plate thickness
2	Offset from the automatically determined diaphragm position
3	Diaphragm type

### Diaphragm thickness

Apply the highest value of the following options:

- Thickness is determined based on the thickest plate among the beam flanges that are at the same height.
- Thickness is determined by the thickest beam flange value + the additional thicknesses defined on the **Fabrication dimensions** tab.
- Thickness is calculated based on the required diaphragm thickness, which takes into account each beam flange thickness and height.

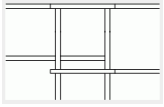
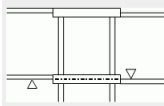


### Diaphragm offset

The diaphragm offset is based on the automatically determined diaphragm height. The offset value is the distance from the reference height. Use the offset when fine-tuning the height of the automatically determined diaphragm. Enter a positive value for the upward offset and a negative value for the downward offset.

### Diaphragm type

The diaphragm height is automatically determined by the height at which the beam flanges meet.

Example	Description
	<p>The example image shows the most commonly used diaphragm arrangement.</p> <p>The outermost upper and lower diaphragms are penetrating diaphragms.</p> <p>The other diaphragm is an inner diaphragm.</p>
	<p>Even if two or more flanges are on slightly different levels, one diaphragm is created if the clearance is smaller than the minimum diaphragm clearance set on the <b>Fabrication dimensions</b> tab.</p>

### Cantilevers tab

Use the **Cantilevers** tab to define the custom components that are used.

### Custom components

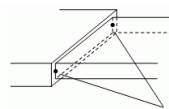
You can define that a custom component is used for the upper flange, lower flange, and the web.

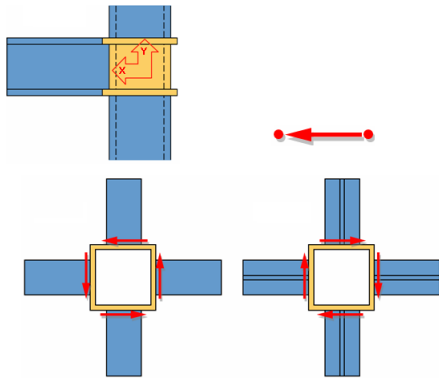
<p><b>Component</b></p>	<p>Custom component name</p> <p>You can use seam or connection type custom components.</p>
<p><b>Parameters</b></p>	<p>Property file name to be used for the custom component.</p> <p>You can define the name if you have specified a custom component.</p>

### Custom components (upper flange, lower flange)

You can use custom components for welds, welding cuts, and weld backing bars.

The images below show examples of custom components applied to beam flanges.



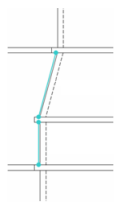


### Custom components (web)

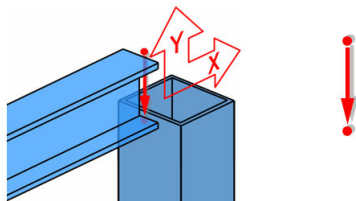
You can use custom components for polygon welds and web cuts.

The beam is the main part and the short column is the secondary part. If the web welds are separated by a penetrating diaphragm, apply a custom component to each web edge.

The example image below shows a situation where the penetrating diaphragm is interrupted and the side of the beam web is divided into two.



The example image below shows the coordinate system, and the first and second points used to define a seam type custom component.



### Bracket tab

Use the **Bracket** tab to define the bracket properties.

## Properties

Option	Description
<b>Parameters</b>	Property file name to be used for <b>Tapered column-beam stub (150)</b> . Define this when you have selected <b>Bracket</b> as the <b>Bracket type</b> on the <b>Design dimensions</b> tab.
<b>Profile name</b>	Select the profile from the profile catalog. The default value is the beam profile when the beam is rolled.
<b>Size up</b>	Plate size increase If you have selected a profile, the profile size value is used.
<b>Profile/Flg</b>	Select the profile/flange plate material.
<b>Web</b>	Select the web plate material. This option is not used when the bracket type is <b>Rolled</b> .

### General tab

Click the link below to find out more:

[General tab](#)

### Design tab

Click the link below to find out more:

[Design tab](#)

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

### Welds

Click the link below to find out more:

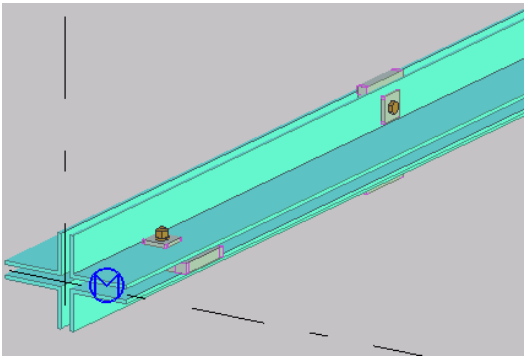
### ***Batten plates (S85)***

**Batten plates (S85)** connects twin profiles with either bolted or welded connections. Backing plates are also created.

#### **Objects created**

- Batten plates
- Backing plates
- Bolts
- Welds

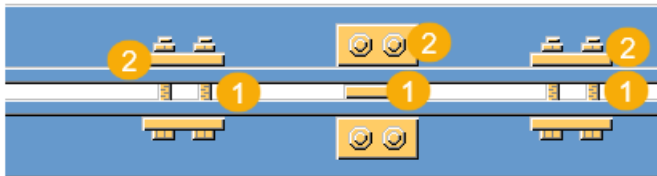
#### **Use for**

<b>Situation</b>	<b>Description</b>
	Twin profile connected with horizontal and vertical batten plates and backing plates.

#### **Selection order**

1. On the ribbon, click **Beam** --> **Twin profile**.
2. Pick a position on the twin profile.
3. Select the first object in the profile.
4. Select the second object in the profile.
5. Click the middle mouse button to create the connection.

#### **Part identification key**



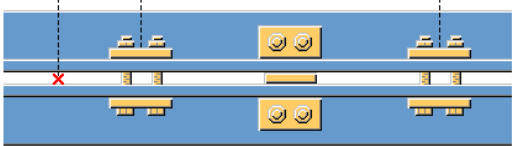
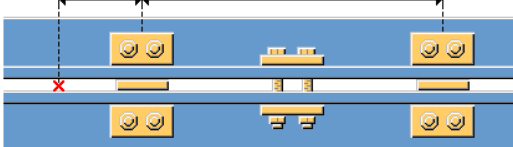
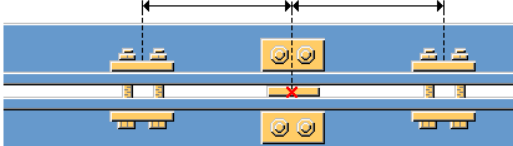
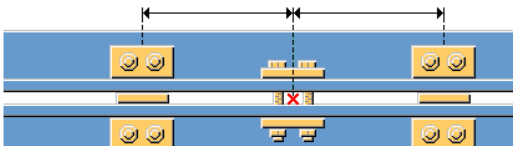
	<b>Description</b>
<b>1</b>	Batten plate
<b>2</b>	Backing plate



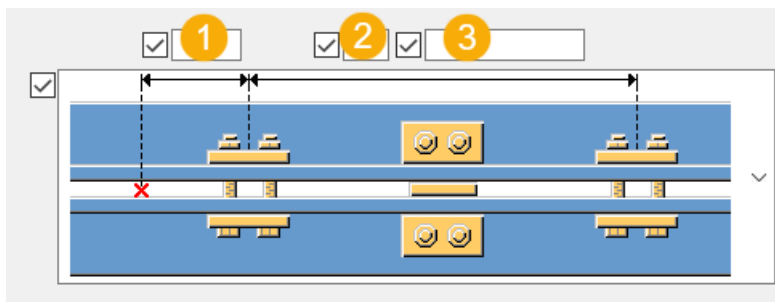
**Picture tab**

Use the **Picture** tab to define the distance of the batten plates from the input point, and the spacing and orientation of the plates.

**Batten plate distribution**

Option	Description
	<p>The first batten plate is vertically oriented.</p> <p>Define the distance of the batten plates from the start point.</p>
	<p>The first batten plate is horizontally oriented.</p> <p>Define the distance of the batten plates from the start point.</p>
	<p>The batten plate in the middle is horizontally oriented.</p> <p>Define the distance of the batten plates from the middle point.</p>
	<p>The batten plate in the middle is vertically oriented.</p> <p>Define the distance of the batten plates from the middle point.</p>

**Batten plate location**



	Description
1	Define the distance from the start point.
2	Define the number of batten plate connections.
3	Define the batten plate spacing.

### Parts tab

Use the **Parts** tab to define the plate properties.

### Parts


Option	Description	Default
<b>Batten plate leg1</b>	Thickness of the batten plate.	Clearance between the angles.
<b>Batten plate leg2</b>	Thickness of the batten plate.	Clearance between the angles.
<b>Back plates</b>	Thickness of the backing plates.	3/8"

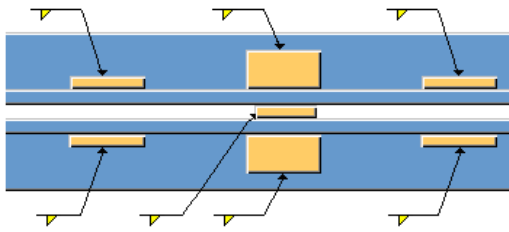
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Parameters tab

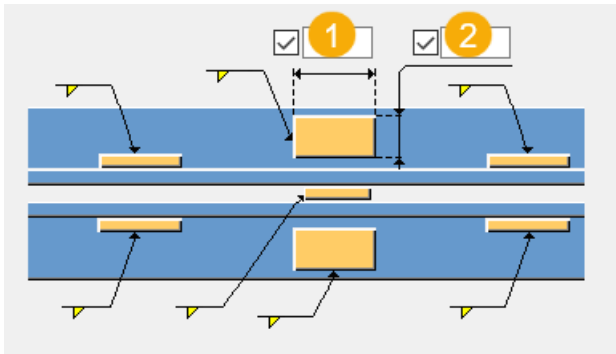
Use the **Parameters** tab to select between bolted or welded plates. You can also define the size of the backing plates for the welded connections.

### Plate type

Option	Description
	Plates are bolted.

Option	Description
	Plates are welded. Define the plate dimensions.

### Welded plate dimensions

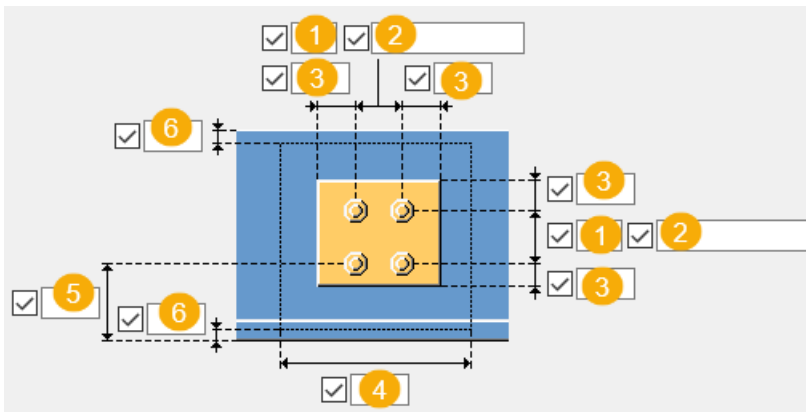


	Description	Default
1	Backing plate width.	3"15/16
2	Backing plate length.	3"15/16

### Bolts tab

Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

### Bolt group dimensions



	Description
1	Number of bolts.

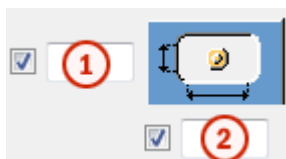
	Description
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Batten plate width.
5	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
6	Batten plate edge distance from the part edge.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

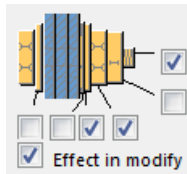


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.









To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

## Welds

Click the link below to find out more:

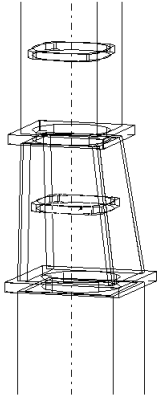
### ***Tapered column (136)***

**Tapered column (136)** creates a transition plate between different size columns. The transition plates can either be tapered or straight.

### **Objects created**

- Diaphragm plates (penetrating and inner)
- Transition plates

**Use for**

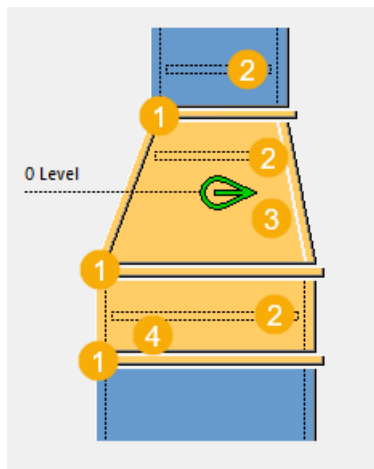
Situation	Description
	<p>Penetrating and inner diaphragm plates, and a tapered section are created.</p>

**Selection order**

1. Select the main part (lower part).
2. Select the secondary part (upper part).

The connection is created automatically when the secondary part is selected.

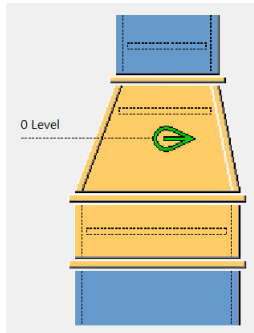
**Part identification key**



	Description
1	Penetrating diaphragm
2	Inner diaphragm
3	Transition plate (tapered)
4	Transition plate (straight)

### Picture tab

The **Picture** tab illustrates the elevation to which all of the parts created by the connection are relative to.



### Parameters tab

Use the **Parameters** tab to define the type of transition columns used in the connection. The short sections of columns can be created of rolled tubes or built up from plates.

### Parts





Option	Description
<b>Penetrating diaphragm, Inner diaphragm</b>	Define the thickness on the <b>Diaphragm</b> tab.
<b>Tapered section</b>	Thickness of the section.
<b>Buildup section</b>	Thickness of the section.
<b>Upper rolled col</b>	Select the profile from the profile catalog.
<b>Lower rolled col</b>	Select the profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in






Option	Description	Default
		<b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Tapered section position

Option	Description
	Default Tapered section is in the upper location. AutoDefaults can change this option.
	Tapered section is not created.
	Tapered section is in the upper location.
	Tapered section is in the lower location.




### Straight short column type

Option	Description
	Default Short straight column is created using the defined rolled profile. AutoDefaults can change this option.

Option	Description
	Short straight column is created using the defined rolled profile.
	Short straight column is created using the defined built-up plate.

### Solid weld cut

Solid weld cut creates beveled cuts for groove welds in the built-up and tapered column plate edges.

Option	Description
	Default Beveled edge cuts are not created. AutoDefaults can change this option.
	Beveled edge cuts are created.
	Beveled edge cuts are not created.

### Diaphragm tab

Use the **Diaphragm** tab to set the number, position and type of the diaphragm plates created in the connection.

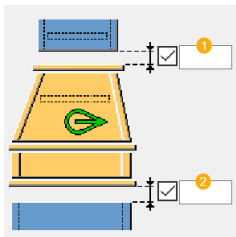
Option	Description	Default
<b>t</b>	Diaphragm plate thickness.	No default Enter a plate thickness to create the diaphragm plate.

Option	Description	Default
<b>Level</b>	Relative distance from the elevation level shown on the <b>Picture</b> tab.	Enter a plus or minus dimension to locate the desired diaphragm.
<b>Depth</b>	Position of the diaphragm in relation to the value entered in the <b>Level</b> box.	
<b>Offset</b>	Diaphragm plate offset from the value entered in the <b>Level</b> box.	0"
<b>Diaphragm</b>	Diaphragm type.	
<b>Bevel cut</b>	Position of the bevel cut on the diaphragm plate.	

### Penetrating diaphragm

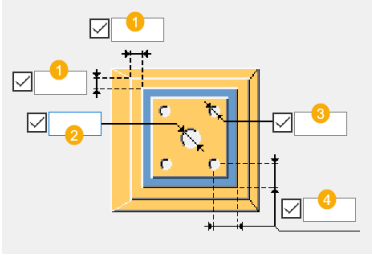
Use the **Penetrating diaphragm** tab to control the size and shape of the diaphragm plate. You can also add holes to the plate and set the root distance from the diaphragm to the column.

### Welding gap




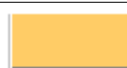



	Description	Default
<b>1</b>	Welding gap to the upper column. Distance from the column to the diaphragm plate.	0"
<b>2</b>	Welding gap to the tower column. Distance from the column to the diaphragm plate.	0"

## Dimensions

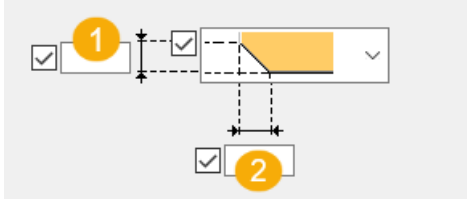


	Description	Default
1	Diaphragm plate edge distance outside of the face of column.	1"
2	Diameter of the center hole in the diaphragm plate.	13/16"
3	Diameter of corner holes created in each corner of the diaphragm plate. To create corner holes you must enter a value.	
4	Position of the corner holes in relation to the face of column.	1" 3/16

## Chamfer type

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

## Chamfer dimensions

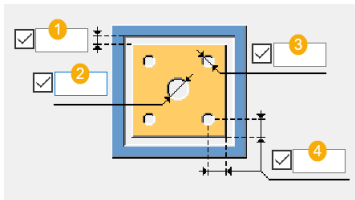


	Description
1	Vertical chamfer dimension.
2	Horizontal chamfer dimension.

## Inner diaphragm


Use the **Inner diaphragm** tab to control the size of the diaphragm plate. You can also add holes to the plate and chamfer the corners.





## Dimensions



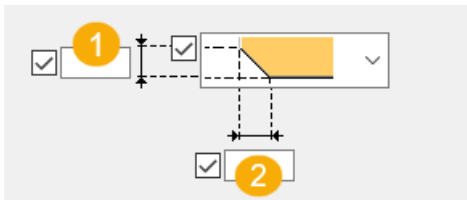
	Description	Default
1	Weld gap Distance from the inside face of the column to the diaphragm plate.	
2	Diameter of the center hole in the diaphragm plate.	13/16"
3	Diameter of the corner holes created in each corner of the diaphragm plate. To create corner holes you must enter a value.	
4	Position of the corner holes in relation to the edge of the inner diaphragm plate.	1"3/16

## Chamfer type

Option	Description
	Default No chamfer AutoDefaults can change this option.

Option	Description
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

### Chamfer dimensions



	Description
1	Vertical chamfer dimension.
2	Horizontal chamfer dimension.

### General tab

Click the link below to find out more:

[General tab](#)

### Design tab

Click the link below to find out more:

[Design tab](#)

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

### Welds

Click the link below to find out more:

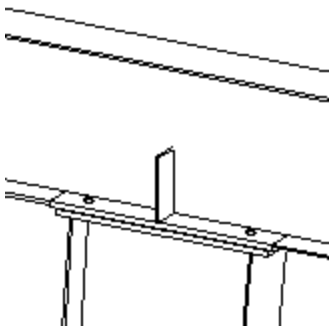
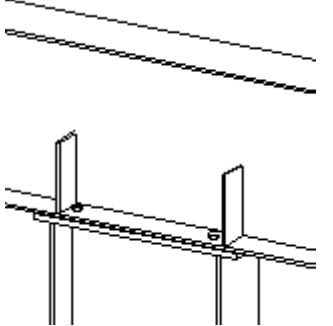
### ***Tapered beam to tapered column (197)***

**Tapered beam to tapered column (197)** creates a connection between a tapered beam and a tapered column.

#### **Objects created**

- End plates (column top, beam flange)
- Stiffeners (2 or 4)
- Bolts
- Welds

#### **Use for**

<b>Situation</b>	<b>Description</b>
	Connection is created using two stiffeners, and flange and column plates. Plates are connected with four bolts, but you can use any number of bolts.
	Connection is created using four stiffeners and a column end plate. A separate plate for the beam flange is not created.

#### **Before you start**

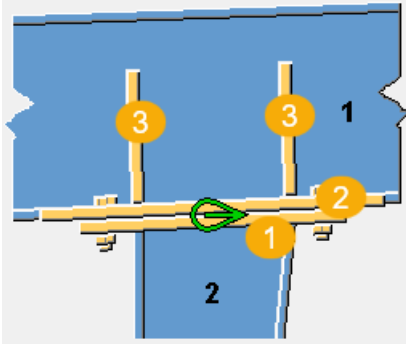
- Create a tapered beam.
- Create a tapered column.

#### **Selection order**

1. Select the flange of the main part (beam).
2. Select the web of the secondary part (column).

The connection is created automatically when the secondary part is selected.

### Part identification key

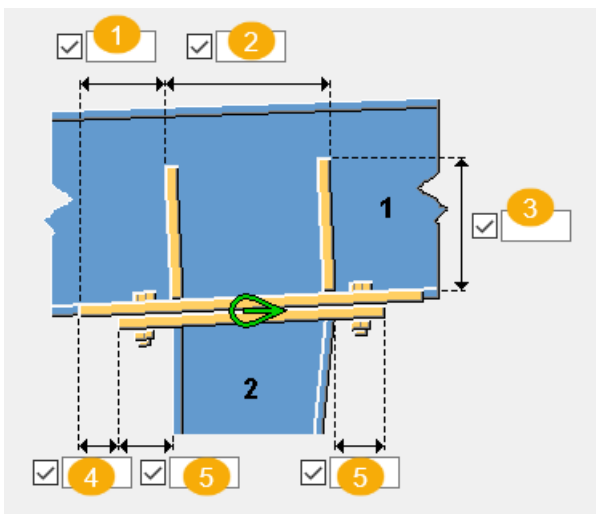


	Description
1	Column end plate
2	Beam flange end plate
3	Stiffener

### Picture tab

Use **Picture** tab to define the dimensions of end plates and stiffeners, and the location of stiffeners.

### Dimensions



	Description
1	Beam end plate edge distance to the stiffener edge.
2	Distance between the stiffeners.
3	Stiffener dimension from the beam web.
4	Column end plate edge distance to the beam end plate edge.
5	Column end plate edge distance to the column edge.



### Parts tab

Use the **Parts** tab to define the properties of the column end plate, the beam end plate, and the stiffeners.

### Parts

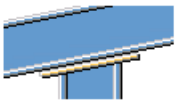

Option	Description
<b>Beam plate</b>	Thickness and width of the beam plate.
<b>Column plate</b>	Thickness and width of the column plate.
<b>Stiffener</b>	Thickness and width of the stiffener.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	



### Parameters tab

Use the **Parameters** tab to define the plate and stiffener positions and orientation.



### Plates

Option	Description
	End plate is created at the column end.
	End plated is created at the column end and beam flange.



## Stiffeners

Option	Description
	One stiffener is created.
	Two stiffeners are created.

## Column flange fit

Option	Description
	Column flange is fitted to be level with the end plate.
	Column flange is perpendicular to the column axis.

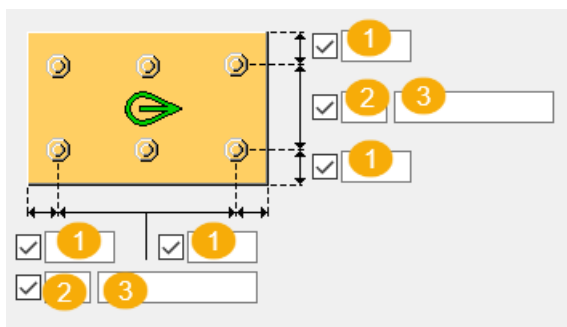
## Stiffener orientation

Option	Description
	Stiffener is parallel to the main part.
	Stiffener is perpendicular to the beam.

## Bolts tab

Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

### Bolt group dimensions

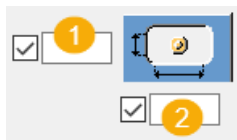


	Description
<b>1</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>2</b>	Number of bolts.
<b>3</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

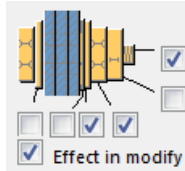


	Description
<b>1</b>	Vertical dimension of slotted hole.
<b>2</b>	Horizontal dimension of slotted hole.

## Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## General tab

Click the link below to find out more:

[General tab](#)

## Analysis tab

Click the link below to find out more:

[Analysis tab](#)

## Welds

Click the link below to find out more:

## ***Tapered column to tapered beam (199)***

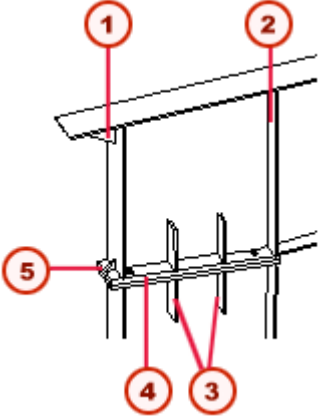
**Tapered column to tapered beam (199)** creates a connection between a tapered column and a tapered beam. All parts are optional.

## Objects created

- End plates (column top, beam flange)
- Web stiffeners (8)
- Triangular beam flange stiffener

- Triangular flange stiffeners (2)
- Beam web stiffeners (2)
- Bolts
- Welds

**Use for**

Situation	Description
	<p>Connection is created using all possible parts. Plates are connected using four bolts, but you can use any number of bolts.</p> <p><b>1</b> Beam flange stiffener <b>2</b> Beam web stiffeners <b>3</b> Web stiffeners <b>4</b> End plates <b>5</b> Flange stiffeners</p>

**Before you start**

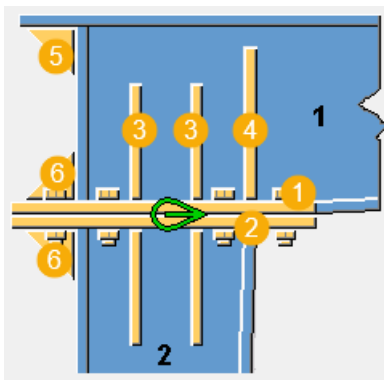
- Create a tapered beam.
- Create a tapered column.

**Selection order**

1. Select the web of the main part (beam).
2. Select the web of the secondary part (column).

The connection is created automatically when the secondary part is selected.

**Part identification key**

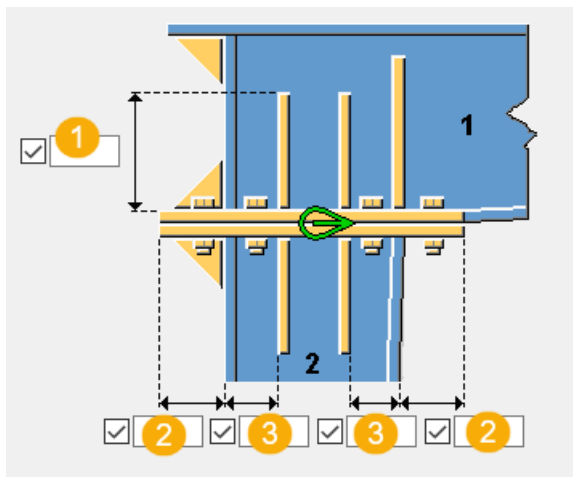


	Description
1	Beam end plate
2	Column end plate
3	Web stiffeners
4	Beam web stiffener
5	Beam flange stiffener
6	Flange stiffener

### Picture tab

Use the **Picture** tab to define the dimensions of end plates and stiffeners, and the location of stiffeners.

### Dimensions



	Description
1	Web stiffener dimension from the end plate.
2	End plate edge dimension from the secondary part edge.
3	Stiffener edge dimension from the secondary part edge.

### Parts tab

Use the **Parts** tab to define the properties of the column plate, beam plate, and stiffeners. Set the part thickness to 0 to omit a part.

### Parts

Option	Description
<b>End plate</b>	Thickness and width of the end plate.
<b>Web stiffener</b>	Thickness and width of the web stiffener.

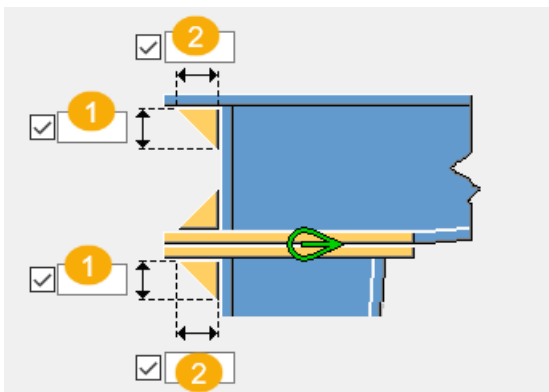
Option	Description
<b>Flange stiffener</b>	Thickness of the flange stiffener.
<b>Beam flange stiff</b>	Thickness of the beam flange stiffener.
<b>Beam web stiff</b>	Thickness and width of the beam web stiffener.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Parameters tab

Use the **Parameters** tab to define whether the column flange and the corner are fitted, and the stiffener chamfer dimensions.

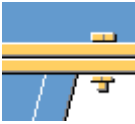

### Stiffener chamfer dimensions





	Description
<b>1</b>	Vertical chamfer dimension.

	Description
2	Horizontal chamfer dimension.

### Column flange fit

Option	Description
	Column flange fitted to be level with the end plate.
	Column flange is perpendicular to the column axis.

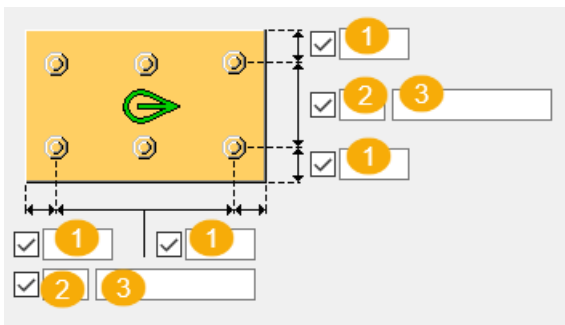
### Corner fitting

Option	Description
	Corner is fitted.
	Corner is not fitted.

### Bolts tab

Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

### Bolts group dimensions



	Description
1	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Number of bolts.

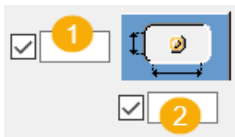


	Description
<b>3</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

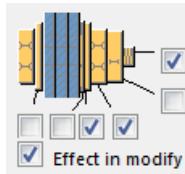


	Description
<b>1</b>	Vertical dimension of slotted hole.
<b>2</b>	Horizontal dimension of slotted hole.

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

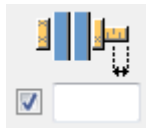
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### **General tab**

Click the link below to find out more:

[General tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

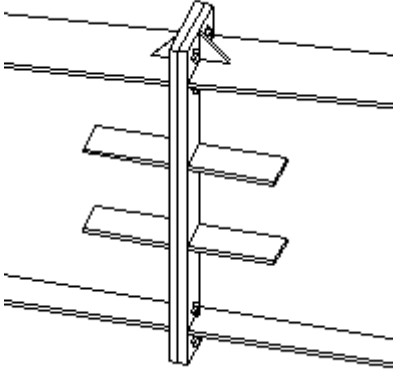
### ***Tapered beam to beam (200)***

**Tapered beam to beam (200)** creates a connection between tapered beams.

### **Objects created**

- End plates (2)
- Flange stiffeners (4) (optional)
- Web stiffeners (8) (optional)
- Bolts
- Welds

## Use for

Situation	Description
	<p>All stiffeners and end plates are created.</p> <p>Plates are connected with eight bolts, but you can use any number of bolts.</p>

## Before you start

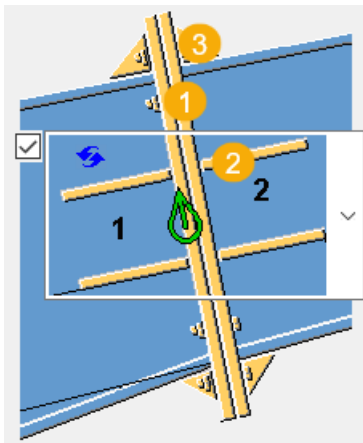
Create two tapered beams.

## Selection order

1. Select the web of the main part (first beam).
2. Select the web of the secondary part (second beam).

The connection is created automatically when the secondary part is selected.

## Part identification key

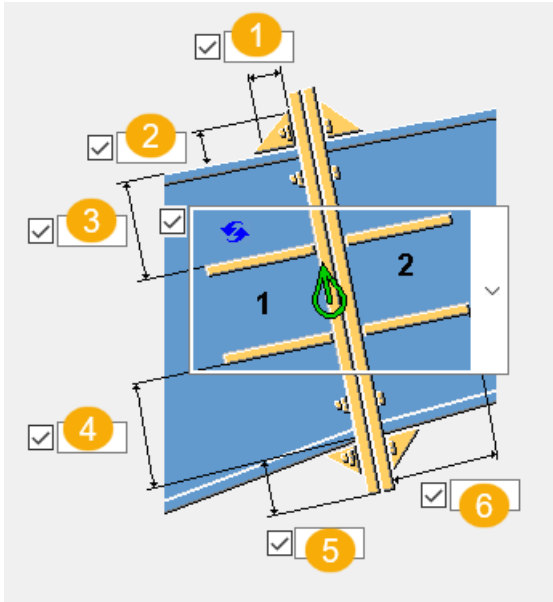


	Description
1	End plates
2	Web stiffeners
3	Flange stiffeners

**Picture tab**

Use the **Picture** tab to define the dimensions of the end plates and stiffeners, the location of the stiffeners, and whether the beam flange is fitted.




**Dimensions**




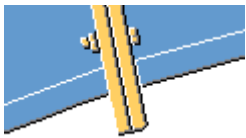
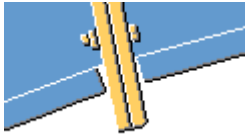
	Description
1	Horizontal dimension of the flange stiffener.
2	Vertical dimension of the flange stiffener.
3	Top web stiffener edge distance to the beam flange.
4	Bottom web stiffener edge distance to the beam flange.
5	End plate dimension from the beam edge.
6	Web stiffener dimension from the end plate.

**Web stiffeners**

Option	Description
	Default Top and bottom web stiffeners are created. AutoDefaults can change this option.
	Top and bottom web stiffeners are created.

Option	Description
	Top web stiffeners are created.
	Bottom web stiffeners are created.
	Web stiffeners are not created.

### Beam flange

Option	Description
	Default Beam flanges are perpendicular to the beam axis. AutoDefaults can change this option.
	Beam flanges are fitted to be level with the end plate.
	Beam flanges are perpendicular to the beam axis.

### Parts tab

Use the **Parts** tab to define the properties of end plates, web stiffeners, and flange stiffeners. Set the part thickness to 0 to omit a part.

### Parts

Option	Description
<b>End plate</b>	Thickness and width of the end plate.
<b>Web stiffener</b>	Thickness and width of the web stiffener.





Option	Description
<b>Flange stiffener</b>	Thickness of the flange stiffener.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	






### Chamfer tab

Use the **Chamfer** tab to define the flange and web stiffener shape, type, and dimensions.

### Flange stiffener

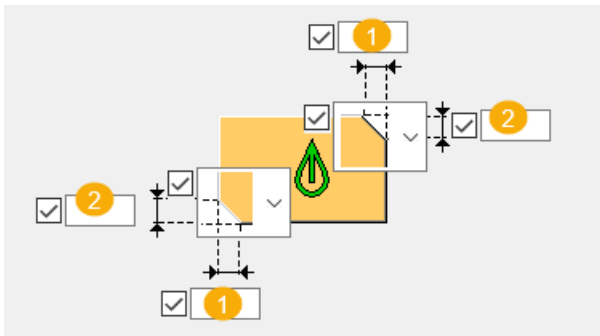
Option	Description
	Default Bevel, chamfered corner AutoDefaults can change this option.
	Bevel, chamfered corner
	Square, one chamfered corner
	Square, two chamfered corners

## Chamfer type

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

## Chamfer dimensions

You can define the chamfer dimensions for both web and flange stiffeners.

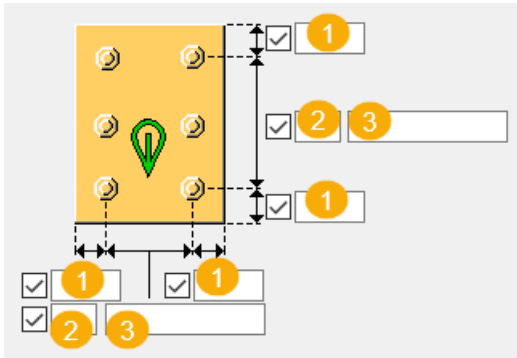


	Description
1	Horizontal chamfer dimension.
2	Vertical chamfer dimension.

## Bolts tab

Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

## Bolt group dimensions



	Description
<b>1</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>2</b>	Number of bolts.
<b>3</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

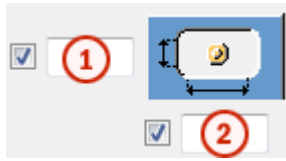
## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site



## Slotted holes

You can define slotted, oversized, or tapped holes.

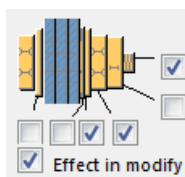


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

## Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### **General tab**

Click the link below to find out more:

General tab

### **Analysis tab**

Click the link below to find out more:

Analysis tab

### **Welds**

Click the link below to find out more:

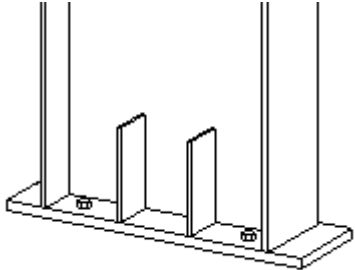
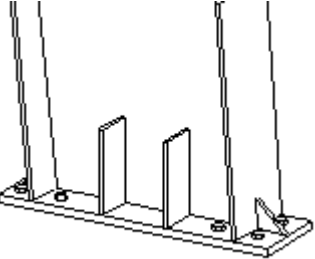
### ***Tapered column base plate (1068)***

**Tapered column base plate (1068)** creates a base plate detail to a tapered column.

### **Parts created**

- End plate
- Web stiffeners (4)
- Flange stiffeners (2) (optional)
- Anchor rods
- Extra plates connecting the anchor rods
- Bolts
- Welds

## Use for

Situation	Example
	<p>The detail uses four web stiffeners. Flange stiffeners are not created.</p> <p>The end plate is connected using four bolts, but you can use any number.</p>
	<p>The detail uses four web stiffeners and two flange stiffeners.</p>

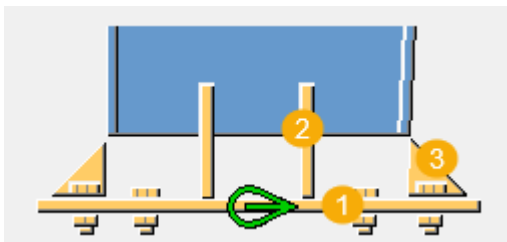
## Before you start

Create a tapered column.

## Selection order

1. Select the tapered column.
2. Pick a point to indicate the location of base plate.

## Part identification key

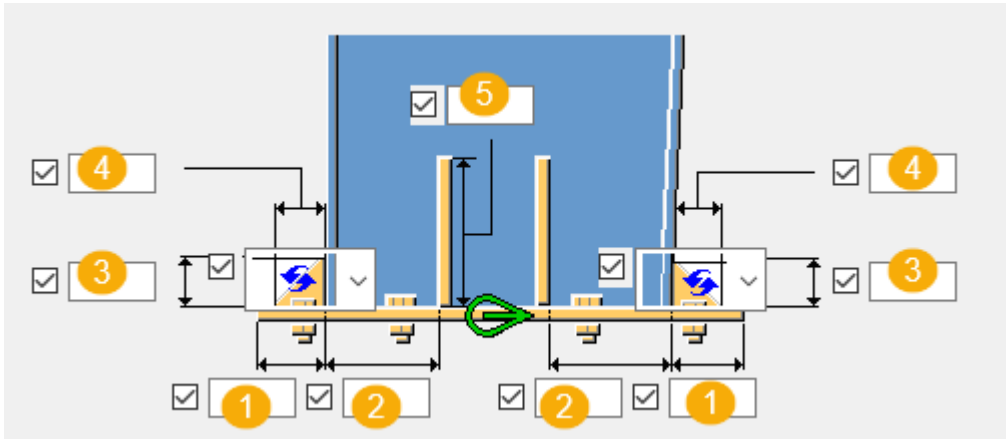


	Description
1	End plate
2	Web stiffener
3	Flange stiffener

## Picture tab

Use the **Picture** tab to define the dimensions of the base plate and stiffeners, the location of web stiffeners, and whether the column flange is fitted.

## Dimensions

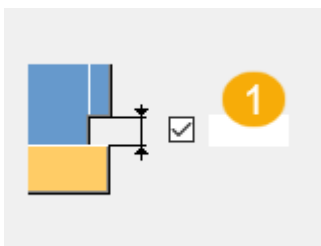


	Description
1	End plate edge distance to the column flange.
2	Web stiffener edge distance.
3	Flange stiffener height.
4	Flange stiffener width.
5	Web stiffener height.

## Flange stiffener shape

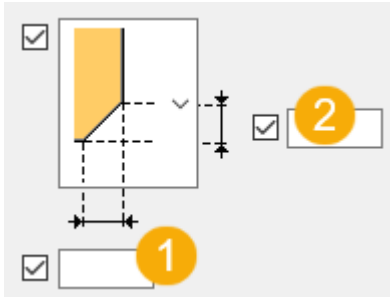
Option	Description
	Default Line shape AutoDefaults can change this option.
	Line shape
	Square shape
	No stiffener

## Flange cut








	Description	Default
1	Define the flange cut from the base plate edge.	2 mm

### Flange stiffener chamfer dimensions





	Description
1	Horizontal chamfer dimension.
2	Vertical chamfer dimension.

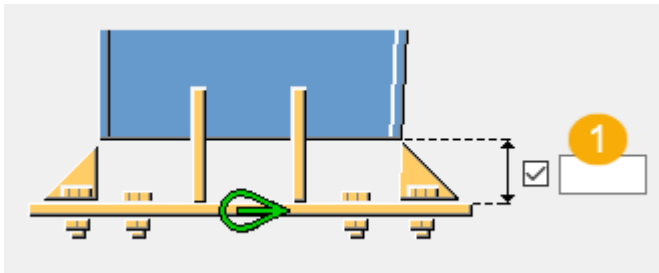
### Flange stiffener chamfer type

Option	Description
	Default No chamfers AutoDefaults can change this option.
	No chamfers
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

## Column flange

Option	Description
	Column flange fitted to be level with the base plate.
	Column flange is perpendicular to column axis.

## End plate offset



	Description
1	End plate offset from the main part bottom edge.

## Parts tab

Use the **Parts** tab to define the properties of the end plate, web stiffeners, and flange stiffeners.

## Parts

Option	Description
<b>End plate</b>	Thickness and width of the end plate.
<b>Web stiffener</b>	Thickness and width of the web stiffener.
<b>Flange stiffener</b>	Thickness of the flange stiffener.

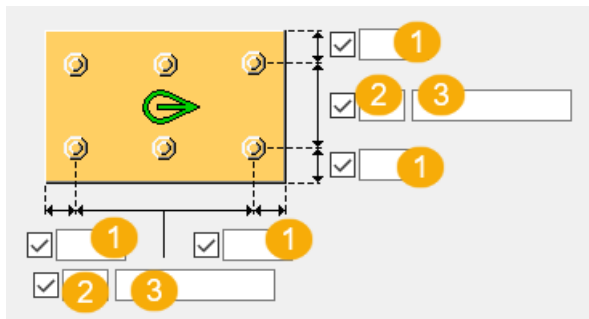
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Bolts tab

Use the **Bolts** tab to define the bolt properties, number of bolts, and spacing.

### Bolt group dimensions



	Description
<b>1</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>2</b>	Number of bolts.
<b>3</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.

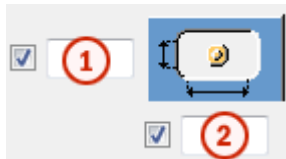
Option	Description	Default
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Cut length

Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

### Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options	

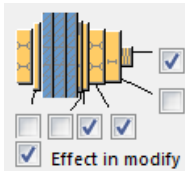


Option	Description	Default
	depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



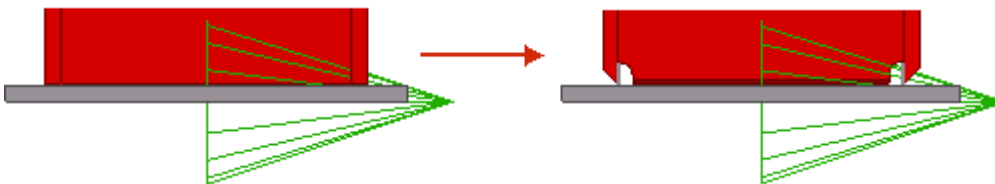
### Parameters tab

Use the **Parameters** tab to define a component.

### Using additional components

You can use additional system or custom components to modify the column end or the base plate. For example, you can create special backing plates, weld preparations, and weld access holes for the column end.

If you use additional system or custom components, you need to manage the column end or the base plate properties in the additional component in question. When using several components, there may be multiple welds and cuts.



Option	Description
<b>Component</b>	Select a system or a custom component from the <b>Applications &amp; components</b> catalog.
<b>Attributes</b>	Select an attribute file for the component.
<b>Input</b>	<p>Define to which parts the selected component is applied.</p> <ul style="list-style-type: none"> <li>• <b>Default</b> is the same as <b>Base + Column</b>.</li> <li>• <b>Column</b> sets the column as the main part. Use this option for details.</li> <li>• <b>Column + Base</b> sets the column as the main part and the base plate as the secondary part.</li> <li>• <b>Base + Column</b> sets the base plate as the main part and the column as the secondary part.</li> <li>• <b>Base</b> sets the base plate as the main part.</li> </ul>

#### Anchor rods tab

Use the **Anchor rods** tab to define the properties of the rod, nut, washer, cast plate, and grout.

#### Anchor rod dimensions

Option	Description
<b>Rod profile</b>	Anchor rod profile. You can add a comment about the part.
<b>Nut profile</b>	Nut profile.
<b>Washer profile</b>	Washer profile.
<b>Plate washer</b>	Plate washer thickness, width and height.
<b>Cast plate</b>	Cast plate thickness, width and height.
<b>Grout</b>	Grout thickness. Grouting helps you to model columns to the top of concrete parts and place the base plate correctly. It also makes

Option	Description
	<p>it easier to dimension the detail in GA drawings.</p> <p>By default, no grouting is created.</p> <p>Select whether the grouting is created with or without slopes above or below the detail creation point. This also affects the shim plates.</p>

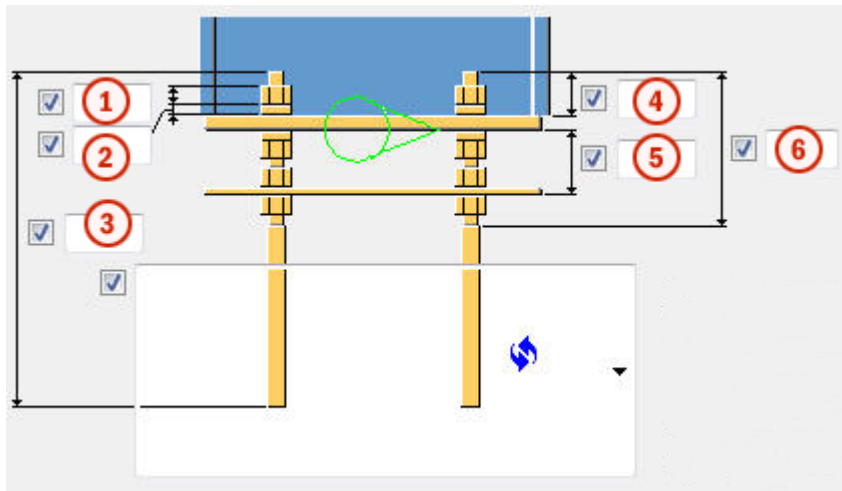
Option	Description	Default
<b>Pos_No</b>	<p>Prefix and start number for the part position number.</p> <p>Some components have a second row of fields where you can enter the assembly position number.</p>	<p>The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b>.</p>
<b>Material</b>	Material grade.	<p>The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b>.</p>
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

### Base plate with

Select whether to create the base plate with bolts, anchor rods, or a custom component.

By default, the base plate is created with **Bolts**.


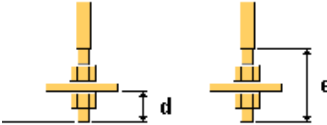
## Anchor rod dimensions








	Description
1	Size or the length of the nut.
2	Size or the thickness of the washer.
3	Length of the anchor rod.
4	Length of the anchor rod above the base plate.
5	Distance between the cast plate and the base plate.
6	Length of the upper thread.

## Anchor rod types

Option	Description	
	Default Type 1 AutoDefaults can change this option.	
	Type 1	
	<b>a</b> Radius of the hook <b>b</b> Width of the hook	<b>a</b> = 2*anchor bar diameter <b>b</b> = 1/5 of anchor bar length




Option	Description	
	<p><b>a</b> Radius of the hook</p> <p><b>b</b> Width of the hook</p> <p><b>c</b> Height of the hook</p>	<p><b>c</b> = same as width of the hook</p>
	<p><b>d</b> Length of the anchor rod below the extra plate</p> <p><b>e</b> Length of the lower thread</p>	<p><b>d</b> = 2*nut size</p> <p><b>e</b> = 4*nut size plus thickness of extra plate</p>

### Hook direction

Option	Description
	<p>Default Type 1 AutoDefaults can change this option.</p>
	<p>Type 1</p>
	<p>Type 2</p>
	<p>Type 3</p>
	<p>Type 4</p>

### Bolting direction

You can define the bolting direction if you have created the base plate with bolts.

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

### Cast plate holes tolerance

Option	Description	Default
<b>Cast plate holes tolerance</b>	Tolerance of the cast plate holes.	same as bolt tolerance

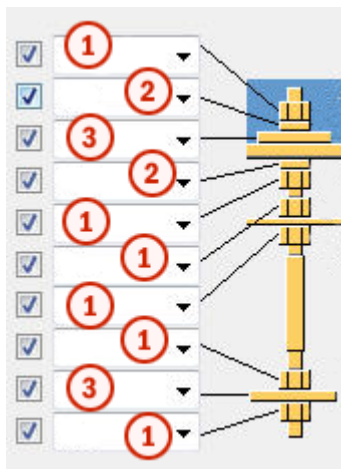
### Washer hole tolerance

Option	Description
<b>Create hole in washer</b>	By default, a hole is not created in the washer.  Tolerance of the washer hole.

### Create assembly from all anchors

Define whether anchors are included in an anchor rod assembly. You can also include leveling plates into the assembly.

### Create



<b>1</b>	Create the nut profile.
<b>2</b>	Create the washer profile.
<b>3</b>	Create the washer plate.

### Anchor rod assembly

Define which parts of the anchor rod are included in the anchor rod assembly. You can weld the washer plates above and below the base plate.

### Extra plates tab

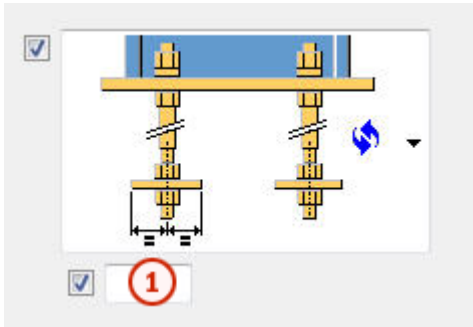
Use the **Extra plates** tab to control the placement, rotation, and type of the profiles (extra profile 1) created at the bottom of each anchor bar and the profiles (extra profile 2) that connect rows of anchor bars.

### Part dimensions

Option	Description
<b>Extra profile 1</b>	First extra profile by selecting it from the profile catalog.
<b>Extra profile 2</b>	Second extra profile by selecting it from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Edge distance of extra profile 1

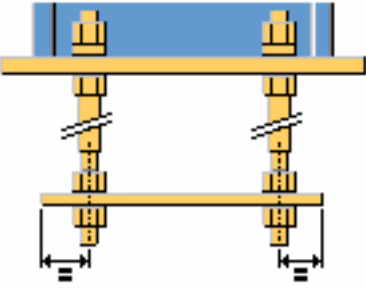


	Description
1	Edge distance of extra profile 1.

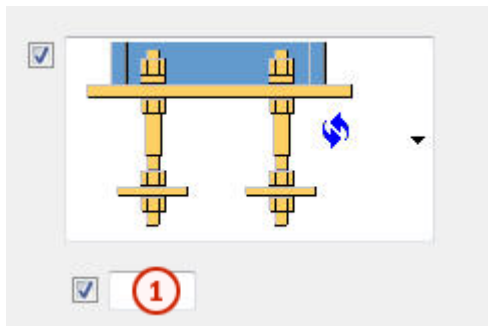
### Type and direction of extra profile 1

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2



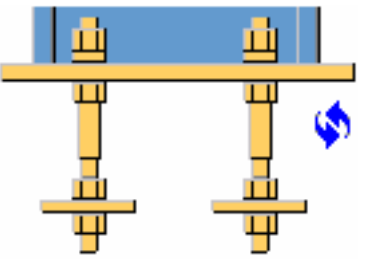
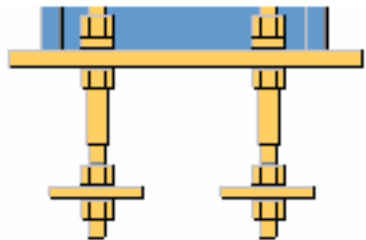
Option	Description
	Type 3

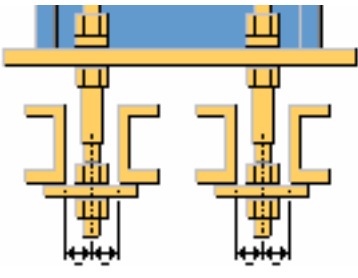
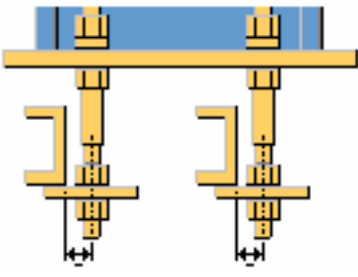
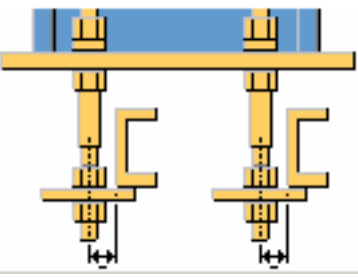
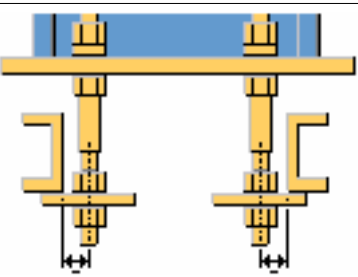
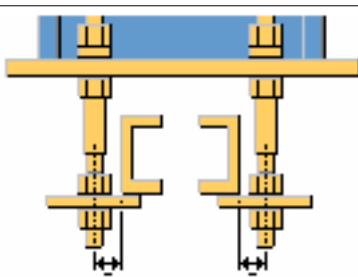
**Edge distance of extra profile 2**



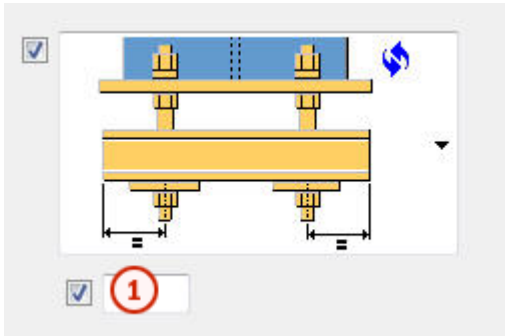
Option	Description	Default
1	Distance of extra profile 2 from the axis of the anchor bar.	Half of the nut size or anchor bar diameter

**Extra profile 2 type**

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1

Option	Description
	Type 2
	Type 3
	Type 4
	Type 5
	Type 6

### Length of extra profile 2



	Description
1	Length of extra profile 2 from the axis of the anchor bar.

### Direction of extra profile 2

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2

### Extra profile 1 properties

Option	Description	Default
<b>Hole tolerance</b>	Hole tolerance of extra profile 1.	Same as bolt tolerance
<b>Circular profile height</b>	Height of circular extra profile 1.	
<b>Profile rotation</b>	Profile rotation of extra profile 1.	Front

### Extra profile 2 rotation

Option	Description	Default
<b>Extra profile 2 rotation</b>	Profile rotation of extra profile 2.	Front

#### General tab

Click the link below to find out more:

[General tab](#)

#### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

#### Welds

Click the link below to find out more:

### ***PEB Knee joint (S93)***

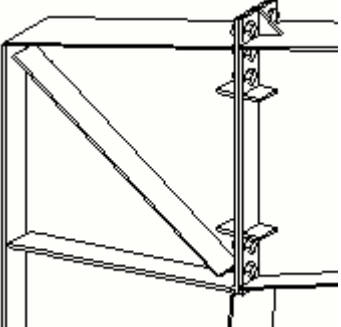
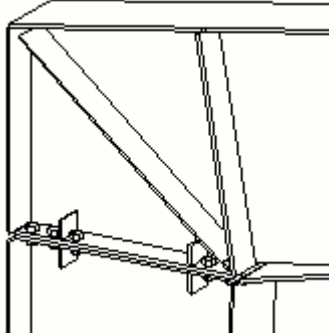
**PEB Knee joint (S93)** creates a knee connection between a rafter and a column. The end plate connection can be located horizontally, vertically, or perpendicular to the rafter.

#### **Objects created**

- End plates
- Web stiffener
- Flange stiffeners (2)
- Inner stiffeners (4)
- Outer stiffeners (4)
- Diagonal stiffeners or web plate

- Bolts
- Welds

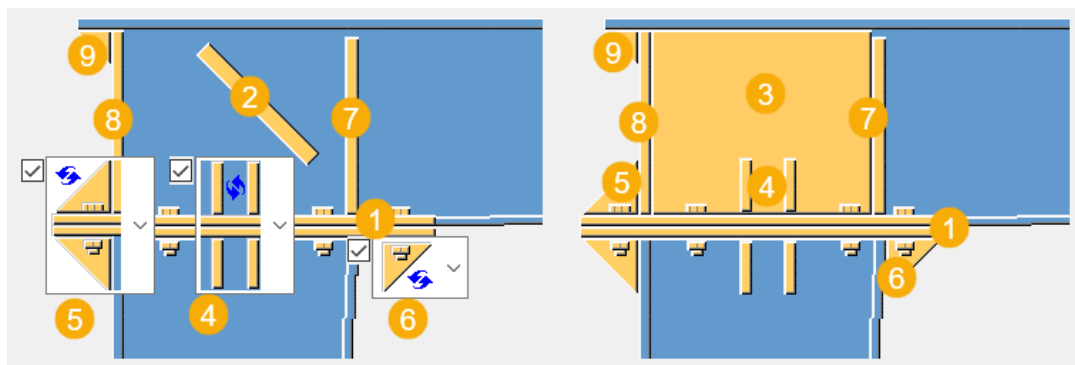
**Use for**

Situation	Description
	<p>Vertical knee connection with triangular flange stiffeners, and inner and outer stiffeners. Web is strengthened with diagonal stiffeners.</p>
	<p>Horizontal knee connection with inner and outer stiffeners. Web is strengthened with diagonal stiffeners.</p>

**Selection order**

1. Select the column.
2. Select the rafter.
3. Click the middle mouse button to create the connection.

**Part identification key**



	Description
1	End plate
2	Diagonal stiffener
3	Web plate
4	Web stiffener
5	External stiffener
6	Inner stiffener
7	Knee stiffener
8	Knee end plate
9	Corner lap stiffener

### Picture tab

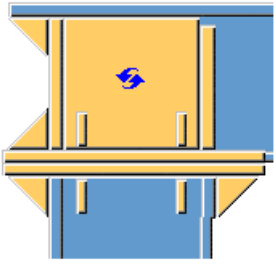
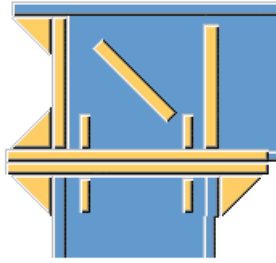
Use the **Picture** tab to define the dimensions and the connection type.


### Connection type

Select how the connection is created:

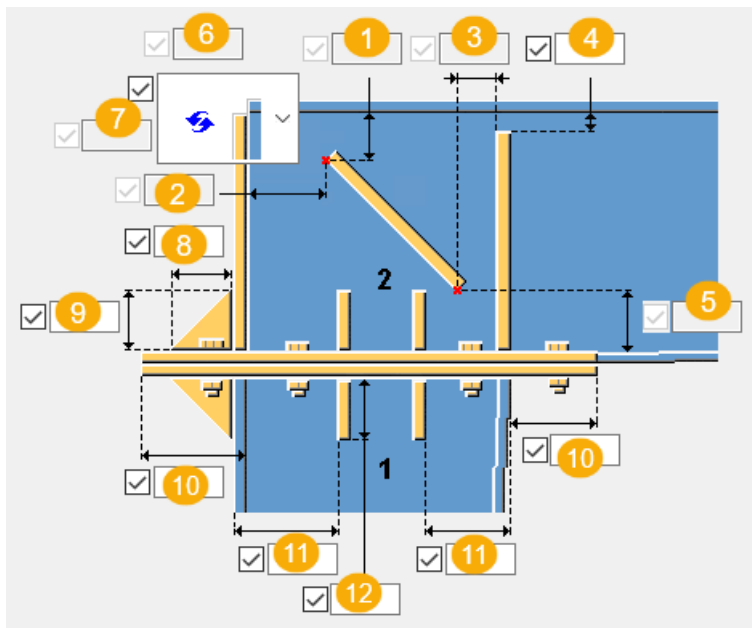
- **Horizontal**
- **Perpendicular**
- **Vertical**

### Create web plate or diagonal stiffener

Option	Description
	<p>Default</p> <p>Web plate is created.</p> <p>AutoDefaults can change this option.</p>
	<p>Diagonal stiffener is created.</p>

Option	Description
	Web plate is created.

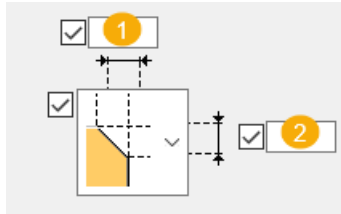
### Dimensions



	Description
<b>1</b>	Vertical distance of the diagonal stiffener upper input point from the secondary part web.
<b>2</b>	Horizontal distance of the diagonal stiffener upper input point from the secondary part flange.
<b>3</b>	Horizontal distance of the diagonal stiffener lower input point from the knee stiffener.
<b>4</b>	Knee stiffener edge distance from the secondary part web.
<b>5</b>	Vertical distance of the diagonal stiffener lower input point from the secondary part web.
<b>6</b>	Horizontal dimension of the corner lap stiffener.
<b>7</b>	Vertical dimension of the corner lap stiffener. If the corner lap stiffener is not created, this is the knee end plate dimension from the secondary part flange.

	Description
8	Horizontal dimension of the external stiffener.
9	Vertical dimension of the external stiffener.
10	Dimension of the end plate extension from the main part web.
11	Web stiffener edge distance from the main part flange.
12	Web stiffener dimension on the main part side.

### Chamfer dimensions



	Description
1	Horizontal chamfer dimension
2	Vertical chamfer dimension

### Chamfer shape

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex chamfer
	Concave chamfer

### Parts tab

Use the **Parts** tab to define the properties of plates and stiffeners.






## Parts

Option	Description
<b>End plate</b>	Thickness and width of the end plate
<b>Diagonal stiffener</b>	Thickness and width of the diagonal stiffener
<b>Web plate</b>	Thickness of the web plate
<b>Web stiffener</b>	Thickness and width of the web stiffeners
<b>External stiffener</b>	Thickness of the external stiffener
<b>Internal stiffener</b>	Thickness, width and height of the internal stiffener
<b>Knee stiffener</b>	Thickness and width of the knee stiffener
<b>Knee end plate</b>	Thickness and width of the knee end plate
<b>Corner lap stiffener</b>	Thickness of the corner lap stiffener

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

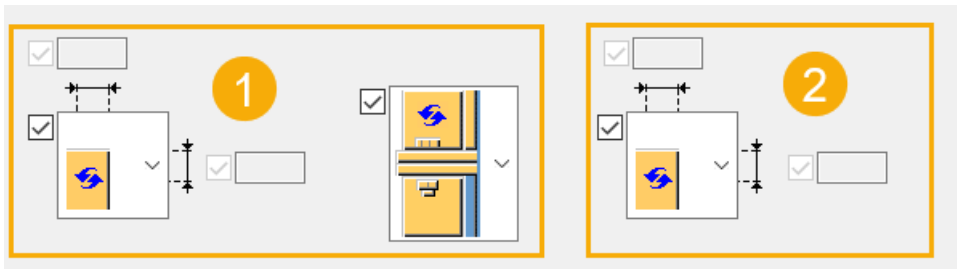
## Stiffener creation

Option	Description
 <p>The first diagram shows a beveled stiffener with a blue rotation icon. The second shows a square stiffener. The third shows a stiffener with a flange. The fourth shows a stiffener without a flange.</p>	<p>Select whether bevel, square, or no flange stiffeners are created.</p> <p>Bevel is the default. AutoDefaults can change this option.</p>
 <p>The diagrams show various web stiffener configurations: two stiffeners, one stiffener, and no stiffeners.</p>	<p>Select how many web stiffeners are created, or whether they are created at all.</p> <p>Two stiffeners is the default. AutoDefaults can change this option.</p>

Option	Description
	<p>Select whether bevel, square, or no inner stiffeners are created.</p> <p>Bevel is the default. AutoDefaults can change this option.</p>

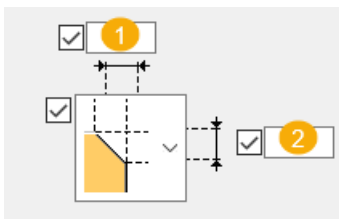
### Stiffener creation

Select how many stiffeners are created, define the shape of the stiffeners, and the chamfer dimensions.








	Description
1	Define the external stiffeners.
2	Define the inner stiffeners in the corner between the main and the secondary part.

### Chamfer dimensions



	Description
1	Horizontal chamfer dimension
2	Vertical chamfer dimension

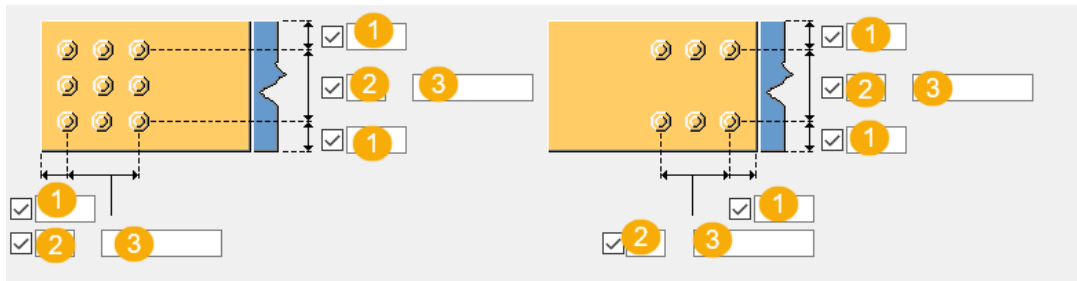
## Chamfer shape

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex chamfer
	Concave chamfer

## Bolts tab

Use the **Bolts** tab to define the bolt properties, number of bolts, and spacing. You can select whether outer and inner bolts are created.

## Bolt group dimensions



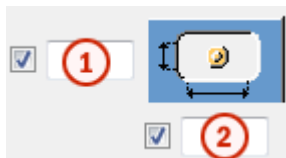
	Description
1	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Number of bolts.
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.



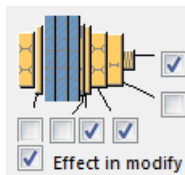
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	

Option	Description	Default
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Welds

Click the link below to find out more:

## 2.18 Bracing components

You can use bracing components to automatically create complete bracing connections. You can also use bracing elements (such as gusset plates and stiffeners) that you can combine with other components to create your own bracing connections

### See also

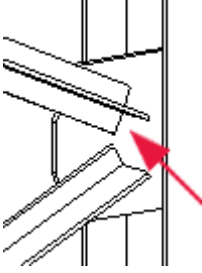
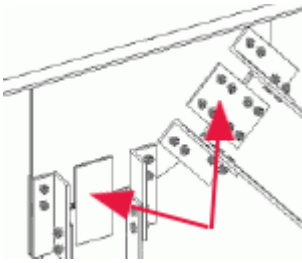
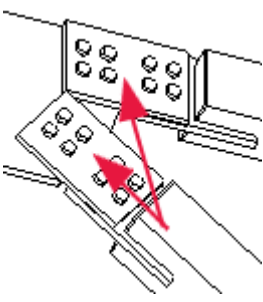
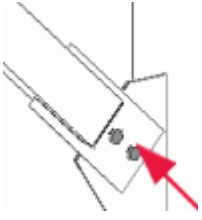
[Simple gusset plate connections \(page 2289\)](#)

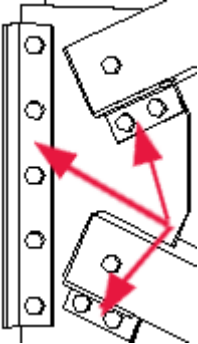
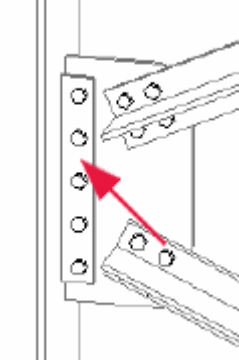
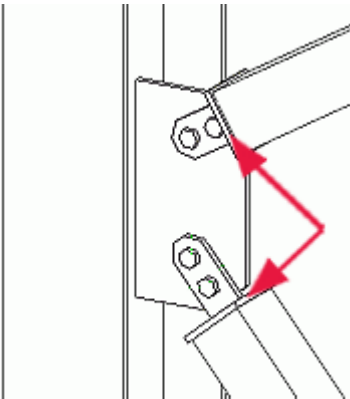
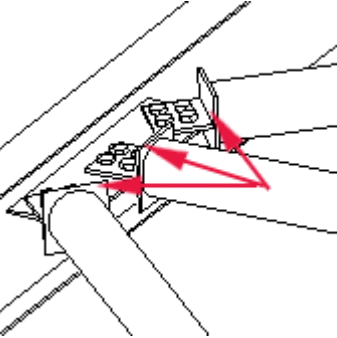
[Corner bracing connections \(page 2423\)](#)

[Windbracing connections \(page 2581\)](#)

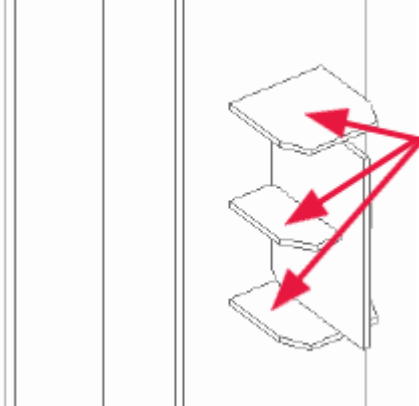
## Glossary of parts

Bracing components create some or all of the following parts:

Part	Image
Gusset plate	 A technical drawing showing a gusset plate connecting two beams to a vertical column. The gusset plate is a rectangular plate with slots for the beams. Red arrows point to the gusset plate.
Connection plate	 A technical drawing showing a connection plate connecting a beam to a column. The connection plate is a rectangular plate with holes for bolts. Red arrows point to the connection plate.
Cover plate	 A technical drawing showing a cover plate connecting a beam to a column. The cover plate is a rectangular plate with holes for bolts. Red arrows point to the cover plate.
Tongue plate <i>A tongue plate slots into a hollow profile brace.</i>	 A technical drawing showing a tongue plate fitting into a hollow profile brace. The tongue plate is a rectangular plate with a slot. Red arrows point to the tongue plate.

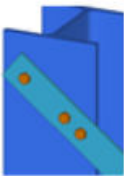
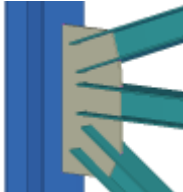
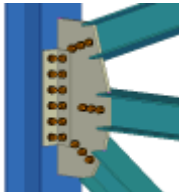
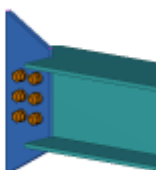
Part	Image
Clip angle	
Shear tab	
<p>Seal plate</p> <p><i>Seal plates</i> seal the ends of hollow braces. In this example they are used with chamfered connection plates.</p>	
<p>Tee</p> <p><i>Tees</i> are formed from T or cut I profiles, or two plates. Tees seal hollow braces and connect them to another part (e.g. a gusset plate)</p>	

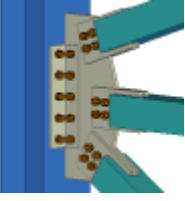
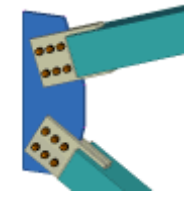
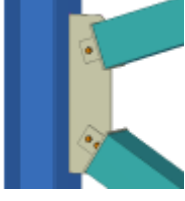

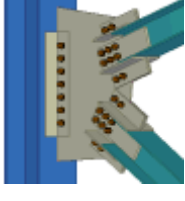
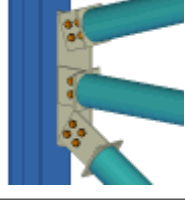
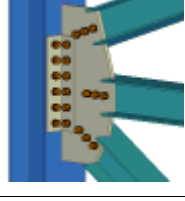


Part	Image
Stiffener	

## Simple gusset plate connections

Simple gusset plate connections automatically connect braces to a single main part, using a gusset plate. Braces either connect directly to the gusset plate, or use connection material. Tekla Structures includes the following simple gusset plate connections:

Component	Image	Description
<a href="#">Simple bolt connection (5) (page 2290)</a>		Creates a bolted connection between two steel profiles.
<a href="#">Welded gusset (10) (page 2295)</a>		Welds braces to a gusset plate.
<a href="#">Bolted gusset (11) (page 2303)</a>		Bolts braces to a gusset plate. Optional clip angles or shear tabs.
<a href="#">Bracing cross (19) (page 2328)</a>		Bolts twin-profile braces to an existing gusset plate.

Component	Image	Description
<a href="#">Tube gusset (20)</a> <a href="#">(page 1372)</a>		Bolts braces to a gusset plate using connection plates and optional tongue plates. Seals braces.
<a href="#">Tube crossing (22)</a> <a href="#">(page 2336)</a>		Bolts braces to an existing gusset plate using connection plates and optional tongue plates. Seals braces.
<a href="#">Std bracing connection (67)</a> <a href="#">(page 2348)</a>		Bolts 1 or 2 braces to a gusset plate using connection plates. Seals hollow braces.
<a href="#">Wrapped cross (61)</a> <a href="#">(page 2356)</a>		Bolts braces to an existing gusset plate, using connection plates and clip angles.
<a href="#">Gusseted cross (62)</a> <a href="#">(page 2368)</a>		Bolts braces to a gusset plate using clip angles and connection plates. Welds or bolts the gusset plate to the beam or column.
<a href="#">Portal bracing (105)</a> <a href="#">(page 2391)</a>		Connects up to three hollow braces to a beam, using a gusset plate and tees.
<a href="#">Bolted gusset (196)</a> <a href="#">(page 2401)</a>		Bolts braces to a gusset plate. Optional clip angles or shear tabs.

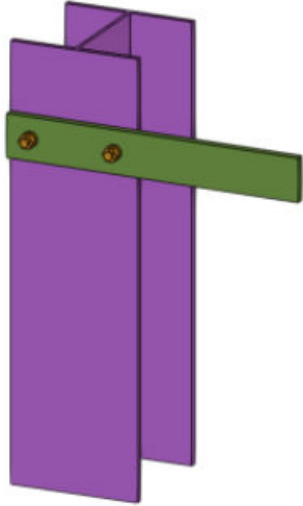
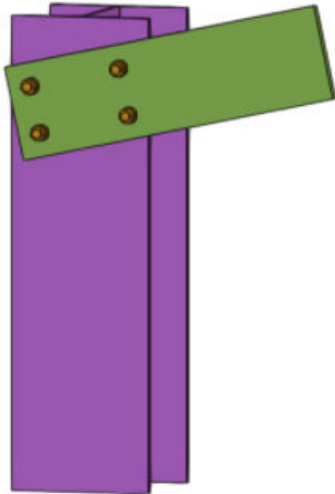
**Simple bolt connection (5)**

**Simple bolt connection (5)** creates a bolted connection between two steel profiles.

**Objects created**

- Bolts

**Use for**

Situation	Description
	Bolted connection
	Bolted connection, skewed secondary part

**Before you start**

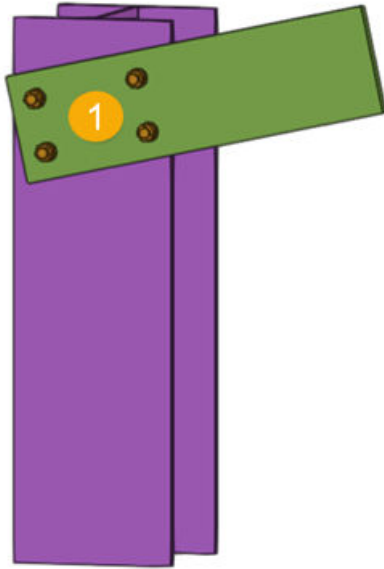
Create two steel profiles.

## Selection order

1. Select the main part (first steel profile).
2. Select the secondary part (second steel profile).

The connection is created automatically when you select the secondary part.

## Part identification key

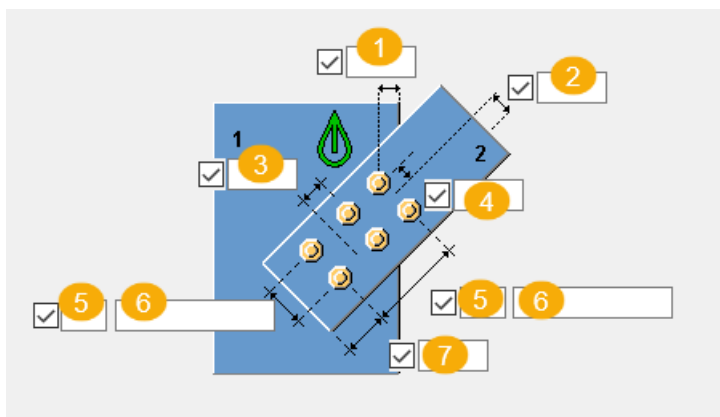


	Description
1	Bolts

## Picture tab

Use the **Picture** tab to define the dimensions and position of the bolts.

## Dimensions



	<b>Description</b>
<b>1</b>	Bolt edge distance from the main part edge.
<b>2</b>	Horizontal bolt distance from the center of the secondary part.
<b>3</b>	Vertical bolt distance from the center of the secondary part.
<b>4</b>	Bolt offset from the line defined by the horizontal bolt distance (2).
<b>5</b>	Number of bolts.
<b>6</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>7</b>	Horizontal bolt distance from the edge of the secondary part.

### **Bolts tab**

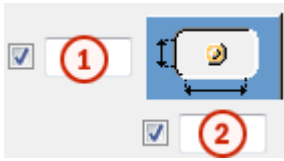
Use the **Bolts** tab to define the bolt properties.

### **Basic bolt properties**

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog. 20 mm
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog. 7990
<b>Tolerance</b>	Gap between the bolt and the hole.	3 mm
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Assembly type</b>	Location where the bolts should be attached.	Site
<b>Rotation</b>	Defines the bolt rotation.	Back

## Slotted holes

You can define slotted, oversized, or tapped holes.

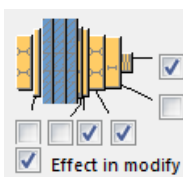


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

## Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

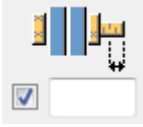
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### General tab

Click the link below to find out more:

### Analysis tab

Click the link below to find out more:

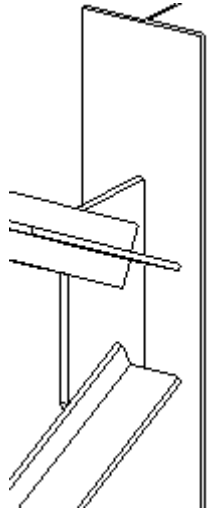
### ***Welded gusset (10)***

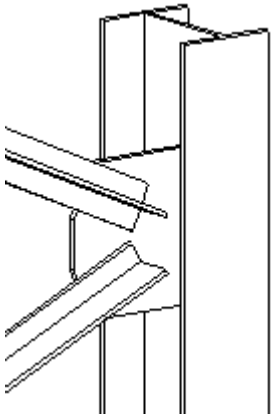
**Welded gusset (10)** connects 1 to 10 braces to a beam or column using a gusset plate that is welded to the web or flange of the beam or column. Braces are welded to the gusset plate.

### Objects created

- Gusset plate
- Seal plates (hollow braces)
- Stiffeners
- Welds
- Cuts

### Use for

Situation	Description
 A technical drawing showing a T-profile brace connected to a vertical column flange via a gusset plate. The gusset plate is welded to the column flange, and the brace is welded to the gusset plate.	Brace profile: T Gusset plate is welded to the column flange. Braces are welded to the gusset plate.

Situation	Description
	<p>Brace profile: T</p> <p>Gusset plate is welded to the column web. Braces are welded to the gusset plate.</p>

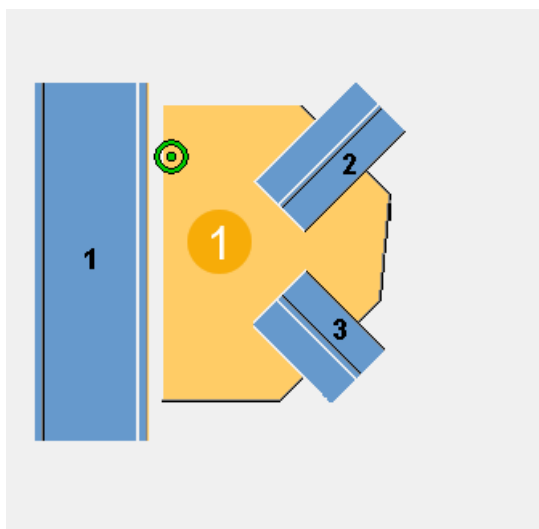
### Before you start

Create a beam or a column, and 1 to 10 braces.

### Selection order

1. Select the main part (beam or column).
2. Select the secondary part (first brace).
3. Select the second secondary part (second brace).
4. Select the subsequent secondary parts (subsequent braces).
5. Click the middle mouse button to create the component.

### Part identification key



	Description
1	Gusset plate

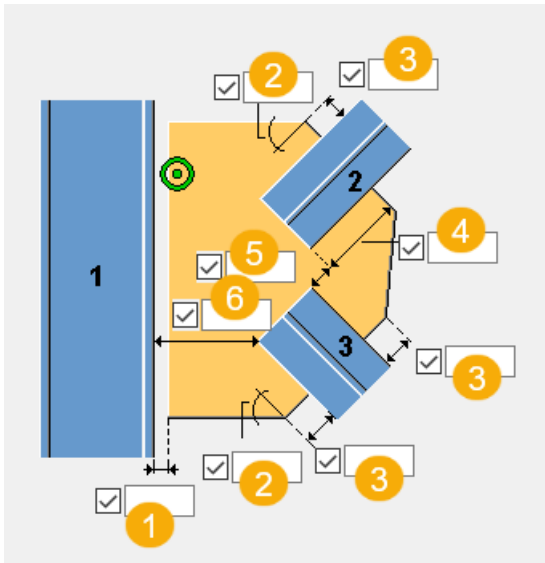


**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

**Picture tab**

Use the **Picture** tab to define the dimensions that control the position and shape of the gusset plate.

**Gusset plate dimensions**



	Description
1	Define the gap distance between the gusset plate edge and the main part.
2	Define the gusset plate corner angle (in degrees). This value affects the gusset plate shape.
3	Define the length of the edge of the gusset plate. This value affects the gusset plate shape.
4	Define the brace length on the gusset plate.
5	Define the distance between the braces.
6	Define the distance between the main part and the brace.

**Gusset tab**

Use the **Gusset** tab to define the gusset plate properties.

**Gusset plate**



Part	Description
Gusset	Thickness, width and height of the gusset plate.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

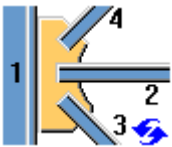
**NOTE** The following examples show only some of the available options. You will find more options on the **Gusset** tab.

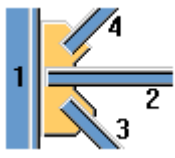
### Gusset plate shape

When you select the option to optimize the gusset plate weight, you can define whether the selection order of the braces affects the position of the braces.

Option	Description
	Default AutoDefaults can change this option.
	This option optimizes the gusset plate weight.




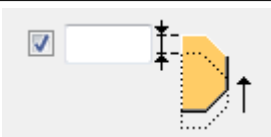
### Brace position

Option	Description
	Default The brace position is not affected. AutoDefaults can change this option.

Option	Description
	The first selected brace is placed closest to the main part.

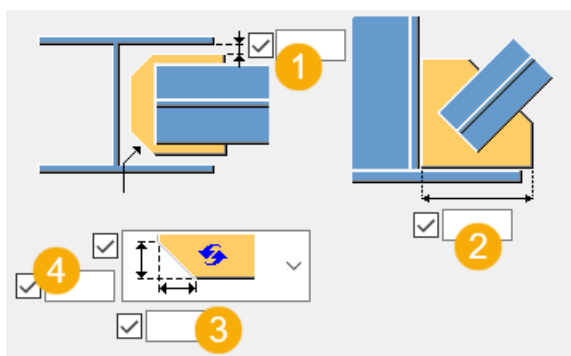
### Gusset plate position on the brace

Define where to place the gusset plate on the brace. If needed, you can fine-tune the gusset plate position by moving the gusset plate in the z or in the y direction.

Option	Description
	Default Gusset plate is positioned in the middle of the brace. AutoDefaults can change this option.
	Gusset plate is positioned on the top flange of the brace.
	Define how much the gusset plate is moved in the z direction.
	Define how much the gusset plate is moved in the y direction.

### Gusset plate chamfer

Define the gusset plate chamfer type and dimensions.

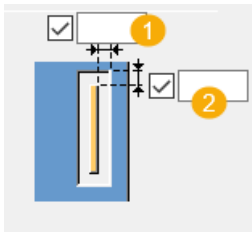


	Description
1	Distance between the gusset plate and the inner flange of the main part.

	Description
2	Horizontal distance between the gusset plate edge and the flange of the main part.
3	Horizontal dimension of the chamfer.
4	Vertical dimension of the chamfer.

### Cut size

If the gusset plate runs through the main part, define the size of the cut created for the gusset plate.



	Description
1	Define the horizontal size of the cut.
2	Define the vertical size of the cut.

### Brace conn tab

Use the **Brace conn** tab to define the seal plate, brace notch and slot properties.

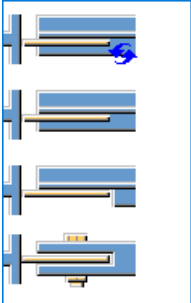
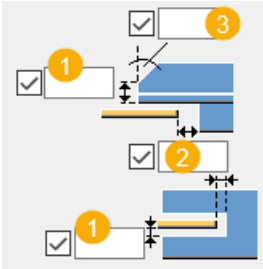
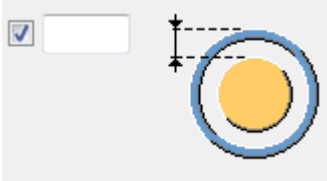
### Seal plate

Part	Description
Seal plate	Thickness of the seal plate.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in

Option	Description	Default
		<b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	

### Brace notch

Option	Description
	Select whether the brace is notched.
	<ol style="list-style-type: none"> <li>1. Vertical notch dimension.</li> <li>2. Horizontal notch dimension.</li> <li>3. Notch angle.</li> </ol>
	Define the plate distance from the brace outer edge.

### Stiffeners tab

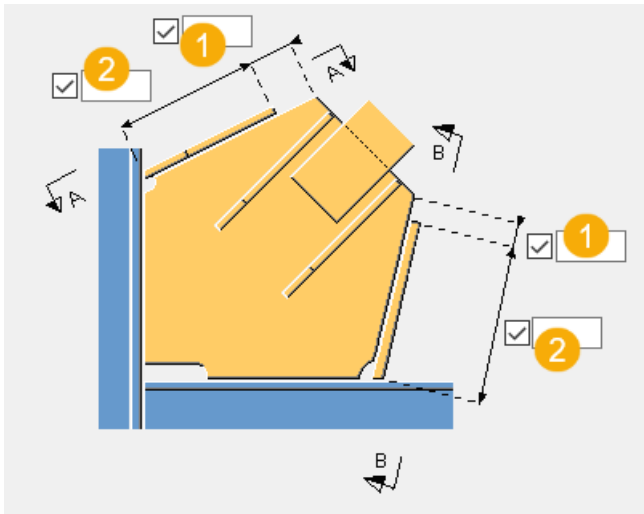
Use the **Stiffeners** tab to define the stiffener properties and dimensions.

### Stiffeners

Part	Description
<b>Stiffener 1, Stiffener 2</b>	Define the stiffener thickness.

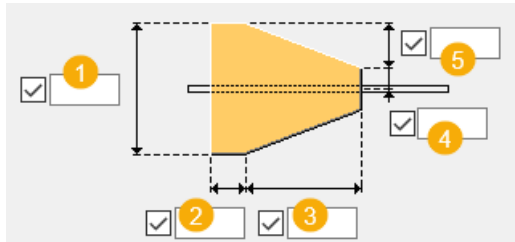
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Stiffener length



<b>1</b>	Distance between the stiffener edge and the gusset plate edge.
<b>2</b>	Length of the stiffener.

## Stiffener dimensions



<b>1</b>	Width of the stiffener.
<b>2</b>	Length of the stiffener base.
<b>3</b>	Length of the skew part of the stiffener.
<b>4</b>	Distance from the stiffener center line.
<b>5</b>	Vertical distance between the stiffener base and the skew part.

### General tab

Click the link below to find out more:

[General tab](#)

### Design tab

Click the link below to find out more:

[Design tab](#)

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

### Welds

Click the link below to find out more:

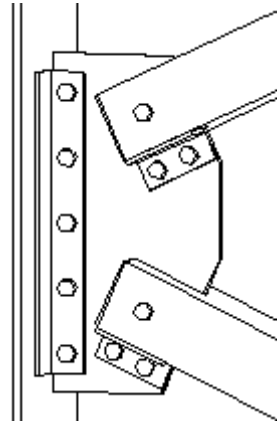
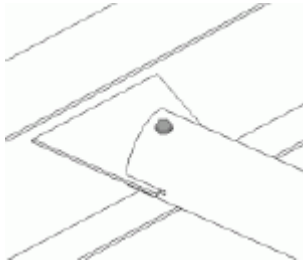
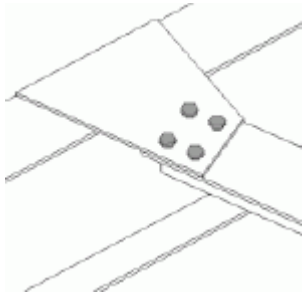
### ***Bolted gusset (11)***

**Bolted gusset (11)** connects 1 to 10 braces to a beam or column using a gusset plate, which is bolted or welded to the beam or column. The braces are bolted to the gusset plate. Clip angles can be created either at the ends of the braces, or on each side.

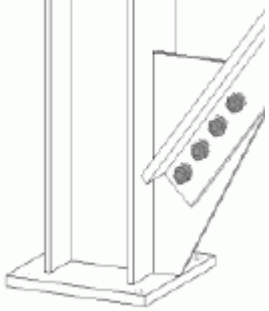
## Objects created

- Gusset plate
- Clip angles or shear tabs (optional) that connect the gusset plate to the beam or column
- Clip angles (optional) that connect the brace to the gusset plate
- Connection plates
- Seal plates (hollow braces)
- Stiffeners (optional)
- Bolts
- Welds
- Cuts

## Use for

Situation	Description
	<p>Brace profile: RHS</p> <p>Gusset plate is bolted to the beam flange using a clip angle. Braces are slotted around the gusset plate and attached to it using bolts and clip angles.</p>
	<p>Brace profile: Tube</p> <p>Gusset plate is welded to the beam web. Brace is notched around the gusset plate and pinned to it.</p>
	<p>Brace profile: T</p> <p>Gusset plate is welded to the beam flange. Brace is bolted to the gusset plate.</p>



Situation	Description
	<p>Brace profile: L</p> <p>Gusset plate is welded to the column flange. Brace is bolted to the gusset plate.</p>

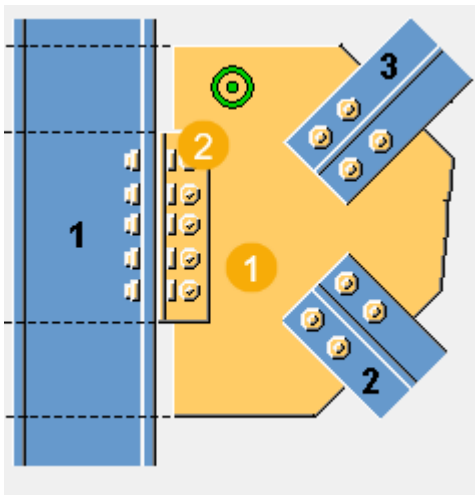
### Before you start

Create a beam or column, and 1 to 10 braces.

### Selection order

1. Select the main part (beam or column).
2. Select the secondary part (first brace).
3. Select the second secondary part (second brace).
4. Select the subsequent secondary parts (subsequent braces).
5. Click the middle mouse button to create the component.

### Part identification key



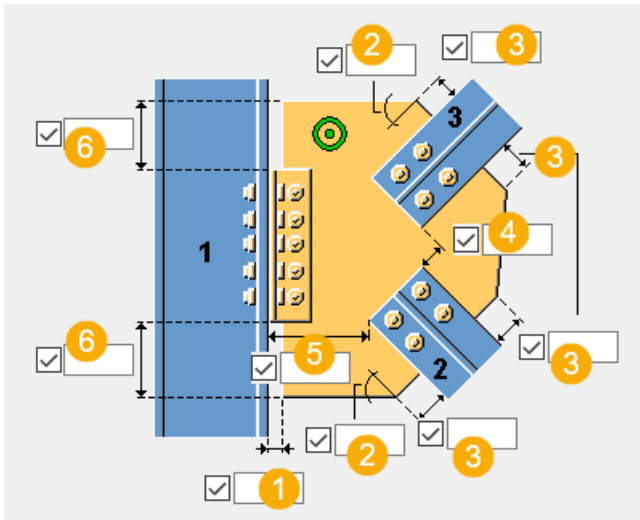
	Description
1	Gusset plate
2	Clip angle

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

### Picture tab

Use the **Picture** tab to define the dimensions that control the position and shape of the gusset plate.

### Dimensions





	Description
1	Define the gap distance between the gusset plate edge and the main part.
2	Define the gusset plate corner angle (in degrees). This value affects the gusset plate shape.
3	Define the length of the edge of the gusset plate. This value affects the gusset plate shape.
4	Define the distance between the braces.
5	Define the distance between the main part and the brace.
6	Define the distance between the clip angle or connection plate edge and the gusset plate edge.

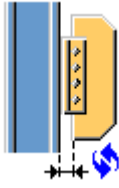

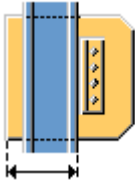
**NOTE** The following examples show only some of the available options. You will find more options on the **Picture** tab.

### Gusset plate positioning

Define how the gusset plate is positioned when a base plate is used.

Option	Description
	Default Gusset plate is parallel to the main part. AutoDefaults can change this option.
	Gusset plate is parallel to the brace.

### Gusset plate dimensions

Option	Description
	Default Gusset plate does not run through the main part. Define the gusset plate cut dimension. AutoDefaults can change this option.
	Gusset plate does not run through the main part. Define the gusset plate cut dimension.
	Gusset plate runs through the main part. Define the gusset plate extension dimension.

### Gusset tab

Use the **Gusset** tab to control the gusset plate properties, shape and position, and clip angle properties and orientation.

### Plates




Option	Description
<b>Gusset</b>	Thickness, width and height of the gusset plate.
<b>Connection plates</b>	Thickness and width of the connection plate.
<b>L profile</b>	Select the clip angle profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

**NOTE** The following examples show only some of the available options. You will find more options on the **Gusset** tab.



### Gusset plate connection

Define how the gusset plate is connected to the main part.

Option	Description
	Default Gusset plate is welded directly to the main part. AutoDefaults can change this option.
	Gusset plate is connected to the main part with clip angles. Select to which side of the gusset plate the clip angles are created.
	Gusset plate is connected to the main part with a connection plate. Select to which side of the gusset plate the connection plate is created.



### Clip angle orientation

Define how the clip angle is placed on the connection.

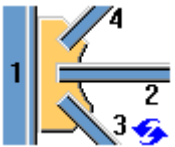
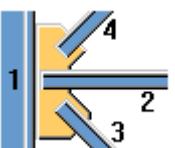
Option	Description
	<p>Default</p> <p>Clip angle is placed on the connection so that the longer leg is connected to the gusset plate.</p> <p>AutoDefaults can change this option.</p>
	<p>Clip angle is placed on the connection so that the longer leg is connected to the main part.</p>

### Gusset plate shape

When you select the option to optimize the gusset plate weight, you can define whether the selection order of the braces affects the position of the braces.





Option	Description
	<p>Default</p> <p>AutoDefaults can change this option.</p>
	<p>This option optimizes the gusset plate weight.</p>

### Brace position

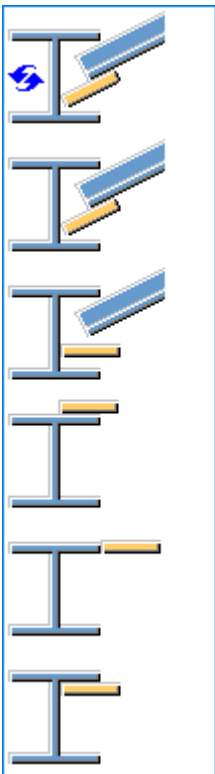
Option	Description
	<p>Default</p> <p>The brace position is not affected.</p> <p>AutoDefaults can change this option.</p>
	<p>The first selected brace is placed closest to the main part.</p>

### Gusset plate position on the brace

Define where to place the gusset plate on the brace. If needed, you can fine-tune the gusset plate position by moving the gusset plate in the z or in the y direction.

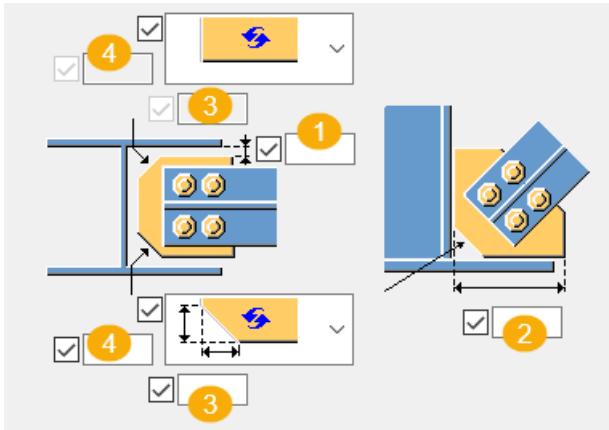
Option	Description
	<p>Default</p> <p>Gusset plate is positioned in the middle of the brace.</p> <p>AutoDefaults can change this option.</p>
	<p>Gusset plate is positioned on the top flange of the brace.</p>
	<p>Define how much the gusset plate is moved in the z direction.</p>
	<p>Define how much the gusset plate is moved in the y direction.</p>

### Gusset plate position on the column or beam

Option	Description
	<p>Select the gusset position.</p> <p>The default option is parallel to the brace.</p>

### Gusset plate chamfer

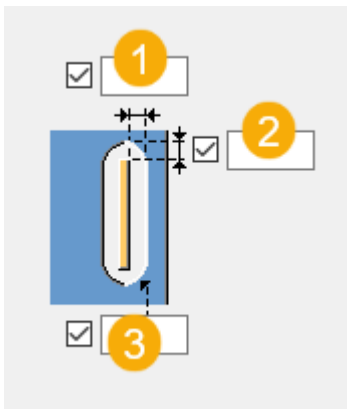
Define the gusset plate chamfer type and dimensions, and the angle limit for parallel bracing.



	Description
1	Distance between the connection plate and the inner flange of the main part.
2	Horizontal distance between the gusset plate edge and the flange of the main part.
3	Horizontal dimension of the chamfer. By default, the second chamfer is not created.
4	Vertical dimension of the chamfer. By default, the second chamfer is not created.

### Cut size

If the gusset plate runs through the main part, define the size of the cut created for the gusset plate.



	Description
1	Define the horizontal size of the cut.
2	Define the vertical size of the cut.
3	Define the radius of the round cut.

### Brace conn

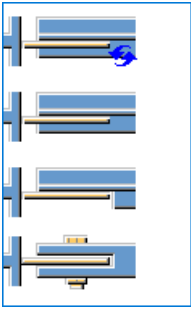
Use the **Brace conn** tab to define the seal plate, brace notch and slot properties.

### Seal plate

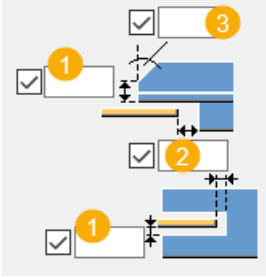

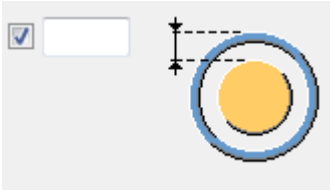
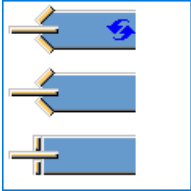
Part	Description
Seal plate	Thickness of the seal plate.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Brace notch

Option	Description
	Select whether the brace is notched.  You may want to notch the brace if the plate collides with the brace flange or if you want to create slots in the hollow braces.  The last option creates a notch and fastens the plate to the brace by using a bolt.



Option	Description
	<ol style="list-style-type: none"> <li>1. Vertical notch dimension.</li> <li>2. Horizontal notch dimension.</li> <li>3. Notch angle.</li> </ol>
	<p>Select the brace notch shape.</p> <p>Define the radius for the round shape.</p>
	<p>Define the plate distance from the brace outer edge.</p>
	<p>Select whether to create bevel cuts at the brace ends or whether to create a square brace end.</p>

### Stiffeners tab

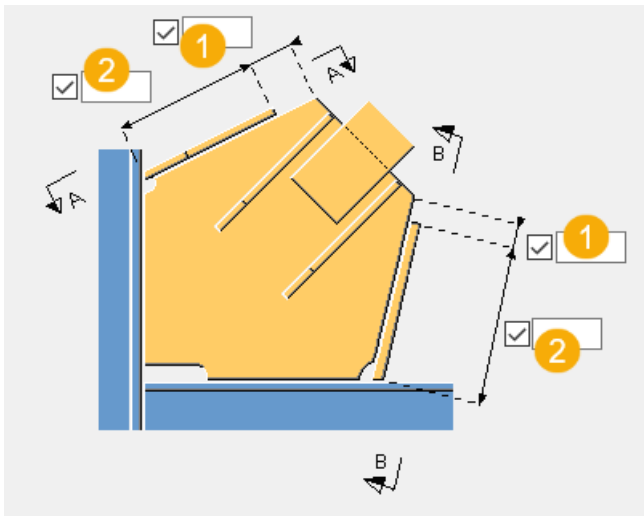
Use the **Stiffeners** tab to define the stiffener properties and dimensions.

### Parts

Part	Description
<b>Stiffener 1, Stiffener 2</b>	Thickness of the stiffener.

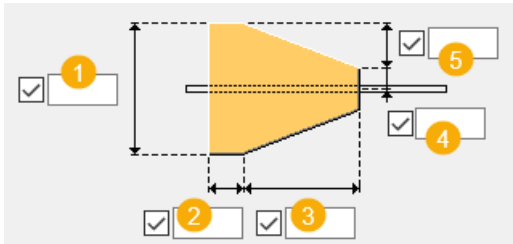
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Stiffener length



<b>1</b>	Define the distance between the stiffener edge and the gusset plate edge.
<b>2</b>	Define the length of stiffener.

## Stiffener dimensions

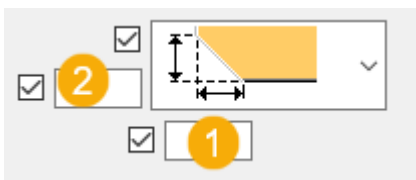


<b>1</b>	Define the width of the stiffener.
<b>2</b>	Define the length of the stiffener base.
<b>3</b>	Define the length of the skew part of the stiffener.
<b>4</b>	Define the distance from the stiffener center line.
<b>5</b>	Define the vertical distance between the stiffener base and the skew part.

## Chamfer type

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

## Chamfer dimensions

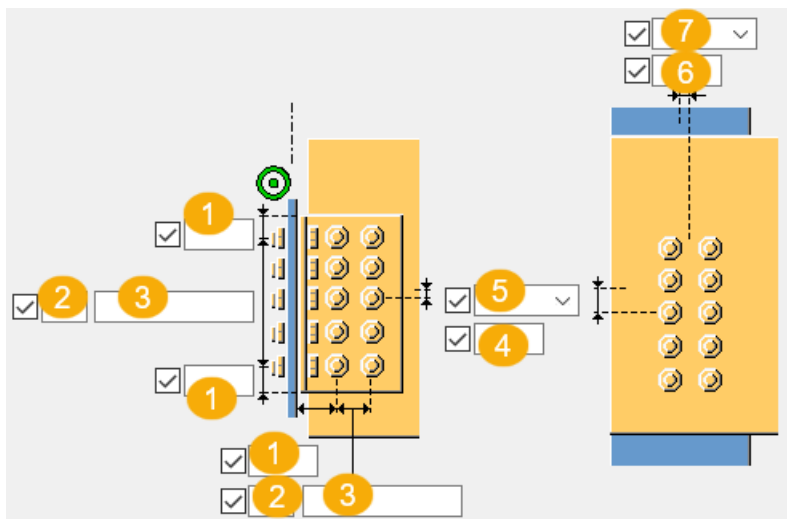


	Description
1	Horizontal dimension of the chamfer.
2	Vertical dimension of the chamfer.

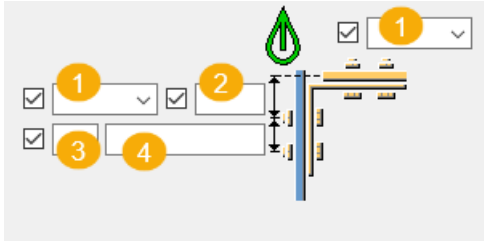
### Gusset bolts tab

Use the **Gusset bolts** tab to control the bolt group properties for bolts that connect the gusset plate to the main part, and to control the clip angle attachment.

### Bolt group dimensions on gusset plate



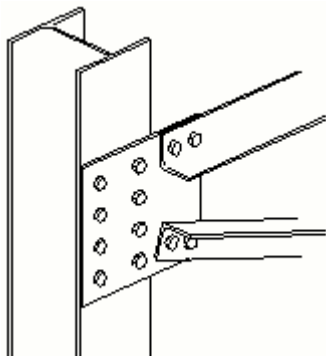
1	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Number of bolts.
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
4	Dimension for vertical bolt group position.
5	Select how to measure the dimensions for vertical bolt group position.
6	Dimension for horizontal bolt group position.
7	Select how to measure the dimensions for horizontal bolt group position.



	Description
<b>1</b>	Location where the bolts should be attached.
<b>2</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>3</b>	Number of bolts.
<b>4</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### Bolt group position

Gusset horizontal position and offset options only affect the following situation, where the gusset is connected to the column flange. When the position is middle, the bolt group offset is calculated from the center line of the column, for example.



Gusset vertical position and offset options affect the bolt group connecting the gusset directly to the flange and also the bolt groups connecting the gusset to the clip angle or connection plate.







---

**NOTE** The following examples show only some of the available options. You will find more options on the **Gusset bolts** tab.

---



### Clip angle attachment type

Define how the clip angle is attached to the gusset plate and to the main part.



Option	Description
	Default Both parts are bolted. AutoDefaults can change this option.
	Automatic When the main part is a tube profile, the clip angles are welded to the main part and bolted to the secondary part. Otherwise the clip angles are bolted to both parts.
	Main part is bolted and secondary part is welded.
	Main part is welded and secondary is part bolted.
	Both parts are bolted.
	Both parts are welded.





### Bolts on gusset plate

Define whether the gusset plate is connected to the main part with bolts when no clip angles are used.

Option	Description
	Default Bolts are not created in the gusset plate. AutoDefaults can change this option.
	Bolts are created in the gusset plate.

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered

Option	Description
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### Cut length

Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

### Slotted holes

You can define slotted, oversized, or tapped holes.

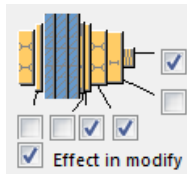


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

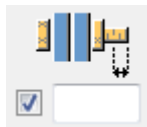
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.




### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.





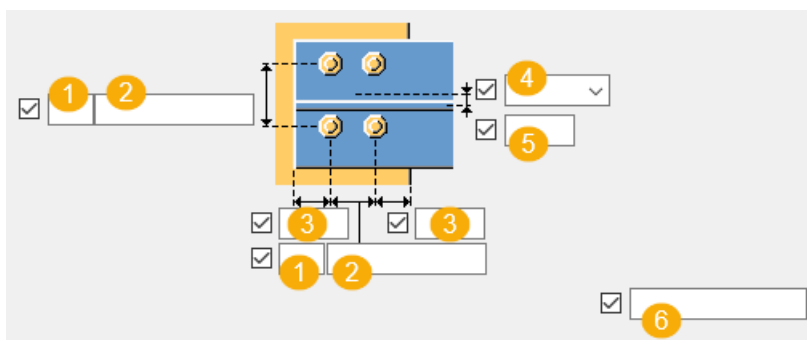
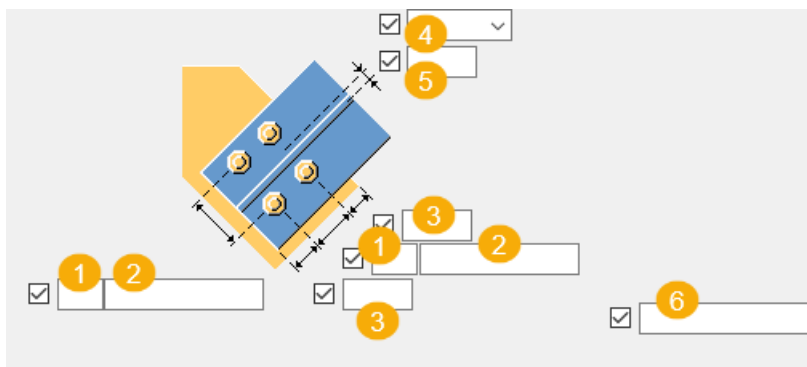
## Bolting direction

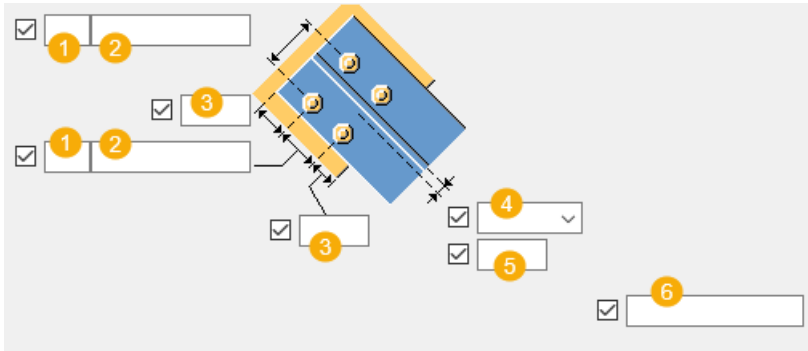
Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

## Brace bolts 1 / Brace bolts 2 / Brace bolts 3 tab

Use the **Brace bolts 1**, **Brace bolts 2** and **Brace bolts 3** tabs to control the bolts that connect the first, the second, and the subsequent braces to the gusset plate.

## Bolt group dimensions

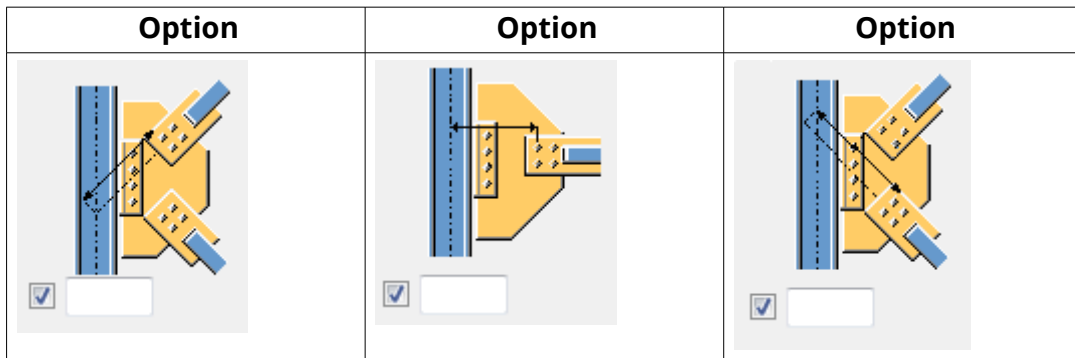










	Description
1	Number of bolts.
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Select how to measure the dimensions for vertical bolt group position.
5	Dimension for vertical bolt group position.
6	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

### Bolt distance

Define the minimum distance from the connection plate bolts to the intersection point of the main part and brace center lines. If a brace is perpendicular to the main part, the distance is measured from the main part center line to the nearest bolts.



## Staggering of bolts

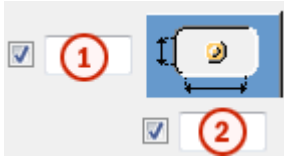
Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## Slotted holes

You can define slotted, oversized, or tapped holes.

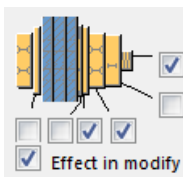


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<p><b>Slotted</b> creates slotted holes.</p> <p><b>Oversized</b> creates oversized or tapped holes.</p> <p><b>No hole</b> does not create holes.</p>	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.






To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## Bolting direction

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

## Angle bolts tab

Use the **Angle bolts** tab to control the bolts that connect the clip angles.

## Part

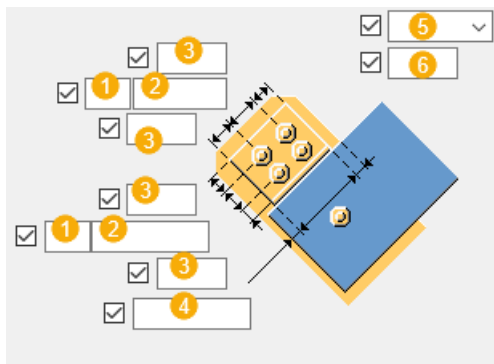
Option	Description
<b>L profile</b>	Select the clip angle profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

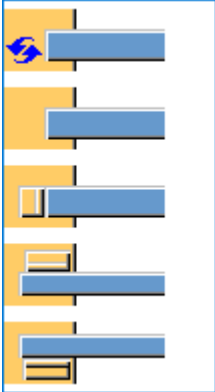
### Bolt group dimensions






	Description
<b>1</b>	Number of bolts.
<b>2</b>	Bolt spacing.  Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>3</b>	Bolt edge distance.  Edge distance is the distance from the center of a bolt to the edge of the part.

	Description
4	Define the edge distance between the clip angle and the brace.
5	Select how to measure the dimensions for vertical bolt group position.
6	Dimension for vertical bolt group position.

### Clip angle position

Option	Description
	Select the clip angle position.

### Bolting direction

Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

### General tab

Click the link below to find out more:

[General tab](#)

### Design tab

Click the link below to find out more:

[Design tab](#)

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

### Welds

Click the link below to find out more:

### ***Bracing cross (19)***

**Bracing cross (19)** bolts one or more twin-profile braces to an existing gusset plate.

---

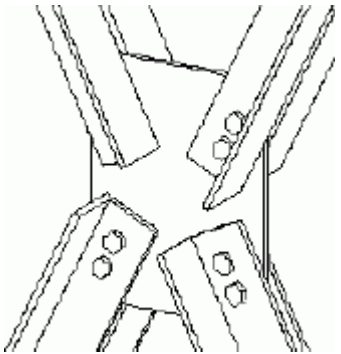
**TIP** To create a gusset plate, use the [Standard gusset \(1065\) \(page 1911\)](#) component, or create a countour plate.

---

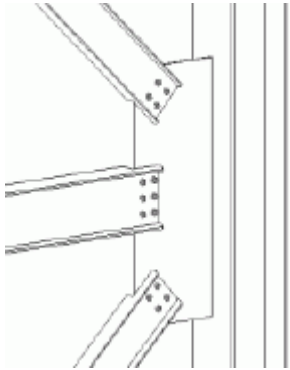
### Objects created

- Bolts
- Cuts
- Welds

### Use for

Situation	Description
 A technical line drawing showing a central gusset plate with four L-shaped braces attached to it. Each brace is bolted to the gusset plate. The braces are arranged in a cross pattern, with two extending upwards and two extending downwards from the center of the gusset plate.	Brace profile: L Braces are bolted directly to the gusset plate.



Situation	Description
	<p>Brace profile: W</p> <p>Braces are notched around the gusset plate and bolted to the gusset plate.</p>

### Before you start

Create a gusset plate, and 1 to 10 braces.

### Selection order

1. Select the main part (gusset plate).
2. Select the secondary part (first brace).
3. Select the second secondary part (second brace).
4. Select the subsequent secondary parts (subsequent braces).
5. Click the middle mouse button to create the component.

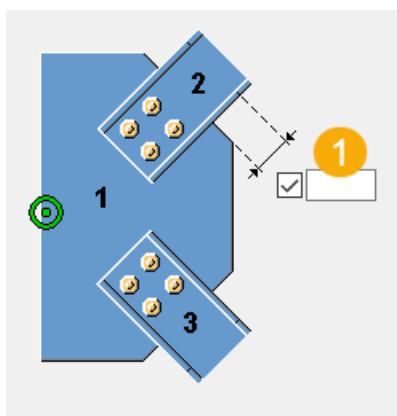
---

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

---

### Picture tab

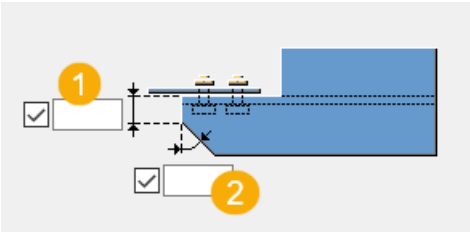
Use the **Picture** tab define the flange cut dimension.



	Description
1	Define the length of the flange cut.

**Parameters tab**

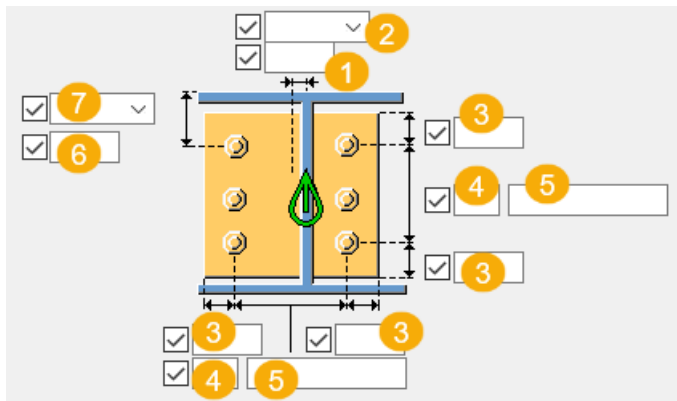
Use the **Parameters** tab to cut the brace flange.

Option	Description
<p><b>Fit secondary</b></p>	<p>Select whether the secondary part is fitted.</p> <p>Selecting <b>Yes</b> fits the secondary part according to the bolt distances.</p>
<p><b>Cut other side flanges</b></p> 	<p>Select whether to create a triangular cut on the opposite side of the flange.</p> <ol style="list-style-type: none"> <li>Vertical cut dimension.</li> <li>Cut angle.</li> </ol>

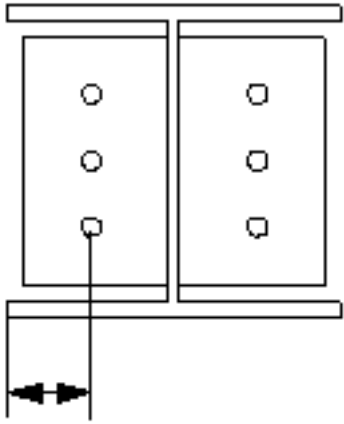
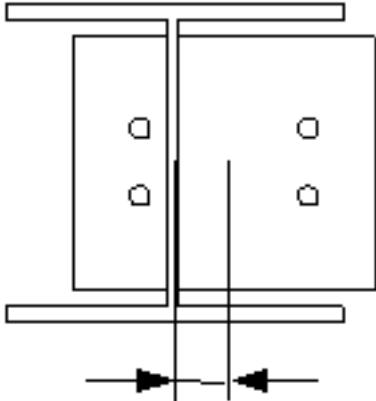
**Bolts tab**

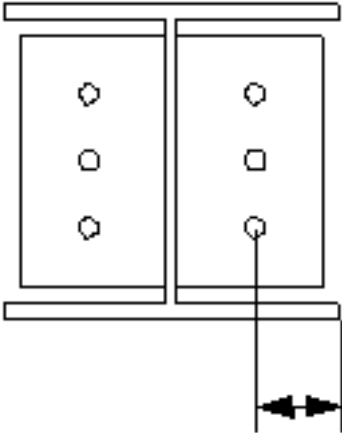
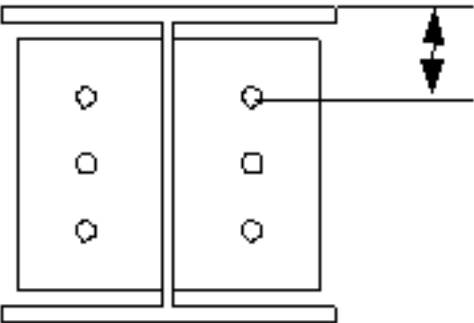
Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

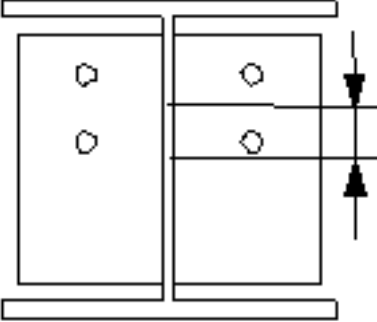
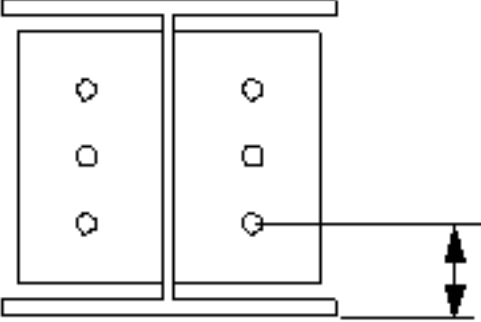
**Bolt group dimensions**



	Description
1	Dimension for horizontal bolt group position.

	Description
2	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Left:</b> From the left edge of the secondary part to the leftmost bolt. </li> </ul>  <ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the secondary part to the center line of the bolts. </li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
<b>3</b>	Bolt edge distance.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>6</b>	Dimension for vertical bolt group position.
<b>7</b>	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 

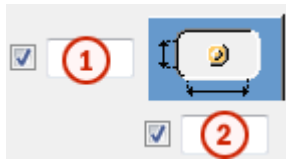
### Bolt basic properties

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

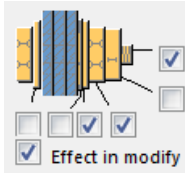


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.








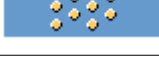
To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### General tab

Click the link below to find out more:

[General tab](#)

### Design tab

Click the link below to find out more:

Design tab

### Analysis tab

Click the link below to find out more:

Analysis tab

### Welds

Click the link below to find out more:

### ***Tube crossing (22)***

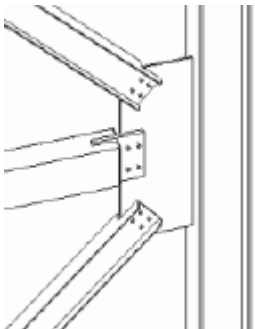
**Tube crossing (22)** bolts one or more braces to an existing gusset plate, directly, or using connection plates. Seals braces.

To create a gusset plate, use the [Standard gusset \(1065\) \(page 1911\)](#) component or the command for creating a contour plate.

### Objects created

- Connection plates
- End plates
- Tongue plates
- Cover plates
- Bolts
- Welds

### Use for

Situation	Description
	Brace profile: RHS, W RHS brace is bolted to the gusset plate using a tongue plate. W profile braces are bolted directly to the gusset plate.



### Before you start

Create a gusset plate, and 1 to 10 braces.

### Selection order

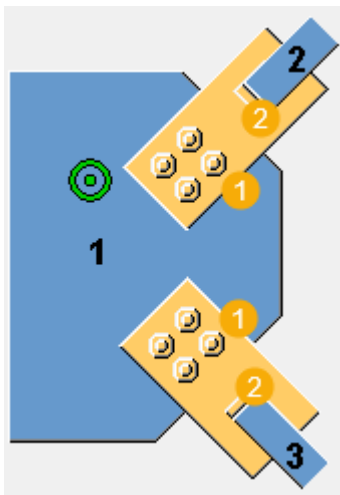
1. Select the main part (gusset plate).
2. Select the secondary part (first brace).
3. Select the second secondary part (second brace).
4. Select the subsequent secondary parts (subsequent braces).
5. Click the middle mouse button to create the connection.

---

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

---

### Part identification key

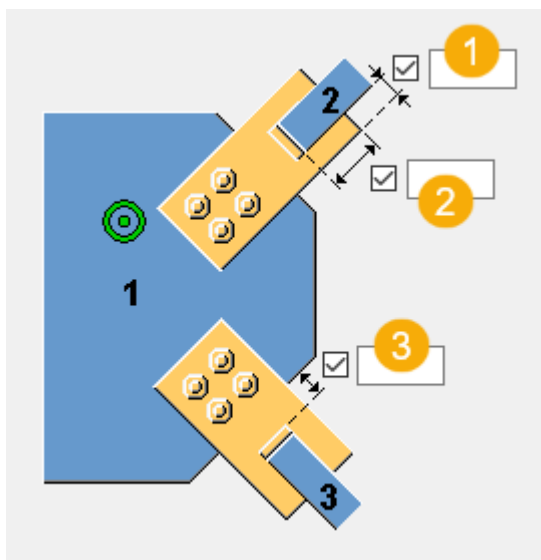


	Description
1	Connection plate
2	End plate

### Picture tab

Use the **Picture** tab to define the plate and brace dimensions.

## Dimensions



	Description
1	Define the length of the edge of the connection plate.
2	Define the brace length on the connection plate. To prevent the connection plate from penetrating the hollow brace, enter a negative value for the dimension.
3	Define the end plate edge distance from the gusset plate.

### Brace conn tab

Use the **Brace conn** tab to control the connection plate, end plate, tongue plate, and cover plate properties.



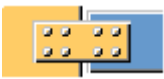

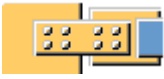
### Brace connection

Option	Description
<b>Connection plate</b>	Thickness, width and height of the connection plate.
<b>End plates</b>	Thickness, width and height of the end plate.
<b>Middle end plate</b>	Thickness and height of the middle end plate.
<b>Tongue plate</b>	Thickness of the tongue plate.
<b>Cover plate</b>	Thickness, width and height of the cover plate.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

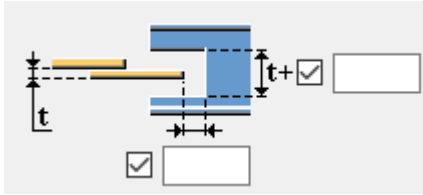
### Brace connection types

Define how the brace is connected to the connection plate.

Option	Description
	Default Brace is welded AutoDefaults can change this option.
	Brace is welded.
	Brace is bolted.
	Brace is welded and notched around the nuts.
	Tongue plate and cover plate are created.

### Cut in bracing

If needed, you can create a cut in the bracing.



Define the width of the cut in the bracing, where **t** is the thickness of the connection plate.

Define the length of the cut in the bracing from the edge of the connection plate.

### Gusset and connection plate distance



Define the distance between the gusset plate and the connection plate.

### Round cut in bracing







If needed, you can create a round cut in the bracing. Enter the radius value.

**NOTE** The following examples show only some of the available options. You will find more options on the **Brace conn** tab.

### Connection plate





Define whether the brace is notched or the connection plate cut when the connection plate is connected to the brace.

Option	Description
	Default Brace is notched. AutoDefaults can change this option.
	Connection plate is cut.
	Connection plate is cut, but the part of the connection plate created inside the bracing is not deleted.

Option	Description
	<p>If you cut the connection plate, you can define the size of the gap between the brace and the connection plate.</p>



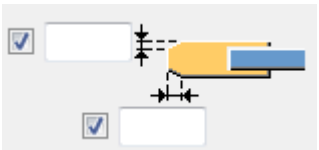
### Number of connection plates

Define whether one or two connection plates are used for connecting the brace to the gusset plate.

Option	Description
	<p>Default One connection plate. AutoDefaults can change this option.</p>
	<p>Two connection plates and a middle end plate at the ends of the connection plates.</p>
	<p>If a middle end plate is created, you can define the width of the end plate.</p>
	<p>Select the middle end plate position.</p>



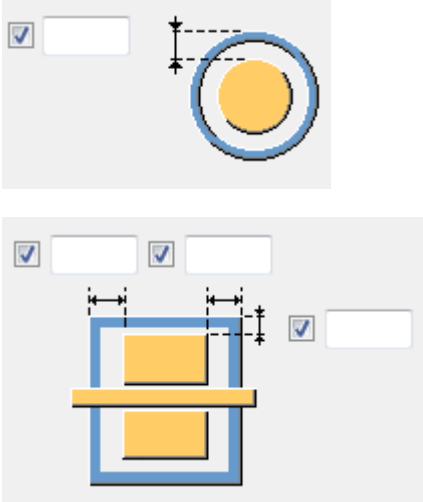
### Connection plate chamfer

Define whether the connection plate is chamfered.

Option	Description
	<p>Default No chamfers are created. AutoDefaults can change this option.</p>
	<p>Chamfers are created.</p>
	<p>If you create chamfers, define the vertical and horizontal chamfer dimensions.</p>

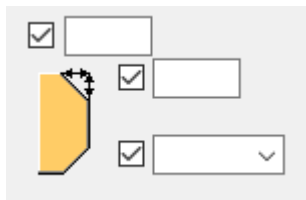
### End plates

If you use the end plates to seal the braces, define the end plate shape and dimensions.

Option	Description
	Default Square end plate. AutoDefaults can change this option.
	Round end plate.
	End plate edge distance from the brace outer edge.

### End plate chamfer

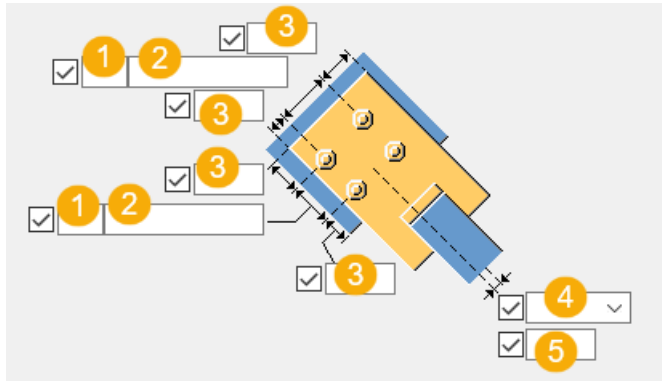
Define the end plate chamfer type and horizontal and vertical dimensions.



### Brace bolts 1 tab

Use the **Brace bolts 1** tab to control the bolts that connect the braces to the gusset plate.

## Bolt group dimensions



	Description
1	Number of bolts.
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Select how to measure the dimensions for vertical bolt group position.
5	Dimension for vertical bolt group position.

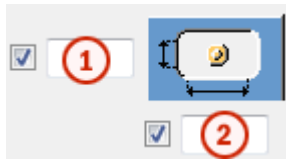
## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



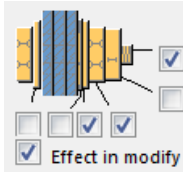
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.





To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Rib plates tab

Use the **Rib plates** tab to control the cross plate and the cover plate properties and position.

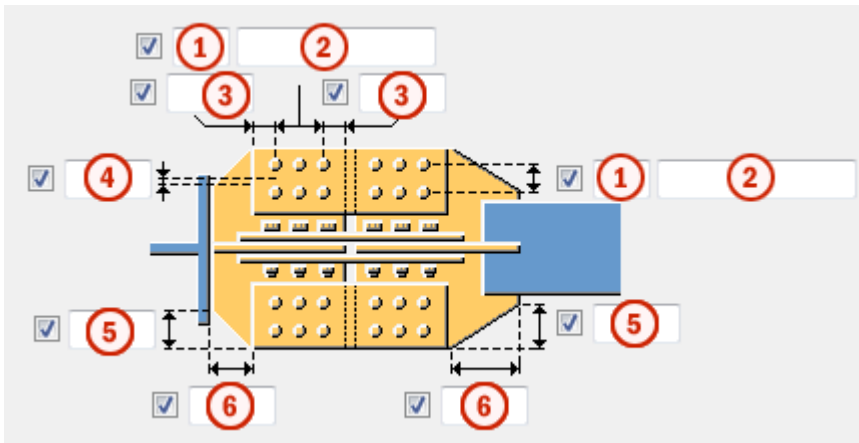
### Plates

Option	Description
<b>Cross plate</b>	Thickness, width and height of the cross plate.

Option	Description
<b>Cover plate</b>	Thickness, width and height of the cover plate.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	





### Bolt group dimensions



<b>1</b>	Number of bolts.
----------	------------------

<b>2</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Dimension for the horizontal bolt group position.
<b>5</b>	Vertical dimension of the chamfer.
<b>6</b>	Horizontal dimension of the chamfer.

### Cross and cover plate position

Option	Description
	Default Cover plate is created on both sides of the cross plate. AutoDefaults can change this option.
	Cover plate is created on both sides of the cross plate.
	Cover plate is created on the bottom of the cross plate.
	Cover plate is created on top of the cross plate.

#### General tab

Click the link below to find out more:

[General tab](#)

#### Design tab

Click the link below to find out more:

[Design tab](#)

#### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

## Welds

Click the link below to find out more:

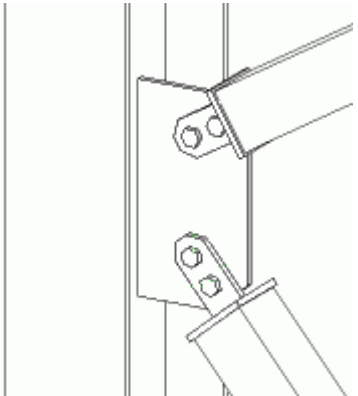
### ***Std bracing connection (67)***

**Std bracing connection (67)** connects 1 or 2 braces to a beam or column using a gusset plate and connection plates. Seals hollow and tube profile braces. You can define different properties for the upper and lower brace connections.

### **Objects created**

- Gusset plate
- Connection plates
- Seal plates
- Bolts
- Welds

### **Use for**

<b>Situation</b>	<b>Description</b>
	Brace profile: RHS Gusset plate is welded to the column web. Brace is bolted to the gusset plate using chamfered connection plates.

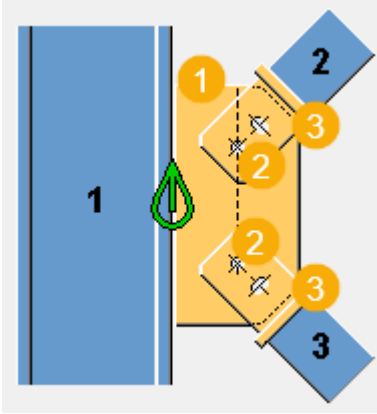
### **Before you start**

Create a beam or column, and 1 or 2 braces.

### **Selection order**

1. Select the main part (beam or column).
2. Select the secondary part (first brace).
3. Select the second secondary part (second brace).
4. Click the middle mouse button to create the component.

### Part identification key

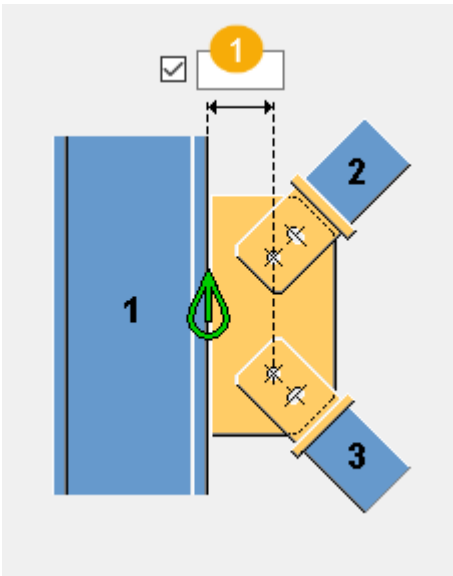


	Description
1	Gusset plate
2	Connection plate
3	Seal plate

### Picture tab

Use the **Picture** tab to define the main part edge dimension to the bolt group.

### Dimensions



	Description
1	Define the main part edge dimension to the bolt group.

**Parts tab**

Use the **Parts** tab to define the plate properties. You can define the plate properties for both braces.

**Plates**

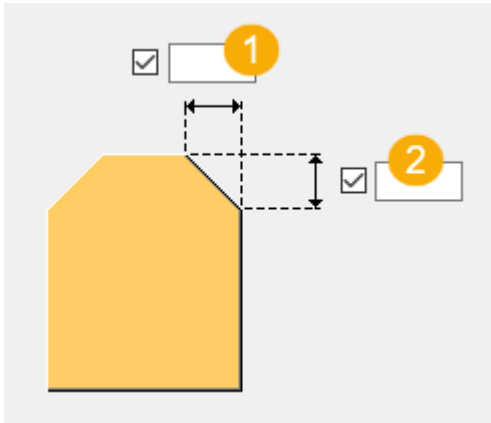
Option	Description
<b>Connection plate</b>	Thickness, width and height of the connection plate.
<b>Seal plate</b>	Thickness, width and height of the seal plate.
<b>Seal plate profile</b>	Select the seal plate profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

**Parameters tab**

Use the **Parameters** tab to define the gusset plate chamfer dimensions.

## Chamfer dimensions

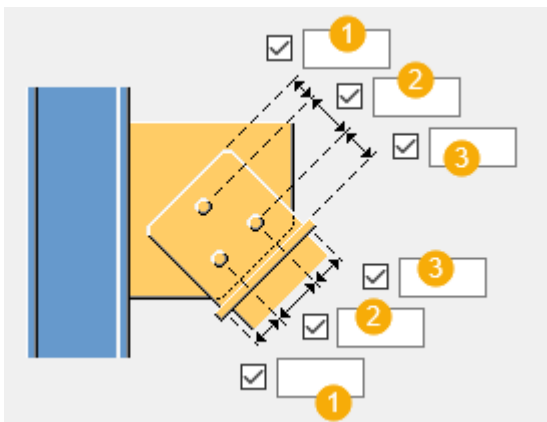


	Description
1	Horizontal chamfer dimension.
2	Vertical chamfer dimension.

## Brace bolts 1 tab

Use the **Brace bolts 1** tab to define the bolt properties for the first brace.

## Bolt group dimensions



	Description
1	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

	Description
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.

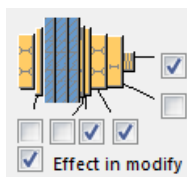
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.

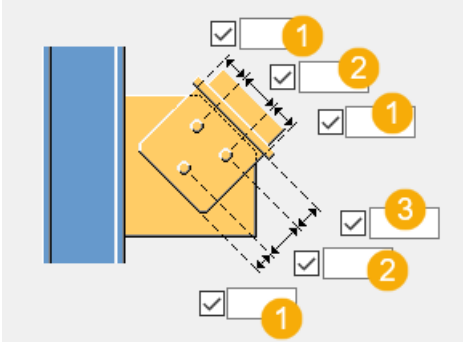




### Brace bolts 2 tab

Use the **Brace bolts 2** tab to define the bolt properties for the second brace.

### Bolt group dimensions



	Description
<b>1</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>2</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within	Yes

Option	Description	Default
	the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Gusset tab

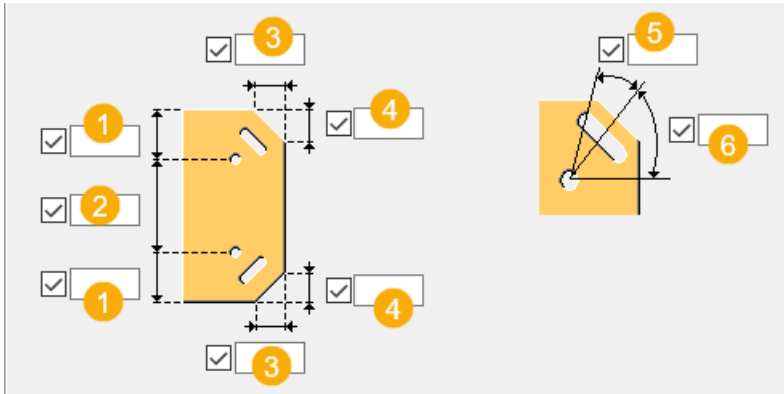
Use the **Gusset** tab to define the gusset plate dimensions and properties.

### Plate

Part	Description
<b>Gusset</b>	Thickness, width and height of the gusset plate.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

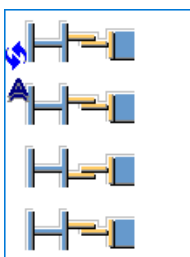
## Gusset dimensions



	Description
1	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Horizontal chamfer dimension.
4	Vertical chamfer dimension.
5	Upper angle of the slotted hole created in the gusset plate.
6	Lower angle of the slotted hole created in the gusset plate.

## Gusset plate position

Select the gusset plate position relative to the beam or column web. The default location is above the beam or column web.



## General tab

Click the link below to find out more:

[General tab](#)

### Design tab

Click the link below to find out more:

[Design tab](#)

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

### Welds

Click the link below to find out more:

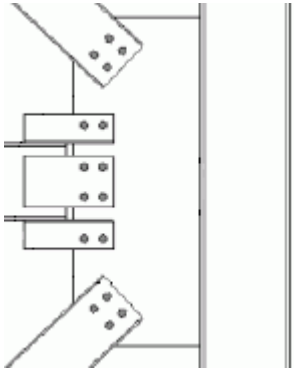
### ***Wrapped cross (61)***

**Wrapped cross (61)** bolts one or more braces to an existing gusset plate, using connection plates and clip angles.

### Objects created

- Connection plates
- Clip angles
- Shear tabs
- Shim plates
- Bolts
- Welds

### Use for

Situation	Description
	Brace profile: W Braces are bolted to the gusset plate using clip angles and connection plates.

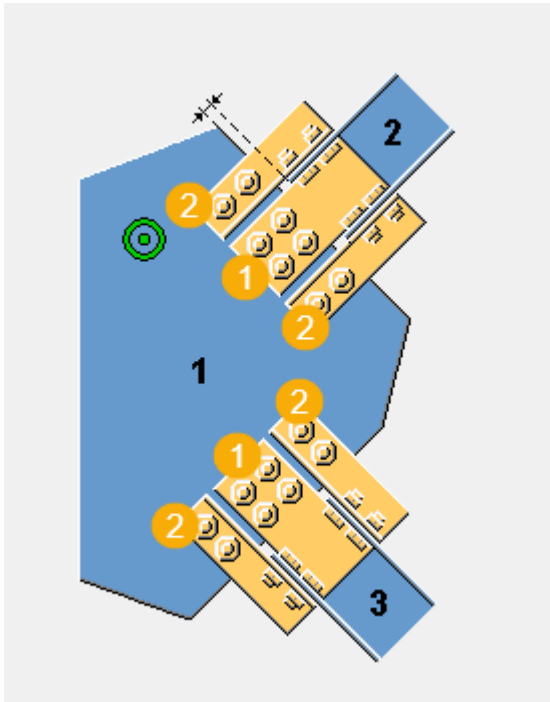
### Before you start

Create a gusset plate, and 1 to 10 braces.

### Selection order

1. Select the main part (gusset).
2. Select the secondary part (first brace).
3. Select the second secondary part (second brace).
4. Select the subsequent secondary part (third brace).
5. Click the middle mouse button to create the component.

### Part identification key

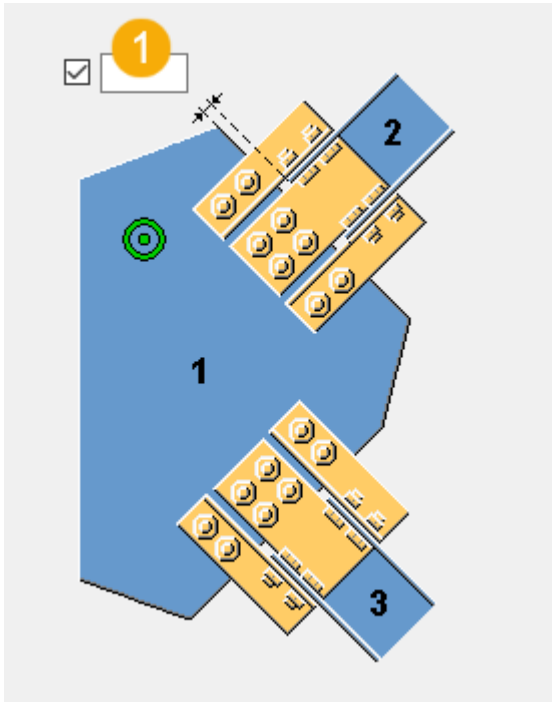


	Description
1	Connection plate
2	Clip angle

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

### Picture tab

Use the **Picture** tab to define the gap dimension between the gusset plate and the brace.



	Description
1	Define the dimension between the gusset plate and the brace.

#### Brace conn tab

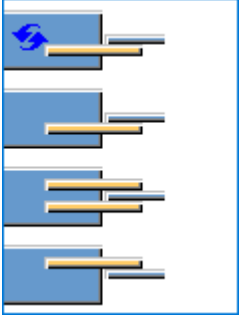
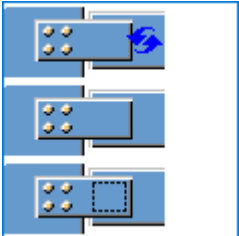
Use the **Brace conn** tab to define the connection plate, clip angle, and filler plate properties. Select whether twin profiles are used for the angle connection.

#### Parts

	Description
<b>Connection plate</b>	Thickness and width of the connection plate.
<b>Conn. plate profile</b>	Select the connection plate profile from the profile catalog.
<b>Upper clip angle</b>	Select the clip angle profile from the profile catalog.
<b>Lower clip angle</b>	Select the clip angle profile from the profile catalog.
<b>Filler plate</b>	Thickness of the filler plate.
<b>Upper shear tab</b>	Thickness, width, and height of the upper shear tab.
<b>Lower shear tab</b>	Height of the lower shear tab.

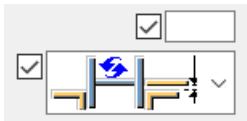
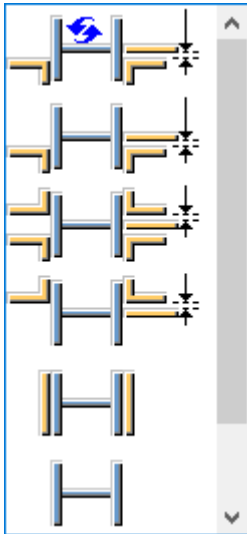
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Plate creation

Option	Description
	Select whether one or two connection plates are created between the brace web and the gusset plate.
	Select whether a filler plate is created between the connection plate and the brace web.  The default is that a filler plate is not created.



### Clip angle creation

Define whether the braces are attached to the gusset plate using clip angles or shear tabs, and specify the number of clip angles to create. The default option is to create two clip angles below the brace web.

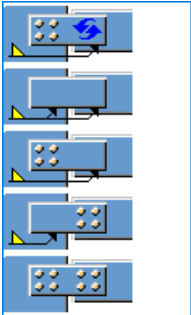


### Clip angle orientation

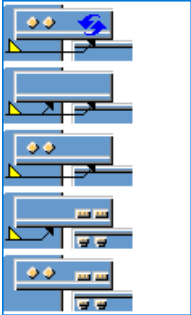
Define how the clip angle is placed on the connection.

Option	Description
	<p>Default</p> <p>Clip angle is placed on the connection so that the longer leg is connected to the gusset plate.</p> <p>AutoDefaults can change this option.</p>
	<p>Clip angle is placed on the connection so that the longer leg is connected to the main part.</p>

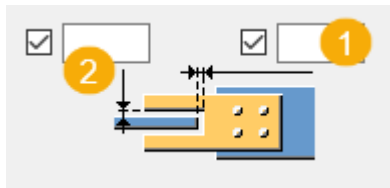
### Connection type

Option	Description
	<p>Select the connection type (weld or bolts) between the gusset plate and the connection plate.</p>



Option	Description
	Select the connection type (weld or bolt) between the gusset plate and the L profile.

### Connection plate gap dimensions



	Description
1	Horizontal gap dimension
2	Vertical gap dimension

### Shim plates tab

Use the **Shim plates** tab to define shim plate properties.

### Plates

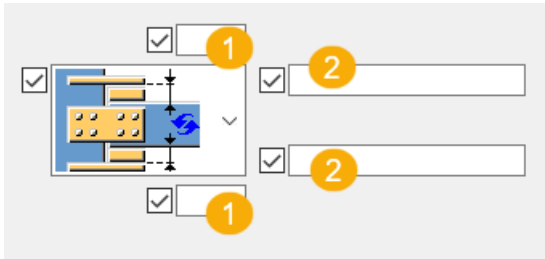
Option	Description
<b>Shim plate 1, Shim plate 2, Shim plate 3</b>	Thickness, width and height of the shim plates.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in

Option	Description	Default
		<b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	

### Shim plate position and number

You can create shim plates when connecting braces to the gusset plate using clip angles.

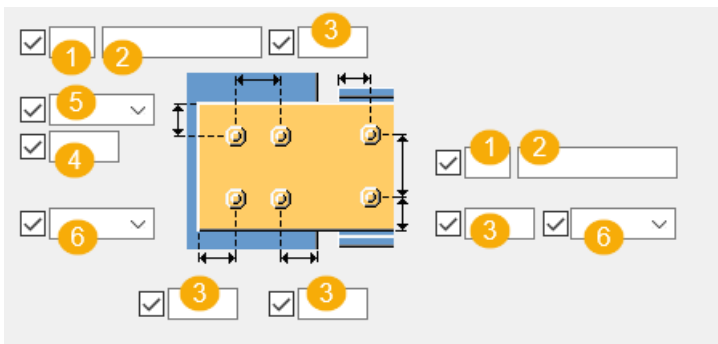


	De
<b>1</b>	Define the gap between the brace and connection plate.
<b>2</b>	Define how many shim plates are created at the top and bottom flanges. Enter the shim plate profile numbers: 1, 2 or 3. These are the numbers that are on the upper part on the <b>Shim plates</b> tab. For example, if you want to create three shim plates at the top flange, and you want to use <b>Shim plate 1</b> twice and <b>Shim plate 2</b> once, enter 1 1 2. The first number you enter is the shim plate closest to the brace flange.

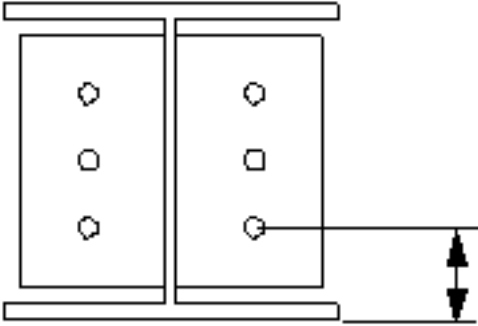
### Brace bolts tab

Use the **Brace bolts** tab to control the bolts that connect the braces to the gusset plate.

### Bolt group dimensions



	<b>Description</b>
<b>1</b>	Number of bolts.
<b>2</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Dimension for vertical bolt group position.
<b>5</b>	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> <div> </div> <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul> <div> </div>

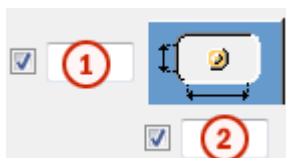
	Description
	<ul style="list-style-type: none"> <li><b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
6	Select the bolt type.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes






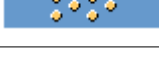
### Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

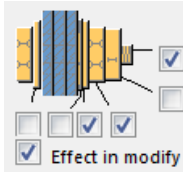
### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

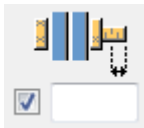
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

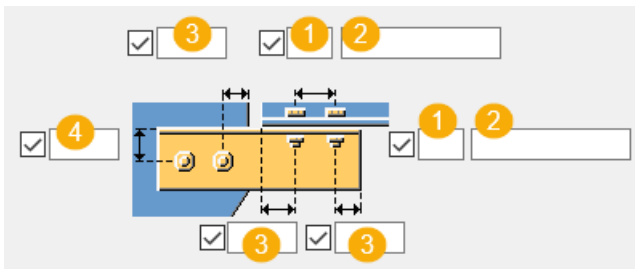
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Angle bolts tab



Use the **Angle bolts** tab to control the bolts that connect the clip angles.

### Bolt group dimensions



	Description
<b>1</b>	Number of bolts.
<b>2</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Dimension for vertical bolt group position.

## Vertical bolt position

Option	Description
	Bolt position from the L profile edge.
	Bolt position from the secondary part center line.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### General tab

Click the link below to find out more:

[General tab](#)

### Design tab

Click the link below to find out more:

[Design tab](#)

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

## Welds

Click the link below to find out more:

Create welds

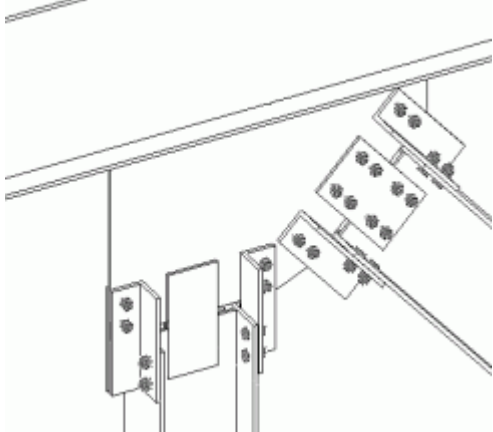
## ***Gusseted cross (62)***

**Gusseted cross** bolts 1 to 10 braces to a beam or column using a gusset plate. The gusset plate is welded or bolted to the beam or column. Braces are bolted to the gusset plate using clip angles and connection plates.

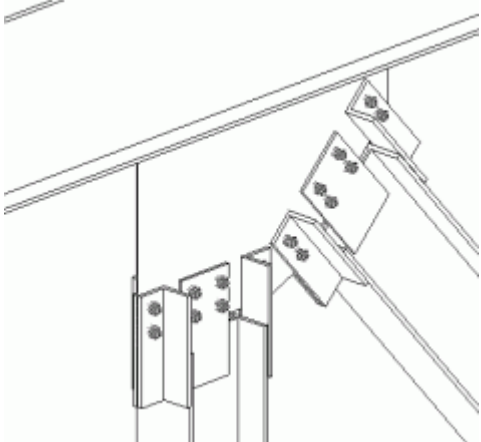
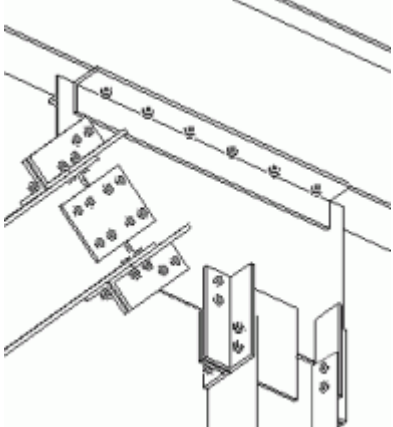
## Objects created

- Gusset plate
- Clip angles
- Connection plates
- Filler plates
- Shim plates
- Stiffeners
- Bolts
- Cuts
- Welds

## Use for

Situation	Description
	Brace profile: W Gusset plate is welded to the beam. Different connection materials are used for each brace.



Situation	Description
	<p>Brace profile: W</p> <p>Gusset plate is welded to the beam. Braces are bolted to the gusset plate using connection plates and clip angles.</p>
	<p>Brace profile: W</p> <p>Gusset plate is welded to the beam. Different connection materials are used for each brace.</p>

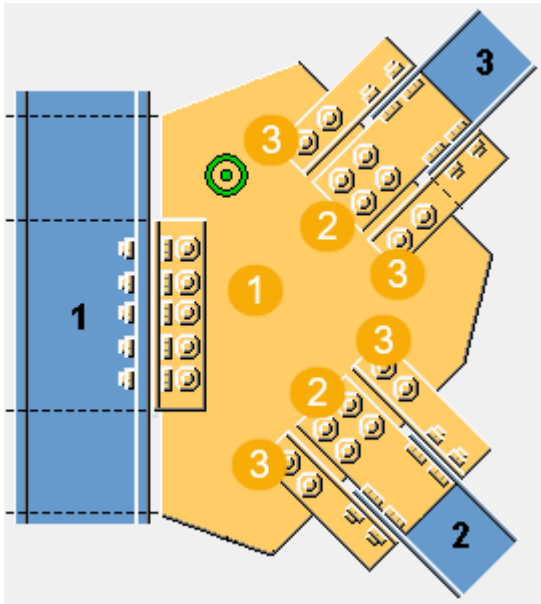
### Before you start

Create a beam or column, and 1 to 10 braces.

### Selection order

1. Select the main part (beam or column).
2. Select the secondary part (first brace).
3. Select the second secondary part (second brace).
4. Select the subsequent secondary parts (subsequent braces).
5. Click the middle mouse button to create the component.

## Part identification key



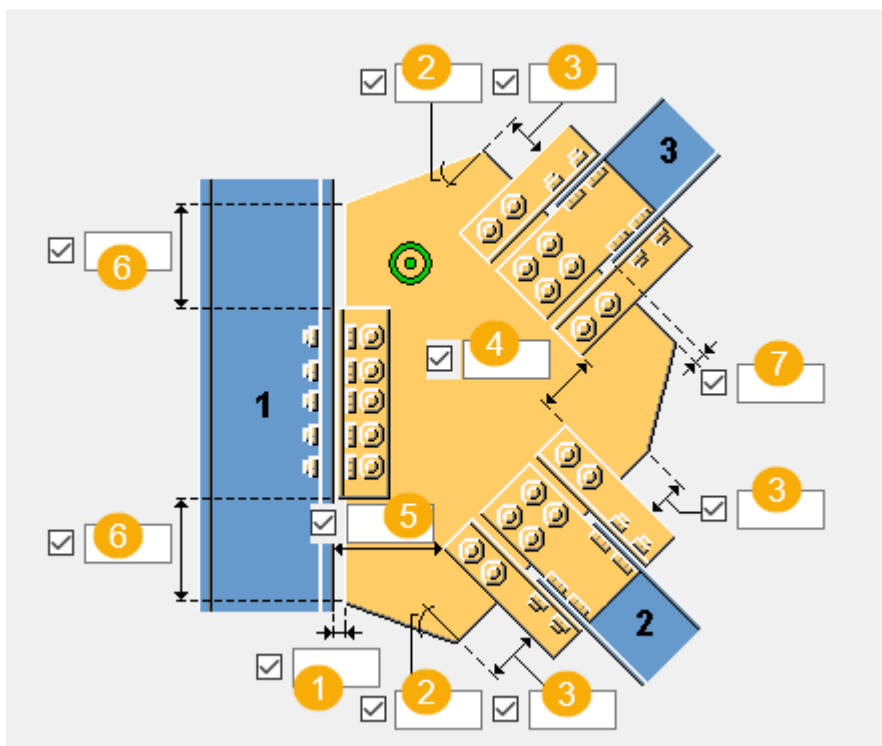
	Description
1	Gusset plate
2	Connection plate
3	Clip angle

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

### Picture tab

Use the **Picture** tab to define the dimensions that control the position and shape of the gusset plate.

## Dimensions






	Description
1	Define the gap distance between the gusset plate edge and the main part.
2	Define the gusset plate corner angle (in degrees). This value affects the gusset plate shape.
3	Define the length of the edge of the gusset plate. This value affects the gusset plate shape.
4	Define the distance between the braces.
5	Define the distance between the main part and the brace.
6	Define the distance between the clip angle or connection plate edge and the gusset plate edge.
7	Define the gap distance between the gusset plate edge and the brace.

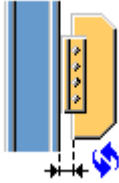


**NOTE** The following examples show only some of the available options. You will find more options on the **Picture** tab.

### Gusset plate positioning

Define how the gusset plate is positioned when a base plate is used.

Option	Description
	Default Gusset plate is parallel to the main part. AutoDefaults can change this option.
	Gusset plate is parallel to the brace.
	Gusset plate is parallel to the brace, without a base plate.

### Gusset plate dimensions

Option	Description
	Default Gusset plate does not run through the main part. Define the gusset plate cut dimension. AutoDefaults can change this option.
	Gusset plate does not run through the main part. Define the gusset plate cut dimension.
	Gusset plate runs through the main part. Define the gusset plate extension dimension.

### Gusset tab

Use the **Gusset** tab to control the gusset plate properties, shape and position, connection plate, and clip angle properties and orientation.

### Plates




Option	Description
<b>Gusset</b>	Thickness, width and height of the gusset plate.
<b>Connection plates</b>	Thickness and width of the connection plate.
<b>L profile</b>	Select the clip angle profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

**NOTE** The following examples show only some of the available options. You will find more options on the **Gusset** tab.



### Gusset plate connection

Define how the gusset plate is connected to the main part.

Option	Description
	Default Gusset plate is welded directly to the main part. AutoDefaults can change this option.
	Gusset plate is connected to the main part with clip angles. Select to which side of the gusset plate the clip angles are created.
	Gusset plate is connected to the main part with a connection plate. Select to which side of the gusset plate the connection plate is created.



### Clip angle orientation

Define how the clip angle is placed on the connection.

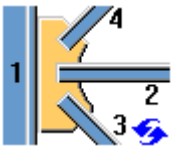
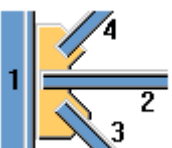
Option	Description
	Default Clip angle is placed on the connection so that the longer leg is connected to the gusset plate. AutoDefaults can change this option.
	Clip angle is placed on the connection so that the longer leg is connected to the main part.

### Gusset plate shape

When you select the option to optimize the gusset plate weight, you can define whether the selection order of the braces affects the position of the braces.




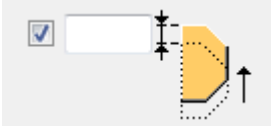
Option	Description
	Default AutoDefaults can change this option.
	This option optimizes the gusset plate weight.

### Brace position

Option	Description
	Default The brace position is not affected. AutoDefaults can change this option.
	The first selected brace is placed closest to the main part.

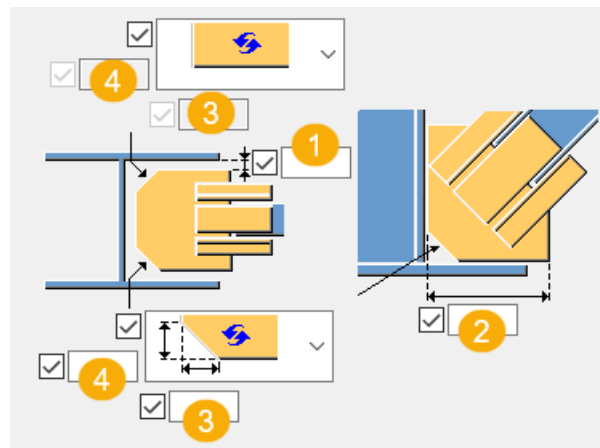
### Gusset plate position on the brace

Define where to place the gusset plate on the brace. If needed, you can fine-tune the gusset plate position by moving the gusset plate in the z or in the y direction.

Option	Description
	<p>Default</p> <p>Gusset plate is positioned in the middle of the brace.</p> <p>AutoDefaults can change this option.</p>
	<p>Gusset plate is positioned on the top flange of the brace.</p>
	<p>Define how much the gusset plate is moved in the z direction.</p>
	<p>Define how much the gusset plate is moved in the y direction.</p>

### Gusset plate chamfer

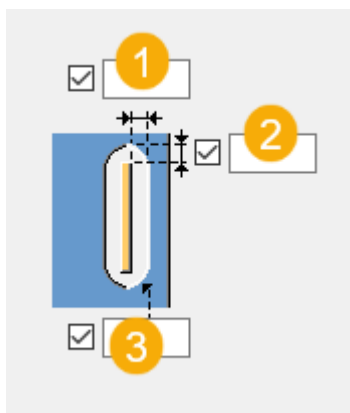
Define the gusset plate chamfer type and dimensions, and the angle limit for parallel bracing.



<p><b>1</b></p>	<p>Distance between the connection plate and the inner flange of the main part.</p>
<p><b>2</b></p>	<p>Horizontal distance between the gusset plate edge and the flange of the main part.</p>
<p><b>3</b></p>	<p>Horizontal dimension of the chamfer.</p> <p>By default, the second chamfer is not created.</p>
<p><b>4</b></p>	<p>Vertical dimension of the chamfer.</p> <p>By default, the second chamfer is not created.</p>

## Cut size

If the gusset plate runs through the main part, define the size of the cut created for the gusset plate.



	Description
1	Define the horizontal size of the cut.
2	Define the vertical size of the cut.
3	Define the radius of the round cut.

## Brace conn tab

Use the **Brace conn** tab to define the connection plate, clip angle, and filler plate properties. Select whether twin profiles are used for the angle connection.

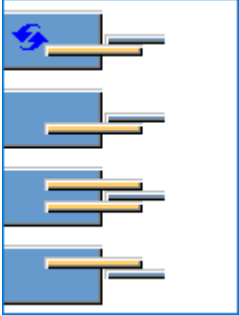
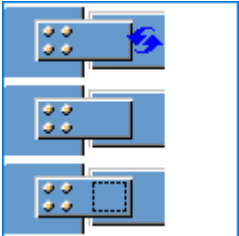
## Parts

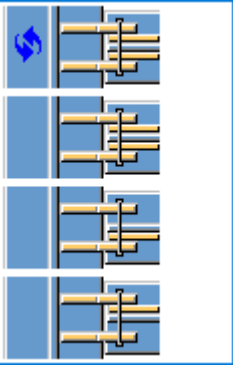
Part	Description
<b>Connect plate</b>	Thickness and width of the connection plate.
<b>Connection profile</b>	Select the profile from the profile catalog.
<b>L prof1 to gus. pl., L prof2 to gus.pl.</b>	Select the clip angle profile from the profile catalog.
<b>Filler plate</b>	Thickness and height of the filler plate.
<b>Plate1 to gus.pl</b>	Thickness, width and height of the plate.
<b>Plate2 to gus.pl</b>	Height of the plate.



Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

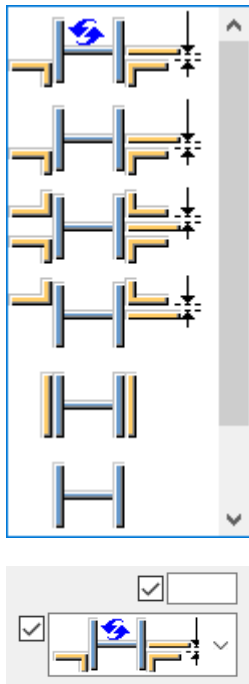
### Plate creation

Option	Description
	Select whether one or two connection plates are created between the brace web and the gusset plate.
	Select whether a filler plate is created between the connection plate and the brace web.  The default is that a filler plate is not created.

Option	Description
	<p>Select the filler plate creation side.</p> <p>You can use this option when you have selected to create two connection plates.</p>



### Clip angle creation

Define whether the braces are attached to the gusset plate using clip angles or shear tabs, and specify the number of clip angles to create. The default option is to create two clip angles below the brace web.

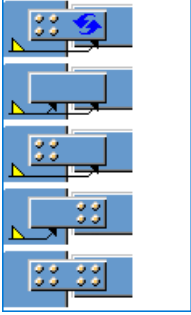
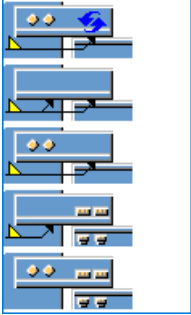


### Clip angle orientation

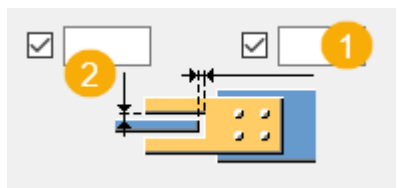
Define how the clip angle is placed on the connection.

Option	Description
	<p>Default</p> <p>Clip angle is placed on the connection so that the longer leg is connected to the gusset plate.</p> <p>AutoDefaults can change this option.</p>
	<p>Clip angle is placed on the connection so that the longer leg is connected to the main part.</p>

### Connection type

Option	Description
	<p>Select the connection type (weld or bolts) between the gusset plate and the connection plate.</p>
	<p>Select the connection type (weld or bolt) between the gusset plate and the L profile.</p>

### Connection plate gap dimensions



	Description
1	Horizontal gap dimension
2	Vertical gap dimension

### Shim plates tab

Use the **Shim plates** tab to define shim plate properties.

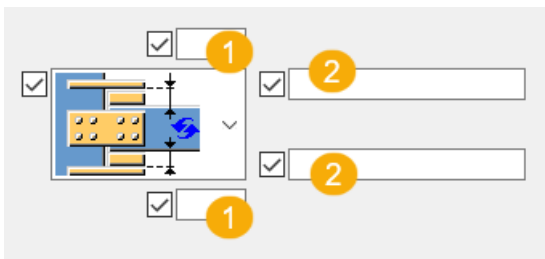
### Plates

Option	Description
<b>Shim plate 1, Shim plate 2, Shim plate 3</b>	Thickness, width and height of the shim plates.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Shim plate position and number

You can create shim plates when connecting braces to the gusset plate using clip angles.



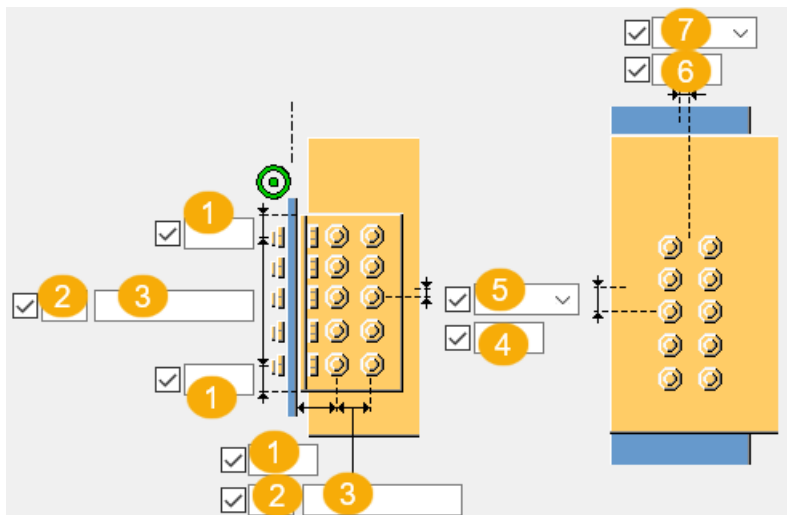
	Description
<b>1</b>	Define the gap between the brace and connection plate.

	Description
2	<p>Define how many shim plates are created at the top and bottom flanges.</p> <p>Enter the shim plate profile numbers: 1, 2 or 3. These are the numbers that are on the upper part on the <b>Shim plates</b> tab.</p> <p>For example, if you want to create three shim plates at the top flange, and you want to use <b>Shim plate 1</b> twice and <b>Shim plate 2</b> once, enter 1 1 2. The first number you enter is the shim plate closest to the brace flange.</p>

### Gusset conn tab

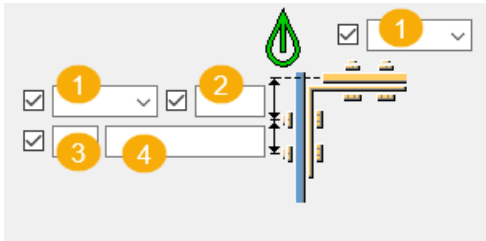
Use the **Gusset conn** tab to control the bolt group properties for bolts that connect the gusset plate to the main part, and to control the clip angle attachment.

### Bolt group dimensions



	Description
1	<p>Bolt edge distance.</p> <p>Edge distance is the distance from the center of a bolt to the edge of the part.</p>
2	Number of bolts.
3	<p>Bolt spacing.</p> <p>Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.</p>
4	Dimension for vertical bolt group position.
5	Select how to measure the dimensions for vertical bolt group position.





	Description
6	Dimension for horizontal bolt group position.
7	Select how to measure the dimensions for horizontal bolt group position.





	Description
1	Location where the bolts should be attached.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### Clip angle attachment type



Define how the clip angle is attached to the gusset plate and to the main part.

Option	Description
	Default Main part is bolted and secondary part is welded. AutoDefaults can change this option.
	Automatic When the main part is a tube profile, the clip angles are welded to the main part and bolted to the secondary part. Otherwise the clip angles are bolted to both parts.
	Main part is bolted and secondary part is welded.
	Main part is welded and secondary is part bolted.







Option	Description
	Both parts are bolted.
	Both parts are welded.

### Bolts on gusset plate

Define whether the gusset plate is connected to the main part with bolts when no clip angles are used.

	Description
	Default Bolts are not created in the gusset plate. AutoDefaults can change this option.
	Bolts are created in the gusset plate.

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

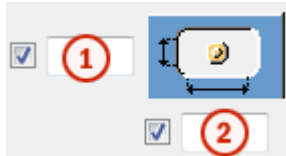
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.

Option	Description	Default
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### Slotted holes

You can define slotted, oversized, or tapped holes.



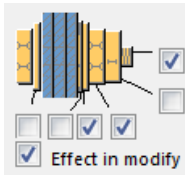
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.



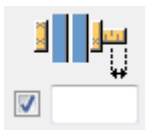
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Stiffeners tab

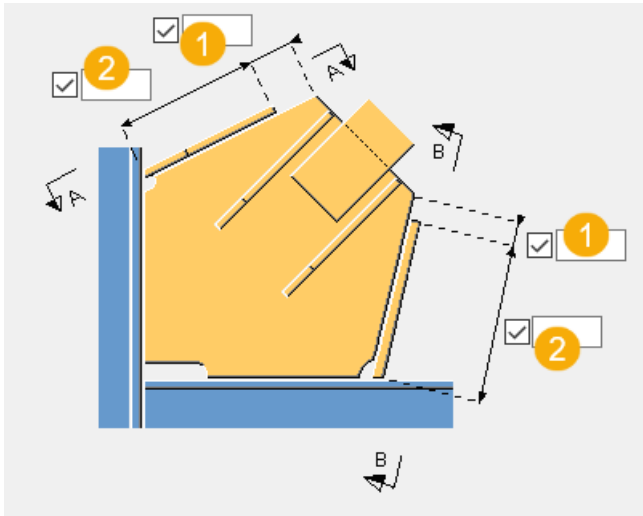
Use the **Stiffeners** tab to define the stiffener properties and dimensions.

### Parts

Part	Description
Stiffener 1, Stiffener 2	Thickness of the stiffener.

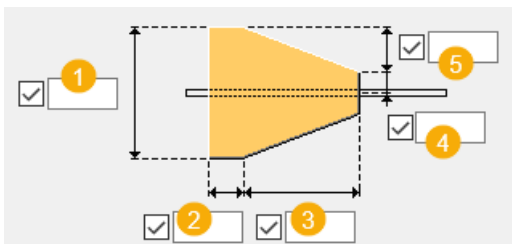
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

## Stiffener length








1	Define the distance between the stiffener edge and the gusset plate edge.
2	Define the length of stiffener.

## Stiffener dimensions

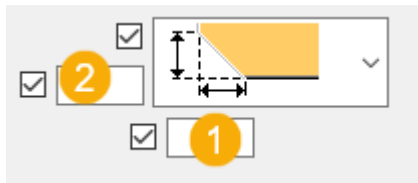


	Description
1	Define the width of the stiffener.
2	Define the length of the stiffener base.
3	Define the length of the skew part of the stiffener.
4	Define the distance from the stiffener center line.
5	Define the vertical distance between the stiffener base and the skew part.

## Chamfer type

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

## Chamfer dimensions

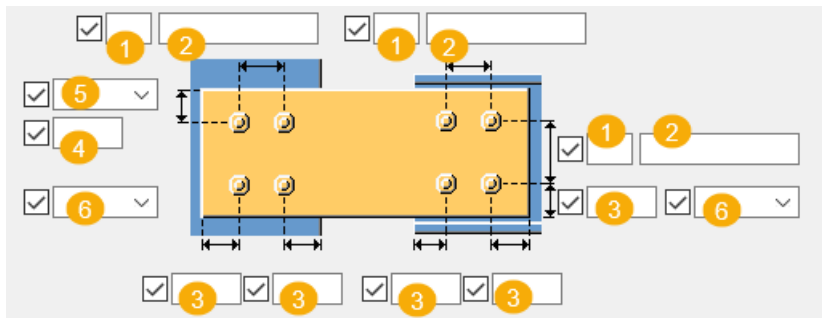


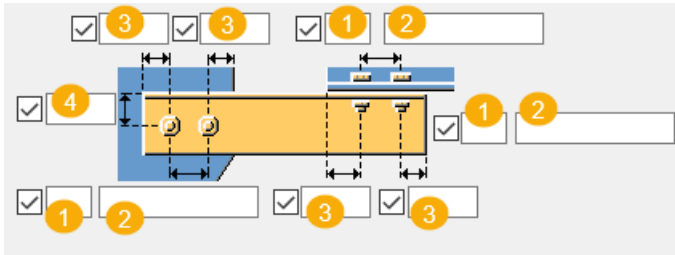
	Description
1	Horizontal dimension of the chamfer.
2	Vertical dimension of the chamfer.

## Brace bolts 1 / Brace bolts 2 / Brace bolts 3 tab

Use the **Brace bolts 1**, **Brace bolts 2** and **Brace bolts 3** tabs to control the bolts that connect the first, the second, and the subsequent braces to the gusset plate.



## Bolt group dimensions





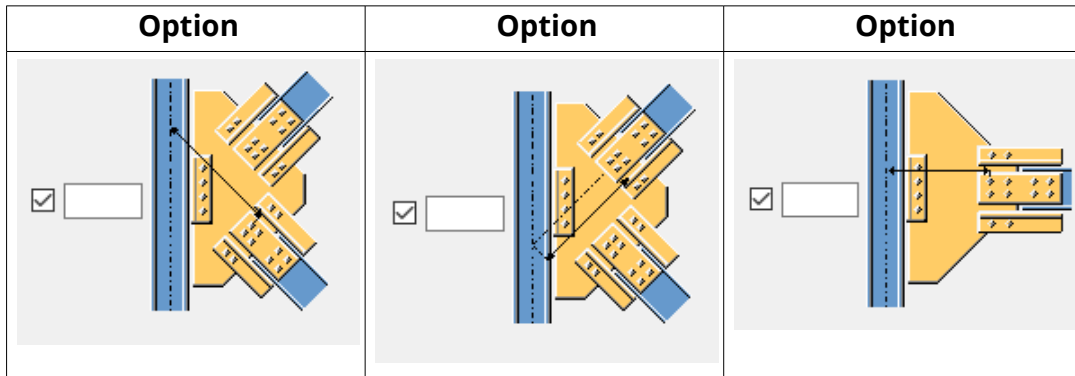
	Description
1	Number of bolts.
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Dimension for vertical bolt group position.
5	Select how to measure the dimensions for vertical bolt group position.
6	Select the bolt type.

### Vertical bolt position

Option	Description
	Bolt position from the L profile edge.
	Bolt position from the secondary part center line.

### Bolt distance

Define the minimum distance from the connection plate bolts to the intersection point of the main part and brace center lines. If a brace is perpendicular to the main part, the distance is measured from the main part center line to the nearest bolts.

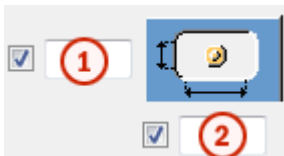


### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### Slotted holes







You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.

Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

#### General tab

Click the link below to find out more:

[General tab](#)

#### Design tab

Click the link below to find out more:

[Design tab](#)

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

### Welds

Click the link below to find out more:

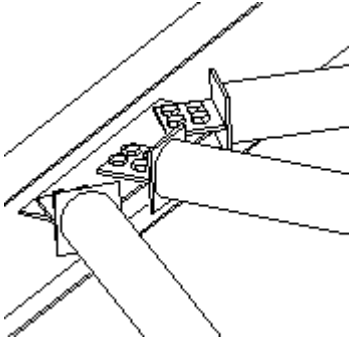
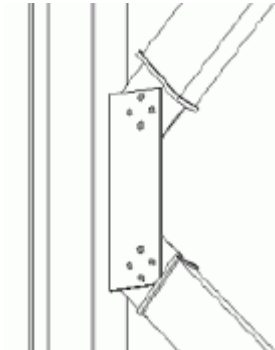
### **Portal bracing (105)**

**Portal bracing (105)** connects up to 3 hollow braces to a beam or column using a gusset plate and tees.

### Objects created

- Gusset plate
- Tees
- Bolts
- Welds

### Use for

Situation	Description
	Brace profile: Tube Gusset plate is welded to the beam. Braces are bolted to the gusset plate using tees.
	Brace profile: RHS Gusset plate is welded to the column. Braces are bolted to the gusset plate using tees.

## Limitations

The braces must be in the same plane.

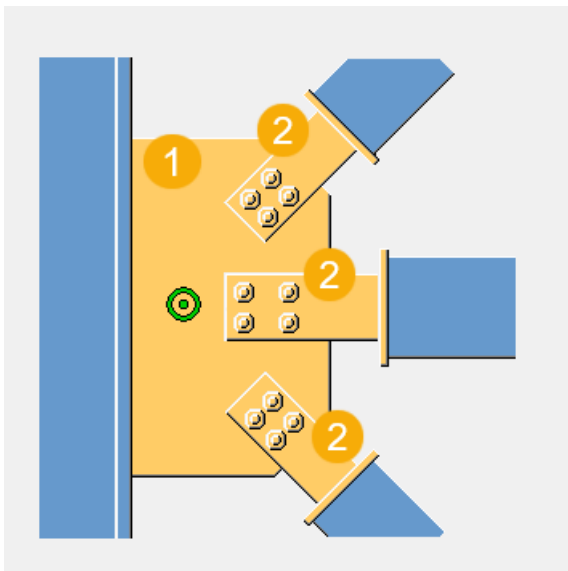
## Before you start

Create a beam, and up to three braces all in the same plane.

## Selection order

1. Select the main part (beam or column).
2. Select the secondary part (first brace).
3. Select the second secondary part (second brace).
4. Select the subsequent secondary part (third brace).
5. Click the middle mouse button to create the component.

## Part identification key

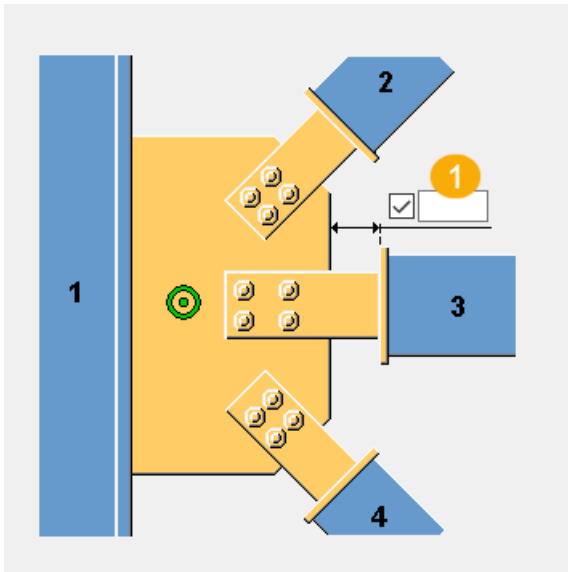


	Description
1	Gusset plate
2	Tee

## Picture tab

Use the **Picture** tab to define the tee dimension from the gusset plate edge.





	Description
1	Define the tee edge dimension.

#### Parts tab

Use the **Parts** tab to define the properties of the gusset plate, and the tees at the ends of the braces. You can define the tees separately for each brace.

#### Parts

Option	Description
<b>Gusset</b>	Thickness, width and height of the gusset plate.
<b>Tee flange</b>	To have Tekla Structures use two plates to create the tee, leave the <b>Tee profile</b> empty. You must enter the thickness, width, and height dimensions for the tee flange and web instead.  Define the thickness, width and height of the tee flange.
<b>Tee web</b>	To have Tekla Structures use two plates to create the tee, leave the <b>Tee profile</b> empty. You must enter the thickness, width, and height dimensions for the tee flange and web instead.  Define the thickness, width and height of the tee web.
<b>Tee profile</b>	Select the tee profile from the profile catalog. You can use a T profile or an I profile.  If you use an I profile, the component creates the tee by cutting the I profile. You must specify where

Option	Description
	to cut the I profile, using the tee depth option on the <b>Parameters</b> tab.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

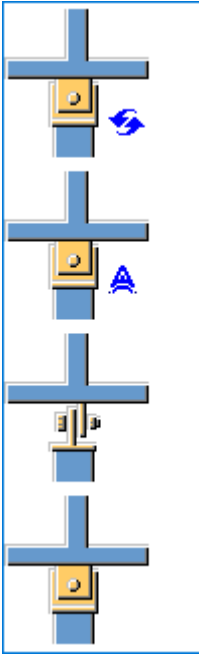
#### Parameters tab

Use the **Parameters** tab to define the tee dimensions, clearances, gusset plate position and chamfers.

Option	Description
<b>Min. cut angle (0-90 deg)</b>	Define the minimum cut angle.
<b>Define welds for each Tee</b>	Select whether to use welds for each tee.
<b>Define bolts for each Tee</b>	Select whether to use bolts for each tee.

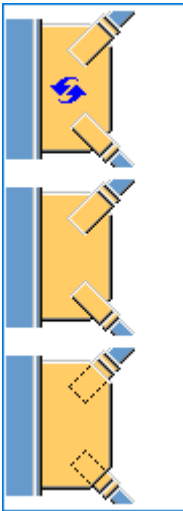
#### Gusset position

Select the gusset position on the brace.






### Tee position

Select the tee position on the gusset.



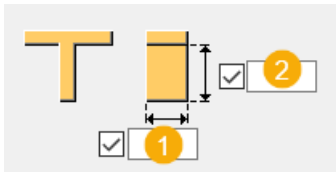
### Gusset chamfer

Option	Description
	Default No chamfer AutoDefaults can change this option.

Option	Description
	No chamfer
	Chamfers are created.

### Tee dimensions

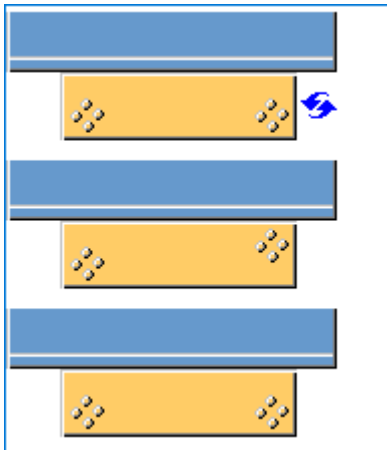
Define the tee dimensions for each brace.



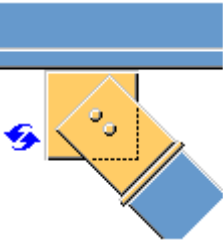


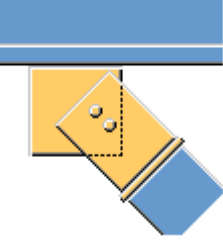
	Description
1	Tee length
2	Tee depth

### Bolt group alignment

Select whether bolt groups are aligned.



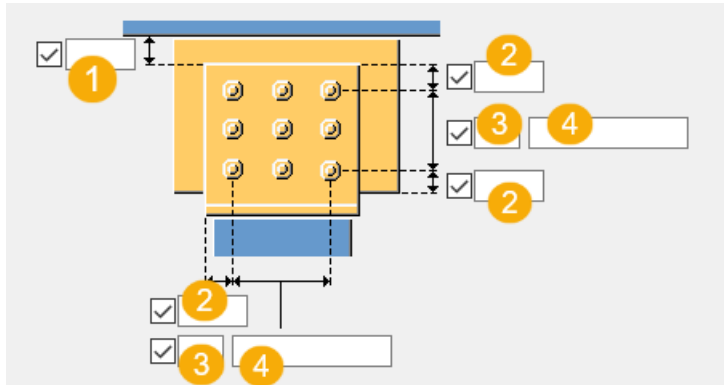
### Gusset position on the main part

Option	Description
	<p>Default</p> <p>Gusset is positioned according to the defined distances.</p> <p>AutoDefaults can change this option.</p>
	<p>Gusset is positioned according to the defined distances.</p>
	<p>Gusset is centered to the center of the bolt group.</p>
	<p>Gusset is centered to the center of the connection origin.</p>

### Bolts 1 / Bolts 2 / Bolts 3 tabs

Use the **Bolts 1**, **Bolts 2** and **Bolts 3** tabs to control the bolts that connect the first, the second, and the third brace to the gusset plate.

## Bolt group dimensions



	Description
<b>1</b>	Plate edge distance to the main part web.
<b>2</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>3</b>	Number of bolts.
<b>4</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

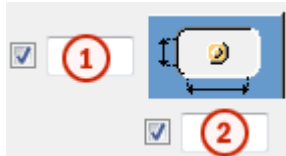
## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

Option	Description	Default
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

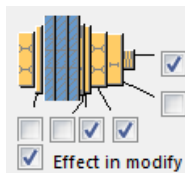


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.









To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### General tab

Click the link below to find out more:

[General tab](#)

### Design tab

Click the link below to find out more:

[Design tab](#)

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)



## Welds

Click the link below to find out more:

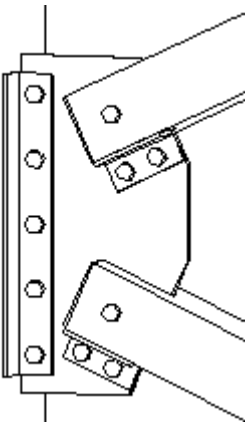
### ***Bolted gusset (196)***

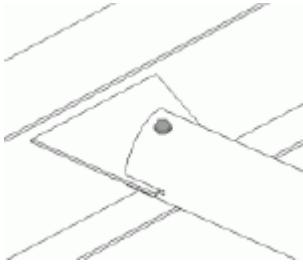
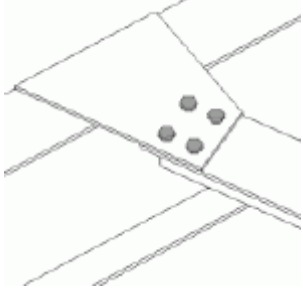
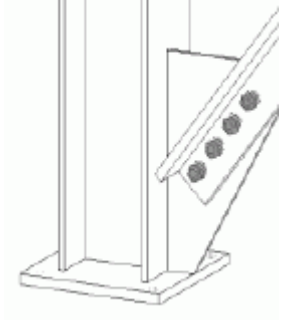
**Bolted gusset (196)** connects 1 to 10 braces to a beam or column using a gusset plate, which is bolted or welded to the beam or column. The braces are bolted to the gusset plate. Clip angles can be created either at the ends of the braces, or on each side.

### **Objects created**

- Gusset plate
- Clip angles or shear tabs (optional) that connect the gusset plate to the beam or column
- Clip angles (optional) that connect the brace to the gusset plate
- Connection plates
- Seal plates (hollow braces)
- Stiffeners (optional)
- Bolts
- Welds
- Cuts

### **Use for**

<b>Situation</b>	<b>Description</b>
	Brace profile: RHS Gusset plate is bolted to the beam flange using a clip angle. Braces are slotted around the gusset plate and attached to it using bolts and clip angles.

Situation	Description
	<p>Brace profile: Tube</p> <p>Gusset plate is welded to the beam web. Brace is notched around the gusset plate and pinned to it.</p>
	<p>Brace profile: T</p> <p>Gusset plate is welded to the beam flange. Brace is bolted to the gusset plate.</p>
	<p>Brace profile: L</p> <p>Gusset plate is welded to the column flange. Brace is bolted to the gusset plate.</p>

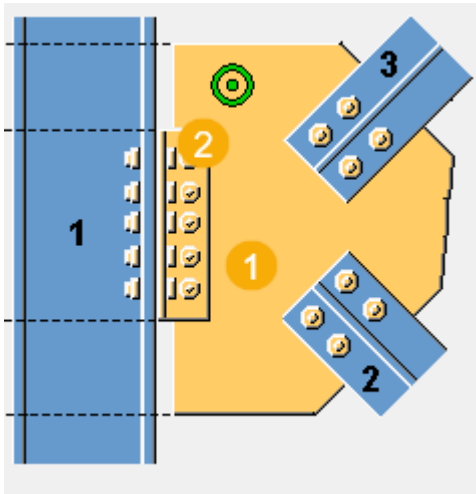
### Before you start

Create a beam or column, and 1 to 10 braces.

### Selection order

1. Select the main part (beam or column).
2. Select the secondary part (first brace).
3. Select the second secondary part (second brace).
4. Select the subsequent secondary parts (subsequent braces).
5. Click the middle mouse button to create the component.

## Part identification key



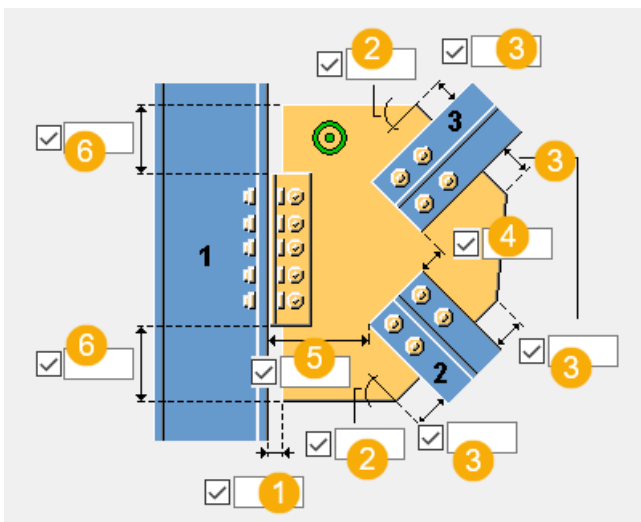
1	Gusset plate
2	Clip angle

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

## Picture tab

Use the **Picture** tab to define the dimensions that control the position and shape of the gusset plate.

## Dimensions





	Description
1	Define the gap distance between the gusset plate edge and the main part.
2	Define the gusset plate corner angle (in degrees). This value affects the gusset plate shape.
3	Define the length of the edge of the gusset plate. This value affects the gusset plate shape.
4	Define the distance between the braces.
5	Define the distance between the main part and the brace.
6	Define the distance between the clip angle or connection plate edge and the gusset plate edge.

**NOTE** The following examples show only some of the available options. You will find more options on the **Picture** tab.

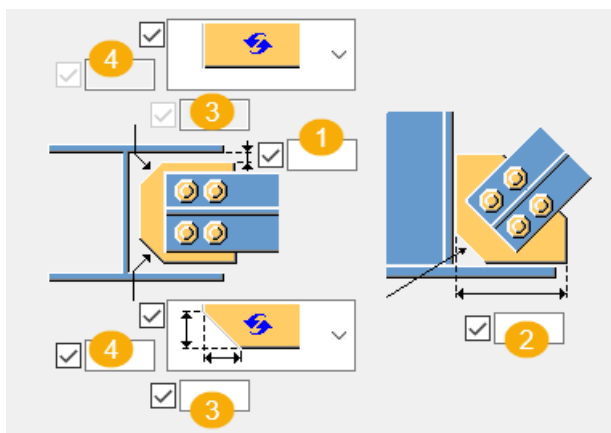
### Gusset plate positioning

Define how the gusset plate is positioned when a base plate is used.

Option	Description
	Default Gusset plate is parallel to the main part. AutoDefaults can change this option.
	Gusset plate is parallel to the brace.

### Gusset plate chamfer

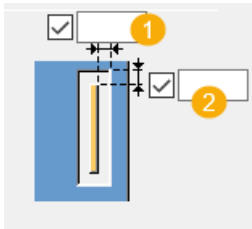
Define the gusset plate chamfer type and dimensions, and the angle limit for parallel bracing.



	Description
1	Distance between the connection plate and the inner flange of the main part.
2	Horizontal distance between the gusset plate edge and the flange of the main part.
3	Horizontal dimension of the chamfer. By default, the second chamfer is not created.
4	Vertical dimension of the chamfer. By default, the second chamfer is not created.

### Cut size

If the gusset plate runs through the main part, define the size of the cut created for the gusset plate.



	Description
1	Define the horizontal size of the cut.
2	Define the vertical size of the cut.

### Gusset tab

Use the **Gusset** tab to control the gusset plate properties, shape and position, clip angle properties and orientation, and angle limit for parallel bracing.

### Plates




Option	Description
<b>Gusset</b>	Thickness, width and height of the gusset plate.
<b>Connection plates</b>	Thickness and width of the connection plate.
<b>L profile</b>	Select the clip angle profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

**NOTE** The following examples show only some of the available options. You will find more options on the **Gusset** tab.



### Gusset plate connection

Define how the gusset plate is connected to the main part.

Option	Description
	Default Gusset plate is welded directly to the main part. AutoDefaults can change this option.
	Gusset plate is connected to the main part with clip angles. Select to which side of the gusset plate the clip angles are created.
	Gusset plate is connected to the main part with a connection plate. Select to which side of the gusset plate the connection plate is created.



### Clip angle orientation

Define how the clip angle is placed on the connection.

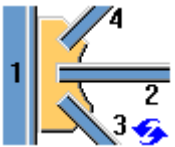
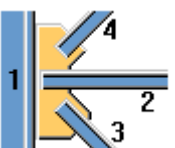
Option	Description
	<p>Default</p> <p>Clip angle is placed on the connection so that the longer leg is connected to the gusset plate.</p> <p>AutoDefaults can change this option.</p>
	<p>Clip angle is placed on the connection so that the longer leg is connected to the main part.</p>

### Gusset plate shape

When you select the option to optimize the gusset plate weight, you can define whether the selection order of the braces affects the position of the braces.




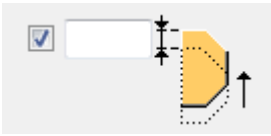
Option	Description
	<p>Default</p> <p>AutoDefaults can change this option.</p>
	<p>This option optimizes the gusset plate weight.</p>

### Brace position

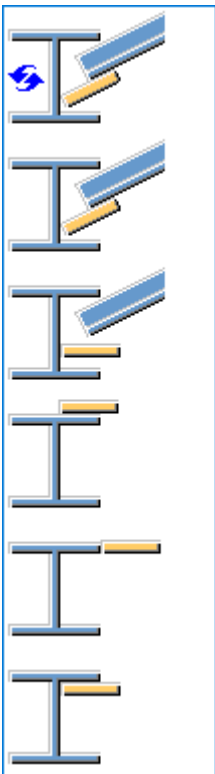
Option	Description
	<p>Default</p> <p>The brace position is not affected.</p> <p>AutoDefaults can change this option.</p>
	<p>The first selected brace is placed closest to the main part.</p>

### Gusset plate position on the brace

Define where to place the gusset plate on the brace. If needed, you can fine-tune the gusset plate position by moving the gusset plate in the z or in the y direction.

Option	Description
	<p>Default</p> <p>Gusset plate is positioned in the middle of the brace.</p> <p>AutoDefaults can change this option.</p>
	<p>Gusset plate is positioned on the top flange of the brace.</p>
	<p>Define how much the gusset plate is moved in the z direction.</p>
	<p>Define how much the gusset plate is moved in the y direction.</p>

### Gusset plate position on the column or beam

Option	Description
	<p>Select the gusset position.</p> <p>The default option is parallel to the brace.</p>

### Brace conn tab

Use the **Brace conn** tab to define the seal plate, brace notch and slot properties.

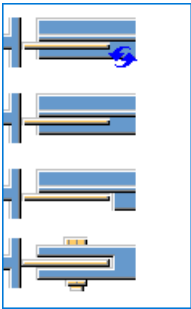
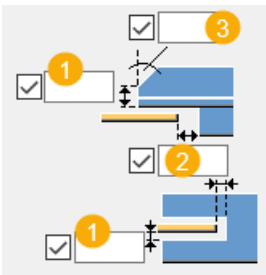


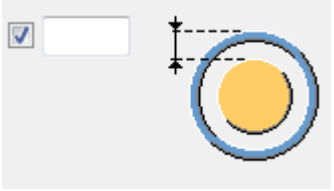
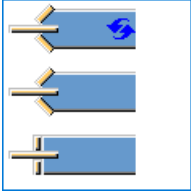
## Seal plate

Option	Description
Seal plate	Thickness of the seal plate.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

## Brace notch

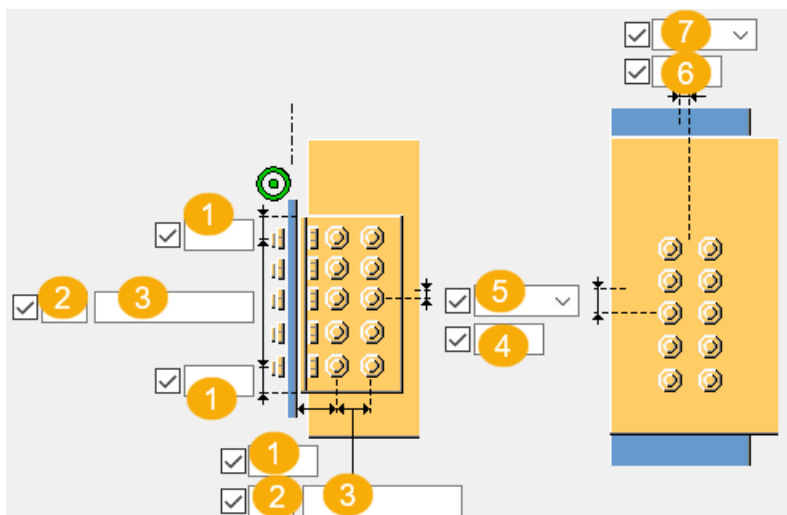
Option	Description
	Select whether the brace is notched.
	<ol style="list-style-type: none"> <li>1. Vertical notch dimension.</li> <li>2. Horizontal notch dimension.</li> <li>3. Notch angle.</li> </ol>

Option	Description
	Define the plate distance from the brace outer edge.
	Select whether to create bevel cuts at the brace ends or whether to create a square brace end.

### Gusset bolts tab

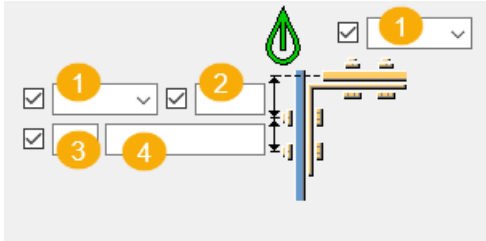
Use the **Gusset bolts** tab to control the bolt group properties for bolts that connect the gusset plate to the main part, and to control the clip angle attachment.

### Bolt group dimensions






<b>1</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>2</b>	Number of bolts.
<b>3</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.




4	Dimension for vertical bolt group position.
5	Select how to measure the dimensions for vertical bolt group position.
6	Dimension for horizontal bolt group position.
7	Select how to measure the dimensions for horizontal bolt group position.



1	Location where the bolts should be attached.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.



### Clip angle attachment type

Option	Description
	Default Both parts are bolted. AutoDefaults can change this option.
	Automatic When the main part is a tube profile, the clip angles are welded to the main part and bolted to the secondary part. Otherwise the clip angles are bolted to both parts.
	Main part is bolted and secondary part is welded.






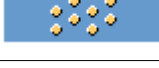
Option	Description
	Main part is welded and secondary is part bolted.
	Both parts are bolted.
	Both parts are welded.

### Bolts on gusset plate

Define whether the gusset plate is connected to the main part with bolts when no clip angles are used.

Option	Description
	Default Bolts are not created in the gusset plate. AutoDefaults can change this option.
	Bolts are created in the gusset plate.

### Staggering of bolts

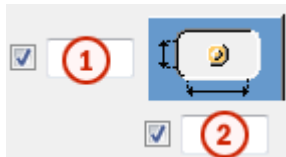
Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

## Slotted holes

You can define slotted, oversized, or tapped holes.



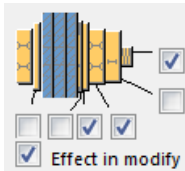
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options	

Option	Description	Default
	depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

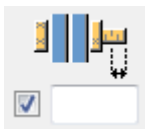
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

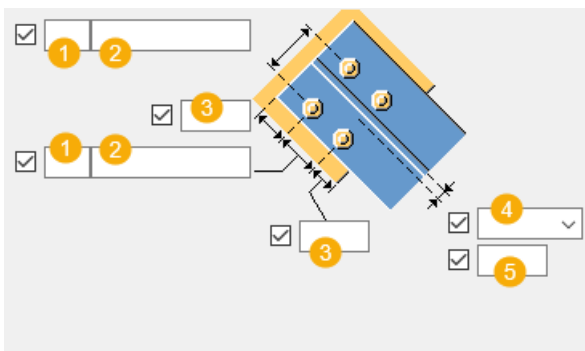
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.

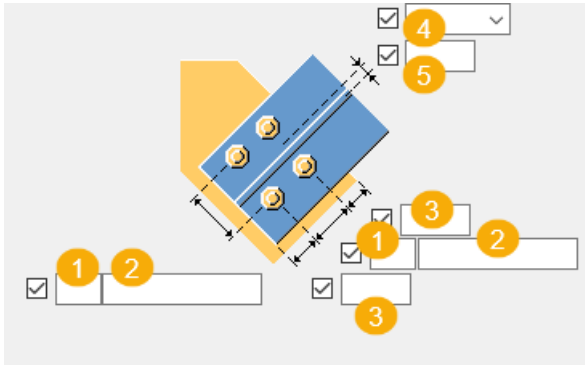
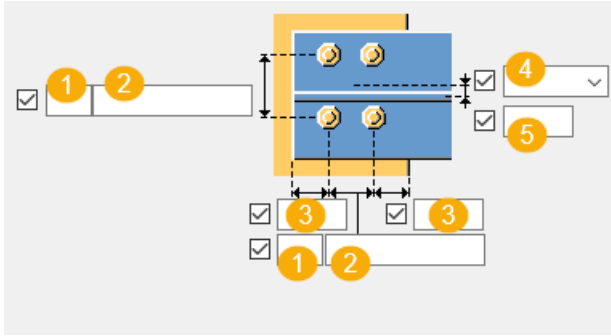


### Brace bolts 1 / Brace bolts 2 / Brace bolts 3 tab

Use the **Brace bolts 1**, **Brace bolts 2** and **Brace bolts 3** tabs to control the bolts that connect the first, the second, and the subsequent braces to the gusset plate.

### Bolt group dimensions

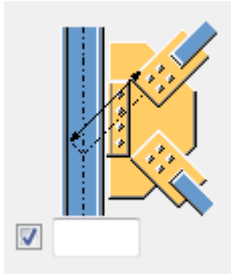




	Description
<b>1</b>	Number of bolts.
<b>2</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Select how to measure the dimensions for vertical bolt group position.
<b>5</b>	Dimension for vertical bolt group position.

### Bolt distance

Define the minimum distance from the connection plate bolts to the intersection point of the main part and brace center lines. If a brace is perpendicular to the main part, the distance is measured from the main part center line to the nearest bolts.









### Attributes for Tube crossing (22)

With hollow secondary parts, **Bolted gusset (196)** automatically removes connection objects created between the gusset plate and the hollow secondary part, and then uses the **Tube crossing (22)** connection between the gusset plate and the hollow secondary part.

To define which property file that **Tube crossing (22)** uses, go to the **Brace bolts 2** tab, and enter the property file name in the **Attributes for Tube crossing (22)** box.

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt basic properties

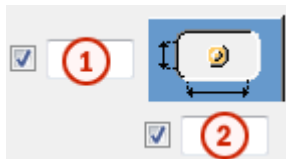
Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.



Option	Description	Default
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Angle bolts tab

Use the **Angle bolts** tab to control the bolts that connect the clip angles.

### Part

Option	Description
<b>L profile</b>	Select the clip angle profile from the profile catalog.

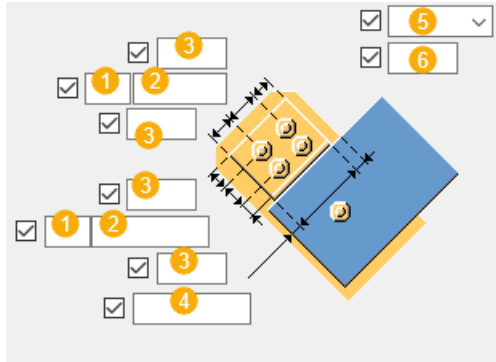
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

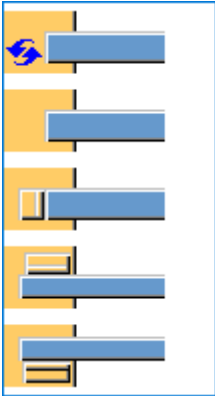
Option	Description	Default
Site/Workshop	Location where the bolts should be attached.	Site

### Bolt group dimensions



	Description
<b>1</b>	Number of bolts.
<b>2</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Define the edge distance between the clip angle and the brace.
<b>5</b>	Select how to measure the dimensions for vertical bolt group position.
<b>6</b>	Dimension for vertical bolt group position.

## Clip angle position

Option	Description
	Select the clip angle position.

## Stiffeners tab

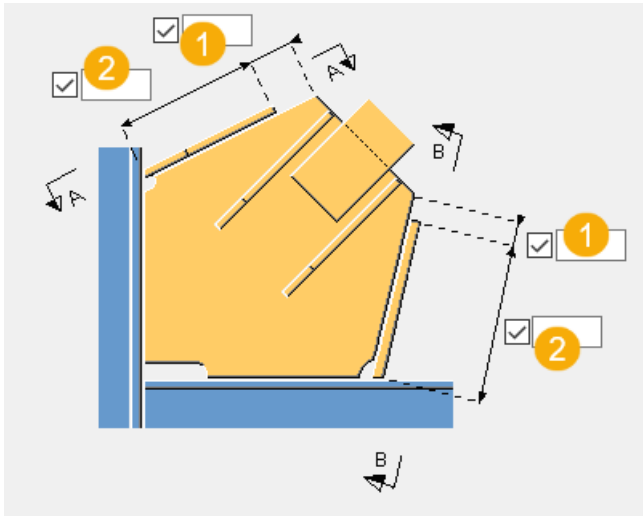
Use the **Stiffeners** tab to define the stiffener properties and dimensions.

## Parts

Part	Description
<b>Stiffener 1, Stiffener 2</b>	Thickness of the stiffener.

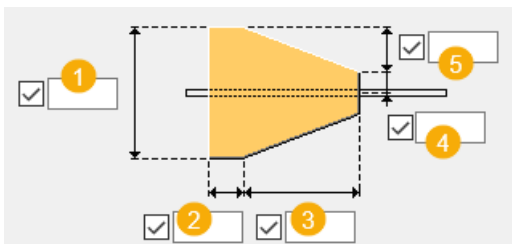
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

## Stiffener length








	Description
1	Define the distance between the stiffener edge and the gusset plate edge.
2	Define the length of stiffener.

## Stiffener dimensions

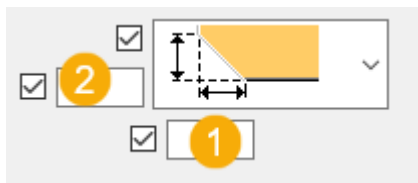


	Description
1	Define the width of the stiffener.
2	Define the length of the stiffener base.
3	Define the length of the skew part of the stiffener.
4	Define the distance from the stiffener center line.
5	Define the vertical distance between the stiffener base and the skew part.

## Chamfer type

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

## Chamfer dimensions



	Description
<b>1</b>	Horizontal dimension of the chamfer.
<b>2</b>	Vertical dimension of the chamfer.

### General tab

Click the link below to find out more:

[General tab](#)

### Design tab

Click the link below to find out more:

[Design tab](#)

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

## Welds

Click the link below to find out more:

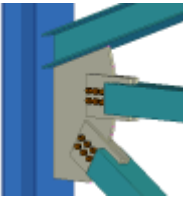
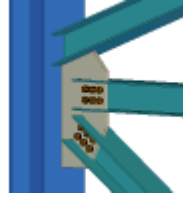
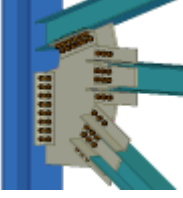
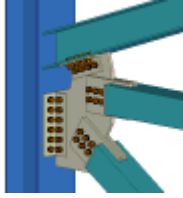
Create welds

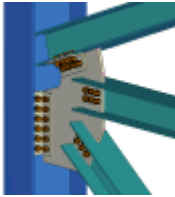
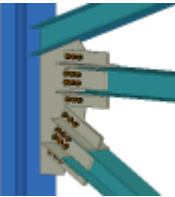
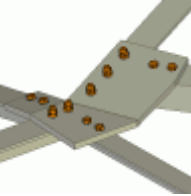
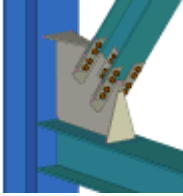
## Corner bracing connections

Use corner bracing connections to automatically connect bracing where two parts meet to form a corner, for example:

- Beam and column
- Column and base plate
- Beam and extended end plate
- Two beams and a column

Tekla Structures includes the following corner bracing connections:

Component	Image	Description
<a href="#">Corner tube gusset (56)</a> (page 2424)		Bolts braces to a gusset plate using connection plates and optional tongue plates. Seals hollow braces.
<a href="#">Corner bolted gusset (57)</a> (page 2441)		Bolts braces to a gusset plate. Welds the gusset plate to one or both of the parts that form the corner. Seals hollow braces.
<a href="#">Wraparound gusset (58)</a> (page 2457)		Bolts or welds braces to a gusset plate. Option to wrap the gusset plate around a third part, usually a column. Option to use connection material to connect the gusset plate to the main parts.
<a href="#">Hollow brace wraparound gusset (59)</a> (page 2485)		Bolts or welds hollow braces to a gusset plate. Option to wrap the gusset plate around a third part, usually a column. Option to use connection material to

Component	Image	Description
		connect the gusset plate to the main parts.
<a href="#">Wraparound gusset cross (60) (page 2506)</a>		Bolts or welds braces to a gusset plate. Option to use clip angles. Option to wrap the gusset plate around a third part, usually a column. Option to use connection material to connect the gusset plate to the main parts.
<a href="#">Corner wrapped gusset (63) (page 2527)</a>		Bolts braces to a gusset plate using clip angles and connection plates. Welds the gusset plate to one of the main parts.
<a href="#">Bent gusset (140) (page 2548)</a>		Connects braces in different planes to one or more beams or columns that are in different planes. Creates a gusset plate that is bent along two different bending lines. Seals hollow braces.
<a href="#">Heavy brace (165) (page 2569)</a>		Bolts a single brace to a gusset plate where two parts meet to form a corner. Rib plates strengthen the connection.

### **Corner tube gusset (56)**

**Corner tube gusset (56)** connects 1 to 10 hollow braces to the corner where two parts meet, using a gusset plate. Bolts braces to the gusset plate using a connection plate or tongue plate slotted into the brace. Option to create extra connection plates. Seals braces.

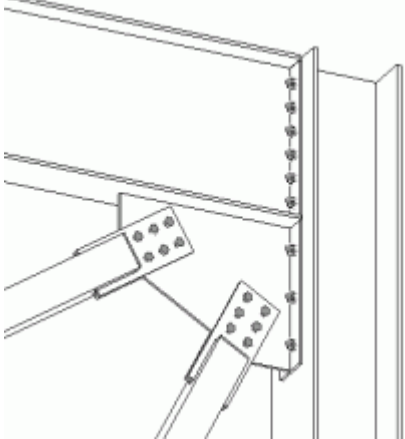
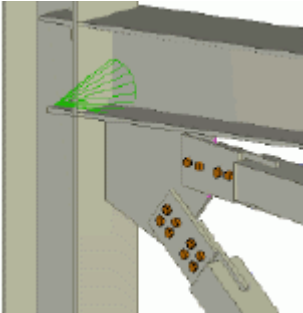
#### **Objects created**

- Gusset plate
- Connection plates
- Seal plates
- Tongue plates (optional)
- Cover plates (optional)



- Stiffeners
- Bolts
- Welds

### Use for

Situation	Description
	<p>Brace profile: RHS</p> <p>Framing type: Column and extended end plate</p> <p>Gusset plate is welded to an extended end plate. Braces are bolted to the gusset plate using tongue plates.</p>
	<p>Brace profile: RHS</p> <p>Framing type: Column and beam</p> <p>Gusset plate is welded to the column flange. Braces are bolted to the gusset plate using tongue plates, and connection and cover plates.</p>

### Before you start

Create two parts that form a corner, and 1 to 10 braces.

### Selection order

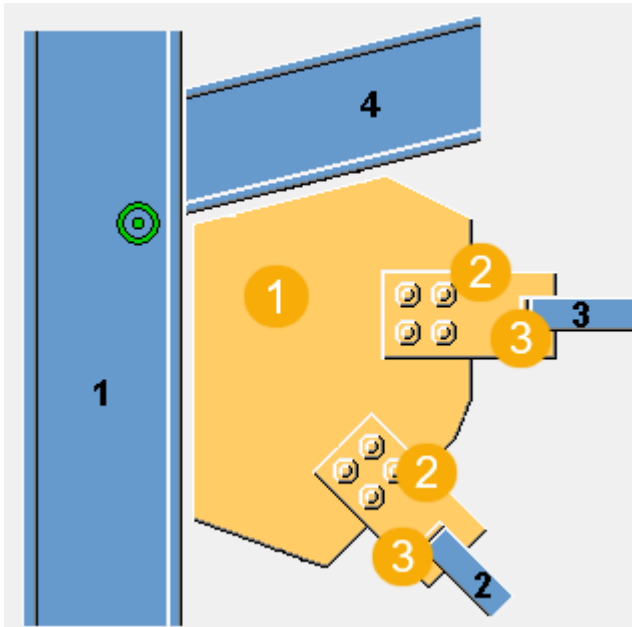
1. Select the main part (the first part that forms the corner).
2. Select the secondary part (first brace).
3. Select the second secondary part (second brace).
4. Select the subsequent secondary parts (subsequent braces).
5. Select the secondary part that forms the corner (Tekla Structures connects the gusset plate to this part).
6. Click the middle mouse button to create the connection.

---

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

---

### Part identification key

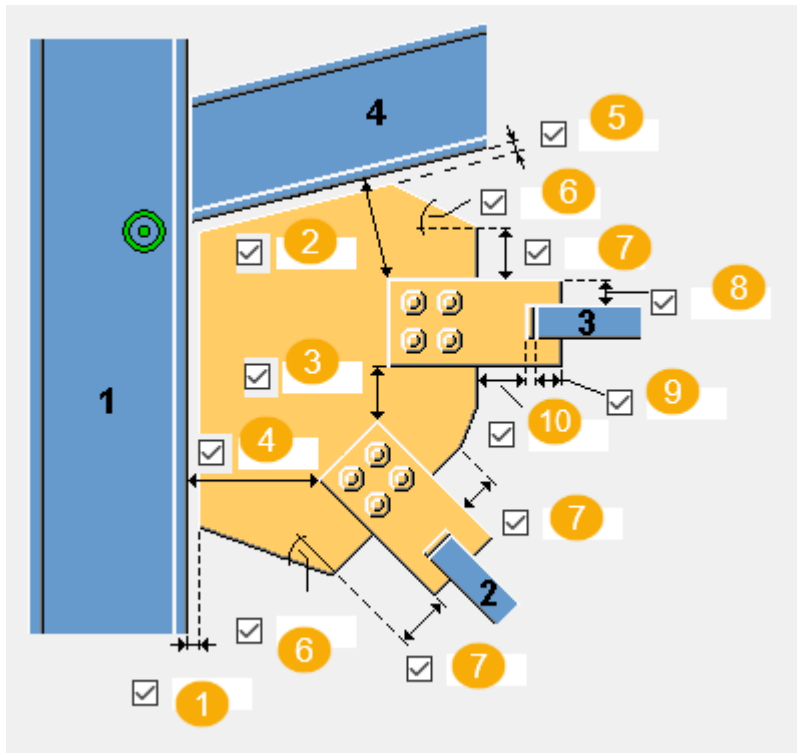


	Description
1	Gusset plate
2	Connection plate
3	Seal plate

### Picture tab

Use the **Picture** tab to define the gusset plate position and shape.

## Dimensions



	Description
<b>1</b>	Define the gap distance between the gusset plate edge and the main part (first part that forms the corner) .
<b>2</b>	Define the edge distance between the connection plate and the last secondary part.
<b>3</b>	Define the distance between the connection plates.
<b>4</b>	Define the edge distance between the connection plate and the main part.
<b>5</b>	Define the gap distance between the gusset plate edge and the secondary part (second part that forms the corner).
<b>6</b>	Define the gusset plate corner angle (in degrees). This value affects the gusset plate shape.
<b>7</b>	Define the length of the edge of the gusset plate. This value affects the gusset plate shape.
<b>8</b>	Define the length of the edge of the connection plate.
<b>9</b>	Define the brace length on the connection plate.
<b>10</b>	Define the edge distance between the seal plate and gusset plate.

### Gusset tab

Use the **Gusset** tab to control the gusset plate properties.

### Gusset plate


Option	Description
<b>Gusset</b>	Thickness, width and height of the gusset plate.


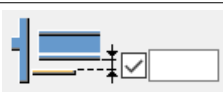
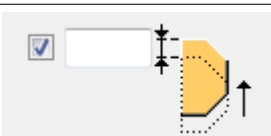
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

**NOTE** The following examples show only some of the available options. You will find more options on the **Gusset** tab.

### Gusset plate position on the brace



Define where to place the gusset plate on the brace. If needed, you can fine-tune the gusset plate position by moving the gusset plate in the z or in the y direction.

Option	Description
	Default Gusset plate is positioned in the middle of the brace. AutoDefaults can change this option.

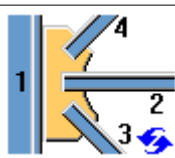
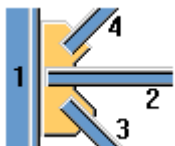
Option	Description
	Gusset plate is positioned on the top flange of the brace.
	Define how much the gusset plate is moved in the z direction.
	Define how much the gusset plate is moved in the y direction.

### Gusset plate shape

When you select the option to optimize the gusset plate weight, you can define whether the selection order of the braces affects the position of the braces.


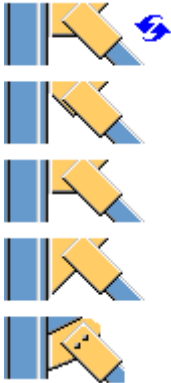
Option	Description
	Default AutoDefaults can change this option.
	This option optimizes the gusset plate weight.

### Brace position


Option	Description
	Default The brace position is not affected. AutoDefaults can change this option.
	The first selected brace is placed closest to the main part.

### Gusset plate shape

The gusset plate edge can be perpendicular either to the main part or the secondary part.



Option	Description
	<p>Select the gusset plate edge shape between the last and second last secondary part.</p>
	<p>Select the gusset plate edge shape between the main part and the first secondary part.</p>



### Gusset plate fitting

Option	Description
	<p>Select whether the gusset is fitted to the last selected secondary part.</p>

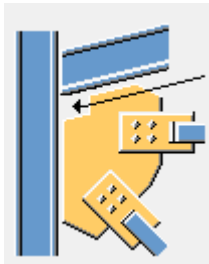
### Gusset welding

Weld 1 is used to weld the gusset part to the main part and weld 4 is used for welding the gusset to the last secondary part.








Option	Description
	<p>Default Gusset plate is welded to the main part. AutoDefaults can change this option.</p>
	<p>Gusset plate is welded to the main part.</p>

Option	Description
	Gusset plate is welded to the secondary part.
	Gusset plate is welded to the main part and the secondary part.

### Gusset plate inner corner



Define the horizontal and vertical chamfer dimensions.

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex chamfer
	Concave chamfer
	Bevel
	Square

### Brace conn tab

Use the **Brace conn** tab to control connection plate, seal plate, tongue plate, and cover plate properties.


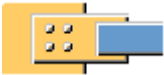

## Plates

Option	Description
<b>Connection plate</b>	Thickness, width and height of the connection plate.
<b>Seal plates</b>	Thickness, width and height of the seal plate.
<b>Tongue plate</b>	Thickness of the tongue plate.
<b>Cover plate</b>	Thickness, width and height of the cover plate.


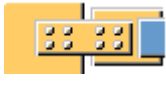
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

## Brace connection types

Define how the brace is connected to the connection plate.

Option	Description
	Default Brace is welded. AutoDefaults can change this option.
	Brace is welded.
	Brace is bolted.

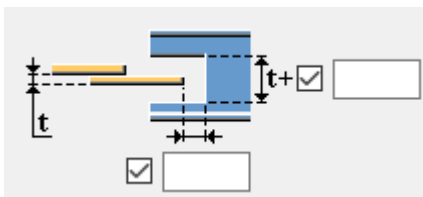


Option	Description
	Brace is welded and notched around the nuts.
	Tongue plate and cover plate are created.




### Cut in bracing

Define the width of the cut in the bracing, where **t** is the thickness of the connection plate.

Define the length of the cut in the bracing from the edge of the connection plate.








### Round cut in bracing

Option	Description
	Default Square cut AutoDefaults can change this option.
	Square cut
	Round cut Enter the radius value.

### Connection plate




Define whether the brace is notched or the connection plate cut when the connection plate is connected to the brace.

Option	Description
	Default Brace is notched. AutoDefaults can change this option.
	Brace is notched.




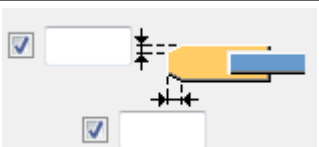
Option	Description
	Connection plate is cut.
	Connection plate is cut, but the part of the connection plate created inside the bracing is not deleted.
	If you cut the connection plate, you can define the size of the gap between the brace and the connection plate.

### Number of connection plates

Define whether one or two connection plates are used for connecting the brace to the gusset plate.




Option	Description
	Default One connection plate AutoDefaults can change this option.
	One connection plate
	Two connection plates

### Connection plate chamfer

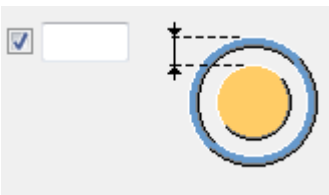
Option	Description
	Default No chamfers are created. AutoDefaults can change this option.
	No chamfers are created.
	Chamfers are created.
	If you create chamfers, define the vertical and horizontal chamfer dimensions.

## End plates

If you use the end plates to seal the braces, define the end plate shape and dimensions.

Option	Description
	Default Square end plate. AutoDefaults can change this option.
	Square end plate.
	Round end plate.

## End plate edge distance

Option	Description
	End plate edge distance from the brace outer edge.

## Stiffeners tab

Use the **Stiffeners** tab to control the stiffener properties and dimensions.

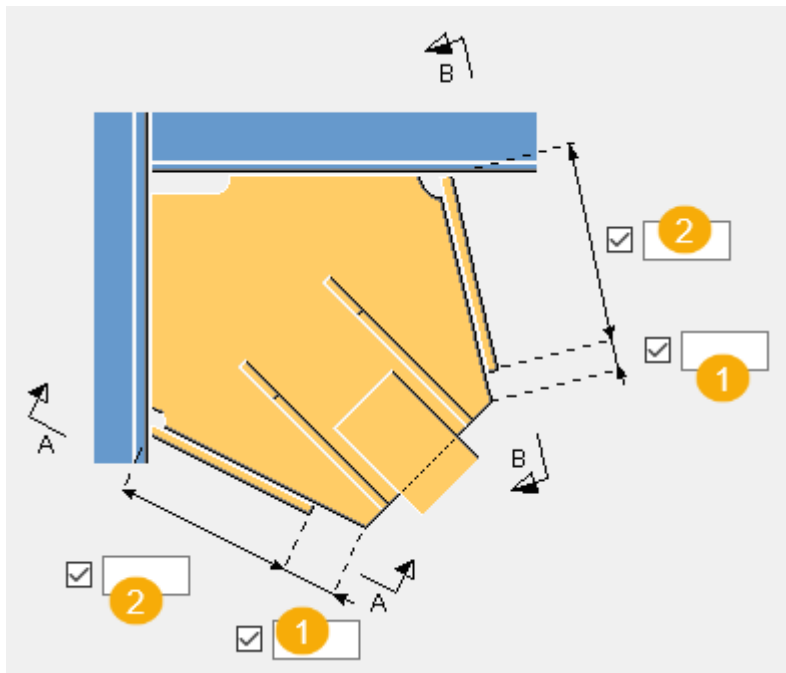
## Stiffeners

Option	Description
<b>Stiffener 1</b>	Thickness of the stiffener.
<b>Stiffener 2</b>	

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part</b>

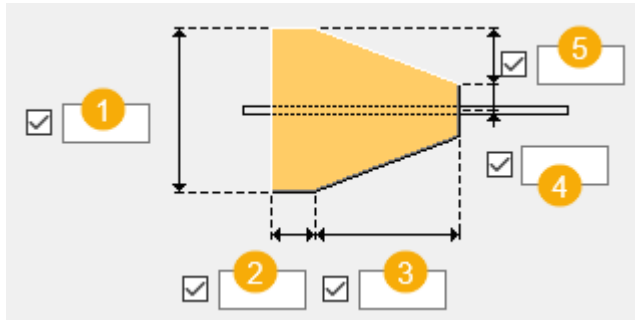
Option	Description	Default
		<b>material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Stiffener length



	Description
<b>1</b>	Distance between the stiffener edge and the gusset plate edge.
<b>2</b>	Length of stiffener.

## Stiffener dimensions

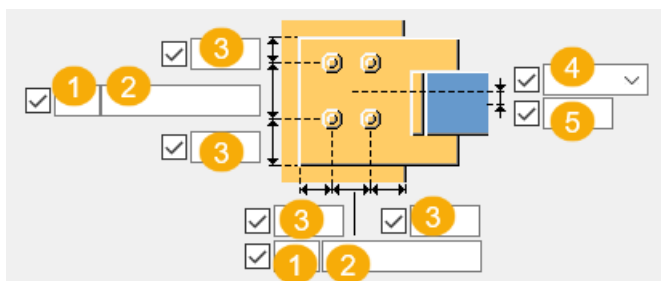
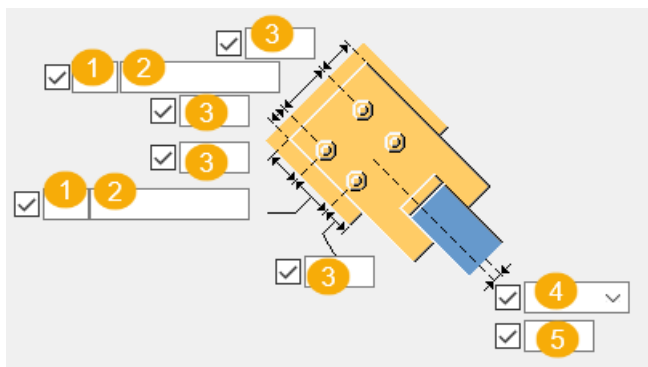


	Description
<b>1</b>	Width of the stiffener.
<b>2</b>	Length of the stiffener base.
<b>3</b>	Length of the skew part of the stiffener.
<b>4</b>	Distance from the stiffener center line.
<b>5</b>	Vertical distance between the stiffener base and the skew part.

## Brace bolts 1 / Brace bolts 2 tab

Use the **Brace bolts 1** and **Brace bolts 2** tabs to control the bolts that connect the first and second brace to the gusset plate.

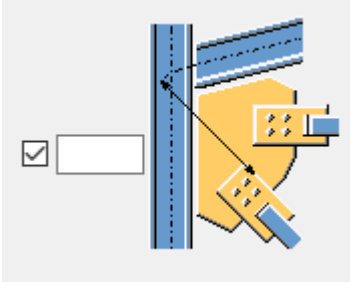
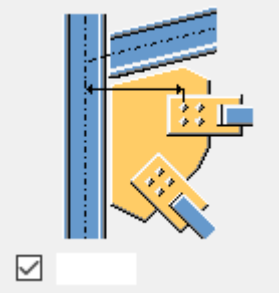
## Bolt group dimensions on connection plates






	Description
1	Number of bolts.
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Select how to measure the dimensions for vertical bolt group position.
5	Dimension for vertical bolt group position.




### Bolt distance

Define the minimum distance from the connection plate bolts to the intersection point of the main part and brace center lines. If a brace is perpendicular to the main part, the distance is measured from the main part center line to the nearest bolts.

Option	Option
	

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1

Option	Description
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Bolt basic properties

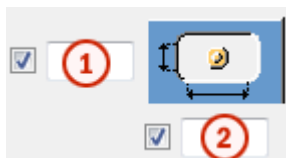
Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### Gusset side and brace side bolt type

Select the bolt type to define the location where the bolts should be attached.

### Slotted holes

You can define slotted, oversized, or tapped holes.



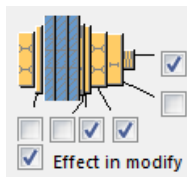
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.

Option	Description	Default
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
Rotate Slots	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
Slots in	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### General tab

Click the link below to find out more:

General tab



### **Design tab**

Click the link below to find out more:

[Design tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

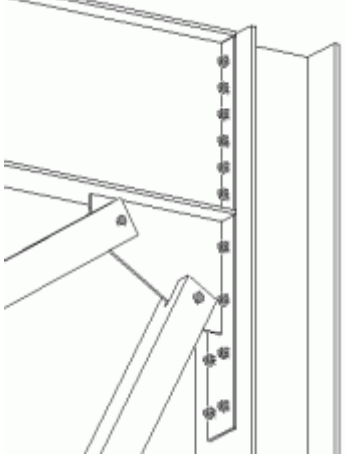
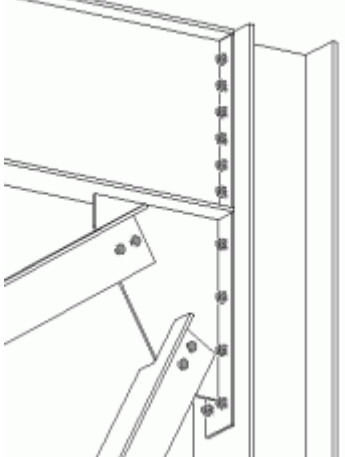
### ***Corner bolted gusset (57)***

**Corner bolted gusset (57)** connects 1 to 10 braces to the corner where two parts meet, using a gusset plate. Welds the gusset plate to the first selected part that forms the corner. Creates optional clip angles, either at the ends of the braces, or on each side. Seals RHS or tube braces.

### **Objects created**

- Gusset plate
- Clip angles (optional)
- Stiffeners
- Brace bolts
- Angle bolts
- Welds

## Use for

Situation	Description
	<p>Brace profile: RHS</p> <p>Framing type: Column and extended end plate</p> <p>Gusset plate is welded to an extended end plate. Braces are pinned to the gusset plate.</p>
	<p>Brace profile: T, L</p> <p>Framing type: Column and extended end plate</p> <p>Gusset plate is welded to an extended end plate. Braces are bolted to the gusset plate.</p>

### Before you start

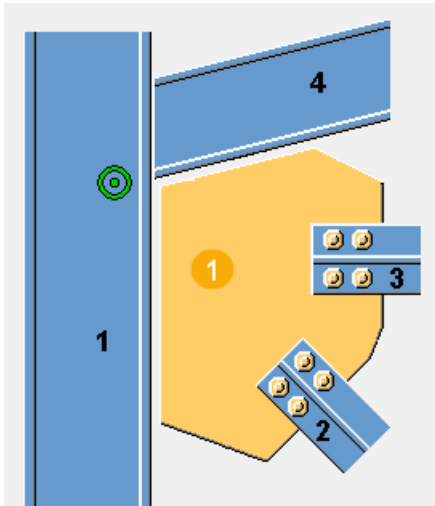
Create two parts to form a corner, and 1 to 10 braces.

### Selection order

1. Select the main part (the first part that forms the corner).  
The gusset plate is connected to this part.
2. Select the secondary part (first brace).
3. Select the second secondary part (second brace).
4. Select the subsequent secondary parts (subsequent braces).
5. Select the secondary part that forms the corner.
6. Click the middle mouse button to create the connection.

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

### Part identification key

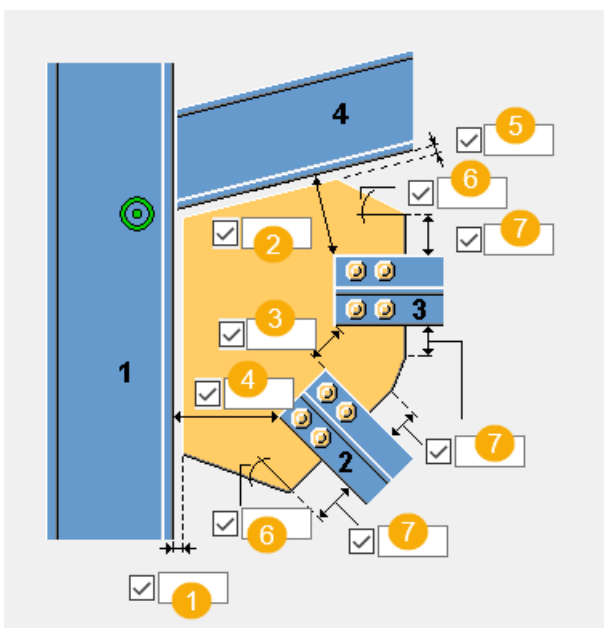


	Description
1	Gusset plate

### Picture tab

Use the **Picture** tab to define the gusset plate position and shape.

### Dimensions



	<b>Description</b>
<b>1</b>	Define the gap distance between the gusset plate edge and the main part (first part that forms the corner).
<b>2</b>	Define the edge distance between the last secondary part and the last brace.
<b>3</b>	Define the distance between the braces.
<b>4</b>	Define the edge distance between the first brace and the main part.
<b>5</b>	Define the gap distance between the gusset plate edge and the secondary part (second part that forms the corner).
<b>6</b>	Define the gusset plate corner angle (in degrees). This value affects the gusset plate shape.
<b>7</b>	Define the length of the edge of the gusset plate. This value affects the gusset plate shape.

#### **Gusset tab**

Use the **Gusset** tab to control the gusset plate properties.

#### **Gusset plate**

<b>Option</b>	<b>Description</b>
<b>Gusset</b>	Thickness, width and height of the gusset plate.




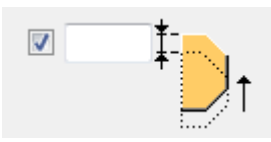
<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

Option	Description	Default
<b>Finish</b>	Describes how the part surface has been treated.	

**NOTE** The following examples show only some of the available options. You will find more options on the **Gusset** tab.



### Gusset plate position on the brace

Define where to place the gusset plate on the brace. If needed, you can fine-tune the gusset plate position by moving the gusset plate in the z or in the y direction.

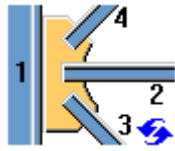
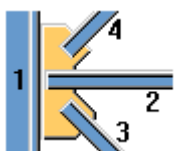
Option	Description
	Default Gusset plate is positioned in the middle of the brace. AutoDefaults can change this option.
	Gusset plate is positioned on the top flange of the brace.
	Define how much the gusset plate is moved in the z direction.
	Define how much the gusset plate is moved in the y direction.

### Gusset plate shape

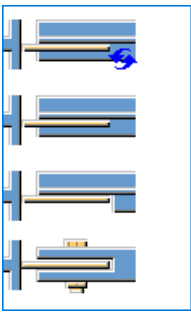
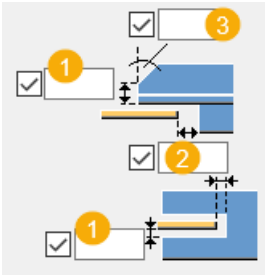
When you select the option to optimize the gusset plate weight, you can define whether the selection order of the braces affects the position of the braces.

Option	Description
	Default AutoDefaults can change this option.
	This option optimizes the gusset plate weight.



### Brace position


Option	Description
	<p>Default</p> <p>The brace position is not affected.</p> <p>AutoDefaults can change this option.</p>
	<p>The first selected brace is placed closest to the main part.</p>

### Brace notch

Option	Description
	<p>Select whether the brace is notched.</p> <p>You may want to notch the brace if the plate collides with the brace flange or if you want to create slots in the hollow braces.</p> <p>The last option creates a notch and fastens the plate to the brace by using a bolt.</p>
	<ol style="list-style-type: none"> <li>1. Vertical notch dimension</li> <li>2. Horizontal notch dimension.</li> <li>3. Notch angle.</li> </ol>


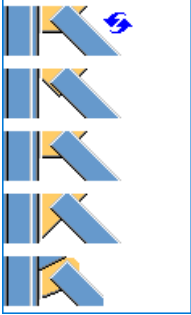
### Round cut in bracing

Option	Description
	<p>Default</p> <p>Square cut</p> <p>AutoDefaults can change this option.</p>
	<p>Square cut</p>


Option	Description
	Round cut Enter the radius value.

### Gusset plate shape





The gusset plate edge can be perpendicular either to the main part or the secondary part.

Option	Description
	Select the gusset plate edge shape between the last and second last secondary part.
	Select the gusset plate edge shape between the main part and the first secondary part.

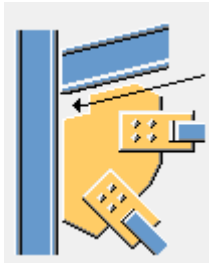
### Gusset plate fitting

Option	Description
	Select whether the gusset is fitted to the last selected secondary part.







## Gusset welding

Option	Description
	Default Gusset plate is welded to the secondary part. AutoDefaults can change this option.
	Gusset plate is welded to the secondary part.
	Gusset plate is welded to the main part.
	Gusset plate is welded to the main part and the secondary part.


## Gusset plate inner corner



Define the horizontal and vertical chamfer dimensions.

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex chamfer
	Concave chamfer
	Bevel



Option	Description
	Square

### Stiffeners tab

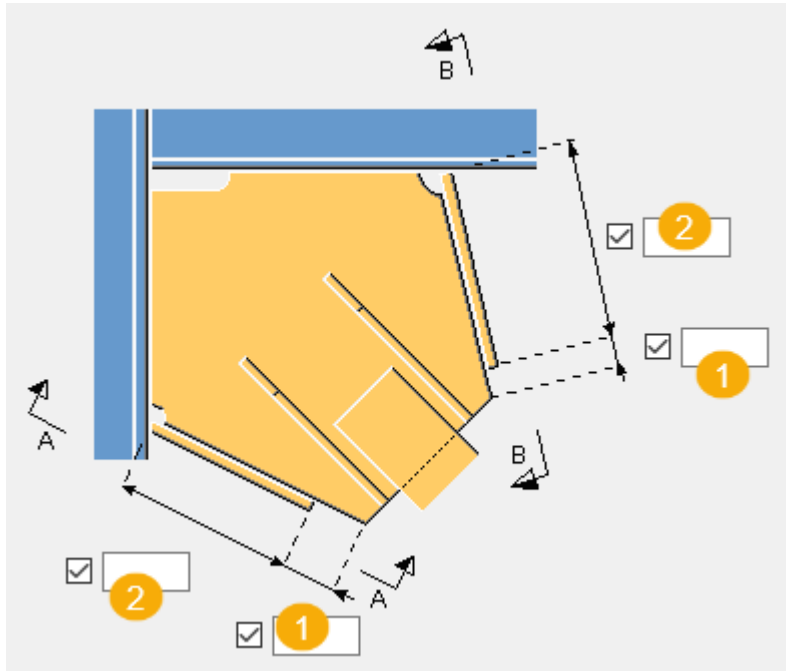
Use the **Stiffeners** tab to control the stiffener properties and dimensions.

### Stiffeners

Option	Description
<b>Stiffener 1</b> <b>Stiffener 2</b>	Thickness of the stiffener.

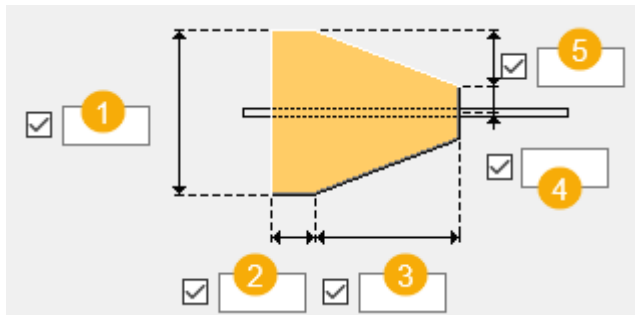
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

## Stiffener length



	Description
1	Distance between the stiffener edge and the gusset plate edge.
2	Length of stiffener.

## Stiffener dimensions

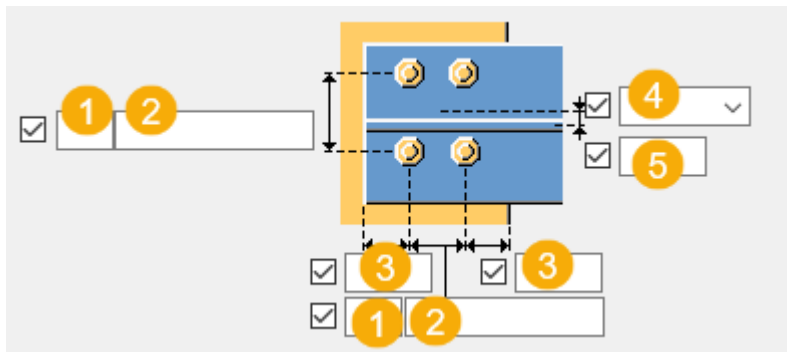
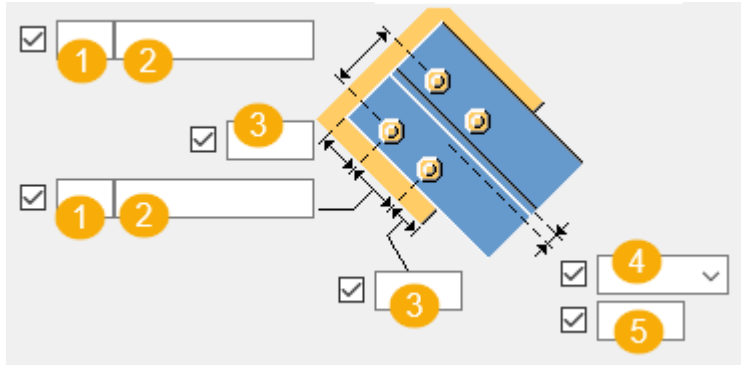


	Description
1	Width of the stiffener.
2	Length of the stiffener base.
3	Length of the skew part of the stiffener.
4	Distance from the stiffener center line.
5	Vertical distance between the stiffener base and the skew part.

### Brace bolts 1 / Brace bolts 2 tabs

Use the **Brace bolts 1** and **Brace bolts 2** tabs to control the bolts that connect the first and subsequent braces to the gusset plate.

### Bolt group dimensions

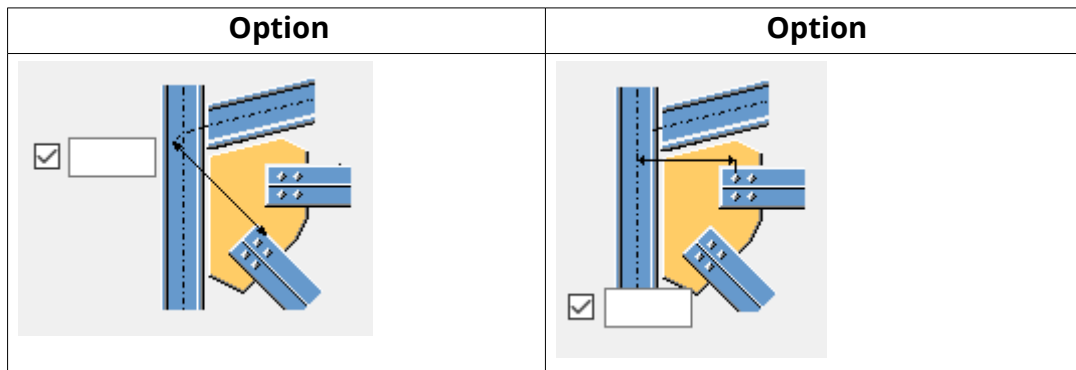


	Description
<b>1</b>	Number of bolts.
<b>2</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Select how to measure the dimensions for vertical bolt group position.
<b>5</b>	Dimension for vertical bolt group position.

### Bolt distance

Define the minimum distance from the connection plate bolts to the intersection point of the main part and brace center lines. If a brace is

perpendicular to the main part, the distance is measured from the main part center line to the nearest bolts.

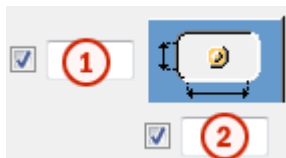


### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### Slotted holes

You can define slotted, oversized, or tapped holes.



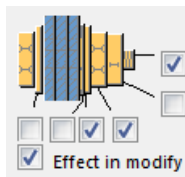
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.

Option	Description	Default
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
Rotate Slots	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
Slots in	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.




To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.






### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.

Option	Description
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Angle bolts tab

Use the **Angle bolts** tab to define the clip angles and to control the bolts that connect the clip angle to the gusset plate.

### Part

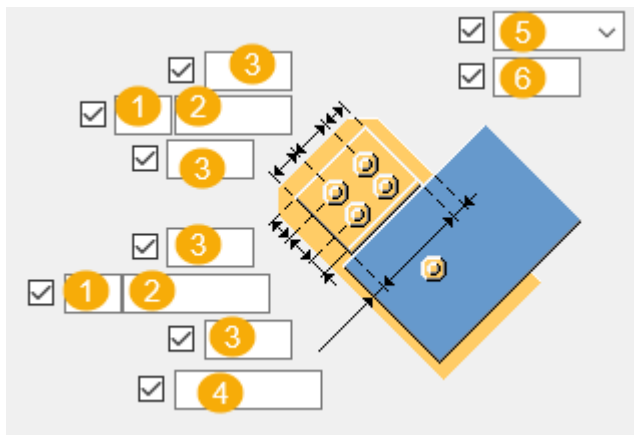
Part	Description
<b>L profile</b>	Select the clip angle profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site


### Bolt group dimensions



	Description
<b>1</b>	Number of bolts.
<b>2</b>	Bolt spacing.  Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

	Description
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Clip angle edge distance to the brace edge.
<b>5</b>	Select how to measure the dimensions for horizontal bolt group position.
<b>6</b>	Dimension for horizontal bolt group position.

### Clip angle position

Option	Description
	Select the clip angle position.

### General tab

Click the link below to find out more:  
[General tab](#)

### Design tab

Click the link below to find out more:  
[Design tab](#)

### Analysis tab

Click the link below to find out more:  
[Analysis tab](#)

### Welds

Click the link below to find out more:



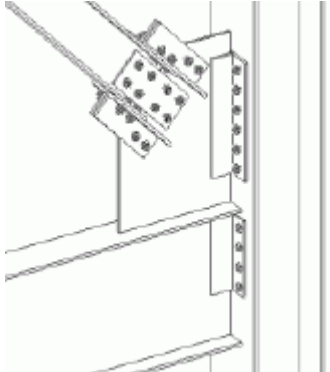
### **Wraparound gusset (58)**

**Wraparound gusset (58)** connects 1 to 10 braces to the corner where two or three parts meet, usually two beams and a column, using a gusset plate. The gusset plate can be wrapped around the third part, usually a column. Bolts or welds the brace web to the gusset plate using connection plates, and bolts or welds the brace flange to the gusset plate using clip angles. Either connects the gusset plate directly to the two beams, or uses clip angles or shear tabs, or connection plates. The brace profile can be C or W.

#### **Objects created**

- Gusset plate
- Clip angles
- Shear tabs
- Connection plates
- Shim plates
- Bolts
- Cuts
- Welds

#### **Use for**

Situation	Description
	Brace profile: W Framing type: Beam and column Gusset plate is bolted to the column flange using a clip angle. Braces are bolted to the gusset plate using a connection plate and clip angles.

#### **Before you start**

Create 2 or 3 parts that form a corner, and 1 to 10 braces.

---

**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

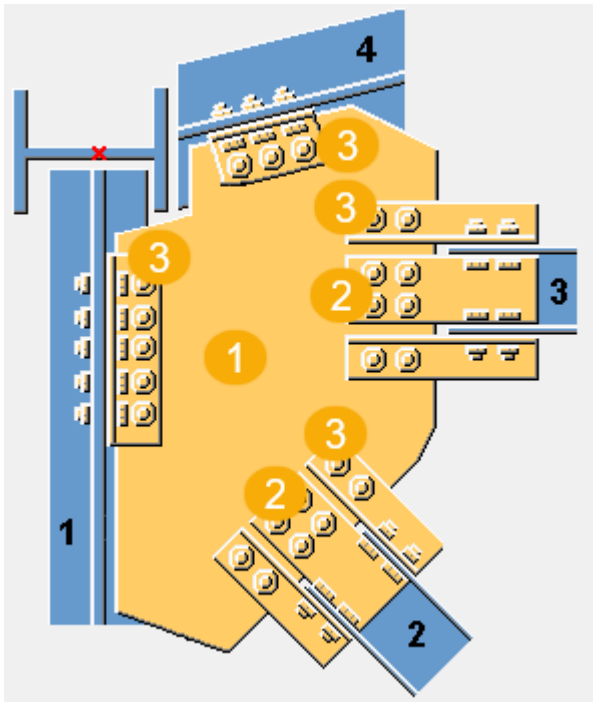
---

#### **Selection order**

1. Select the main part (the first part that forms the corner).

2. Select the secondary part (first brace).
3. Select the second secondary part (second brace).
4. Select the subsequent secondary parts (subsequent braces).
5. Select the secondary part that forms the corner.
6. If needed, select the column to wrap the gusset plate around the column where two beams and the column meet.
7. Click the middle mouse button to create the component.

### Part identification key

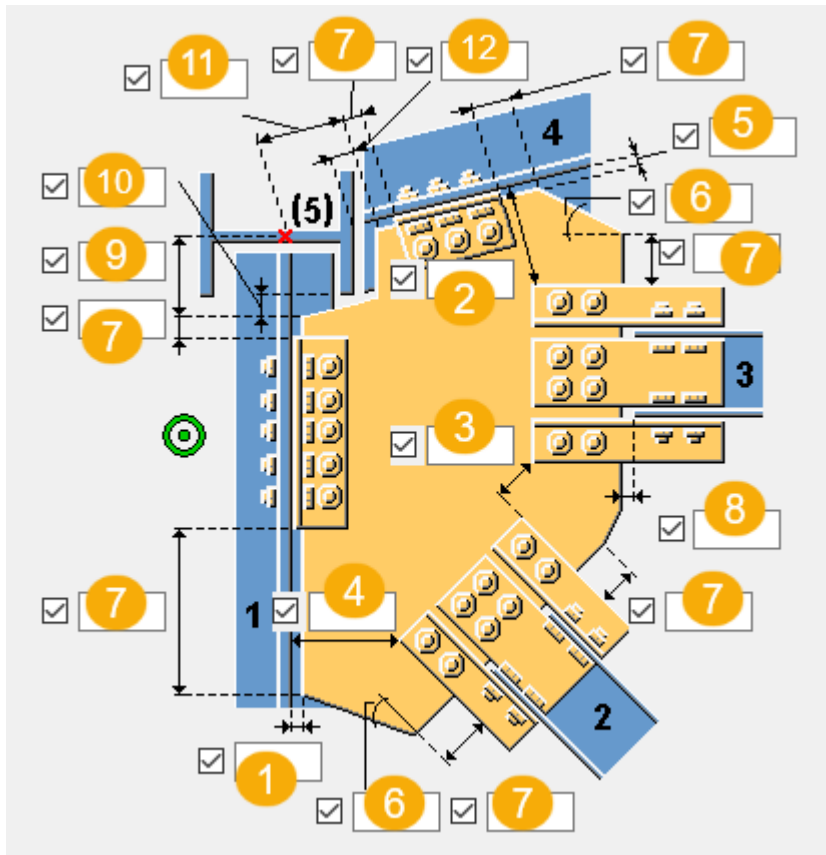


	Description
1	Gusset plate
2	Connection plate
3	Clip angle

### Picture tab

Use the **Picture** tab to define the shape of the gusset plate, location of the braces and clip angles, and the work point location.

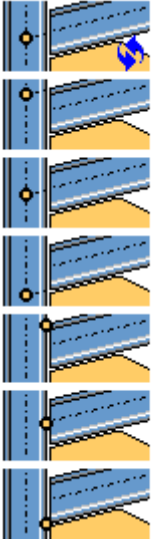
## Dimensions



	Description
1	Define the gap distance between the gusset plate edge and the main part.
2	Define the edge distance between the last secondary part and the last brace.
3	Define the distance between the braces.
4	Define the edge distance between the first brace and the main part.
5	Define the gap distance between the gusset plate edge and the secondary part (second part that forms the corner).
6	Define the gusset plate corner angle (in degrees). This value affects the gusset plate shape.
7	Define the length of the edge of the gusset plate. This value affects the gusset plate shape.
8	Define the gap distance between the gusset plate edge and the brace.
9	Define the gusset plate edge distance in relation to the work point.

	Description
10	Define the gusset plate edge distance to the flange of the third part.
11	Define the clip angle edge distance in relation to the work point.
12	Define the clip angle edge distance to the flange of the third part.

### Work point position

Option	Description
	<p>Select the work point position. The default position is the point where the two main parts intersect.</p> <p>Tekla Structures uses the work point of a component to calculate check dimensions and part position dimensions in drawings.</p>

### Gusset tab

Use the **Gusset** tab to define gusset plate, connection plate and clip angle properties.




### Parts

Option	Description
<b>Gusset</b>	Thickness, width and height of the gusset plate.
<b>Connection plates</b>	Thickness and height of the connection plates.
<b>Upper clip angle</b> <b>Lower clip angle</b>	Select the clip angle profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Gusset plate connection

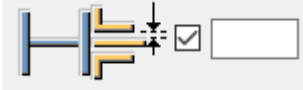
Define how the gusset plate is connected to the main part.

Option	Description
	Default Gusset plate is connected to the main part with a clip angle. AutoDefaults can change this option.
	Gusset plate is connected to the main part with clip angles. Select to which side of the gusset plate the clip angles are created.
	Gusset plate is connected to the main part with a connection plate. Select to which side of the gusset plate the connection plate is created.

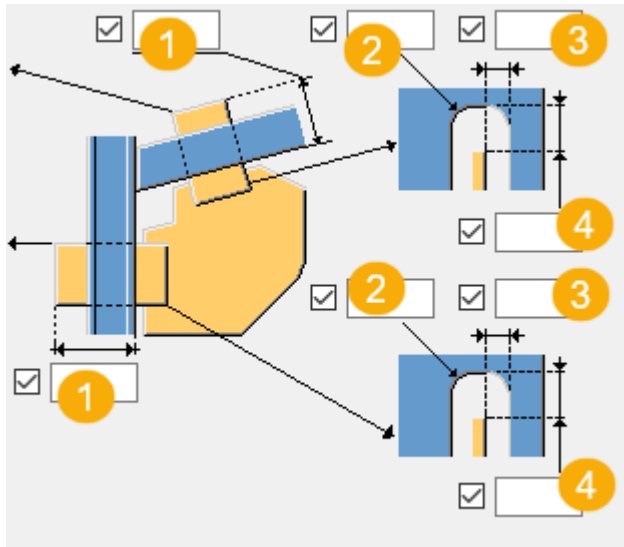
### Erection clearance

You can define the clearance for both the main part and the last secondary part connection plates or clip angles.

## Gap dimensions

Option	Description
	Define the gap dimension between the gusset plate and the connection plates or the clip angles.



## Connection plate cut through dimensions



	Description
1	Connection plate cut through length
2	Chamfer radius
3	Horizontal chamfer dimension
4	Vertical chamfer dimension



## Clip angle orientation

Define how the clip angle is placed on the connection.

Option	Description
	Default Clip angle is placed on the connection so that the longer leg is connected to the gusset plate. AutoDefaults can change this option.
	Clip angle is placed on the connection so that the longer leg is connected to the main part.




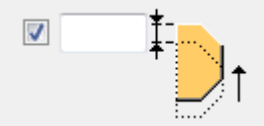
### Gusset plate shape

When you select the option to optimize the gusset plate weight, you can define whether the selection order of the braces affects the position of the braces.


Option	Description
	Default AutoDefaults can change this option.
	This option optimizes the gusset plate weight.



### Gusset plate position on the brace

Define where to place the gusset plate on the brace. If needed, you can fine-tune the gusset plate position by moving the gusset plate in the z or in the y direction.








Option	Description
	Default Gusset plate is positioned in the middle of the brace. AutoDefaults can change this option.
	Gusset plate is positioned on the top flange of the brace.
	Define how much the gusset plate is moved in the z direction.
	Define how much the gusset plate is moved in the y direction.

### Notch angle

Option	Description
	Default Square notch

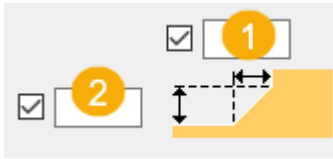
Option	Description
	<p>If the gusset plate clashes with the column, the gusset plate is notched to wrap around the column.</p> <p>AutoDefaults can change this option.</p>
	Square notch
	Bevel notch

### Notch chamfer type

Option	Description
	<p>Default</p> <p>Bevel chamfer</p> <p>AutoDefaults can change this option.</p>
	<p>No chamfer</p> <p>Notched edges are parallel to the edges of the gusset plate.</p>
	Bevel chamfer
	<p>Rounded chamfer calculated as a quarter of a circle.</p> <p>Enter the diameter of the circle as the horizontal dimension of the chamfer.</p>
	<p>Rounded chamfer calculated as a three quarters of a circle.</p> <p>Enter the diameter of the circle as the horizontal dimension of the chamfer.</p> <p>The center point of the circle is the corner of the notch.</p>
	Corner of the gusset plate is beveled.
	Corner of the gusset plate is not notched or chamfered.



### Chamfer dimensions



	Description
1	Horizontal dimension of the chamfer
2	Vertical dimension of the chamfer

### Gusset plate shape

The gusset plate edge can be perpendicular either to the main part or the secondary part.

Option	Description
	Select the gusset plate edge shape between the last and second last secondary part.
	Select the gusset plate edge shape between the main part and the first secondary part.

### Brace conn tab

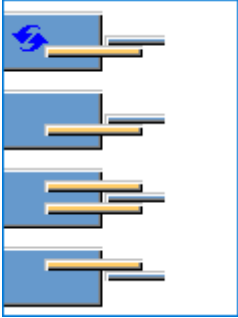
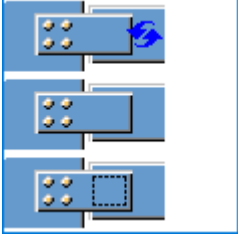
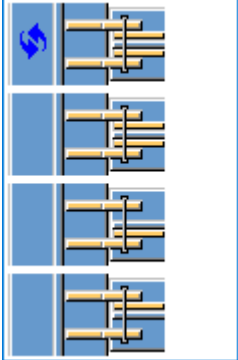
Use the **Brace conn** tab to control the properties of connection plates, clip angles, filler plates, and shear tabs, and the angle connection profile.

## Plates

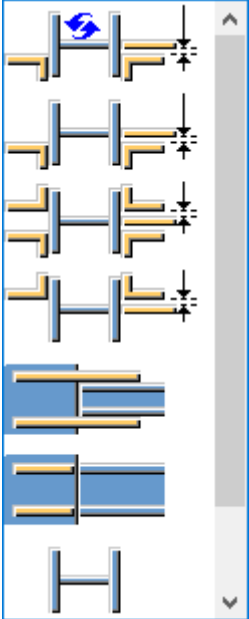
Option	Description
<b>Connection plate</b>	Thickness and width of the connection plate. Select the connection plate profile.
<b>Upper clip angle</b> <b>Lower clip angle</b>	Select the clip angle profile.
<b>Filler plate</b>	Thickness, width and height of the filler plate.
<b>Upper shear tab</b>	Thickness, width and height of the upper shear tab.
<b>Lower shear tab</b>	Height of the lower shear tab.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

## Plate creation



Option	Description
	<p>Select whether one or two connection plates are created between the brace web and the gusset plate.</p>
	<p>Select whether a filler plate is created between the connection plate and the brace web.</p> <p>The default is that a filler plate is not created.</p>
	<p>Select the filler plate creation side.</p> <p>You can use this option when you have selected to create two connection plates.</p>

## Clip angle creation

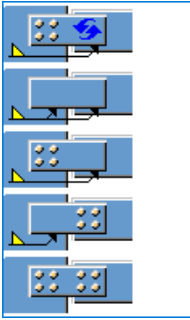
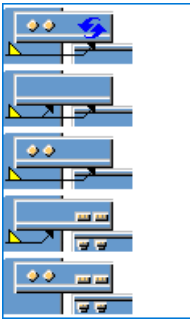
Option	Description
	<p>Define whether the braces are attached to the gusset plate using clip angles or shear tabs, and specify the number of clip angles to create.</p> <p>The default option is to create two clip angles below the brace web.</p>

## Clip angle orientation

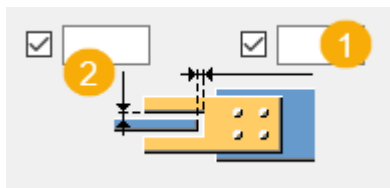
Define how the clip angle is placed on the connection.

Option	Description
	<p>Default</p> <p>Clip angle is placed on the connection so that the longer leg is connected to the gusset plate.</p> <p>AutoDefaults can change this option.</p>
	<p>Clip angle is placed on the connection so that the longer leg is connected to the main part.</p>

## Connection type

Option	Description
	Select the connection type (weld or bolts) between the gusset plate and the connection plate.
	Select the connection type (weld or bolt) between the gusset plate and the L profile.

## Connection plate gap dimensions



	Description
1	Horizontal gap dimension
2	Vertical gap dimension

## Shim plates

Use the **Shim plates** tab to define shim plate properties.

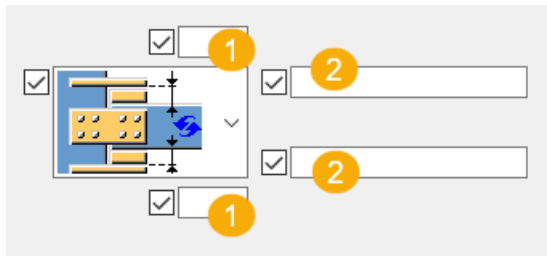
## Plates

Option	Description
<b>Shim plate 1</b> <b>Shim plate 2</b> <b>Shim plate 3</b>	Thickness, width and height of the shim plates.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Shim plate position

You can create shim plates when connecting braces to the gusset plate using clip angles.

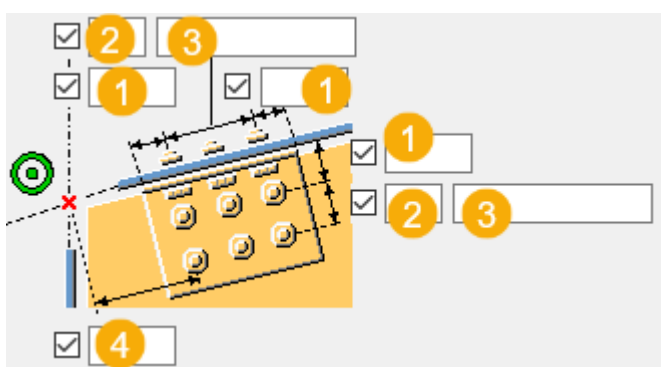
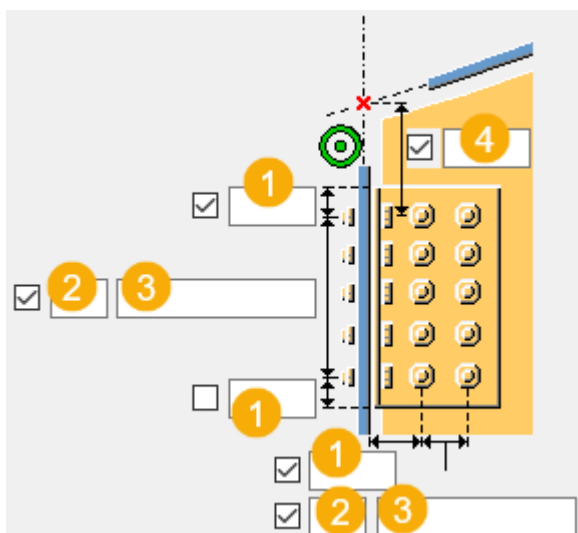


	Description
<b>1</b>	Define the gap between the brace and connection plate.
<b>2</b>	Define how many shim plates are created at the top and bottom flanges.  Enter the shim plate profile numbers: 1, 2 or 3. These are the numbers that are on the upper part on the <b>Shim plates</b> tab.  For example, if you want to create three shim plates at the top flange, and you want to use <b>Shim plate 1</b> twice and <b>Shim plate 1</b> once, enter 1 1 2. The first number you enter is the shim plate closest to the brace flange.

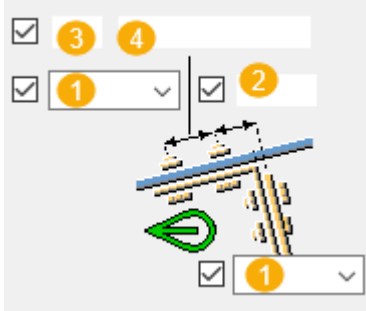
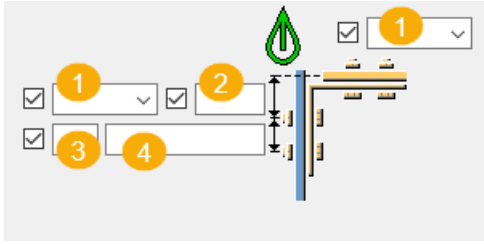
### Gusset bolts 1 / Gusset conn 2 tab

Use the **Gusset bolts 1** and **Gusset conn 2** tabs to control the bolt group properties for bolts that connect the gusset plate to the main part and the secondary part, and to control the clip angle attachment.

### Bolt group dimensions



<b>1</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>2</b>	Number of bolts.
<b>3</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>4</b>	Vertical bolt group dimension in relation to the work point. Work point is the intersection point between the center lines of the main part and the last secondary part.



	Description
1	Location where the bolts should be attached.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### Bolt basic properties

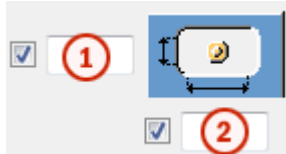
Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the	Yes



Option	Description	Default
	<p>bolted parts when bolts are used with a shaft.</p> <p>This has no effect when full-threaded bolts are used.</p>	

### Slotted holes

You can define slotted, oversized, or tapped holes.

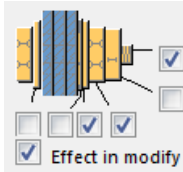


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<p><b>Slotted</b> creates slotted holes.</p> <p><b>Oversized</b> creates oversized or tapped holes.</p> <p><b>No hole</b> does not create holes.</p>	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

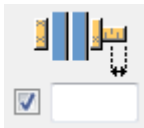
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.







### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.









### Clip angle attachment type

Define how the clip angle is attached to the gusset plate and to the main part.

Option	Description
	<p>Default</p> <p>When the main part is a tube profile, the clip angles are welded to the main part and bolted to the secondary part. Otherwise the clip angles are bolted to both parts.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>When the main part is a tube profile, the clip angles are welded to the main part and bolted to the secondary part. Otherwise the clip angles are bolted to both parts.</p>
	<p>Main part is bolted and secondary part is welded.</p>
	<p>Main part is welded and secondary is part bolted.</p>
	<p>Both parts are bolted.</p>
	<p>Both parts are welded.</p>

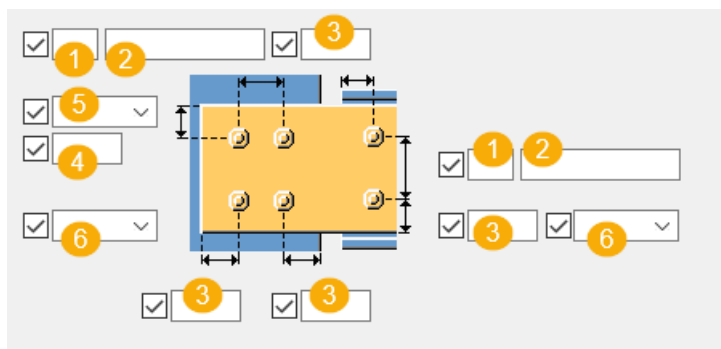
## Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

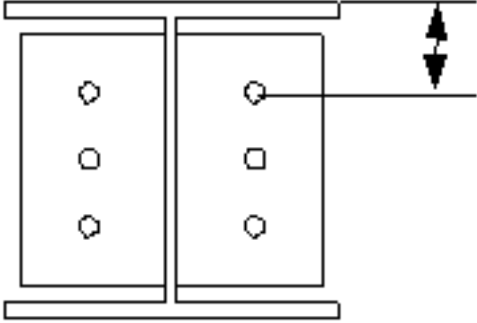
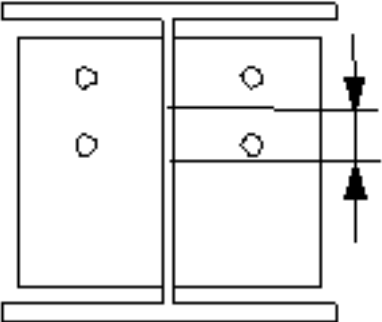
### Brace bolts 1 / Brace bolts 2 tab

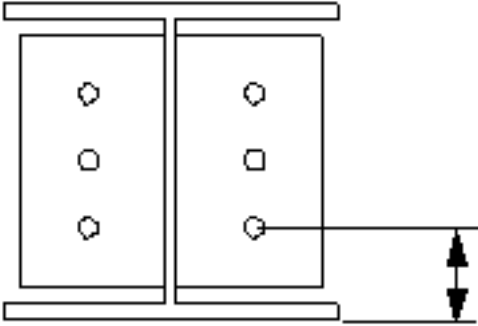
Use the **Brace bolts 1** and **Brace bolts 2** tabs to control the bolts that connect the braces to the gusset plate.

### Bolt group dimensions

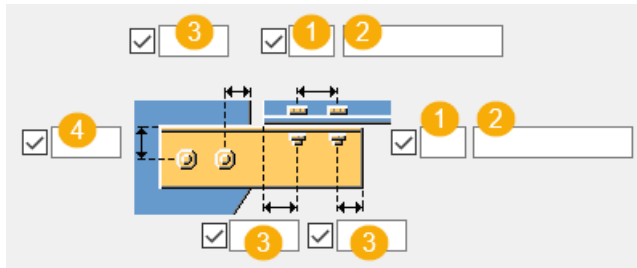


	Option
1	Number of bolts.
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

	<b>Option</b>
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Dimension for vertical bolt group position.
<b>5</b>	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> <div style="text-align: center; margin: 10px 0;">  </div> <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul> <div style="text-align: center; margin: 10px 0;">  </div>

	Option
	<ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
6	Select the bolt type.

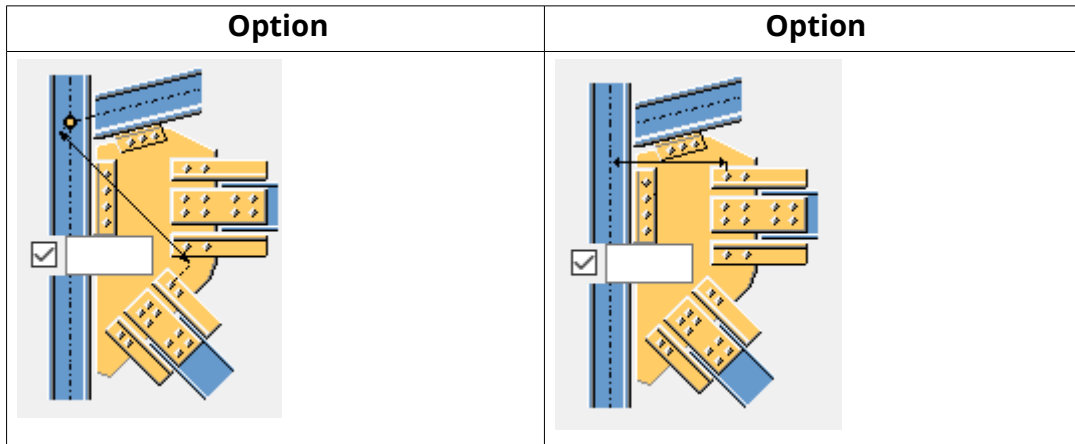
### Angle bolt group dimensions





	Option
1	Number of bolts.
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Dimension for vertical bolt group position.

### Bolt distance

Define the minimum distance from the connection plate bolts to the intersection point of the main part and brace center lines. If a brace is perpendicular to the main part, the distance is measured from the main part center line to the nearest bolts.



### Vertical bolt position

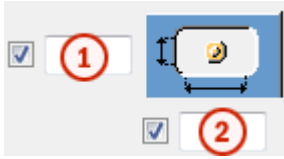
Option	Description
	Bolt position from the L profile edge.
	Bolt position from the secondary part center line.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### Slotted holes

You can define slotted, oversized, or tapped holes.

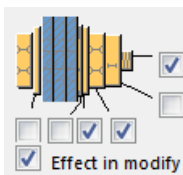


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<p><b>Slotted</b> creates slotted holes.</p> <p><b>Oversized</b> creates oversized or tapped holes.</p> <p><b>No hole</b> does not create holes.</p>	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.









To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.




## Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Clip angle extra bolts 1 tab

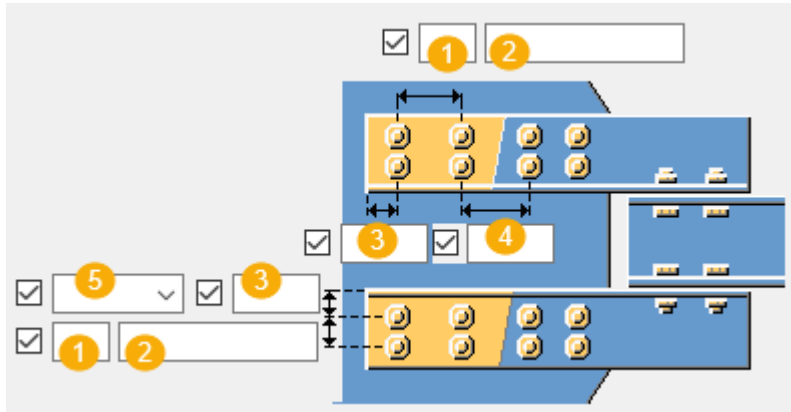
Use the **Clip angle extra bolts 1** tab to define the clip angle bolt group dimensions and bolt properties.

### Clip angle extensions

	Select whether clip angles are extended, and the extension sides.
---	---

Define the bolt group dimensions of the clip angle extensions.





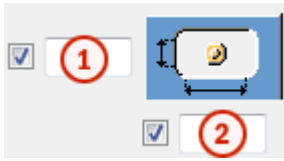
	Description
1	Number of bolts.
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Bolt spacing to the bolts in the clip angle extension.
5	Location where the bolts should be attached.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

## Slotted holes

You can define slotted, oversized, or tapped holes.

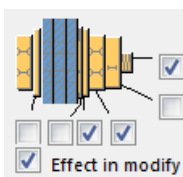


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

## Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## Bolt length increase

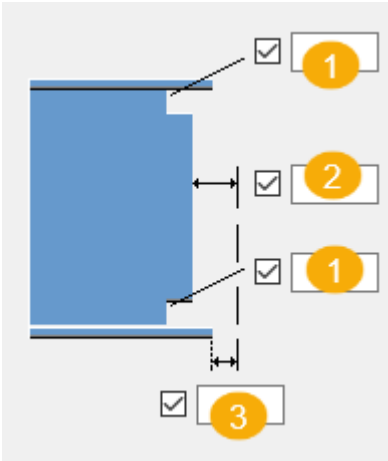
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Beam cut tab

Use the **Beam cut** tab to control weld access holes, beam end preparations, and flange cuts.



### Weld access hole dimensions









	Option
1	Dimension for the top and the bottom weld access holes.
2	Gap between the secondary part web and the main part.
3	Gap between the secondary part bottom flange and the main part.

### Weld access holes







Option	Option	Description
		Default Round weld access hole AutoDefaults can change this option.
		Round weld access hole
		Square weld access hole

Option	Option	Description
		Diagonal weld access hole

### Flange cut

Option for top flange	Option for bottom flange	Description
		Default Flange is not cut. AutoDefaults can change this option.
		Flange is not cut.
		Flange is cut.

### Beam end preparation

Option	Description
	Default Top and bottom flange are prepared. AutoDefaults can change this option.
	Automatic Top and bottom flange are prepared.
	Beam end is not prepared.
	Top and bottom flange are prepared.
	Top flange is prepared.
	Bottom flange is prepared.

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

[Design tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

[Create welds](#)

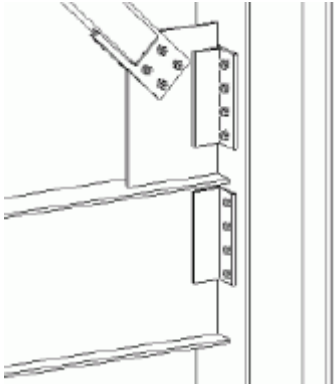
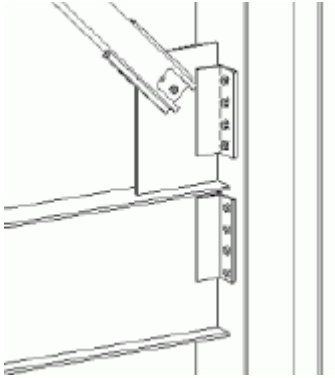
### ***Hollow brace wraparound gusset (59)***

**Hollow brace wraparound gusset (59)** connects 1 to 10 braces to the corner where 2 or 3 parts meet, using a gusset plate. The gusset plate can be wrapped around the third part, usually a column. Bolts or welds the brace web to the gusset plate using connection plates, and bolts or welds the brace flange to the gusset plate using clip angles. Either connects the gusset plate directly to the existing parts, or uses clip angles or connection plates. Seals braces.

### **Objects created**

- Gusset plate
- Connection plates (optional)
- Clip angles (optional)
- Seal plates
- Tongue plates
- Cover plate
- Bolts
- Welds

## Use for

Situation	Description
	<p>Brace profile: RHS</p> <p>Framing type: Beam and column</p> <p>Gusset plate is bolted to the column flange using a clip angle. Braces are bolted to the gusset plate using a tongue plate.</p>
	<p>Brace profile: RHS</p> <p>Framing type: Beam and column</p> <p>Gusset plate is bolted to the column flange using a clip angle. Braces are welded to the connection plate. The end of the brace is notched to accommodate the bolts in the connection between the connection plate and the gusset plate.</p>

## Before you start

Create 2 or 3 parts that form a corner, and 1 to 10 braces.

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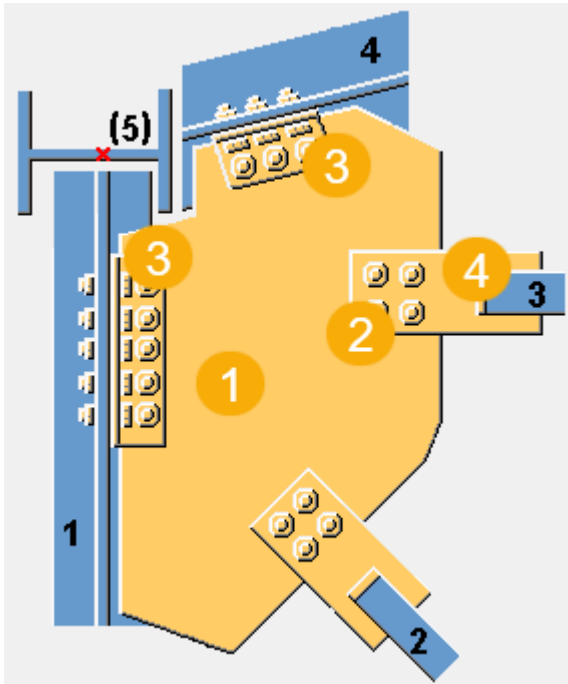
**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

---

## Selection order

1. Select the main part (the first part that forms the corner).
2. Select the secondary part (first brace).
3. Select the second secondary part (second brace).
4. Select the subsequent secondary parts (subsequent braces).
5. Select the secondary part that forms the corner (Tekla Structures connects the gusset plate to this part).
6. If needed, select the column to wrap the gusset plate around the column where two beams and the column meet.
7. Click the middle mouse button to create the connection.

## Part identification key

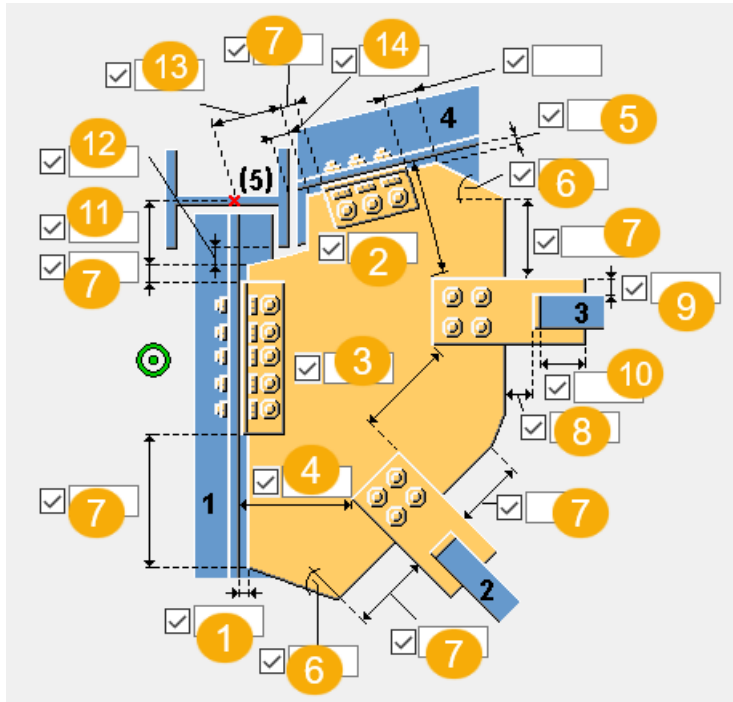


	Description
1	Gusset plate
2	Connection plate
3	Clip angle
4	Seal plate

### Picture tab

Use the **Picture** tab to define the shape of the gusset plate, location of the braces and clip angles, and the work point location.

## Dimensions

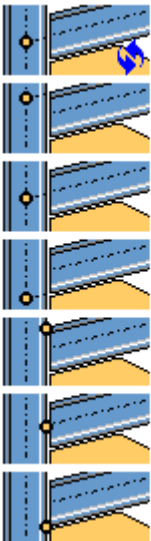


	Description
1	Define the gap distance between the gusset plate edge and the main part.
2	Define the edge distance between the last secondary part and the last brace.
3	Define the distance between the braces.
4	Define the edge distance between the first brace and the main part.
5	Define the gap distance between the gusset plate edge and the secondary part (second part that forms the corner).
6	Define the gusset plate corner angle (in degrees). This value affects the gusset plate shape.
7	Define the length of the edge of the gusset plate. This value affects the gusset plate shape and connection plate width.
8	Define the gap distance between the gusset plate edge and the seal plate.
9	Define the length of the edge of the connection plate.
10	Define the brace dimension on the connection plate. To prevent the connection plate from penetrating the hollow brace, enter a negative value for the dimension.



	<b>Description</b>
<b>11</b>	Define the gusset plate edge distance in relation to the work point.
<b>12</b>	Define the gusset plate edge distance to the flange of the third part.
<b>13</b>	Define the clip angle edge distance in relation to the work point.
<b>14</b>	Define the clip angle edge distance to the flange of the third part.

### Work point position

<b>Option</b>	<b>Description</b>
	<p>Select the work point position. The default position is the point where the two main parts intersect.</p> <p>Tekla Structures uses the work point of a component to calculate check dimensions and part position dimensions in drawings.</p>

### Gusset tab

Use the **Gusset** tab to define the gusset plate, connection plate and clip angle properties.

### Parts




<b>Option</b>	<b>Description</b>
<b>Gusset</b>	Thickness, width and height of the gusset plate.
<b>Connection plates</b>	Thickness and height of the connection plates.
<b>Upper clip angle</b> <b>Lower clip angle</b>	Select the clip angle profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

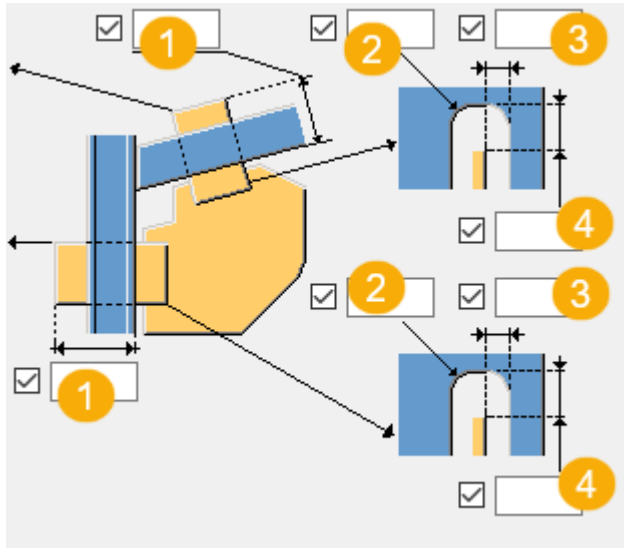
**NOTE** The following examples show only some of the available options. You will find more options on the **Gusset** tab.

### Gusset plate connection

Define how the gusset plate is connected to the main part.

Option	Description
	Default Gusset plate is connected to the main part with a clip angle. AutoDefaults can change this option.
	Gusset plate is connected to the main part with clip angles. Select to which side of the gusset plate the clip angles are created.
	Gusset plate is connected to the main part with a connection plate. Select to which side of the gusset plate the connection plate is created.



## Connection plate cut through dimensions



	Description
1	Connection plate cut through length
2	Chamfer radius
3	Horizontal chamfer dimension
4	Vertical chamfer dimension

## Clip angle orientation

Define how the clip angle is placed on the connection.



Option	Description
	<p>Default</p> <p>Clip angle is placed on the connection so that the longer leg is connected to the gusset plate.</p> <p>AutoDefaults can change this option.</p>
	<p>Clip angle is placed on the connection so that the longer leg is connected to the main part.</p>

## Erection clearance

You can define the clearance for both the main part and the last secondary part connection plates or clip angles.




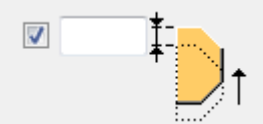
## Gusset plate shape

When you select the option to optimize the gusset plate weight, you can define whether the selection order of the braces affects the position of the braces.



Option	Description
	Default AutoDefaults can change this option.
	This option optimizes the gusset plate weight.


### Gusset plate position on the brace

Define where to place the gusset plate on the brace. If needed, you can fine-tune the gusset plate position by moving the gusset plate in the z or in the y direction.








Option	Description
	Default Gusset plate is positioned in the middle of the brace. AutoDefaults can change this option.
	Gusset plate is positioned on the top flange of the brace.
	Define how much the gusset plate is moved in the z direction.
	Define how much the gusset plate is moved in the y direction.

### Notch angle

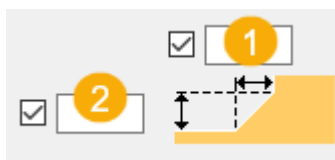
Option	Description
	Default Square notch If the gusset plate clashes with the column, the gusset plate is notched to wrap around the column. AutoDefaults can change this option.
	Square notch

Option	Description
	Bevel notch

### Notch chamfer type

Option	Description
	Default Bevel chamfer AutoDefaults can change this option.
	No chamfer Notched edges are parallel to the edges of the gusset plate.
	Bevel chamfer
	Rounded chamfer calculated as a quarter of a circle. Enter the diameter of the circle as the horizontal dimension of the chamfer.
	Rounded chamfer calculated as a three quarters of a circle. Enter the diameter of the circle as the horizontal dimension of the chamfer. The center point of the circle is the corner of the notch.
	Corner of the gusset plate is beveled.
	Corner of the gusset plate is not notched or chamfered.


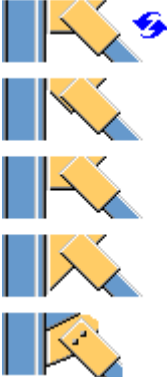
### Chamfer dimensions



	Description
1	Horizontal dimension of the chamfer
2	Vertical dimension of the chamfer

## Gusset plate shape

The gusset plate edge can be perpendicular either to the main part or the secondary part.

Option	Description
	<p>Select the gusset plate edge shape between the last and second last secondary part.</p>
	<p>Select the gusset plate edge shape between the main part and the first secondary part.</p>

## Brace conn tab

Use the **Brace conn** tab to control the connection plate, seal plate, tongue plate, and cover plate properties.


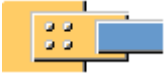


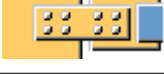
### Parts

Option	Description
<b>Connection plate</b>	Thickness, width and height of the connection plate.
<b>Seal plates</b>	Thickness and height of the seal plates.
<b>Tongue plate</b>	Thickness and height of the tongue plate.
<b>Cover plate</b>	Thickness, width and height of the cover plate.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Brace connection types

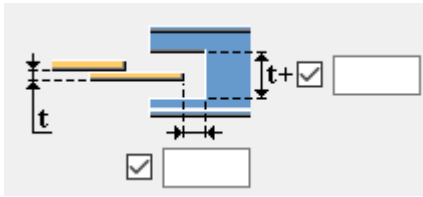
Define how the brace is connected to the connection plate.

Option	Description
	Default Brace is welded. AutoDefaults can change this option.
	Brace is welded.
	Brace is bolted.
	Brace is welded and notched around the nuts.
	Tongue plate and cover plate are created.




### Cut in bracing

Define the width of the cut in the bracing, where **t** is the thickness of the connection plate.

Define the length of the cut in the bracing from the edge of the connection plate.







### Round cut in bracing

Option	Description
	Default Square cut AutoDefaults can change this option.
	Square cut
	Round cut Enter the radius value.

### Connection plate




Define whether the brace is notched or the connection plate cut when the connection plate is connected to the brace.

Option	Description
	Default Brace is notched. AutoDefaults can change this option.
	Brace is notched.
	Connection plate is cut.
	If you cut the connection plate, you can define the size of the gap between the brace and the connection plate.




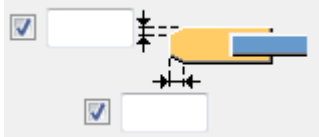
### Number of connection plates

Define whether one or two connection plates are used for connecting the brace to the gusset plate.






Option	Description
	Default One connection plate. AutoDefaults can change this option.
	One connection plate.
	Two connection plates

### Connection plate chamfer

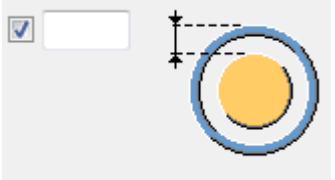
Option	Description
	Default No chamfers are created. AutoDefaults can change this option.
	No chamfers are created.
	Chamfers are created.
	If you create chamfers, define the vertical and horizontal chamfer dimensions.

### End plates

If you use the end plates to seal the braces, define the end plate shape and dimensions.

Option	Description
	Default Square end plate. AutoDefaults can change this option.
	Square end plate.
	Round end plate.

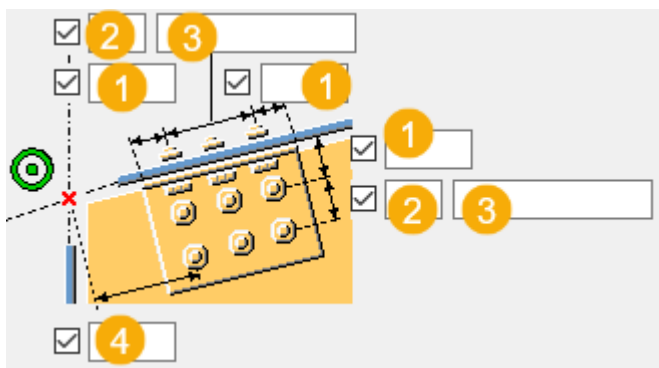
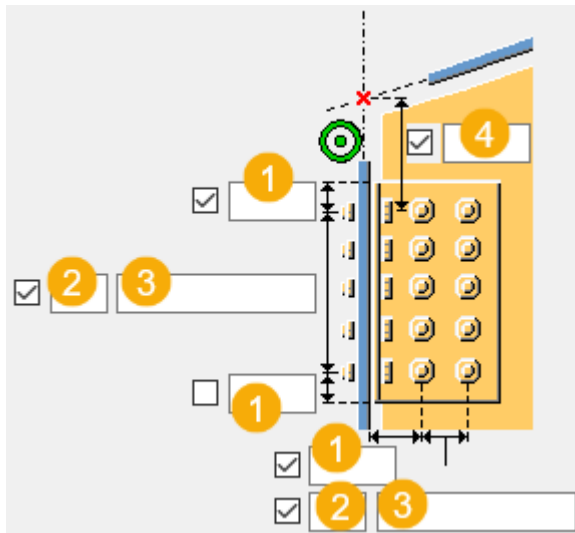
## End plate edge distance

Option	Description
	End plate edge distance from the brace outer edge.

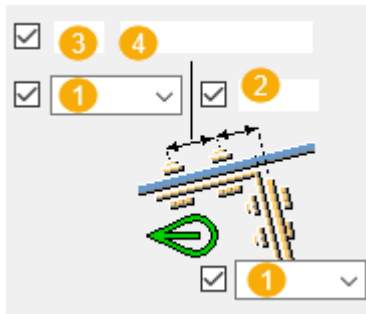
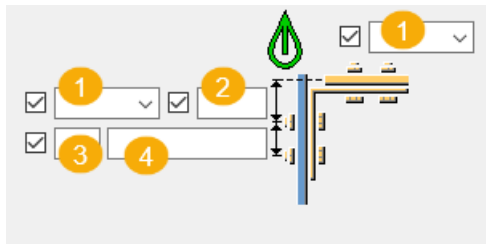
## Gusset conn 1 / Gusset conn 2 tab

Use the **Gusset conn 1** and **Gusset conn 2** tabs to control the bolt group properties for bolts that connect the gusset plate to the main part and secondary parts, and to control the clip angle attachment.

## Bolt group dimensions



	Description
1	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Number of bolts.
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
4	Vertical bolt group dimension in relation to the work point.



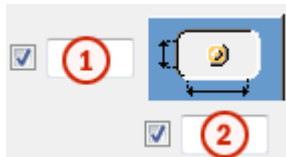
1	Location where the bolts should be attached.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

## Slotted holes

You can define slotted, oversized, or tapped holes.



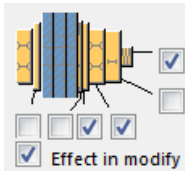
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options	

Option	Description	Default
	depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

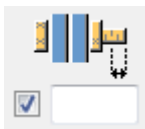
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase




Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.









### Clip angle attachment type

Define how the clip angle is attached to the gusset plate and to the main part.

Option	Description
	<p>Default</p> <p>When the main part is a tube profile, the clip angles are welded to the main part and bolted to the secondary part. Otherwise the clip angles are bolted to both parts.</p> <p>AutoDefaults can change this option.</p>
	<p>Automatic</p> <p>When the main part is a tube profile, the clip angles are welded to the main part and bolted to the secondary part. Otherwise the clip angles are bolted to both parts.</p>
	<p>Main part is bolted and secondary part is welded.</p>

Option	Description
	Main part is welded and secondary is part bolted.
	Both parts are bolted.
	Both parts are welded.

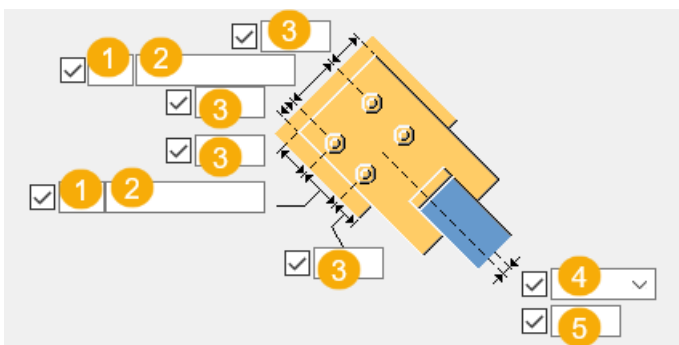
### Staggering of bolts

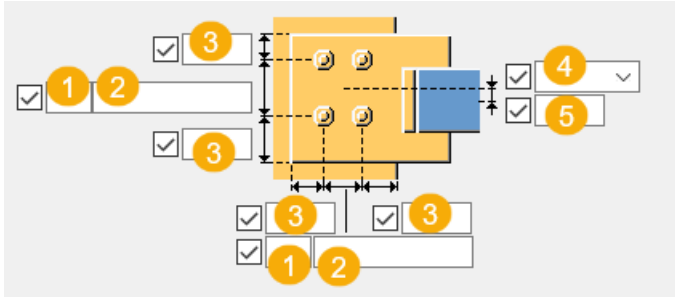
Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Brace bolts 1 / Brace bolts 2 tab

Use the **Brace bolts 1** and **Brace bolts 2** tabs to control the bolts that connect the first and second brace to the gusset plate.

### Bolt group dimensions on connection plates

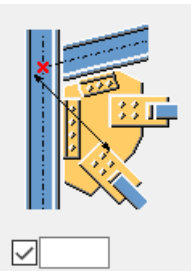
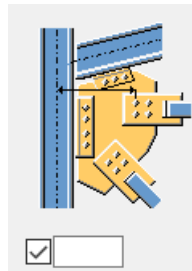










	Description
1	Number of bolts.
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Select how to measure the dimensions for vertical bolt group position.
5	Dimension for vertical bolt group position.

### Bolt distance

Define the minimum distance from the connection plate bolts to the intersection point of the main part and brace center lines. If a brace is perpendicular to the main part, the distance is measured from the main part center line to the nearest bolts.

Option	Option
	

## Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

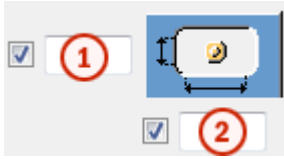
## Gusset side and brace side bolt type

Select the bolt type to define the location where the bolts should be attached.

## Slotted holes

You can define slotted, oversized, or tapped holes.



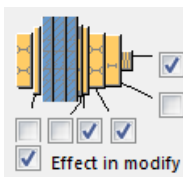


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<p><b>Slotted</b> creates slotted holes.</p> <p><b>Oversized</b> creates oversized or tapped holes.</p> <p><b>No hole</b> does not create holes.</p>	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

[Design tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

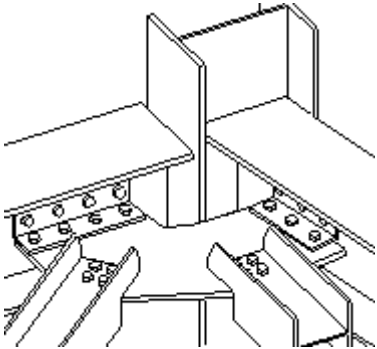
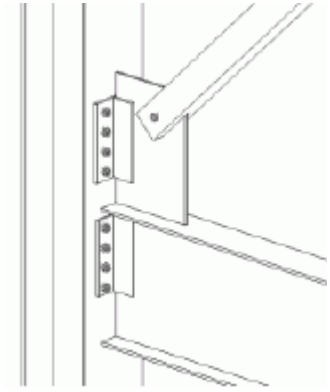
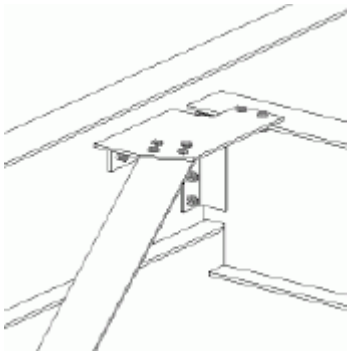
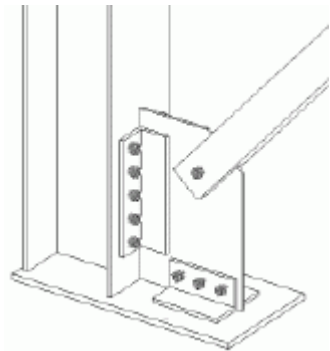
### ***Wraparound gusset cross (60)***

**Wraparound gusset cross (60)** connects 1 to 10 braces to a gusset plate where 2 or 3 parts meet to form a corner, using clip angles and connection plates. The gusset plate can be wrapped around the third part, usually a column. Connects the gusset plate to the parts using clip angles or connection plates, or welds it directly to the first selected part. Clip angles can be created, either at the ends of the braces, or on each side. Seals hollow braces. The braces can have L, W, WT, RHS, and tube profiles.

### **Objects created**

- Gusset plate
- Connection plates
- Clip angles (optional)
- Seal plates (hollow braces)
- Welds

**Use for**

Situation	Description
	<p>Brace profile: W</p> <p>Framing profile: Column and 2 beams</p> <p>Gusset plate is bolted to the beams using clip angles. Braces are notched and bolted to the gusset plate.</p>
	<p>Brace profile: RHS</p> <p>Framing profile: Column and beam</p> <p>Gusset plate is bolted to the column using a clip angle. Brace is pinned to the gusset plate.</p>
	<p>Brace profile: L</p> <p>Framing profile: Two beams with different elevations</p> <p>Gusset plate is notched and bolted to both beams using clip angles. Brace is bolted to the gusset plate.</p>
	<p>Brace profile: RHS</p> <p>Framing profile: Column and column base plate</p> <p>Gusset plate is bolted to the column and the base plate using clip angles. Brace is pinned to the gusset plate.</p>

## Before you start

Create 2 or 3 parts that meet to form a corner, and 1 to 10 braces.

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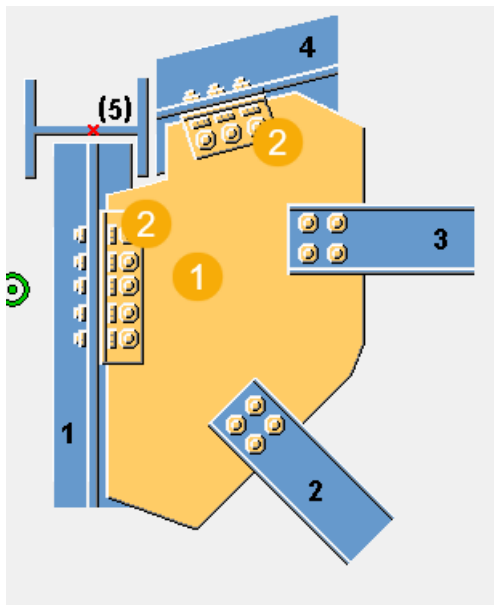
**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

---

## Selection order

1. Select the main part (the first part that forms the corner).
2. Select the secondary part (first brace).
3. Select the second secondary part (second brace).
4. Select the subsequent secondary parts (subsequent braces).
5. Select the secondary part that forms the corner.
6. If needed, select the column to wrap the gusset plate around the column where two beams and the column meet.
7. Click the middle mouse button to create the component.

## Part identification key

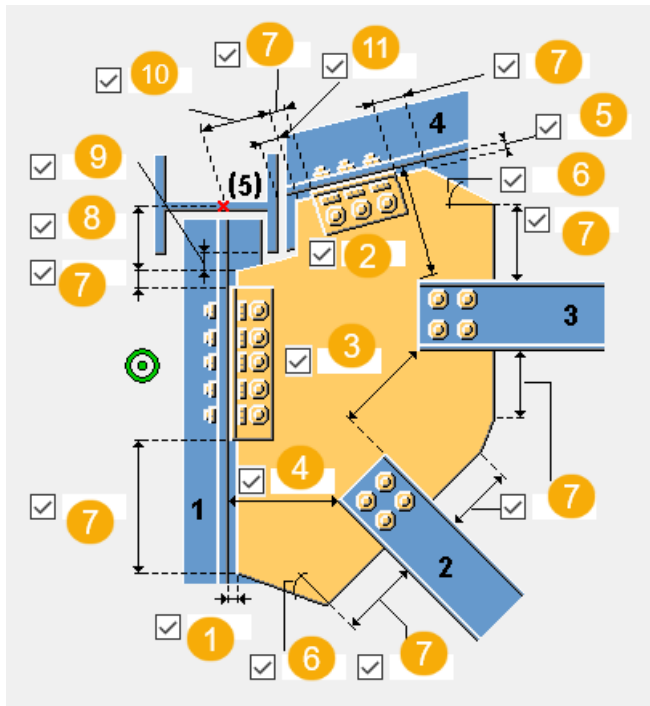


	Description
1	Gusset plate
2	Clip angle

## Picture tab

Use the **Picture** tab to define the shape of the gusset plate, location of the braces and clip angles, and the work point location.

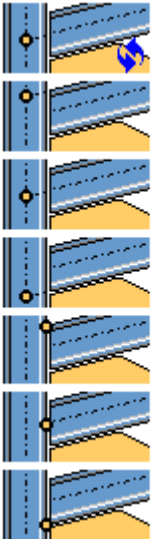
## Dimensions



	Description
1	Define the gap distance between the gusset plate edge and the main part.
2	Define the edge distance between the last secondary part and the last brace.
3	Define the distance between the braces.
4	Define the edge distance between the first brace and the main part.
5	Define the gap distance between the gusset plate edge and the secondary part (second part that forms the corner).
6	Define the gusset plate corner angle (in degrees). This value affects the gusset plate shape.
7	Define the length of the edge of the gusset plate. This value affects the gusset plate shape.
8	Define the gusset plate edge distance in relation to the work point.
9	Define the gusset plate edge distance to the flange of the third part.
10	Define the clip angle edge distance in relation to the work point.

	Description
11	Define the clip angle edge distance to the flange of the third part.

### Work point position

Option	Description
	<p>Select the work point position. The default position is the point where the two main parts intersect.</p> <p>Tekla Structures uses the work point of a component to calculate check dimensions and part position dimensions in drawings.</p>

### Gusset tab

Use the **Gusset** tab to define the gusset plate, connection plate and clip angle properties.

### Parts




Option	Description
<b>Gusset</b>	Thickness, width and height of the gusset plate.
<b>Connection plates</b>	Thickness and width of the connection plates.
<b>Upper clip angle</b> <b>Lower clip angle</b>	Select the clip angle profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	<p>Prefix and start number for the part position number.</p> <p>Some components have a second row of fields where you can enter the</p>	<p>The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b>.</p>

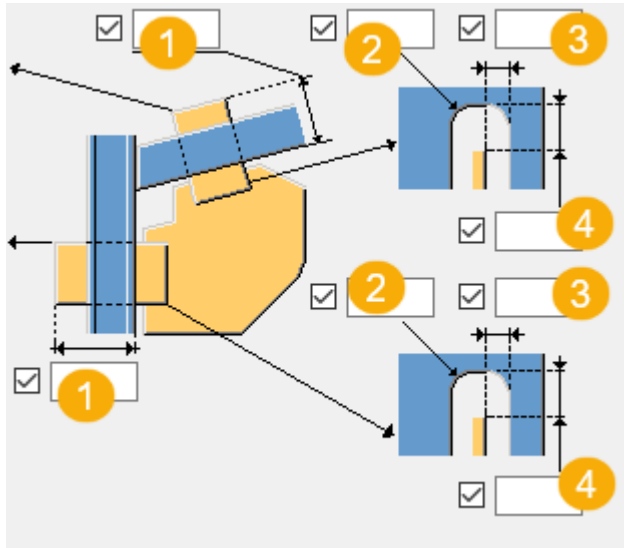
Option	Description	Default
	assembly position number.	
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Gusset plate connection

Define how the gusset plate is connected to the main part.

Option	Description
	Default Gusset plate is connected to the main part with a clip angle. AutoDefaults can change this option.
	Gusset plate is connected to the main part with clip angles. Select to which side of the gusset plate the clip angles are created.
	Gusset plate is connected to the main part with a connection plate. Select to which side of the gusset plate the connection plate is created.



## Connection plate cut through dimensions



	Description
1	Connection plate cut through length
2	Chamfer radius
3	Horizontal chamfer dimension
4	Vertical chamfer dimension

## Clip angle orientation

Define how the clip angle is placed on the connection.

Option	Description
	<p>Default</p> <p>Clip angle is placed on the connection so that the longer leg is connected to the gusset plate.</p> <p>AutoDefaults can change this option.</p>
	<p>Clip angle is placed on the connection so that the longer leg is connected to the main part.</p>



## Erection clearance

You can define the clearance for both the main part and the last secondary part connection plates or clip angles.

## Gusset plate shape



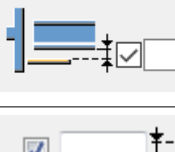

When you select the option to optimize the gusset plate weight, you can define whether the selection order of the braces affects the position of the braces.





Option	Description
	Default AutoDefaults can change this option.
	This option optimizes the gusset plate weight.


### Gusset plate position on the brace

Define where to place the gusset plate on the brace. If needed, you can fine-tune the gusset plate position by moving the gusset plate in the z or in the y direction.








Option	Description
	Default Gusset plate is positioned in the middle of the brace. AutoDefaults can change this option.
	Gusset plate is positioned on the top flange of the brace.
	Define how much the gusset plate is moved in the z direction.
	Define how much the gusset plate is moved in the y direction.

### Notch angle

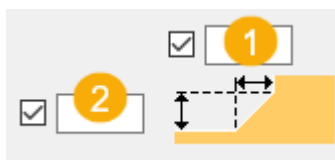
Option	Description
	Default Square notch If the gusset plate clashes with the column, the gusset plate is notched to wrap around the column. AutoDefaults can change this option.
	Square notch

Option	Description
	Bevel notch

### Notch chamfer type

Option	Description
	Default Bevel chamfer AutoDefaults can change this option.
	No chamfer Notched edges are parallel to the edges of the gusset plate.
	Bevel chamfer
	Rounded chamfer calculated as a quarter of a circle. Enter the diameter of the circle as the horizontal dimension of the chamfer.
	Rounded chamfer calculated as a three quarters of a circle. Enter the diameter of the circle as the horizontal dimension of the chamfer. The center point of the circle is the corner of the notch.
	Corner of the gusset plate is beveled.
	Corner of the gusset plate is not notched or chamfered.


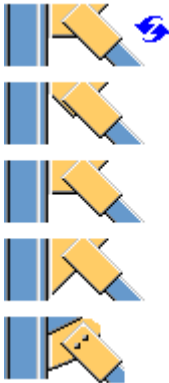
### Chamfer dimensions



	Description
1	Horizontal dimension of the chamfer
2	Vertical dimension of the chamfer

## Gusset plate shape

The gusset plate edge can be perpendicular either to the main part or the secondary part.

Option	Description
	Select the gusset plate edge shape between the last and second last secondary part.
	Select the gusset plate edge shape between the main part and the first secondary part.

## Brace conn tab

Use the **Brace conn** tab to define the seal plate, brace notch and slot properties.

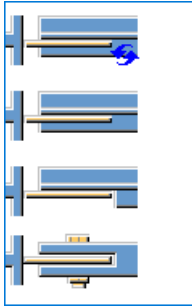
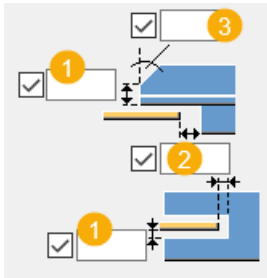

### Part

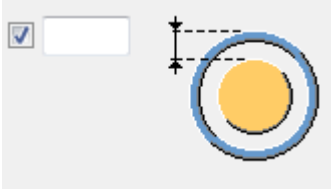
Option	Description
<b>Seal plate</b>	Thickness of the seal plate.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .




Option	Description	Default
	assembly position number.	
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Brace notch

Option	Description
	<p>Select whether the brace is notched.</p> <p>You may want to notch the brace if the plate collides with the brace flange or if you want to create slots in the hollow braces.</p> <p>The last option creates a notch and fastens the plate to the brace by using a bolt.</p>
	<ol style="list-style-type: none"> <li>1. Vertical notch dimension.</li> <li>2. Horizontal notch dimension.</li> <li>3. Notch angle.</li> </ol>
	<p>Select whether the secondary parts (except the last secondary part) are fitted.</p>

Option	Description
	Seal plate edge distance from the brace outer edge.

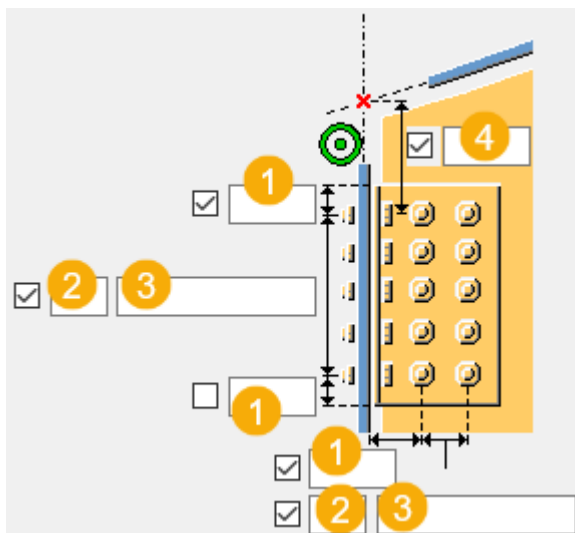
### Round cut in bracing

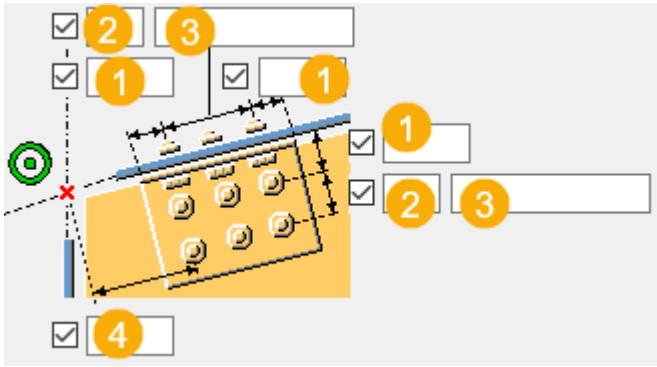
Option	Description
	Default Square cut AutoDefaults can change this option.
	Square cut
	Round cut Enter the radius value.

### Gusset conn 1 / Gusset conn 2 tabs

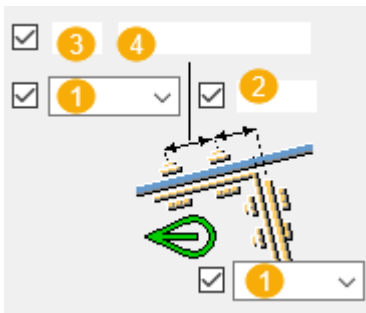
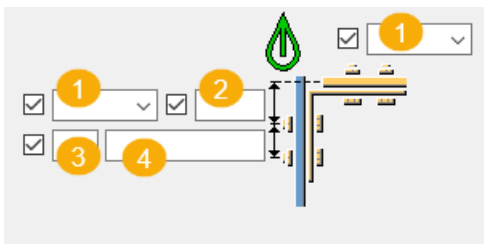
Use the **Gusset conn 1** and **Gusset conn 2** tabs to control the bolt group properties for bolts that connect the gusset plate to the main and secondary parts, and to control the clip angle attachment.

### Bolts group dimensions





	Description
1	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Number of bolts.
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
4	Vertical bolt group dimension in relation to the work point.



	Description
1	Location where the bolts should be attached.
2	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.

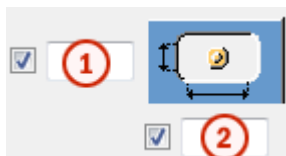
	Description
3	Number of bolts.
4	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### Slotted holes

You can define slotted, oversized, or tapped holes.



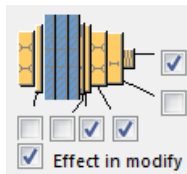
Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.

Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.


### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.








### Clip angle attachment type







Define how the clip angle is attached to the gusset plate and to the main part.

Option	Description
	Default When the main part is a tube profile, the clip angles are welded to the main part and bolted to the secondary part.



Option	Description
	Otherwise the clip angles are bolted to both parts. AutoDefaults can change this option.
	Automatic When the main part is a tube profile, the clip angles are welded to the main part and bolted to the secondary part. Otherwise the clip angles are bolted to both parts.
	Main part is bolted and secondary part is welded.
	Main part is welded and secondary part is bolted.
	Both parts are bolted.
	Both parts are welded.

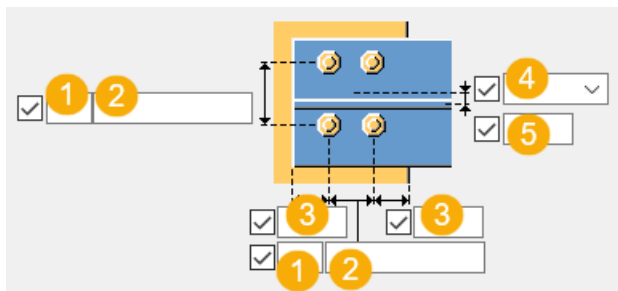
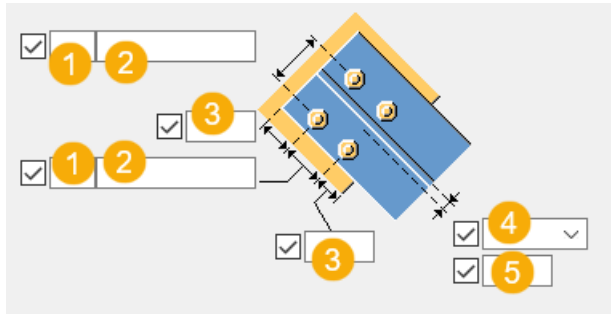
### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Brace bolts 1 / Brace bolts 2 tab

Use the **Brace bolts 1** and **Brace bolts 2** tabs to control the bolts that connect the first and second brace to the gusset plate.

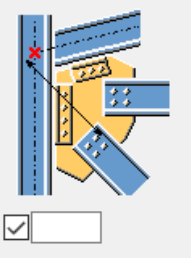
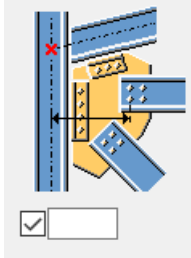
## Bolt group dimensions



	Description
1	Number of bolts.
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Select how to measure the dimensions for vertical bolt group position.
5	Dimension for vertical bolt group position.

## Bolt distance

Define the minimum distance from the connection plate bolts to the intersection point of the main part and brace center lines. If a brace is perpendicular to the main part, the distance is measured from the main part center line to the nearest bolts.

Option	Option
	

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



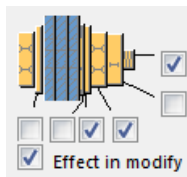
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.

Option	Description	Default
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
Rotate Slots	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
Slots in	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.




To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.






### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.

Option	Description
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Angle bolts tab

Use the **Angle bolts** tab to control the bolts that connect the clip angles.

### Part

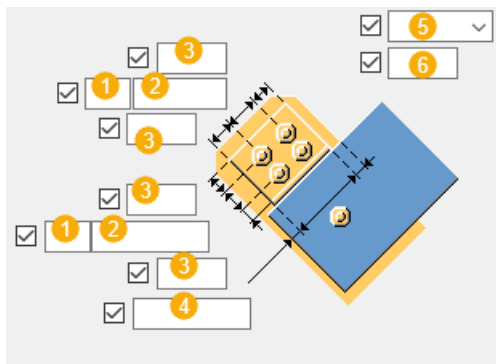
Option	Description
<b>L profile</b>	Select the clip angle profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site


### Bolt group dimensions



	Description
<b>1</b>	Number of bolts.
<b>2</b>	Bolt spacing.  Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>3</b>	Bolt edge distance.  Edge distance is the distance from the center of a bolt to the edge of the part.

	Description
4	Define the edge distance between the clip angle and the brace.
5	Select how to measure the dimensions for vertical bolt group position.
6	Dimension for vertical bolt group position.

### Clip angle position

Option	Description
	Select the clip angle position.

### General tab

Click the link below to find out more:

[General tab](#)

### Design tab

Click the link below to find out more:

[Design tab](#)

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

### Welds

Click the link below to find out more:

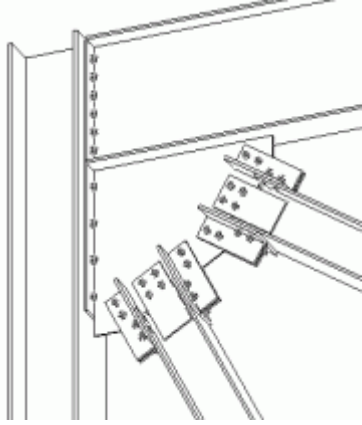
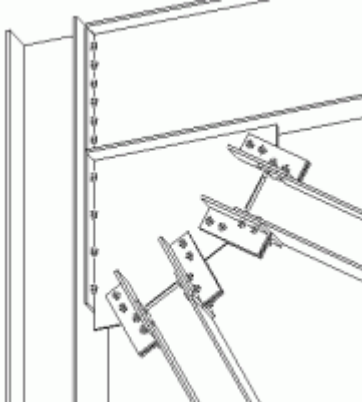
### **Corner wrapped gusset (63)**

**Corner wrapped gusset (63)** bolts 1 to 10 braces to a gusset plate where two parts form a corner, using clip angles and connection plates. Welds the gusset plate to one of the parts that form the corner.

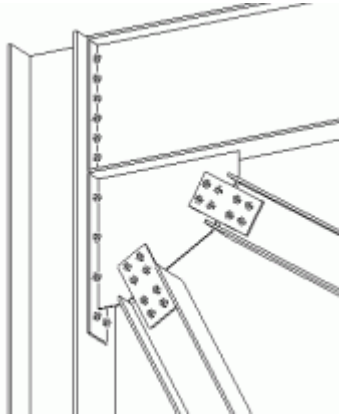
#### **Objects created**

- Gusset plate
- Connection plate between the gusset plate and the brace web
- Shear tab between the gusset plate and the brace flange
- Clip angles
- Shim plates
- Stiffeners
- Bolts
- Welds

#### **Use for**

<b>Situation</b>	<b>Description</b>
	Brace profile: W Gusset plate is welded to an extended end plate. Braces are bolted to the gusset plate using clip angles on the flanges and connection plates on the webs.
	Brace profile: W Gusset plate is welded to an extended end plate. Braces are bolted to the gusset plate using clip angles on the flanges.



Situation	Description
	<p>Brace profile: W</p> <p>Gusset plate is welded to an extended end plate. Braces are bolted to the gusset plate using connection plates on the webs.</p>

### Before you start

Create two parts that form a corner, and 1 to 10 braces.

---

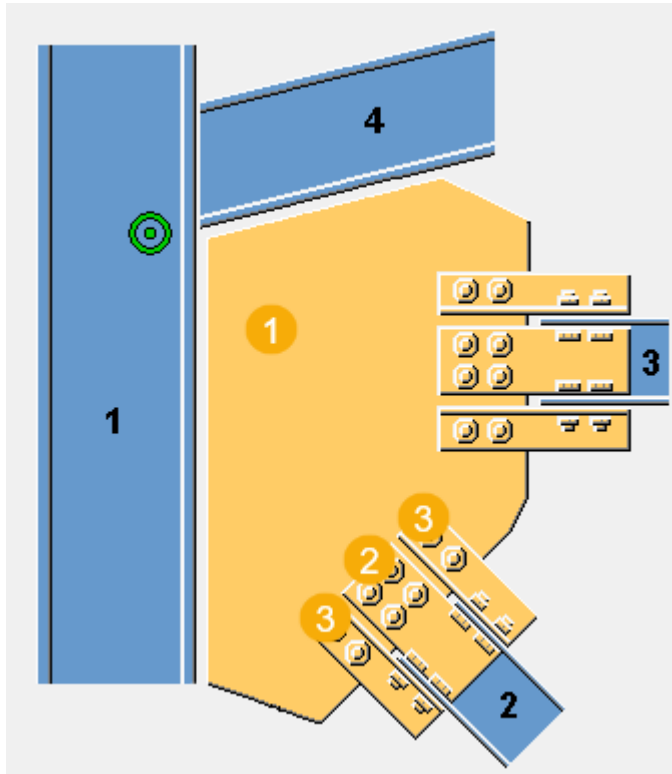
**NOTE** Tekla Structures uses values in the `joints.def` file to create this component.

---

### Selection order

1. Select the main part (the first part that forms the corner).
2. Select the secondary part (first brace).
3. Select the second secondary part (second brace).
4. Select the subsequent secondary parts (subsequent braces).
5. Select the secondary part that forms the corner.
6. Click the middle mouse button to create the component.

## Part identification key

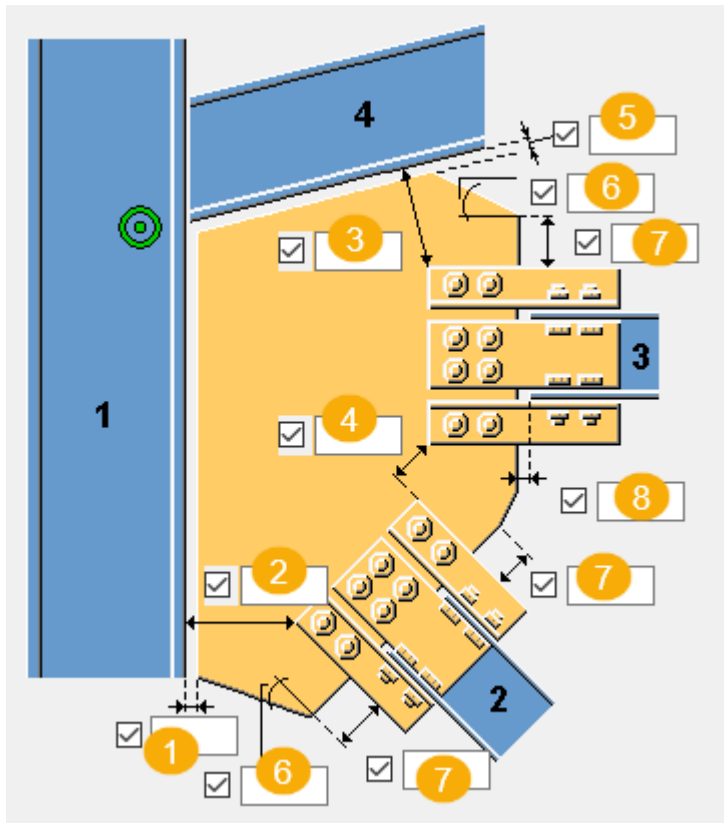


	Description
1	Gusset plate
2	Connection plate
3	Clip angle

### Picture tab

Use the **Picture** tab to define the dimensions that control the position and shape of the gusset plate.

## Dimensions



	Description
1	Define the gap distance between the gusset plate edge and the main part.
2	Define the edge distance between the main part and the clip angle.
3	Define the edge distance between the clip angle and the last secondary part.
4	Define the edge distance between the clip angles.
5	Define the gap distance between the gusset plate edge and the second part.
6	Define the gusset plate corner angle (in degrees). This value affects the gusset plate shape.
7	Define the length of the edge of the gusset plate. This value affects the gusset plate shape.
8	Define the distance between the gusset plate and the brace.

### Gusset tab

Use the **Gusset** tab to control the gusset plate properties.

## Gusset plate




Option	Description
<b>Gusset</b>	Thickness, width and height of the gusset plate.

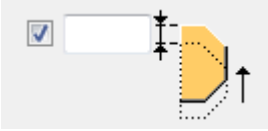
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

**NOTE** The following examples show only some of the available options. You will find more options on the **Gusset** tab.

### Gusset plate position on the brace



Define where to place the gusset plate on the brace. If needed, you can fine-tune the gusset plate position by moving the gusset plate in the z or in the y direction.

Option	Description
	Default Gusset plate is positioned in the middle of the brace.  AutoDefaults can change this option.
	Gusset plate is positioned on the top flange of the brace.
	Define how much the gusset plate is moved in the z direction.

Option	Description
	Define how much the gusset plate is moved in the y direction.


### Gusset plate shape

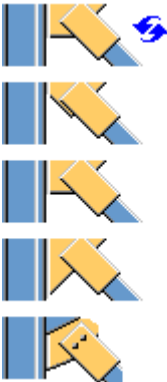
When you select the option to optimize the gusset plate weight, you can define whether the selection order of the braces affects the position of the braces.

Option	Description
	Default AutoDefaults can change this option.
	This option optimizes the gusset plate weight.


### Gusset plate shape

The gusset plate edge can be perpendicular either to the main part or the secondary part.




Option	Description
	Select the gusset plate edge shape between the last and second last secondary part.

Option	Description
	<p>Select the gusset plate edge shape between the main part and the first secondary part.</p>

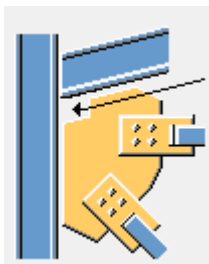
### Gusset plate fitting

Option	Description
	<p>Select whether the gusset is fitted to the last selected secondary part.</p>








### Gusset welding

Option	Description
	<p>Default Gusset plate is welded to the main part. AutoDefaults can change this option.</p>
	<p>Gusset plate is welded to the main part.</p>
	<p>Gusset plate is welded to the secondary part.</p>

### Gusset plate inner corner



Define the horizontal and vertical chamfer dimensions.

Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex chamfer
	Concave chamfer
	Bevel
	Square

### Brace conn tab

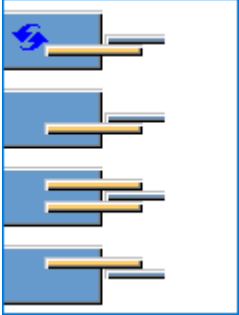
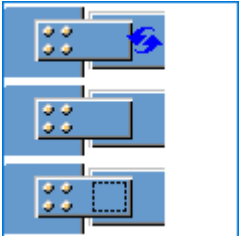
Use the **Brace conn** tab to control connection plate, clip angle, filler plate, and shear tab properties.

### Plates

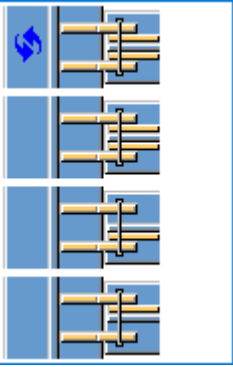
Option	Description
<b>Connection plate</b>	Thickness and width of the connection plate. Select the connection plate profile.
<b>Upper clip angle</b> <b>Lower clip angle</b>	Select the clip angle profile.
<b>Filler plate</b>	Thickness of the filler plate.
<b>Upper shear tab</b>	Thickness, width and height of the upper shear tab.
<b>Lower shear tab</b>	Height of the lower shear tab.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Plate creation

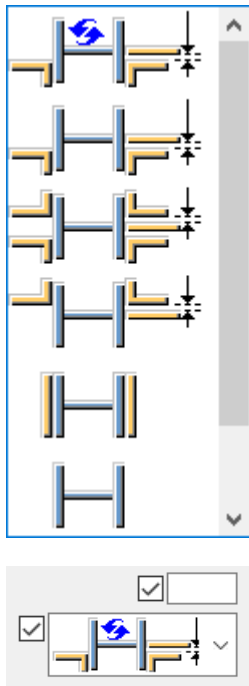
Option	Description
	Select whether one or two connection plates are created between the brace web and the gusset plate.
	Select whether a filler plate is created between the connection plate and the brace web.  The default is that a filler plate is not created.



Option	Description
	<p>Select the filler plate creation side.</p> <p>You can use this option when you have selected to create two connection plates.</p>



### Clip angle creation

Define whether the braces are attached to the gusset plate using clip angles or shear tabs, and specify the number of clip angles to create. The default option is to create two clip angles below the brace web.

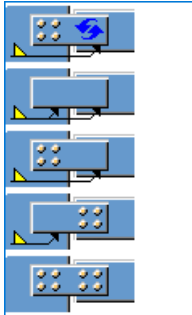
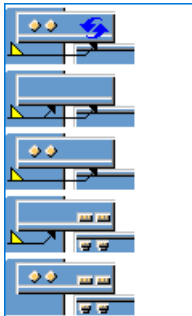


### Clip angle orientation

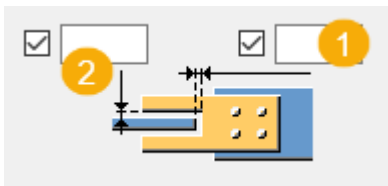
Define how the clip angle is placed on the connection.

Option	Description
	<p>Default</p> <p>Clip angle is placed on the connection so that the longer leg is connected to the gusset plate.</p> <p>AutoDefaults can change this option.</p>
	<p>Clip angle is placed on the connection so that the longer leg is connected to the main part.</p>

### Connection type

Option	Description
	<p>Select the connection type (weld or bolts) between the gusset plate and the connection plate.</p>
	<p>Select the connection type (weld or bolt) between the gusset plate and the clip angle.</p>

### Connection plate gap dimensions



	Description
1	Horizontal gap dimension
2	Vertical gap dimension

### Shim plates tab

Use the **Shim plates** tab to define shim plate properties.

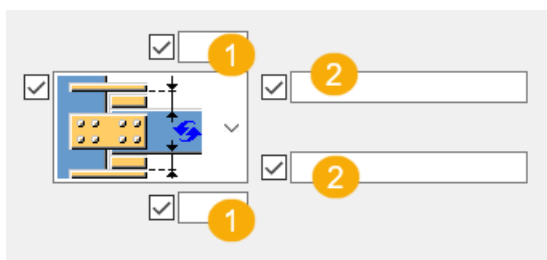
### Plates

Option	Description
<b>Shim plate 1</b>	Thickness, width and height of the shim plate.
<b>Shim plate 2</b>	
<b>Shim plate 2</b>	

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Shim plate position

You can create shim plates when connecting braces to the gusset plate using clip angles.



	Description
<b>1</b>	Define the gap between the brace and connection plate.

	<b>Description</b>
<b>2</b>	<p>Define how many shim plates are created at the top and bottom flanges.</p> <p>Enter the shim plate profile numbers: 1, 2 or 3. These are the numbers that are on the upper part on the <b>Shim plates</b> tab.</p> <p>For example, if you want to create three shim plates at the top flange, and you want to use <b>Shim plate 1</b> twice and <b>Shim plate 1</b> once, enter 1 1 2. The first number you enter is the shim plate closest to the brace flange.</p>

### Stiffeners tab

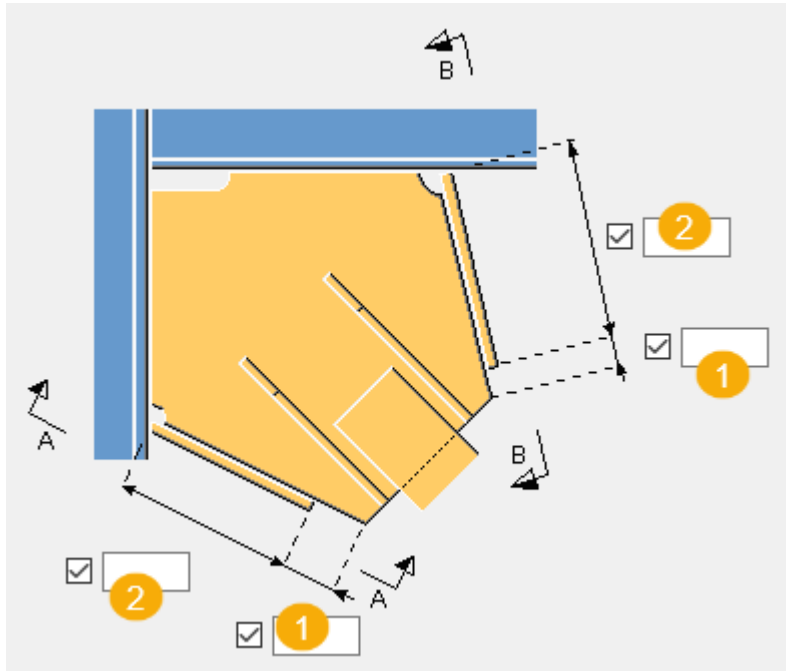
Use the **Stiffeners** tab to control the stiffener properties and dimensions.

### Stiffeners

<b>Option</b>	<b>Description</b>
<b>Stiffener 1</b>	Thickness of the stiffener.
<b>Stiffener 2</b>	

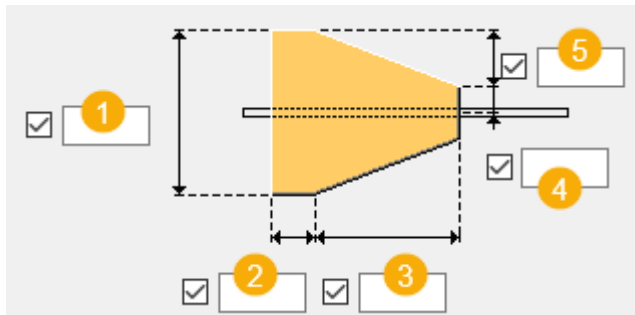
<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	<p>Prefix and start number for the part position number.</p> <p>Some components have a second row of fields where you can enter the assembly position number.</p>	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

## Stiffener length



	Description
1	Distance between the stiffener edge and the gusset plate edge.
2	Length of stiffener.

## Stiffener dimensions

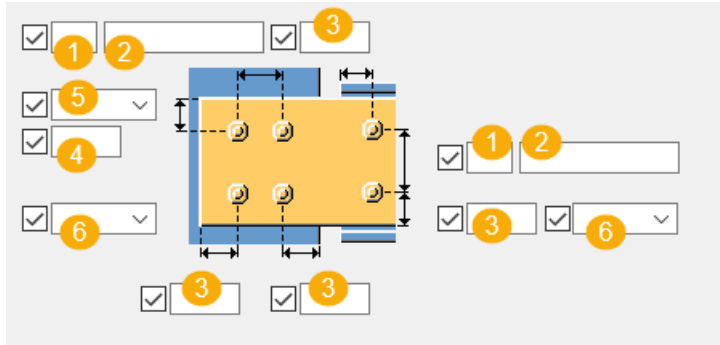


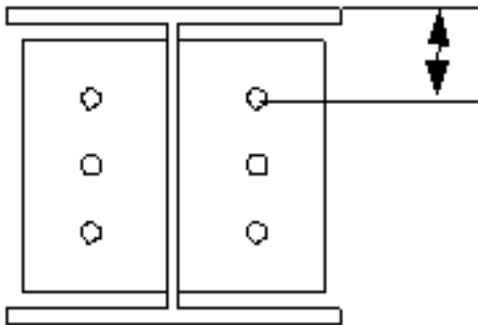
	Description
1	Width of the stiffener.
2	Length of the stiffener base.
3	Length of the skew part of the stiffener.
4	Distance from the stiffener center line.
5	Vertical distance between the stiffener base and the skew part.

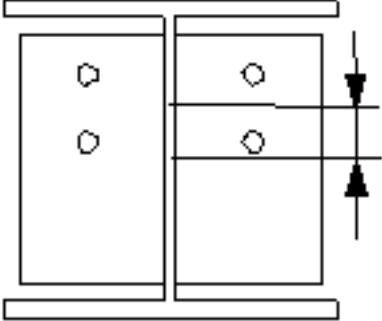
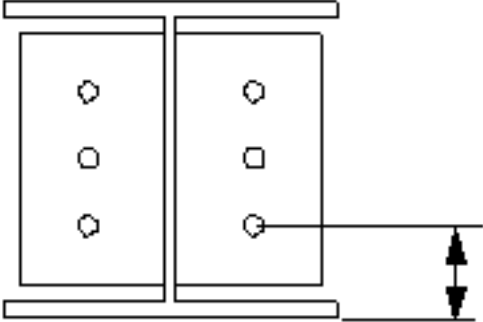
### Brace bolts 1 / Brace bolts 2 tab

Use the **Brace bolts 1** and **Brace bolts 2** tabs to control the bolts that connect the first and second brace to the gusset plate.





### Bolt group dimensions

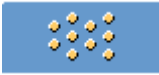



	Description
1	Number of bolts.
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Dimension for vertical bolt group position.
5	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li><b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	Description
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>
6	Select the bolt type.

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2

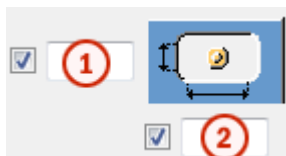
Option	Description
	Staggered type 3
	Staggered type 4

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.

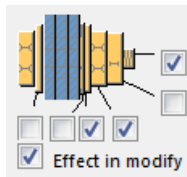


Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

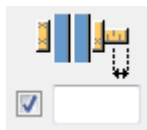
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

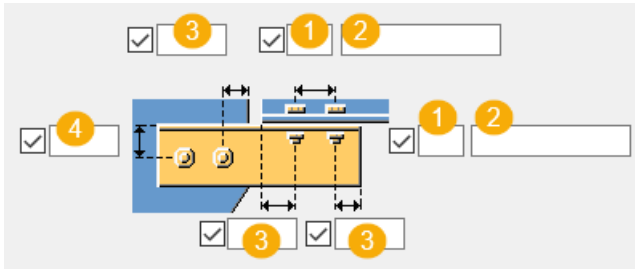
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Angle bolts 1 / Angle bolts 2 tabs

Use the **Angle bolts** tabs to control the bolts that connect the clip angles.

### Bolt group dimensions



	Description
1	Number of bolts.
2	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Dimension for vertical bolt group position.


### Bolt distance

Define the minimum distance from the connection plate bolts to the intersection point of the main part and brace center lines. If a brace is perpendicular to the main part, the distance is measured from the main part center line to the nearest bolts.

Option	Option
<input checked="" type="checkbox"/> <input type="text"/> 	<input checked="" type="checkbox"/> <input type="text"/> 

### Vertical bolt position

Option	Description
<input checked="" type="checkbox"/> <input type="text"/> 	Bolt position from the clip angle edge.

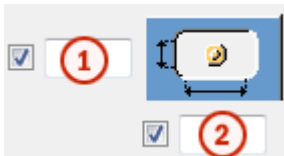
Option	Description
	Bolt position from the secondary part center line.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	

Option	Description	Default
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### **General tab**

Click the link below to find out more:

General tab

### **Design tab**

Click the link below to find out more:

Design tab

### **Analysis tab**

Click the link below to find out more:

Analysis tab

### **Welds**

Click the link below to find out more:

Create welds

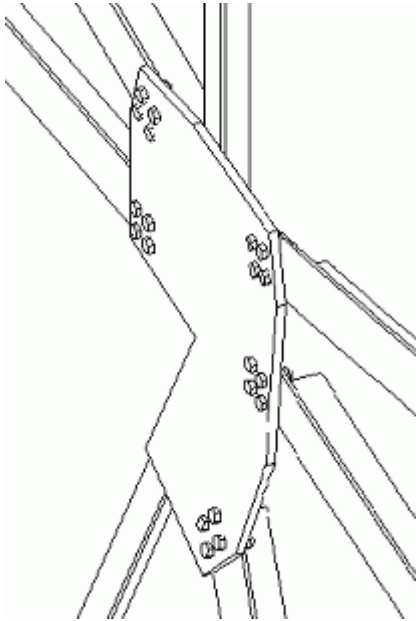
### ***Bent gusset (140)***

**Bent gusset (140)** connects braces in different planes to one or more beams or columns that are in different planes. The component creates a gusset plate that is bent along two bending lines, and seals tube or hollow profile braces.

### **Objects created**

- Gusset plate
- Seal plates
- Bolts
- Welds

## Use for

Situation	Description
	Gusset plate is connected to L profile braces.

## Do not use for

Beams or columns that are in the same plane.

## Before you start

Create one or more beams and columns, and 1 to 10 braces.

## Selection order

1. Select the beam or column in the first plane.
2. Select the first brace.
3. Select the second and subsequent braces in the first plane.
4. Select the braces in planes 2 and 3.
5. Select the beam or column in the second plane.
6. Click the middle mouse button to create the component

## Part identification key

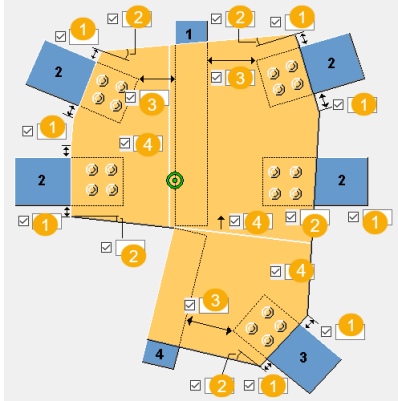


	Description
1	Gusset plate
2	Seal plate

### Picture tab




Use the **Picture** tab to define the gusset plate dimensions, clearance between the braces, and cut options for the brace ends.

### Dimensions



	Description
1	Length of the gusset plate edge
2	Gusset plate corner angle (in degrees)
3	Brace edge distance from the main part
4	Bending line offset from the secondary part

### Brace end cut

Option	Description
	Default Brace ends are cut square. AutoDefaults can change this option.
	Brace ends are cut square.
	Brace ends are cut perpendicular.

### Gusset tab

Use the **Gusset** tab to define the gusset plate properties, brace notch properties, and the weld options.

## Parts




Option	Description
<b>Gusset</b>	Thickness, width, and height of the gusset plate

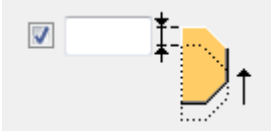
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

**NOTE** The following examples show only some of the available options. You will find more options on the **Gusset** tab.

### Gusset plate position on the brace



Define where to place the gusset plate on the brace. If needed, you can fine-tune the gusset plate position by moving the gusset plate in the z or in the y direction.

Option	Description
	Default Gusset plate is positioned in the middle of the brace.  AutoDefaults can change this option.
	Gusset plate is positioned on the top flange of the brace.
	Define how much the gusset plate is moved in the z direction.

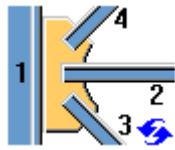
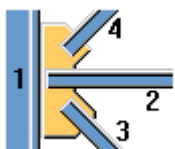
Option	Description
	Define how much the gusset plate is moved in the y direction.

### Gusset plate shape

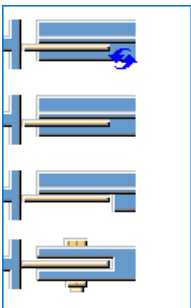
When you select the option to optimize the gusset plate weight, you can define whether the selection order of the braces affects the position of the braces.

Option	Description
	Default AutoDefaults can change this option.
	This option optimizes the gusset plate weight.

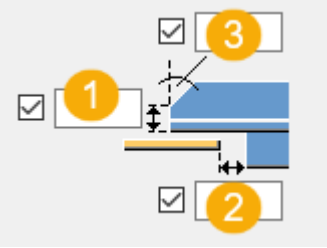
### Brace position

Option	Description
	Default The brace position is not affected. AutoDefaults can change this option.
	The first selected brace is placed closest to the main part.

### Brace notch

Option	Description
	Select whether the brace is notched. You may want to notch the brace if the plate collides with the brace flange or if you want to create slots in the hollow braces. The last option creates a notch and fastens the plate to the brace by using a bolt.




Option	Description
	<ol style="list-style-type: none"> <li>1. Vertical notch dimension</li> <li>2. Horizontal notch dimension</li> <li>3. Notch angle</li> </ol>

### Gusset plate shape

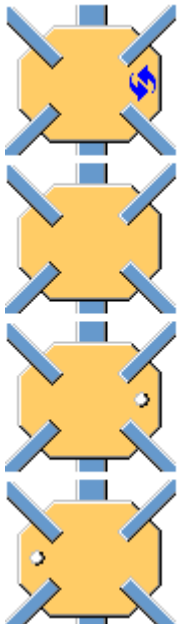
Option	Description
	<p>Select the gusset plate shape.</p>

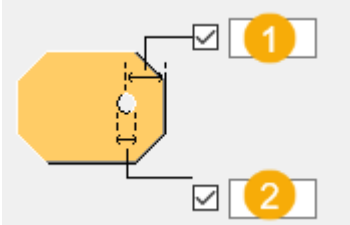
### Gusset plate cut

Option	Description
 The image shows three vertical diagrams of a gusset plate connection. Each diagram features a vertical blue member on the left and a diagonal blue member on the right. A yellow gusset plate is positioned between them. In the top diagram, a blue lightning bolt icon is on the top edge of the gusset plate, indicating a cut. In the middle diagram, the lightning bolt is on the right edge. In the bottom diagram, the lightning bolt is on the bottom edge.	Select whether the gusset plate is cut at the top.


### Gusset plate hole

You may need to create an orientation hole in the gusset plate to indicate the position of the plate when the connection is assembled in the shop, or during erection.

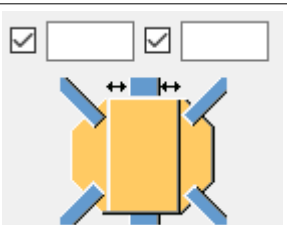
Option	Description
 The image shows four vertical diagrams of a gusset plate connection. Each diagram features a vertical blue member on the left and a diagonal blue member on the right. A yellow gusset plate is positioned between them. In the top diagram, there is a blue lightning bolt icon on the right edge of the gusset plate. In the second diagram, there is a small white circle on the right edge. In the third diagram, there is a small white circle on the left edge. In the bottom diagram, there is a small white circle on the top edge.	Select whether a hole is created in the gusset plate, and the hole side.

Option	Description
	<ol style="list-style-type: none"> <li>1. Define the distance from the center of the hole to the gusset plate edge.</li> <li>2. Define the hole diameter.</li> </ol>

### Gusset plate welding

Option	Description
	<p>Select whether the gusset plate is welded to the brace.</p>

### Bending line dimensions

Option	Description
	<p>Enter the bending line dimensions for the gusset plate in skewed connections.</p> <p>The gusset plate is bent by the angles created by the secondary parts.</p>

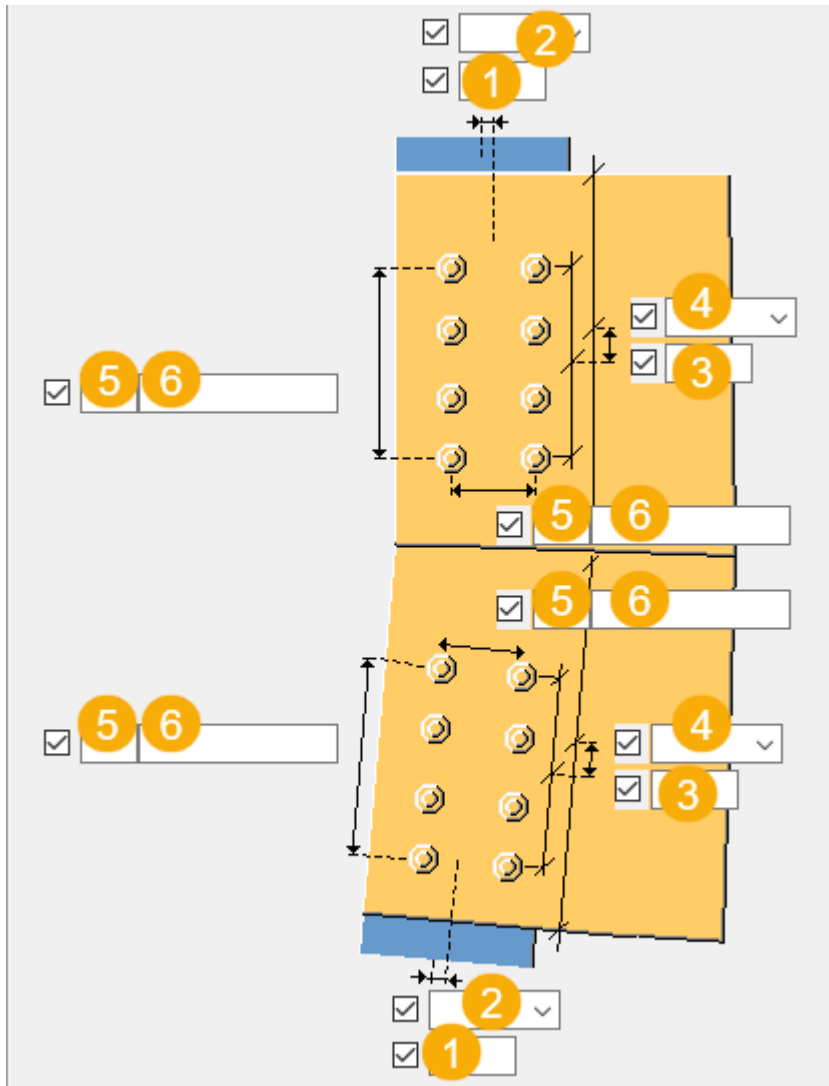
### Dimensioning holes in drawings

Set **Create extra bolt holes for gusset** to **Yes** to create an extra bolt hole that is perpendicular to the gusset plate. This helps to ensure that the hole dimensions are correct when the gusset plate is skewed so that the gusset hole is not perpendicular to the gusset plate.

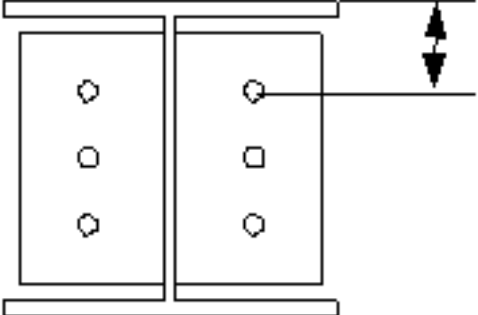
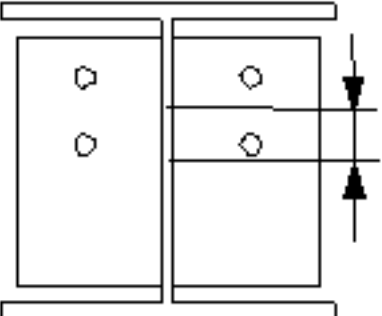
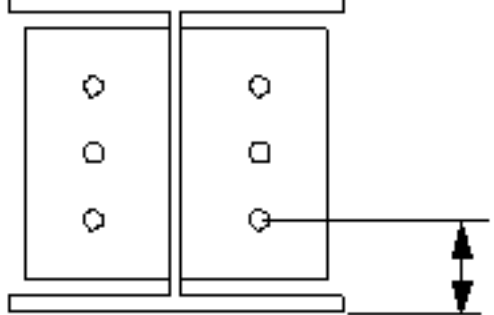
### Gusset bolts tab

Use the **Gusset bolts** tab to define the bolt group dimensions and the bolt properties.

## Bolt group dimensions






	Description
1	Dimension for horizontal bolt group position.
2	Select how to measure the dimensions for horizontal bolt group position.
3	Dimension for vertical bolt group position.

	Description
<p><b>4</b></p>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li> <p><b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</p>  </li> <li> <p><b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</p>  </li> <li> <p><b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</p>  </li> </ul>
<p><b>5</b></p>	<p>Number of bolts.</p>

	Description
6	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.







### Gusset plate connection type

Option	Description
	Default Gusset plate is welded. AutoDefaults can change this option.
	Gusset plate is welded.
	Gusset plate is bolted.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

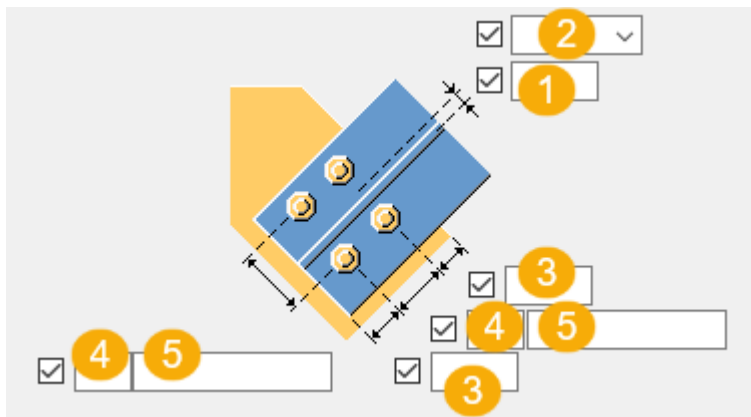
## Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

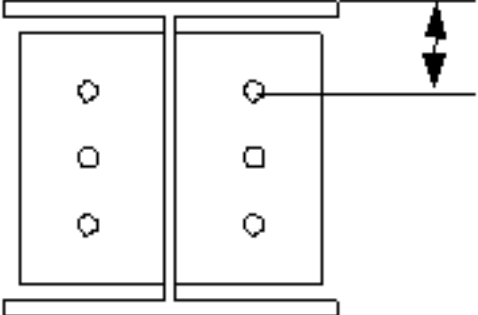
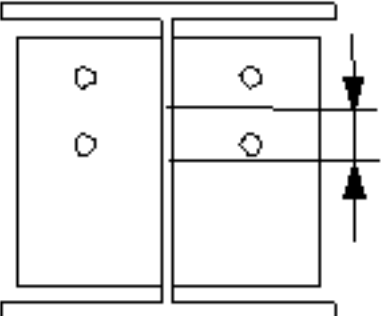
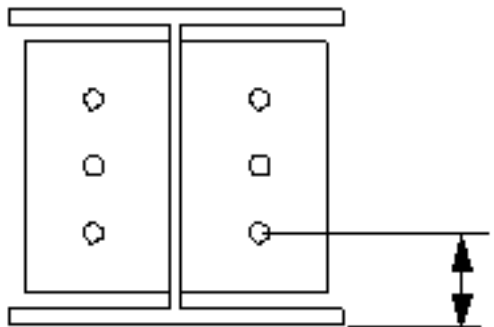
### Brace bolts 1 tab

Use the **Brace bolts 1** tab to define the bolt group dimensions and the bolt properties.

### Bolt group dimensions



	Description
1	Dimension for vertical bolt group position.

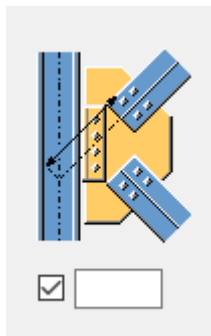
	<b>Description</b>
<b>2</b>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 



	Description
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### Bolt distance

Define the minimum distance from the brace bolts to the intersection point of the main part and brace center lines. If a brace is perpendicular to the main part, the distance is measured from the main part center line to the nearest bolts.



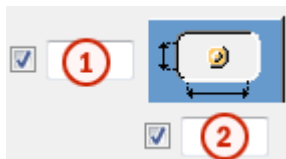
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

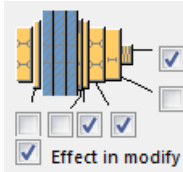


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

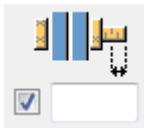
If you want to create a hole only, clear all the check boxes.









To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



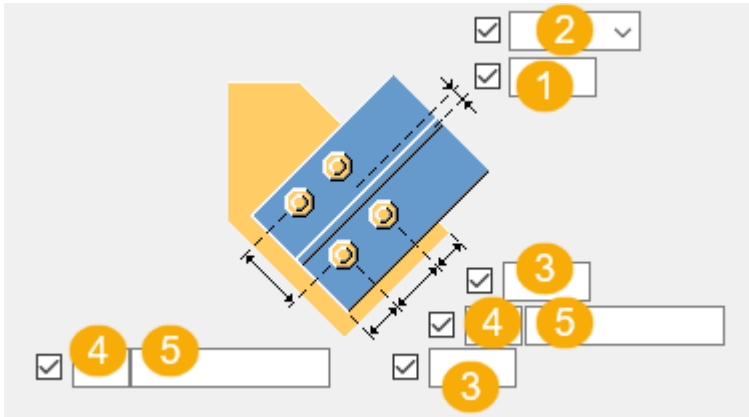
### Staggering of bolts

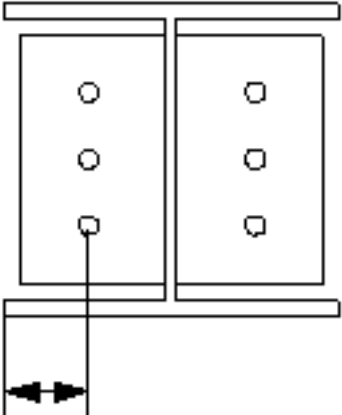
Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Brace bolts 2/Brace bolts 3 tab

Use the **Brace bolts 2** and **Brace bolts 3** tabs to define the bolt group dimensions and the bolt properties.

## Bolt group dimensions

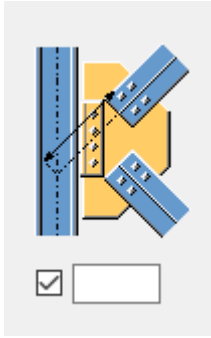


	Description
1	Dimension for horizontal bolt group position.
2	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li><b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</li> </ul> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> <div style="text-align: center;"> </div>
<b>3</b>	<p>Bolt edge distance.</p> <p>Edge distance is the distance from the center of a bolt to the edge of the part.</p>
<b>4</b>	<p>Number of bolts.</p>
<b>5</b>	<p>Bolt spacing.</p> <p>Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.</p>

### **Bolt distance**

Define the minimum distance from the brace bolts to the intersection point of the main part and brace center lines. If a brace is perpendicular to the main part, the distance is measured from the main part center line to the nearest bolts.

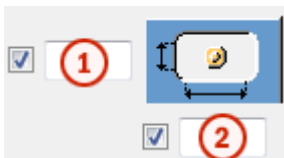


### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes






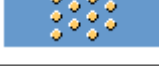
You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.

Option	Description	Default
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
Rotate Slots	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
Slots in	Part(s) in which slotted holes are created. The options depend on the component in question.	




### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Plates tab

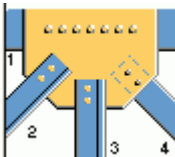
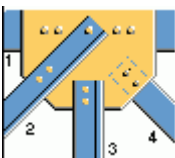
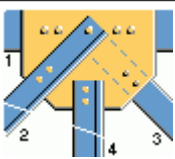
Use the **Plates** tab to define the shim plate creation, and how the braces are bolted to the gusset plate and to the first or second beam or column.

## Shim plate

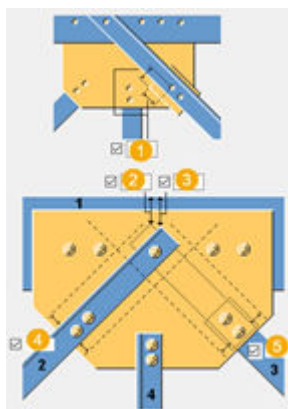
Option	Description
	Default Shim plate is created. AutoDefaults can change this option.
	Shim plate is not created.
	Shim plate is created.

## Double-bolting braces

By default, braces are bolted to the gusset plate. You can also select to bolt braces to the first or second beam, or to the selected column.

Option	Description
	Bolts braces to the gusset plate. This is the default option.
	Bolts the first selected brace to both the gusset plate and the first selected beam or column.
	Bolts the first and subsequently selected braces to both the gusset plate and the first selected beam or column.

## Dimensions





	Description
<b>1</b>	Bolt edge distance
<b>2</b>	Distance to fit the secondary part
<b>3</b>	Distance to fit the secondary part
<b>4</b>	Brace edge dimension

### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

[Design tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

[Create welds](#)

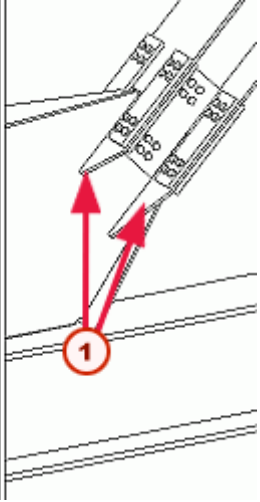
### ***Heavy brace (165)***

**Heavy brace (165)** connects a single brace to a gusset plate where two parts meet to form a corner.

### **Objects created**

- Gusset plate
- Connection plates (flange and web)
- Rib plates
- Shim plates (flange and web)
- Stiffeners
- Bolts
- Welds

## Use for

Situation	Description
	<p>Gusset plate is welded to the column. Brace web is bolted to the gusset plate with a connection plate. Rib plates are indicated with <b>1</b> in the image.</p> <p>Column or beam profile: RHS, tube, I Brace profile: H</p>

## Do not use for

Sloped or skewed beams

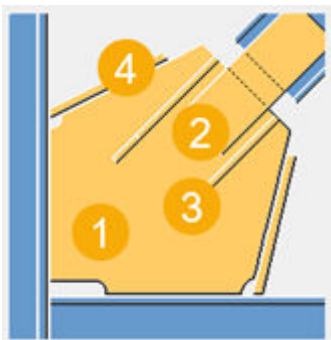
## Before you start

Create two parts that meet to form a corner, and one brace.

## Selection order

1. Select the first part that forms the corner.
2. Select the first brace.
3. Select the second and subsequent braces.
4. Select the second part that forms the corner.
5. Click the middle mouse button to create the component.

## Part identification key

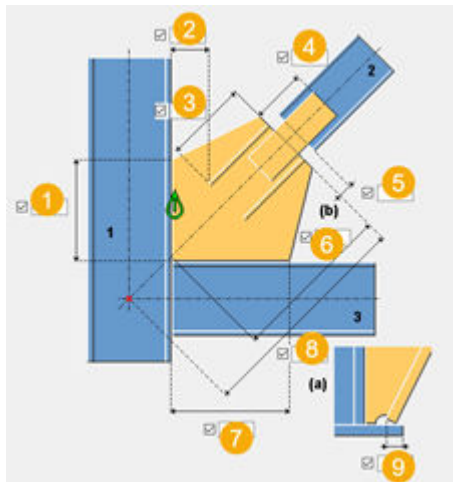


	Description
1	Gusset plate
2	Connection plate
3	Rib plate
4	Stiffener

### Picture tab

Use the **Picture** tab to define the dimensions of the gusset plate and the rib plate, and the clearance between the plate and the brace.

### Dimensions



	Description
1	Vertical dimension of the gusset plate
2	Rib plate edge dimension from the main part
3	Rib plate dimension to the gusset plate edge
4	Connection plate dimension to the gusset plate edge
5	Clearance between the gusset plate and the brace
6	Gusset plate length
7	Horizontal dimension of the gusset plate
8	Gusset plate edge dimension to the reference point
9	Secondary part edge dimension to the shim plate edge

### Parts tab

Use the **Parts** tab to define the part properties.

## Parts

Option	Description
<b>Gusset plate</b>	Thickness of the gusset plate
<b>Flange plates</b>	Thickness of the flange plates
<b>Web plates</b>	Thickness of the web plates
<b>Rib plates</b>	Thickness of the rib plates
<b>Stiffener 1</b>	Thickness of the stiffener
<b>Stiffener 2</b>	Thickness of the stiffener
<b>Flange filler plates</b>	Thickness of the flange shim plates The thickness of the shim plates depends on the gap between the connection plate and the brace flange or web, as shown in the table below.
<b>Web filler plates</b>	Thickness of the web shim plates The thickness of the shim plates depends on the gap between the connection plate and the brace flange or web, as shown in the table below.

Gap (mm)	Flange filler plate thickness	Web filler plate thickness
1	No plate	No plate
2	2.3	1.6
3	3.2	1.6
4	4.5	2.3
5	4.5	2.3
6	6.0	3.2
7	6.0	3.2
8	9.0	4.5
9	9.0	4.5
10	9	4.5

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .





Option	Description	Default
	assembly position number.	
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	

### Gusset tab

Use the **Gusset** tab to define the gusset plate chamfers, and the gap between the gusset plate and the brace.

### Gusset plate chamfers



Option	Description
	No chamfer
	Line chamfer Define the horizontal and vertical chamfer dimension.
	Concave chamfer Define the horizontal chamfer.
	Concave chamfer Define the horizontal and vertical chamfer.

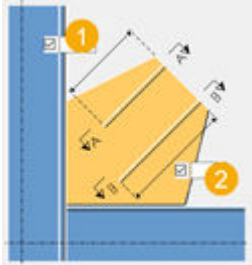
### Ribs tab

Use the **Ribs** tab to define the size and location of the rib plates.

Option	Description
<b>Ribs same length</b>	Select whether the rib plates have the same length.

Option	Description
<b>Flange single plate</b>	Select whether to create a single flange plate.

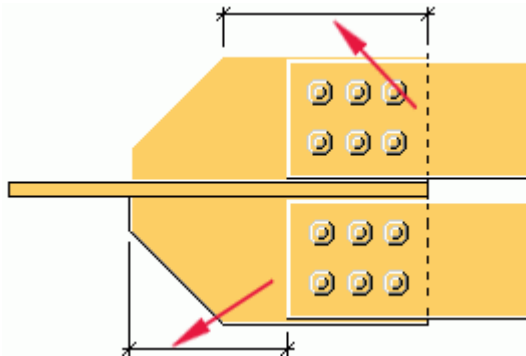
### Plate length



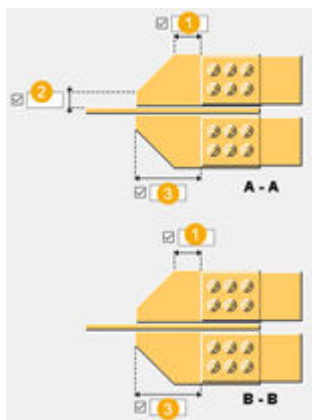
	Description
<b>1</b>	Length of the first rib
<b>2</b>	Length of the second rib

### Rib plate dimensions

Tekla Structures automatically calculates the following dimensions from the length of the rib plate and bolt group properties.



Define the following dimensions:

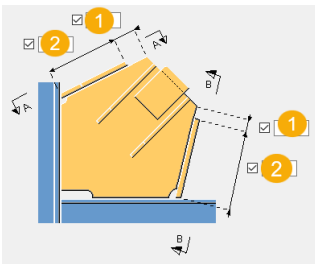


	Description
1	Horizontal rib dimension
2	Vertical rib dimensions
3	Horizontal rib dimension

### Stiffeners tab

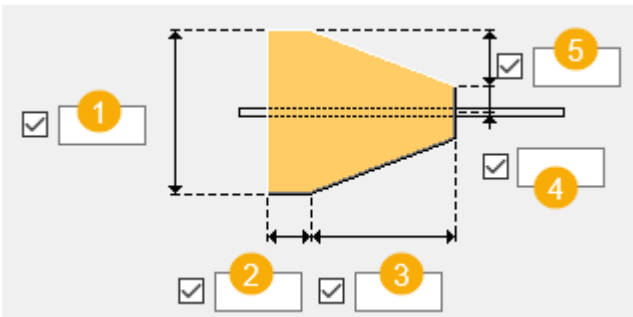
Use the **Stiffeners** tab to define the stiffener dimensions.

### Stiffener length



	Description
1	Distance between the stiffener edge and the gusset plate edge
2	Length of the stiffener

### Stiffener dimensions

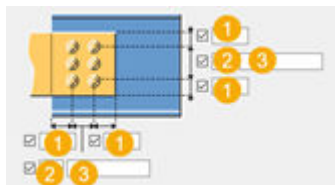


	Description
1	Width of the stiffener.
2	Length of the stiffener base.
3	Length of the skew part of the stiffener.
4	Distance from the stiffener center line.
5	Vertical distance between the stiffener base and the skew part.

### Web bolts tab

Use the **Web bolts** tab to define the bolt group dimensions and the properties of the bolts that fasten the web connection plate to the gusset plate.

### Bolt group dimensions



	Description
<b>1</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>2</b>	Number of bolts.
<b>3</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

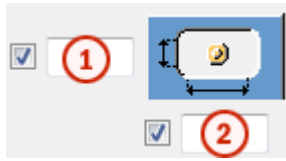
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site



## Slotted holes

You can define slotted, oversized, or tapped holes.

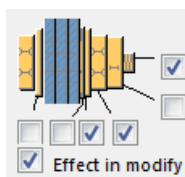


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

## Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



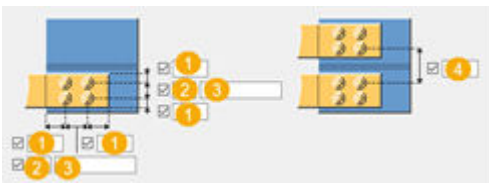
### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Flange bolts tab

Use the **Flange bolts** tab to define bolt group dimensions and the properties of the bolts that fasten the flange connection plate to the gusset plate.

### Bolt group dimensions



	Description
1	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Number of bolts.

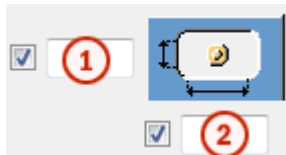
	Description
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
4	Dimension for vertical bolt group position.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes

### Slotted holes







You can define slotted, oversized, or tapped holes.



Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.

Option	Description	Default
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Staggering of bolts

Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Defining plate sizes in marketsizes.dat

In the Japanese environment, **Heavy brace (165)** takes the default thickness values for several plates from the `marketsizes.dat` file, located in the `\profil\` folder. This file lists the standard plate thicknesses available in specific material grades. Edit this file by using any standard text editor, such as Notepad.

---

**NOTE** Enter a thickness value on the **Parts** tab to override the default value for any plate.

---

## Example

In this example, the `marketsizes.dat` file lists the standard plate thicknesses available in material grade SS400. The `DEFAULT` line lists the thicknesses available in all other material grades.

```
# Market size (thickness) table
# Specify the material as given in Tekla Structures material database
# and after that the market sizes separated by commas
SS400,1.6,2.3,3.2,4.5,6,9,12,16,19,22,25,28,32,38
DEFAULT,6,9,12,16,19,22,25,28,32,38
```

`marketsizes.dat` file

## General tab

Click the link below to find out more:

[General tab](#)

## Design tab

Click the link below to find out more:

[Design tab](#)

## Analysis tab

Click the link below to find out more:

[Analysis tab](#)

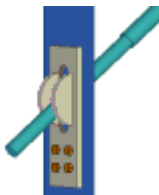
## Welds

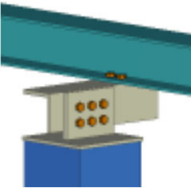

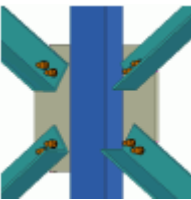
Click the link below to find out more:

[Create welds](#)

## Windbracing connections

Use the following components to automatically create windbracing:

Component	Image	Description
<a href="#">Windbracing (1)</a> (page 2582)		Connects a single brace to a beam or column, using a connection plate, round plates, a threaded rod, and nuts.

Component	Image	Description
<a href="#">Wind column (5)</a> (page 2591)		Connects a rafter to a wind column by using a single L profile or a twin seat profile.
<a href="#">Windbracing 2 (16)</a> (page 2600)		Connects a single hollow brace to a beam or a column, using a connection plate, threaded rod, and nuts.
<a href="#">Windbrace connection (110)</a> (page 2615)		Bolts braces to a gusset plate. Welds or bolts the gusset plate to the main part. Braces can be: <ul style="list-style-type: none"> <li>• Located in the same work plane as the beam or column, or skewed</li> <li>• On the same side of the beam or column, or on each side</li> </ul>

### **Windbracing (1)**

**Windbracing (1)** connects a single hollow brace to a beam or a column using a connection plate, threaded rod, and nuts. Round plates are welded to the connection plate and the connection plate is bolted to the beam or column.

---

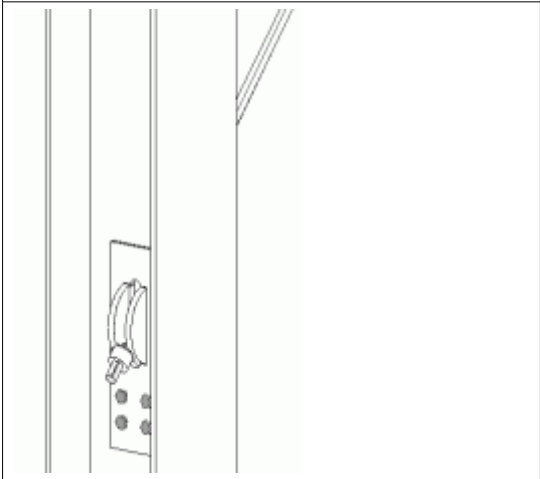
**NOTE** Tekla Structures automatically attaches the rod to the brace so that the rod and the brace are treated as a single part when you use commands like **DeleteMove**, or **Copy**.

---

### **Objects created**

- Connection plate
- Round plates (2)
- Shim plate
- Threaded rod
- Washer
- Nuts on rod (2)
- Bolts
- Welds

## Use for

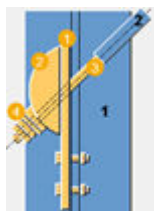
Situation	Description
	The column or beam profile is <b>H</b> , and the brace profile is <b>RHS</b> .

## Selection order

1. Select the main part (beam or column).
2. Select the secondary part (brace).

The connection is created automatically when the secondary part is selected.

## Part identification key

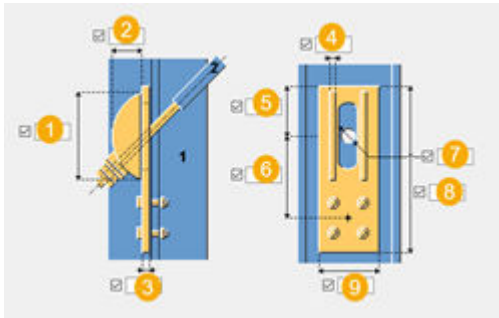


	Description
<b>1</b>	Connection plate
<b>2</b>	Round plate
<b>3</b>	Threaded rod
<b>4</b>	Shim plate Washer Nut Extra nut

## Picture tab

Use the **Picture** tab to define the size and position of the connection and round plates.

## Dimensions



	Description
1	Round plate vertical dimension
2	Round plate horizontal dimension
3	Connection plate thickness
4	Round plate thickness
5	Connection plate upper dimension from the hole center
6	Connection plate lower dimension from the hole center
7	Hole diameter
8	Connection plate height
9	Connection plate width

### Parts tab

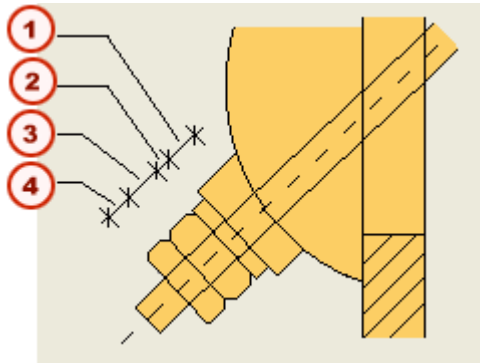
Use the **Parts** tab to define the part properties.

### Parts

Option	Description
<b>Connection plate</b>	Thickness, width, and height of the connection plate
<b>Round plates</b>	Thickness, width, and height of the round plates
<b>Filler plate</b>	Select the profile from the profile catalog.
<b>Washer</b>	Select the profile from the profile catalog.
<b>Nut</b>	Select the profile from the profile catalog.
<b>Extra nut</b>	Select the profile from the profile catalog.



## Thickness dimensions



	Description
1	Thickness of the shim plate
2	Thickness of the washer
3	Thickness of the nut
4	Thickness of the extra nut

## Brace conn tab

Use the **Brace conn** tab to define the properties of the hole in the beam or column, slot in the connection plate, position of round plates, and rod dimensions.

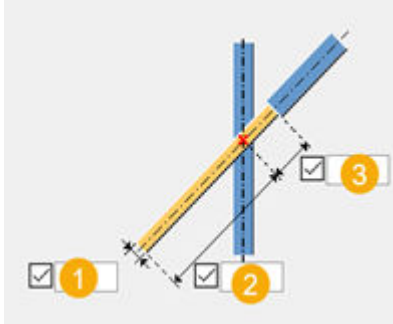
## Hole type

Option	Description
<b>Create hole in primary</b>	<ul style="list-style-type: none"><li>• <b>Partcut</b> cuts a hole for the rod.</li><li>• <b>Bolt</b> creates a bolt hole.</li><li>• <b>Partcut+bolthole</b> cuts a hole for the rod and creates a bolt hole.</li></ul>

## Horizontal position of round plate

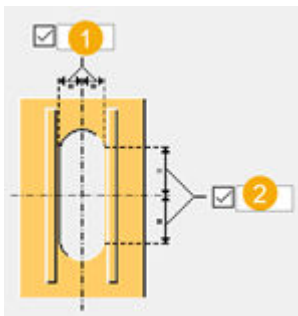
Define the horizontal offset of the round plate.

### Rod dimensions



	Description
1	Rod thickness
2	Rod length, below the intersection point of the main part and secondary part
3	Rod length, above the intersection point of the main part and secondary part

### Slot dimensions

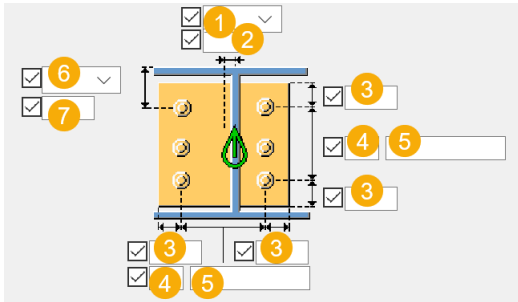


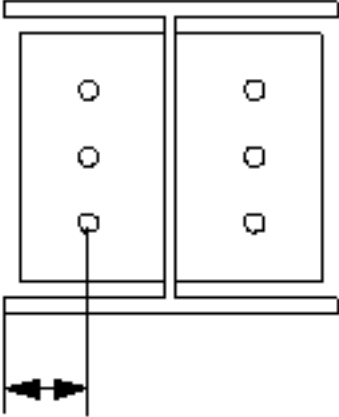
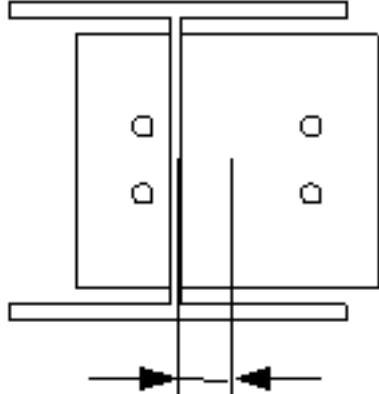
	Description
1	Horizontal dimension
2	Vertical dimension

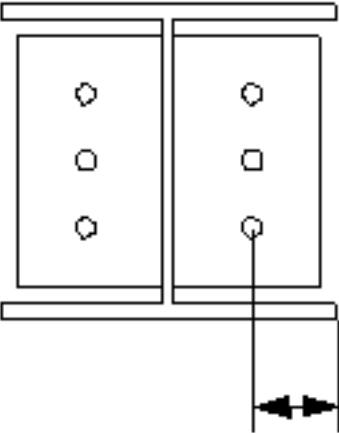
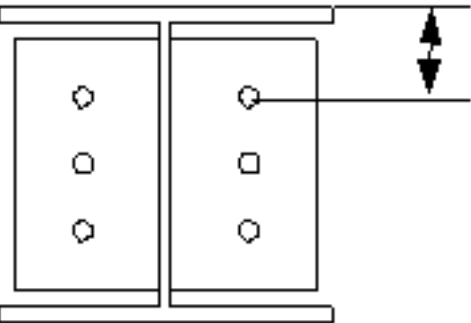
### Bolts tab

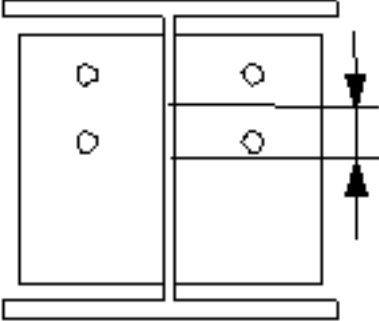
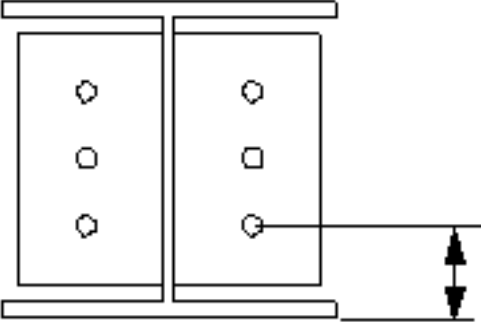
Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

## Bolt group dimensions



	Description
<p><b>1</b></p>	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <p><b>Left:</b> From the left edge of the secondary part to the leftmost bolt.</p>  </li> <li> <p><b>Middle:</b> From the center line of the secondary part to the center line of the bolts.</p>  </li> </ul>

	Description
	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
2	Dimension for horizontal bolt group position.
3	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Number of bolts.
5	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
6	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	Description
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part. </li> </ul>  <ul style="list-style-type: none"> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt. </li> </ul> 
7	Dimension for vertical bolt group position.

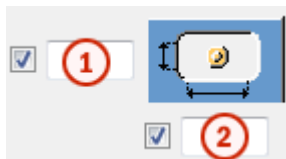
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

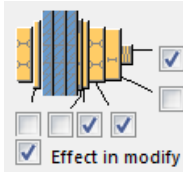


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

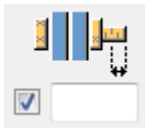
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### **Bolt length increase**

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### **General tab**

Click the link below to find out more:

[General tab](#)

### **Design tab**

Click the link below to find out more:

[Design tab](#)

### **Analysis tab**

Click the link below to find out more:

[Analysis tab](#)

### **Welds**

Click the link below to find out more:

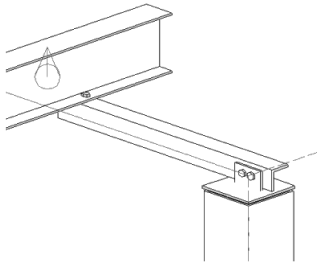
### ***Wind column (5)***

**Wind column (5)** connects a rafter to a wind column by using a single L profile or a twin seat profile. A cap plate is added to the wind column, and a vertical plate on top of the cap plate to be connected to the seat. The seat can be created above or below the rafter, and the wind column is adjusted accordingly. The seat can either be bolted or welded to the rafter and the vertical plate.

### Objects created

- Vertical plate
- Cap plate
- L/T seat profile
- Bolts
- Welds

### Use for

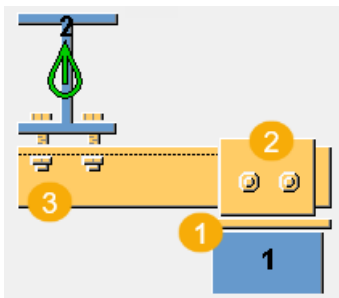
Situation	Description
	Rafter connected to a wind column.

### Selection order

1. Select the main part (wind column).
2. Select the secondary part (rafter).

The connection is created automatically when the secondary part is selected.

### Part identification key



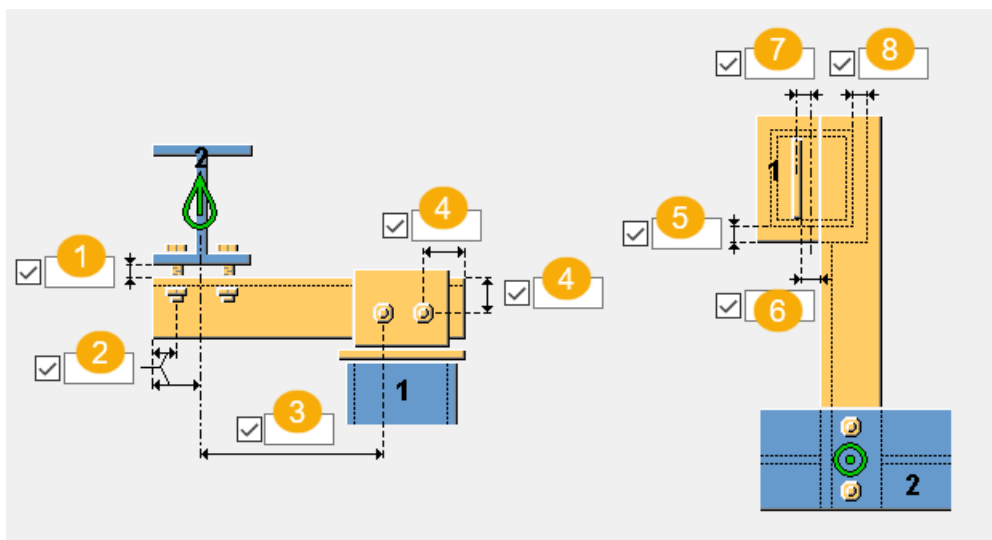
	Description
1	Cap plate
2	Vertical plate
3	L/T seat profile

### Picture tab

Use the **Picture** tab to define the connection dimensions.



## Dimensions



	Description
1	Distance between the rafter and the seat.
2	If the seat is bolted, this dimension is the bolt edge distance of the seat on the rafter side. If the seat is welded, this dimension is the distance from the rafter center line to the edge of the seat.
3	Distance from the rafter center to the nearest plate bolt.
4	Bolt edge distance.
5	Cap plate edge extension in the direction parallel to the seat.
6	Distance between the vertical plate and the seat.
7	Distance between the column center line and the vertical plate.
8	Cap plate edge extension in the direction perpendicular to the seat.

### Parts tab

Use the **Parts** tab to define the part properties.

### Parts

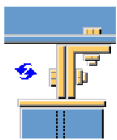
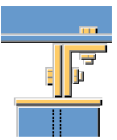


Option	Description
<b>Vertical plate</b>	Thickness of the vertical plate.
<b>Cap plate</b>	Thickness of the cap plate.
<b>L/T profile</b>	Select the profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	




### Parameters tab

Use the **Parameters** tab to define the seat type, orientation, and position.



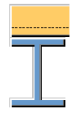
### Seat type

Option	Description
	Default Seat at the near side. AutoDefaults can change this option.
	Seat at the near side.
	Seat at the far side.
	Seat at both sides.

### Seat orientation

Option	Description
	Default Longer leg is horizontal. AutoDefaults can change this option.
	Longer leg is horizontal.
	Longer leg is vertical.

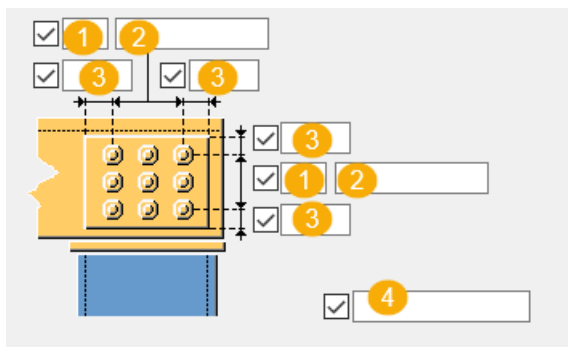
### Seat position

Option	Description
	Default Seat is below the rafter. AutoDefaults can change this option.
	Seat is below the rafter.
	Seat is above the rafter.

### Plate bolts tab

Use the **Plate bolts** tab to define the bolt group dimensions, bolt properties, and the vertical plate connection to the seat.

### Bolt group dimensions



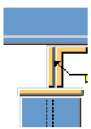


	Description
1	Number of bolts.

	Description
<b>2</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

### Connection type

Select how the vertical plate is connected to the seat.

Option	Description
	Default Bolted AutoDefaults can change this option.
	Bolted
	Welded

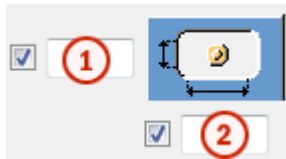
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.

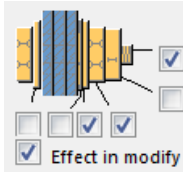


Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

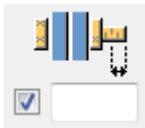
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

### Bolt length increase

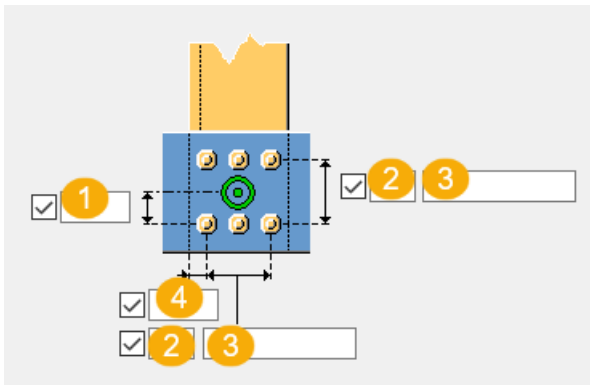
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Beam bolts

Use the **Beam bolts** tab to define the bolt group dimensions, bolt properties, and the rafter connection to the seat.



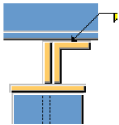
### Bolt group dimensions



	Description
1	Distance between the rafter center and the bolts.
2	Number of bolts.
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
4	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.

## Connection type

Select how the rafter is connected to the seat.

Option	Description
	Default Bolted AutoDefaults can change this option.
	Bolted
	Welded

## Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

## General tab

Click the link below to find out more:

[General tab](#)

### Design tab

Click the link below to find out more:

### Analysis tab

Click the link below to find out more:

Analysis tab

### Welds

Click the link below to find out more:

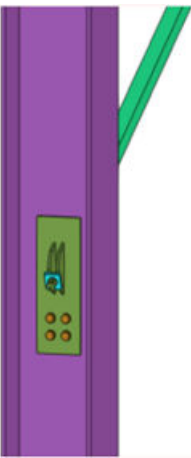
### **Windbracing 2 (16)**

**Windbracing 2 (16)** connects a single hollow brace to a beam or a column, using a connection plate, threaded rod, and nuts. Round plates are welded to the connection plate and the connection plate bolted to the beam or column.

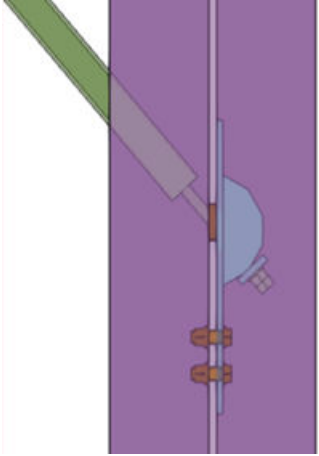
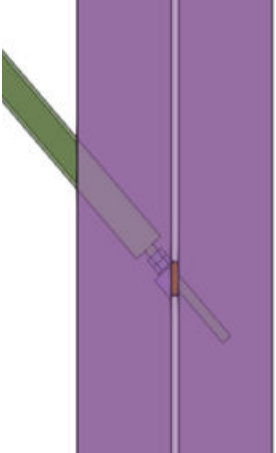
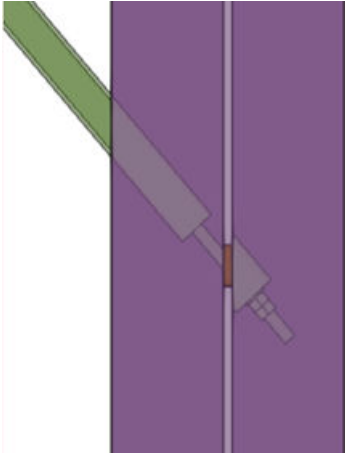
### Objects created

- Connection plate
- Round plates
- Shim plate
- Threaded rod
- Nuts on rod
- Tube profile

### Use for

Situation	Description
	Windbracing, connection plate is bolted to the column. Round plates are welded to the connection plate.



Situation	Description
	<p>Windbracing, connection plate is bolted to the column. Round plates are welded to the connection plate.</p>
	<p>Windbracing, without round plate.</p>
	<p>Windbracing, triangular plate.</p>

**Before you start**

Create a beam or a column and one brace.

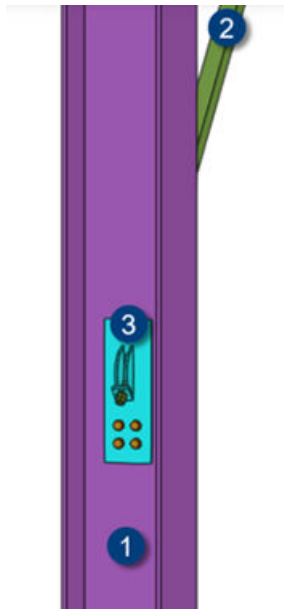
**Selection order**

1. Select the beam or the column (main part).

2. Select the brace (secondary part).

The connection is created automatically when you select the secondary part.

### Part identification key

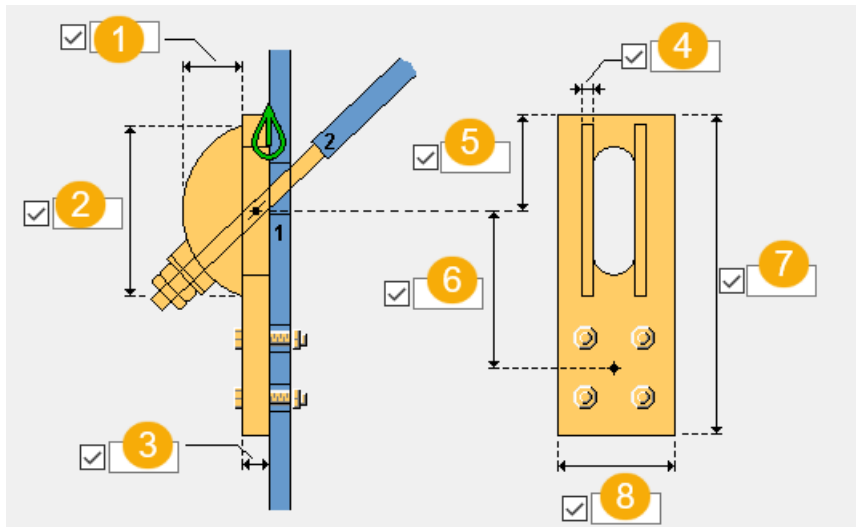


	Description
1	Beam - main part
2	Brace - secondary part
3	Windbracing connection with connection plate, round plate, and bolts

### Picture tab

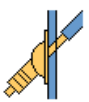
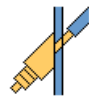

Use the **Picture** tab to define the size and the position of the connection plate and the round plate.










## Plate dimensions



	Description
1	Width of the round plate.
2	Height of the round plate.
3	Thickness of the connection plate.
4	Thickness of the round plate.
5	Distance from the top of the connection plate to the center of the slotted hole.
6	Vertical distance from the center of the slotted hole to the center of the bolt group.
7	Height of the connection plate.
8	Width of the connection plate.

## Round plate or tube

Option	Description
	Round plates with a threaded rod.
	Tapered tube with a threaded rod.
	Threaded rod.

Option	Description
	Triangular plate on the tie rod side with a threaded rod.
	Triangular plate at the end side with a threaded rod.
	Triangular plates on both sides with a threaded rod.
	No plates or a threaded rod.
	Triangular plate on the tie rod side.
	Triangular plate at the end side.
	Triangular plates on both sides.
	No plates or a threaded rod.
	Rod welded to an L profile.

### Create assembly with connecting parts

Define whether or not the connecting parts (shim plate, washer, nuts) are welded together.

### Weld connecting parts

Define which parts are welded.

### Parts tab

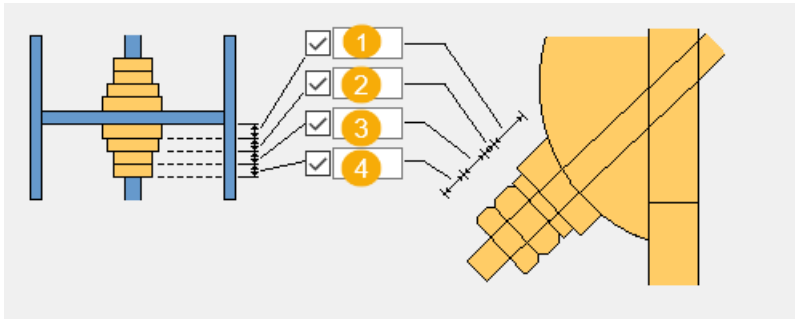
Use the **Parts** tab to define the part properties.

## Parts

Option	Description
<b>Connection plate</b>	Thickness, width, and height of the connection plate.
<b>Round plate</b>	Thickness, width, and height of the round plate.
<b>Filler</b>	Select the profile from the profile catalog.  Tekla Structures creates a simplified shim plate. In reality, the plate is curved on one side, equal to the radius of the round plate.  Enter the width and height, for example PL50*50 or 50*50.
<b>Washer</b>	Select the profile from the profile catalog.
<b>Nut</b>	Select the profile from the profile catalog.
<b>Extra nut</b>	Select the profile from the profile catalog.
<b>Tube</b>	Select the profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Comment</b>	Add a comment about the part.	

## Thickness dimensions



	Description
1	Thickness of the shim plate.
2	Thickness of the washer.
3	Thickness of the nut.
4	Thickness of the extra nut.

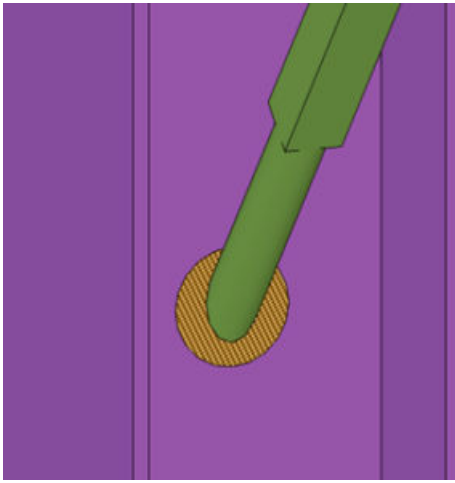
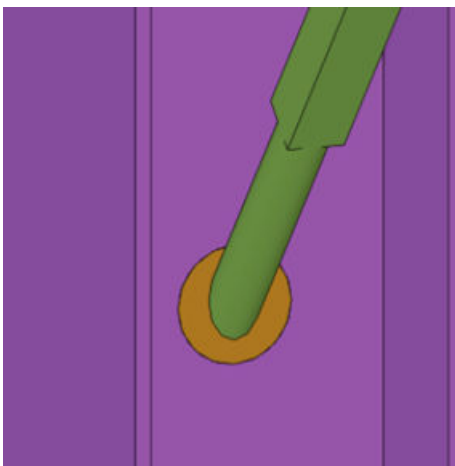
### Parameters tab

Use the **Parameters** tab to define the rod and hole dimensions.

### Hole creation

Define how the hole is created in the main part.

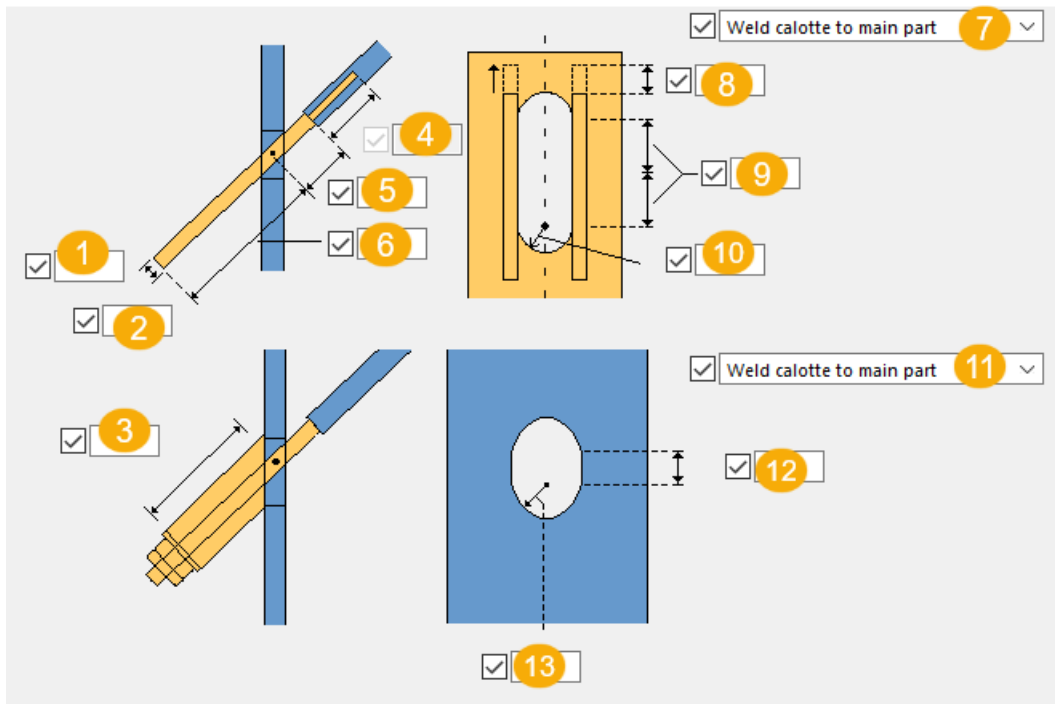
Option	Example
Hole by part cut	

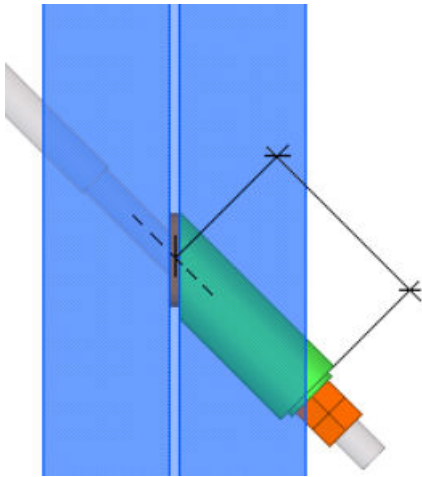
Option	Example
<b>Hole by bolt</b>	
<b>Hole by part cut and bolt</b>	

**Connection method**

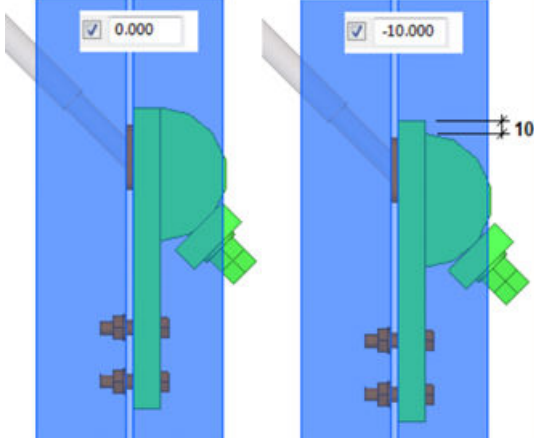
Define how the round plates are joined to the connection plate.

## Dimensions



	Description
1	Diameter of the rod end.
2	Offset from the secondary part edges.
3	Length of the connecting piece. You can define this if a tube is created. Length is measured along the center line.
	
4	Slot length in the main part.
5	Rod length to the center of the main part.
6	Rod length to the center of the main part.

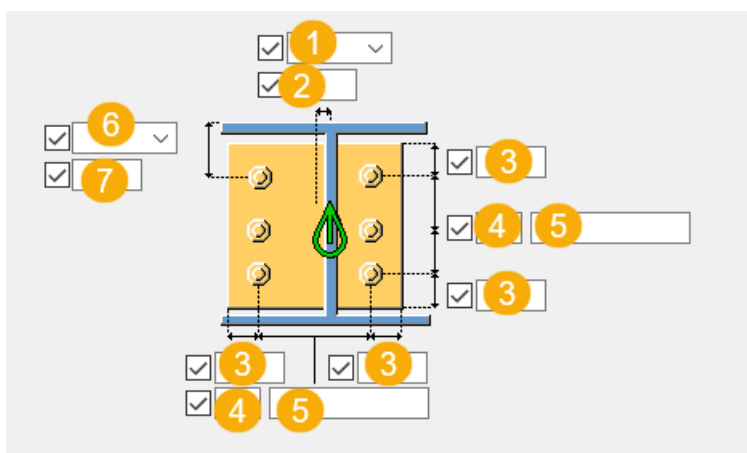


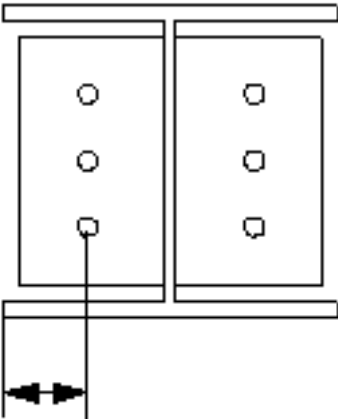
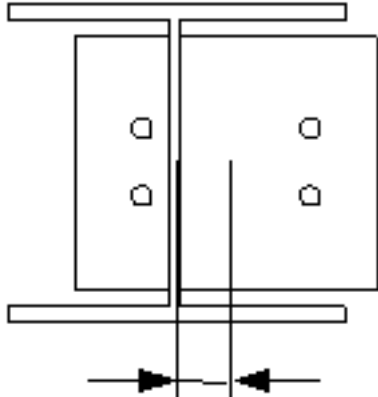
	<b>Description</b>
<b>7</b>	Define how the calotte is welded. When not welded, the calotte is connected to the main part with a bolted connection.
<b>8</b>	Vertical offset of the round plates. Define a value to offset the plates in the vertical direction. 
<b>9</b>	Slotted hole height.
<b>10</b>	Slotted hole width.
<b>11</b>	Define how the rod connection is welded.
<b>12</b>	Slotted hole height in the main part.
<b>13</b>	Slotted hole width in the main part.

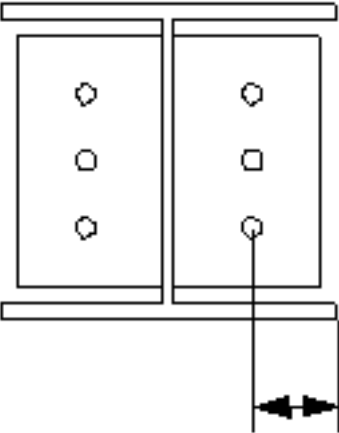
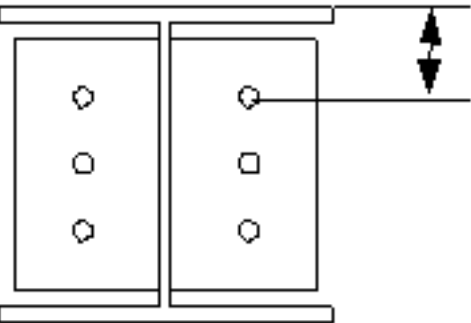
### **Bolts tab**

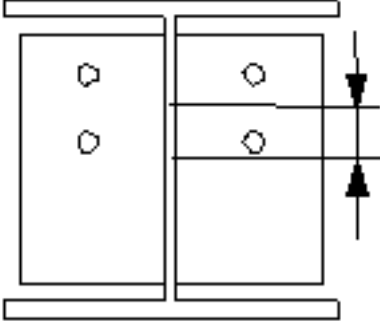
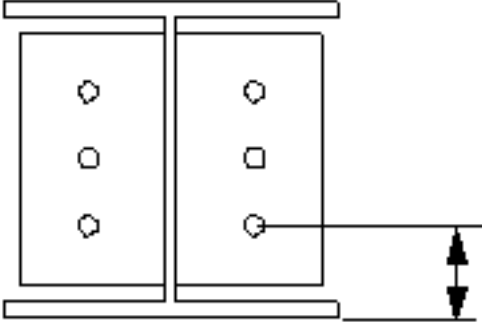
Use the **Bolts** tab to define the bolt group dimensions and bolt properties.

### **Bolt group dimensions**



	Description
1	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.              </li> <li> <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.              </li> </ul>

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
<b>2</b>	Dimension for horizontal bolt group position.
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
	Select how to measure the dimensions for vertical bolt group position. <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
Dimension for vertical bolt group position.	

### Basic bolt properties

<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog. 16 mm
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog. 4014-8.8
<b>Tolerance</b>	Gap between the bolt and the hole.	4 mm
<b>Thread in mat</b>	Defines whether the thread may be within	Yes

Option	Description	Default
	the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Cut length

Defines the depth at which Tekla Structures searches for the sections of the bolted parts. You can determine whether the bolt will go through one flange or two.

### Slotted holes

You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

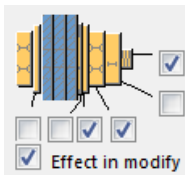
## Examples of slotted holes



## Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

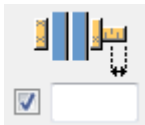
If you want to create a hole only, clear all the check boxes.



To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

## Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



## UDA tab

Use the **UDA** tab to define the user-defined attributes for the connection plate.

You can define the fabricator name, type, nomination, article number, product code, and product description.

## General

Click the link below to find out more:

## Analysis tab

Click the link below to find out more:

## Welds

Click the link below to find out more:

### **Windbrace connection (110)**

**Windbrace connection (110)** connects 1 to 10 braces to a beam or column by bolting them to a gusset plate, and welding or bolting the gusset plate to the beam or column.

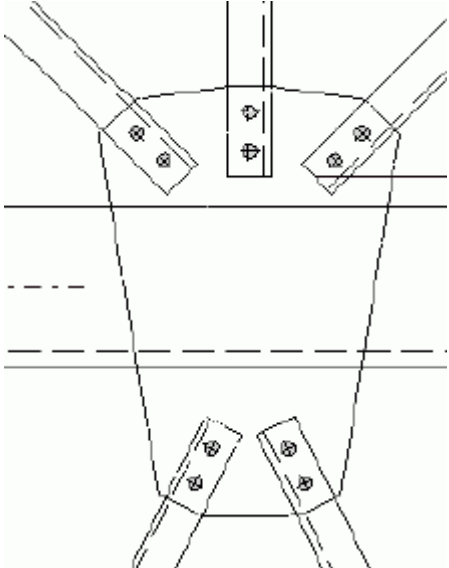
The braces can be:

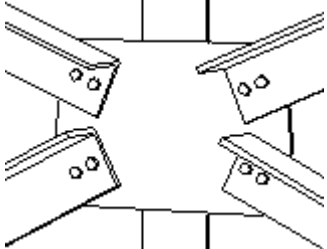
- Located in the same work plane as the beam or column, or they can be skewed
- On the same side or on each side of the beam or column

### **Objects created**

- Gusset plate
  - One gusset plate, if the braces are located on the same side of the beam or column
  - One gusset plate on each side of the beam or column, if the braces are located on either side of the beam or column. The plates are welded in the shop to create a folded gusset plate.
- Bolts
- Welds

### **Use for**

<b>Situation</b>	<b>Description</b>
	Two gusset plates welded in the shop to form a folded plate. Braces are bolted directly to the gusset plate. Brace profile: L

Situation	Description
	<p>Gusset plate is welded to the column. Brace webs are bolted to the gusset plate. Stiffeners are not created.</p> <p>Column or beam profile: L</p> <p>Brace profile: L</p>

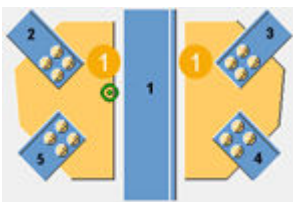
### Before you start

Create a beam or column, and 1 to 10 braces.

### Selection order

1. Select the main part (beam or column).
2. Select the secondary part (first brace).
3. Select the second secondary parts (second brace, up to 10 braces).
4. Click the middle mouse button to create the connection.

### Part identification key

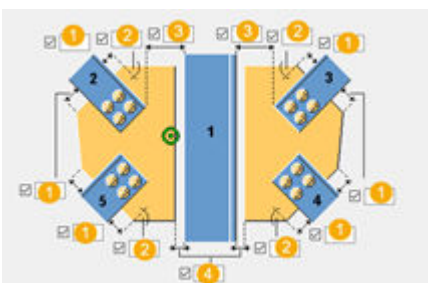


	Description
1	Gusset plate

### Picture tab

Use the **Picture** tab to define the gusset plate dimensions, brace clearance, and cut options for the brace ends on both sides of the main part.




### Dimensions





	<b>Description</b>
<b>1</b>	Length of the edge of the gusset plate This value affects the gusset plate shape.
<b>2</b>	Gusset plate corner angle (in degrees) This value affects the gusset plate shape.
<b>3</b>	Brace edge distance from the main part
<b>4</b>	Gusset plate edge distance from the main part

### Brace end cut

<b>Option</b>	<b>Description</b>
	Default Brace ends are cut square. AutoDefaults can change this option.
	Brace ends are cut square.
	Brace ends are cut perpendicular.

### Gusset tab

Use the **Gusset** tab to define the gusset plate properties, brace notch properties, and welding.

### Parts

<b>Option</b>	<b>Description</b>
<b>Gusset</b>	Thickness, width, and height of the gusset plate





<b>Option</b>	<b>Description</b>	<b>Default</b>
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in

Option	Description	Default
		<b>File menu --&gt; Settings --&gt; Options.</b>
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Finish</b>	Describes how the part surface has been treated.	

**NOTE** The following examples show only some of the available options. You will find more options on the **Gusset** tab.


### Gusset plate position on the brace


Define where to place the gusset plate on the brace. If needed, you can fine-tune the gusset plate position by moving the gusset plate in the z or in the y direction.

Option	Description
	Default Gusset plate is positioned in the middle of the brace. AutoDefaults can change this option.
	Gusset plate is positioned on the top flange of the brace.
	Define how much the gusset plate is moved in the z direction.
	Define how much the gusset plate is moved in the y direction.

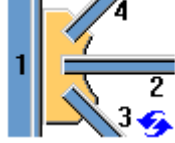
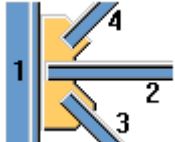
### Gusset plate shape

When you select the option to optimize the gusset plate weight, you can define whether the selection order of the braces affects the position of the braces.

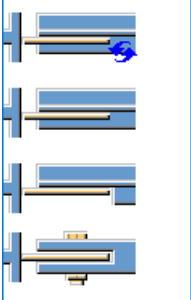
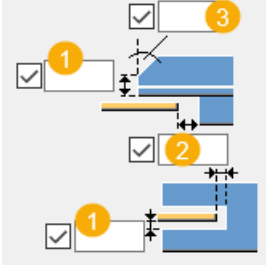
Option	Description
	Default AutoDefaults can change this option.

Option	Description
	<p>This option optimizes the gusset plate weight.</p>

### Brace position

Option	Description
	<p>Default The brace position is not affected. AutoDefaults can change this option.</p>
	<p>The first selected brace is placed closest to the main part.</p>


### Brace notch

Option	Description
	<p>Select whether the brace is notched. You might want to notch the brace if the plate collides with the brace flange or if you want to create slots in the hollow braces. The last option creates a notch and fastens the plate to the brace by using a bolt.</p>
	<ol style="list-style-type: none"> <li>1. Vertical notch dimension</li> <li>2. Horizontal notch dimension</li> <li>3. Notch angle</li> </ol>

### Gusset plate shape

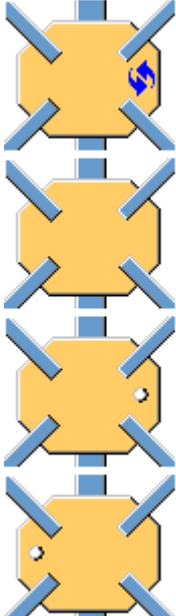
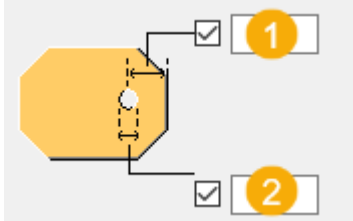
Option	Description
	<p>Select the gusset plate shape.</p>

### Gusset plate cut


Option	Description
	<p>Select whether the gusset plate is cut at the top.</p>

### Gusset plate hole

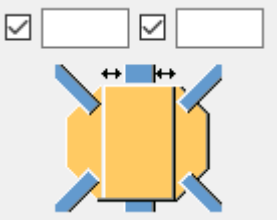
You might need to create an orientation hole in the gusset plate to indicate the position of the plate when the connection is assembled in the shop, or during erection.

Option	Description
	<p>Select whether a hole is created in the gusset plate, and the hole side.</p>
	<ol style="list-style-type: none"> <li>1. Define the distance from the center of the hole to the gusset plate edge.</li> <li>2. Define the hole diameter.</li> </ol>

### Gusset plate welding

Option	Description
	<p>Select whether the gusset plate is welded to the brace.</p>

## Bending dimensions

Option	Description
	<p>Enter the bending line dimensions for the gusset plate in skewed connections.</p> <p>The gusset plate is bent by the angles created by the secondary parts.</p>

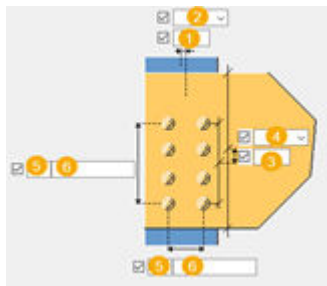
## Dimensioning holes in drawings

Set **Create extra bolt holes for gusset** to **Yes** to create an extra bolt hole that is perpendicular to the gusset plate. This helps to ensure that the hole dimensions are correct when the gusset plate is skewed so that the gusset hole is not perpendicular to the gusset plate.

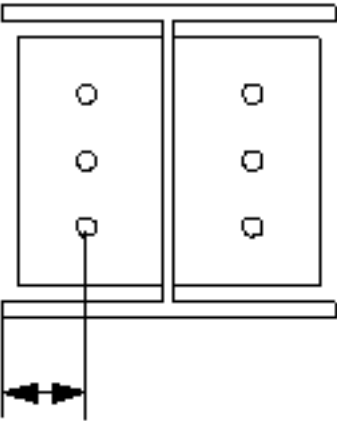
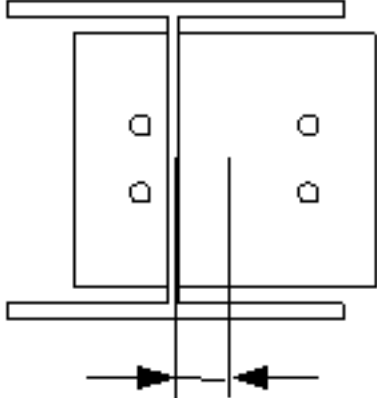
## Gusset bolts tab

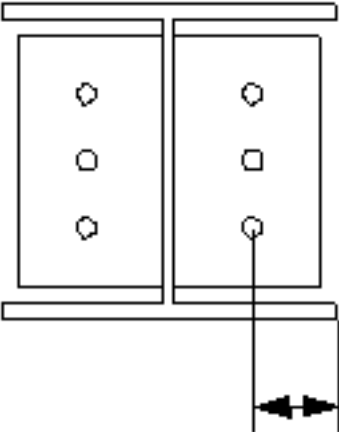
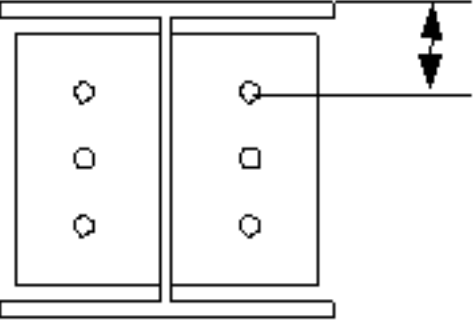
Use the **Gusset bolts** tab to define the bolt group dimensions and properties of bolts that connect the gusset plate to the beam or column.

## Bolt group dimensions

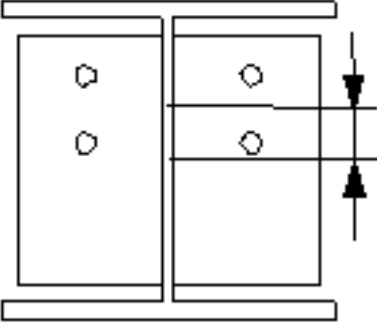
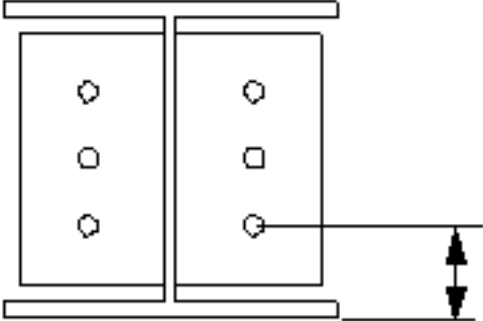


	Description
1	Dimension for horizontal bolt group position.



	Description
2	<p>Select how to measure the dimensions for horizontal bolt group position.</p> <ul style="list-style-type: none"> <li> <b>Left:</b> From the left edge of the secondary part to the leftmost bolt.              </li> <li> <b>Middle:</b> From the center line of the secondary part to the center line of the bolts.              </li> </ul>


	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Right:</b> From the right edge of the secondary part to the rightmost bolt.</li> </ul> 
<b>3</b>	Dimension for vertical bolt group position.
<b>4</b>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul> 



	Description
	<ul style="list-style-type: none"> <li> <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.              </li> <li> <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.              </li> </ul>
5	Number of bolts.
6	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### Gusset plate connection type






Option	Description
	Default Gusset plate is welded. AutoDefaults can change this option.
	Gusset plate is welded.


Option	Description
	Gusset plate is bolted.

### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Staggering of bolts

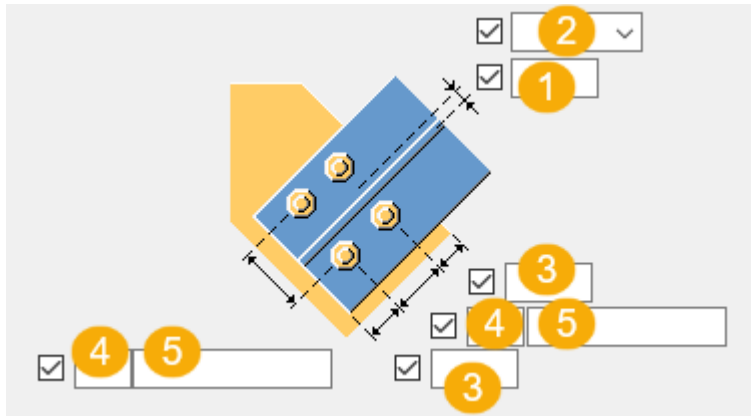
Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3

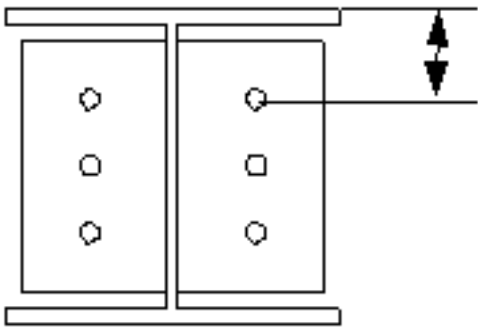
Option	Description
	Staggered type 4

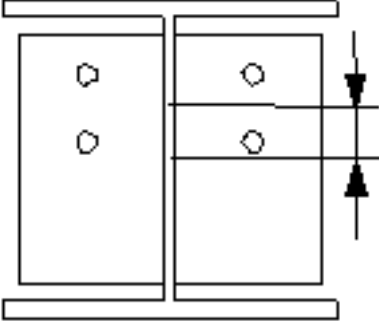
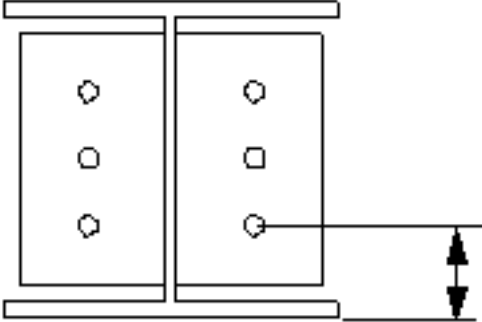
**Brace bolts 1 tab**

Use the **Brace bolts 1** tab to define the bolt group dimensions and properties of bolts that connect the braces to the upper brace, or to the gusset plate only.

**Bolt group dimensions**

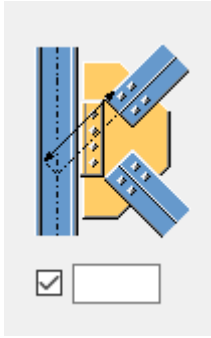


	Description
1	Dimension for vertical bolt group position.
2	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul>  <p>The diagram shows two vertical plates with three bolts each. A horizontal line is drawn from the top edge of the right plate to the center of the top bolt. A vertical double-headed arrow indicates the distance from this line to the top edge of the left plate.</p>

	<b>Description</b>
	<ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 
<b>3</b>	<p>Bolt edge distance.</p> <p>Edge distance is the distance from the center of a bolt to the edge of the part.</p>
<b>4</b>	Number of bolts.
<b>5</b>	<p>Bolt spacing.</p> <p>Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.</p>

### **Bolt distance**

Define the minimum distance from the brace bolts to the intersection point of the main part and brace center lines. If a brace is perpendicular to the main part, the distance is measured from the main part center line to the nearest bolts.

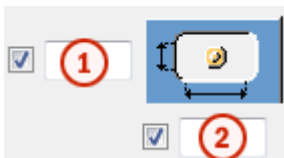


### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.  This has no effect when full-threaded bolts are used.	Yes
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site

### Slotted holes

You can define slotted, oversized, or tapped holes.



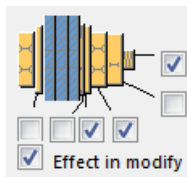
Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.

Option	Description	Default
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
Rotate Slots	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
Slots in	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Bolt assembly

The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

If you want to create a hole only, clear all the check boxes.




To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.






### Bolt length increase

Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



### Staggering of bolts

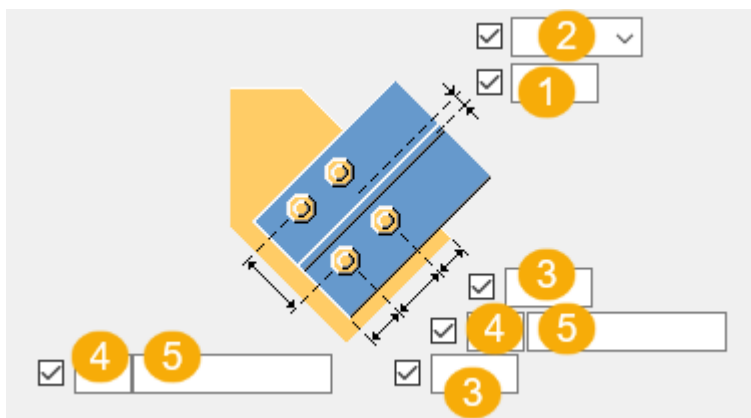
Option	Description
	Default Not staggered AutoDefaults can change this option.

Option	Description
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

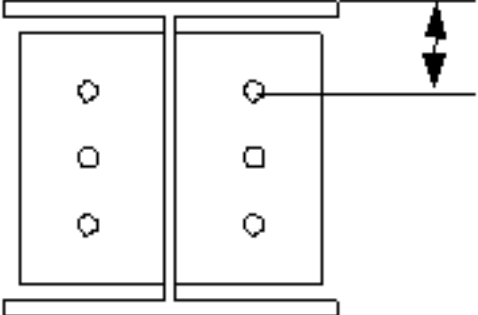
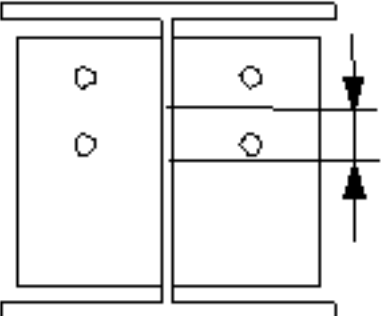
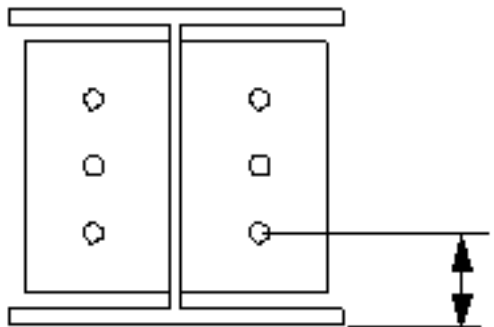
### Brace bolts 2 tab

Use the **Brace bolts 2** tab to define the bolt group dimensions and properties of bolts that connect the braces to the lower gusset plate.

### Bolt group dimensions



	Description
1	Dimension for vertical bolt group position.

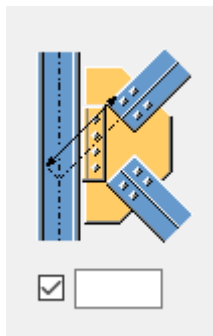
	<b>Description</b>
<b>2</b>	<p>Select how to measure the dimensions for vertical bolt group position.</p> <ul style="list-style-type: none"> <li>• <b>Top:</b> From the upper edge of the secondary part to the uppermost bolt.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Middle:</b> From the center line of the bolts to the center line of the secondary part.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Below:</b> From the lower edge of the secondary part to the lowest bolt.</li> </ul> 



	Description
<b>3</b>	Bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
<b>4</b>	Number of bolts.
<b>5</b>	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

### Bolt distance

Define the minimum distance from the brace bolts to the intersection point of the main part and brace center lines. If a brace is perpendicular to the main part, the distance is measured from the main part center line to the nearest bolts.



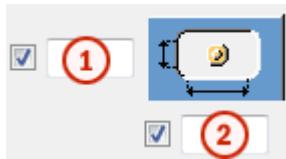
### Bolt basic properties

Option	Description	Default
<b>Bolt size</b>	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
<b>Bolt standard</b>	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
<b>Tolerance</b>	Gap between the bolt and the hole.	
<b>Thread in mat</b>	Defines whether the thread may be within the bolted parts when	Yes

Option	Description	Default
	bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
<b>Site/Workshop</b>	Location where the bolts should be attached.	Site


### Slotted holes






You can define slotted, oversized, or tapped holes.



Option	Description	Default
<b>1</b>	Vertical dimension of slotted hole.	0, which results in a round hole.
<b>2</b>	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
<b>Hole type</b>	<b>Slotted</b> creates slotted holes. <b>Oversized</b> creates oversized or tapped holes. <b>No hole</b> does not create holes.	
<b>Rotate Slots</b>	When the hole type is <b>Slotted</b> , this option rotates the slotted holes.	
<b>Slots in</b>	Part(s) in which slotted holes are created. The options depend on the component in question.	

### Staggering of bolts




Option	Description
	Default Not staggered AutoDefaults can change this option.

Option	Description
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

### Brace conn tab

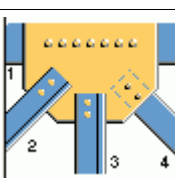
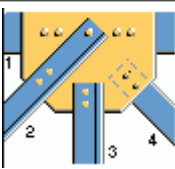
Use the **Brace conn** tab to create shim plates between the braces and the gusset plate, to bolt the braces to the beam or column, or the gusset plate.

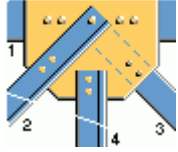
### Shim plate

Option	Description
	Default Shim plate is created. AutoDefaults can change this option.
	Shim plate is not created.
	Shim plate is created.

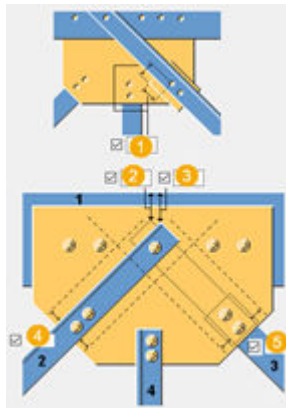
### Double-bolting braces

By default, braces are bolted to the gusset plate. You can also select to bolt braces to the first or second beam, or to the selected column.

Option	Description
	Bolts braces to the gusset plate. This is the default option.
	Bolts the first selected brace to both the gusset plate and the first selected beam or column.

Option	Description
	Bolts the first and subsequent selected braces to both the gusset plate and the first selected beam or column.

### Dimensions



	Description
1	Bolt edge distance
2	Distance to fit the secondary part
3	Distance to fit the secondary part
4	Brace edge dimension
5	

### General tab

Click the link below to find out more:

[General tab](#)

### Design tab

Click the link below to find out more:

[Design tab](#)

### Analysis

Click the link below to find out more:


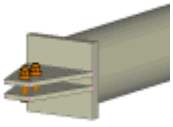

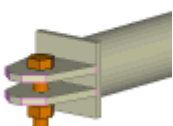
[Analysis tab](#)

## Welds

Click the link below to find out more:

## Bracing connection elements

Use the following components to create individual bracing elements, such as stiffeners and gusset plates. You can then use these elements to connect bracing to one or more parts, or in custom components.

Component	Image	Description
<a href="#">Crushed tube in points (S46) (page 2637)</a>	 A 3D rendering of a crushed tube in points connection. It shows a grey cylindrical tube with a flattened end, secured by two orange bolts.	Creates a tube brace between two points using a tube crushed between bolts.
<a href="#">Gusset tube in points (S47) (page 2638)</a>	 A 3D rendering of a gusset tube in points connection. It shows a grey rectangular gusset plate with a circular hole, secured by two orange bolts.	Creates a tube brace between two points that you pick, using a circular hollow section with 2 Tees at each end.
<a href="#">Crushed tube in bolts (S48) (page 2639)</a>	 A 3D rendering of a crushed tube in bolts connection. It shows a grey cylindrical tube with a flattened end, secured by two orange bolts.	Creates a tube brace using a tube crushed between two existing bolts.
<a href="#">Gusset tube in bolts (S49) (page 2640)</a>	 A 3D rendering of a gusset tube in bolts connection. It shows a grey rectangular gusset plate with a circular hole, secured by two orange bolts.	Creates a tube brace between two bolts, with tees at both ends.

### ***Crushed tube in points (S46)***

Creates a brace between two points that you pick, using a circular hollow section. Creates bolt groups at each end of the brace.

---

**WARNING** You cannot modify the individual objects that this component creates.

---

### **Parts created**

Tube brace

### Before you start

Create 2 points.

---

**WARNING** To adjust the rotation of the tees, change the work plane before you create the connection.

---

### Defining properties

Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents
Picture	Dimensions that define the location of the bolts.
Parts	Properties of the tube brace.
Tube pos.	Options that affect the position, plane and class of the tube.
Bolts	Bolt group properties.

### Selection order

1. Start point of the tube
2. End point of the tube
3. Click the middle mouse button to create the component

### ***Gusset tube in points (S47)***

Creates a brace between two points that you pick, using a circular hollow section with 2 Tees at each end. Seals tube.

---

**WARNING** You cannot modify the individual objects that this component creates.

---

### Parts created

- Tube
- Tees (4)
- End plate (2)

### Before you start

Create two points. See .

---

**WARNING** To adjust the rotation of the tees, change the work plane before you create the connection.

---

### Defining properties

Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents
Picture	
Parts	Properties of the tube, end plate, and tees
Tube pos.	Options that affect the position, plane and class of the tube.
Bolts	Bolt group properties.

### Selection order

1. Start point of the tube
2. End point of the tube
3. Click the middle mouse button to create the component

### ***Crushed tube in bolts (S48)***

Creates a brace using a crushed tube between two existing bolts.

---

**WARNING** You cannot modify the individual objects that this component creates.

---

### Parts created

Tube

### Before you start

Create two bolts, either manually or using a detailing component ([Standard gusset \(1065\) \(page 1911\)](#)).

### Defining properties

Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents
Picture	Dimensions that define the crushed end of the tube.
Parts	Properties of the tube.
Parameters	Options that affect the position, plane and class of the tube.
Bolts	

### Selection order

1. First bolt
2. Second bolt
3. Click the middle mouse button to create the component

### ***Gusset tube in bolts (S49)***

Creates a brace using a tube between two bolts, with a built-up T profile at both ends. Seals tube.

---

**WARNING** You cannot modify the individual objects that this component creates.

---

### Parts created

- Tube
- Tees (2)
- End plate

### Before you start

Create 2 bolts on the plane where you want to create the brace.

### Defining properties

Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
<b>Picture</b>	Dimensions that define the end of the tube and the tees.	
<b>Parts</b>	Properties of the tube, end plate and Tees.	
<b>Parameters</b>	General connection properties.	
<b>Bolts</b>	Properties of bolts.	

### Selection order

1. First bolt
2. Second bolt
3. Click the middle mouse button to create the component



## 2.19 Tower components

You can use tower components to automatically create:

- Complete towers, and tower elements such as legs and bracing
- Brace to tower leg connections
- Brace to brace connections

### See also

[Tower elements \(page 2641\)](#)


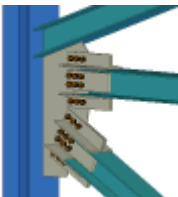


[Brace to tower leg connections \(page 2647\)](#)

[Brace to brace connections \(page 2654\)](#)

[Editing tools \(page 2661\)](#)

### Tower elements

Tekla Structures includes the following components that you can use to automatically create a complete tower, or structural elements, such as tower legs or bracing:

Component	Icon	Description
<a href="#">Tower generation (S43) (page 2642)</a>		Creates a complete tower.
<a href="#">Tower member (S63) (page 2643)</a>		Creates tower legs.
<a href="#">Transmission tower cross arm (S65) (page 2645)</a>		Creates cross arms using bent, angle-profile cleats.
<a href="#">Tower diagonal (S66) (page 2646)</a>		Creates bracing panels.

### **Tower generation (S43)**

Creates a complete tower, with a square or rectangular base.

#### **Profiles**

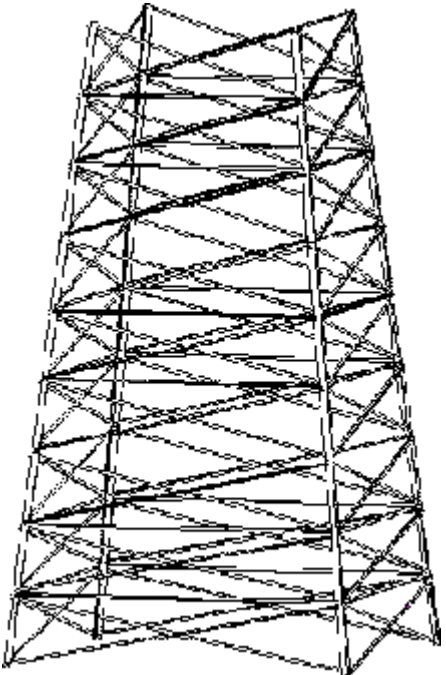
**Tower legs:** L

**Bracing:** L, flat, U, twin

#### **Parts created**

- Tower legs (4)
- Bracing panels (you define the quantity)

#### **Use for**

<b>Situation</b>	<b>Description</b>
	

#### **Before you start**

Check the current work plane, as it affects the position of the tower. For more information, read [Position of the tower \(S43, S63\) \(page 2666\)](#)

#### **Defining properties**

Use the following tabs in the component dialog box to define the properties of the parts this component creates:

<b>Tab</b>	<b>Contents</b>	<b>See also</b>
<b>Picture</b>	Quantity of bracing panels, dimensions that define the location of cross braces on the tower legs.	<a href="#">Defining bracing panels (S43, S66) (page 2672)</a>
<b>Parts</b>	Part properties, profiles for legs and bracing.	
<b>Leg Parameters</b>	Quantity of profiles in each leg, lift length, option to tile profiles	<a href="#">Defining tower legs (S63) (page 2669)</a>
<b>Tower Parameters</b>	Options that define the type of bracing to create, class numbers of bracing.	<a href="#">Defining bracing panels (S43, S66) (page 2672)</a>
<b>Twin Profiles</b>	Options to use twin profiles for bracing.	
<b>Model Points</b>		<a href="#">Creating construction points (S43, S66) (page 2666)</a>
<b>Joints</b>	Components that connect braces to tower legs.	<a href="#">Defining bracing connections (S43, S66) (page 2672)</a>

### **Picking order**

Pick a point to indicate the position of the tower leg at the bottom left corner of the base of the tower.

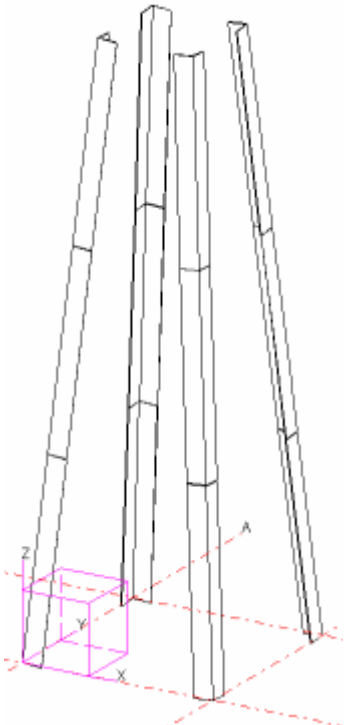
### ***Tower member (S63)***

Creates the 4 legs of a tower, using angle profiles. The legs form a square or rectangular base.

### **Parts created**

Legs (4)

## Use for

Situation	Description
	

### Before you start

Check the current work plane, as it affects the position of the tower. For more information, read [Position of the tower \(S43, S63\) \(page 2666\)](#)

### Defining properties

Use the following tabs in the component dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
<b>Picture</b>	Properties of angle profiles, quantity of profiles in each leg, lift length, option to tile profiles.	<a href="#">Defining tower legs (S63) (page 2669)</a> <a href="#">Creating sloping legs (S63) (page 2670)</a>
<b>Parts</b>		
<b>Parameters</b>	Gaps between angle profiles	<a href="#">Pattern of angle profiles (S63) (page 2670)</a>

### Picking order

Pick a point to indicate the lower left corner of the tower.

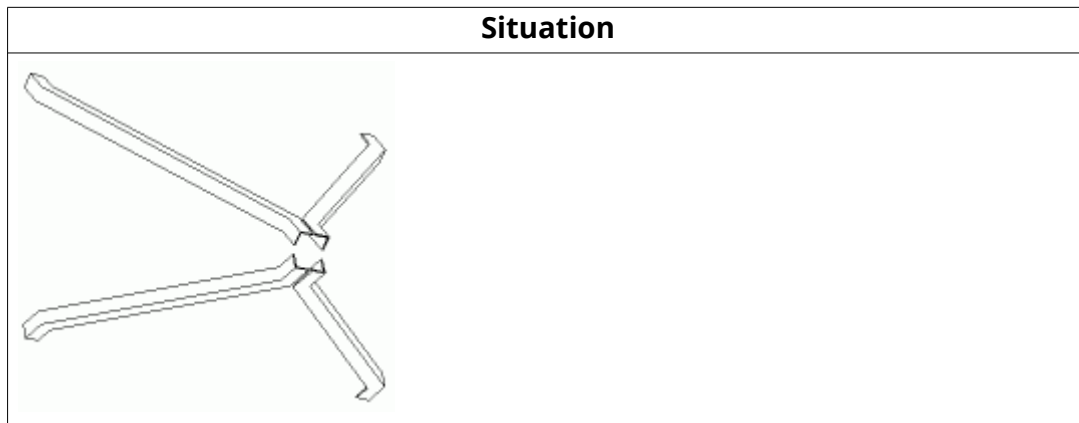
### ***Transmission tower cross arm (S65)***

Creates cross arms using bent, angle-profile cleats.

#### **Parts created**

Bent, angle-profile cleats

#### **Use for**

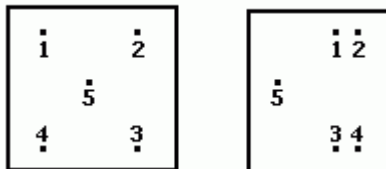


#### **Do not use for**

Twin-profile cross arms.

#### **Before you start**

Create 5 points. The 5th point must be in the center of the pattern, vertically:



#### **Defining properties**

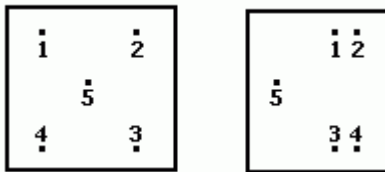
Use the following tabs in the component dialog box to define the properties of the parts this component creates:

<b>Tab</b>	<b>Contents</b>	<b>See also</b>
<b>Picture</b>	Dimensions that define the shape and size of the upper and lower cross arms.	
<b>Parts</b>	Part properties of the cross arms.	

Tab	Contents	See also
Parameters	Layout of profiles	<a href="#">Layout of profiles (S65) (page 2671)</a>

### Picking order

The picking order depends on the location of the 5th point:



### ***Tower diagonal (S66)***

Creates bracing panels between 2 or 4 existing columns.

#### Profiles

Bracing: L, flat, U, twin

#### Parts created

- Horizontal braces
- Diagonal braces

#### Use for

Situation	Description

## Before you start

Create 2 or 4 tower legs.

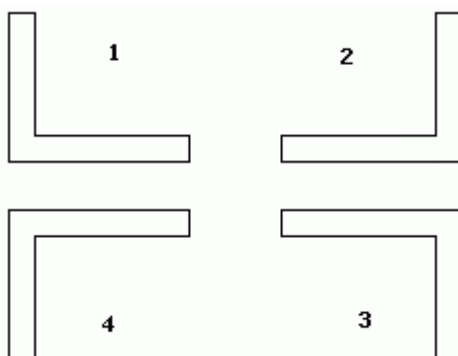
## Defining properties

Use the following tabs in the component dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
<b>Picture</b>	Dimensions that define the location of diagonal braces, quantity of bracing panels.	<a href="#">Defining bracing panels (S43, S66) (page 2672)</a>
<b>Parts</b>	Part properties of the horizontal and diagonal braces.	
<b>Parameters</b>	Options that define the type of bracing to create.	<a href="#">Defining bracing panels (S43, S66) (page 2672)</a>
<b>Twin Profiles</b>	Option to create twin-profile braces, position of twin profiles.	
<b>Model Points</b>	Option to create construction points, construction point properties.	<a href="#">Creating construction points (S43, S66) (page 2666)</a>
<b>Joints</b>	Components to use to connect braces to tower legs.	<a href="#">Defining bracing connections (S43, S66) (page 2672)</a>

## Picking order



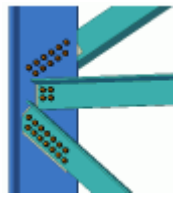
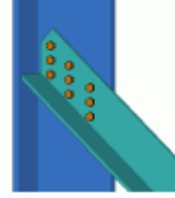
1. Pick the tower legs clockwise, starting with the top left leg:



2. Click the middle mouse button to create the component

## Brace to tower leg connections

Tekla Structures includes the following components to connect one or more braces to tower legs:

Component	Icon	Description
<a href="#">Tower 1 diagonal (87)</a> (page 2648)		Bolts 1 diagonal brace to a tower leg.
<a href="#">Tower 2 diagonal (89)</a> (page 2650)		Bolts 2 diagonal braces to a tower leg.
<a href="#">Leg - 2 and 3 diagonals (177)</a> (page 2651)		Bolts 2 diagonal braces and 1 horizontal brace (optional) to a tower leg. No gusset plate.
<a href="#">Leg - 1 diagonal (178)</a> (page 2653)		Bolts 1 diagonal brace directly to the outside or inside face of a tower leg. No gusset plate.

### ***Tower 1 diagonal (87)***

Bolts 1 diagonal brace to a tower leg.

#### **Profiles**

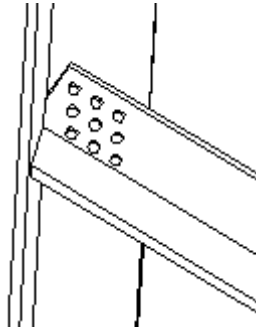
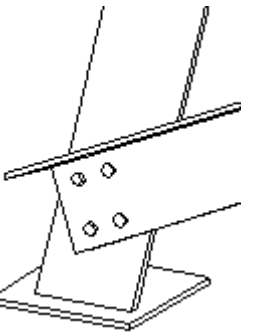
**Brace and tower leg:** L

#### **Parts created**

-



## Use for

Situation	
	
	

## Before you start

Create a tower leg and a brace.

## Defining properties

Use the following tabs in the component dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
<b>Picture</b>	Option to create bolts, Location of bolts.	<a href="#">About bolt gage lines (page 2678)</a> <a href="#">Creating bolts (89) (page 2681)</a>
<b>Parts</b>	Option to cut vertical leg of brace, dimensions of cut.	<a href="#">Cutting braces (87, 89) (page 2673)</a>
<b>Bolts</b>	Bolt properties	
<b>General</b>	Connection properties, AutoDefaults and AutoConnection rule groups.	

Tab	Contents	See also
<b>Extra cuts</b>	Option to cut horizontal leg of brace, dimensions of cut.	
<b>Check</b>		
<b>Analysis</b>	Information used in structural analysis	

### Selection order

1. Tower leg
2. Brace

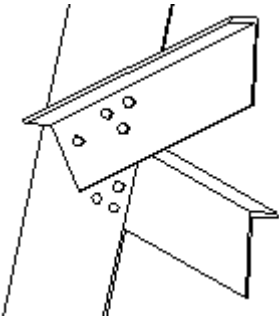
### ***Tower 2 diagonal (89)***

Bolts 2 diagonal braces to a tower leg.

### Parts created

-

### Use for

Situation	More information
	

### Do not use for

Braces that clash.

### Before you start

Create a tower leg and 2 diagonal braces.

### Defining properties

Use the following tabs in the component dialog box to define the properties of this component:

<b>Tab</b>	<b>Contents</b>	<b>See also</b>
<b>Picture</b>	Bolt gages that define the location of bolts that connect all parts.	<a href="#">About bolt gage lines (page 2678)</a> <a href="#">Creating bolts (89) (page 2681)</a>
<b>Picture2</b>	Bolt gages that define the location of bolts in the bolt groups that connect: <ul style="list-style-type: none"> <li>• 1st brace to the tower leg</li> <li>• 2nd brace to the tower leg</li> </ul>	
<b>Parts</b>	Dimensions that define the cuts in the vertical legs of the diagonal braces.	<a href="#">Cutting braces (87, 89) (page 2673)</a>
<b>General</b>	Connection properties, AutoDefaults and AutoConnection rule groups.	
<b>Cuts d.1</b>	Dimensions that define the cuts in the horizontal leg of the first brace picked.	<a href="#">Cutting braces (87, 89) (page 2673)</a>
<b>Cuts d.2</b>	Dimensions that define the cuts in the horizontal leg of the second brace picked.	
<b>Bolts</b>	Bolt properties.	
<b>Check</b>		
<b>Analysis</b>	Information used in structural analysis	

### **Selection order**

1. Tower leg
2. First brace
3. Second brace
4. Click the middle mouse button to create the component

### **Leg - 2 and 3 diagonals (177)**

Bolts 2 diagonal braces and 1 horizontal brace (optional) to a tower leg. Does not create a gusset plate.

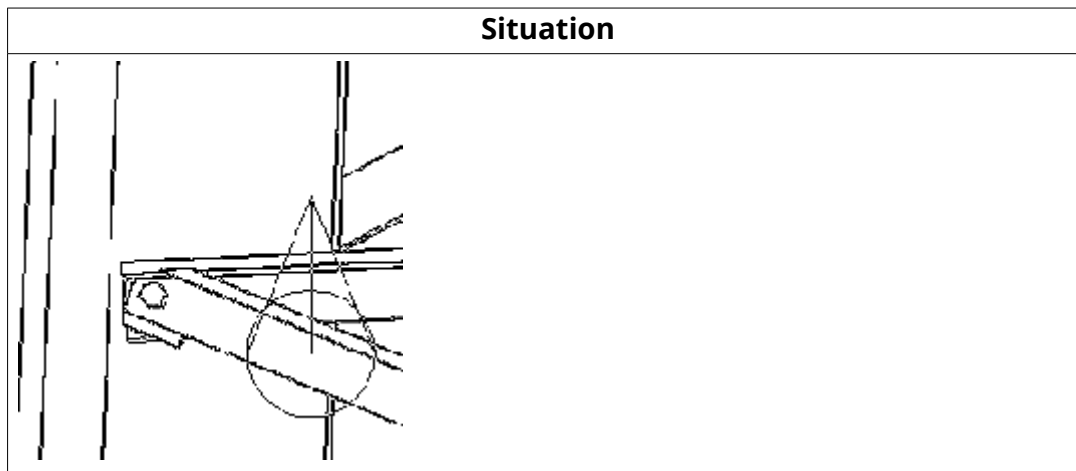
#### **Profiles**

Tower leg and braces: L

#### **Parts created**

Filler plates (optional)

#### **Use for**



#### **Before you start**

Create the following parts

- Tower leg
- 1 diagonal brace to the outside of the tower leg
- 1 diagonal brace to the inside of the tower leg
- 1 horizontal brace (optional)

#### **Defining properties**

Use the following tabs in the component dialog box to define the properties of the parts this component creates:

<b>Tab</b>	<b>Contents</b>	<b>See also</b>
<b>Picture</b>	Edge distances, dimensions that define the cut in the diagonal brace on the inside of the tower leg and the horizontal brace.	<a href="#">Creating your own defaults (177) (page 2675)</a>

<b>Tab</b>	<b>Contents</b>	<b>See also</b>
<b>Parameters</b>	Edge distances that define the location of bolt groups.	<a href="#">Creating your own defaults (177) (page 2675)</a>
<b>Bolts</b>	Bolt properties, dimensions that define the location of bolts, and bolt pattern of bolt groups.	
<b>General</b>	Connection properties, AutoDefaults and AutoConnection rule groups.	
<b>Plates</b>	Option to create filler plates, filler plate properties.	<a href="#">Defining filler plates (177) (page 2684)</a>
<b>Design</b>	Option to use UDL with AutoDefaults, reaction forces.	
<b>Analysis</b>	Information used in structural analysis	

### **Selection order**

1. Tower leg
2. Diagonal brace on the inside of the tower leg
3. Diagonal brace on the outside of the tower leg
4. Horizontal brace (optional)
5. Click the middle mouse button to create the component

### ***Leg - 1 diagonal (178)***

Bolts 1 diagonal brace directly to the outside or inside face of a tower leg.

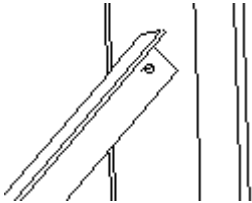
### **Profiles**

**Brace and tower leg:** L

### **Parts created**

-

## Use for

Situation	More information
	

## Before you start

Create a tower leg and a diagonal brace.

## Defining properties





Use the following tabs in the component dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
<b>Picture</b>	Dimensions that define how the brace is cut.	
<b>Parameters</b>	Bolt gage lines that define the positions of bolts.	<a href="#">About bolt gage lines (page 2678)</a>
<b>Bolts</b>	Quantity of bolts, bolt properties.	
<b>General</b>	Connection properties, AutoDefaults and AutoConnection rule groups.	
<b>Design</b>	Option to use UDL with AutoDefaults, reaction forces.	
<b>Analysis</b>	Information used in structural analysis	

## Selection order

1. Tower leg
2. Diagonal brace

## Brace to brace connections

Component	Icon	Description
<a href="#">Bolted gusset brace (167)</a> (page 2655)		Bolts 2 diagonal braces to 2 horizontal braces, using a gusset plate.
<a href="#">Bolted bridge brace (169)</a> (page 2656)		Bolts 2 horizontal braces and 1 diagonal brace to a bridge plate or angle profile.
<a href="#">Bolted Brace (181)</a> (page 2658)		Bolts 1 diagonal brace to 1 or 2 horizontal braces.
<a href="#">Bolted Plate Brace (182)</a> (page 2660)		Bolts 1 diagonal brace to 1 or 2 horizontal braces, using a plate.

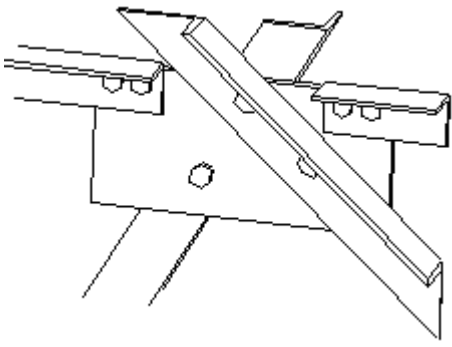
### ***Bolted gusset brace (167)***

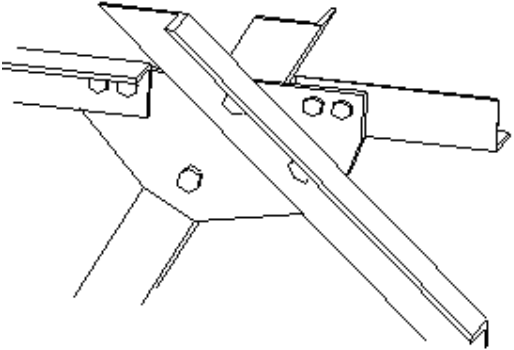
Bolts 2 diagonal braces to 2 horizontal braces, using a gusset plate.

#### **Parts created**

Gusset plate

#### **Use for**

Situation	Description
	Rectangular gusset plate.

Situation	Description
	<p>Braces connect to different faces of chamfered gusset plate.</p>

### Before you start

Create 2 diagonal braces and 2 horizontal braces.

### Defining properties

Use the following tabs in the component dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
<b>Picture</b>	Dimensions that define bolt locations.	<a href="#">About bolt gage lines (page 2678)</a>
<b>Parts</b>	Properties of gusset plate.	
<b>Parameters</b>	Properties of bolts in horizontal braces, option to chamfer gusset plate.	
<b>General</b>	Connection properties, AutoDefaults and AutoConnection rule groups.	
<b>Analysis</b>	Information used in structural analysis	

### Selection order

1. First diagonal brace
2. Second diagonal brace
3. First horizontal brace
4. Second horizontal brace
5. Click the middle mouse button to create the component



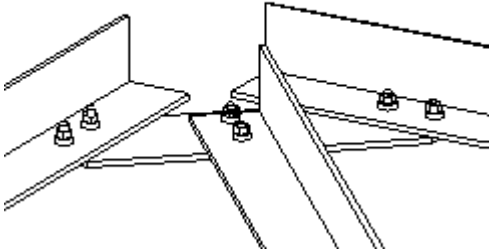
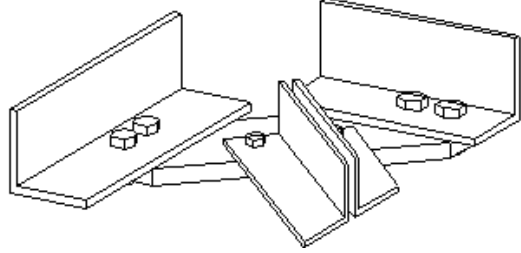
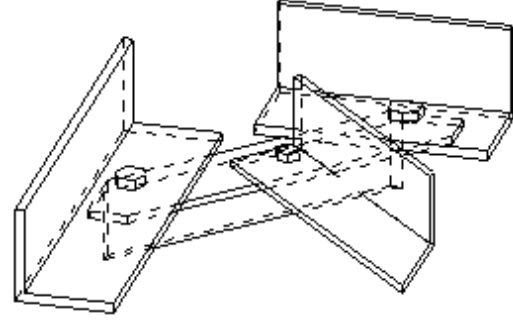
### ***Bolted bridge brace (169)***

Bolts 2 horizontal braces and 1 diagonal brace to a bridge plate or angle profile. Cuts the diagonal brace.

#### **Parts created**

Bridge plate or angle profile

#### **Use for**

Situation	More information
	
	Twin-profile diagonal braces
	Angle profile used as a bridge

#### **Do not use for**

Braces on different planes, or braces that clash.

---

**NOTE** **Bolted bridge brace (69)** does not cut the horizontal braces.

---

#### **Before you start**

Create 2 horizontal braces and 1 diagonal brace (single or twin profile).

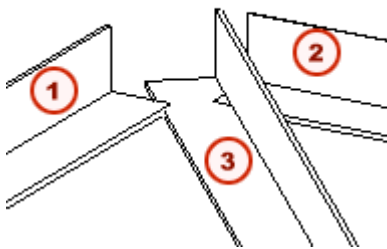
## Defining properties

Use the following tabs in the component dialog box to define the properties of the component:

Tab	Contents
Picture	Dimensions that define bolt locations and the clearance between the bridge and horizontal braces.
Parts	Part properties of the bridge.
Parameters	Properties of bolts in horizontal braces, bridge cut options.

## Picking order

1. First horizontal brace
2. Second horizontal brace
3. Diagonal brace
4. If the diagonal brace is a twin profile, pick the second profile.
5. Click the middle mouse button to create the component.



	Description
1	First horizontal brace
2	Second horizontal brace
3	Diagonal brace

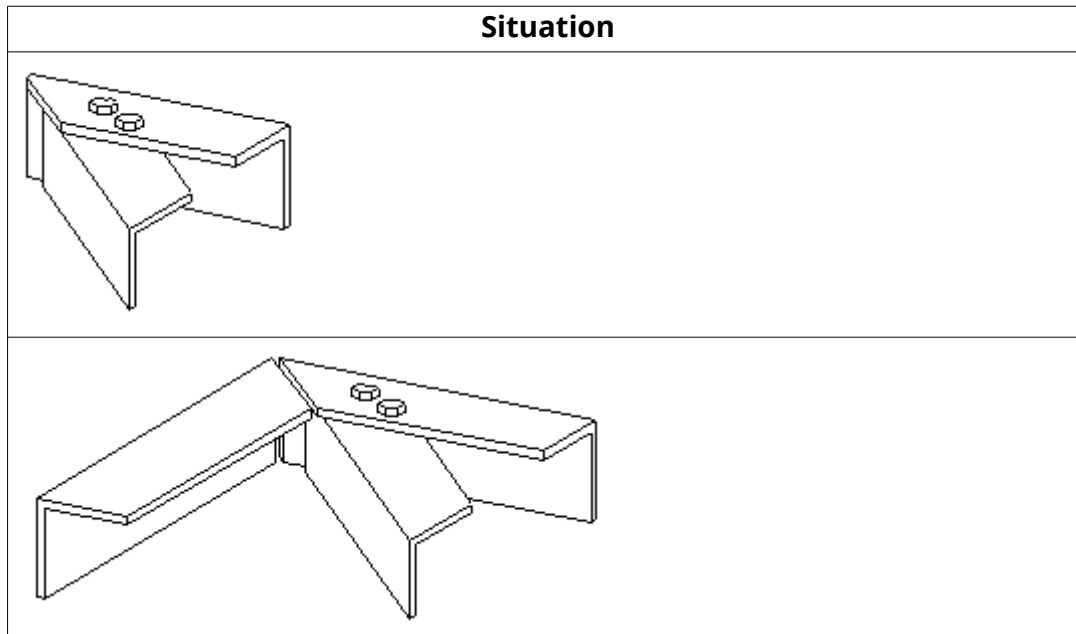
## ***Bolted Brace (181)***

Bolts 1 diagonal brace to 1 or 2 horizontal braces.

## Parts created

-

## Use for



## Do not use for

Braces that are not in the same plane.

## Before you start

Create 1 diagonal brace and 1 or 2 horizontal braces. The braces can be built-up beams.

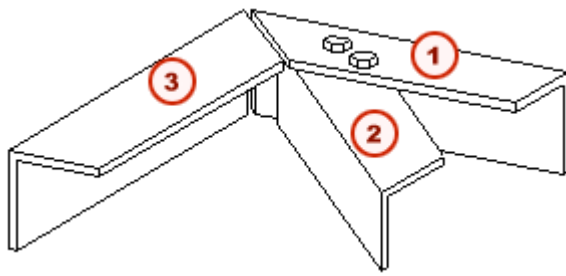
## Defining properties

Use the following tabs in the component dialog box to define the properties of this component:

Tab	Contents	See also
<b>Picture</b>	Dimensions that define the position of bolts. Clearance between braces.	<a href="#">Defining bolt gage lines (87) (page 2679)</a> <a href="#">Cutting braces (181, 182) (page 2674)</a>
<b>Parameters</b>	Bolt and cut options for horizontal braces.	

## Picking order

1. First horizontal brace
2. Diagonal brace
3. Second horizontal brace (optional)



	Description
1	First horizontal brace
2	Diagonal brace
3	Second horizontal brace (optional)

### ***Bolted Plate Brace (182)***

Bolts 1 diagonal brace to 1 or 2 horizontal braces, using a plate. Connects the diagonal brace to the inside or outside face of the horizontal brace.

#### **Parts created**

- Plate
- Filler plate(s)

#### **Use for**

Situation

#### **Do not use for**

Braces that are not in the same plane.

#### **Before you start**

Create 1 diagonal brace, and 1 or 2 horizontal braces.

## Defining properties

Use the following tabs in the component dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
<b>Picture</b>	Dimensions that define the location of bolts, clearance between horizontal braces.	<a href="#">About bolt gage lines (page 2678)</a> <a href="#">Cutting braces (181, 182) (page 2674)</a>
<b>Parts</b>	The properties of the plate and optional filler plate.	
<b>Parameters</b>	Shape of cut in braces, bolt options, plate options.	<a href="#">Defining filler plates (182) (page 2685)</a> <a href="#">Creating bolts (182) (page 2682)</a>

## Picking order


1. Horizontal brace to which to bolt the diagonal brace
2. Diagonal brace
3. Second horizontal brace (optional)
4. Click the middle mouse button to create the component





	Description
<b>1</b>	Horizontal brace to which to bolt the diagonal brace
<b>2</b>	Diagonal brace
<b>3</b>	Second horizontal brace (optional)

## Editing tools

Use the following components to modify tower bracing:

Component	Icon	Description
<a href="#">Open/Close angle ends</a>		Simulates the opening or closing of one end of an angle profile.

Component	Icon	Description
(1050) (page 2662)		
Open/Close angle (1051) (page 2663)		Simulates the opening or closing of an inner portion of an angle profile.
Autoposition (S67) (page 2665)		Adjusts the position of braces connected to a tower leg. Cuts braces.

### ***Open/Close angle ends (1050)***

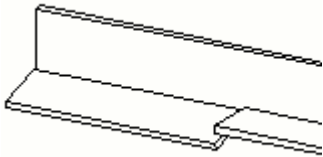
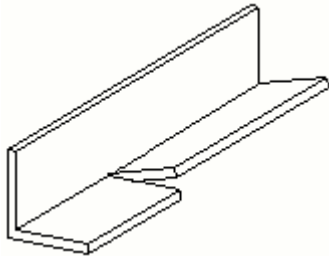
Simulates the opening or closing of one end of an angle profile by cutting and bending the profile.

**NOTE** Use this component to create detail drawings that indicate where to open or close angle profiles used in tower bracing. In the shop, the angle profile is machined, not cut.

### **Parts created**

-

### **Use for**

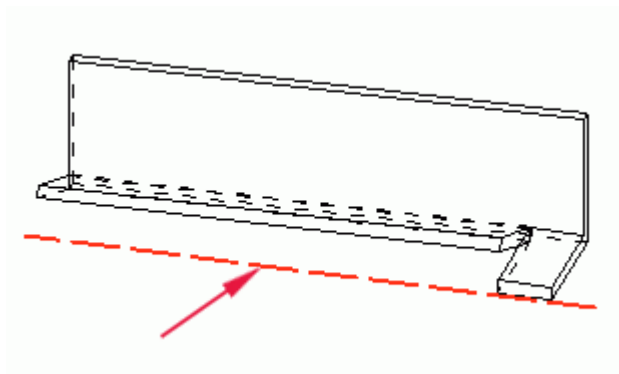
Situation	More information
	
	

### Do not use for

To open or close the inner portion of an angle profile, use [Open/Close angle \(1051\)](#) (page 2663).

### Before you start

- Create an angle profile
- Create a point to locate the component
- Set the work plane parallel to the outer face of the leg of the angle profile that you want to bend:



### Defining properties

Use the following tab in the **Open/Close angle ends (1050)** dialog box to define the properties of the component:

Tab	Contents	More information
<b>Parameters</b>	Which leg to open or close, location of cut, bend angle.	<a href="#">Adjusting length of leg to open or close (1050, 1051)</a> (page 2667)

### Picking order

1. Angle profile
2. A point on the angle profile

### ***Open/Close angle (1051)***

Simulates the opening or closing of an inner portion of an angle profile by cutting and bending the profile.

---

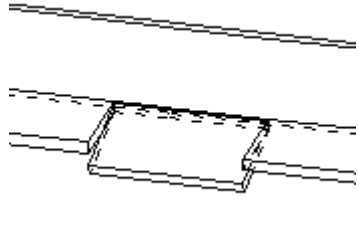
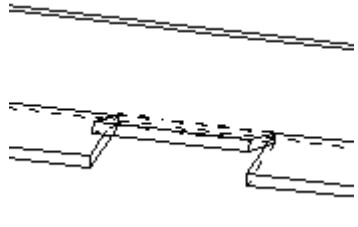
**NOTE** Use this component to create detail drawings that indicate where to open or close angle profiles used in tower bracing. In the shop, the angle profile is machined, not cut.

---

## Parts created

-

## Use for

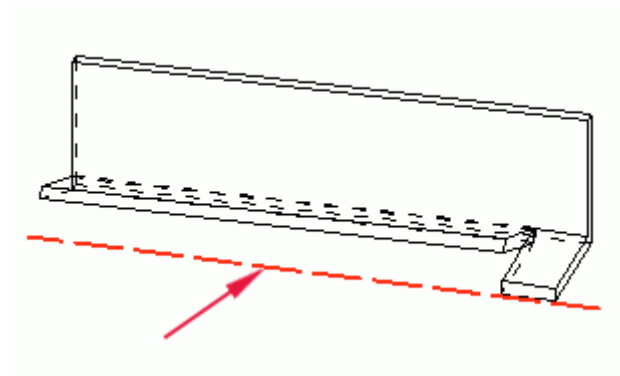
Situation	More information
	
	

## Do not use for

To open or close one end of an angle profile, use [Open/Close angle ends \(1050\)](#) (page 2662).

## Before you start

- Create a point to locate the component
- Set the work plane parallel to the outer face of the leg of the angle profile that you want to bend:



## Defining properties

Use the following tabs in the component dialog box to define the properties of the component:



Tab	Contents	More information
<b>Parameters</b>	Which leg to open or close, location of cut, bend angle.	<a href="#">Adjusting length of leg to open or close (1050, 1051) (page 2667)</a>

### Picking order

1. Angle profile
2. A point on the angle profile

### ***Autoposition (S67)***

Adjusts the position of 1 or 2 braces connected to a tower leg. Cuts braces.

---

**WARNING** Use **Autoposition (S67)** when you have completed all other work on a model. Changing the model may override the adjustments you make using this component.

---

### Parts created

-

### Before you start

Create 1 or 2 braces and connect them to a tower leg.

### Defining properties

Use the following tab in the component dialog box to adjust the braces and create cuts:

Tab	Contents	See also
<b>Picture</b>		<a href="#">Moving and cutting braces (S67) (page 2676)</a>

### Picking order

1. Tower leg
2. First brace
3. Second brace (optional)
4. Click the middle mouse button

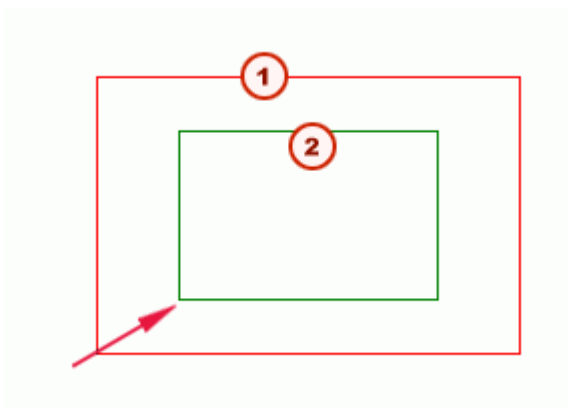
## Defining general properties

Click the links below to find out more:

- [Position of the tower \(S43, S63\) \(page 2666\)](#)
- [Creating construction points \(S43, S66\) \(page 2666\)](#)
- [Adjusting length of leg to open or close \(1050, 1051\) \(page 2667\)](#)

### **Position of the tower (S43, S63)**

Tekla Structures creates the tower along the z axis of the current work plane. If the tower has a rectangular base, the longest side of the base runs parallel to the x axis:



	Description
1	Base of tower
2	Top of tower

### **Creating construction points (S43, S66)**

*Construction points* are points that you can pick to attach components to parts. For example, you might create construction points on tower legs to use to connect bracing to the legs.

To create construction points on tower legs or braces, go to the **Model Points** tab. For each type of brace:

- Select the location of the points (1). For example, select **Before** to create points on the outer face of a brace;

- Enter the distance between the points, followed by the quantity of points (2). For example, enter 400\*4 to create 4 points, 400 mm apart.

Horizontal profile model points	<input checked="" type="checkbox"/>	Behind <b>1</b>
Before model points	<input checked="" type="checkbox"/>	
Behind model points	<input checked="" type="checkbox"/>	400*4 <b>2</b>

### ***Adjusting length of leg to open or close (1050, 1051)***

To adjust the length of leg to open or close, go to the **Parameters** tab and enter one of the following dimensions:

<b>Field</b>	<b>Description</b>
<b>External length of the portion to be opened/closed</b>	Measured from the point you pick to create the component towards the start of the part reference line
<b>Internal length of the portion to be opened/closed</b>	Measured from the point you pick to create the component towards the end of the part reference line

### **Defining tower leg properties**

This section explains how to define the properties of tower legs.

Click the links below to find out more:

- [Defining tower legs \(S43\) \(page 2667\)](#)
- [Defining tower legs \(S63\) \(page 2669\)](#)
- [Layout of profiles \(S65\) \(page 2671\)](#)

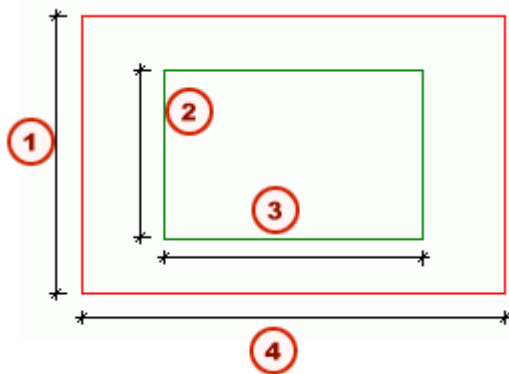
### ***Defining tower legs (S43)***

Tower legs are constructed using angle profiles.

- [Creating sloping legs \(S43\) \(page 2667\)](#)
- [Type and quantity of angle profiles \(S43\) \(page 2668\)](#)

### Creating sloping legs (S43)

To define the slope of the tower legs, go to the **Leg Parameters** tab and enter the x and y dimensions of the base and top of the tower:

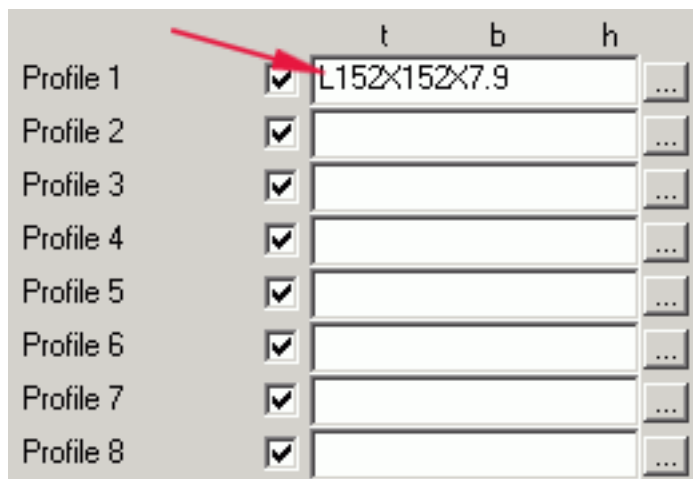


	Description
1	Base y
2	Top y
3	Top x
4	Base x

### Type and quantity of angle profiles (S43)

To specify the angle profiles to use for the tower legs:

1. Go to the **Parts** tab and enter the profiles you want to use in the **Profile 1**, **Profile 2**, etc. fields. You can specify up to 8 profile types.



- Go to the **Profiles to be used** field on the **Leg Parameters** tab and enter the quantity of each profile type to use for the legs. Here we are using 6 lifts of Profile 1 to create the tower leg:

Picture	Parts	Leg Parameters	Tower Parameters	Twin Profiles	Model Point
		Base x dimension	<input checked="" type="checkbox"/>	8000.00	
		Base y dimension	<input checked="" type="checkbox"/>	8000.00	
		Top x dimension	<input checked="" type="checkbox"/>	5000.00	
		Top y dimension	<input checked="" type="checkbox"/>	5000.00	
		Cut back at top	<input checked="" type="checkbox"/>	2.50	
		Cut back at bottom	<input checked="" type="checkbox"/>	2.50	
		Vertical distances b/w subs. levels	<input checked="" type="checkbox"/>	3*6000	
		Profiles to be used	<input checked="" type="checkbox"/>	6*1	
		Profiles to be tiled	<input checked="" type="checkbox"/>		

### ***Defining tower legs (S63)***

Tower legs are constructed using angle profiles.

- [Type and quantity of angle profiles \(S63\) \(page 2669\)](#)
- [Creating sloping legs \(S63\) \(page 2670\)](#)
- [Pattern of angle profiles \(S63\) \(page 2670\)](#)
- [Splicing legs \(S63\) \(page 2671\)](#)

### **Type and quantity of angle profiles (S63)**

To define the type and quantity of angle profiles to use:

- Go to the **Picture** tab. Use fields **1** to **8** to define the angle profiles you want to use.
- In the **Profiles for part** field, enter the quantity of each profile type to use for each leg. For example, enter 6\*1 to create tower legs each made up of 6 lifts with the profile type you defined in field **1**.

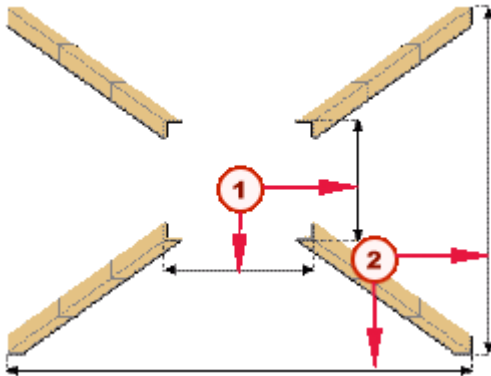
- On the illustration, enter the quantity and length of the lifts that make up each leg. Enter 6\*6000 to create tower legs using 6 lifts, each 6000 long:



- To tile specific leg lifts, enter the numbers of the lifts to tile in the **Parts to be tiled** field, counting from the bottom of the leg. For example, enter 3 5 to tile lifts 3 and 5.

### Creating sloping legs (S63)

To create sloping tower legs, go to the illustration on the **Parts** tab and enter the x and y dimensions of the base and top sections of the tower:



	Description
1	Dimensions of top of tower
2	Dimensions of base of tower

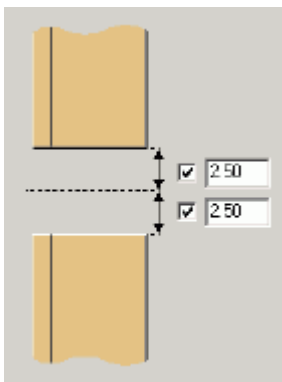
### Pattern of angle profiles (S63)

To define the quantity of angle profiles that form each leg, in cross section, use the graphic option on the **Parts** tab. The default option is one angle profile:



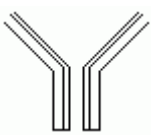
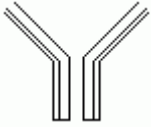
### Splicing legs (S63)

To enable the erector to splice tower legs, go to the **Parameters** tab and set the cut back distance between the angle profiles:



### Layout of profiles (S65)

The options are:

Option	Layout
Inside	
Outside	

## Defining tower bracing properties

This section explains how to define the properties of tower bracing. Click the links below to find out more:

- [Defining bracing panels \(S43, S66\) \(page 2672\)](#)
- [Defining bracing connections \(S43, S66\) \(page 2672\)](#)
- [Cutting braces \(87, 89\) \(page 2673\)](#)
- [Cutting braces \(177\) \(page 2674\)](#)
- [Cutting braces \(181, 182\) \(page 2674\)](#)
- [Creating your own defaults \(177\) \(page 2675\)](#)
- [Moving and cutting braces \(S67\) \(page 2676\)](#)

### ***Defining bracing panels (S43, S66)***

To define the quantity of bracing panels to create between each pair of tower legs, enter a number in the **Number of Diagonals field** on the **Picture** tab.

To define the layout of the bracing panels, go to the **Tower Parameters** tab and select an option in the **Type of Diagonal** dropdown list. The default layout is cross bracing:



You can also create diagonal bracing, in various layouts.

### ***Defining bracing connections (S43, S66)***

To specify the components to use to connect braces to the tower legs, go to the **Joints** tab. You can use different components to connect the left and right diagonal braces, and the horizontal braces.

---

**WARNING** You cannot use custom components to connect the braces to the tower legs.

---

To define each connection, on the **Joints** tab:

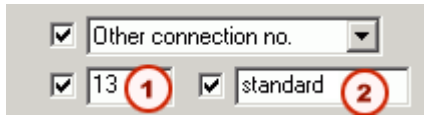
- Select a component from the dropdown list,
- or
- To select a component that is not on the dropdown list,, select **Custom** and enter the component number.

You can also use a predefined set of properties for the component:

1. Enter the number of the component to use (1). Here we are using **Fitting (13)**.



2. Indicate the predefined set of properties to use (2).

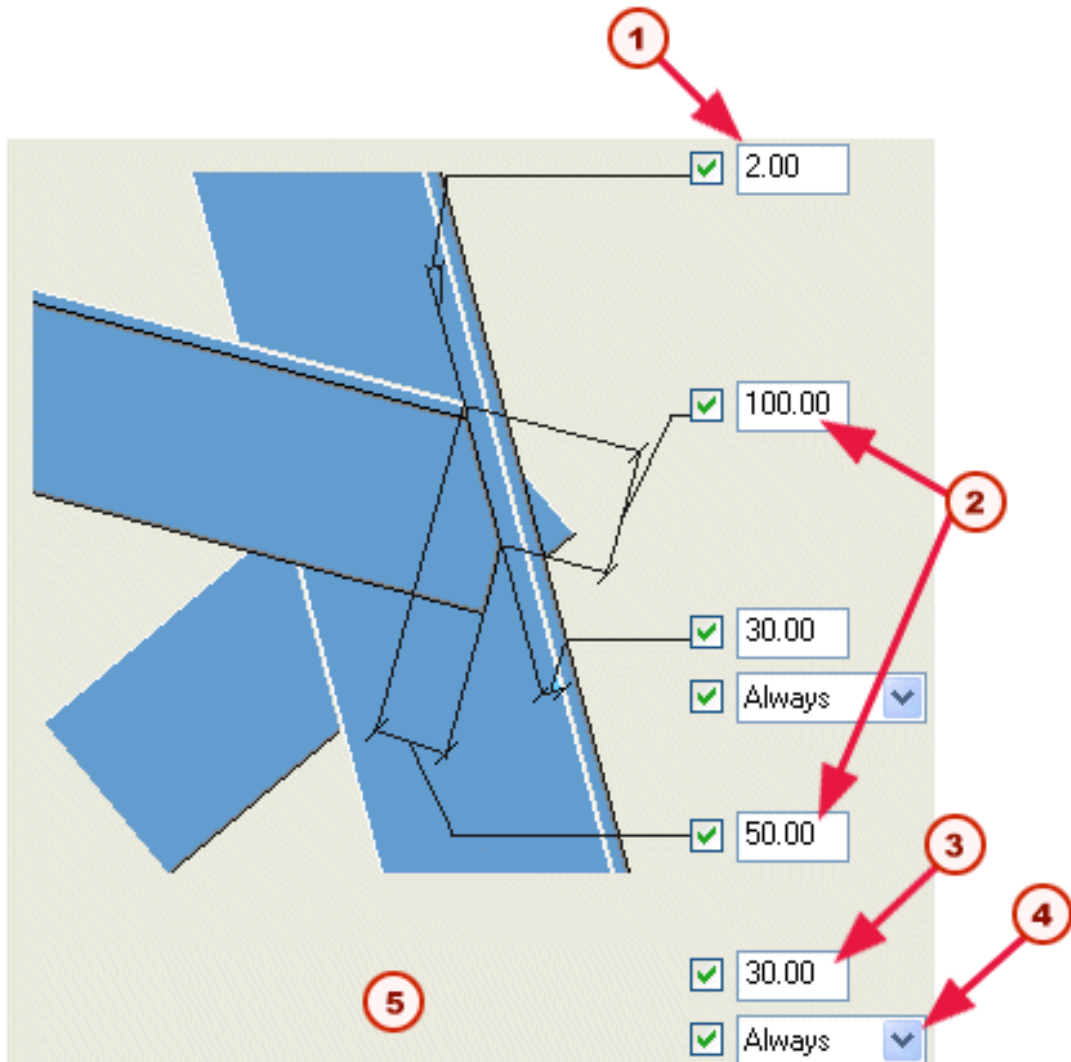


### **Cutting braces (87, 89)**

To define the cuts in the legs of the braces, go to:

- Horizontal legs: **Parts** tab
- Vertical legs: **Extra cuts** tab (87), **Cuts d.1** and **Cuts d.2** tab (89)

These tab pages contain options to cut the legs of the braces, and the dimensions of the cut. This is how they appear on the **Parts** tab:



	Description
1	Incremental value for the angle of the cut. If you enter 2, the actual angle can be 2, 4, 8, etc
2	Cut dimensions
3	Clearance to heel of tower leg
4	Cut options
5	Clearance between main profile leg and diagonal 2

**NOTE** Use the **Always** cut option to cut the braces and create the clearance to the heel of the tower leg. This option overrides the bolt edge distances on the **Picture** tab.

### ***Cutting braces (177)***

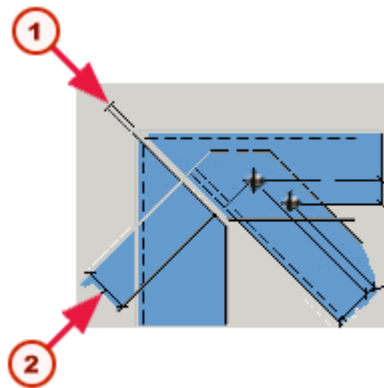
**Leg - 2 & 3 diagonals (177)** automatically cuts the braces according to the bolt edge distances specified for each brace on the **Picture** tab.

### ***Cutting braces (181, 182)***

Tekla Structures automatically:

- Miters the end of the horizontal brace, or braces and
- Cuts the end of the diagonal brace, according to the bolt edge distance.

To specify these dimensions, go to the **Picture** tab:



	Description
1	Clearance between horizontal braces
2	Bolt edge distance

To define the shape of the cut, use the following fields:

- **Switch for shape of horiz. braces cut** on the **Parameters** tab (181).

- **Switch to manage brace cut shape** on the **Parameters** tab (182).

### ***Creating your own defaults (177)***

Default values for all the properties in the **Parameters** tab, except clearance, plus the bolt end distances of the diagonals can be specified in text files called `tower_joint_clearance_N.txt`, where N is the bolt diameter. For example, `tower_joint_clearance_16.txt`, `tower_joint_clearance_24.txt`, etc.

This file can be created in the current model folder or system folder.

If the text file for a particular bolt diameter is not found, the connection will calculate its own default values.

The format of this text file is:

Format 1: <L-profile> <C> <D1> <D2> <D3> <D4> <E> | <C> <D1> <D2> <D3> <D4> <E>

Format 2: <L-profile> <C> <D1> <D2> <D3> <D4> <E>

Format 3: <L-profile> <H> | <B>

Format 4: <L-profile> <H>

Where

- <L-profile> = L-profile name; eg, L200\*200\*20, L200/15.
- <C> = distance from the edge of the part to the nearest bolt.
- <D1> = distance from the heel of the part.
- <D2> = distance from the outside-border of the part.
- <D3> = distance from the heel of the part, away from the part.
- <D4> = distance from the cut-end of the part, if any.
- <E> = distance between bolts.
- <H> = see the section below on Format 3 & 4.
- <B> = see the section below on Format 3 & 4.
- The first set of values in Format 1 is for the first flange (h) of the part, and the second set for the second flange (b).
- In Format 2, h and b have the same values.
- In Format 3, the first set of <C> <D1> ... <D4> <E> values are assigned with the value of <H>, and the second assigned with <B>.
- In Format 4, both sets of values are assigned with the value of <H>.

Note that

- Lines starting with a ';' or '' are skipped.
- <L-profile> must start on the first position of the line.

- There must be at least one blank space between <L-profile> and the first value.
- The component finds only the first occurrence of the specified L-profile.

### Examples

L40\*5 20

L50\*50\*5 25 | 25

L80\*10 30 30 30 30 30 30

L200/15 40 45 40 40 40 35

L200/20 40 45 40 40 40 35

RSA45\*45\*5 20 25 20 20 20 20

RSA100\*100\*8 30 45 40 40 40 35

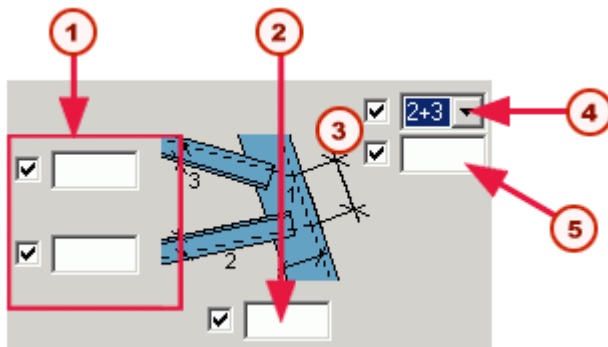
RSA75\*150\*15 30 35 30 30 30 25 | 35 40 35 35 35 30

RSA150\*75\*15 35 40 35 35 35 30 | 30 35 30 30 30 25

RSA200\*200\*20 40 45 40 40 40 35

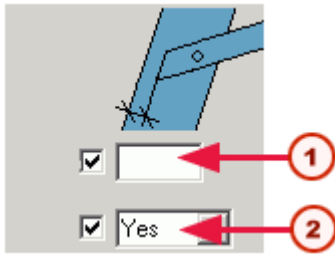
### Moving and cutting braces (S67)

To move the ends of braces:



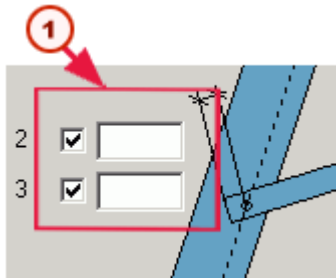
	Description
1	Define the bolt gage lines for the braces
2	Define the bolt gage line for the tower leg
3	Move points
4	Indicate which brace(s) to move
5	Enter the distance to move the point(s) where the gage lines intersect

To cut the braces:



	Description
1	Enter the distance from the end of the brace(s) to the edge of the tower leg
2	Select <b>Yes</b> to cut the brace(s)

To move bolt groups:



	Description
1	Enter the distance from the first bolt in the group to the end of the brace

## Defining bolt properties

This section explains how to define the properties of bolts in tower components.

Click the links below to find out more:

- [About bolt gage lines \(page 2678\)](#)
- [Editing default gage lines \(page 2680\)](#)
- [Creating bolts \(87\) \(page 2681\)](#)
- [Creating bolts \(89\) \(page 2681\)](#)
- [Creating bolts \(178\) \(page 2682\)](#)
- [Creating bolts \(181\) \(page 2682\)](#)
- [Creating bolts \(182\) \(page 2682\)](#)
- [Bolt location \(87, 89\) \(page 2682\)](#)

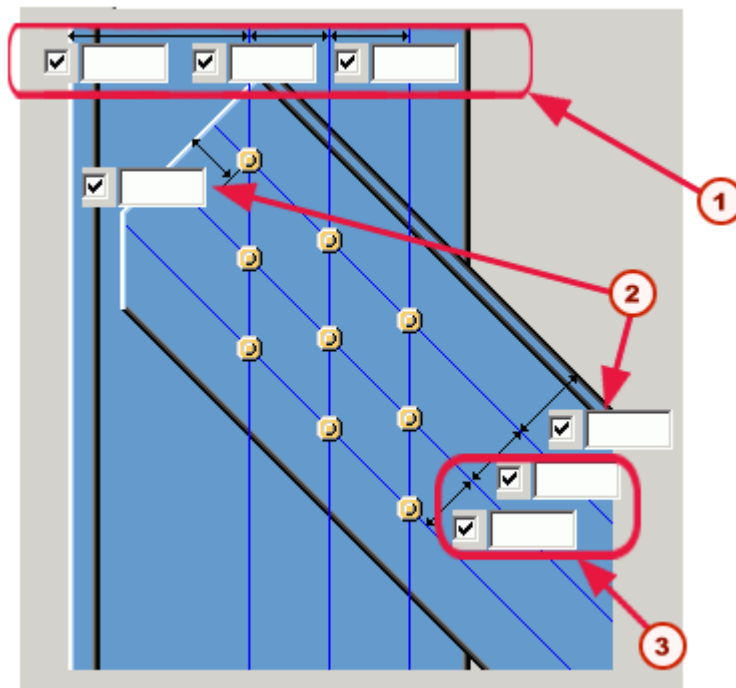
### About bolt gage lines

Several components use gage lines that you can use to:

- Define the location of bolts on a brace
- Adjust the position of individual bolts
- Remove bolts

For example, **Leg 1 - diagonal (178)** uses gage lines.

Gage lines specify several dimensions:



	Description
1	Distance between bolts, horizontally
2	Distance from the center of the bolt to the edge of the brace
3	Distance between bolts, vertically

To use a default set of gage lines:

- Ensure that the `gage_lines.dat` file is in the profile folder of the environment you are using,
- Leave all the fields blank on the **Parameters** tab.

**TIP** To learn how to change the default gage lines, see [Editing default gage lines \(page 2680\)](#).

## Components using gauge\_lines.dat

The following components use the `gauge_lines.dat` file:

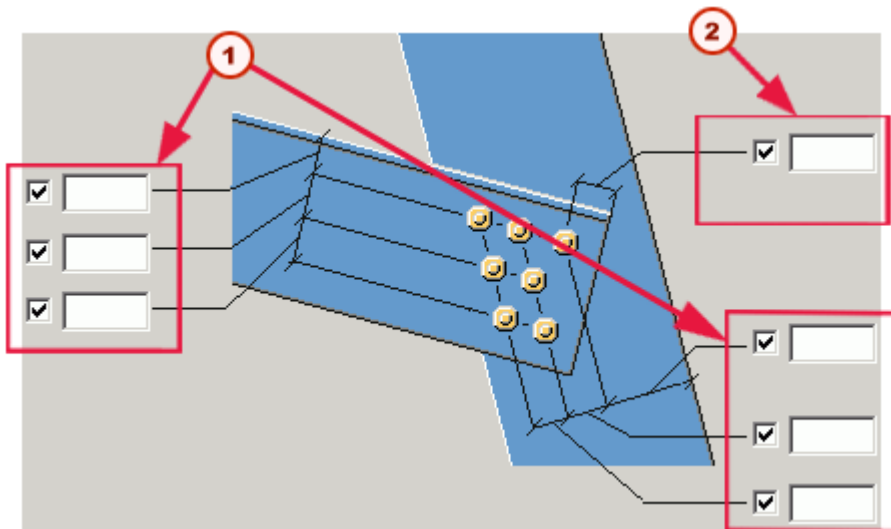
- **Tower Generation Macro (S43)**
- **Tower diagonal (S66)**
- **Auto position (S67)**
- **Batten plates (S85)**
- **Windbrace connection (110)**
- **Bent gusset (140)**
- **L splice (175)**
- **Parallel L profiles (176)**
- **Leg - 1 Diagonal (178)**

### See also

[Bolt location \(87, 89\) \(page 2682\)](#)

### Defining bolt gage lines (87)

To define bolt gage lines for **Tower 1 diagonal (87)**, go to the **Picture** tab and enter the following dimensions:



	Description
1	Location of gage lines
2	Location of gage lines

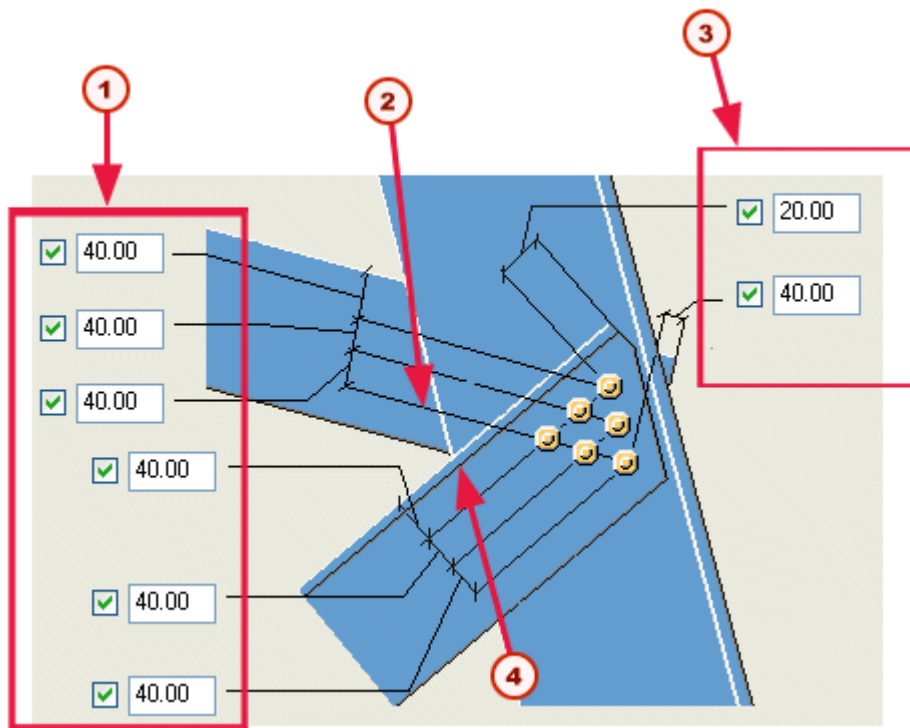
To learn how to create bolts, see [Bolt location \(87, 89\) \(page 2682\)](#).

### Defining bolt gage lines (89)

To define bolt gage lines for each bolt group in **Tower 2 diagonal (89)**, go to the following tabs:

Bolt group	Tab
Connects all parts	<b>Picture</b>
Connects first and second brace picked to the tower leg	<b>Picture 2</b>

For example, on the **Picture** tab, enter the following dimensions:



	Description
<b>1</b>	Location of gage lines
<b>2</b>	Gage line 1(second brace picked)
<b>3</b>	Bolt edge distances
<b>4</b>	Gage line 1 (first brace picked)

To learn how to create bolts, see [Bolt location \(87, 89\) \(page 2682\)](#).



### ***Editing default gage lines***

To change the default gage lines for all components that use them, edit the file `gauge_lines.dat`, with any text editor (e.g. Notepad). The file is located in the system folder.

### ***Creating bolts (87)***

This component creates a single bolt group that connects the brace to the tower leg. To create bolts, you need to:

- Define the bolt gage lines and edge distances. See [About bolt gage lines \(page 2678\)](#)
- Create bolts, and specify the location of individual bolts. See [Bolt location \(87, 89\) \(page 2682\)](#)

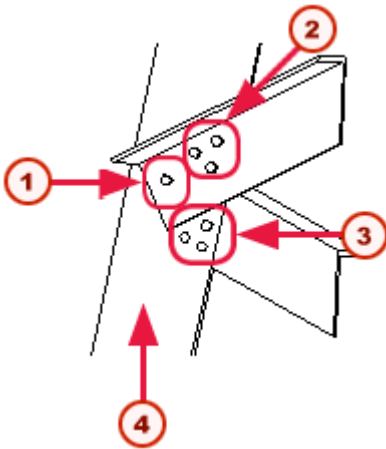
---

**WARNING** This component does not create any bolts by default. So you must define the bolts to use.

---

### ***Creating bolts (89)***

This component creates several bolt groups:



	<b>Description</b>
<b>1</b>	Bolt group that connects all parts
<b>2</b>	Bolt group that connects the first brace picked to the tower leg
<b>3</b>	Bolt group that connects the second brace picked to the tower leg. (component 89 only)
<b>4</b>	Tower leg

For each bolt group, you need to:

- Define the bolt gage lines and edge distances. See [About bolt gage lines \(page 2678\)](#)
- Create bolts, and specify the location of individual bolts. See [Bolt location \(87, 89\) \(page 2682\)](#)

---

**WARNING** This component does not create any bolts by default. So you must define the bolts to use.

---

### ***Creating bolts (178)***

To create bolts, go to the **Parameters** tab and define the bolt gage lines. See [About bolt gage lines \(page 2678\)](#).

---

**WARNING** This component does not create any bolts by default, so you must define the bolts to use.

---

### ***Creating bolts (181)***

By default, this component creates one bolt at the intersection of the main bolt gages of the horizontal brace and the diagonal brace. To create a second bolt:

1. Go to the **Picture** tab and define the main and secondary bolt gages for the braces:
2. Go to the **Parameters** tab. Select one of the options in the **Switch for common bolt** dropdown list. The default option is **None**.

### ***Creating bolts (182)***

By default, Tekla Structures creates the following bolts:

- One bolt where the main bolt gages of the braces intersect, which connects all the braces to the plate.

To create a second bolt, go to the **Parameters** tab. Select one of the options in the **Switch for common bolt** dropdown list. The default option is **None**.

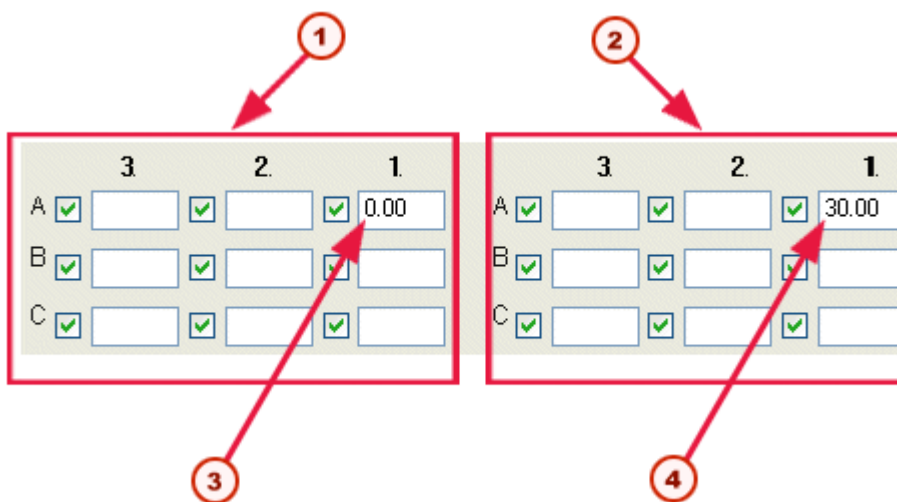
- A bolt on the main bolt gage line of each brace, which connects the brace to the plate.

### Bolt location (87, 89)

Use the fields at the bottom of the **Picture** tab pages to create bolts in each bolt group, use the fields at the bottom of the **Picture** tab page(s):

Bolt group	Tab
Connects all parts	<b>Picture</b>
Connects first and second brace picked to the tower leg	<b>Picture 2</b>

- Enter 0 to create a bolt on the intersection of gage lines
- Enter 1 or more to move the bolt along the gage line, away from the end of the brace, on either the first or second diagonal brace picked:



	Description
<b>1</b>	First brace picked
<b>2</b>	Second brace picked (component 89 only)
<b>3</b>	Creates bolt at intersection of gage lines
<b>4</b>	Moves bolt 30 mm along the gage line, away from the end of the brace

**TIP** To move a bolt towards the edge of the brace, enter a negative number, e.g. -10.

### Defining connection material

This section explains how to define the properties of connection material in tower components.

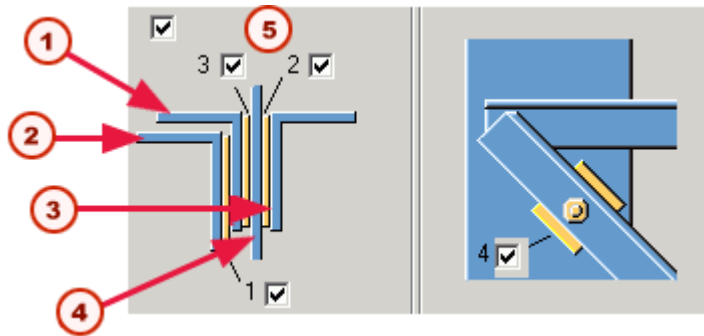
Click the links below to find out more:

- [Defining filler plates \(177\) \(page 2684\)](#)

- [Defining filler plates \(182\) \(page 2685\)](#)

### **Defining filler plates (177)**

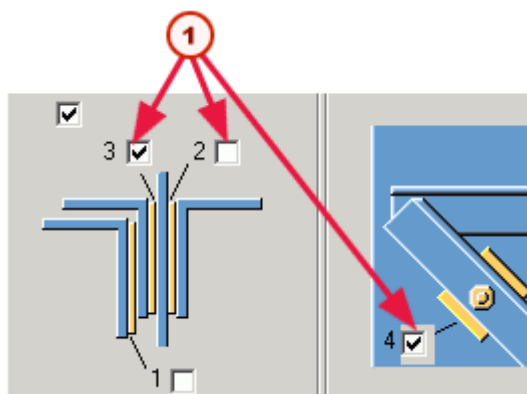
If necessary, **Leg - 2 & 3 diagonals (177)** automatically creates filler plates in the gaps between the braces and the tower leg.



	Description
	<b>Plate 1:</b> Between the first diagonal brace picked and the horizontal brace
	<b>Plate 2:</b> Between the second diagonal brace picked and the tower leg
	<b>Plate 3:</b> Between the horizontal brace and the tower leg
	<b>Plate 4:</b> Between the first horizontal brace picked and the tower leg
<b>1</b>	Horizontal brace
<b>2</b>	First diagonal brace picked
<b>3</b>	Second diagonal brace picked
<b>4</b>	Tower leg
<b>5</b>	Effect in modify

To specify the properties of each filler plate, use the fields on the **Plates** tab.

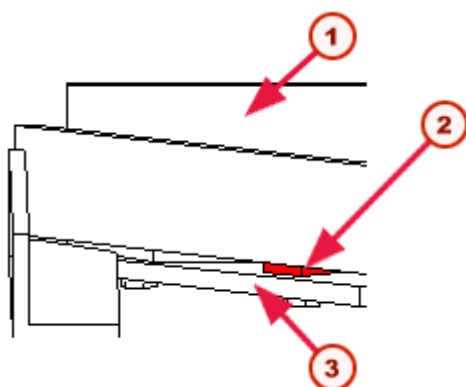
To remove a filler plate, go to the illustration and clear the checkbox against it:



	Description
1	To remove a plate, clear its checkbox. Here we are removing plates 1 and 2

### **Defining filler plates (182)**

If the diagonal brace connects to the inside of the horizontal brace, Tekla Structures creates one or more filler plates to fill the gap between the diagonal brace and the plate:



	Description
1	Diagonal brace
2	Filler plate
3	Plate

To replace the filler plate with a ring or square washer, go to the **Parameters** tab and select an option in the **Switch to manage what kind of filler plate** list box.

## **2.20 Connection Map**

This section introduces example illustrations of different connections, grouped according to their usage.

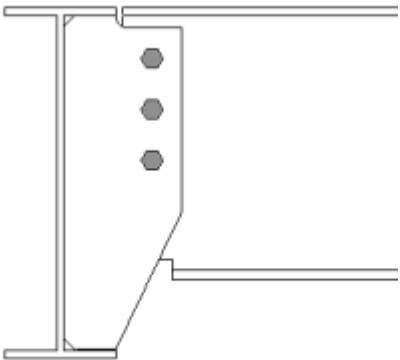
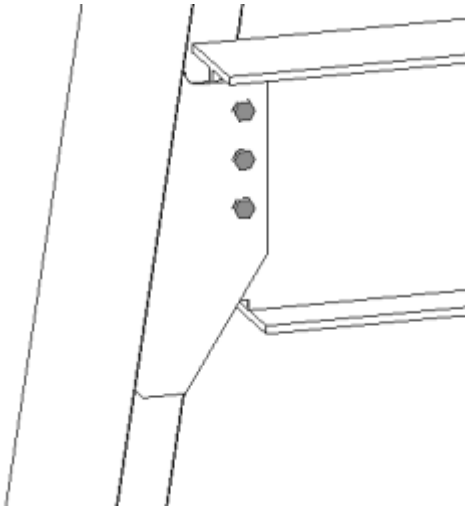
Click the links below to find out more:

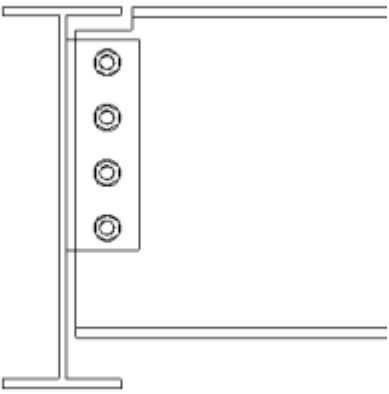
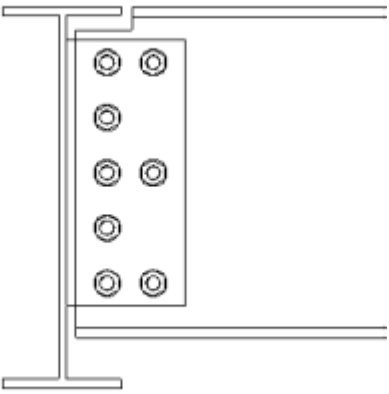
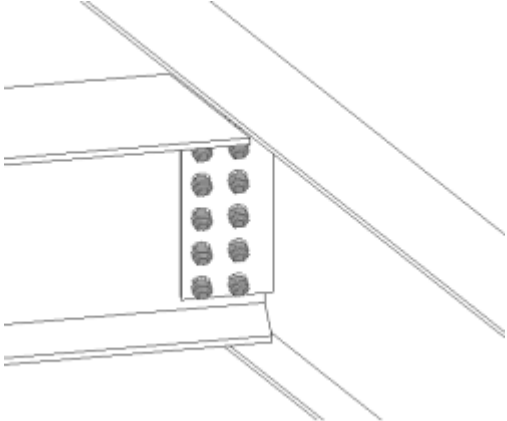
- [Beam to beam framing connections \(page 2686\)](#)
- [Beam to column framing connections \(page 2704\)](#)
- [Splice connections \(page 2726\)](#)
- [Joist connections \(page 2733\)](#)
- [Vertical member to beam \(page 2736\)](#)

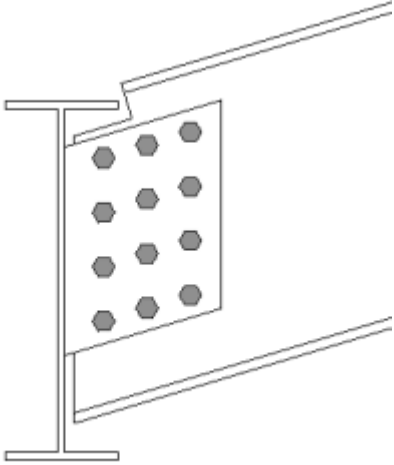
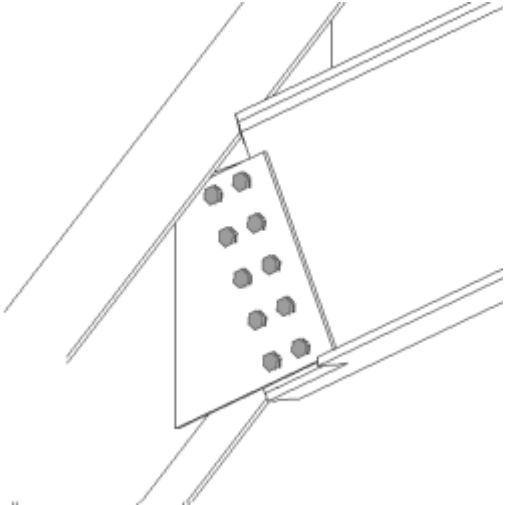
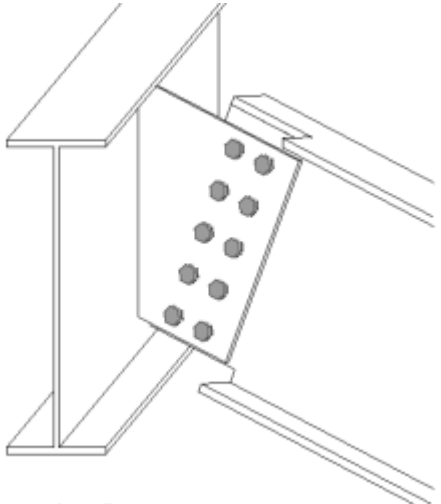
- [Bracing connections \(page 2740\)](#)
- [Welded connections \(page 2748\)](#)
- [Details \(page 2752\)](#)

## Beam to beam framing connections

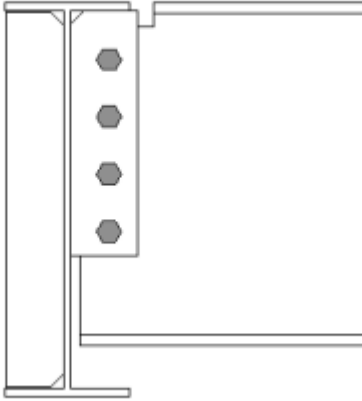
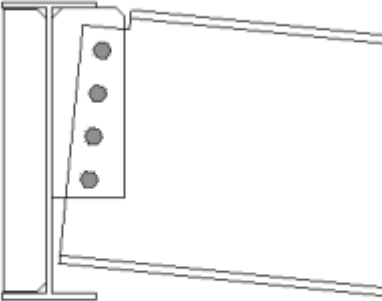
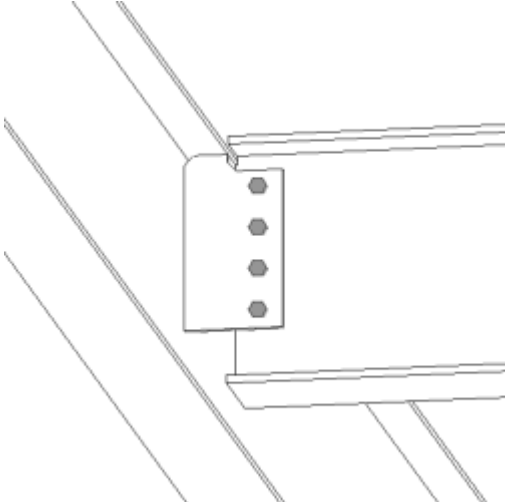
### *Shear tabs*

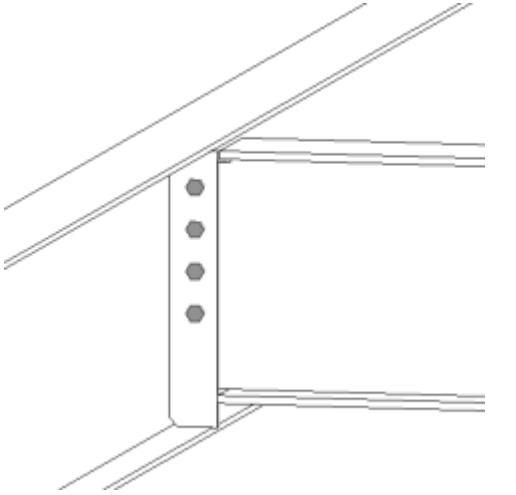
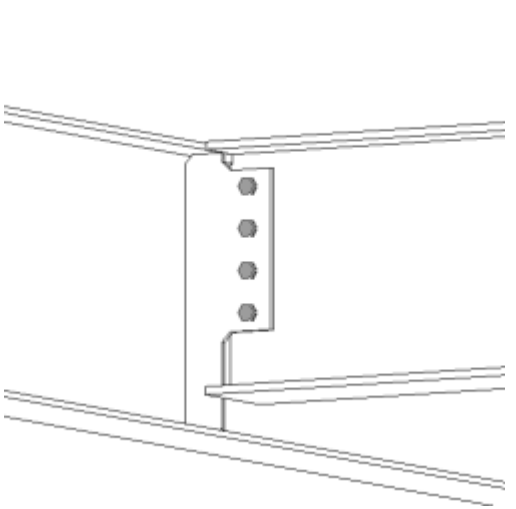
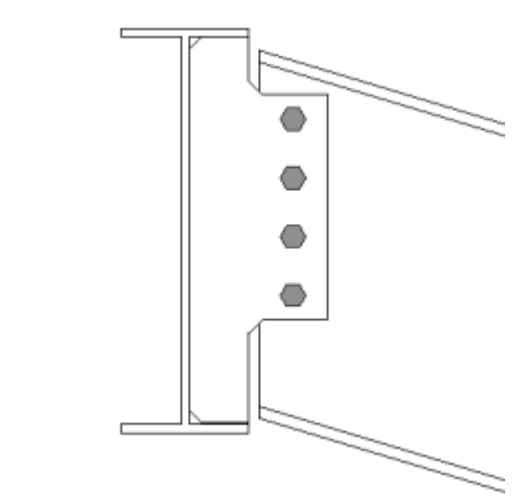
Example	Description
 <p>The diagram shows a vertical I-beam on the left and a horizontal secondary beam on the right. The secondary beam is connected to the vertical beam via a shear tab that is cut short of the main part of the secondary beam. Three bolts are shown along the length of the shear tab.</p>	<p>Full depth shear tab - secondary beam cut short of main part. Use <b>Beam with stiffener (129)</b>.</p>
 <p>The diagram shows a vertical I-beam on the left and a horizontal secondary beam on the right. The secondary beam is connected to the vertical beam via a shear tab that is sloped and/or skewed. Three bolts are shown along the length of the shear tab.</p>	<p>Full depth shear tab - secondary part sloped and/or skewed. Use <b>Beam with stiffener (129)</b>.</p>

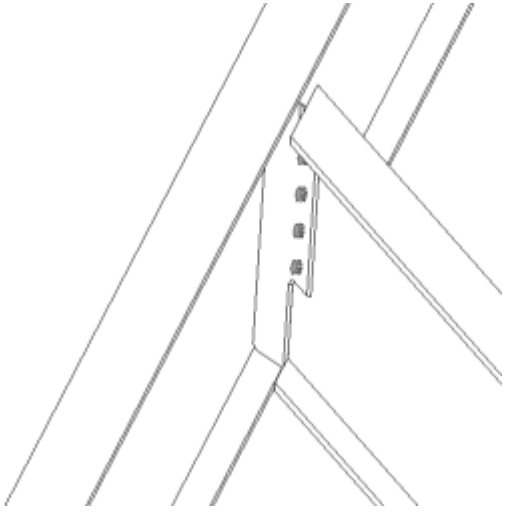
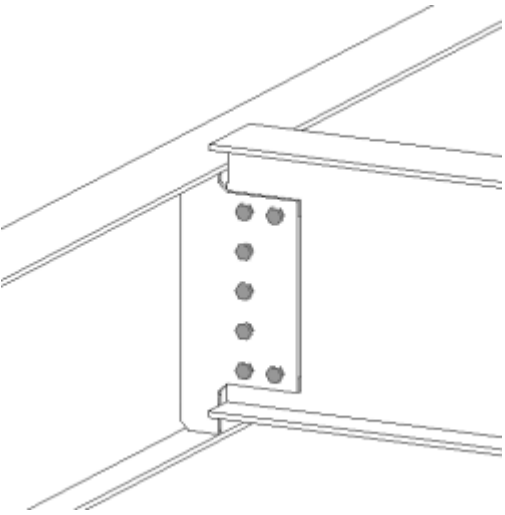
Example	Description
 <p>A schematic diagram showing a vertical I-beam on the left and a horizontal beam on the right. A vertical shear tab is attached to the web of the I-beam and extends to the top flange of the horizontal beam. Four bolts are arranged in a single vertical column on the shear tab, connecting it to the horizontal beam.</p>	<p>Simple shear tab to beam. Use <b>Shear plate simple (146)</b>.</p>
 <p>A schematic diagram similar to the first one, showing an I-beam and a horizontal beam connected by a shear tab. However, there are two columns of bolts on the shear tab, with four bolts in each column, for a total of eight bolts.</p>	<p>Simple shear tab to beam - bolt elimination option. Use <b>Shear plate simple (146)</b>.</p>
 <p>A schematic diagram showing an I-beam and a horizontal beam. A shear tab is attached to the web of the I-beam and connects to the horizontal beam. The secondary part of the connection is skewed, with diagonal lines indicating the orientation of the secondary part relative to the horizontal beam.</p>	<p>Simple shear tab to beam - skewed secondary part. Use <b>Shear plate simple (146)</b>.</p>

Example	Description
	<p>Simple shear tab to beam - sloped (and skewed) secondary part. Bolts and plate oriented with secondary part.</p> <p>Use <b>Shear plate simple (146)</b>.</p>
	<p>Simple shear tab to beam - sloped and skewed secondary part. Valley condition.</p> <p>Use <b>Shear plate simple (146)</b>.</p>
	<p>Simple shear tab to beam - sloped and skewed secondary part. Valley condition.</p> <p>Use <b>Shear plate simple (146)</b>.</p>

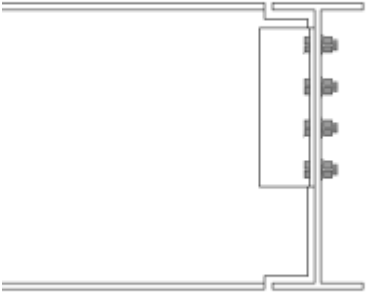
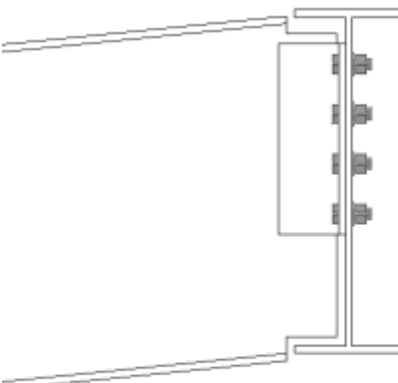
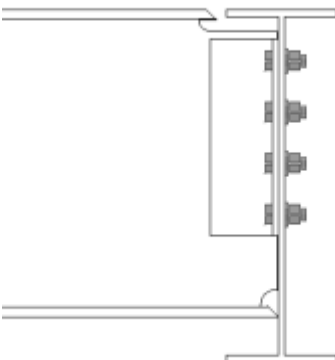


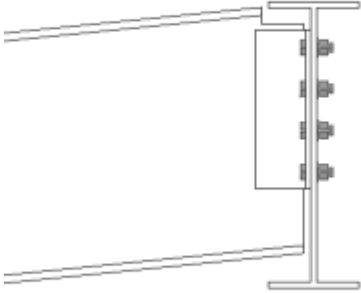
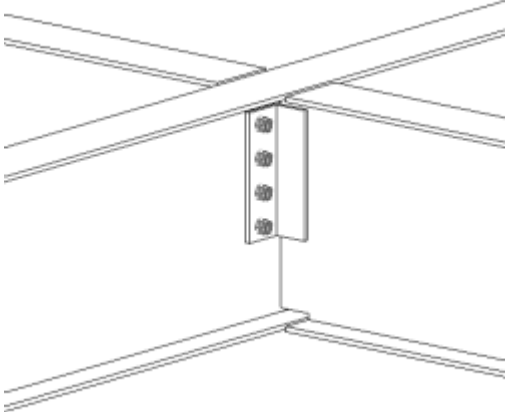
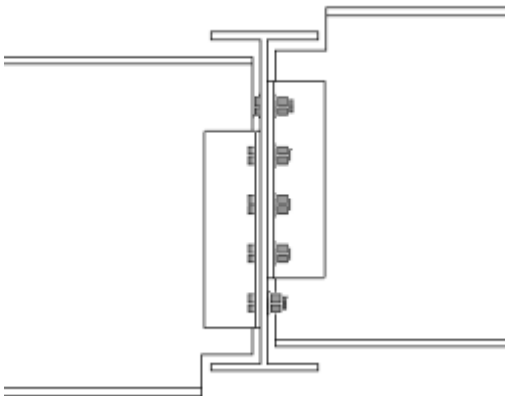
Example	Description
	<p>Partial depth shear tab to top flange of beam - square or skewed, stiffener option.</p> <p>Use <b>Welded to top flange (147)</b>.</p>
	<p>Partial depth shear tab to top flange of beam. Sloped/ square or skewed.</p> <p>Use <b>Welded to top flange (147)</b>.</p>
	<p>Partial depth shear tab to top flange of beam, secondary beam cut short of main part. Square, sloped, skewed.</p> <p>Use <b>Welded to top flange S (149)</b>.</p>

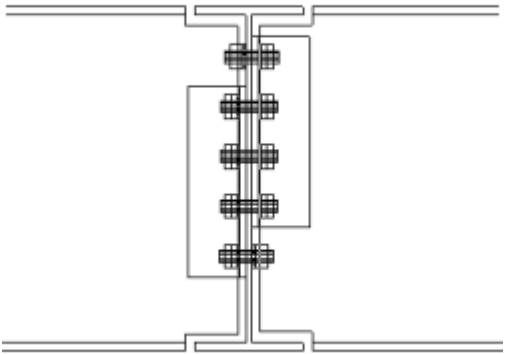
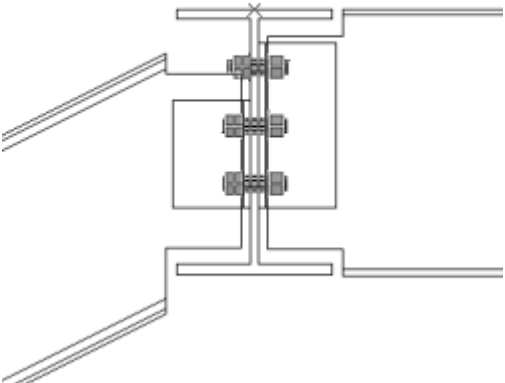
Example	Description
	<p>Full depth shear tab. Square, sloped, skewed.</p> <p>Use <b>Full depth (184)</b>.</p>
	<p>Full depth shear tab. Secondary beam cut short of main part.</p> <p>Use <b>Full depth S (185)</b>.</p>
	<p>Full depth shear tab. Secondary beam cut short of main part. Sloped secondary.</p> <p>Use <b>Full depth S (185)</b>.</p>

Example	Description
	<p>Full depth shear tab. Secondary beam cut short of main part. Sloped and skewed secondary (hip &amp; valley). Use <b>Full depth S (185)</b>.</p>
	<p>Full depth shear tab. Secondary beam cut short of main part. Secondary offset. Bolt elimination option. Use <b>Full depth S (185)</b>.</p>

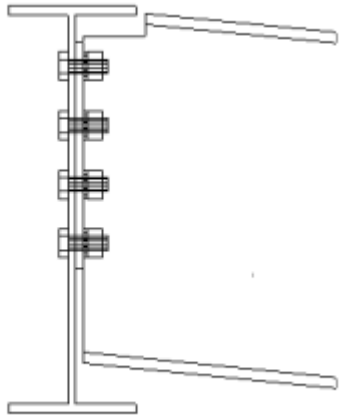
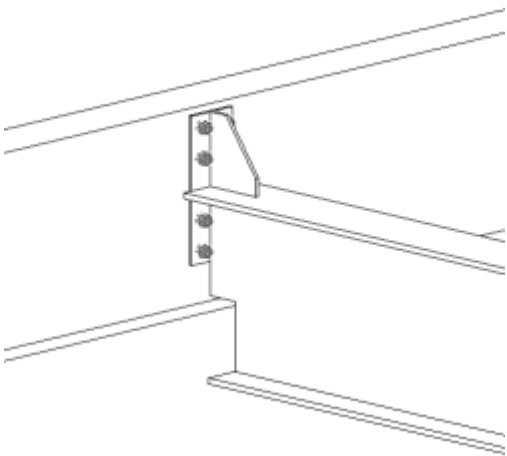
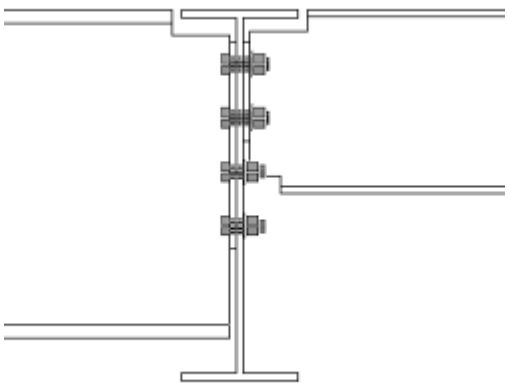
## Clip angles

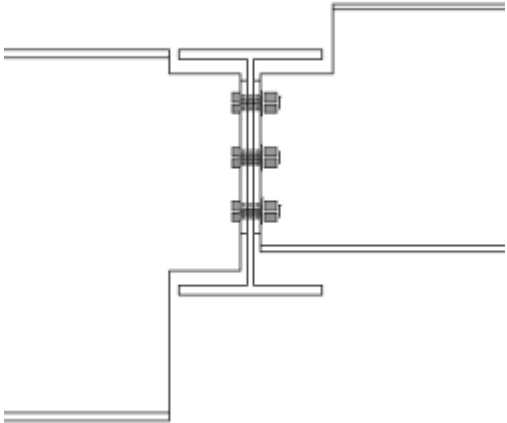
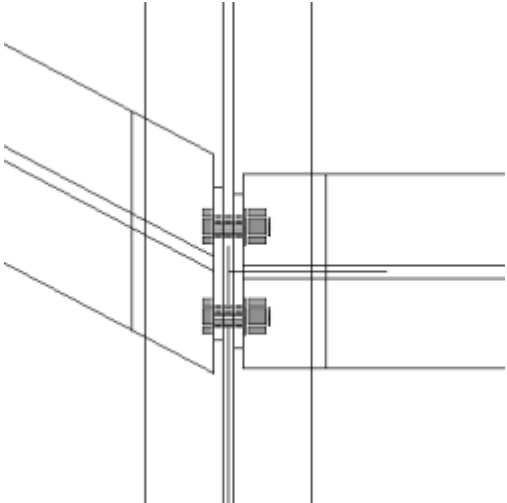
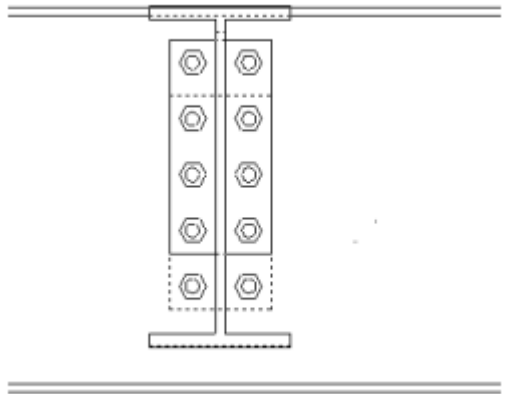
Example	Description
 <p>The diagram shows a vertical I-beam column with a horizontal secondary member attached to its side. A rectangular clip angle is positioned between the secondary member and the column flange. The clip angle is secured to the column flange with four bolts. The secondary member is attached to the clip angle with four bolts on its top edge and four bolts on its bottom edge.</p>	<p>Clip angle connection – single-sided clip/double-sided clip. Use <b>Clip angle (141)</b>.</p>
 <p>The diagram shows a vertical I-beam column with a horizontal secondary member attached to its side. The secondary member is sloped upwards from left to right. A rectangular clip angle is positioned between the secondary member and the column flange. The clip angle is secured to the column flange with four bolts. The secondary member is attached to the clip angle with four bolts on its top edge and four bolts on its bottom edge.</p>	<p>Clip angle connection – single-sided clip/double-sided clip. Sloped secondary part. Various notching options. Use <b>Clip angle (141)</b>.</p>
 <p>The diagram shows a vertical I-beam column with a horizontal secondary member attached to its side. A rectangular clip angle is positioned between the secondary member and the column flange. The clip angle is secured to the column flange with four bolts. The secondary member is attached to the clip angle with four bolts on its top edge and four bolts on its bottom edge. There is a small gap or notch at the bottom of the secondary member where it meets the clip angle.</p>	<p>Clip angle connection – single-sided clip/double-sided clip. Weld preparation option. Use <b>Clip angle (141)</b>.</p>

Example	Description
	<p>Clip angle connection – single-sided clip/double-sided clip. Sloped secondary part.</p> <p>Use <b>Clip angle (141)</b>.</p>
	<p>Clip angle connection – single-sided clip/double-sided clip. Two secondary parts. Bolted/bolted, welded/bolted, welded/welded options.</p> <p>Use <b>Two sided clip angle (143)</b>.</p>
	<p>Clip angle connection – single-sided clip/double-sided clip. Two secondary parts at differing heights.</p> <p>Use <b>Two sided clip angle (143)</b>.</p>

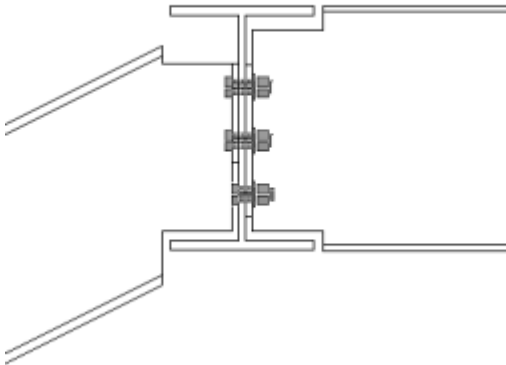
Example	Description
	<p>Clip angle connection – single-sided clip/double-sided clip. Two secondary parts. Safety connection.</p> <p>Use <b>Two sided clip angle (143)</b>.</p>
	<p>Clip angle connection – single-sided clip/double-sided clip. Two secondary parts. One sloped.</p> <p>Use <b>Two sided clip angle (143)</b>.</p>

## End plates

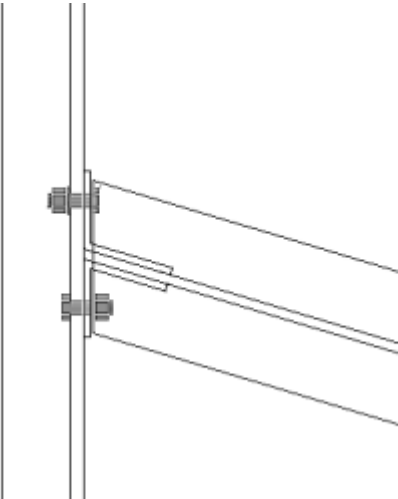
Example	Description
	<p>End plate connection - level or sloped, square or skewed secondary part. Various notching options.</p> <p>Use <b>End plate (144)</b>.</p>
	<p>End plate connection - extended plate with or without haunches.</p> <p>Use <b>End plate (144)</b>.</p>
	<p>End plate connection - two secondary parts. Automatic notch for bolt clearance.</p> <p>Use <b>Two sided end plate (142)</b>.</p>

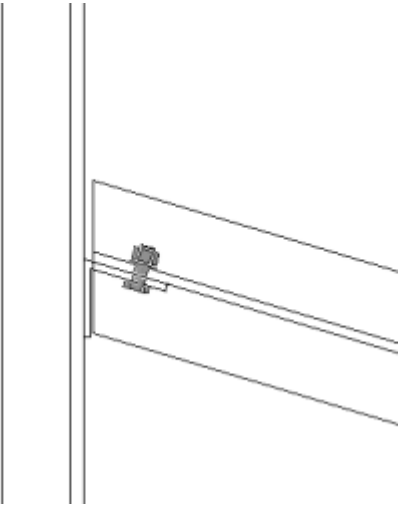
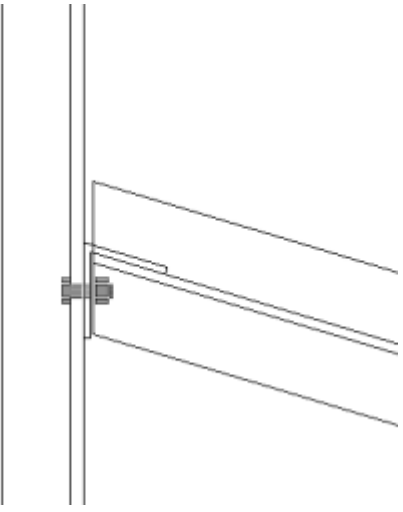
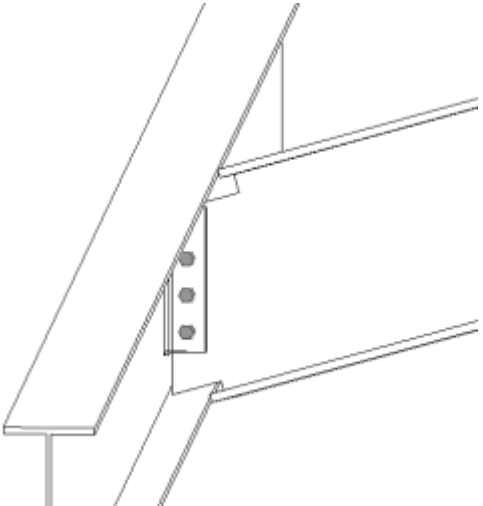
Example	Description
	<p>End plate connection – two secondary parts at differing heights.</p> <p>Use <b>Two sided end plate (142)</b>.</p>
	<p>End plate connection – two secondary parts. Square and /or skewed.</p> <p>Use <b>Two sided end plate (142)</b>.</p>
	<p>End plate connection – two secondary parts. Safety connection.</p> <p>Use <b>Two sided end plate (142)</b>.</p>



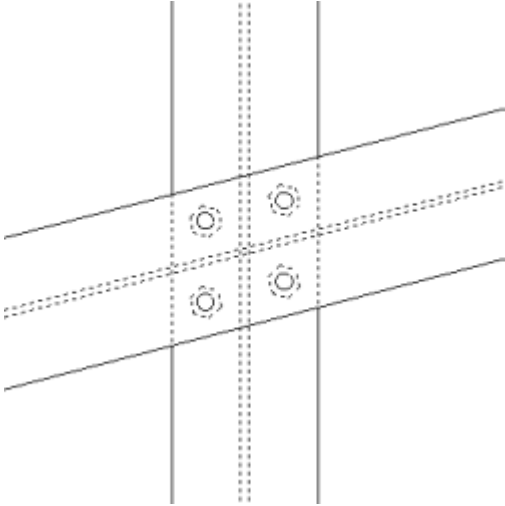
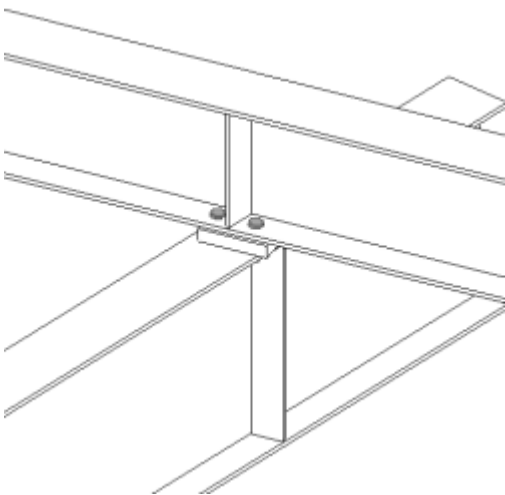
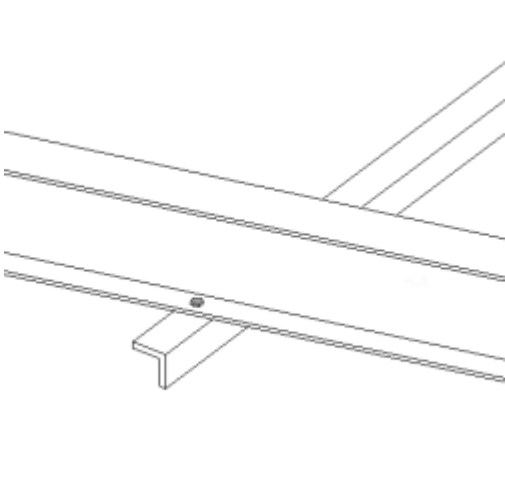
Example	Description
	<p>End plate connection – two secondary parts. Level and/or sloped.</p> <p>Use <b>Two sided end plate (142)</b>.</p>

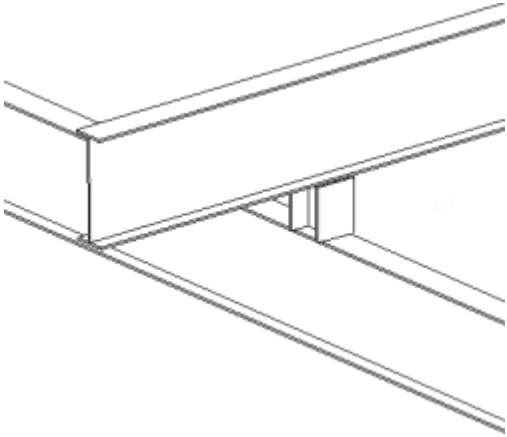
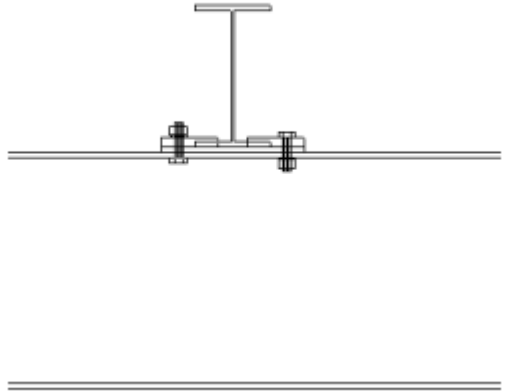
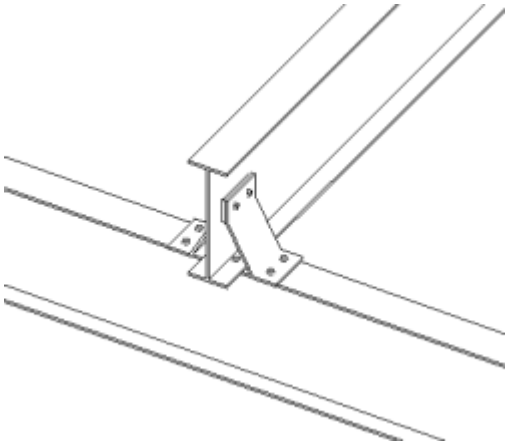
### ***Bent plate***

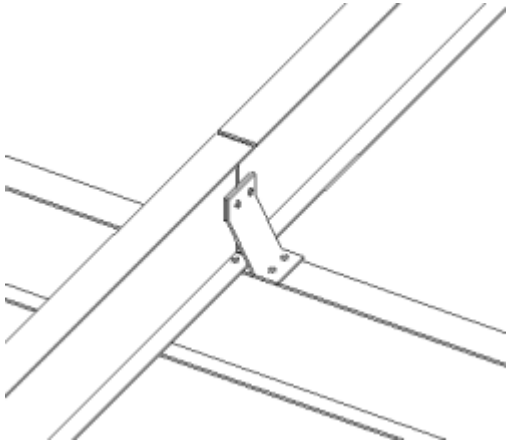
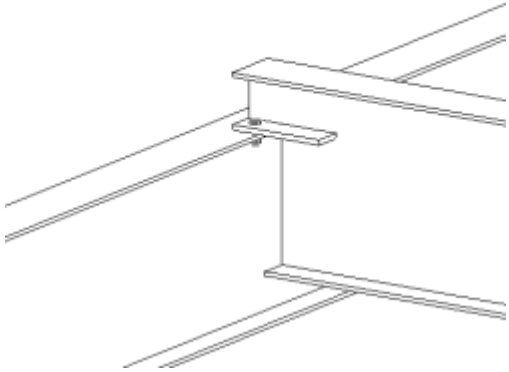
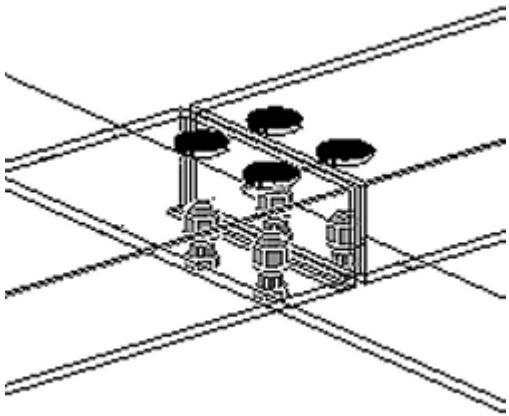
Example	Description
	<p>Bent plate connection – skewed or square secondary part, plate near side and far side.</p> <p>Use <b>Bent plate (190)</b>.</p>

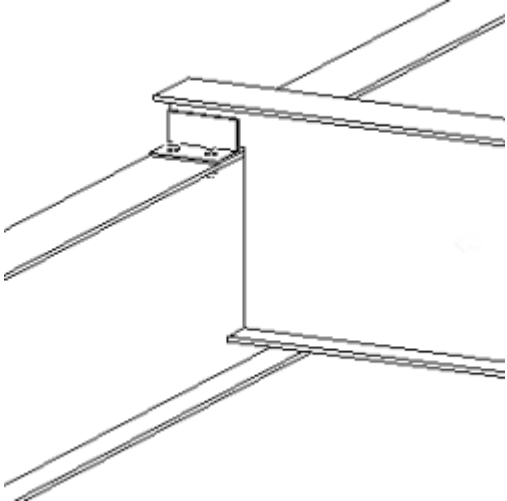
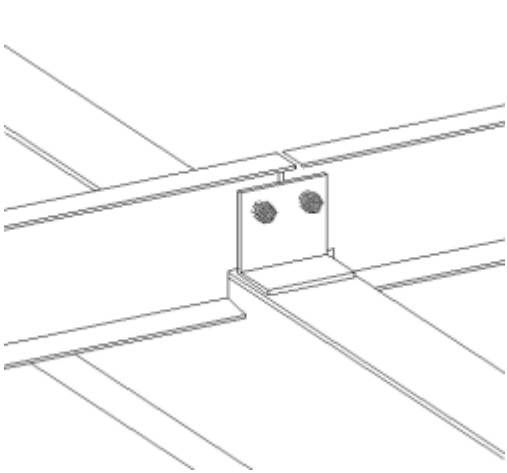
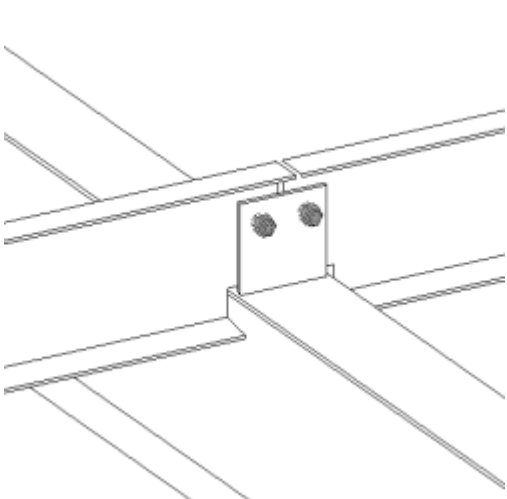
Example	Description
	<p>Bent plate connection – skewed or square secondary part, plate one side.</p> <p>Use <b>Bent plate (190)</b>.</p>
	<p>Bent plate connection – skewed or square secondary part, plate one side. Various plate placing options.</p> <p>Use <b>Bent plate (190)</b>.</p>
	<p>Bent plate connection – skewed and sloped (hip &amp; valley).</p> <p>Use <b>Bent plate (190)</b>.</p>

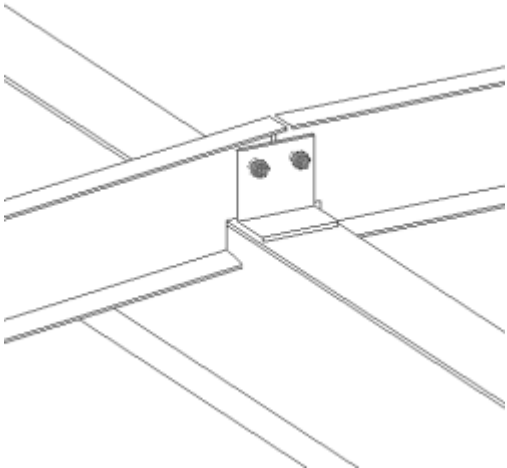
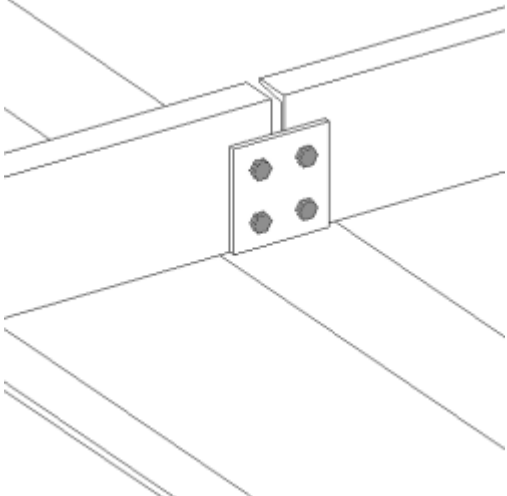
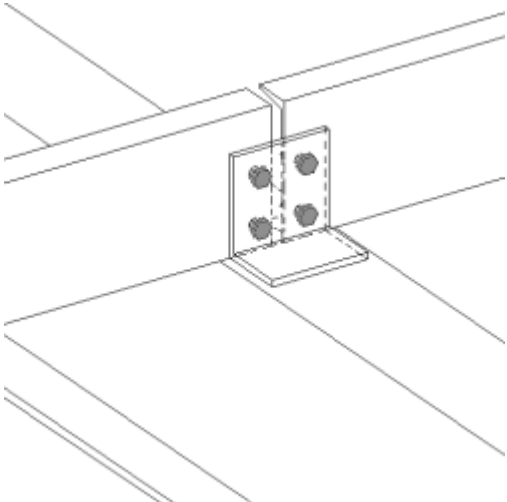
## Bearing type

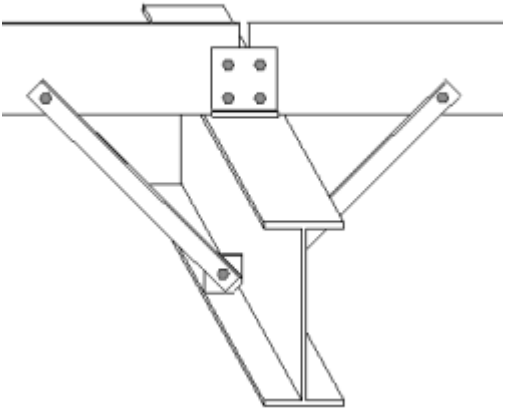
Example	Description
 A technical drawing showing a top-down view of two steel beams intersecting. The beams are represented by solid lines, and their web locations are indicated by vertical dashed lines. Four circular bolt symbols are arranged in a 2x2 grid at the intersection point. A diagonal dashed line represents the centerline of the beams.	<p>Beam to beam bearing connection. Options for 1,2,3, or 4 bolts. Use <b>Seating (30)</b>.</p>
 A 3D perspective drawing of a beam-to-beam bearing connection. A vertical beam is shown supporting a horizontal beam. A vertical spacer is positioned between the top flange of the vertical beam and the bottom flange of the horizontal beam. Two bolts are shown passing through the spacer and the top flange of the vertical beam into the bottom flange of the horizontal beam.	<p>Beam to beam bearing connection. Spacer option. Use <b>Seating (30)</b>.</p>
 A 3D perspective drawing of a beam-to-beam bearing connection. A horizontal beam is supported by a vertical beam. A diagonal brace is attached to the top flange of the vertical beam and the bottom flange of the horizontal beam. A single bolt is shown passing through the brace and the top flange of the vertical beam into the bottom flange of the horizontal beam.	<p>Beam to beam bearing connection. Brace support. Use <b>Seating (30)</b>.</p>

Example	Description
	<p>Beam to beam bearing connection with stub column. Square, sloped and skewed conditions.</p> <p>Use <b>Cross (4)</b>.</p>
	<p>Beam to beam bearing clamp type connection.</p> <p>Use <b>Seating with nail (36)</b>.</p>
	<p>Beam to beam bearing purlin connection to single purlin.</p> <p>Use <b>Purlin connections (93)</b>.</p>

Example	Description
	<p>Beam to beam bearing purlin connection to two purlins.</p> <p>Use <b>Purlin connections (93)</b>.</p>
	<p>Beam to beam bearing notched seating connection. Square and skewed conditions.</p> <p>Use <b>Notched seating (9)</b>.</p>
	<p>Beam to beam bearing tube steel rails to main part. Cope or hole bolt access options.</p> <p>Use <b>Tube rail (113)</b>.</p>

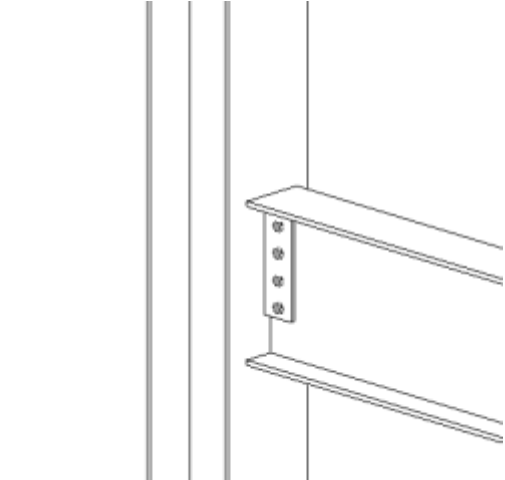
Example	Description
 <p>A technical line drawing showing a horizontal beam resting on a vertical support. The beam is notched at its end to fit over the support. An angle is attached to the top of the support, and the beam's end is seated on top of this angle. The angle is secured to the support with two bolts.</p>	<p>Beam to beam bearing notched seat with angle. Use <b>Rail joint (70)</b>.</p>
 <p>A technical line drawing showing a horizontal beam supported by a vertical rafter. The beam is notched at its end to fit over the rafter. A plate is attached to the top of the rafter, and the beam's end is seated on top of this plate. The plate is secured to the rafter with two bolts.</p>	<p>Beam to beam bearing rafter connection to two secondary parts. Notching required. Use <b>Rail joint (70)</b>.</p>
 <p>A technical line drawing showing a horizontal beam supported by a vertical rafter. The beam is notched at its end to fit over the rafter. A plate is attached to the top of the rafter, and the beam's end is seated on top of this plate. The plate is secured to the rafter with two bolts.</p>	<p>Beam to beam bearing rafter connection to two secondary parts. Plate. Notching required. Use <b>Rail joint (70)</b>.</p>

Example	Description
	<p>Beam to beam bearing rafter connection to two secondary parts. Sloped/level notching required.</p> <p>Use <b>Rail joint (70)</b>.</p>
	<p>Beam to beam full bearing rafter connection to two secondary parts. Plate.</p> <p>Use <b>Cold rolled overlap (1)</b>.</p>
	<p>Beam to beam full bearing rafter connection to two secondary parts. Angle.</p> <p>Use <b>Cold rolled overlap (1)</b>.</p>

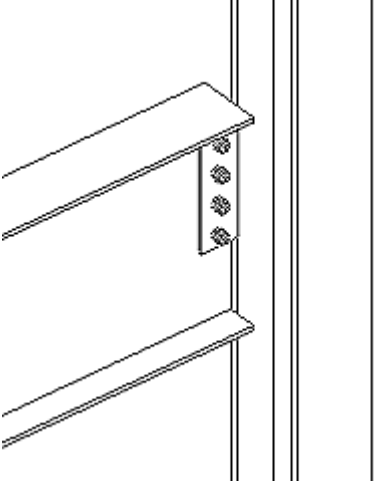
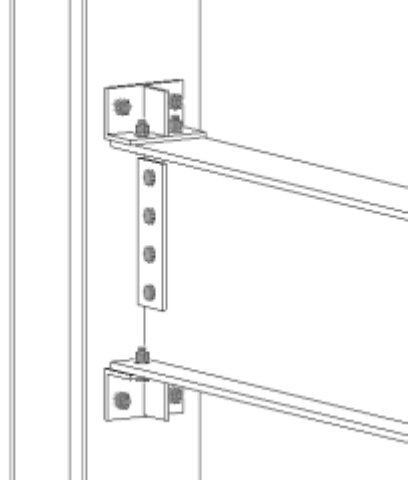
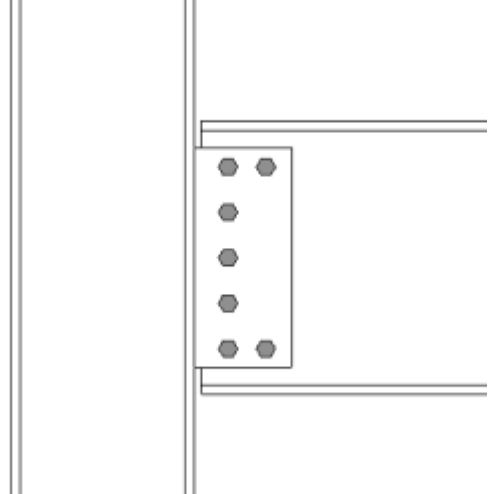
Example	Description
 <p>The diagram shows a cross-section of a steel beam-to-beam connection. A top horizontal beam is supported by a vertical column. A secondary beam is attached to the top flange of the column. Two diagonal knee braces are attached to the secondary beam and the column. A square gusset plate is bolted to the top flange of the column and the secondary beam. The secondary beam is bolted to the top flange of the column.</p>	<p>Beam to beam full bearing rafter connection to two secondary parts. Knee brace option. Use <b>Cold rolled overlap (1)</b>.</p>

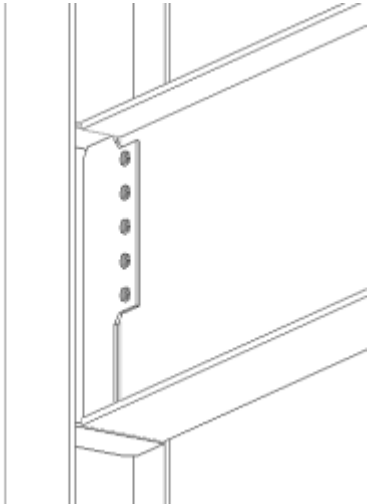
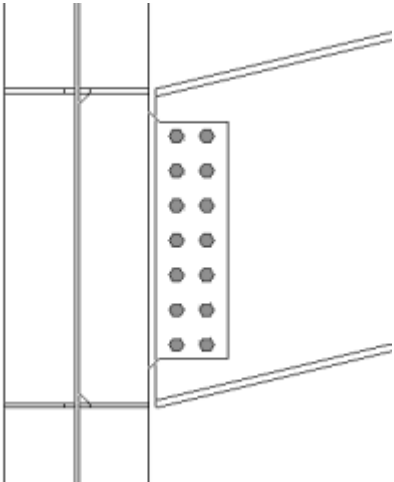
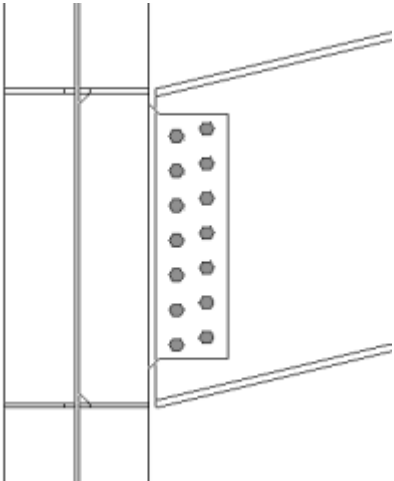
## Beam to column framing connections

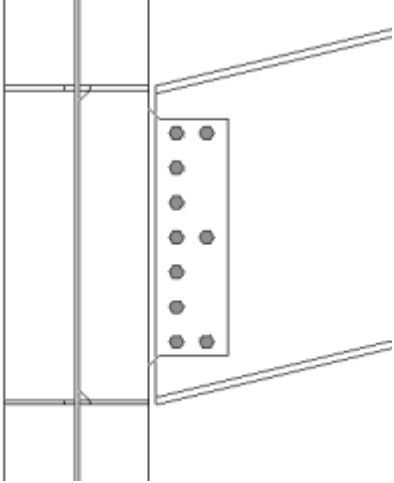
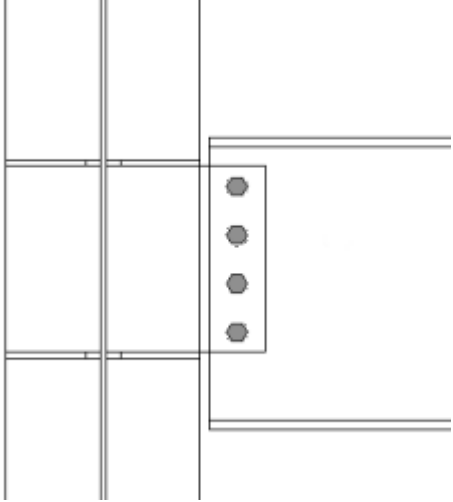
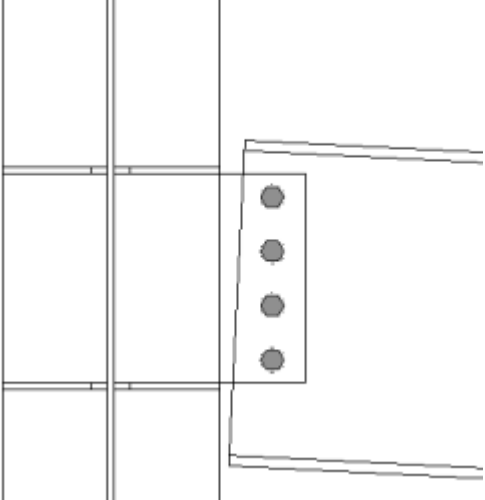
### *Shear tabs*

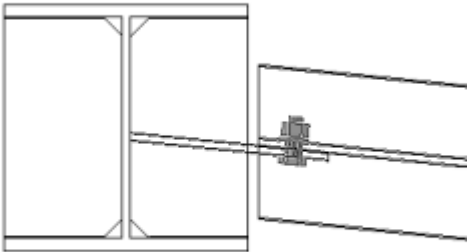
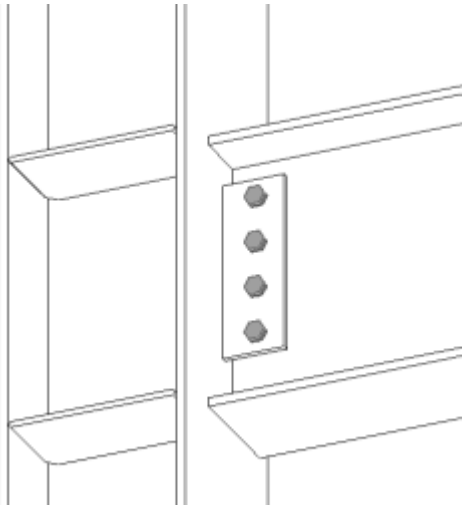
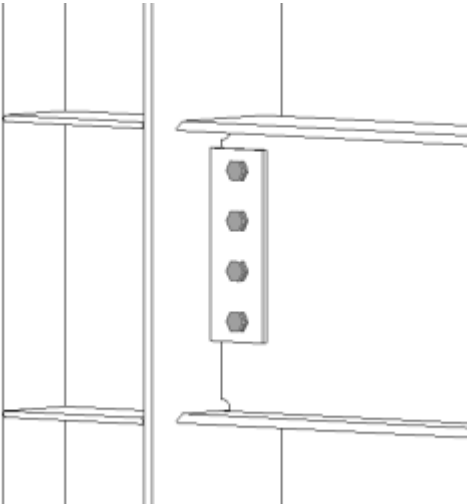
Example	Description
 <p>The diagram shows a cross-section of a beam-to-column connection using shear tabs. A horizontal beam is attached to a vertical column. Two horizontal shear tabs are bolted to the column flange. The top shear tab is bolted to the top flange of the column, and the bottom shear tab is bolted to the bottom flange of the column. The beam is bolted to the top flange of the column.</p>	<p>Simple shear tab to column flange. Use <b>Shear plate simple (146)</b>.</p>

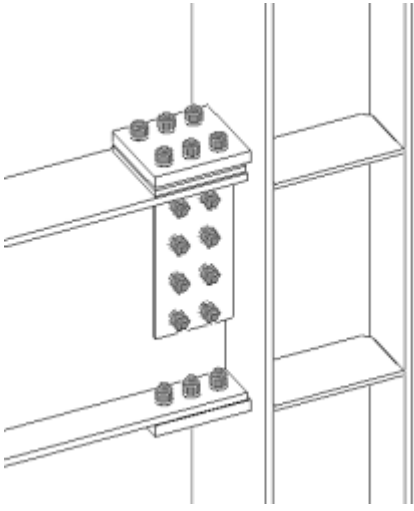
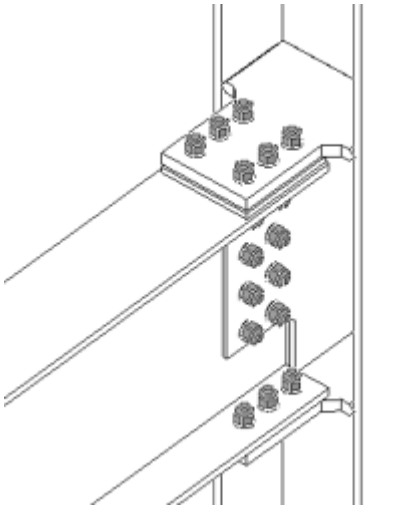
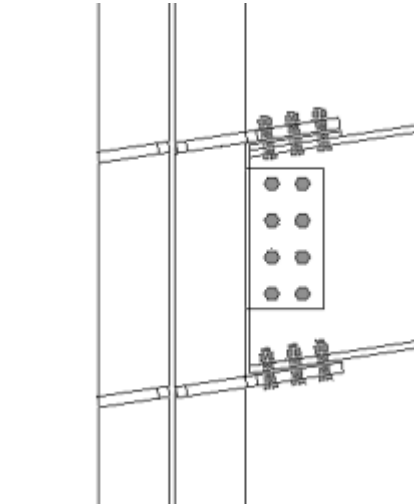


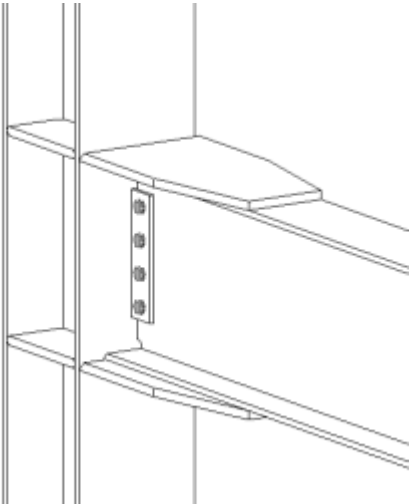
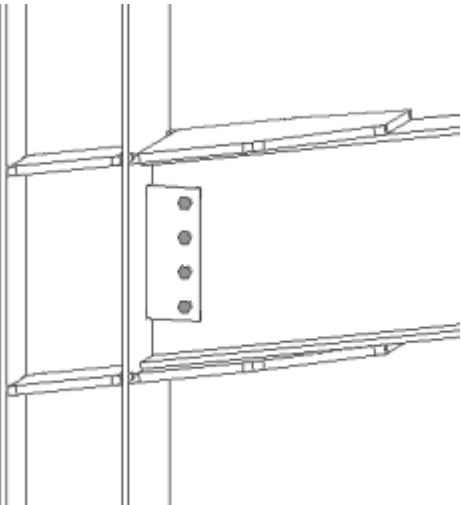
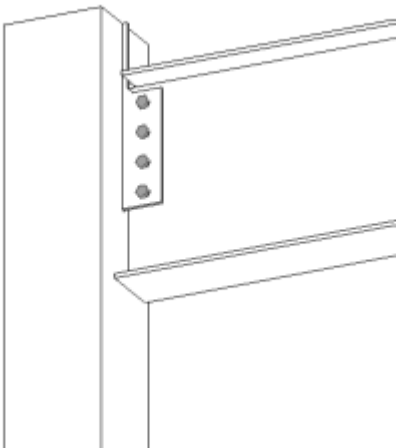
Example	Description
	<p>Simple shear tab to edge/column flange.</p> <p>Use <b>Shear plate simple (146)</b>.</p>
	<p>Simple shear tab to column flange with seat angle options.</p> <p>Use <b>Shear plate simple (146)</b>.</p>
	<p>Simple shear tab to column flange. Bolt elimination options.</p> <p>Use <b>Shear plate simple (146)</b>.</p>

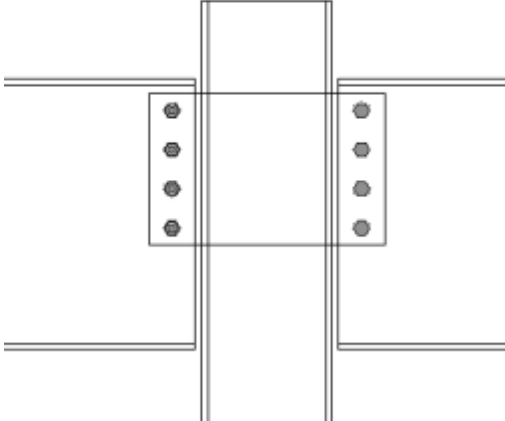
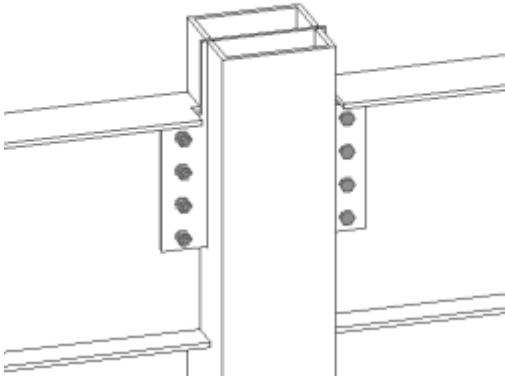
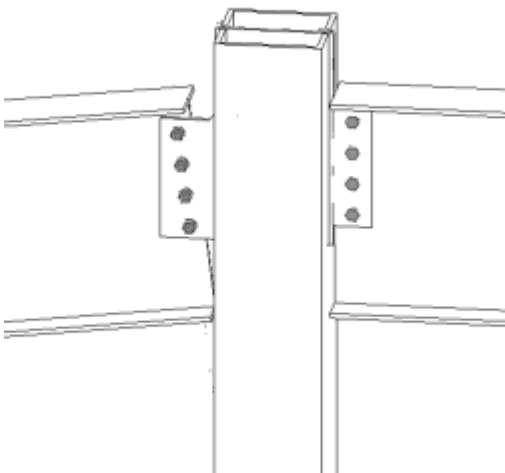
Example	Description
	<p>Shaped shear tab with column stiffeners.</p> <p>Use <b>Column with stiffeners W (182)</b>.</p>
	<p>Shaped shear tab with column stiffeners. Sloped secondary.</p> <p>Use <b>Column with stiffeners W (182)</b>.</p>
	<p>Shaped shear tab with column stiffeners. Bolts aligned with secondary part.</p> <p>Use <b>Column with stiffeners W (182)</b>.</p>

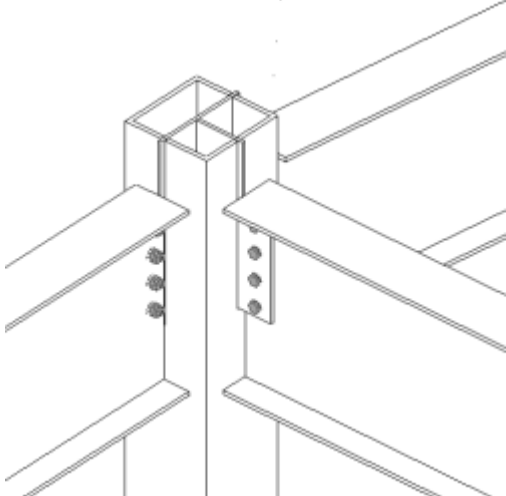
Example	Description
	<p>Shaped shear tab with column stiffeners. Bolt elimination option. Use <b>Column with stiffeners W (182)</b>.</p>
	<p>Shear tab with column stiffeners. Use <b>Column with stiffeners (186)</b>.</p>
	<p>Shear tab with column stiffeners. Sloped secondary. Use <b>Column with stiffeners (186)</b>.</p>

Example	Description
	<p>Shear tab with column stiffeners. Skewed secondary.</p> <p>Use <b>Column with stiffeners (186)</b>.</p>
	<p>Shear tab to column flange with column stiffeners.</p> <p>Use <b>Column with stiffeners (188)</b>.</p>
	<p>Shear tab to column flange with column stiffeners. Weld preparation and weld access holes for moment connection option.</p> <p>Use <b>Column with stiffeners (188)</b>.</p>

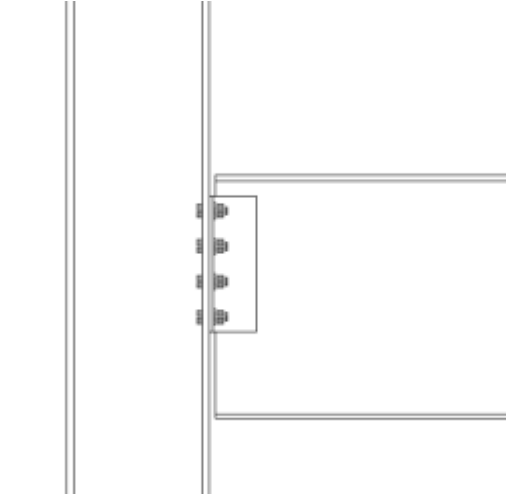
Example	Description
 <p>The diagram shows a perspective view of a steel beam-to-column connection. The beam is attached to the column flange using a top and bottom flange plate. The top flange plate is connected to the column flange with four bolts. The bottom flange plate is connected to the column flange with four bolts. The column has stiffeners on both sides of the beam. The beam is shown in a slightly elevated position relative to the column.</p>	<p>Bolted moment connection to column flange with column stiffeners. Use <b>Bolted moment connection (134)</b>.</p>
 <p>The diagram shows a perspective view of a steel beam-to-column connection. The beam is attached to the column web using a top and bottom flange plate. The top flange plate is connected to the column web with four bolts. The bottom flange plate is connected to the column web with four bolts. The column has stiffeners on both sides of the beam. The beam is shown in a slightly elevated position relative to the column.</p>	<p>Bolted moment connection to column web. Use <b>Bolted moment connection (134)</b>.</p>
 <p>The diagram shows a perspective view of a steel beam-to-column connection. The beam is attached to the column web using a top and bottom flange plate. The top flange plate is connected to the column web with four bolts. The bottom flange plate is connected to the column web with four bolts. The column has stiffeners on both sides of the beam. The beam is shown in a slightly elevated position relative to the column.</p>	<p>Bolted moment connection to column web. Sloped secondary part. Use <b>Bolted moment connection (134)</b>.</p>

Example	Description
	<p>Welded moment connection to column flange. Beam weld preparation and weld access hole options.</p> <p>Use <b>Moment connection (181)</b>.</p>
	<p>Welded moment connection to column flange. Sloped.</p> <p>Use <b>Moment connection (181)</b>.</p>
	<p>Shear tab through tube column.</p> <p>Use <b>Shear plate tube column (189)</b>.</p>

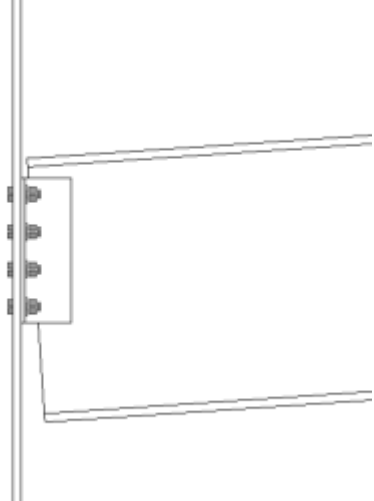
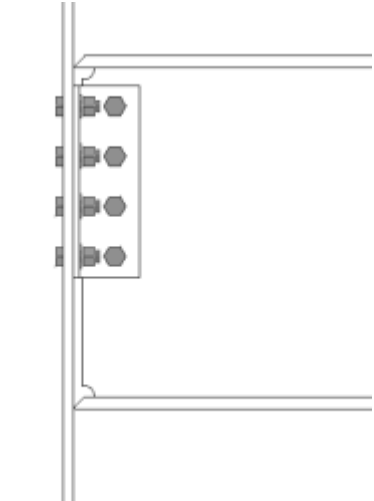
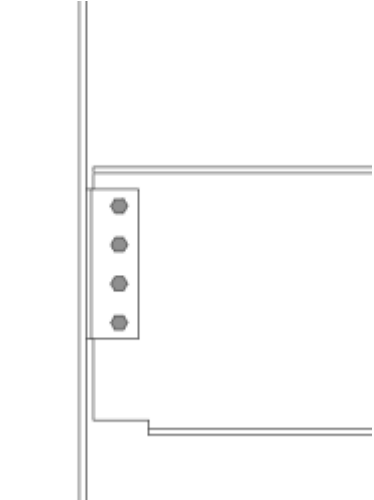
Example	Description
	<p>Shear tab through tube column. Two secondary parts.</p> <p>Use <b>Shear plate tube column (189)</b>.</p>
	<p>Shear tab through tube column. Two secondary parts. Plate extended to top of column option.</p> <p>Use <b>Shear plate tube column (189)</b>.</p>
	<p>Shear tab through tube column. Two secondary parts, level and/or sloped. Bolt alignment options.</p> <p>Use <b>Shear plate tube column (189)</b>.</p>

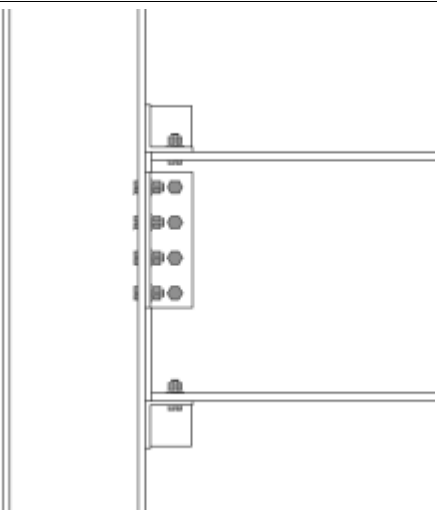
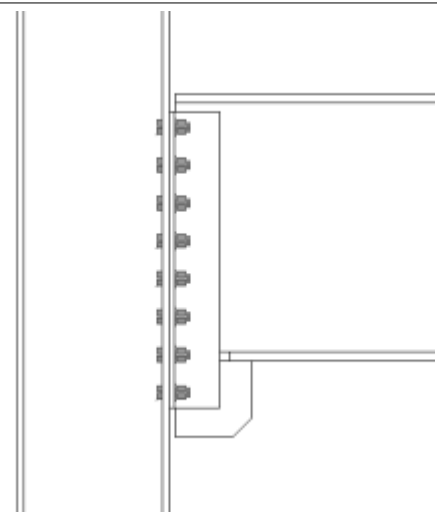
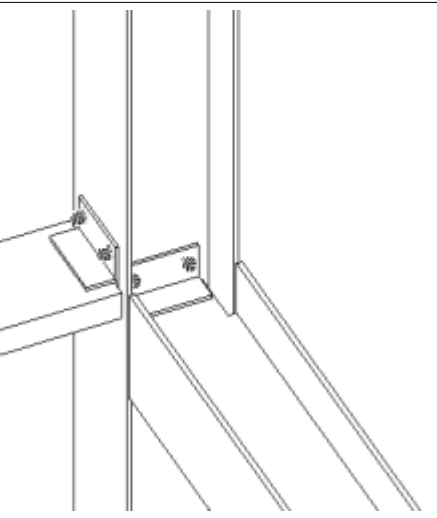
Example	Description
	<p>Shear tab through tube column. Third secondary part after connection applied to original two secondary parts.</p> <p>Use <b>Shear plate tube column (189)</b>.</p>

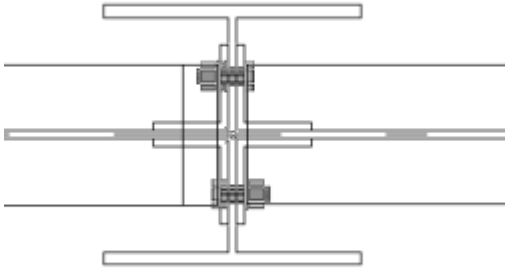
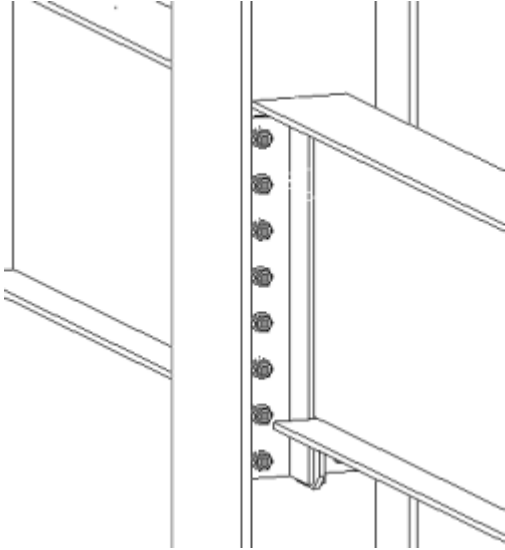
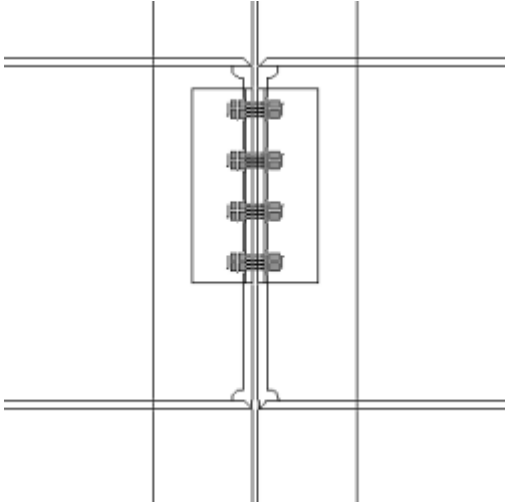
### **Clip angles**

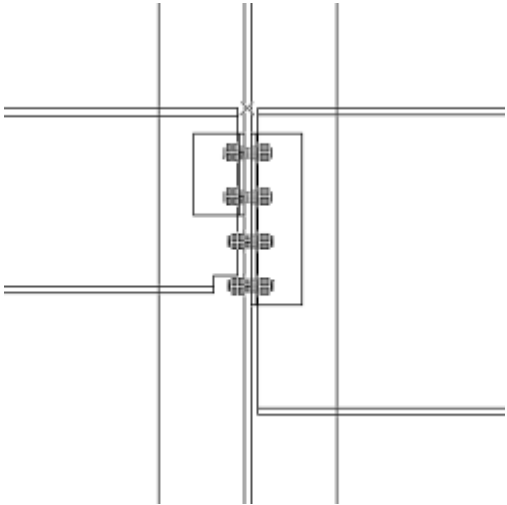
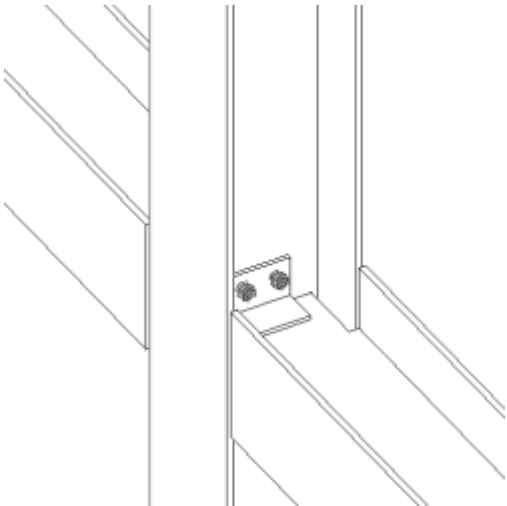
Example	Description
	<p>Clip angle connection to column flange or web. Single-sided /double-sided clip. Welded/bolted, bolted/bolted, welded/welded options.</p> <p>Use <b>Clip angle (141)</b>.</p>



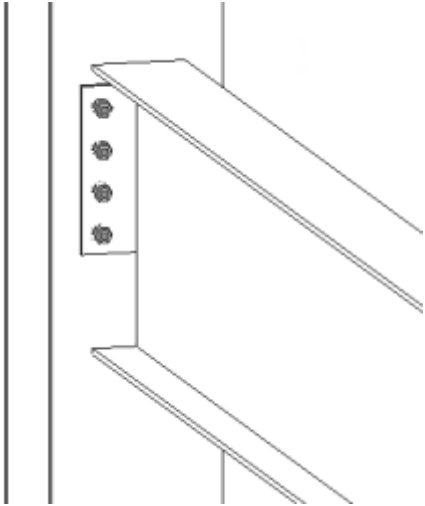
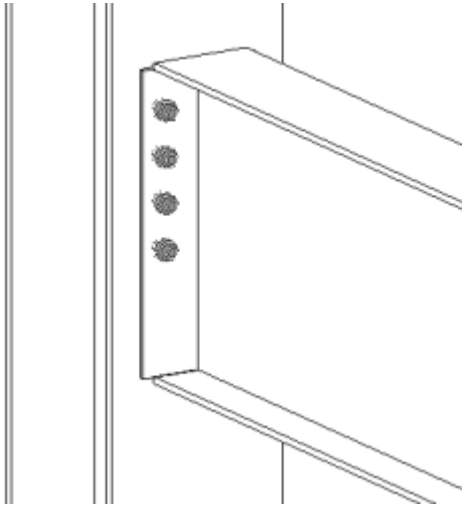
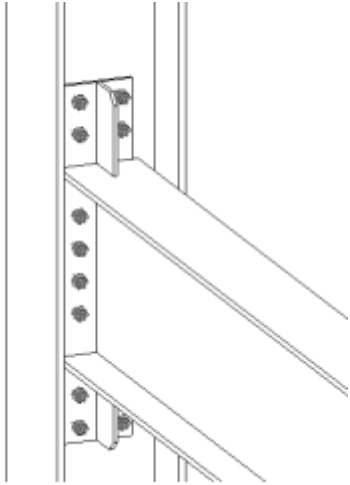
Example	Description
	<p>Clip angle connection to column flange or web. Single-sided /double-sided clip. Sloped secondary part. Square or bevel cut secondary options.</p> <p>Use <b>Clip angle (141)</b>.</p>
	<p>Clip angle connection to column flange or web. Single-sided /double-sided clip. Weld preparation and weld access holes for moment connection.</p> <p>Use <b>Clip angle (141)</b>.</p>
	<p>Clip angle connection to column knife connection. Bottom flange blocked or stripped for erection.</p> <p>Use <b>Clip angle (141)</b>.</p>

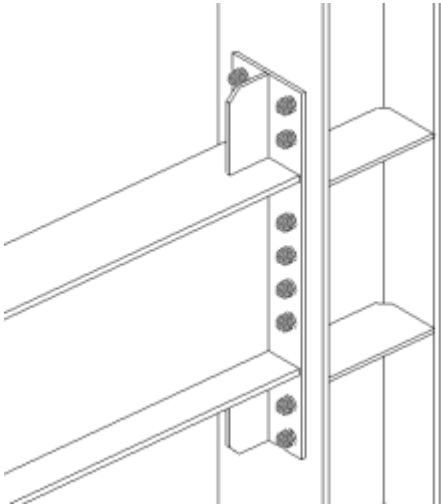
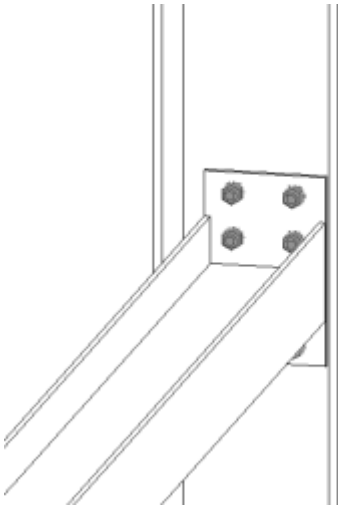
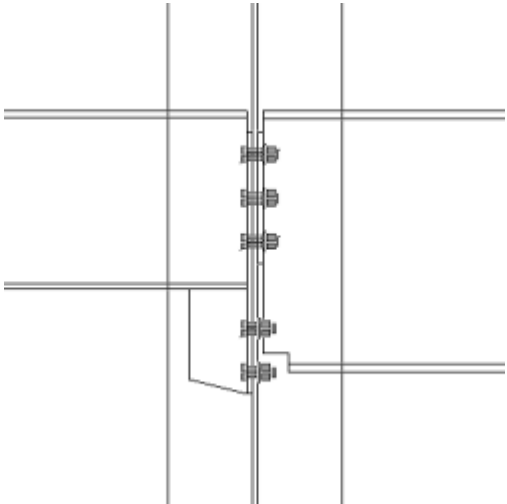
Example	Description
	<p>Clip angle connection to column. Seat angle option. Top/Bottom/Both.</p> <p>Use <b>Clip angle (141)</b>.</p>
	<p>Clip angle connection to column flange or web. Single-sided /double-sided clip. Haunch extension option. Top/Bottom/Both.</p> <p>Use <b>Clip angle (141)</b>.</p>
	<p>Clip angle connection to column flange or web. Single-sided /double-sided clip. Rotated secondary part.</p> <p>Use <b>Clip angle (141)</b>.</p>

Example	Description
	<p>Clip angle connection. Single-sided / double-sided clip. Two secondary parts. Bolted/bolted, welded/bolted, welded/welded options.</p> <p>Use <b>Two sided clip angle (143)</b>.</p>
	<p>Clip angle connection. Single-sided / double-sided clip. Two secondary parts. Haunch extension option. Top/Bottom/Both.</p> <p>Use <b>Two sided clip angle (143)</b>.</p>
	<p>Clip angle connection. Single-sided / double-sided clip. Two secondary parts. Weld preparation and weld access holes for moment connection.</p> <p>Use <b>Two sided clip angle (143)</b>.</p>

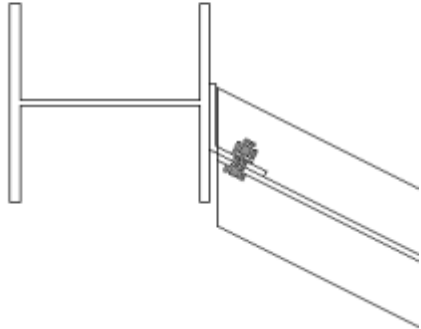
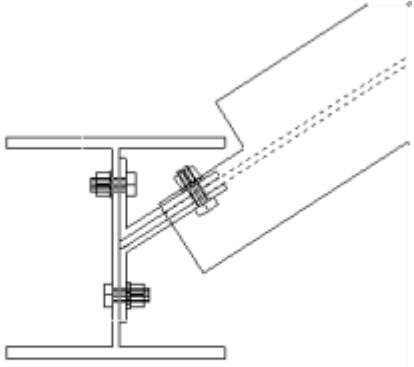
Example	Description
 <p>A technical drawing showing a clip angle connection. A vertical member is connected to a horizontal member. The clip angle is attached to the vertical member with four bolts. The horizontal member has a notch cut into it to provide clearance for the clip angle and bolts. The clip angle is also attached to the horizontal member with four bolts.</p>	<p>Clip angle connection. Automatic notching of secondary part to provide bolt clearance.</p> <p>Use <b>Two sided clip angle (143)</b>.</p>
 <p>A technical drawing showing a clip angle connection. A vertical member is connected to a horizontal member. The clip angle is attached to the vertical member with two bolts. The horizontal member is rotated, and the clip angle is attached to it with two bolts. The clip angle is also attached to the vertical member with two bolts.</p>	<p>Clip angle connection. Single-sided / double-sided clip. Two secondary parts rotated.</p> <p>Use <b>Two sided clip angle (143)</b>.</p>

## End plates

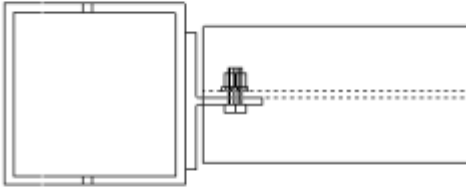
Example	Description
	<p>End plate connection to column flange or web. Level or sloped, square or skewed secondary part.</p> <p>Use <b>End plate (144)</b>.</p>
	<p>Full depth end plate connection to column flange or web. Level or sloped, square or skewed secondary part.</p> <p>Use <b>End plate (144)</b>.</p>
	<p>End plate connection to column web. Extended plate with haunches option.</p> <p>Use <b>End plate (144)</b>.</p>

Example	Description
	<p>End plate connection to column flange. Column stiffener option. Use <b>End plate (144)</b>.</p>
	<p>End plate connection to column. Secondary part rotated. Use <b>End plate (144)</b>.</p>
	<p>End plate connection. Two secondary parts. Automatic notching for bolt clearance. Haunch option. Use <b>Two sided end plate (142)</b>.</p>

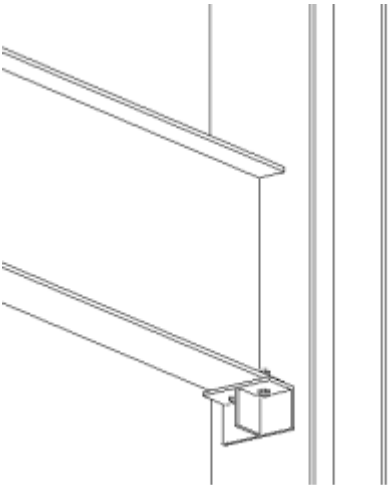
## ***Bent plate***

<b>Example</b>	<b>Description</b>
	<p>Bent plate connection to column flange. Skewed or square secondary part. Plate near side\far side\both sides.</p> <p>Use <b>Bent plate (190)</b>.</p>
	<p>Bent plate connection to column web. Skewed or square secondary part. Plate near side\far side\both sides.</p> <p>Use <b>Bent plate (190)</b>.</p>

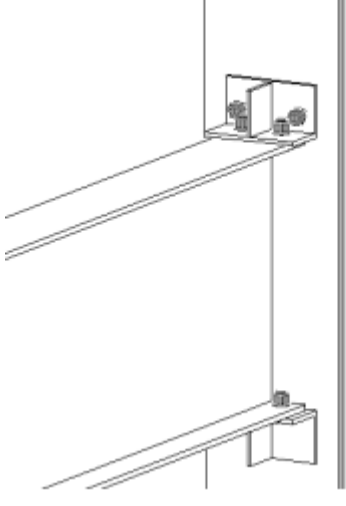
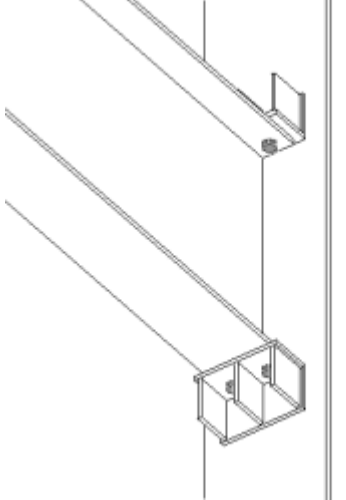
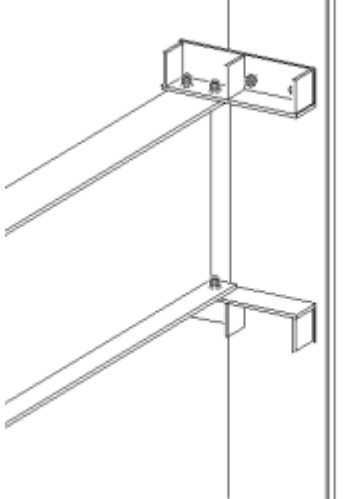
### ***Welded tee***

<b>Example</b>	<b>Description</b>
 <p>The diagram shows a cross-section of a welded tee connection. On the left is a square column section. On the right is a horizontal beam section. The beam's web is welded to the column's flange. A dashed horizontal line indicates the centerline of the beam.</p>	<p>Welded tee to column. Use <b>Welded tee (32)</b>.</p>

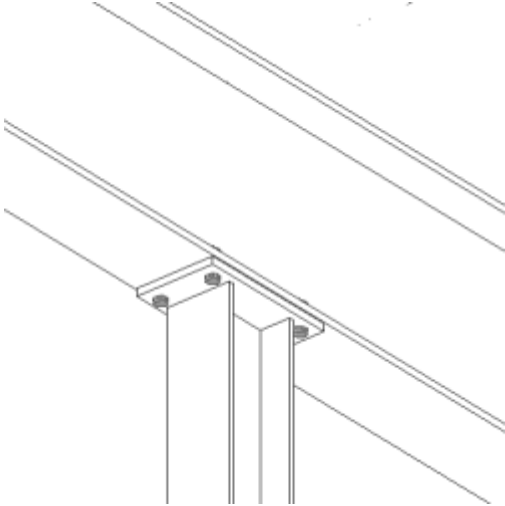
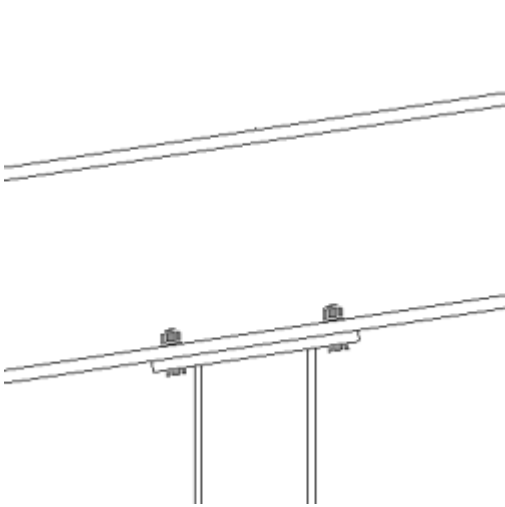
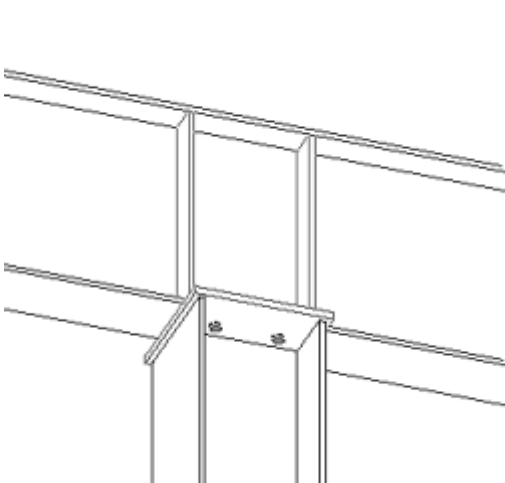
### ***Seated connection***

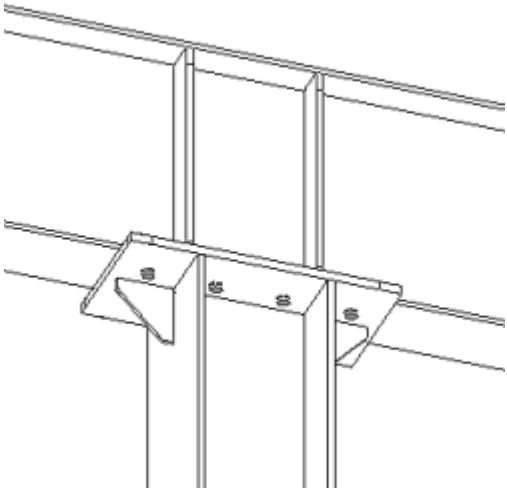
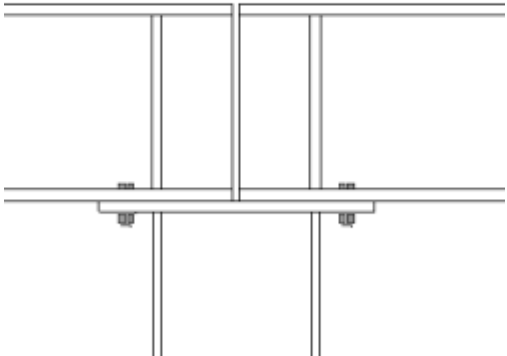
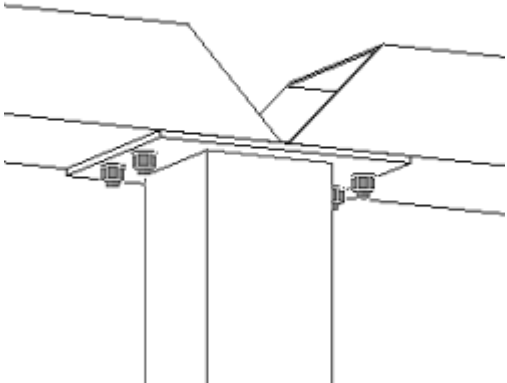
<b>Example</b>	<b>Description</b>
 <p>The diagram shows a cross-section of a beam seat connection. A horizontal beam is seated on a vertical column. The beam's bottom flange rests on a seat. Two vertical stiffeners are shown on the column flange, one on each side of the beam's web, to provide support.</p>	<p>Beam seat with stiffeners. Use <b>Rail joint (170)</b>.</p>

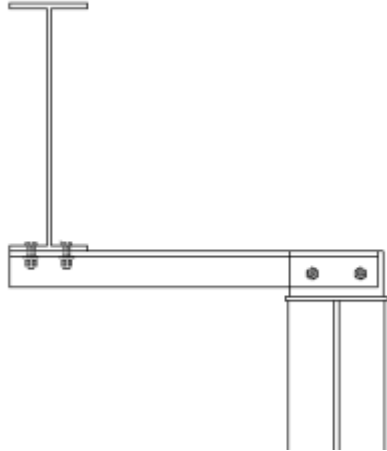
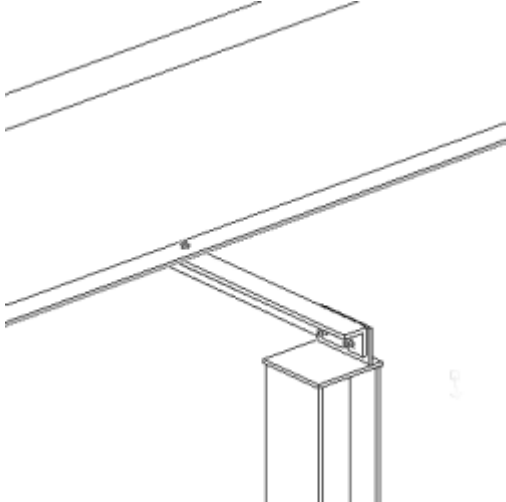


Example	Description
 <p>A technical drawing showing a beam seat connection. A horizontal beam is seated on a vertical column. The top of the beam is supported by a stiffener plate, and the bottom is supported by another stiffener plate. Both stiffeners are bolted to the column. The beam is also bolted to the column at its end.</p>	<p>Beam seat top and bottom with stiffeners. Various bolting options. Use <b>Rail joint (170)</b>.</p>
 <p>A technical drawing showing a beam seat connection with multiple stiffener options. The top of the beam is supported by a stiffener plate, and the bottom is supported by a different stiffener plate. Both stiffeners are bolted to the column. The beam is also bolted to the column at its end.</p>	<p>Beam seat. Multiple stiffener options. Use <b>Rail joint (170)</b>.</p>
 <p>A technical drawing showing a beam seat connection with an offset secondary part. The top of the beam is supported by a stiffener plate, and the bottom is supported by a different stiffener plate. The secondary part is offset from the main stiffener. Both stiffeners are bolted to the column. The beam is also bolted to the column at its end.</p>	<p>Beam seat. Offset secondary part. Use <b>Rail joint (170)</b>.</p>

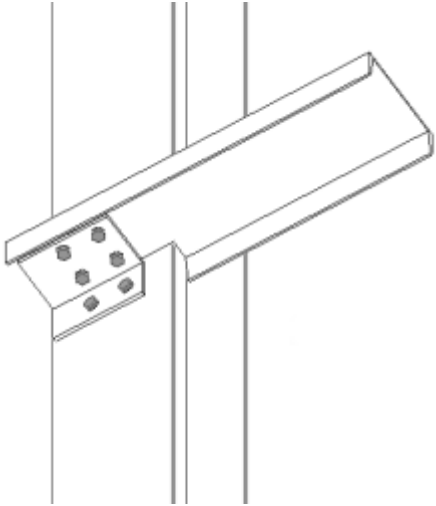
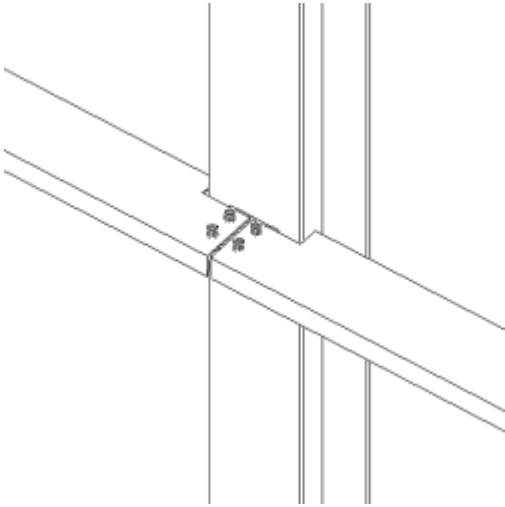
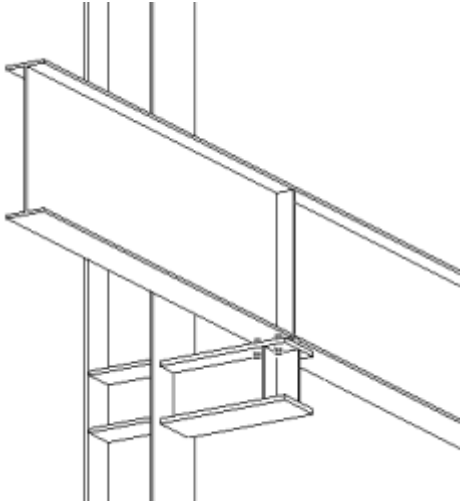
**Bearing type cap plate**

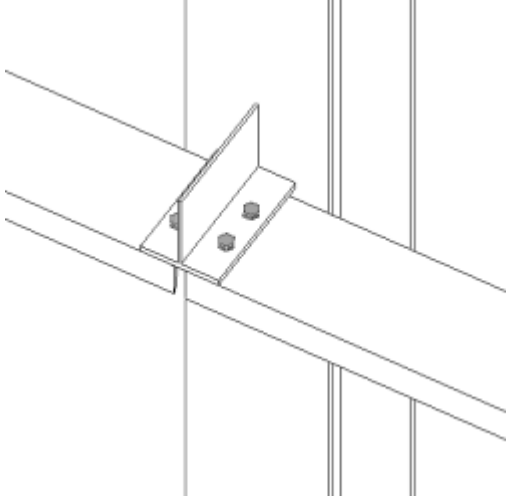
<b>Example</b>	<b>Description</b>
 A technical drawing showing a beam cantilevered over a column. The beam is supported by a cap plate on top of the column. The cap plate is bolted to the top flange of the column. The beam extends to the left of the column.	<p>Beam cantilever over column with cap plate. Use <b>U.S. Base plate joint (71)</b>.</p>
 A technical drawing showing a beam cantilevered over a column. The beam is supported by a cap plate on top of the column. The cap plate is bolted to the top flange of the column. The beam extends to the left of the column. A sloped secondary part is attached to the bottom flange of the column.	<p>Beam cantilever over column with cap plate. Sloped secondary part. Use <b>U.S. Base plate joint (71)</b>.</p>
 A technical drawing showing a beam cantilevered over a column. The beam is supported by a cap plate on top of the column. The cap plate is bolted to the top flange of the column. The beam extends to the left of the column. A beam stiffener is attached to the bottom flange of the column.	<p>Beam cantilever over column with cap plate. Beam stiffener option. Use <b>U.S. Base plate joint (71)</b>.</p>

Example	Description
	<p>Beam cantilever over column with cap plate. Column stiffener option. Use <b>U.S. Base plate joint (71)</b>.</p>
	<p>Two beams to column cap plate. Beam stiffener options. Use <b>Seating (39)</b>.</p>
	<p>Beam column cap plate. Tube steel rails to main part. Cope or hole bolt access options. Use <b>Column tube seating (100)</b>.</p>

Example	Description
	<p>Wind column to beam connection. Use <b>Wind column (5)</b>.</p>
	<p>Wind column to beam connection. Plate offset option. Use <b>Wind column (5)</b>.</p>

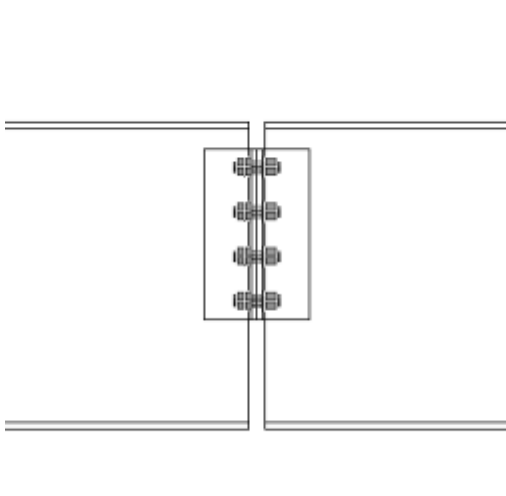
## Girt to column

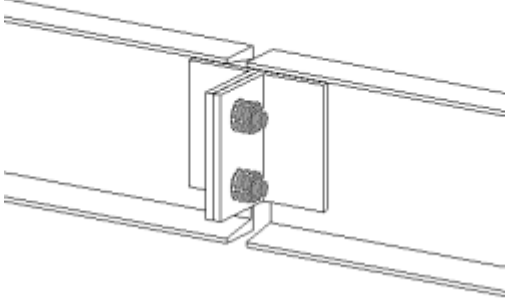
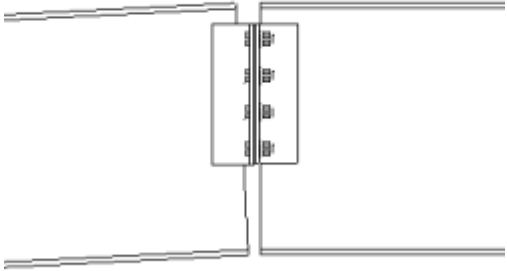
Example	Description
 A technical drawing showing a single girt (horizontal beam) connected to a vertical column. The connection is made using an angle bracket that is bolted to the side of the column and the top flange of the girt. The girt is shown extending to the right from the column.	<p>Single girt to column. Angle connection.</p> <p>Use <b>Rail joint (70)</b>.</p>
 A technical drawing showing two girts connected to a vertical column. The connection is made using an angle bracket that is bolted to the side of the column and the top flange of the upper girt. The lower girt is positioned below the upper one and is also connected to the column.	<p>Two girts to column. Angle connection.</p> <p>Use <b>Rail joint (70)</b>.</p>
 A technical drawing showing a beam to column outrigger connection. A horizontal beam is connected to a vertical column using a complex outrigger assembly. The assembly includes a main part and a secondary part, both of which are bolted to the column and the beam. The beam is shown extending to the right from the column.	<p>Beam to column outrigger connection. Main and secondary part stiffener options.</p> <p>Use <b>Stub (28)</b>.</p>

Example	Description
	<p>Two girts to column. WT connection. Use <b>U.S. seat joint 3 (74)</b>.</p>

## Splice connections

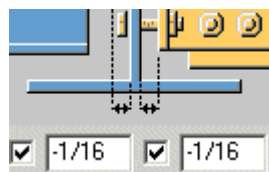
### *Beam to beam*

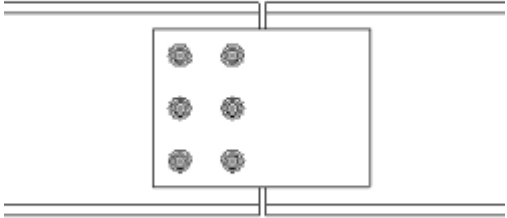
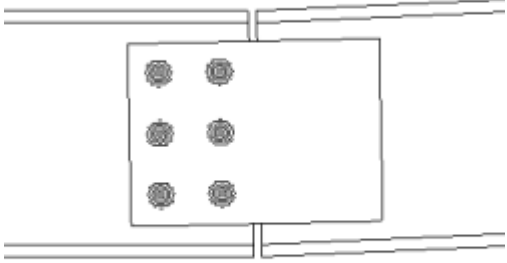
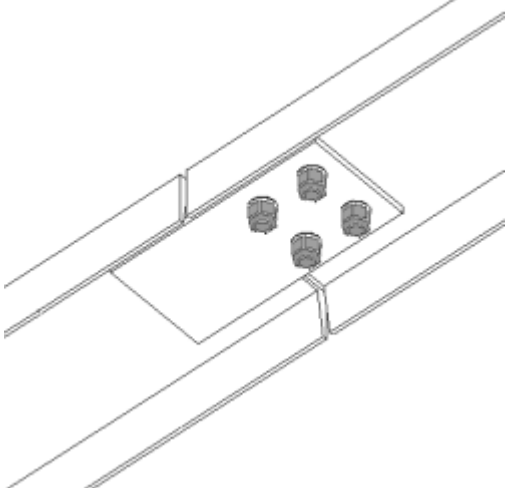
Example	Description
	<p>Clip angle splice connection. Bolted/ bolted, welded/bolted, welded/ welded options. Use <b>Two sided clip angle (143)</b>.</p>

Example	Description
	<p>Clip angle splice connection. One sided. Bolted/bolted, welded/bolted, welded/welded options.</p> <p>Use <b>Two sided clip angle (143)</b>.</p>
	<p>Clip angle splice connection. Beams in differing planes.</p> <p>Use <b>Two sided clip angle (143)</b>.</p>

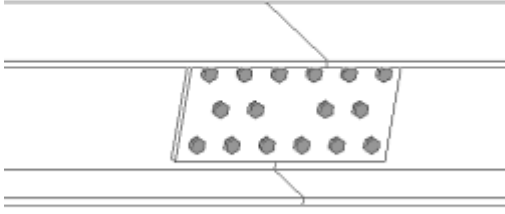
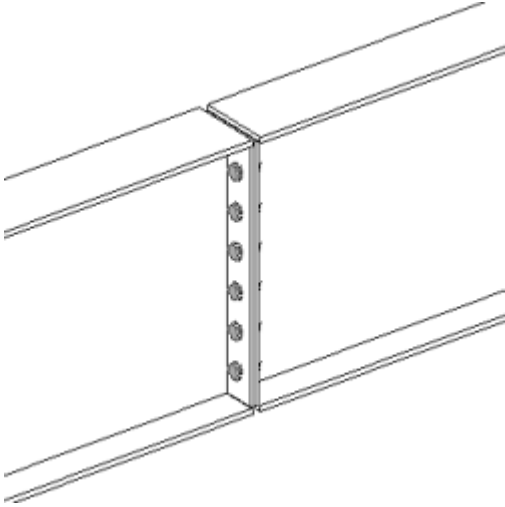
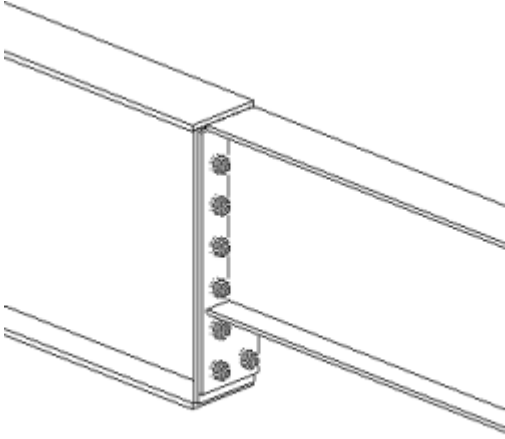
**NOTE** To make a clip angle type splice connection, it is necessary to create a dummy main part to bolt through. The secondary parts are spliced.

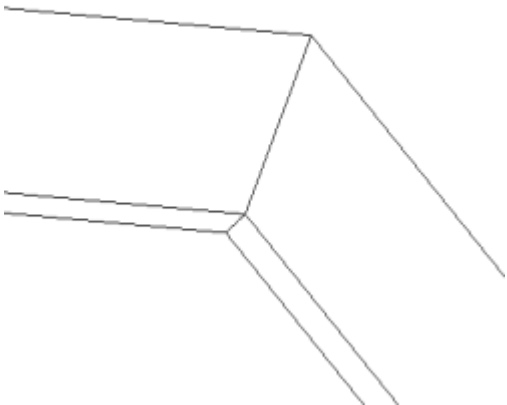
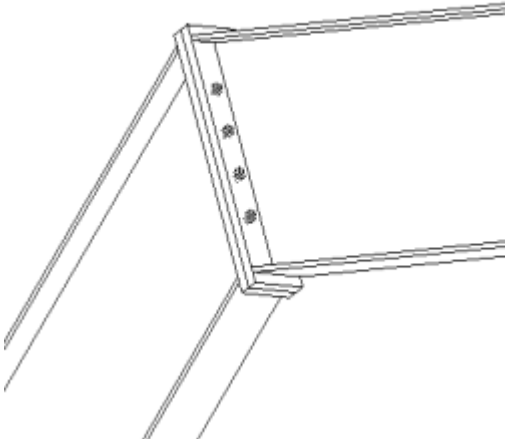
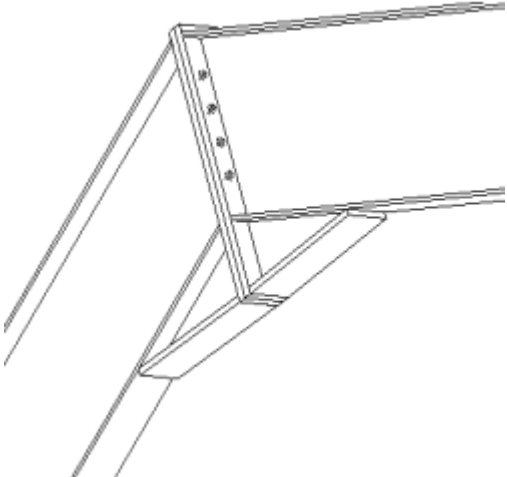
Make the dummy plate 1/8" thick with special properties so that it can be filtered out when making drawings. Use the settings shown below on the **Picture** tab.

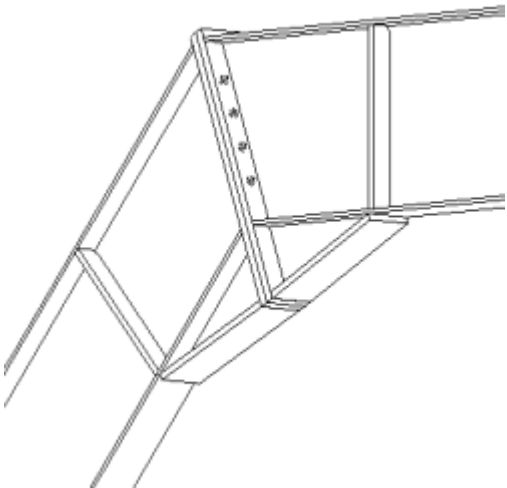
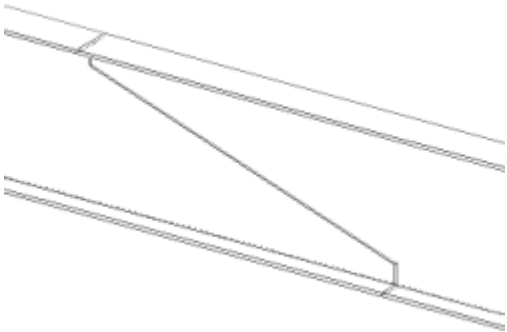
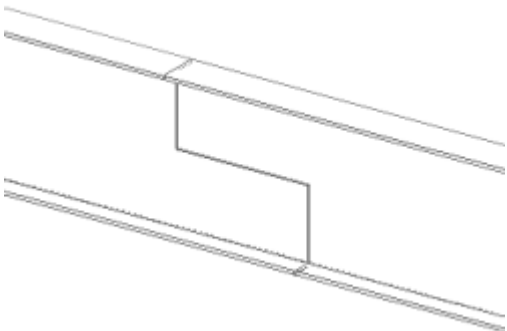


Example	Description
	<p>Beam to beam web splice plate welded to main part/ bolted to secondary part.</p> <p>Use <b>Tab plate (33)</b>.</p>
	<p>Beam to beam web splice plate welded to main part/ bolted to secondary part. Beams in differing planes.</p> <p>Use <b>Tab plate (33)</b>.</p>
	<p>Beam to beam web splice plate welded to main part/ bolted to secondary part. Parts rotated.</p> <p>Use <b>Tab plate (33)</b>.</p>

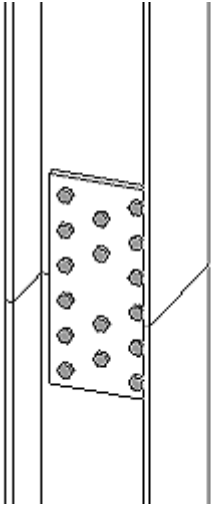
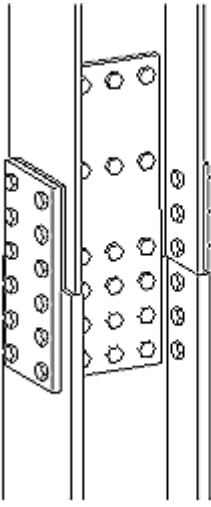
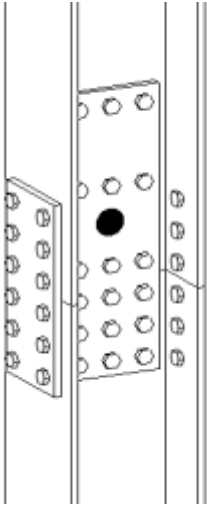


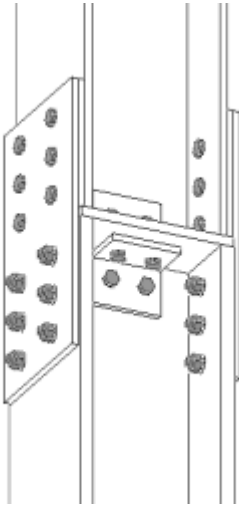
Example	Description
 <p>The diagram shows a top-down view of two horizontal steel beams. A rectangular splice plate is positioned between them, overlapping both. The splice plate has a grid of 16 circular bolt holes. Two lines with arrows point to the top and bottom edges of the splice plate, indicating its connection to the beams.</p>	<p>Beam to beam web splice plate bolted to both parts. Both parts in the same plane.</p> <p>Use <b>Column splice (42)</b>.</p>
 <p>The diagram shows a 3D perspective of two steel beams meeting at an end. A vertical joining plate is bolted to the end of the top beam and the side of the bottom beam. The joining plate has a vertical row of six circular bolt holes.</p>	<p>Beam to beam end plate splice.</p> <p>Use <b>Joining plates (14)</b>.</p>
 <p>The diagram shows a 3D perspective of two steel beams of different depths meeting at an end. A vertical joining plate is bolted to the end of the deeper top beam and the side of the shallower bottom beam. The joining plate has a vertical row of six circular bolt holes.</p>	<p>Beam to beam end plate splice. Parts of different depths.</p> <p>Use <b>Joining plates (14)</b>.</p>

Example	Description
	<p>Beam to beam welded splice. Stair stringer to landing.</p> <p>Use <b>Cranked beam (41)</b>.</p> <p><b>Note:</b> Does not work on very shallow slopes, or beams in the same plane.</p>
	<p>Beam to beam bolted end plate splice.</p> <p>Use <b>Cranked beam (41)</b>.</p> <p><b>Note:</b> Does not work on very shallow slopes, or beams in the same plane.</p>
	<p>Beam to beam bolted end plate splice with haunch.</p> <p>Use <b>Cranked beam (41)</b>.</p> <p><b>Note:</b> Does not work on very shallow slopes, or beams in the same plane.</p>

Example	Description
	<p>Beam to beam bolted end plate splice with haunch stiffener plate option.</p> <p>Use <b>Cranked beam (41)</b>.</p> <p><b>Note:</b> Does not work on very shallow slopes, or beams in the same plane.</p>
	<p>Beam to beam welded splice, "Z" cut.</p> <p>Use <b>Offshore Z (192)</b>.</p>
	<p>Beam to beam welded splice, "Z" square cut.</p> <p>Use <b>Offshore Z (192)</b>.</p>

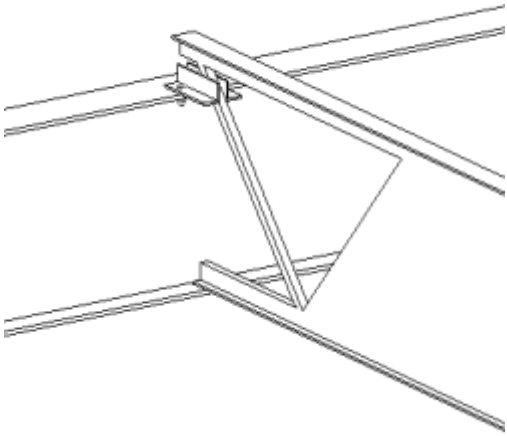
## Column splice

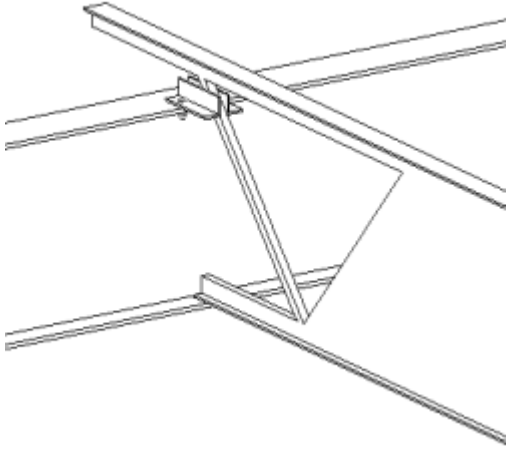
Example	Description
	<p>Column splice. Bolted to both parts. Both parts in the same plane.</p> <p>Use <b>Column splice (42)</b>.</p>
	<p>Column splice. Bolted to both parts. Shim plates for differing profiles.</p> <p>Use <b>Column splice (42)</b>.</p>
	<p>Column splice. Bolted to both parts. Lifting hole option.</p> <p>Use <b>Column splice (42)</b>.</p>

Example	Description
	<p>Column splice with division plate and connection angles.</p> <p>Use <b>Column splice (132)</b>.</p>

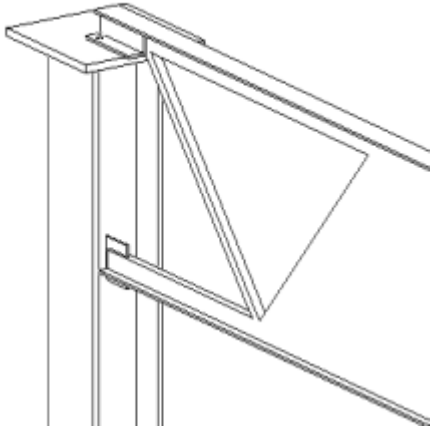
## Joist connections

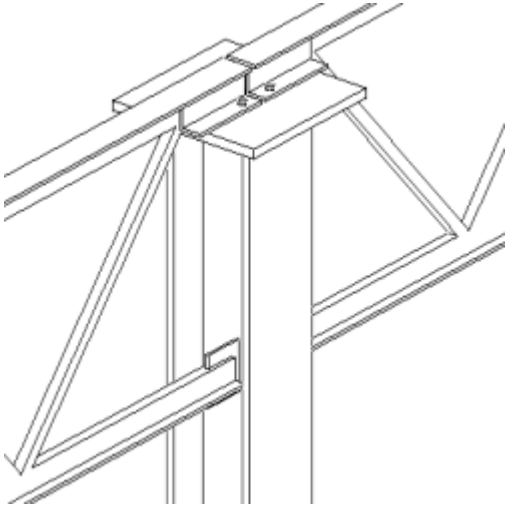
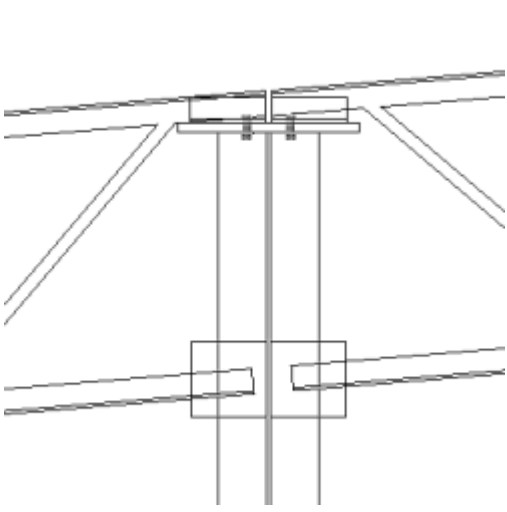
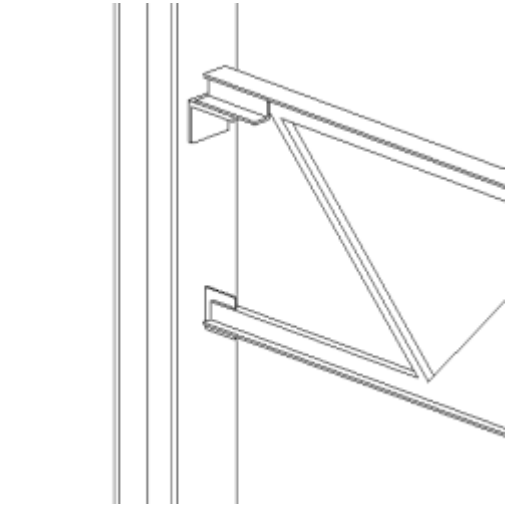
### *Joist to beam*

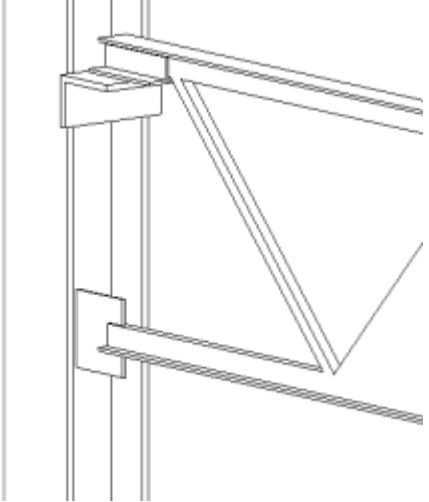
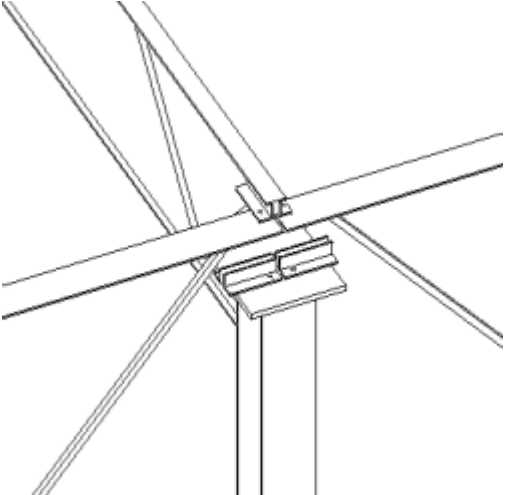
Example	Description
	<p>Joist bearing on beam.</p> <p>Use <b>Joist to beam, type 1 (160)</b>.</p>

Example	Description
	<p>Joist bearing on beam. Top chord extension option.</p> <p>Use <b>Joist to beam, type 1 (160)</b>.</p>

***Joist to column***

Example	Description
	<p>Joist bearing to column. Cap plate, stabilizer bar or angle option. Top chord extension option also available.</p> <p>Use <b>Joist to column, type 1 (161)</b>.</p>

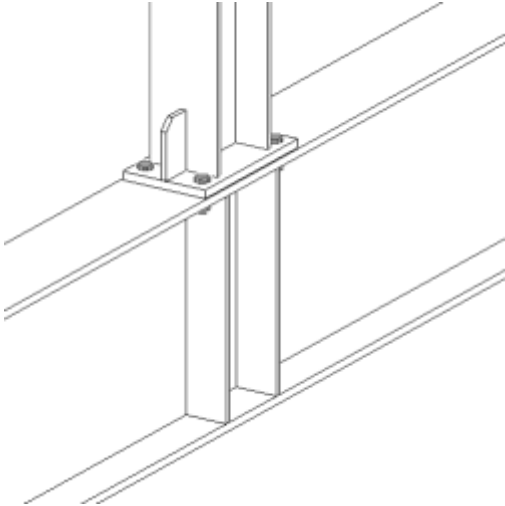
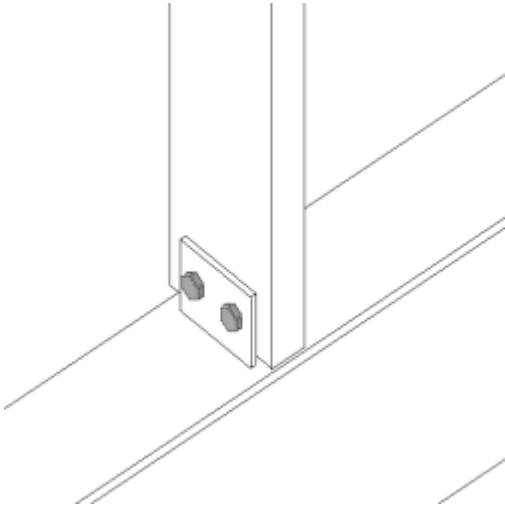
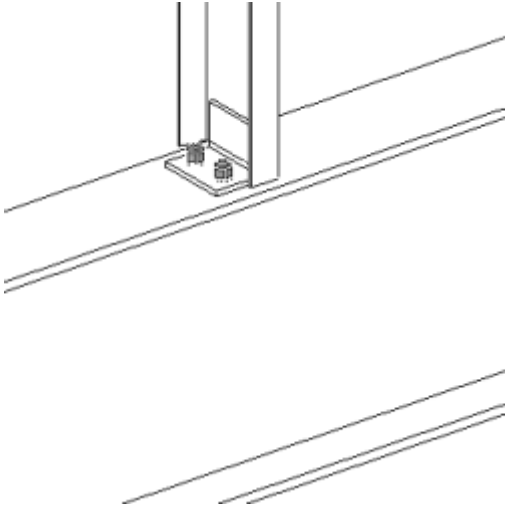
Example	Description
	<p>Two joists bearing to column. Cap plate, stabilizer bar or angle option. Use <b>2 sided joist to column (162)</b>.</p>
	<p>Two joists bearing to column. Cap plate, cap plate level or on slope of joists. Use <b>2 sided joist to column (162)</b>.</p>
	<p>Joist framing to side of column. Stabilizer bar or angle option. Use <b>Joist to column, type 2 (163)</b>.</p>

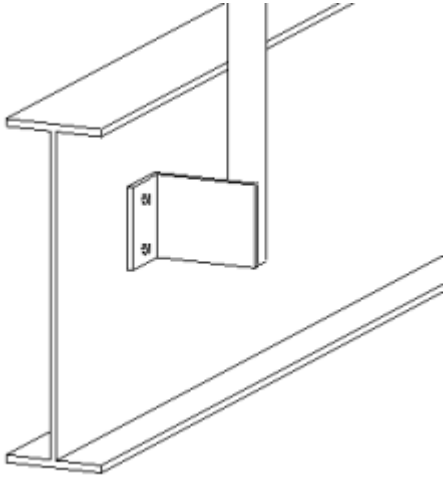
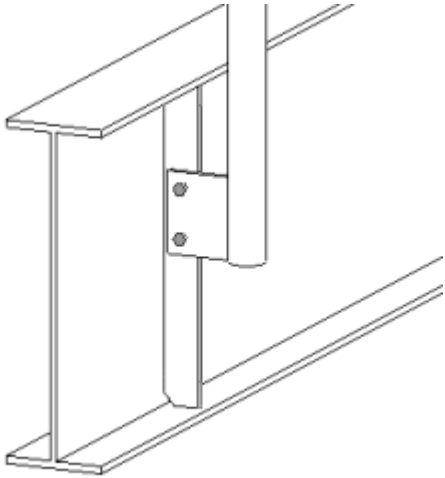
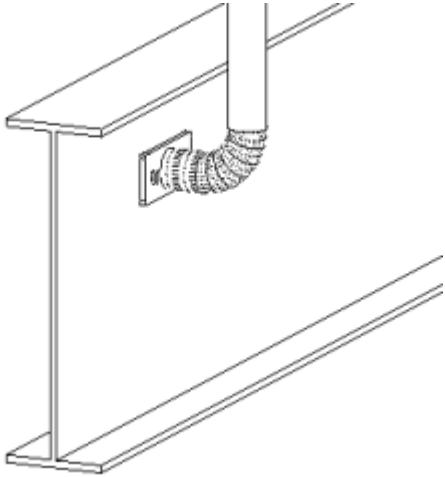
Example	Description
	<p>Joist framing to side of column. Seat angle across toes of flanges.</p> <p>Use <b>Joist to column, type 2 (163)</b>.</p>
	<p>Joist framing to joist girders at column.</p> <p>Use <b>Joist to beam and column (164)</b>.</p>

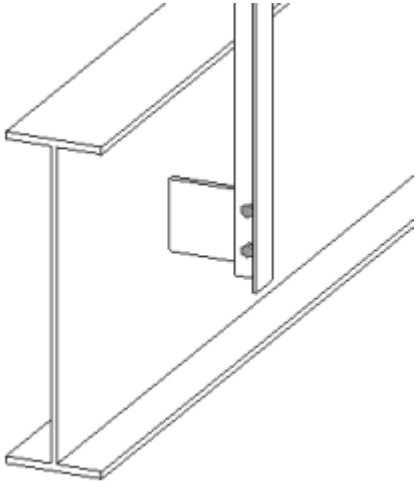
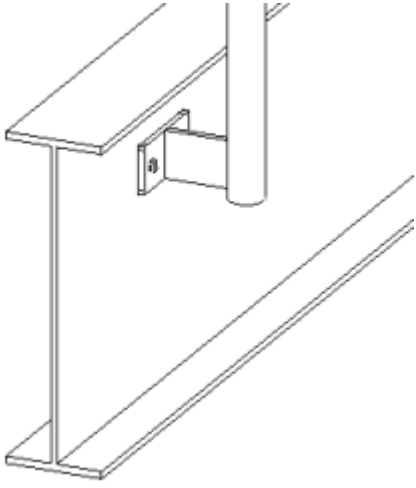
## Vertical member to beam



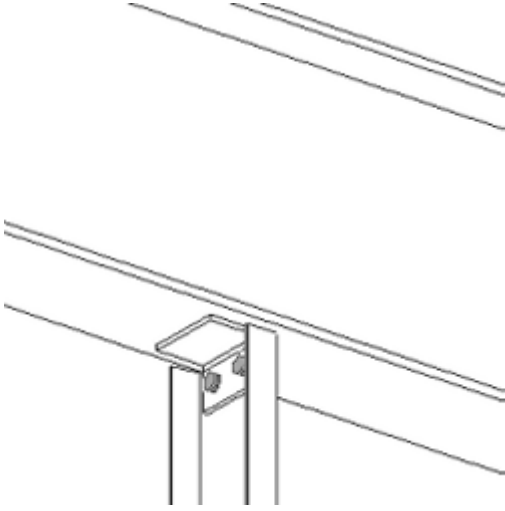
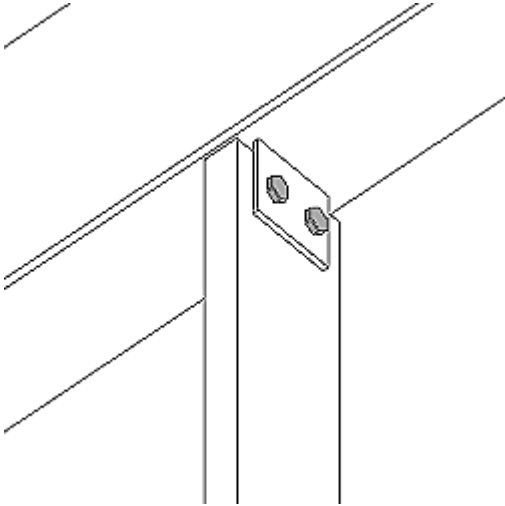
**Post and door jamb to top of beam**

<b>Example</b>	<b>Description</b>
	<p>Post base plate to top of beam. Main and secondary stiffener options.</p> <p>Use <b>U.S. base plate connection (71)</b>.</p>
	<p>Simple shear tab to post or channel jamb.</p> <p>Use <b>Shear plate simple (146)</b>.</p>
	<p>Clip angle to channel jamb.</p> <p>Use <b>Clip angle (141)</b>.</p>

Example	Description
	<p>Clip angle to railing post. Use <b>Stringer stanchion L profile (68)</b>.</p>
	<p>Railing post connection plate to beam stiffener. Use <b>Stringer stanchion st (69)</b>.</p>
	<p>Railing post elbow to connection plate. Use <b>Stanchion curved (84)</b>.</p>

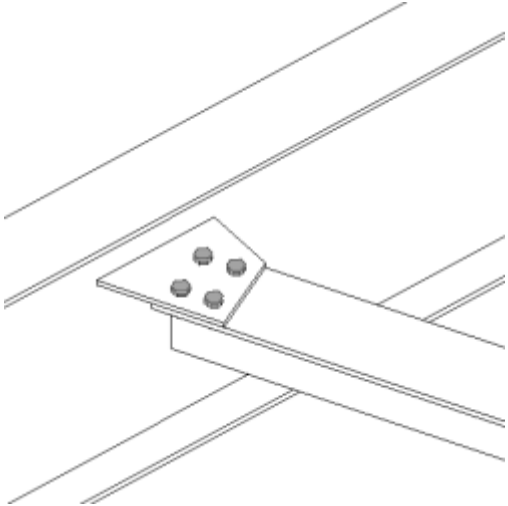
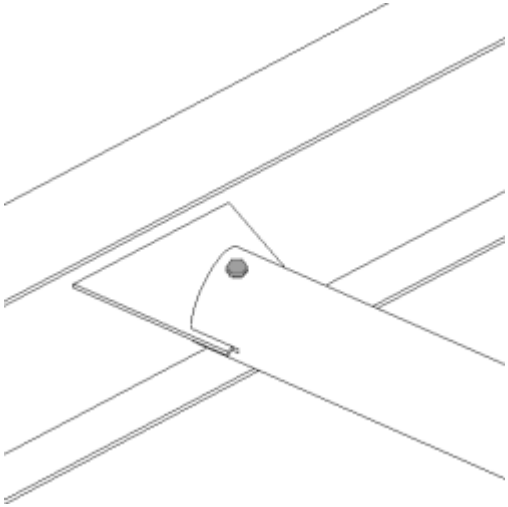
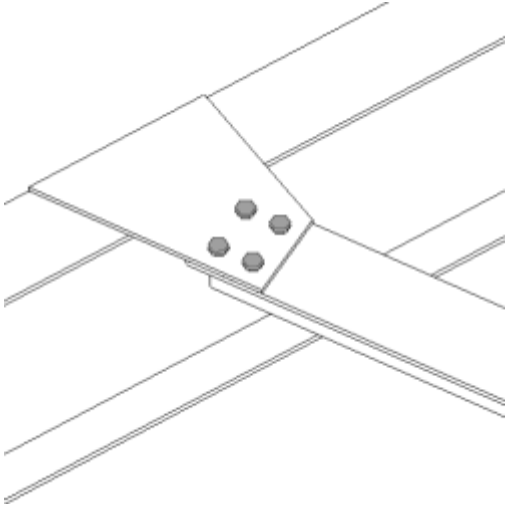
Example	Description
	<p>Shear tab to railing post. Use <b>Stanchion side profile (86)</b>.</p>
	<p>Built-up plate railing post connection. Use <b>Stanchion double plate (87)</b>.</p>

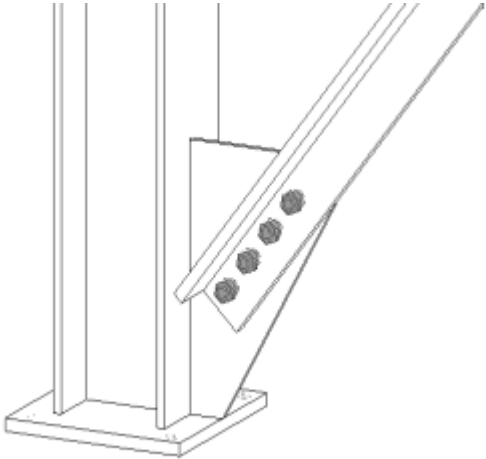
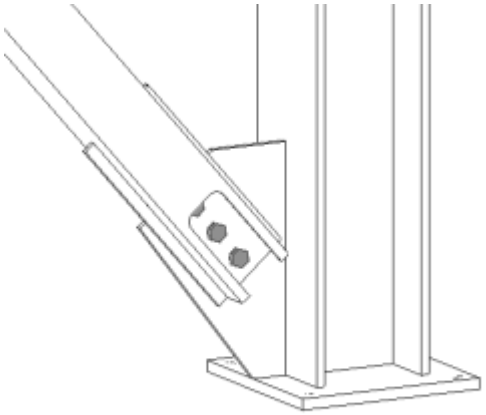
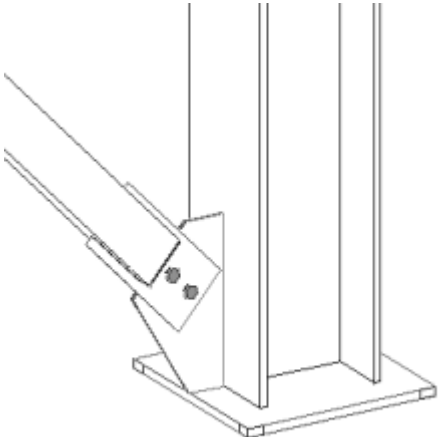
### Hangers from underside of beam

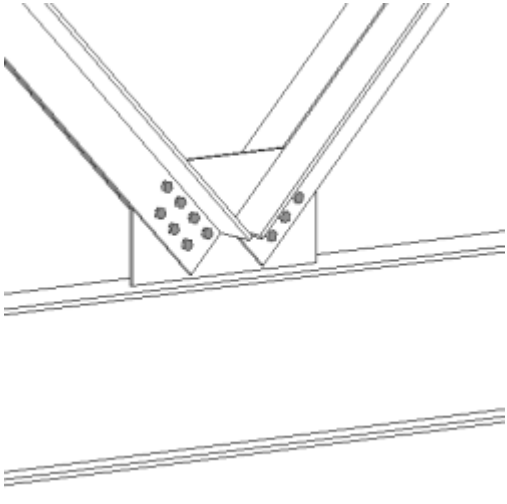
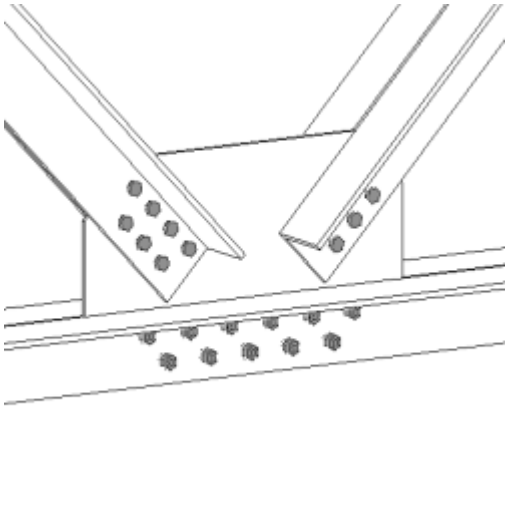
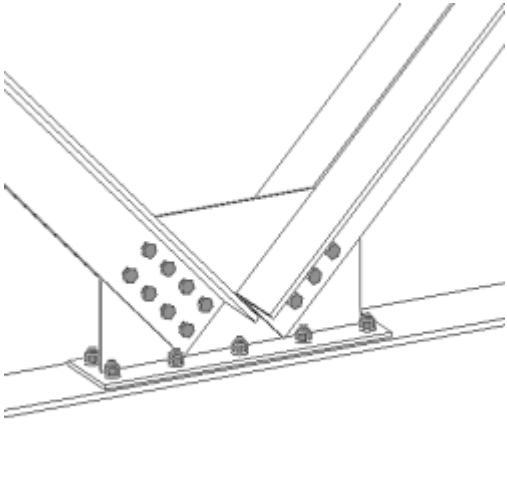
Example	Description
	Clip angle hanger connection. Use <b>Clip angle (141)</b> .
	Simple shear tab hanger connection. Use <b>Shear plate simple (146)</b> .

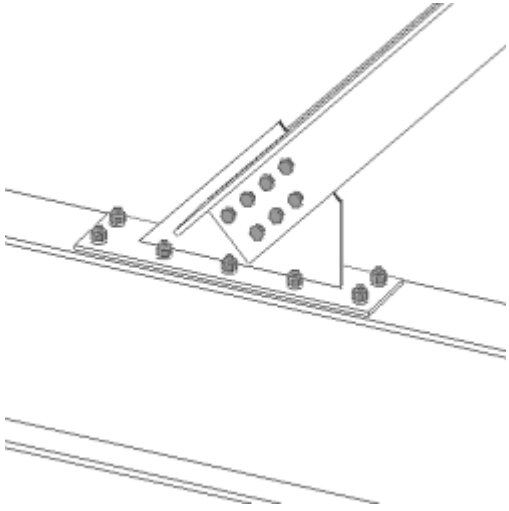
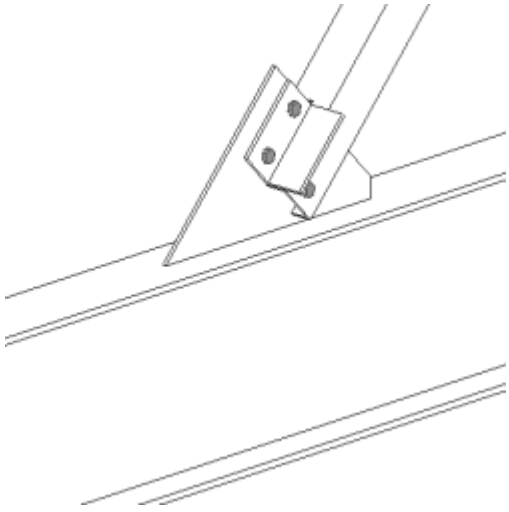
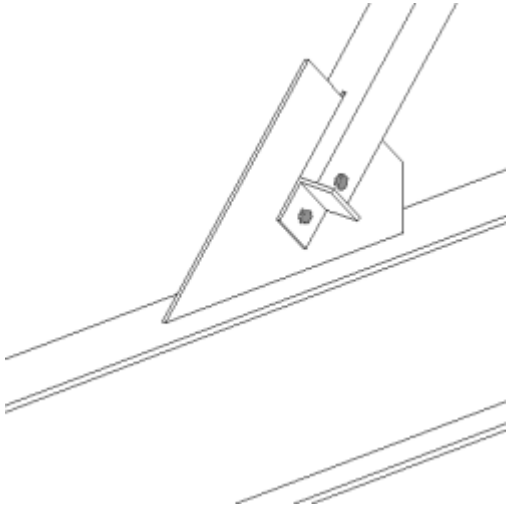
### Bracing connections

### Simple gusset plate connections

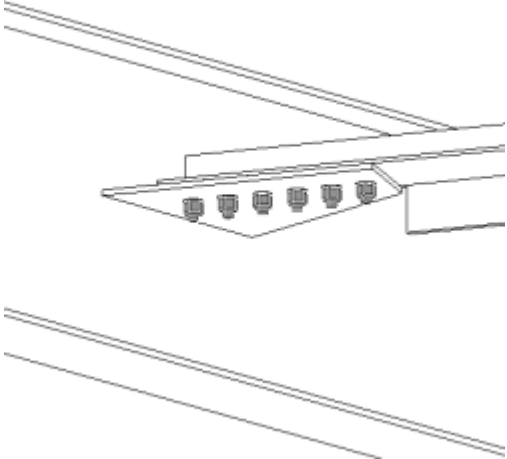
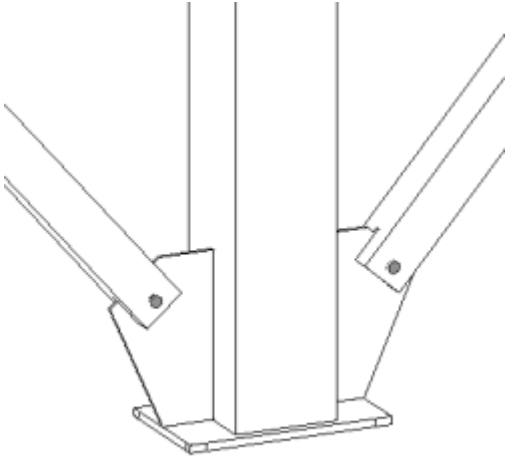
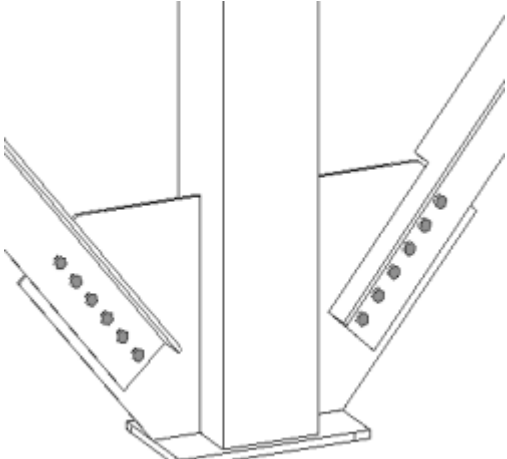
Example	Description
	<p>Gusset plate to single brace. Horizontal and vertical bracing. Various bracing profiles.</p> <p>Use <b>Bolted gusset (11)</b>.</p> <p>Load connection attribute &lt; <b>Defaults</b> &gt; and select <b>Defaults</b> for <b>Rule group</b> for best results.</p>
	<p>Gusset plate to single brace. Horizontal and vertical bracing. Hollow round brace with pin bolt option.</p> <p>Use <b>Bolted gusset (11)</b>.</p> <p>Load connection attribute &lt; <b>Defaults</b> &gt; and select <b>Defaults</b> for <b>Rule group</b> for best results.</p>
	<p>Gusset plate to single brace. Brace and main part at the same elevation.</p> <p>Use <b>Bolted gusset (11)</b>.</p>

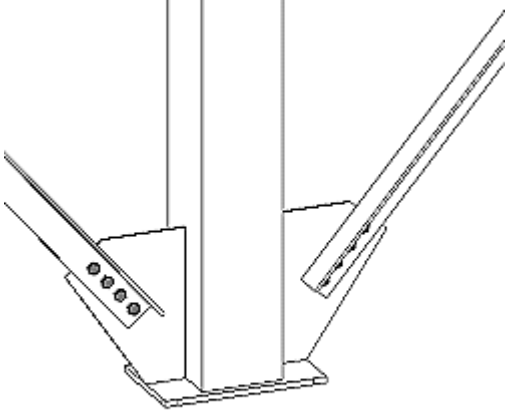
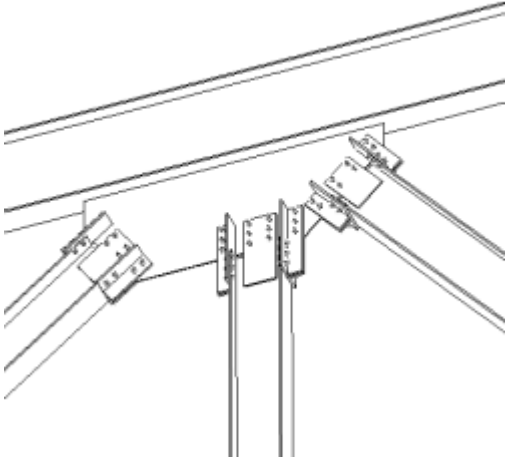
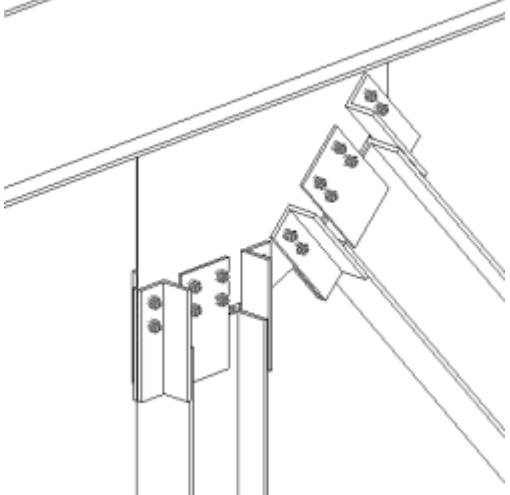
Example	Description
	<p>Gusset plate to single brace at base plate of column.</p> <p>Use <b>Bolted gusset (11)</b>.</p>
	<p>Gusset plate hollow section "Bird's mouth" connection to secondary parts.</p> <p>Use <b>Tube gusset (20)</b>.</p>
	<p>Gusset plate hollow section tongue plate connection to secondary parts.</p> <p>Use <b>Tube gusset (20)</b>.</p>

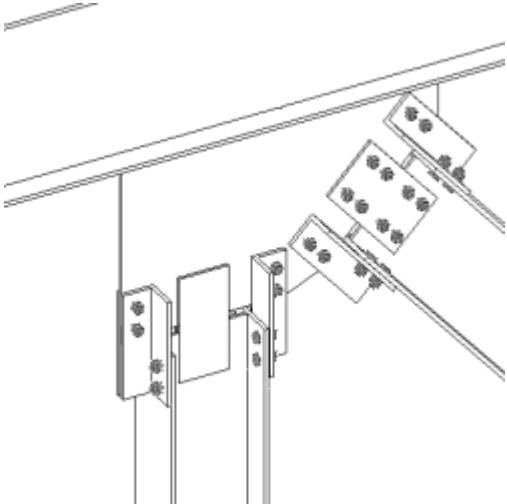
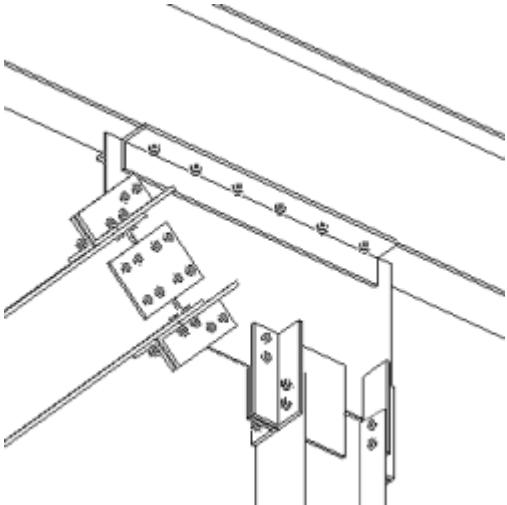
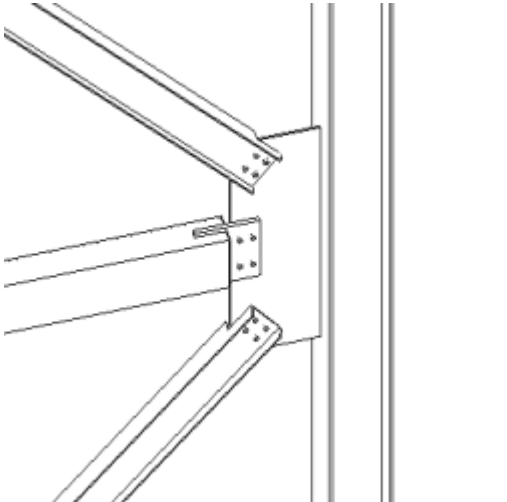
Example	Description
 <p>The diagram shows a cross-section of a steel connection. Two twin profile braces meet at a central point. A gusset plate is positioned between the braces and a main horizontal member below. The gusset plate is bolted to both braces and the main member. The bolts are arranged in a staggered pattern along the length of the gusset plate.</p>	<p>Gusset plate to twin profile brace. Vertical or horizontal brace. Multiple bracing members.</p> <p>Use <b>Bolted gusset (11)</b>.</p>
 <p>The diagram shows a cross-section of a steel connection. Two twin profile braces meet at a central point. A gusset plate is positioned between the braces and a twin profile main part below. The gusset plate is bolted to both braces and the main part. The bolts are arranged in a staggered pattern along the length of the gusset plate.</p>	<p>Gusset plate to twin profile brace. Twin profile main part. Welded or bolted to main part.</p> <p>Use <b>Bolted gusset (11)</b>.</p>
 <p>The diagram shows a cross-section of a steel connection. Two twin profile braces meet at a central point. A gusset plate is positioned between the braces and a main horizontal member below. A connection plate is bolted to the main member and the gusset plate. The bolts are arranged in a staggered pattern along the length of the connection plate.</p>	<p>Gusset plate with connection plate. Bolted to main part.</p> <p>Use <b>Bolted gusset (11)</b>.</p>

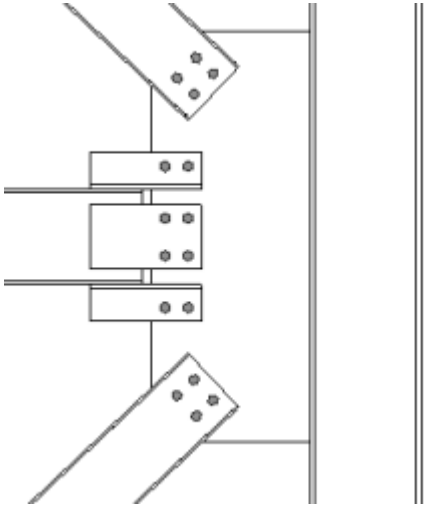
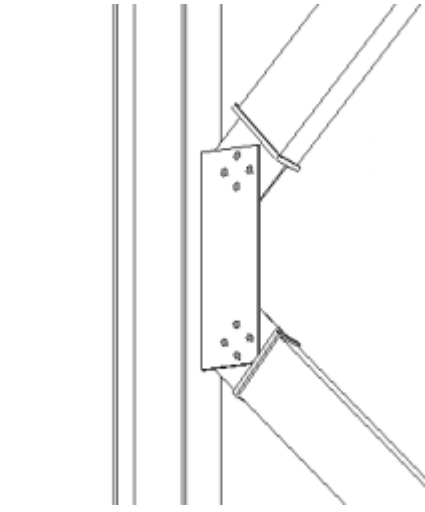
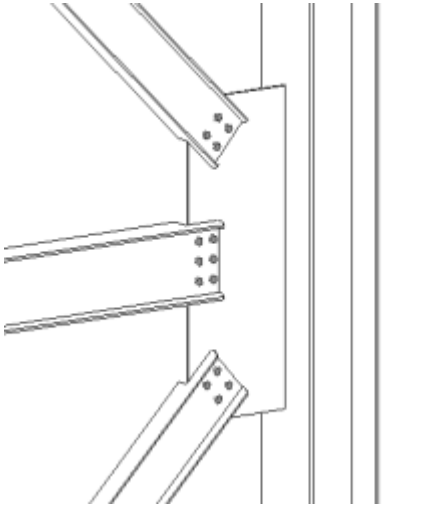
Example	Description
	<p>Gusset plate with connection plate. Bolted to main part. Various gusset plate shaping options.</p> <p>Use <b>Bolted gusset (11)</b>.</p>
	<p>Gusset plate to hollow section brace. Pin bolt and tension angle option.</p> <p>Use <b>Bolted gusset (11)</b>.</p>
	<p>Gusset plate to hollow section brace. Pin bolt and tension angle option.</p> <p>Use <b>Bolted gusset (11)</b>.</p>



Example	Description
	<p>Gusset plate to WT section brace. Notching option.</p> <p>Use <b>Bolted gusset (11)</b>.</p> <p>Load connection attribute &lt; <b>Defaults</b> &gt; and select <b>Defaults</b> for <b>Rule group</b> for best results.</p>
	<p>Gusset plate through hollow section column to hollow section bracing at base plate.</p> <p>Use <b>Bolted gusset (11)</b>.</p> <p>Select column, then brace and brace.</p>
	<p>Gusset plate through hollow section column to WT bracing at base plate.</p> <p>Use <b>Bolted gusset (11)</b>.</p> <p>Select column, then brace and brace.</p>

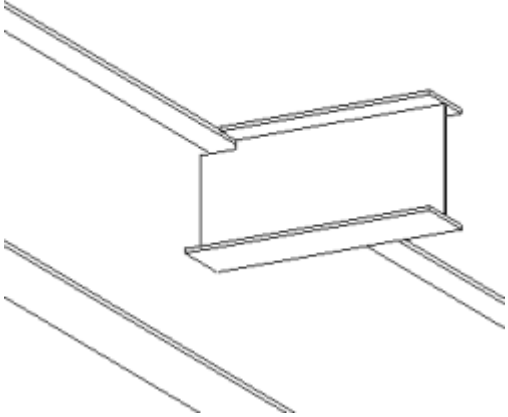
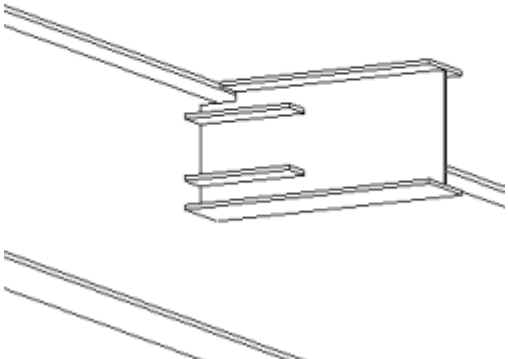
Example	Description
	<p>Gusset plate through hollow section column to angle bracing at base plate. Single or twin profile.</p> <p>Use <b>Bolted gusset (11)</b>.</p> <p>Select column, then brace and brace.</p>
	<p>Wrapped gusset plate W section bracing. Various bracing connection options. Welded/bolted, bolted/bolted.</p> <p>Use <b>Gusset wrapped cross (62)</b>.</p>
	<p>Wrapped gusset plate W section bracing. Various bracing connection options. Welded/bolted, bolted/bolted.</p> <p>Use <b>Gusset wrapped cross (62)</b>.</p>

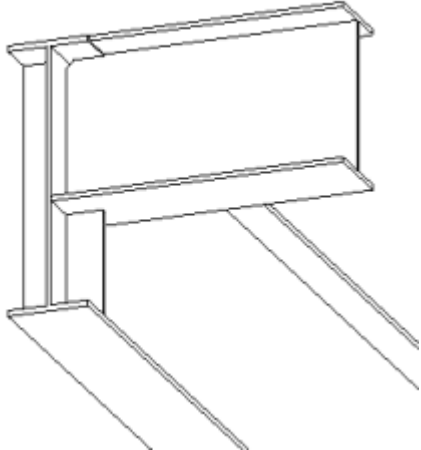
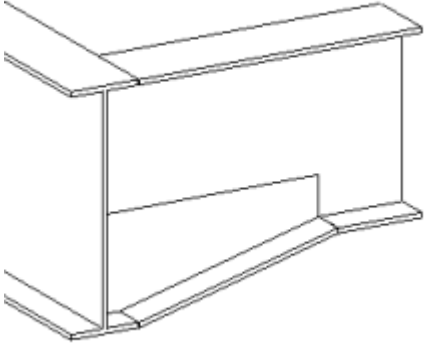
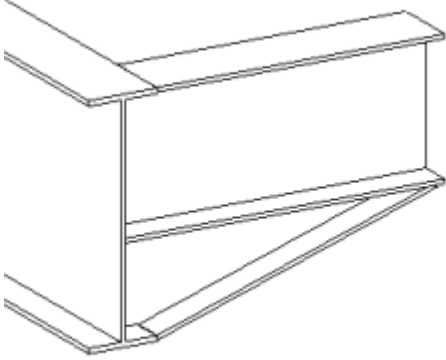
Example	Description
	<p>Wrapped gusset plate W section bracing. Various bracing connection options for each brace.</p> <p>Use <b>Gusset wrapped cross (62)</b>.</p>
	<p>Wrapped gusset plate W section bracing. Various gusset plate connection options.</p> <p>Use <b>Gusset wrapped cross (62)</b>.</p>
	<p>Hollow section bracing tongue plate connection to existing gusset plate.</p> <p>Use <b>Tube crossing (22)</b>.</p>

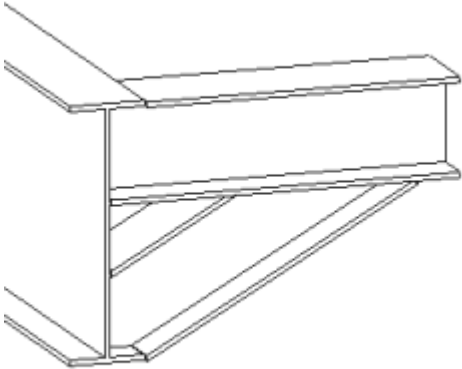
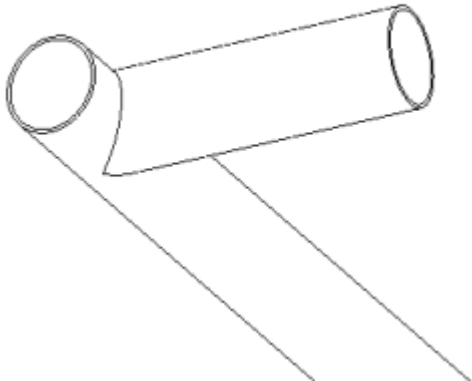
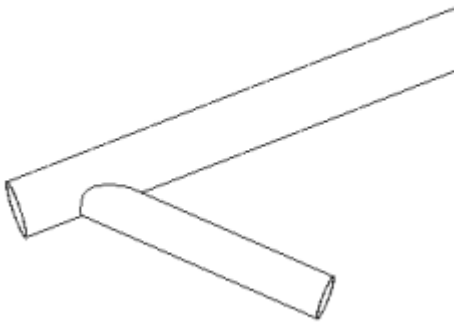
Example	Description
	<p>Wrapped gusset W section bracing connection to existing gusset plate. Use <b>Wrapped cross (61)</b>.</p>
	<p>Hollow section bracing WT end connection to existing gusset plate. Use <b>Portal bracing (105)</b>.</p>
	<p>Bolted brace connection to existing gusset plate. Use <b>Bracing cross (19)</b>.</p>

## Welded connections

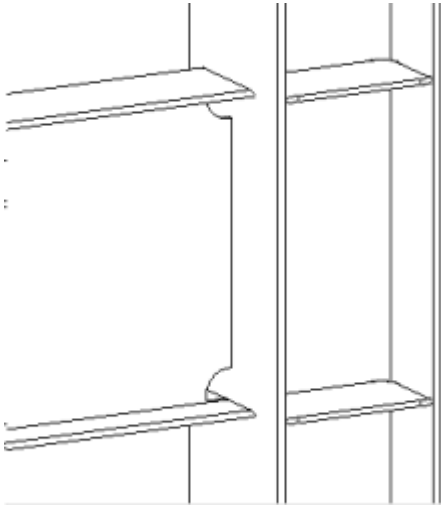
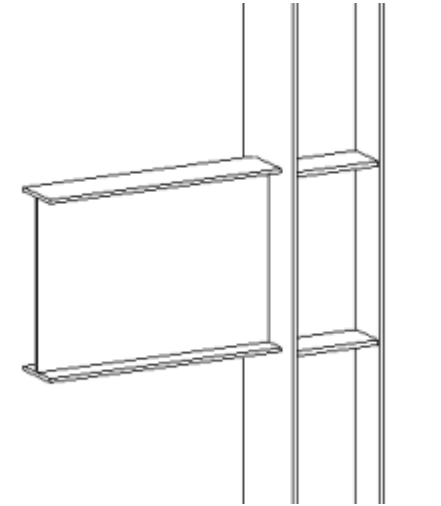
### *Beam to beam*

Example	Description
 A technical line drawing showing a 3D perspective of a welded beam-to-beam connection. A horizontal beam is attached to a vertical beam. The connection is made by welding the top flange of the horizontal beam to the top flange of the vertical beam. The vertical beam has a web and a bottom flange. The horizontal beam has a top flange, a web, and a bottom flange. The drawing shows the beams meeting at a right angle.	<p>Welded beam to beam. Use <b>Fitting (13)</b>.</p>
 A technical line drawing showing a 3D perspective of a welded beam-to-beam connection with horizontal stiffeners. The setup is similar to the first diagram, but with two horizontal stiffeners added. One stiffener is attached to the top flange of the horizontal beam, and the other is attached to the web of the horizontal beam. Both stiffeners are welded to the top flange of the vertical beam. The drawing shows the beams meeting at a right angle.	<p>Welded beam to beam with horizontal stiffeners. Use <b>Fitting (13)</b>.</p>

Example	Description
	<p>Welded beam to beam with primary. Vertical stiffeners.</p> <p>Use <b>Welded beam to beam (123)</b>.</p>
	<p>Welded beam to beam with haunch.</p> <p>Use <b>Offshore (194)</b>.</p>
	<p>Welded beam to beam with haunch. Various haunch options.</p> <p>Use <b>Offshore (194)</b>.</p>

Example	Description
	<p>Welded beam to beam with haunch. Various haunch options.</p> <p>Use <b>Offshore (194)</b>.</p>
	<p>Welded round profile to round profile.</p> <p>Use <b>Round tube (23)</b>.</p>
	<p>Welded round profile to round profile. Differing profile size and skewed secondary part.</p> <p>Use <b>Round tube (23)</b>.</p>

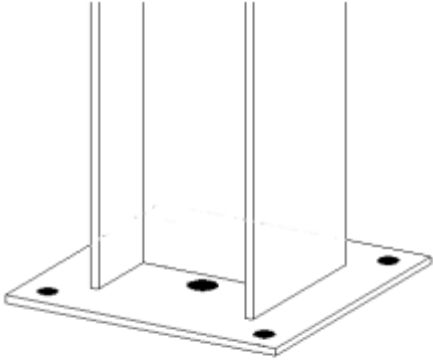
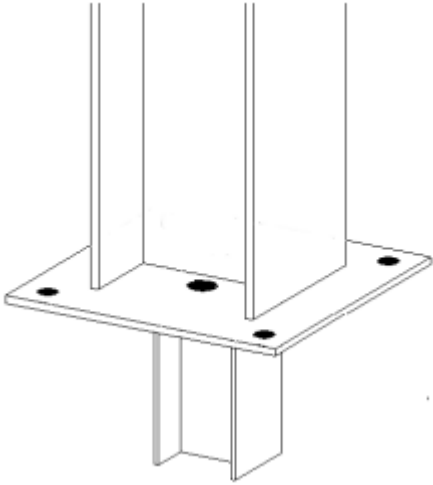
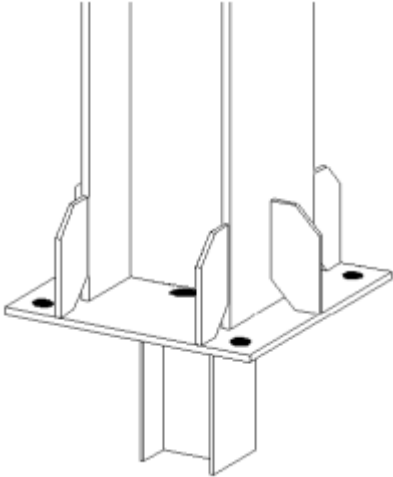
## Beam column

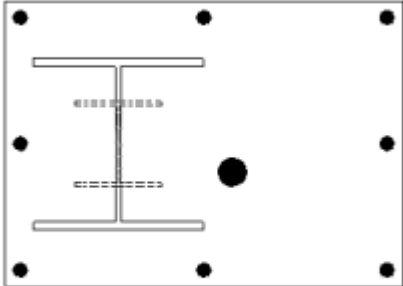
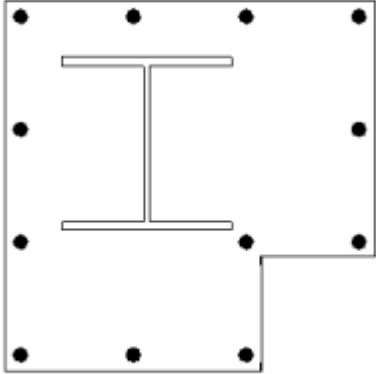
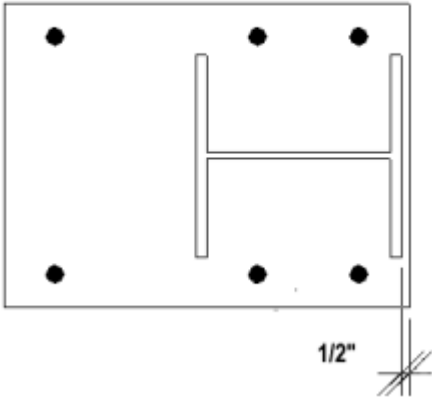
Example	Description
 A technical line drawing showing a beam-column connection. The beam is welded to the column with stiffeners. The stiffeners are shown as vertical plates on the column face, with the beam flanges resting on them. The drawing shows two views: a side view and a front view.	<p>Welded to column with weld preparation and stiffener options.</p> <p>Use <b>Welded column with stiffeners (128)</b>.</p>
 A technical line drawing showing a beam-column connection. The beam is welded to the column without stiffeners. The drawing shows two views: a side view and a front view.	<p>Welded to column.</p> <p>Use <b>Welded column (31)</b>.</p>

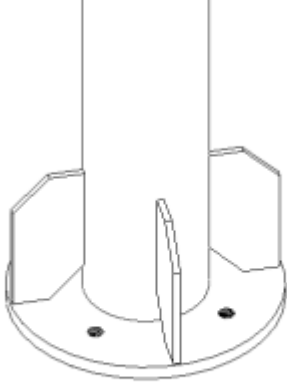
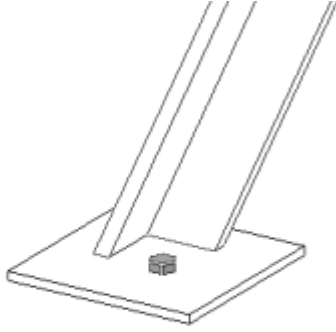
## Details



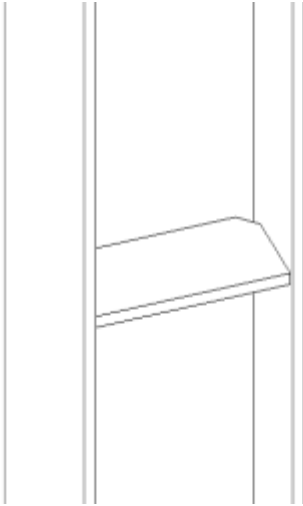
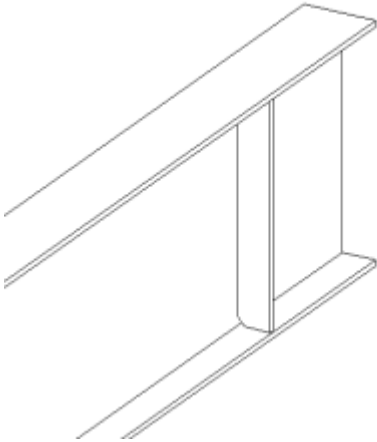
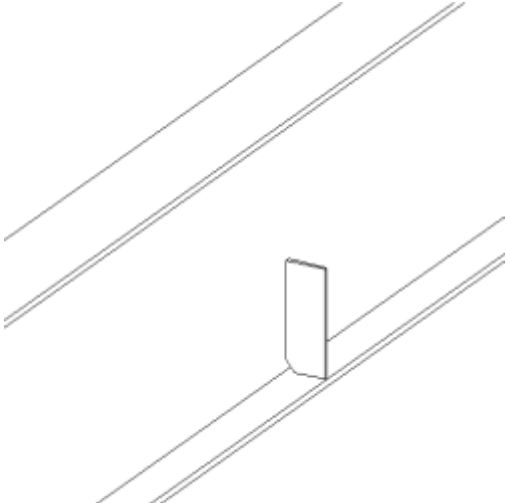
## Base plates

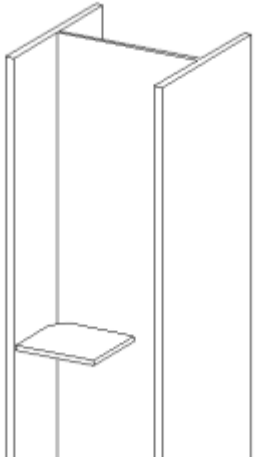
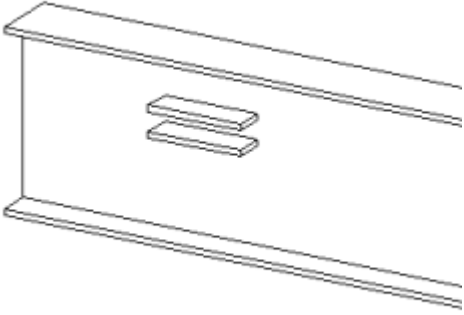
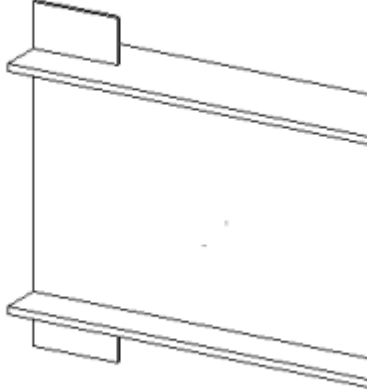
Example	Description
 A 3D perspective drawing of a column base plate. The plate is rectangular and has four circular holes, one in each corner. A vertical column is shown attached to the center of the plate. The plate is shown from a slightly elevated angle, showing its thickness.	<p>Column base plate with grout hole option.</p> <p>Use <b>U.S. base plate (1047)</b>.</p>
 A 3D perspective drawing of a column base plate. The plate is rectangular and has four circular holes, one in each corner. A vertical column is shown attached to the center of the plate. The plate is shown from a slightly elevated angle, showing its thickness. A shear key is visible on the bottom edge of the plate, extending downwards.	<p>Column base plate with shear key option.</p> <p>Use <b>U.S. base plate (1047)</b>.</p>
 A 3D perspective drawing of a column base plate. The plate is rectangular and has four circular holes, one in each corner. A vertical column is shown attached to the center of the plate. The plate is shown from a slightly elevated angle, showing its thickness. Stiffeners are visible on the top surface of the plate, extending upwards.	<p>Column base plate with stiffener option.</p> <p>Use <b>U.S. base plate (1047)</b>.</p>

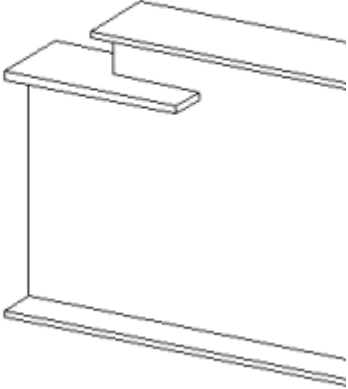
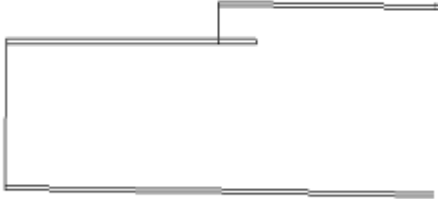
Example	Description
 <p>The diagram shows a rectangular base plate with an I-beam column centered on the left side. There are eight bolt holes: four at the corners and four along the right edge. A shear key is shown on the left side of the column web. A dashed circle on the right side of the plate indicates an optional grout hole.</p>	<p>Offset column base plate (shear key and grout hole optional). Use <b>U.S. base plate (1047)</b>.</p>
 <p>The diagram shows a rectangular base plate with an I-beam column centered. There are eight bolt holes: four at the corners and four along the right edge. The bottom right corner of the plate is chamfered. The bottom edge of the plate is shorter on the right side.</p>	<p>Column base plate bolt elimination and interior corner chamfer option. Use <b>U.S. base plate (1047)</b>.</p>
 <p>The diagram shows a rectangular base plate with an I-beam column. The base plate is located from the face of the flange. There are six bolt holes: two at the top corners and two at the bottom corners. A dimension line at the bottom right indicates a distance of 1/2" from the edge of the plate to the centerline of the column web.</p>	<p>Column base plate located from face of flange. Use <b>Base plate (1042)</b>.</p>

Example	Description
 <p>A technical drawing showing a circular column base plate. A vertical column is shown passing through the center of the plate. A vertical stiffener is attached to the inner surface of the plate, extending upwards. Two circular bolt holes are visible on the bottom surface of the plate.</p>	<p>Circular column base plate with stiffener option. Use <b>Circular base plates (1052)</b>.</p>
 <p>A technical drawing showing a horizontal rectangular base plate. A sloped post is attached to the top surface of the plate. A bolt is shown passing through the plate and the post.</p>	<p>Horizontal base plate to sloped post. Use <b>Base plate (1053)</b>.</p>

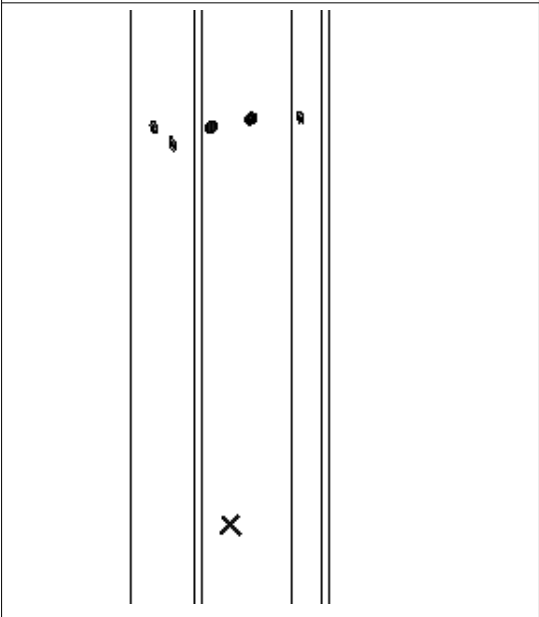
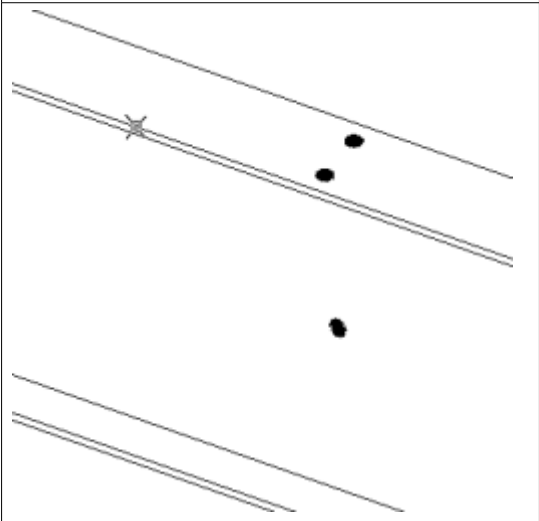
## Stiffeners

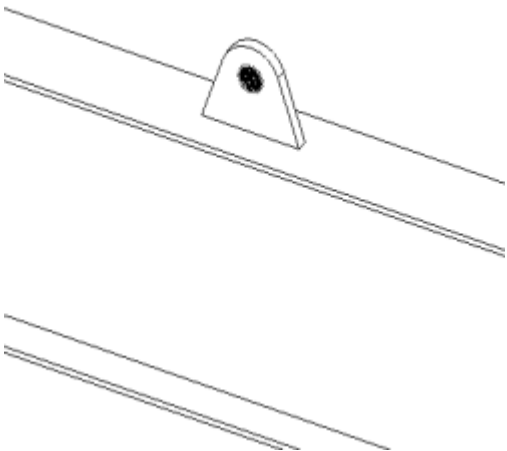
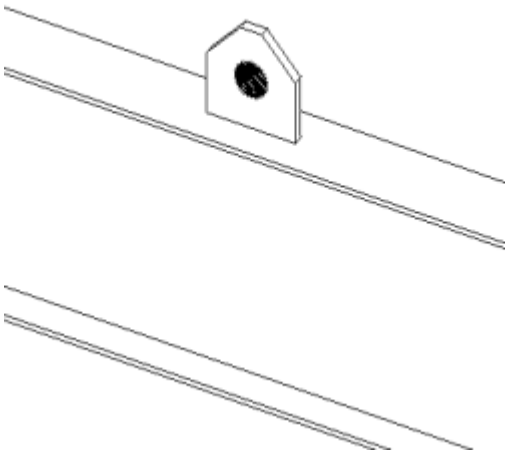
Example	Description
 A technical drawing showing a stiffener plate detail to a column. The plate is shown in a perspective view, attached to a vertical column. The plate has a flange that fits into a groove in the column's web.	Stiffener plate detail to column. Use <b>Stiffeners (1003)</b> .
 A technical drawing showing a stiffener plate detail to a beam. The plate is shown in a perspective view, attached to a horizontal beam. The plate has a flange that fits into a groove in the beam's web.	Stiffener plate detail to beam. Use <b>Stiffeners (1003)</b> .
 A technical drawing showing a partial depth stiffener plate detail to a beam. The plate is shown in a perspective view, attached to a horizontal beam. The plate is shorter than the full depth stiffener, with a flange that fits into a groove in the beam's web.	Partial depth stiffener plate detail to beam. Use <b>Stiffeners (1041)</b> .

Example	Description
 <p>The diagram shows a vertical column with a horizontal stiffener plate attached to its side. The stiffener plate is a flat rectangular plate that is partially attached to the column's flange, extending from the column's edge towards the center. The plate is shown in a perspective view, highlighting its depth and how it connects to the column's web.</p>	<p>Partial depth stiffener plate detail to column. Use <b>Stiffeners (1041)</b>.</p>
 <p>The diagram shows a horizontal beam with two parallel stiffener plates attached to its top and bottom flanges. The stiffener plates are rectangular and run parallel to the beam's length. They are shown in a perspective view, illustrating their placement relative to the beam's web and flanges.</p>	<p>Parallel stiffener plates. Use <b>Horizontal stiffener (1017)</b>.</p>
 <p>The diagram shows a horizontal beam with two flange stiffener plates attached to its top and bottom flanges. The stiffener plates are rectangular and are positioned such that they extend beyond the edge of the beam's flange. They are shown in a perspective view, illustrating their placement relative to the beam's web and flanges.</p>	<p>Flange stiffener plates. Use <b>Stiffeners (1030)</b>.</p>

Example	Description
	<p>Stiffened notch. Use <b>Stiffened notch (1006)</b>.</p>
	<p>Stiffened notch. Notch cut bevel to part. Use <b>Stiffened notch (1006)</b>.</p>

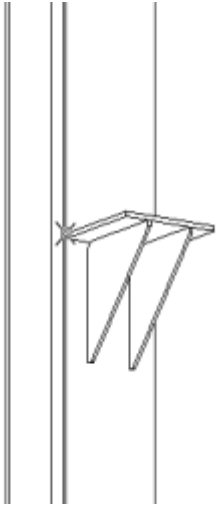
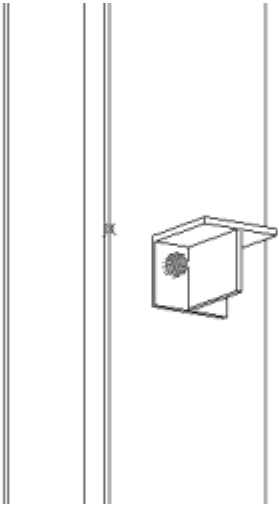
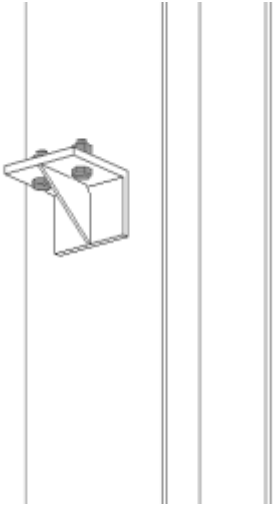
**Manlock holes and lifting lugs**

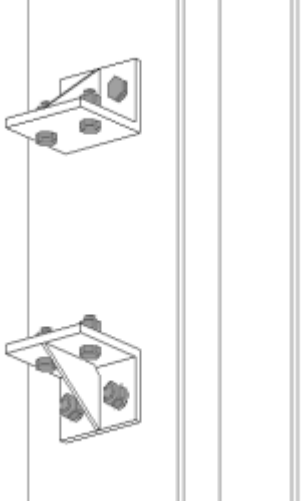
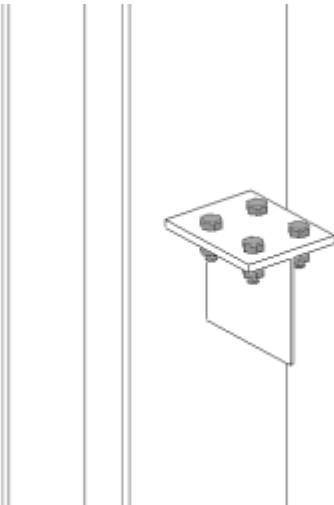
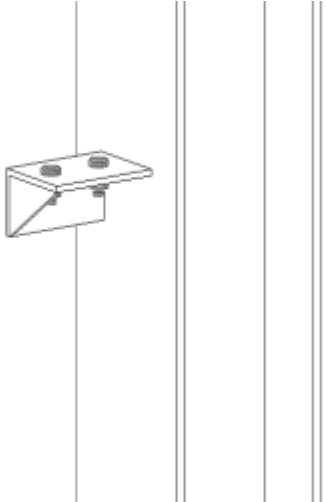
<b>Example</b>	
	Manlock holes in column. Use <b>Manlock column (1032)</b> .
	Manlock holes in beam. Use <b>Manlock beam (1033)</b> .

Example	
	<p>Lifting lug to beam. Use <b>Lifting/alignment pieces (1031)</b>.</p>
	<p>Lifting lug to beam chamfered plate. Use <b>Lifting/alignment pieces (1031)</b>.</p>

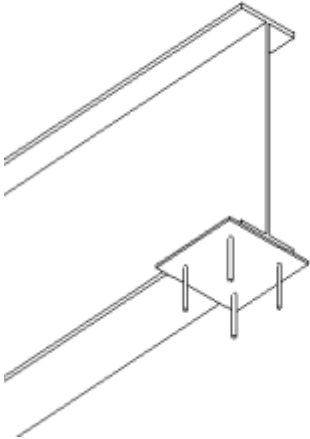
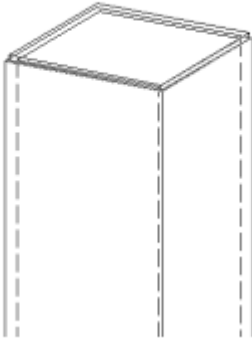


**Seat details**

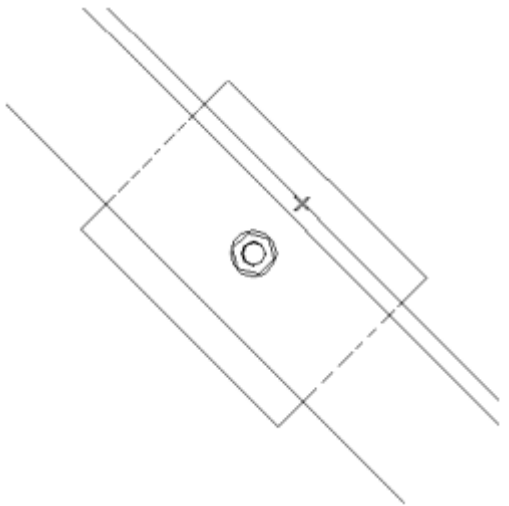
Example	Description
	<p>Plate seat with stiffeners. Use <b>Stub plate (1013)</b>.</p>
	<p>Angle seat with stiffener. Use <b>Angle profile box (1040)</b>.</p>
	<p>Angle seat with stiffener. Bolt to main part and through seat options. Use <b>U.S. seat detail (1048)</b>.</p>

Example	Description
	<p>Angle seat with stiffener. Bolt to main part placed at a given distance apart. Use <b>U.S. seat detail (1048)</b>.</p>
	<p>WT seat detail. Use <b>U.S. seat detail 2 (1049)</b>.</p>
	<p>Rotated angle seat. Stiffener plate option available. Use <b>U.S. seat detail 2 (1049)</b>.</p>

### Cap plate and bearing plate

Example	Description
	Bearing plate at end of beam. Use <b>U.S. bearing plate (1044)</b> .
	Cap plate. Use <b>End plate detail (1002)</b> .

**Miscellaneous**

<b>Example</b>	<b>Description</b>
 <p>The diagram shows two parallel steel profiles connected by a rectangular spacer plate. A bolt is shown passing through the center of the spacer plate and the two profiles. Dashed lines indicate the hidden edges of the profiles and the spacer plate. A small cross symbol is located on the top profile.</p>	<p>Spacer plate between twin profiles. Welded or bolted.</p> <p>Use <b>Twin profile connection plate (1046)</b>.</p>

# 3 Concrete components

This section contains information on the use of concrete components that ship with Tekla Structures.

If you know which component you need, you can press F1 in the component dialog box to quickly access the correct help page. Some components use locally installed help files in a legacy format, which you can only access by pressing F1 in the component dialog box.

More components are available in [Tekla Warehouse](#) for you to download and install.

You can also modify many of the existing components and create your own custom components, see .

## 3.1 Concrete detailing

This section introduces the concrete detailing tools available in Tekla Structures.

Click the links below to find out more:

- [Seating connections \(page 2766\)](#)
- [Beam and column connections \(page 2793\)](#)
- [Panels and walls \(page 2882\)](#)
- [Formwork placing tools \(page 3033\)](#)
- [Openings \(page 3142\)](#)
- [Flooring \(page 3154\)](#)
- [Concrete stairs \(page 3215\)](#)
- [Foundations \(page 3267\)](#)

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**NOTE** Precast components can only be applied to precast cast units. They cannot be applied to cast-in-place cast units.

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## Seating connections

Tekla Structures includes several seating connections that you can use to connect concrete columns and beams using anchor bolts. The seating connection tools are:

- [Seating with dowel \(75\) \(page 2766\)](#)
- [Two-sided seating with dowel \(76\) \(page 2773\)](#)
- [Seating with dowel to flange \(77\) \(page 2781\)](#)
- [Two-sided seating with dowel to flange \(78\) \(page 2787\)](#)

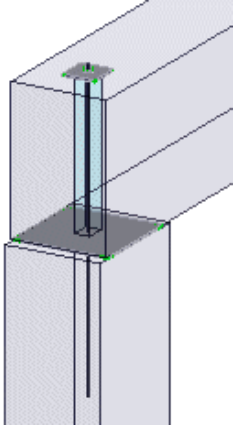
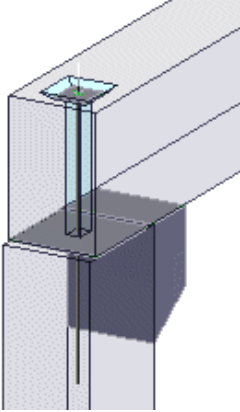
### ***Seating with dowel (75)***

**Seating with dowel (75)** connects a column and a beam using an anchor bolt.

#### **Parts created**

- Anchor bolt
- Nut
- Washer plate
- Bearing plate
- Fittings for beam and column
- Hole for bolt
- Corbel (optional)
- Recess for nut and washer plate (optional)

## Use for

Situation	Description
	Connects a beam and a column using an anchor bolt. Washer plate and nut protrude from the beam.
	Connects a beam and a column using an anchor bolt and a beveled corbel. Washer plate and nut recessed into the beam.

### Before you start

Create the following parts:

- Concrete column (round or rectangular profile)
- Concrete beam (rectangular, HI, I, L, or inverted T profile)

### Selection order

1. Select the main part (column).
2. Select the secondary part (beam).

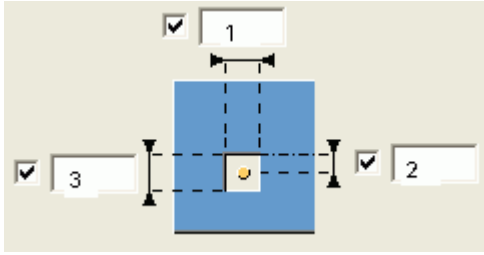
The connection is created automatically when the second part is selected.

### Picture tab

Use the **Picture** tab to define position of anchor bolt and bearing plate, bolt hole dimensions, grout type, and beam clearance.



### Bolt hole

Enter the following bolt hole dimensions:





	Description
1	Hole dimension in the direction of the beam.
2	The distance from beam center line to hole center and bolt.
3	Hole dimension in the direction perpendicular to the beam.

Select the shape of the bolt hole:

Option	Description
	Rectangular Default
	Round

### Beam and column



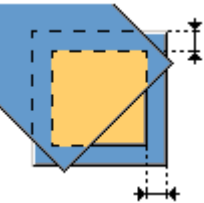
Select one of the following options to have Tekla Structures fit the column or the beam:

Option	Description
	Fits the column. Default
	Fits the beam. The beam must be sloped.



## Bearing plate

Select one of the following options to define the position of the bearing plate:

Option	Description
	Square with beam. Default
	Square with columnn.
	Square with columnn. Enter the distances from column edges.

## Dowel tab

Use the **Dowel** tab to define dowel and grout properties.




### Dowel

Option	Description
<b>Profile</b>	Select the dowel profile from the profile catalog.
<b>Prefix, Start number</b>	Prefix and start number for the part position number.
<b>Material</b>	Material grade. The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.
<b>Finish</b>	Describes how the part surface has been treated.
<b>Class</b>	Enter a number to group the parts that the component creates. By

Option	Description
	default, the class number affects the color in which the part is shown in model views.
<b>Size</b>	Diameter of the bars.
<b>Grade</b>	Strength of the steel used in the bars.
<b>Number of bars</b>	Select <b>1 Dowel</b> to create one reinforcing bar.  Select <b>2 Dowels</b> to create two reinforcing bars. Then define the distance between the bars in the <b>Bar distance</b> field.



### Grout

Select one of the following options to include and define grout:

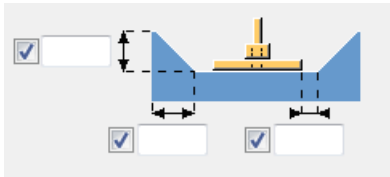
Option	Description
	No grout. Default
	Bolt hole grouted. No nut or washer plate.
	Bolt hole grouted. Bolt, washer plate, and anchor bolt protruding.

### Nut and washer plate

Select one of the following options to define if the nut and washer plate are recessed into the beam:

Option	Description
	Nut and washer plate on the surface of the beam. Default
	Nut and bolt plate recessed into the beam.

If you choose to recess the nut and washer plate into the beam, enter the following dimensions to define the recess:

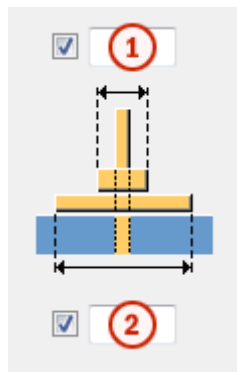


### Parts tab

Use the **Parts** tab to define bearing pad, drainage hole, grout, bolt plate, nut, and tube properties.

Option	Description
<b>t, b, h</b>	Define the part thickness, width and height.
<b>Pos_No</b>	Define a prefix and a start number for the part position number.
<b>Material</b>	Define the material grade.
<b>Name</b>	Define a name for the part.
<b>Class</b>	Use <b>Class</b> to group the parts.
<b>Cast unit</b>	Select to add the parts to the cast unit.

### Nut and bolt plate



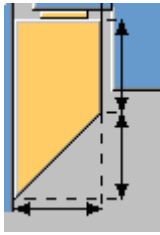
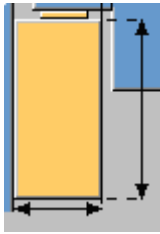
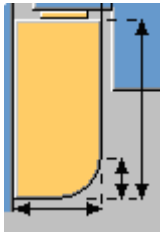
Field	Description
1	Nut width.
2	Bolt plate width.

### Corbel tab

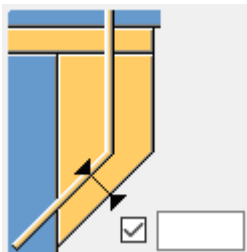
Use the **Corbel** tab to create a corbel and define its properties.

Select to create a corbel from the **Create corbel** list.

The options for chamfering corbels are:

Option	Description
	Beveled Default
	Straight
	Rounded

Define the placement of the corbel rebar.



Option	Description
<b>t, b, h</b>	Define the thickness, width, and height of the part.
<b>Pos_No</b>	Prefix and start number for the part position number.  The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description
<b>Name</b>	Name that is shown in drawings and reports.
<b>Class</b>	Part class number.

### General tab

Click the link below to find out more:

[General tab](#)

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

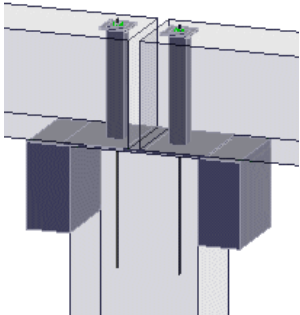
### ***Two-sided seating with dowel (76)***

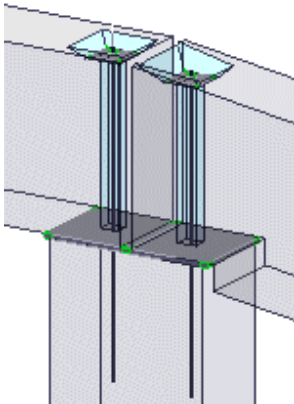
**Two-sided seating with dowel (76)** connects a column and two beams using anchor bolts.

### Parts created

- Anchor bolts (2)
- Nuts (2)
- Washer plates (2)
- Bearing plates (2)
- Fittings for beam and column (2)
- Holes for bolts (2)
- Corbels (optional) (2)
- Recesses for washer plate and nut (optional) (2)

### Use for

Option	Description
	<p>Connects two beams to a column using anchor bolts and creates corbels. Nuts and washer plates on the surface of the beams.</p>

Option	Description
	<p>Connects two beams to a column using anchor bolts. Nuts and washer plates recessed into the beams. Second beam is sloped, and is cut to create a gap between the beam and the column.</p>

### Before you start

Create the following parts:

- Concrete column (round or rectangular profile)
- Two concrete beams (rectangular, HI, I, L, or inverted T profile)

### Selection order

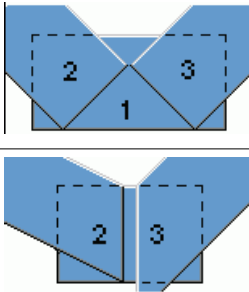
1. Select the main part (column).
2. Select the secondary part (beam).
3. Select the second secondary part (beam).
4. Click the middle mouse button to create the connection.

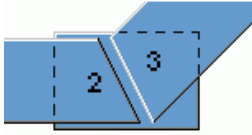
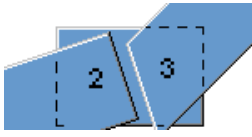
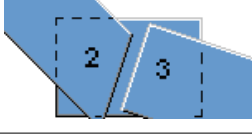
### Picture tab

Use the **Picture** tab to define dimensions and the position of the anchor bolts relative to the beams and bearing plates.

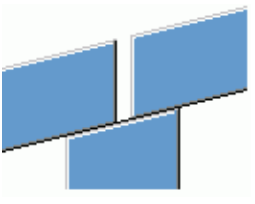
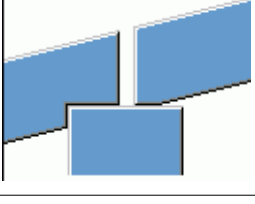
### Beam and column

Select one of the following options to define how the end of the beams are cut and shaped:

Key	Options
<p>1 = column 2 = first beam picked 3 = second beam picked</p>	

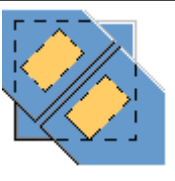

Key	Options
	
	
	

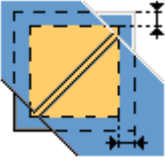
Select one of the following options to fit the beams or the column:

Option	Description
	Fits column. Default
	Fits beam.

### Bearing plate

Select one of the following options to define the position of the bearing plate:

Option	Description
	Square with beam. Default
	Square with column.

Option	Description
	<p>Square with column.</p> <p>Enter the distances from column edges.</p>

### Dowel tab

Use the **Dowel** tab to define dowel properties.

Option	Description
<b>Profile</b>	Select the dowel profile from the profile catalog.
<b>Prefix, Start number</b>	Prefix and start number for the part position number.
<b>Material</b>	Material grade. The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.
<b>Finish</b>	Describes how the part surface has been treated.
<b>Class</b>	Enter a number to group the parts that the component creates. By default, the class number affects the color in which the part is shown in model views.
<b>Size</b>	Diameter of the bars.
<b>Grade</b>	Strength of the steel used in the bars.
<b>Number of bars</b>	<p>Select <b>1 Dowel</b> to create one reinforcing bar.</p> <p>Select <b>2 Dowels</b> to create two reinforcing bars. Then define the distance between the bars in the <b>Bar distance</b> field.</p>

### Parts tab

Use the **Parts** tab to define bearing pad, drainage hole, grout, bolt plate, nut, and tube properties.



Option	Description
<b>t, b, h</b>	Define the part thickness, width and height.
<b>Pos_No</b>	Define a prefix and a start number for the part position number.
<b>Material</b>	Define the material grade.
<b>Name</b>	Define a name for the part.
<b>Class</b>	Use <b>Class</b> to group the parts.

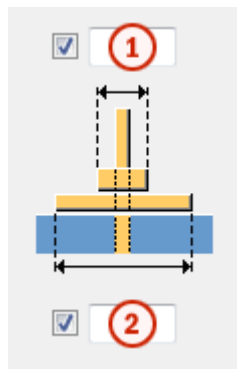
### Left beam/Right beam tab

Use the **Left beam/Right beam** tab to define anchor bolt, bolt hole and recess properties.

Left beam is the first beam selected and right is the second.

You can create a clearance between beam and column if beam is sloped.

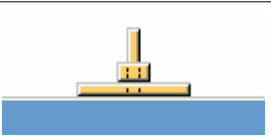
### Nut and bolt plate




Field	Description
1	Nut width.
2	Bolt plate width.

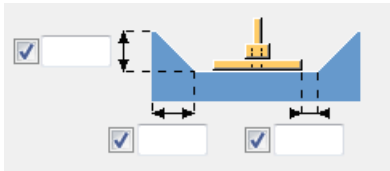
### Nut and washer plate

Select one of the following options to define if the nut and washer plate are recessed into the beam:

Option	Description
	Nut and washer plate on the surface of the beam. Default




Option	Description
	Nut and bolt plate recessed into the beam.

If you choose to recess the nut and washer plate into the beam, enter the following dimensions to define the recess:



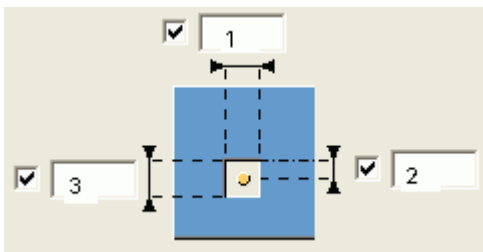
### Grout

Select one of the following options to include and define grout:

Option	Description
	No grout. Default
	Bolt hole grouted. No nut or washer plate.
	Bolt hole grouted. Bolt, washer plate, and anchor bolt protruding.

### Bolt hole


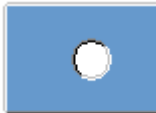
Enter the following bolt hole dimensions:



Field	Description
1	Hole dimension in the direction of the beam.



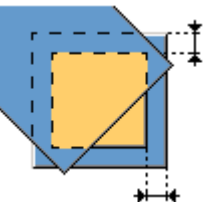
Field	Description
2	The distance from beam center line to hole center and bolt.
3	Hole dimension in the direction perpendicular to the beam.

Select the shape of the bolt hole:

Option	Description
	Rectangular Default
	Round

### Bearing plate

Select one of the following options to define the position of the bearing plate:

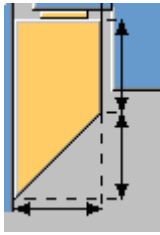
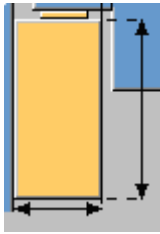
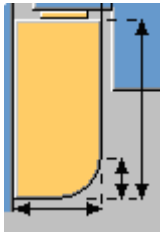
Option	Description
	Square with beam. Default
	Square with column.
	Square with column. Enter the distances from column edges.

### Left corbel/Right corbel tab

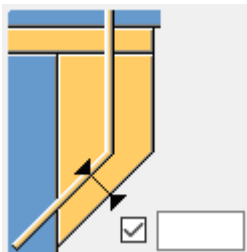
Use the **Left corbel/Right corbel** tab to create a corbel and define its properties.

Select to create a corbel from the **Create corbel** list.

The options for chamfering corbels are:

Option	Description
	Beveled Default
	Straight
	Rounded

Define the placement of the corbel rebar.



Option	Description
<b>t, b, h</b>	Define the thickness, width, and height of the part.
<b>Pos_No</b>	Prefix and start number for the part position number.  The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description
<b>Name</b>	Name that is shown in drawings and reports.
<b>Class</b>	Part class number.

### **General tab**

Click the link below to find out more:

General tab

### **Analysis tab**

Click the link below to find out more:

Analysis tab

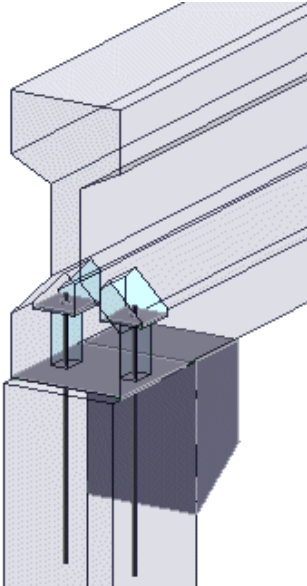
### ***Seating with dowel to flange (77)***

**Seating with dowel to flange (77)** connects the flanges of a beam to a column using anchor bolts and an optional corbel.

### **Parts created**

- Anchor bolts (2)
- Nuts (2)
- Washer plates (2)
- Bearing plate (1)
- Fittings for beam and column
- Holes for bolts (2)
- Corbel (optional)
- Recess for nut and washer plates

## Use for

Situation	More information
	Connects the flanges of a beam to a column using anchor bolts and a beveled corbel. Nuts and washer plates recessed.

### Before you start

Create the following parts:

- Concrete column (Round or rectangular profile)
- Concrete beam with flange (rectangular, HI, I, L, or inverted T profile)

### Selection order

1. Select the main part (column).
2. Select the secondary part (beam).

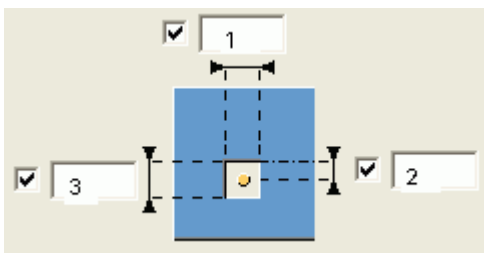
The connection is created automatically when the second part is selected.

### Picture tab

Use the **Picture** tab to define position and length of anchor bolt, and bolt hole dimensions and position.



### Bolt hole

Enter the following bolt hole dimensions:



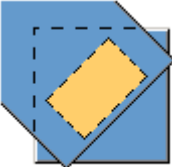

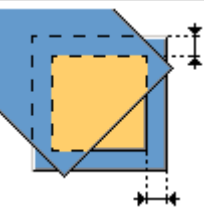
	Description
1	Hole dimension in the direction of the beam.
2	The distance from beam center line to hole center and bolt.
3	Hole dimension in the direction perpendicular to the beam.

Select the shape of the bolt hole:

Option	Description
	Rectangular Default
	Round

### Bearing plate

Select one of the following options to define the position of the bearing plate:

Option	Description
	Square with beam. Default
	Square with column.
	Square with column. Enter the distances from column edges.

### Dowel tab

Use the **Dowel** tab to define dowel properties.

Select to create the dowel as a reinforcement bar, poly-profile, or custom component part from the **Type** list.

<b>Option</b>	<b>Description</b>
<b>Profile</b>	Select the dowel profile from the profile catalog.
<b>Prefix, Start number</b>	Prefix and start number for the part position number.
<b>Material</b>	Material grade. The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.
<b>Finish</b>	Describes how the part surface has been treated.
<b>Class</b>	Enter a number to group the parts that the component creates. By default, the class number affects the color in which the part is shown in model views.
<b>Size</b>	Diameter of the bars.
<b>Grade</b>	Strength of the steel used in the bars.

#### **Parts tab**

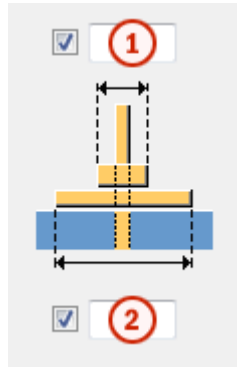
Use the **Parts** tab to define bearing pad, drainage hole, bolt plate, nut and recess properties.

#### **Part properties**

<b>Option</b>	<b>Description</b>
<b>t, b, h</b>	Define the part thickness, width and height.
<b>Pos_No</b>	Define a prefix and a start number for the part position number.
<b>Material</b>	Define the material grade.
<b>Name</b>	Define a name for the part.
<b>Class</b>	Use <b>Class</b> to group the parts.



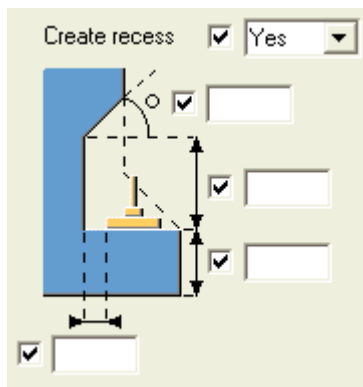
## Nut and bolt plate



Field	Description
1	Nut width.
2	Bolt plate width.

## Recess

To cut a recess in the beam web, select the **Yes** option in the **Create recess** list. Enter the following dimensions to define the recess:

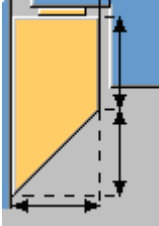
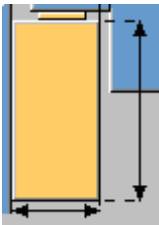
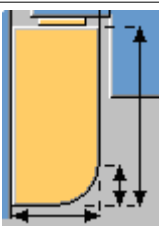


## Corbel tab

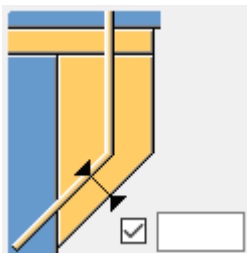
Use the **Corbel** tab to create a corbel and define its properties.

Select to create a corbel from the **Create corbel** list.

The options for chamfering corbels are:

Option	Description
	Beveled Default
	Straight
	Rounded

Define the placement of the corbel rebar.



Option	Description
<b>t, b, h</b>	Define the thickness, width, and height of the part.
<b>Pos_No</b>	Prefix and start number for the part position number.  The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.
<b>Class</b>	Part class number.

### General tab

Click the link below to find out more:

General tab

### Analysis tab

Click the link below to find out more:

Analysis tab

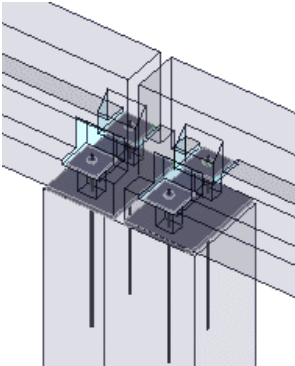
### ***Two-sided seating with dowel to flange (78)***

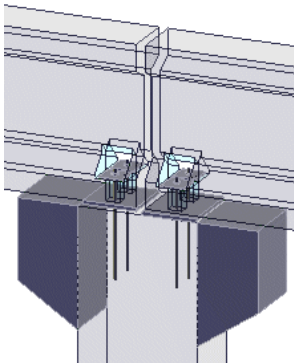
**Two-sided seating with dowel to flange (78)** connects the flanges of two beams to a column using anchor bolts and optional corbels.

### Parts created

- Anchor bolts (4)
- Nuts (4)
- Washer plates (4)
- Bearing plate (2)
- Fittings for beam and column
- Holes for bolts (4)
- Corbels (2) optional
- Recesses for nut and washer plate (4)

### Use for

Situation	Description
	Connects the flanges of two beams to a column using anchor bolts.

Situation	Description
	<p>Connects the flanges of two beams to a column using anchor bolts and beveled corbels.</p>

### Before you start

Create the following parts:

- Concrete column (Round or rectangular profile)
- Concrete beam with flange (rectangular, HI, I, L, or inverted T profile)

### Selection order

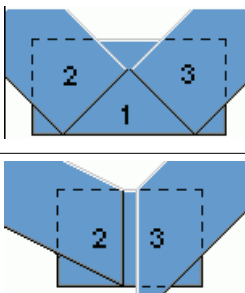
1. Select the main part (column).
2. Select the secondary part (beam).
3. Select the second secondary part (beam).
4. Click the middle mouse button to create the connection.

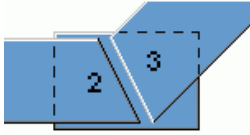
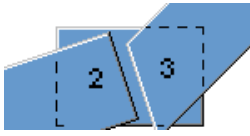
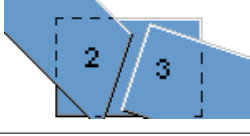
### Picture tab

Use the **Picture** tab to define dimensions and the position of the anchor bolts relative to the beam and bearing plate, length of anchor bolts, and beam ends.

### Beam and column



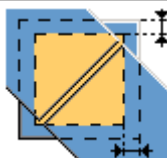
Select one of the following options to define how the end of the beams are cut and shaped:

Key	Options
<p>1 = column 2 = first beam picked 3 = second beam picked</p>	

Key	Options
	
	
	

### Bearing plate

Select one of the following options to define the position of the bearing plate:

Option	Description
	Square with beam. Default
	Square with column.
	Square with column. Enter the distances from column edges.

### Dowel tab

Use the **Dowel** tab to define dowel properties.

Select to create the dowel as a reinforcement bar, poly-profile, or custom component part from the **Type** list.

Option	Description
<b>Profile</b>	Select the dowel profile from the profile catalog.
<b>Prefix, Start number</b>	Prefix and start number for the part position number.

Option	Description
<b>Material</b>	Material grade. The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.
<b>Finish</b>	Describes how the part surface has been treated.
<b>Class</b>	Enter a number to group the parts that the component creates. By default, the class number affects the color in which the part is shown in model views.
<b>Size</b>	Diameter of the bars.
<b>Grade</b>	Strength of the steel used in the bars.

#### Parts tab

Use the **Parts** tab to define bearing pad, drainage hole, bolt plate, and nut properties.

Option	Description
<b>t, b, h</b>	Define the part thickness, width and height.
<b>Pos_No</b>	Define a prefix and a start number for the part position number.
<b>Material</b>	Define the material grade.
<b>Name</b>	Define a name for the part.
<b>Class</b>	Use <b>Class</b> to group the parts.

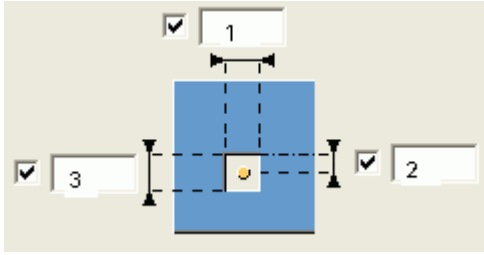
#### Left beam/Right beam tab

Use the **Left beam/Right beam** tab to define anchor bolt, bolt hole and recess properties.

Left beam is the first beam picked and right is the second.



#### Bolt hole

Enter the following bolt hole dimensions:

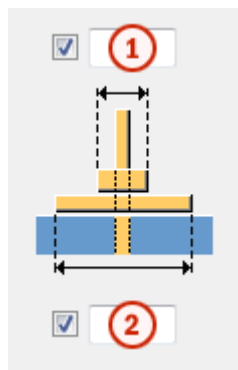


Field	Description
1	Hole dimension in the direction of the beam.
2	The distance from beam center line to hole center and bolt.
3	Hole dimension in the direction perpendicular to the beam.

Select the shape of the bolt hole:

Option	Description
	Rectangular Default
	Round

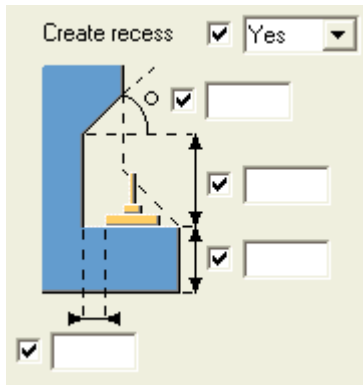
### Nut and bolt plate



Field	Description
1	Nut width.
2	Bolt plate width.

## Recess

To cut a recess in the beam web, select the **Yes** option in the **Create recess** list. Enter the following dimensions to define the recess:

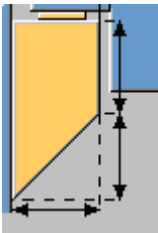
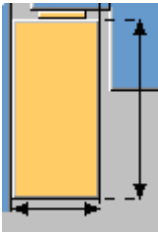
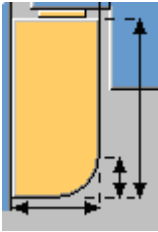


## Left corbel/Right corbel tab

Use the **Left corbel/Right corbel** tab to create a corbel and define its properties.

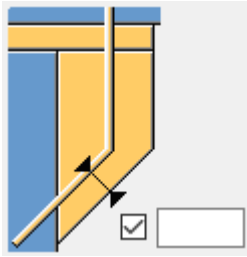
Select to create a corbel from the **Create corbel** list.

The options for chamfering corbels are:

Option	Description
	Beveled Default
	Straight
	Rounded

Define the placement of the corbel rebar.





Option	Description
<b>t, b, h</b>	Define the thickness, width, and height of the part.
<b>Pos_No</b>	Prefix and start number for the part position number.  The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.
<b>Class</b>	Part class number.

### General tab

Click the link below to find out more:

[General tab](#)

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

## Beam and column connections

This section introduces components that can be used in concrete connections.

Click the links below to find out more:

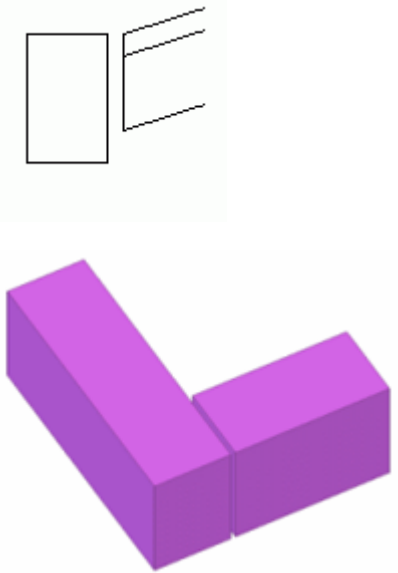
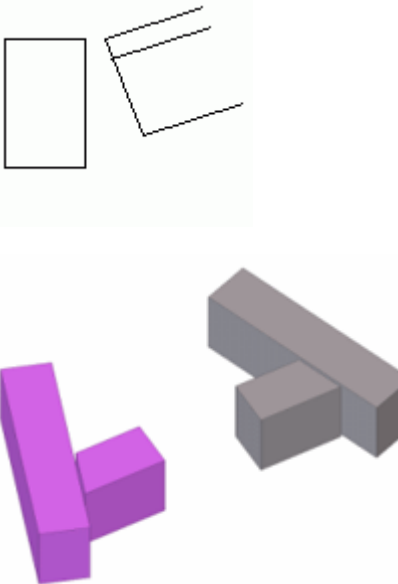
- [Battering connection \(13\) \(page 2794\)](#)
- [Corbel connection \(14\) \(page 2795\)](#)
- [Column - beam \(14\) \(page 2807\)](#)
- [Tapered I beam \(81\) \(page 2813\)](#)
- [Corbels and recesses \(82\) \(page 2821\)](#)

- [Concrete console \(110\) \(page 2827\)](#)
- [Concrete console \(111\) \(page 2841\)](#)
- [Concrete beam-beam \(112\) \(page 2851\)](#)

***Battering connection (13)***

**Battering connection (13)** fits the secondary part, for example, in a custom component either square to the main part, or at an angle.

**Use for**

Situation	Description
	<p>Secondary is fit square to the main part.</p>
	<p>Secondary is fit to the main part at an angle.</p>

### Before you start

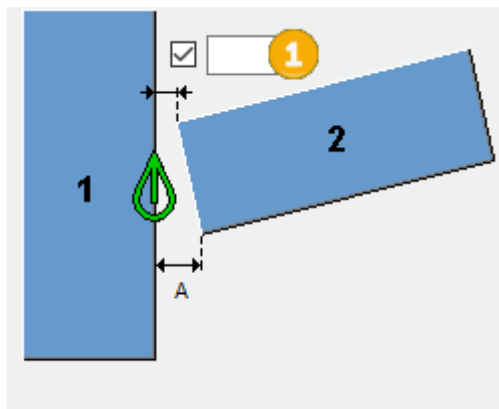
Create two parts.

### Selection order

1. Select the main part
2. Select the secondary part.

### Picture tab

Use the **Picture** tab to define the angle and the distance between the parts.



	Description
1	Define the angle between the parts. If the part angle makes the gap larger than the value <b>A</b> , then the part is cut at the end.

### General tab

Click the link below to find out more:

[General tab](#)

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

### **Corbel connection (14)**

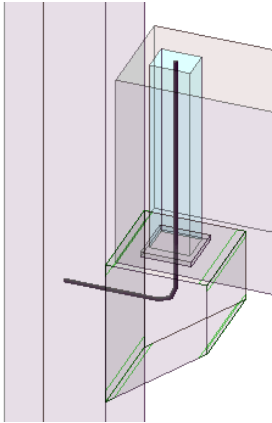
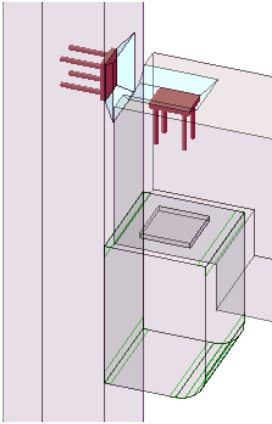
**Corbel connection (14)** connects a beam to a column using a straight, beveled, or rounded corbel and reinforcing bars or fastening plates.

### Objects created

- Corbel

- Bearing plate
- Drainage holes in bearing plate (1 or 2) (optional)
- Reinforcing bars (1 or 2) (optional)
  - Bolt plates for reinforcing bars
  - Nuts for reinforcing bars
  - Recesses for bolt plates and nuts
- Fastening plates (2) (optional)
  - Recesses for fastening plates

**Use for**

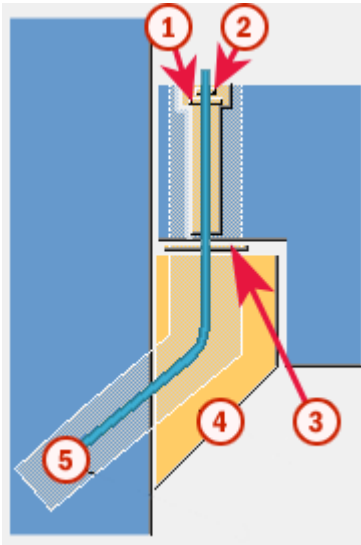
Situation	Description
	<p>Connects a beam to a column using a reinforcing bar and a beveled corbel.</p>
	<p>Connects a beam to a column using fastening plates and a rounded corbel.</p>

**Selection order**

1. Select the main part (column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.


## Part identification key



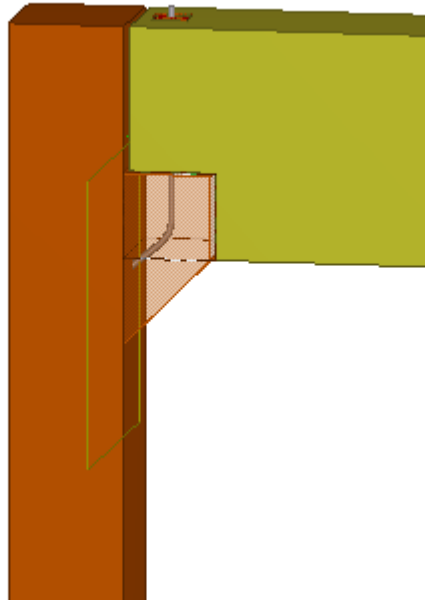
	Part
1	Bolt plate
2	Nut
3	Bearing plate
4	Corbel
5	Reinforcing bar

### Example: Add a corbel connection using Corbel connection (14)

In this example, you will add a corbel connection between a column and a beam.

1. Click the **Applications & components** button  in the side pane to open the **Applications & components** catalog.
2. Enter `corbel` in the search box.
3. Select **Corbel connection (14)**.
4. Select the main part (column).
5. Select the secondary part (beam).

Tekla Structures automatically adds the corbel connection between the column and the beam when you select the beam.



#### Picture tab

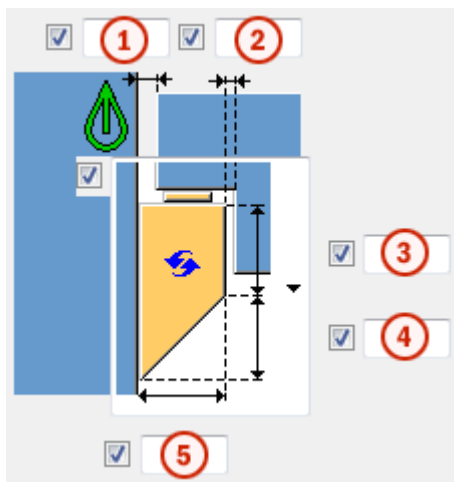
Use the **Picture** tab to control the corbel shape and dimensions, beam end shape and dimensions, and corbel side chamfers in **Corbel connection (14)**.

#### When beam sloped, adjust

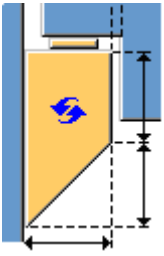
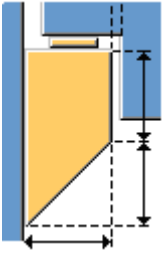
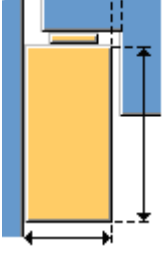
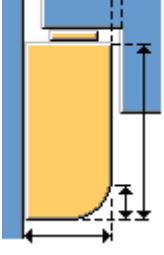
If the beam in the connection is sloped, define whether the beam or the corbel is cut.

When the beam end is cut, the corbel top stays horizontal. When the corbel is cut, the corbel top has the same slope as the beam.

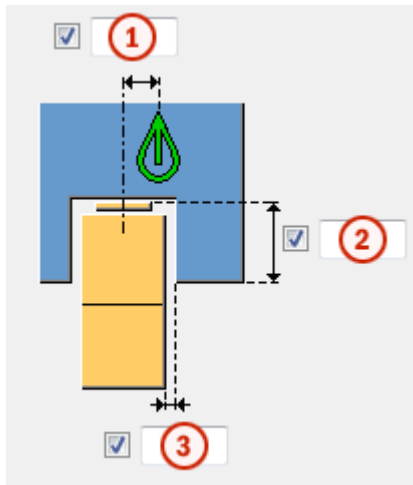
#### Corbel dimensions and shape



	Description
1	Gap between the column and the beam.
2	Gap between the corbel and the beam.
3	Vertical corbel dimension.
4	Beveled corbel dimension.
5	Corbel width.

Option	Description
	Default Beveled corbel AutoDefaults can change this option.
	Beveled corbel
	Square corbel
	Rounded corbel

## Corbel position



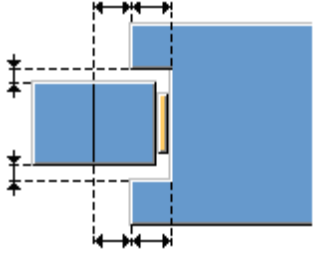
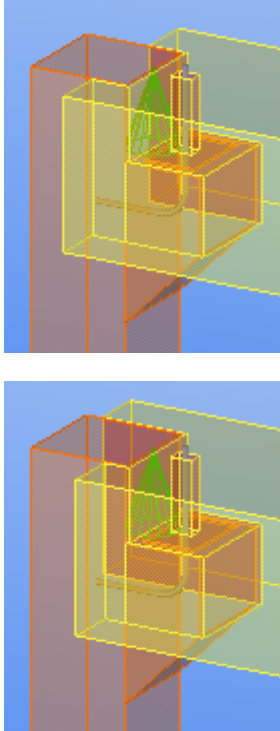
	Description
1	Horizontal corbel offset.
2	Height of the beam cut.
3	Gap between the corbel and extended beam.

## Beam end shape

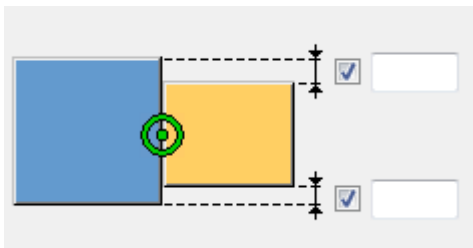
You can fit the beam end to the column, or you can create a straight beam end.

Option	Description	Example
	Default Straight beam end AutoDefaults can change this option.	
	Straight beam end	



Option	Description	Example
	<p>Beam end is fit to the column based on the dimensions you define.</p> <p>Beam can extend symmetrically on both sides of the column, or with different dimensions.</p>	

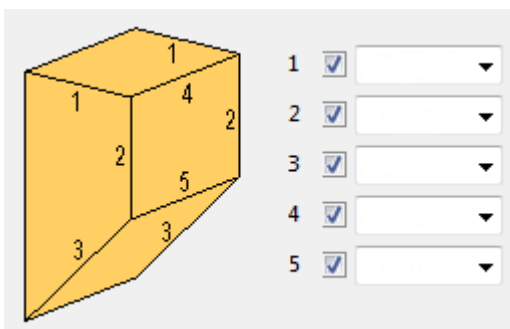
### Corbel thickness



Define the distances from column edges to set the corbel thickness.

### Corbel side chamfers

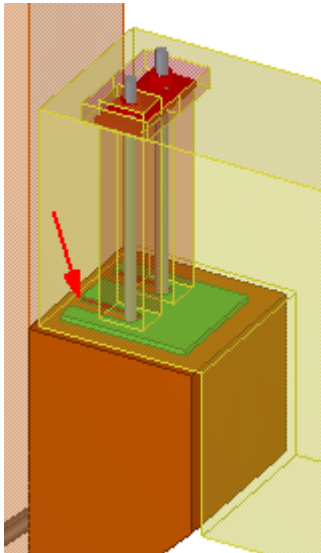
Define whether the corbel sides are chamfered. By default, no chamfers are created.



### Parts tab

Use the **Parts** tab to control the corbel part properties and dimensions in **Corbel connection (14)**.

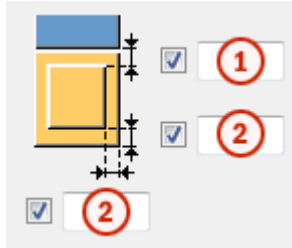
### Corbel parts

Part	Description
<b>Bearing plate</b>	Bearing plate thickness.
<b>Cast unit</b>	Select whether cast unit is formed.
<b>Drainage hole</b>	Select whether drainage holes for each reinforcing bar are created in the bearing plate. 
<b>Bolt plate</b>	Bolt plate thickness.
<b>Nut</b>	Nut thickness.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the <b>Components</b> tab in the <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box on the <b>Components</b> tab in <b>File</b>

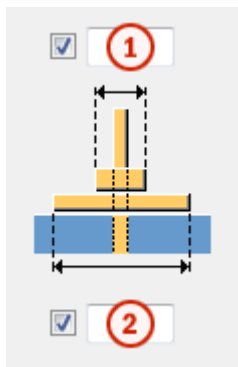
Option	Description	Default
		menu --> Settings --> Options.
<b>Name</b>	Name that is shown in drawings and reports.	

### Bearing plate dimensions



	Description
1	Bearing plate distance from the column edge.
2	Bearing plate distance from the corbel edges.

### Nut and bolt plate dimensions



	Description
1	Nut width.
2	Bolt plate width.

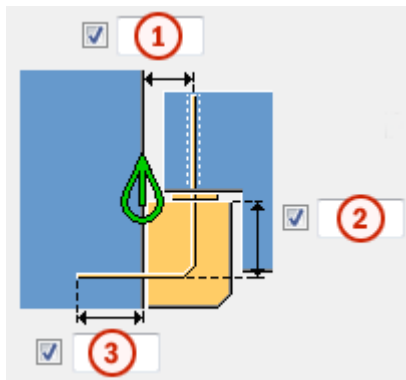
### Reinforcing bar tab

Use the **Reinforcing bar** tab to control the reinforcing bar and fastening plate properties, and the bolt plate and fastening plate recesses in **Corbel connection (14)**.

## Reinforcing bar properties

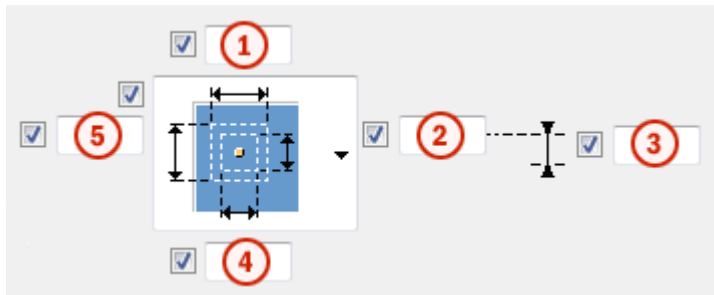
Option	Description
<b>Grade</b>	Strength of the steel used in the reinforcing bars.
<b>Size</b>	Diameter of the reinforcing bar.
<b>Bending radius</b>	Internal radius of the bends in the bar.
<b>Name</b>	Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use <b>Class</b> to group reinforcements. For example, you can display different reinforcement classes in different colors.
<b>Number of bars</b>	Select <b>1 Dowel</b> to create one reinforcing bar. Select <b>2 Dowels</b> to create two reinforcing bars. Then define the distance between the bars in the <b>Bar distance</b> field.

## Reinforcing bar length



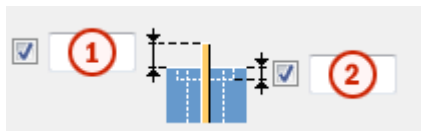
	Description
<b>1</b>	Distance between reinforcing bar center line and the column edge.
<b>2</b>	Vertical length of the reinforcing bar inside the corbel.
<b>3</b>	Length of the reinforcing bar inside the column.

## Recess for bolt plate and nut



	Description
1	Size of the bolt plate recess in the x direction.
5	Size of the bolt plate recess in the y direction.
2	Size of the nut recess in the y direction.
4	Size of the nut recess in the x direction.
3	Reinforcing bar offset.

## Reinforcing bar extra length





	Description
1	Extra length of the reinforcing bar.
2	Length of the reinforcing bar inside the recess.

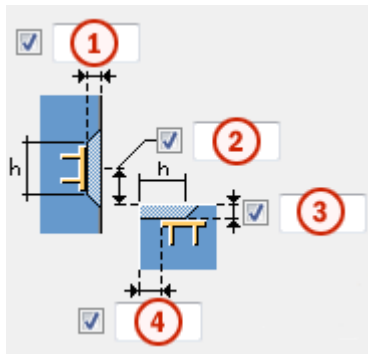
## Connecting devices

Define the connecting devices that connect the beam and the column.

Option	Description
	<p>Default</p> <p>One or two reinforcing bars bent to the same angle as the corbel bevel</p> <p>Available for bevel corbels.</p> <p>AutoDefaults can change this option.</p>
	<p>One or two reinforcing bars bent to the same angle as the corbel bevel</p> <p>Available for bevel corbels.</p>

Option	Description
	One or two reinforcing bars Default for straight and rounded corbels.
	Two fastening plates Use custom components as fastening plates.

### Recess for fastening plate



	Description
1	Depth of column recess.
2	Depth of beam recess.
3	Offset of column recess.
4	Offset of beam recess.
<b>Column recess</b>	Height and width of column and beam recess.
<b>Beam recess</b>	

### Using custom components as fastening plates

You can use custom components as fastening plates. Use the **Column component** and **Beam component** sections to define the fastening plates in the column and beam.

1. Select the following option in the **Connecting devices** list:



- In the **Custom** list, select **Yes**.

The image shows two side-by-side configuration panels. The left panel is titled 'Column component' and the right panel is titled 'Beam component'. Both panels have the same layout of settings:

- Custom:** A checked checkbox followed by a dropdown menu showing 'Yes'.
- Component:** A checked checkbox followed by a text field containing 'fastening\_pl1' and a three-dot menu button.
- Custom settings:** A checked checkbox followed by an empty text field and a three-dot menu button.
- Up direction:** A checked checkbox followed by a dropdown menu showing 'Auto'.
- Rotation:** A checked checkbox followed by a dropdown menu showing 'Front' and a three-dot menu button.

- Click the ... button next to the **Component** field to open the **Select component** dialog box.
- Browse for the custom component you want to use as fastening plate. The component you select must be a custom part and have two or more input points.
- Select the component and click **OK**.
- To use saved custom component properties, select the saved properties file in **Custom settings**.
- If the direction or rotation of the fastening plate is not correct, select another option in the **Up direction** or **Rotation** list.

### General tab

Click the link below to find out more:

General tab

### Analysis tab

Click the link below to find out more:

Analysis tab

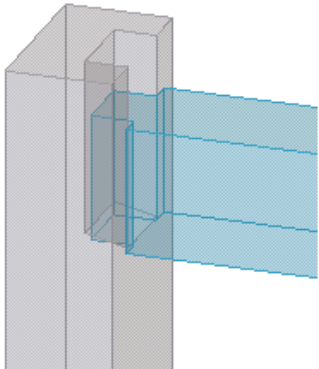
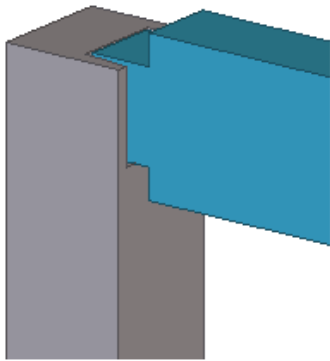
### **Column - beam (14)**

**Column - beam (14)** creates a connection between a concrete column and a concrete beam or wall/panel. The orientation of the beam can be horizontal or sloped. Note that the connection works only with precast parts.

### Objects created

- Cuts
- Fittings

**Use for**

Option	Description
	Beam end rests on the column.
	Beam end rests on the column.

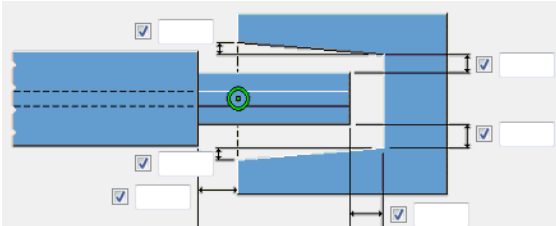
**Selection order**

1. Select the main part (column).
2. Select the secondary part (beam/wall/panel).

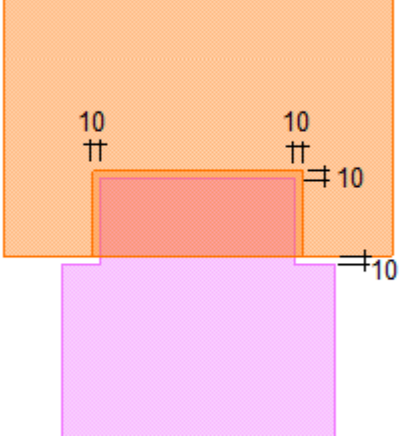
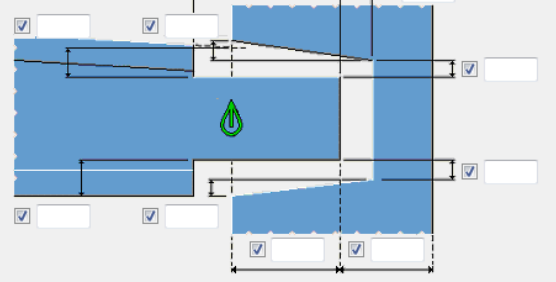
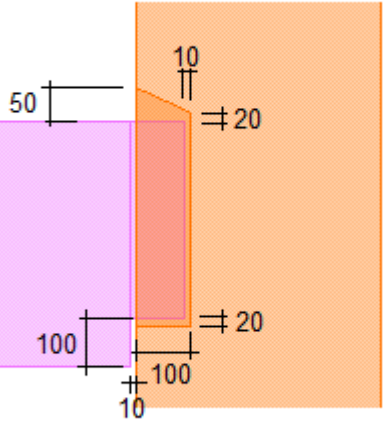
**Picture tab**

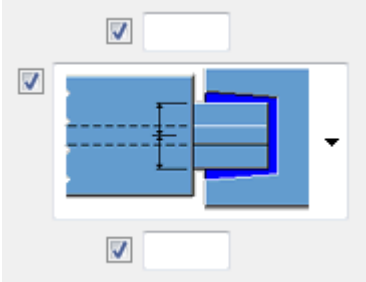
Use the **Picture** tab to define cut-out shapes and cut-out dimensions of the column and the beam.

**Cut-out dimensions**

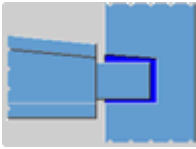
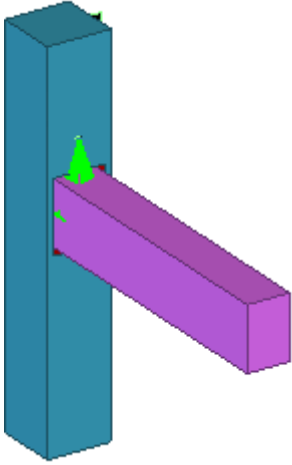

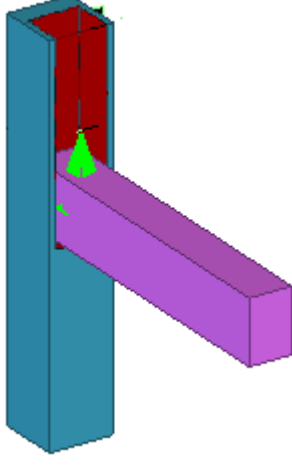
Option	Description
	<p>Cut-outs of the main part and the secondary part in the horizontal direction.</p> <p>The space between the column and the beam can be defined at both sides. For tapered openings</p>

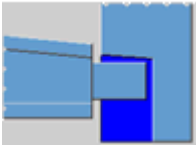
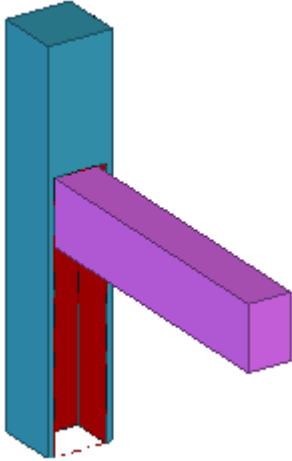
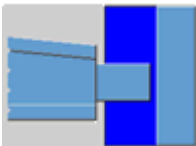
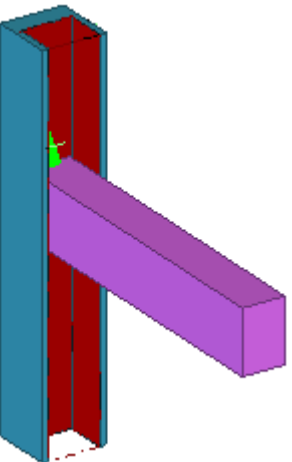
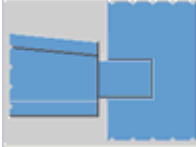


Option	Description
	<p>you can define how much the opening is reduced.</p> <p>Example:</p> 
	<p>Cut-outs of the main part and the secondary part in the vertical direction.</p> <p>The space between the column and the beam can be defined at both sides. For tapered openings you can define how much the opening is reduced.</p> <p>Example:</p> 

Option	Description
	<p>Select the how the opening is reduced.</p> <p>The options are:</p> <ul style="list-style-type: none"> <li>• From beam centerline</li> <li>• From beam edges</li> </ul>

### Cut-out shape

Option	Description
	<p>Cut around the secondary part</p> 
	<p>Cut-out to the top of the column</p> 

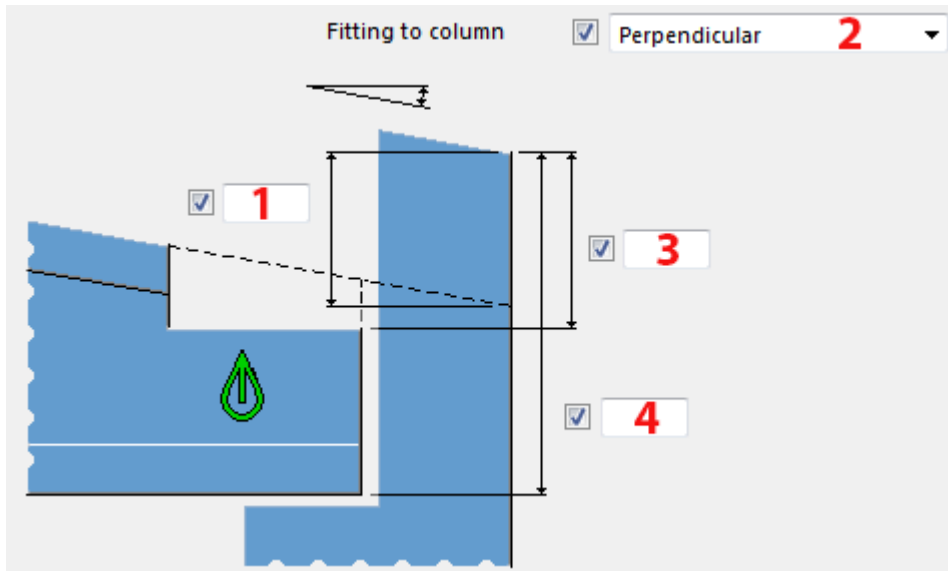
Option	Description
	<p>Cut-out to the bottom of the column</p> 
	<p>Full vertical cut-out</p> 
	<p>No cut-out</p>

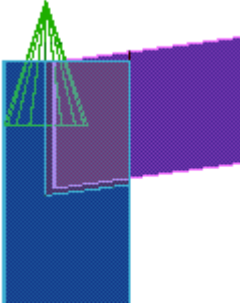
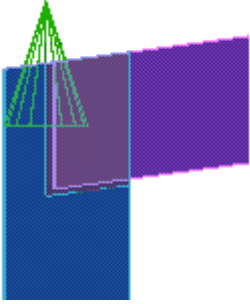
**Column tab**

Use the **Column** tab to define how the top of the column is modified.

**Column extension**

Define the column extension. If you do not enter any values, the column is extended to its original top level.



	Description
1	Column extension in the vertical direction from the beam top. This dimension has the highest priority among the three dimensions (1, 3, 4) for defining the column extension.
2	Select whether the top of the column is perpendicular or parallel to the beam. <b>Perpendicular:</b>  <b>Parallel with top of beam:</b> 
3	Column extension in the vertical direction.

	Description
4	Column extension in the vertical direction from the beam bottom.

### General tab

Click the link below to find out more:

General tab

### Analysis tab

Click the link below to find out more:

Analysis tab

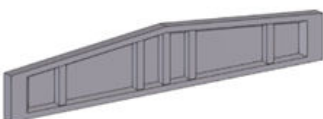


### ***Tapered I beam (81)***

**Tapered I beam (81)** creates beams with multiple types of cross-sections and height variations. Cross-section types include I, T, inverted T, and rectangular. The beam height can be tapered, tapered ridge, or constant. The component can also be used to create columns.

### Objects created

- Beam, one part or multiple parts
- Stiffeners
- End blocks

### Use for

Example	Example	Example
		

### Before you start

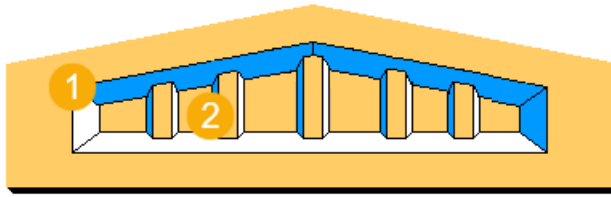
Ensure that you have two points to pick.

### Selection order

1. Pick the beam start point.
2. Pick the beam end point.

The beam is created automatically when you pick the end point.

## Part identification key



	Description
1	Tapered beam
2	Stiffener

## Parameters tab

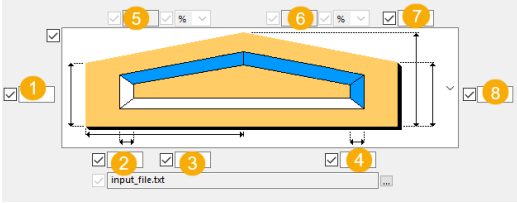
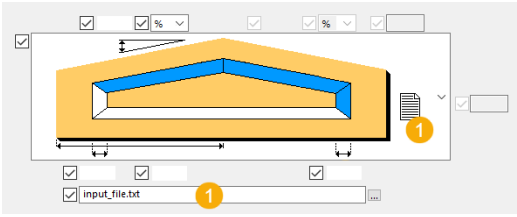
Use the **Parameters** tab to define the beam type and the dimensions.

### Beam type

Option	Description
	Select the beam shape type.
	<p>Select whether the beam is created as one part or as separate parts. The available options depend on the beam shape type you have selected.</p> <p>The magenta color indicates the main part of the cast unit and the cyan color indicates the secondary part.</p>

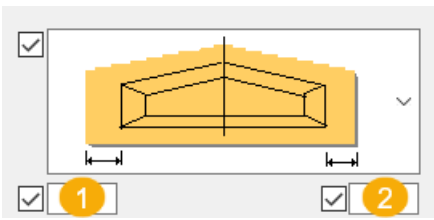
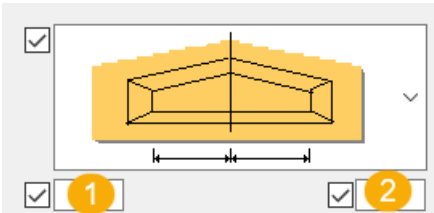
### Beam dimensions

The available dimensions depend on the option you select. The example images below show the dimensions you can define.

Option	Description
	<p><b>1</b> Height of the beam on the start point side</p> <p><b>2</b> Width of the chamfer on the start point side</p> <p><b>3</b> Location of the ridge. If left empty, the ridge is in the middle.</p> <p><b>4</b> Width of the chamfer on the end point side</p> <p><b>5</b> Angle of the start point edge of the beam, either as percentage or in degrees</p> <p><b>6</b> Angle of the end point edge of the beam, either as a percentage or in degrees</p> <p><b>7</b> Dimension of the beam from the bottom to the highest edge</p> <p><b>8</b> Height of the beam on the end point side</p>
	<p><b>1</b> You can use an external configuration file for defining the dimensions. Define the path to the external file.</p>

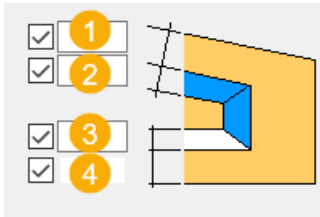
### End block dimensions

You can define the end block dimensions with certain beam shape types.

Option	Description
	<p><b>1</b> Length of the start point end block</p> <p><b>2</b> Length of the end point end block</p>
	<p><b>1</b> Dimension between the start point end block and the middle of the beam</p> <p><b>2</b> Dimension between the end point end block and the middle of the beam</p>

Option	Description
<b>Position h middle</b>	Select the middle height position: <ul style="list-style-type: none"> <li>The height is in the middle of the picked points. Offsets are not taken into account.</li> <li>The height is in the middle of the actual beam, including the offsets.</li> </ul>

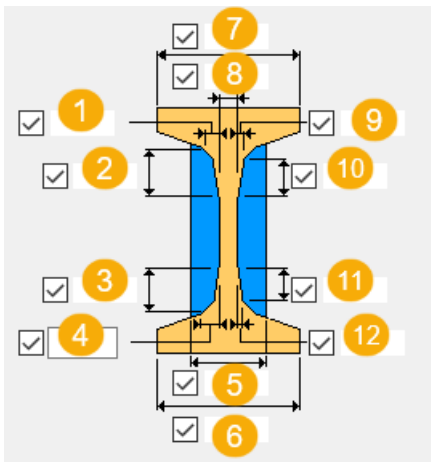
### Flange and chamfer dimensions



	Description
<b>1</b>	Height of the top flange
<b>2</b>	Height of the top chamfer
<b>3</b>	Height of the bottom chamfer
<b>4</b>	Height of the bottom flange

### Profile cross section dimensions

The available dimension options depend on the selected beam shape type.



	Description
<b>1</b>	Width of the first top chamfer
<b>2</b>	Height of the first top chamfer
<b>3</b>	Height of the first bottom chamfer



	<b>Description</b>
<b>4</b>	Width of the first bottom chamfer
<b>5</b>	Width of the end detail
<b>6</b>	Width of the bottom flange
<b>7</b>	Width of the top flange
<b>8</b>	Width of the web
<b>9</b>	Width of the second top chamfer
<b>10</b>	Height of the second top chamfer
<b>11</b>	Height of the second bottom chamfer
<b>12</b>	Width of the second bottom chamfer

### **Properties tab**

Use the **Properties** tab to define the part properties. These settings affect all parts created by the component: beam parts, stiffeners, and end detail parts.

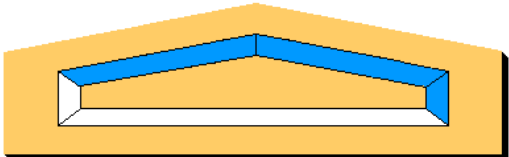
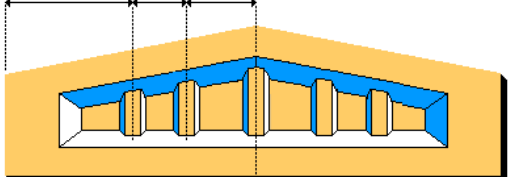
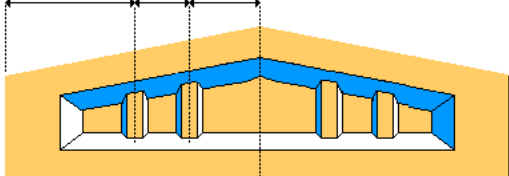
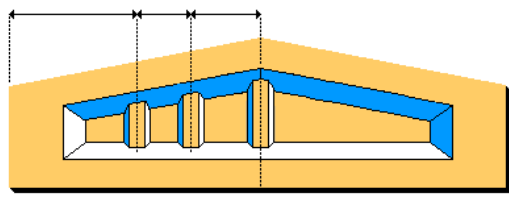
### **Properties**

<b>Option</b>	<b>Description</b>
<b>Name</b>	Part name
<b>Material</b>	Material grade
<b>Finish</b>	Part finish
<b>Class</b>	Part class number
<b>Position on plane</b>	Horizontal position of the beam in relation to the input points. You can define an additional offset, if needed.
<b>Position at depth</b>	Depth position of the beam in relation to the input points. You can define an additional offset, if needed.
<b>End offset</b>	End offsets of the part
<b>Cast unit numbering</b>	Numbering prefix and start number for the cast unit
<b>Global displacement</b>	Offset for the part in the x, y, and z direction
<b>Method</b>	Method to connect the created parts together

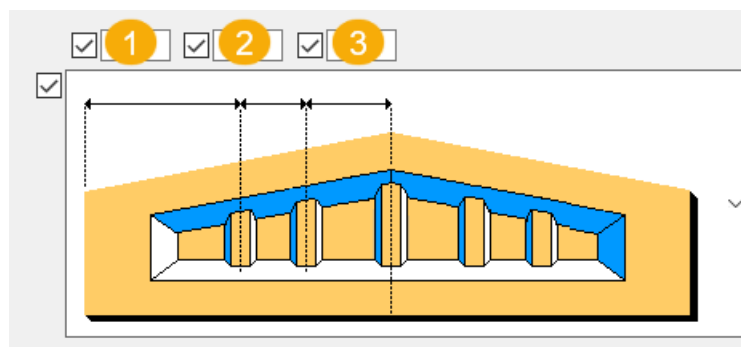
### **Stiffeners tab**

Use the **Stiffeners** tab to define the stiffener creation.

## Stiffener type

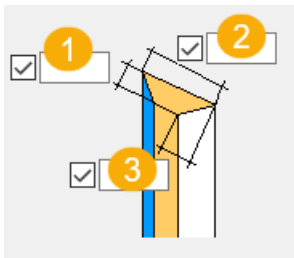
Option	Description
	Stiffeners are not created.
	Stiffeners are created. The middle stiffener is created.
	Stiffeners are created. The middle stiffener is not created.
	Asymmetrical stiffeners are created.

## Stiffener dimensions



	Description
1	Dimension from the edge of the beam to the first stiffener
2	Dimension from the first stiffener to the second stiffener

	Description
3	Dimension from the second stiffener to the central stiffener If the central stiffener is not created, this is the dimension from the second stiffener to the center of the beam.  Note that if all three values are defined, only values 1 and 2 will be used.



	Description
1	Thickness of the stiffener
2	Width of the stiffener
3	Width of the top part of the stiffener

### Connection method

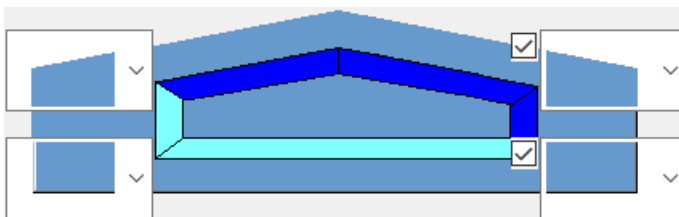
Select how the stiffeners are connected to the main part.


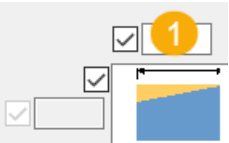
### End details tab

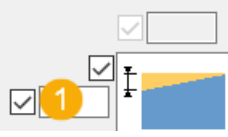
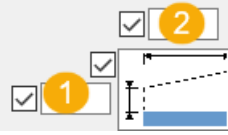

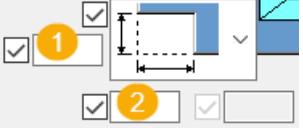

Use the **End details** tab to define the end detail creation.

### End detail shape and dimensions



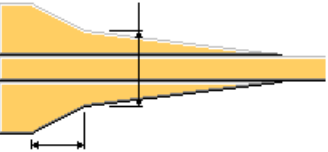
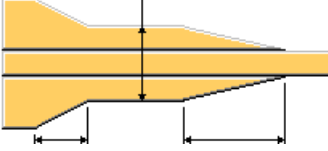
Select the top and bottom end detail on both sides of the beam.

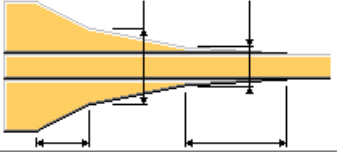


Option	Description
	No end detail at the top
	Horizontal dimension of the added block

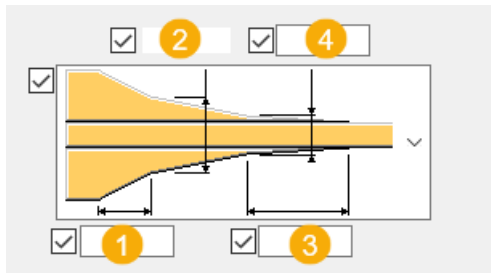
Option	Description
	Vertical dimension of the added block
	<b>1</b> Vertical dimension of the cut <b>2</b> Horizontal dimension of the cut
	No end detail at the bottom
	<b>1</b> Vertical dimension of the cut <b>2</b> Horizontal dimension of the cut
	<b>1</b> Vertical dimension of the cut <b>2</b> Horizontal dimension of the cut <b>3</b> Horizontal dimension of the first chamfer

### End block shape

Option	Description
	End blocks are not created.
	End blocks without chamfers are created.
	End blocks with one chamfer are created.
	End blocks with two chamfers are created.

Option	Description
	End blocks with three chamfers are created.

### End block dimensions



	Description
1	Length of the first chamfer
2	Width of the end blocks
3	Width of the end blocks at the end of the second chamfers
4	Width of the third chamfers If there are two chamfers, this is the width of the second chamfer.

### UDA tab

Use the **UDA** tab to define the user-defined attributes.

- **String** for text
- **Integer** for integers
- **Float** for values with decimals after a comma
- **Option** for predefined values

### **Corbels and recesses (82)**

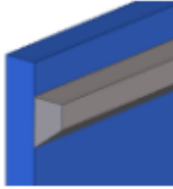
**Corbels and recesses (82)** adds concrete parts or cuts to a concrete part. You can define the position, offsets and rotation of the added parts or cuts in several ways.

### Objects created

The component can add a maximum of four parts or cuts to a concrete part. The added parts can be welded to the main part, added as parts and cast units, or as sub-assemblies.

### Use for

- Cut-out seams from concrete walls
- Adding concrete support blocks to concrete columns or walls



### Selection order

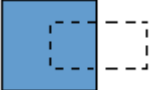
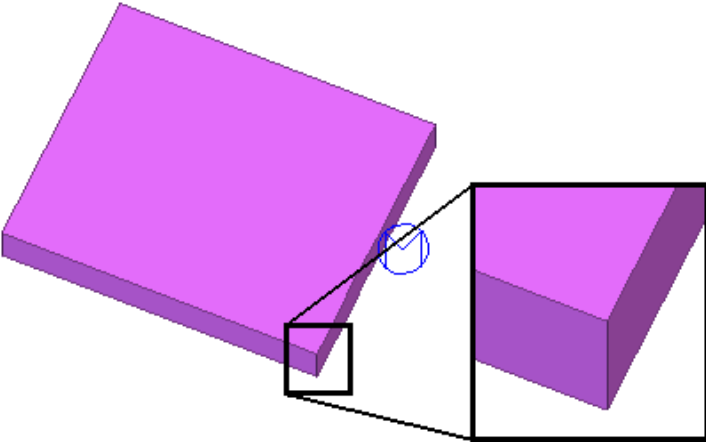
1. Select the main part.  
The part or cut is created automatically.

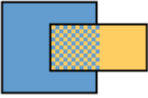
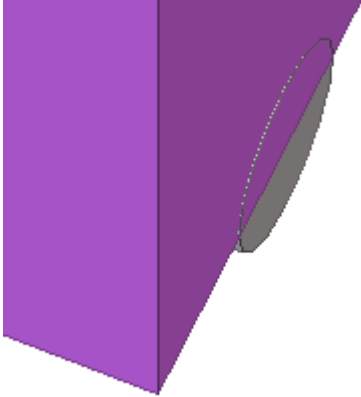
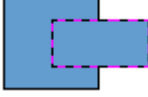
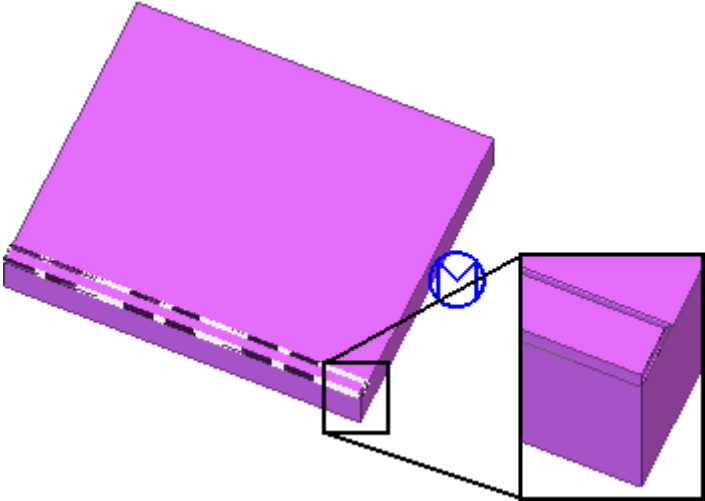
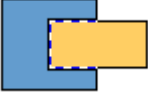
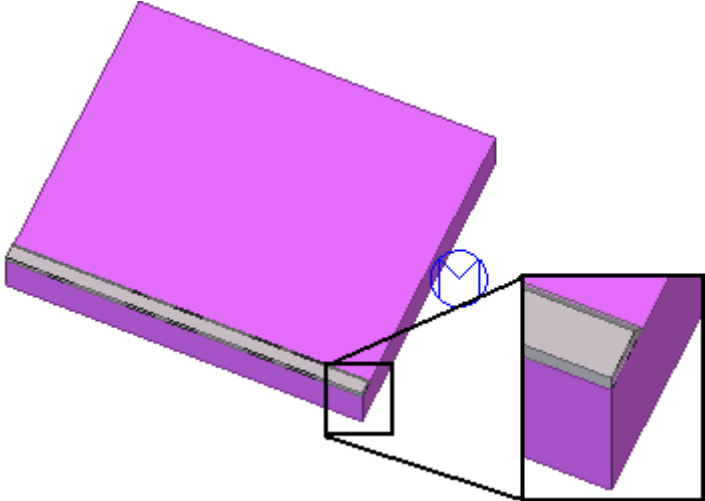
### Part 1 / Part 2 / Part 3 / Part 4 tab

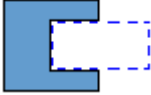
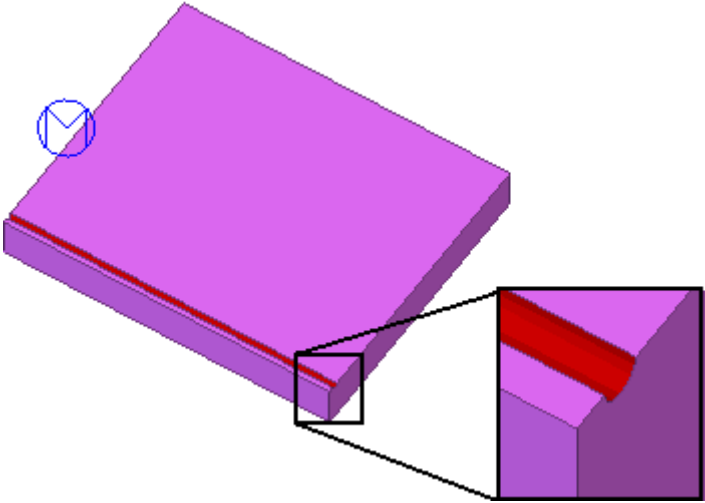
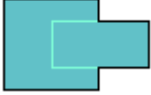
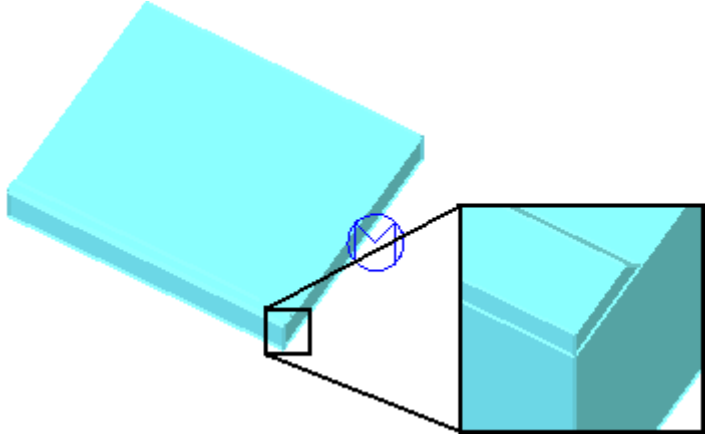
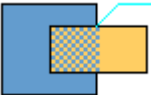
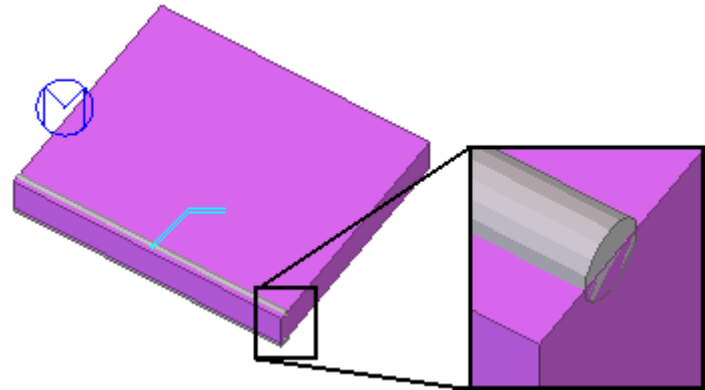
Use the **Part 1**, **Part 2**, **Part 3** or **Part 4** tab to create one additional part or cut to the concrete part.

### Profile

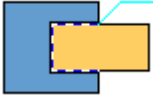
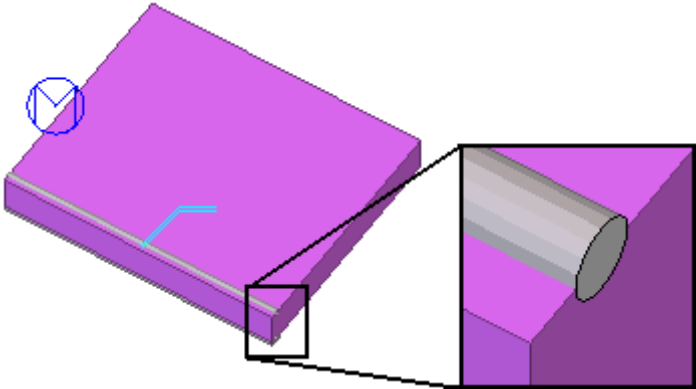


Select the profile to be added to the concrete part or used for the cut.  
Select how the added part is connected to the main part.

Option	Example
	<p>No part created.</p> 

Option	Example
	<p>Part is created.</p> 
	<p>Part is created and added to the main part.</p> 
	<p>Part is created and the main part is cut.</p> 

Option	Example
	<p>Main part is cut.</p> 
	<p>Part is created and cast unit is created.</p> 
	<p>Part is created and welded to the main part.</p> 

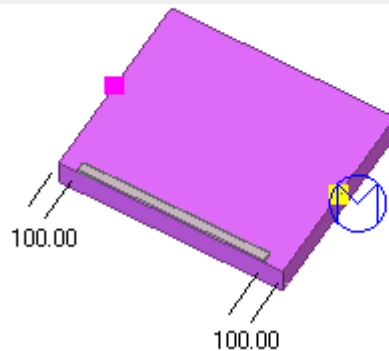
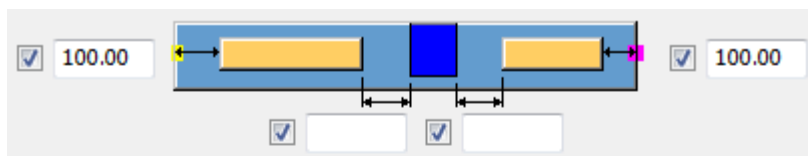


Option	Example
	<p>Part is created and welded to the main part, and the main part is cut.</p> 
	<p>Part is created and added as sub-assembly.</p>
	<p>Part is created and added as sub-assembly, and the main part is cut.</p>

### Offset

Define the offset of the added part from the main part. You can set the offset also for openings.

By default, the added parts or cuts are created between the end points of the concrete part.



## Coordinate system

On the **Part 1** tab, select **Use global xy-plane** to place the corbels on the global XY plane or **Use local** to place the corbels on the local XY plane of the part.

Note that setting the coordinate system on the **Part 1** tab also affects the corbels that are created on the **Part 2 - 4** tabs.

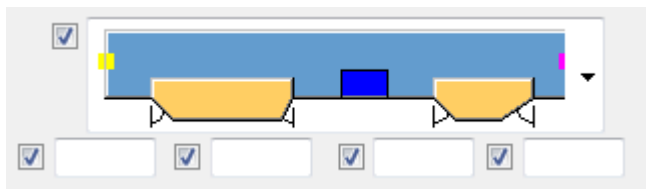
## Create diamond corbel around column

Select whether a diamond corbel is created around the column.

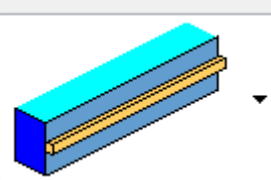
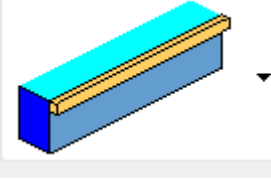
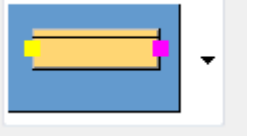
If you create the corbel, you cannot enter any values on the **Part 2**, **Part 3** or **Part 4** tabs.

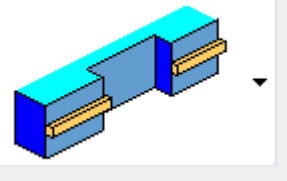
## Chamfers

You can chamfer the added parts. You can define the chamfers either as angles or as dimensions.



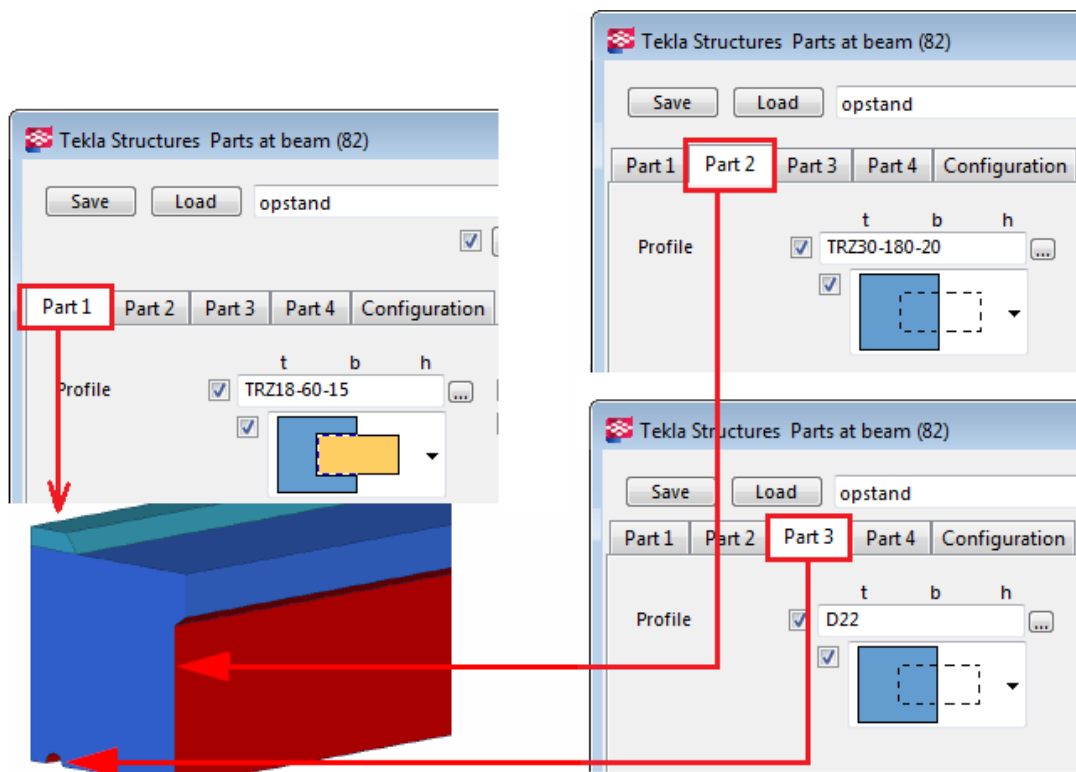
## Positioning of the parts

Option	Description
	Select the side where the added parts or cuts are created.
	Select the alignment of the added parts or cuts.
	You can swap the end points of the added parts or cuts.

Option	Description
<input checked="" type="checkbox"/> 	Select whether the existing cuts should be taken into account when the added parts are created.

### Part 2 / Part 3 / Part 4 tab

You can add or cut more than one part at the same time. To do this, use the tabs **Part 2**, **Part 3** and **Part 4**.



### Configuration tab

Use the **Configuration** tab to define the distance in material and whether information needs to be printed.

### UDA tab

Use the **UDA** tab to define user-defined attributes for the parts.

Use the **Fabricator name**, **Name**, **Type**, **Nomination**, **Article number** and **Comment** user-defined attributes (UDAs) to add information for the added parts or cuts.

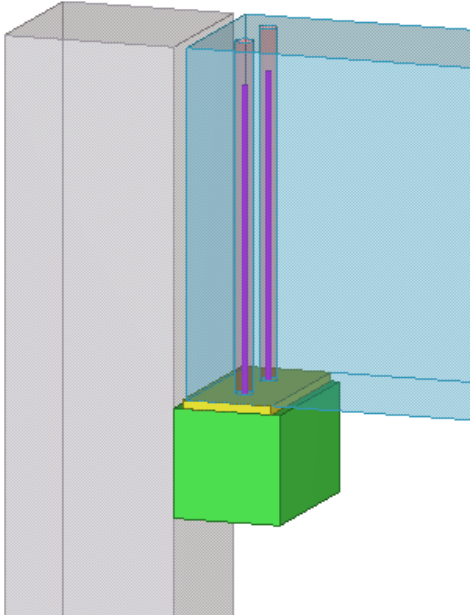
### **Concrete console (110)**

**Concrete console (110)** creates a connection between a concrete column and a concrete beam. The beam rests on a console which is attached to the column.

#### **Objects created**

- Console
- Neoprene strip
- Steel plate between console and beam
- Anchor rods
- Tubes
- Sockets

#### **Use for**

<b>Situation</b>	<b>Description</b>
	Console connection between a concrete column and a concrete beam.

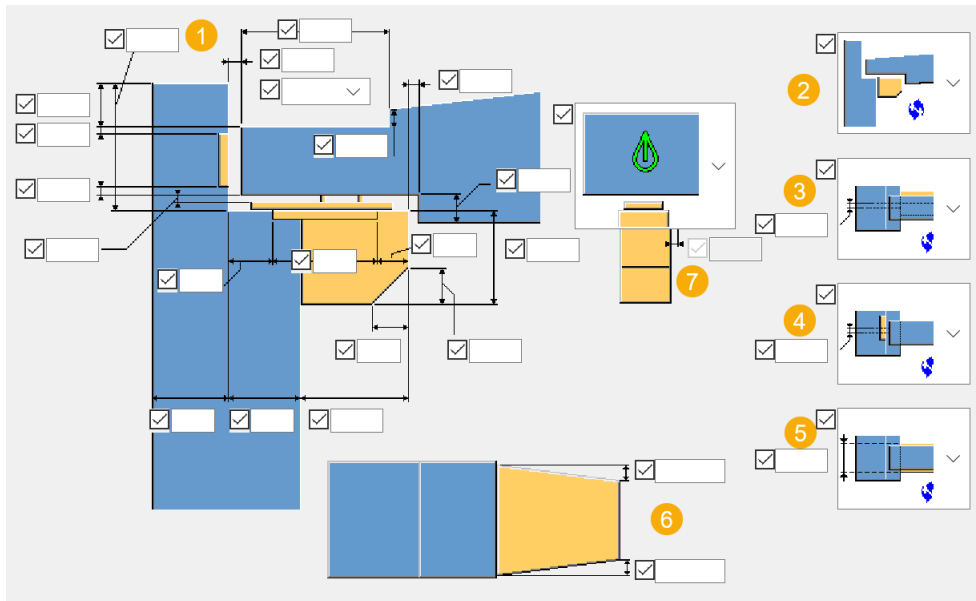
#### **Selection order**

1. Select the main part (column).
2. Select the secondary part (beam).

The connection is created automatically when the secondary part is selected.

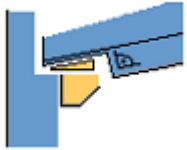
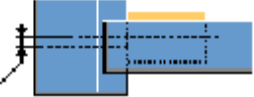
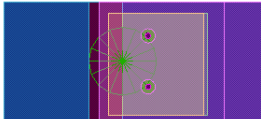
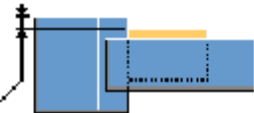
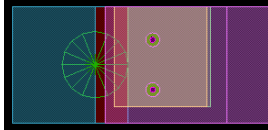
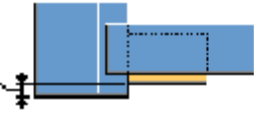
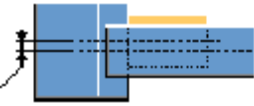
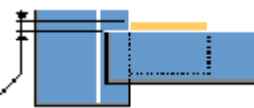
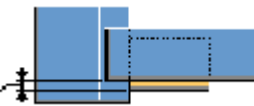
**Picture tab**

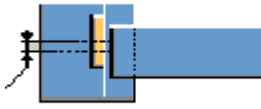
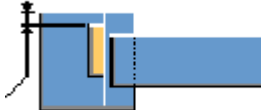
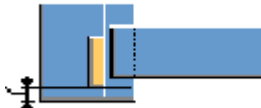
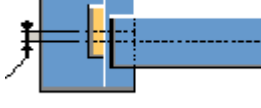
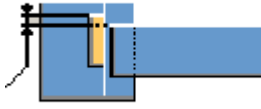

Use the **Picture** tab to define the shape and the dimensions of the console, and the steel support plates and the neoprene layer.



<b>Description</b>	
<b>1</b>	Shape and dimensions of the concrete console and the steel and neoprene parts.
<b>2</b>	Select how the shape of the secondary beam is modified if the secondary beam is sloping.

		Description	

Description		
		
<p><b>3</b> Console offset.</p> <p>You can set the reference to be the main part or the secondary part. Additionally, the offset distance can be defined.</p>		<p>Reference = column centerline</p> <p>If no offset value is applied, the console is placed symmetrically compared to the column.</p> 
		<p>Reference = column left side</p> 
		<p>Reference = column right side</p>
		<p>Reference = beam centerline</p>
		<p>Reference = beam left side</p>
		<p>Reference = beam right side</p>

<b>Description</b>		
<b>4</b>	<p>Vertical plate offset.</p> <p>You can set the reference to be the main part or the secondary part. Additionally, the offset distance can be defined.</p>	 <p>Reference = column centerline</p>
	 <p>Reference = column left side</p>	
	 <p>Reference = column right side</p>	
	 <p>Reference = beam centerline</p>	
	 <p>Reference = beam left side</p>	
	 <p>Reference = beam right side</p>	
<b>5</b>	<p>Define the console thickness.</p> <p>Select whether the console thickness is taken from the secondary part or the main part. The default option is that the console thickness is taken from the secondary part.</p>	
<b>6</b>	<p>Console tapering.</p>	




	<b>Description</b>
<b>7</b>	Select whether to create a cut around the console in the secondary part. Define the cut dimension from the edge of the cut to the edge of the console.

### **Parts tab**

Use the **Parts** tab to define properties for the console, the neoprene layer and the optional steel plates.

<b>Option</b>	<b>Description</b>
<b>Concrete console</b>	Prefix and start number for the part position number, material, name, class and comment for the console.
<b>Console to column</b>	Select how the console is attached to the concrete column. Default is <b>Part Add</b> . The <b>No action</b> option means that the console is a loose part and not attached to any other part in the component.
<b>Create console like</b>	Select how the console is created. Default is <b>Contour plate</b> . <b>Contour plate</b> = the console is created using the <b>Contour plate</b> command. <b>Beam</b> = the console is created using the <b>Beam</b> command.
<b>Neoprene</b>	Neoprene layer properties. A neoprene plate for shock absorbing and sound-damping can be created between the beam and the console. If a trapezium shaped neoprene block is used, the defined thickness will be the thickness on the column side.
<b>Neoprene to</b>	Select to which part the neoprene layer is attached, and how the neoprene is attached. Default is <b>Beam</b> and <b>Weld</b> .
<b>Holes in neoprene</b>	Select how the holes in the neoprene part are created. Default is <b>By bolt</b> .
<b>Diameter of holes in neoprene</b>	Diameter of the holes in the neoprene part.

Option	Description
	By default, the hole size in the neoprene part is equal to the holes in the console. Enter a value to overwrite this default hole size.
<b>Steel plate horizontal</b>	Horizontal steel plate size and properties. The plate is placed under the neoprene part.
<b>Steel plate vertical</b>	Vertical steel plate size and properties. The plate is placed at the console side.
<b>Add steel plate to the column by</b>	Select how the steel plate is attached to the column. Default is <b>Weld</b> .
<b>Rotate console polygon</b>	Define the rotation start point of the console polygon. By default, the rotation starts from point 1. Enter 2, 3, 4, or 5 to change the start point. 
<b>Console polygon direction</b>	Select the direction of the console polygon.

#### Connection tab

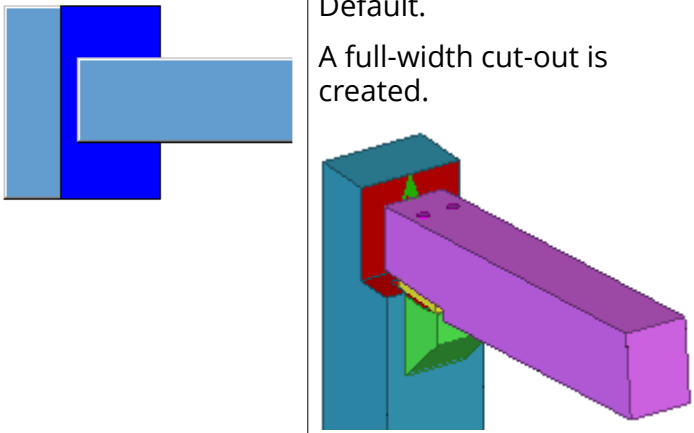
Use the **Connection** tab to define the properties of the anchor rods, nuts and washers and injection tubes and to select how these parts are connected to the console or the main part.

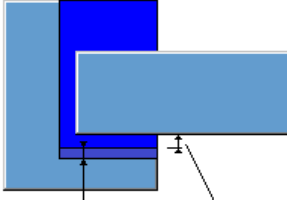
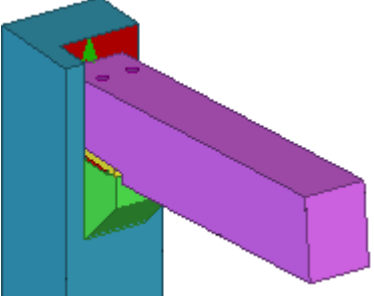
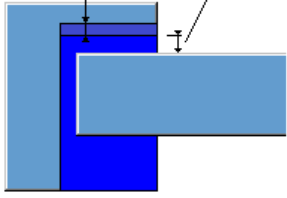
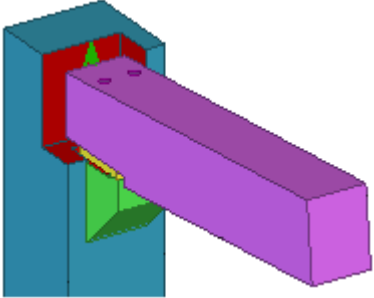
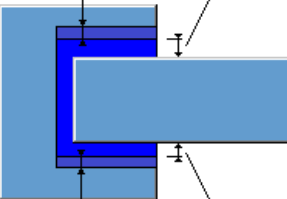
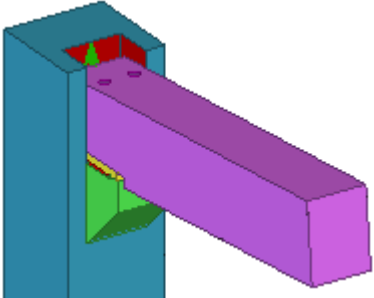

Option	Description
<b>Anchor rods</b>	Anchor rod profile. Define the length and number of rods on the <b>Anchor rods</b> tab.
<b>Type of reinforcing bars</b>	Select the reinforcing bar type.
<b>Anchors to</b>	Select to which part the anchor rods are attached, and how the anchors are attached. Default is <b>Column</b> and <b>Weld</b> .
<b>Anchors all the same L</b>	Select whether the anchor rods have the same length.
<b>Bottom section</b>	Select the profile from profile catalog.
<b>Nut</b>	Nut profile. Define the height of the nut on the <b>Anchor rods</b> tab.
<b>Washer</b>	Washer profile.

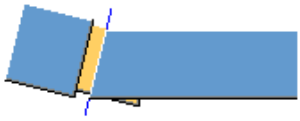

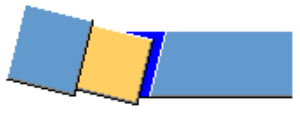
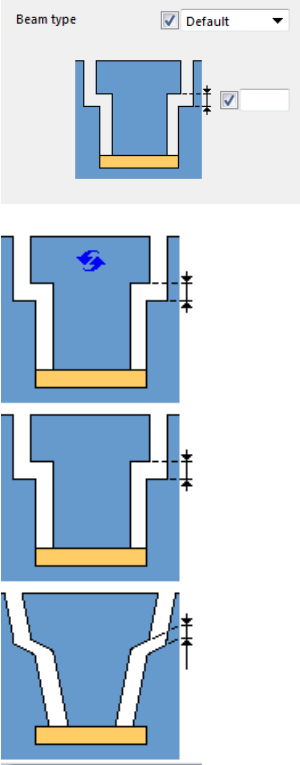
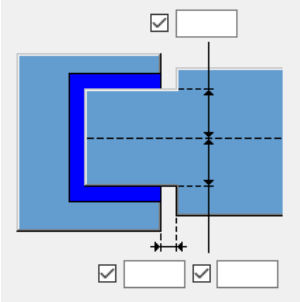
Option	Description
	You can define the direction and the rotation for each washer. Define the thickness of the washer on the <b>Anchor rods</b> tab.
<b>Weld washer and nut to anchor</b>	Select whether washers and nuts are welded to the anchors.
<b>Tube top</b>	Tubular embed for creating a round hole for the anchors. The tube top starts at the bottom level of the nut.
<b>Tube bottom</b>	Tubular embed for creating a round hole for the anchors. The height of the tubular profile can be modified on the <b>Anchor rods</b> tab.
<b>Tubes around anchors to beam</b>	Select how the tubes around the anchors are attached to the beam. Default is <b>Weld</b> .
<b>Tubes all the same L</b>	Select whether the tubes have the same length.
<b>Tubes aligned with</b>	Select whether the tubes are aligned with the column, top of the beam, or bottom of the beam.
<b>Create cuts around tubes</b>	Select whether cuts are created around the tubes.

#### Parameters tab

Use the **Parameters** tab to define how the column and the beam are cut (skew/square).

Option	Description
<b>Fitting to column</b>	Select how the top of the column is fitted. Default is <b>Perpendicular</b> .
Column cut-out	<p>Default. A full-width cut-out is created.</p> 

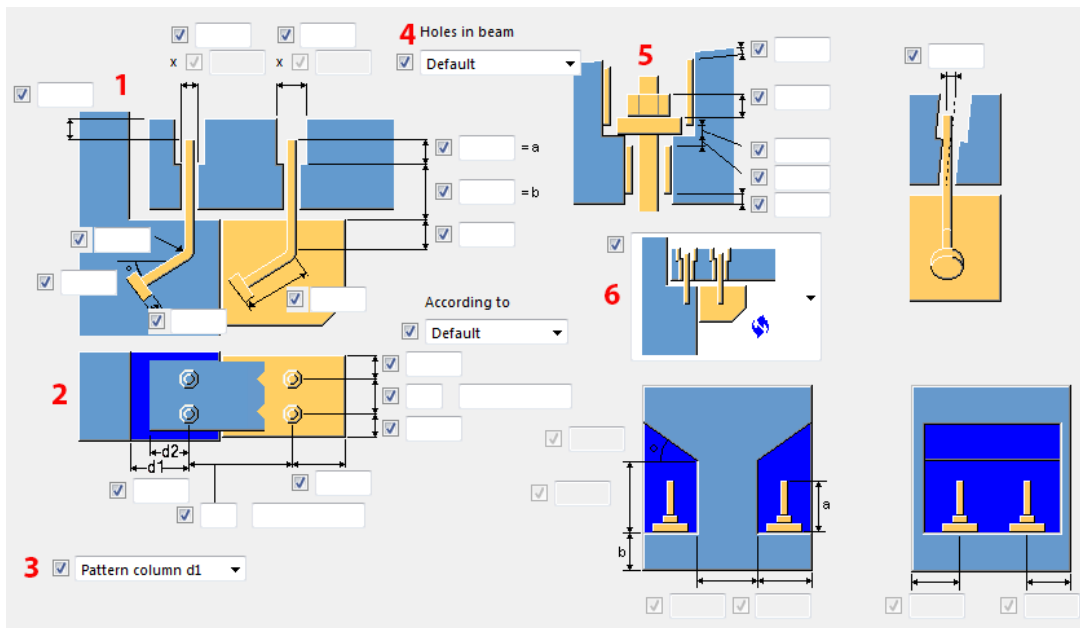
Option	Description	
		<p>Column left side cut-out. Clearance between the column and the beam can be set.</p> 
		<p>Column right side cut-out. Clearance between the column and the beam can be set.</p> 
		<p>Both sides cut-out. Clearance between the column and the beam can be set on both sides.</p> 
<p>Beam end cut-out Use this option when the beam and the column are not aligned.</p>		<p>Square beam end</p>

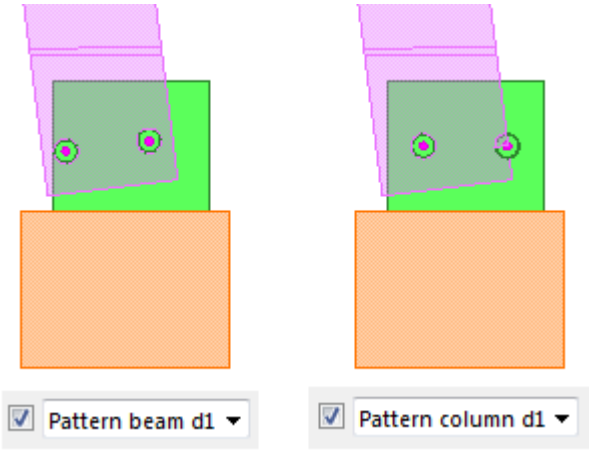
Option	Description	
		Skewed beam end (according to main part)
Beam bottom cut-out Use this option when the beam and the column are not aligned.		Square beam bottom
		Skewed beam bottom (according to main part)
Column cut-out for T-shaped secondary part		<p>In <b>Beam type</b>, select the shape of the secondary part.</p> <ul style="list-style-type: none"> <li>• <b>Rectangular</b> - always creates a rectangular column cut-out.</li> <li>• <b>T-beam</b> - Tekla Structures checks the shape of the beam and creates a T-shaped column cut-out.</li> <li>• <b>Automatic</b> - Tekla Structures automatically checks the shape of the secondary part, and creates either a rectangular or a T-shaped column cut-out.</li> </ul> <p><b>Automatic</b> is the default value.</p> <p>For T-shaped cut-outs, define the cut-out dimension between the column and the beam.</p>
Secondary part width		Define the maximum width of the secondary part and cut it to this width.

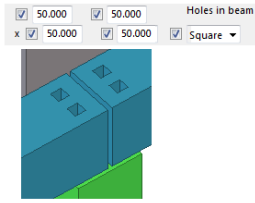
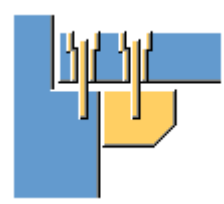
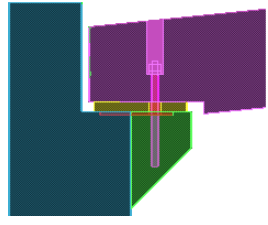
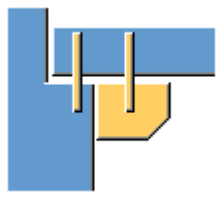
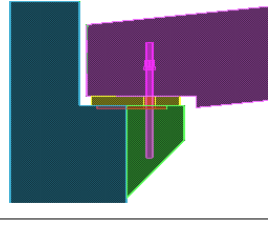
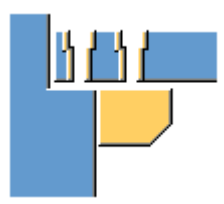
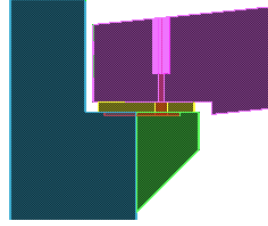
Option	Description
<b>Cut extra secondary parts</b>	You can find and cut extra secondary parts by using classes or name search.


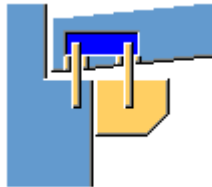
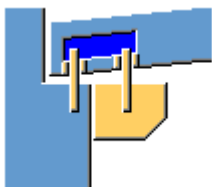
**Anchor rods tab**

Use the **Anchor rods** tab to define dimensions and position of the anchor rods.



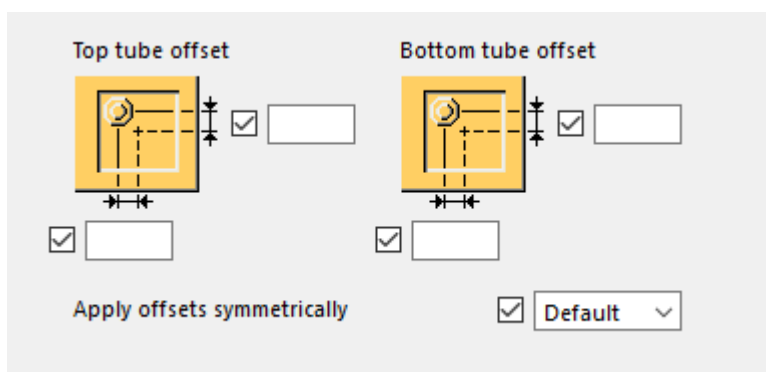
	Description
1	Anchor rod length, hole diameter and top offset.
2	Number of anchor rods, distances and edge distances.
3	Anchor rod distribution options. Useful when the beam is not aligned with the column. <div style="text-align: center;">  </div>

		Description
4	<p>Select the type of the hole in the beam.</p> <p>Default is <b>Circular</b>.</p> <p>If you set the type to <b>Circular</b>, use the two boxes on the left to define the hole diameter.</p> <p>If you set the type to <b>Square</b>, use the four boxes on the left to define the dimensions of the square cut.</p>	
5	Height of the tubular profile, nut and washer.	
6	Anchor rods and cuts	<p>Default.</p> <p>Anchor rods are created. Holes for the anchors are created.</p>  
		<p>Anchor rods are created. No holes are created.</p>  
		<p>Only holes are created. No anchors are created.</p>  

		Description	
			Only anchor rods are created. No holes are created.
			Cut-out in the concrete beam. Anchor rods are created. No holes are created.
			Cut-out in the concrete beam (parallel to beam). Anchor rods are created. No holes are created.

### Tube offset

Define the offsets for the tube profiles in both the X and Y directions.



### Socket tab

Use the **Socket** tab to define whether socket anchors are created, how they are connected and the dimensions and position of the socket anchors.

If you create the sockets on the **Socket** tab, the anchor rods on the **Connection** tab are automatically considered as sockets.

Option	Description
<b>Create socket</b>	Select whether sockets are created and which parts are included.



Option	Description
<b>Connect socket to prim by</b>	Select how the sockets are connected to the main part.
<b>Connection rod-connector</b>	Select the connection method between the rod and the connecting profile.
<b>Type of reinforcing bars</b>	Select the rod type.
<b>Leg rotation</b>	Select the direction of the rod. You can enter an angle in the box on the right.
<b>Legs symmetrically</b>	Select whether custom part sockets are created symmetrically.
<b>Connector Dowel</b>	Properties for the connecting profile and the rod.
<b>Partname component</b>	If you want to use a custom part to create the socket, select the <b>Custom part</b> option in the <b>Create socket</b> list. Then browse for the component, and use the list of options to position the custom part.  To use saved custom component properties, select the saved properties file.

#### **General tab**

Click the link below to find out more:

#### **Analysis tab**

Click the link below to find out more:

#### ***Concrete console (111)***

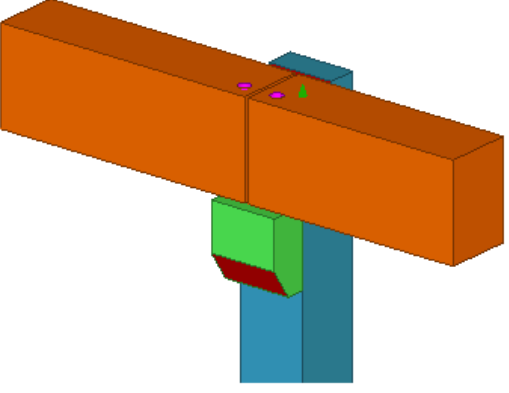
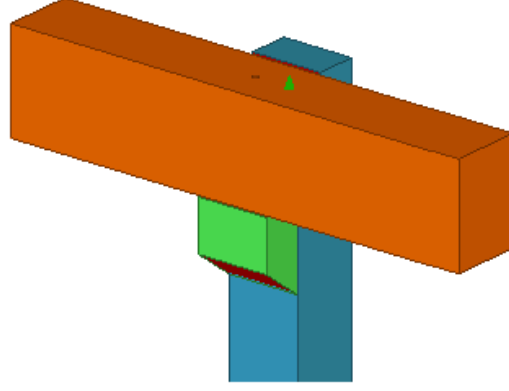
**Concrete console (111)** creates a connection between a concrete column and two secondary concrete beams. The beams rest on a console which is attached to the column.

#### **Objects created**

- Console
- Neoprene strip
- Steel plates

- Anchor rods
- Tubes
- Sockets

**Use for**

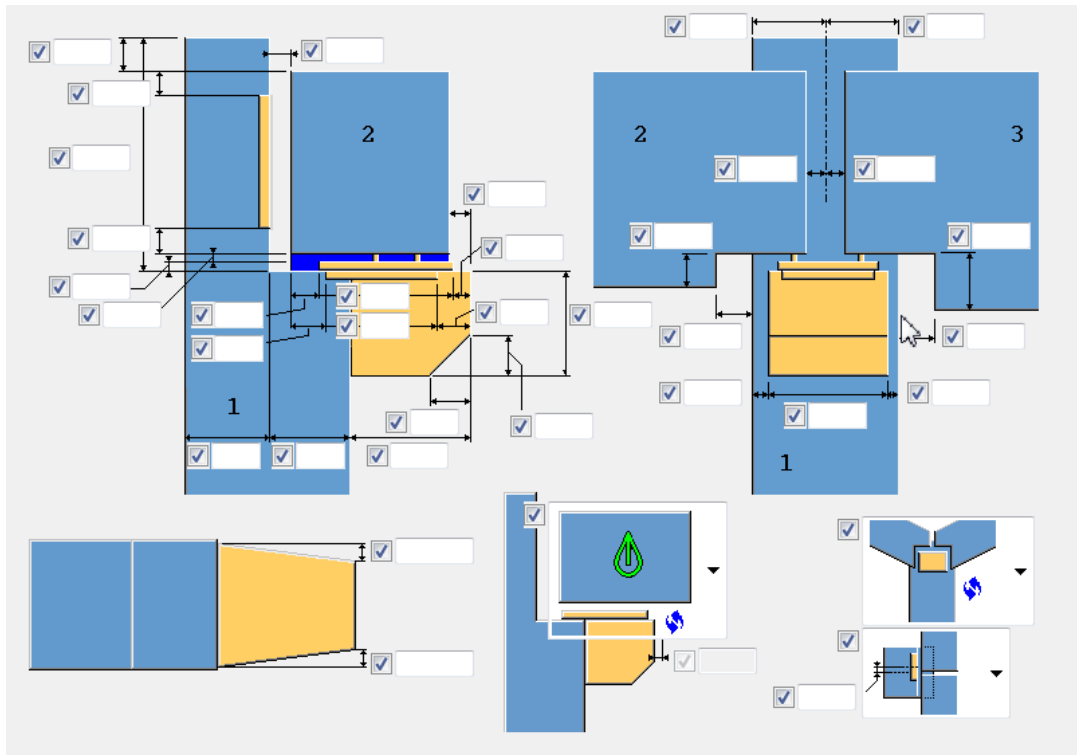
Situation	Description
	<p>Console connection between a concrete column and two concrete beams.</p>
	<p>Console connection between a concrete column and one concrete beam.</p>

**Selection order**

1. Select the main part (column).
2. Select the first secondary part (beam).
3. Select the secondary part (beam).
4. Click the middle mouse button to create the connection.

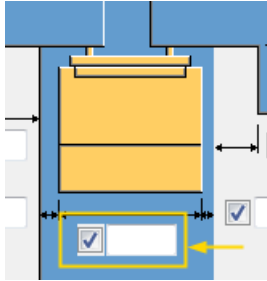
**Picture tab**

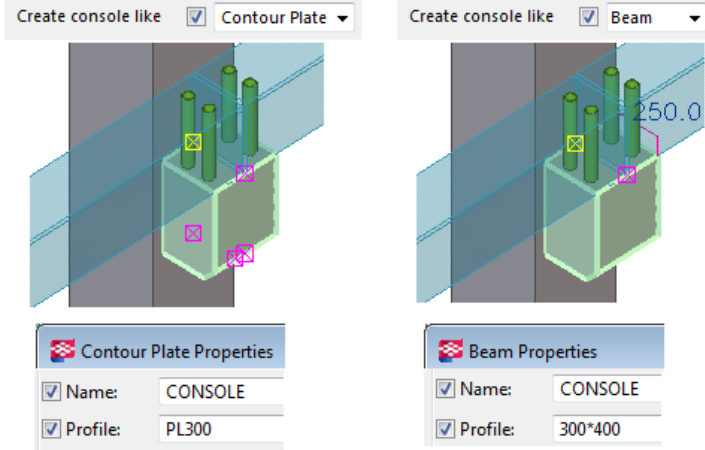
Use the **Picture** tab to define the shape and the dimensions of the console, and the steel support plates and the neoprene layer.


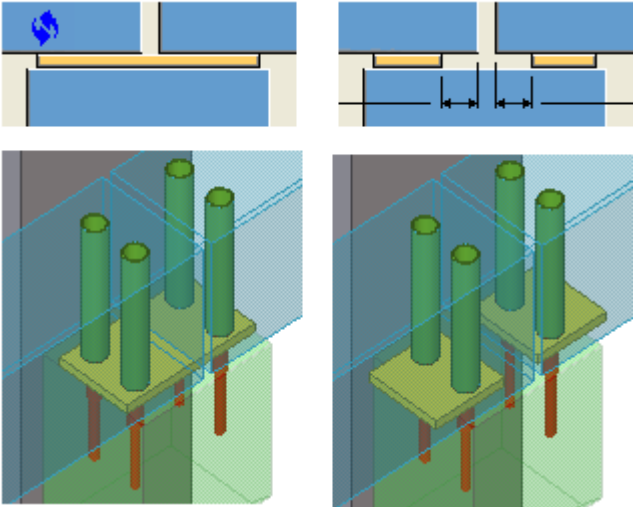
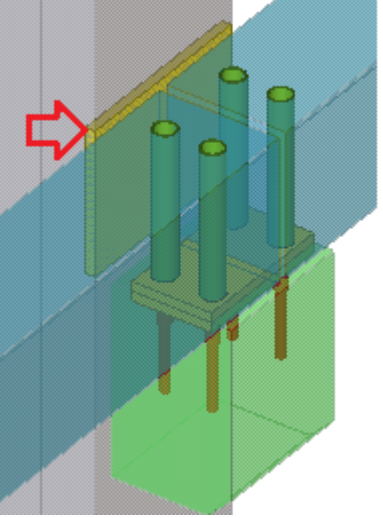



**Parts tab**

Use the **Parts** tab to define properties for the console, the neoprene layer and the optional steel plates.

Option	Description
<p><b>Console width</b></p>	<p>Define the prefix and a start number for the part position number, material, name, class and comment for the console.</p> <p>Define the width on the <b>Picture</b> tab.</p>  <p>If no value is entered, the width is the same as the width of the beam.</p>
<p><b>Console to column</b></p>	<p>Select how the console is attached to the column.</p>

Option	Description
	<p>Default is <b>Part Add</b>.</p> <p>The <b>No action</b> option means that the console is a loose part and not attached to any other part in the component.</p>
<p><b>Create console like</b></p>	<p>Select the profile type of the console.</p> <p>Default is <b>Contour plate</b>.</p> <p><b>Contour plate</b> = the console is created using the <b>Contour plate</b> command.</p> <p><b>Beam</b> = the console is created using the <b>Beam</b> command.</p> 
<p><b>Neoprene</b></p>	<p>Neoprene layer properties.</p> <p>A neoprene plate for shock absorbing and sound-damping can be created between the beam and the console.</p> <p>If a trapezium shaped neoprene block is used, the defined thickness will be the thickness on the column side.</p>
<p><b>Neoprene to</b></p>	<p>Select to which part the neoprene layer is attached, and how the neoprene is attached.</p> <p>Default is <b>Beam</b> and <b>Weld</b>.</p>
<p><b>Holes in neoprene</b></p>	<p>Select how the holes in the neoprene part are created.</p> <p>Default is <b>By bolt</b>.</p>
<p><b>Diameter of holes in neoprene</b></p>	<p>Diameter of the holes in the neoprene part.</p> <p>By default, the hole size in the neoprene part is equal to the holes in the console.</p> <p>Enter a value to overwrite this default hole size.</p>

Option	Description
	<p>Select if the neoprene layer is split for each beam separately.</p> 
<p><b>Steel plate horizontal</b></p>	<p>Horizontal steel plate size and properties. The plate is placed under the neoprene part.</p>
<p><b>Steel plate vertical</b></p>	<p>Vertical steel plate size and properties. The plate is placed at the console side.</p> 
<p><b>Add steel plate to the column by</b></p>	<p>Select how the steel plate is attached to the column. Default is <b>Weld</b>.</p>

Option	Description
<b>Rotate console polygon</b>	Define the rotation start point of the console polygon. By default, the rotation starts from point 1. Enter 2, 3, 4, or 5 to change the start point. 
<b>Console polygon direction</b>	Select the direction of the console polygon.

### Anchor tab

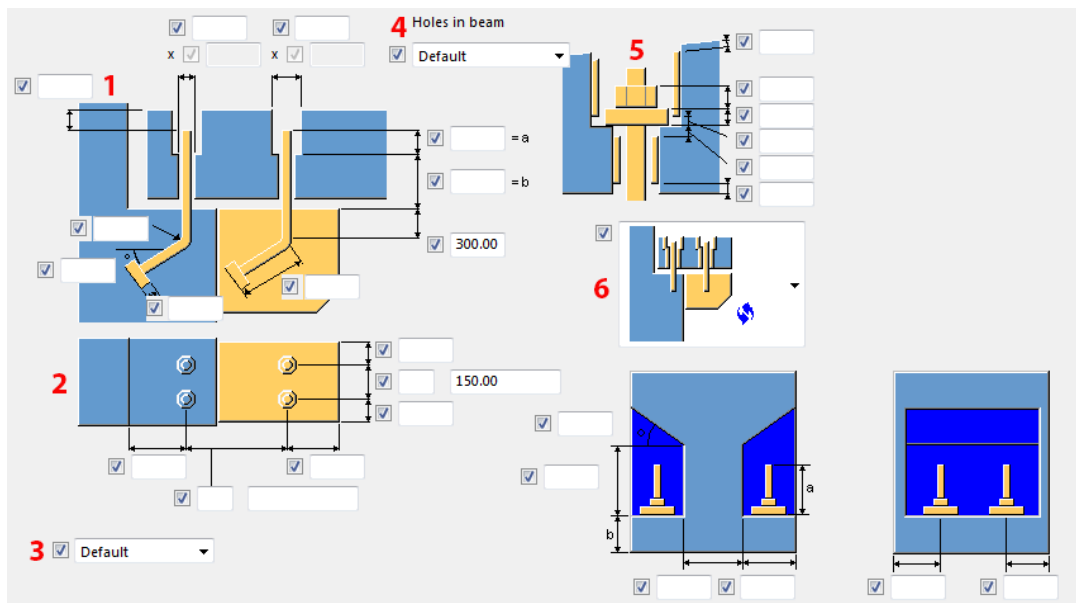
Use the **Anchor** tab to define the properties of the anchor rods, nuts and washers and injection tubes, and select how these parts are connected to the console or the main part.

Option	Description
<b>Anchor rods</b>	Anchor rod profile. Define the length and number of rods on the <b>Anchor rods</b> tab.
<b>Type of reinforcing bars</b>	Select the reinforcing bar type.
<b>Anchors to</b>	Select to which part the anchor rods are attached, and how the anchors are attached. Default is <b>Column</b> and <b>Weld</b> .
<b>Anchors all the same L</b>	Select whether the anchor rods have the same length.
<b>Bottom section</b>	Select the profile from profile catalog.
<b>Washer</b>	Washer profile. Define the thickness of the washer on the <b>Anchor rods</b> tab.
<b>Nut</b>	Nut profile. Define the height of the nut on the <b>Anchor rods</b> tab.
<b>Weld washer and nut to anchor</b>	Select whether washers and nuts are welded to the anchors.
<b>Tube top</b>	Tubular embed for creating a round hole for the anchors. The tube top starts at the bottom level of the nut.
<b>Tube bottom</b>	Tubular embed for creating a round hole for the anchors. The height of the tubular profile can be modified on the <b>Anchor rods</b> tab.

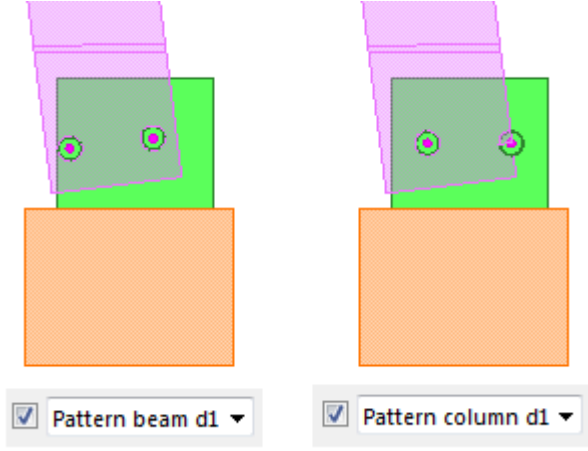
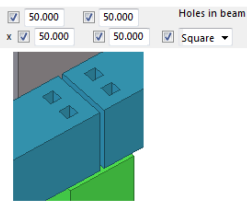
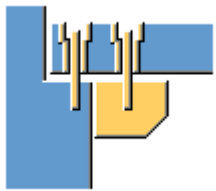
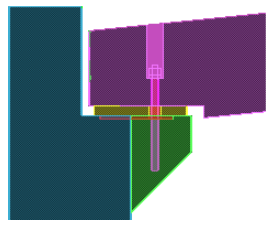
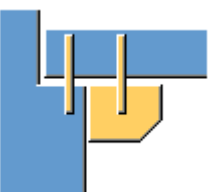
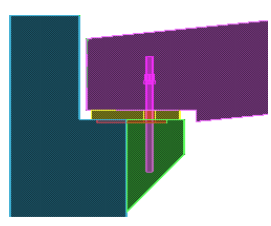
Option	Description
<b>Tubes around anchors to beam</b>	Select how the tubes around the anchors are attached to the beam. Default is <b>Weld</b> .
<b>Tubes all the same L</b>	Select whether the tubes have the same length.
<b>Tubes aligned with</b>	Select whether the tubes are aligned with the column, top of the beam, or bottom of the beam.
<b>Create cuts around tubes</b>	Select whether cuts are created around the tubes.

### Anchor rods tab

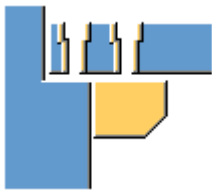
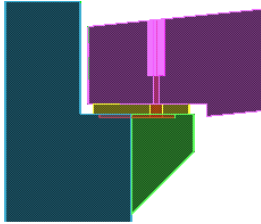

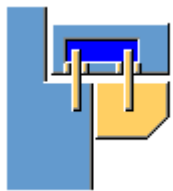
Use the **Anchor rods** tab to define dimensions and position of the anchor rods.



	Description
<b>1</b>	Anchor rod length, hole diameter and top offset.
<b>2</b>	Number of anchor rods, distances and edge distances.
<b>3</b>	Anchor rod distribution options.

		<b>Description</b>	
		Useful when the beam is not aligned with the column.	
			
<b>4</b>	<p>Select the type of the hole in the beam.</p> <p>Default is <b>Circular</b>.</p> <p>If you set the type to <b>Circular</b>, use the two boxes on the left to define the hole diameter.</p> <p>If you set the type to <b>Square</b>, use the four boxes on the left to define the dimensions of the square cut.</p>		
<b>5</b>	Height of the tubular profile, nut and washer.		
<b>6</b>	Anchor rods and cuts		<p>Default.</p> <p>Anchor rods are created. Holes for the anchors are created.</p> 
			<p>Anchor rods are created. No holes are created.</p> 



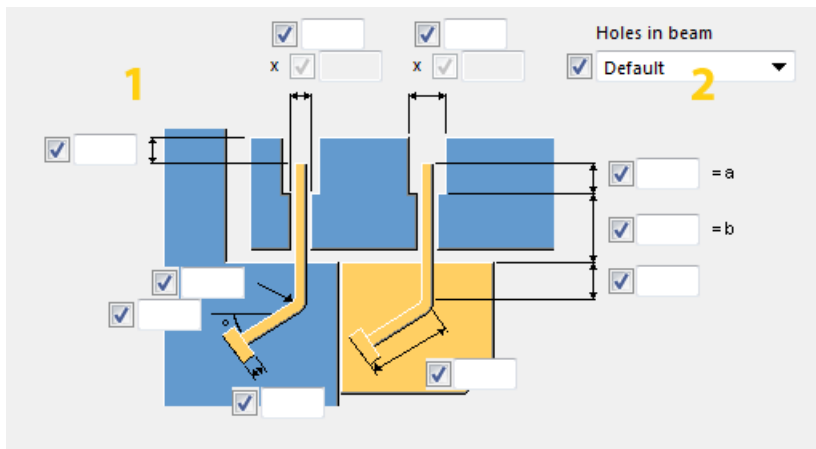
		Description	
			<p>Only holes are created. No anchors are created.</p> 
			<p>Only anchor rods are created. No holes are created.</p>
			<p>Cut-out in the concrete beam. Anchor rods are created. No holes are created.</p>

#### Anchor rods beam 2 tab

Use the **Anchor rods beam 2** tab to define the properties of the anchor rods, nuts and washers and injection tubes for the second secondary beam. The default profile for the anchor rods created for the second secondary beam is the same as for the anchors created on the **Anchor** tab.

Option	Description
<b>Anchor rods</b>	Anchor rod profile. Define the length and number of rods on the <b>Anchor rods</b> tab.
<b>Type of reinforcing bar</b>	Select the reinforcing bar type.
<b>Bottom section</b>	Select the profile from the profile catalog.
<b>Nut</b>	Nut profile. Define the height of the nut on the <b>Anchor rods</b> tab.
<b>Washer</b>	Washer profile. Define the thickness of the washer on the <b>Anchor rods</b> tab.

Option	Description
<b>Tube top</b>	<p>Tube profile.</p> <p>Tubular embed for creating a round hole for the anchors.</p> <p>The tube top starts at the bottom level of the nut.</p>
<b>Tube bottom</b>	<p>Tube profile.</p> <p>Tubular embed for creating a round hole for the anchors.</p> <p>The height of the tubular profile can be modified on the <b>Anchor rods</b> tab.</p>



	Description
<b>1</b>	Anchor rod length, hole diameter and top offset.
<b>2</b>	<p>Select the type of the hole in the beam.</p> <p>If you set the type to <b>Circular (neg.vol.)</b>, use the two boxes on the left to define the hole diameter. <b>Circular (neg.vol.)</b> is the default value.</p> <p>If you set the type to <b>Circular (drilling)</b>, use the two boxes on the left to define the hole diameter.</p> <p>If you set the type to <b>Square</b>, use the four boxes on the left to define the dimensions of the square cut.</p>

### Socket tab

Use the **Socket** tab to define whether socket anchors are created, how they are connected and the dimensions and position of the socket anchors.

If you create the sockets on the **Socket** tab, the anchor rods on the **Anchor** tab are automatically considered as sockets.

Option	Description
<b>Create socket</b>	Select whether sockets are created and which parts are included.
<b>Connect socket to prim by</b>	Select how the sockets are connected to the main part.
<b>Connection rod-connector</b>	Select the connection method between the rod and the connecting profile.
<b>Type of reinforcing bars</b>	Select the rod type.
<b>Leg rotation</b>	Select the direction of the sockets. You can enter an angle in the box on the right.
<b>Connecting profile</b> <b>Rod</b>	Properties for the connecting profile and the rod.
<b>Partname component</b>	If you want to use a custom part to create the socket, select the <b>Custom part</b> option in the <b>Create socket</b> list. Then browse for the component, and use the list of options to position the custom part.  To use saved custom component properties, select the saved properties file.

#### **General tab**

Click the link below to find out more:

#### **Analysis tab**

Click the link below to find out more:

#### ***Concrete beam-beam (112)***

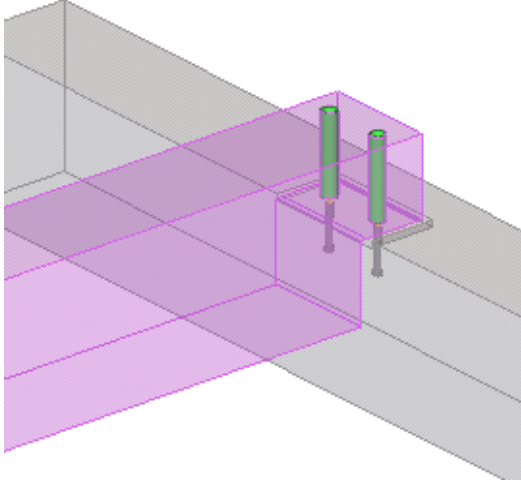
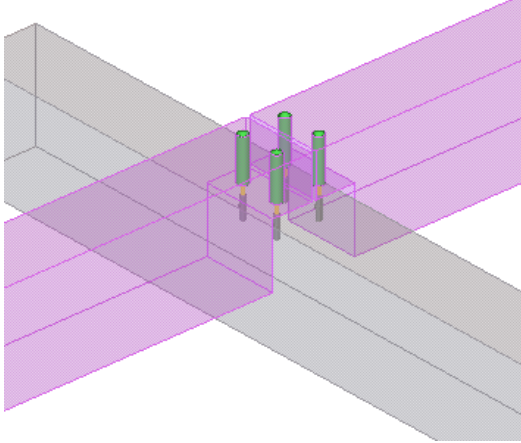
**Concrete beam - beam (112)** creates a connection between a concrete beam and one or two secondary concrete beams.

#### **Objects created**

- Neoprene
- Steel plates

- Anchor rods
- Tubes
- Sockets

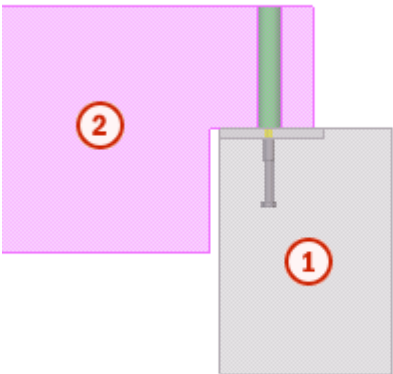
**Use for**

Situation	Description
	<p>Connection between two concrete beams.</p>
	<p>Connection between three concrete beams.</p>

**Selection order**

1. Select the main part (beam).
2. Select one or two secondary parts (beam).
3. Click the middle mouse button to create the connection.

**Part identification key**

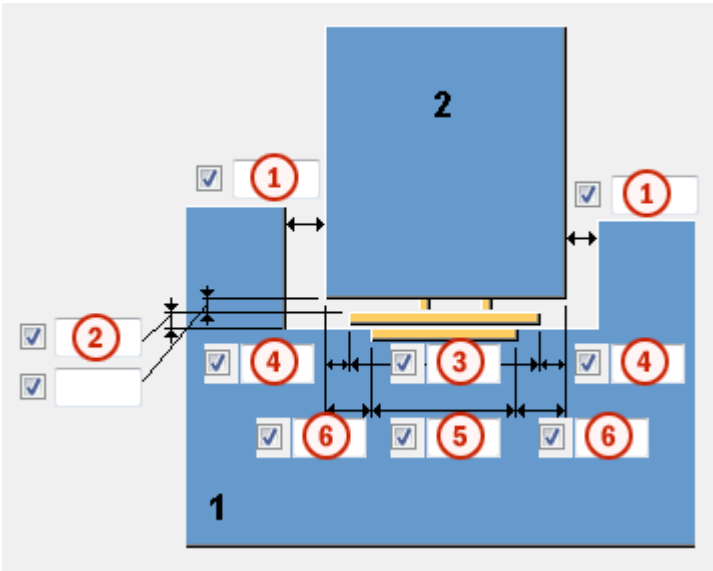


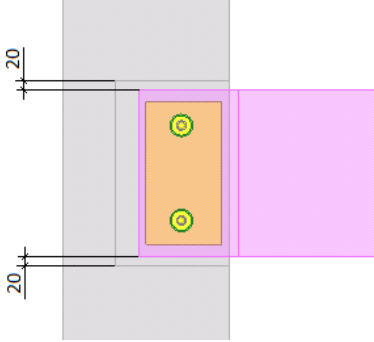
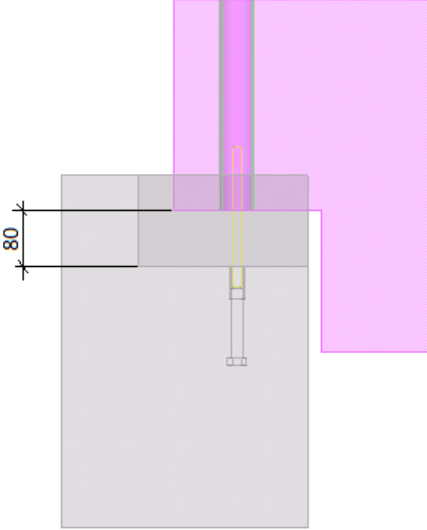
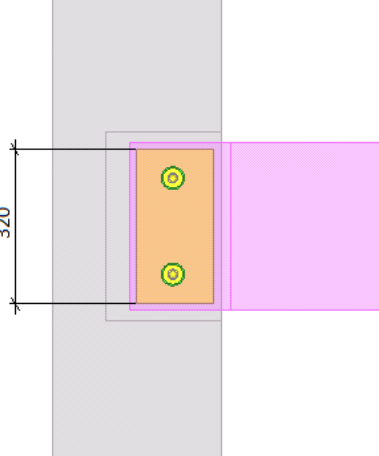
Part	
1	Beam
2	Beam

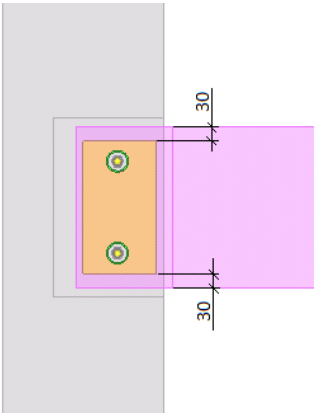
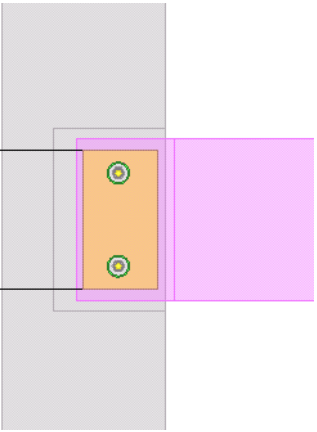
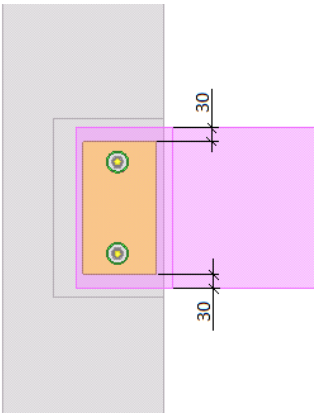
**Picture tab**

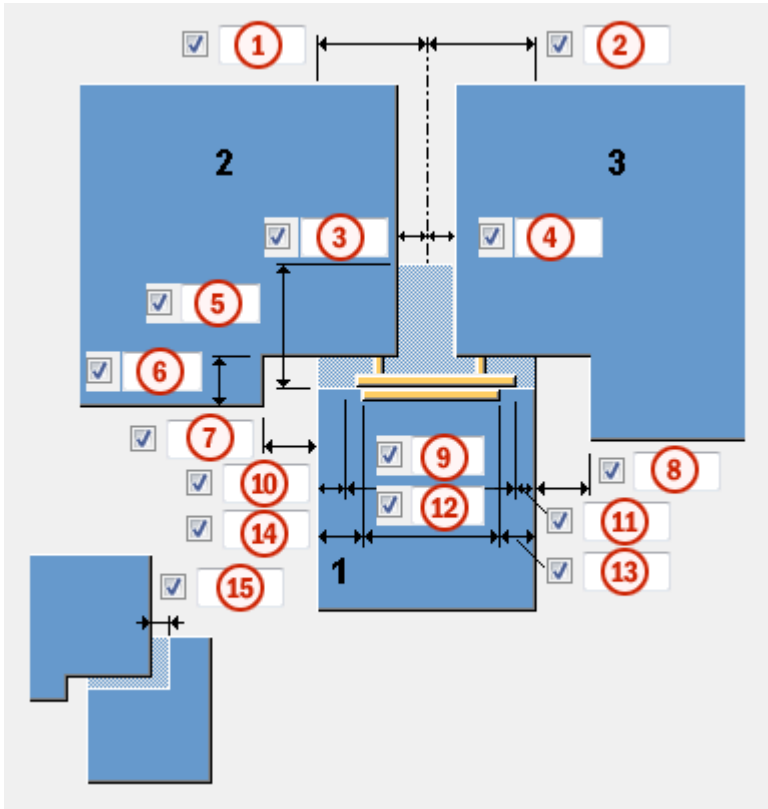
Use the **Picture** tab to control the part dimensions and the shapes of the parts, and the recesses.

**Dimensions**



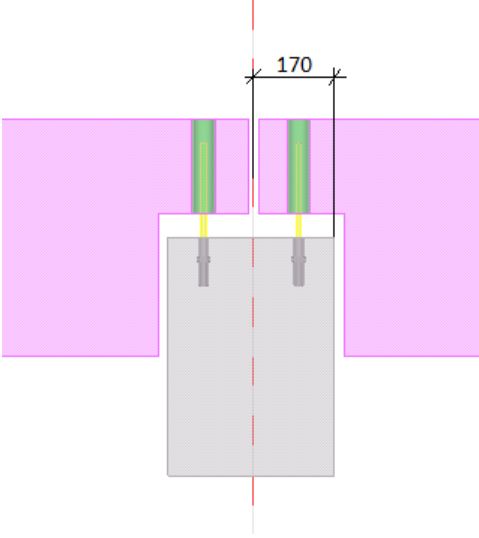
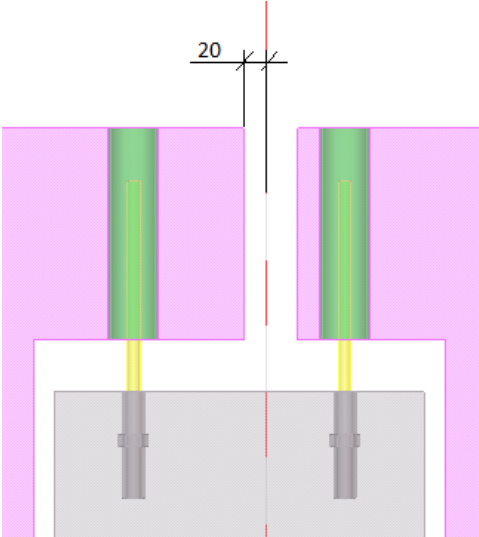
	<b>Description</b>	<b>Example</b>
<b>1</b>	Define the gap between the main part and the secondary part on the left and the right side.	 <p>A cross-sectional diagram of a joint between a main part (grey) and a secondary part (purple). An orange rectangular component is embedded in the main part. Two green circles with 'G' inside are located within the orange component. Dimension lines on the left indicate a gap of 20 units between the main part and the secondary part on both the top and bottom.</p>
<b>2</b>	Define the vertical gap between the main part and the secondary part.	 <p>A cross-sectional diagram showing a vertical joint between a main part (grey) and a secondary part (purple). A vertical rod or pipe passes through the main part. A dimension line on the left indicates a vertical gap of 80 units between the top of the main part and the top of the secondary part.</p>
<b>3</b>	Define the length of the neoprene.	 <p>A cross-sectional diagram showing a joint between a main part (grey) and a secondary part (purple). A neoprene seal is shown between them. A dimension line on the left indicates the length of the neoprene seal is 320 units.</p>

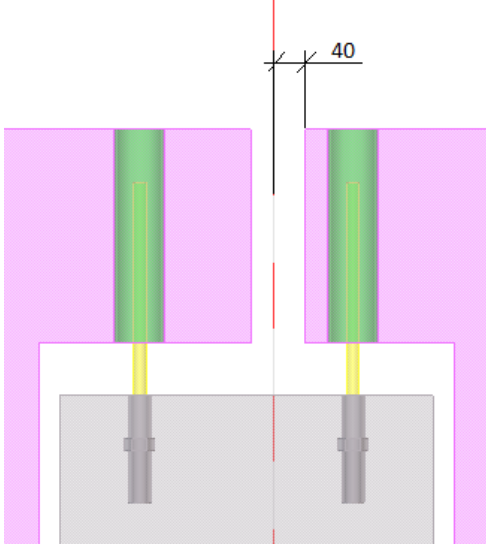
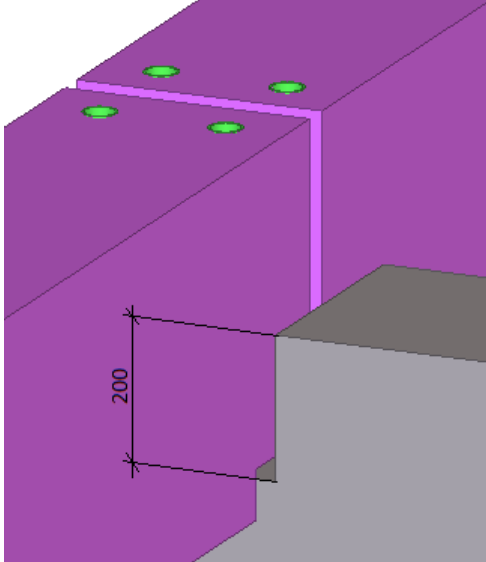
	Description	Example
4	Define the gap between the neoprene and the secondary part on the left and the right side.	 <p>The diagram shows a cross-section of a joint. On the left is a grey concrete structure. In the center is an orange steel plate with two green circular fasteners. To the right of the steel plate is a purple neoprene seal. A light purple secondary part is positioned to the right of the neoprene. Two dimension lines on the right side indicate a gap of 30 units between the neoprene and the secondary part, one above and one below the neoprene.</p>
5	Define the length of the steel plate.	 <p>The diagram shows a cross-section of a joint. On the left is a grey concrete structure. In the center is an orange steel plate with two green circular fasteners. To the right of the steel plate is a purple neoprene seal. A light purple secondary part is positioned to the right of the neoprene. A vertical dimension line on the left side indicates a length of 300 units for the steel plate.</p>
6	Define the gap between the steel plate and the secondary part on the left and the right side.	 <p>The diagram shows a cross-section of a joint. On the left is a grey concrete structure. In the center is an orange steel plate with two green circular fasteners. To the right of the steel plate is a purple neoprene seal. A light purple secondary part is positioned to the right of the neoprene. Two dimension lines on the right side indicate a gap of 30 units between the steel plate and the secondary part, one above and one below the neoprene.</p>

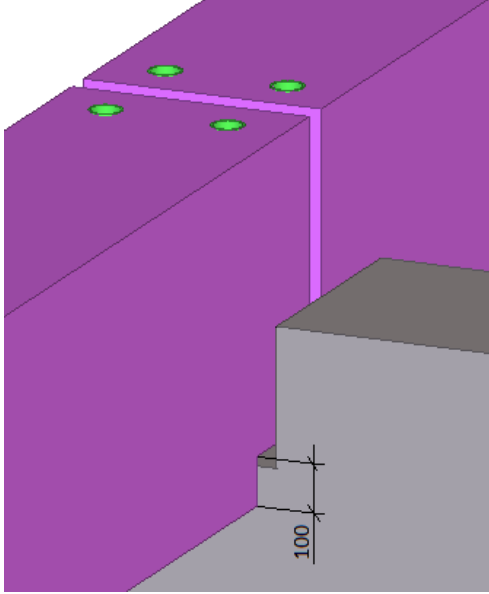
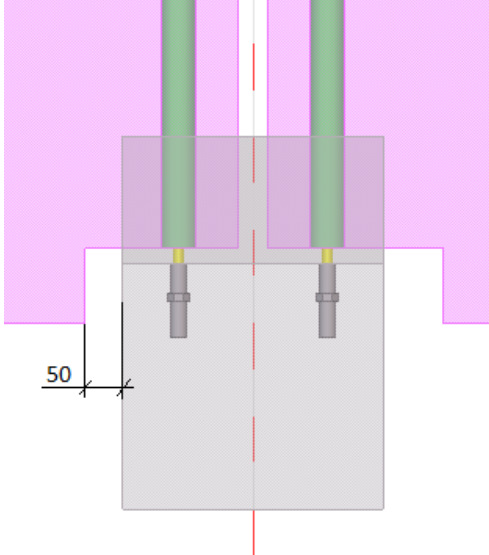


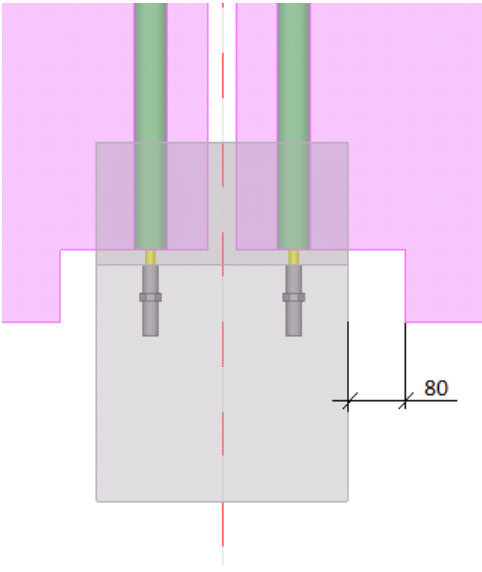
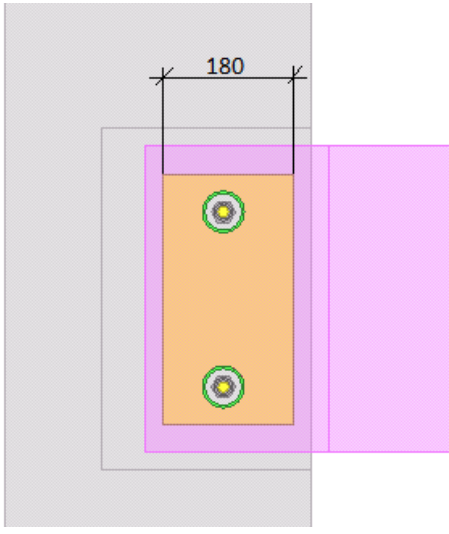
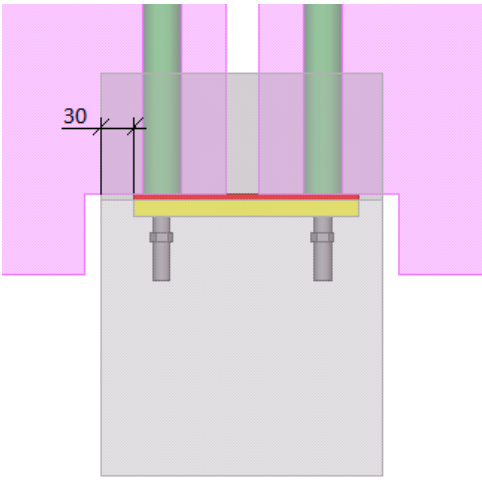
	Description	Example
1	Define the distance from the centerline of the secondary parts to the outer contour of the main part on the left side.	

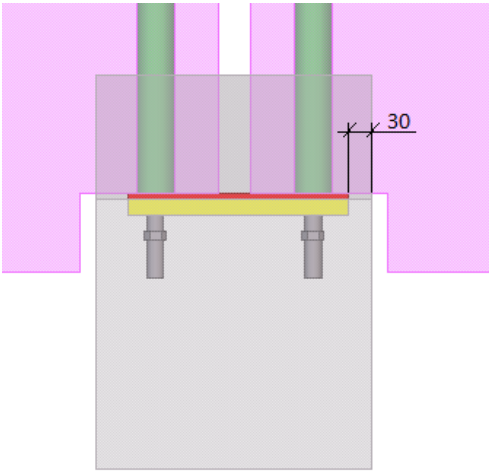
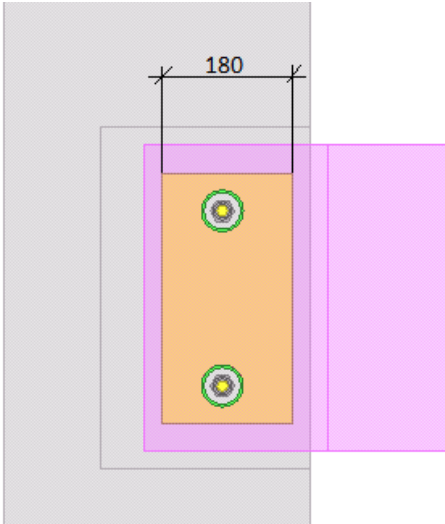
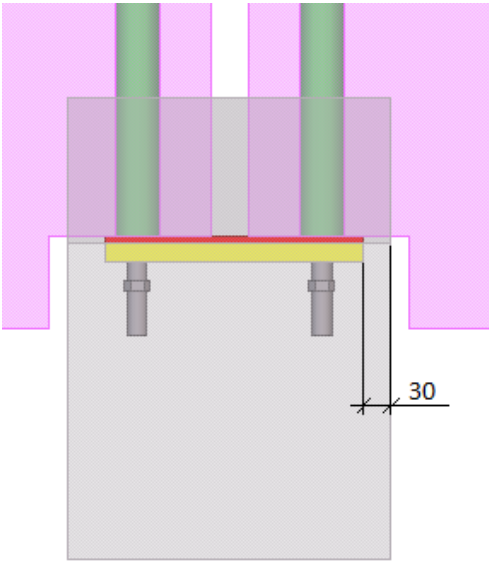


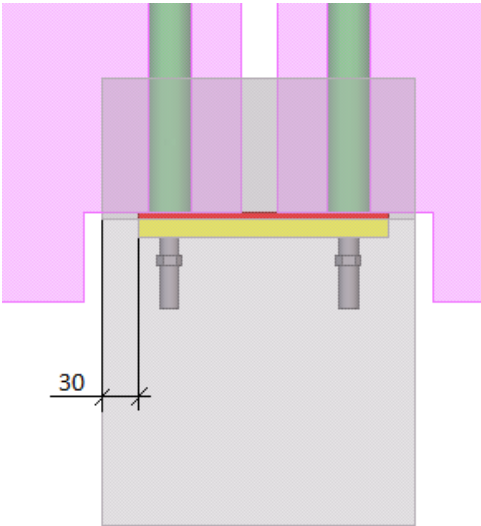
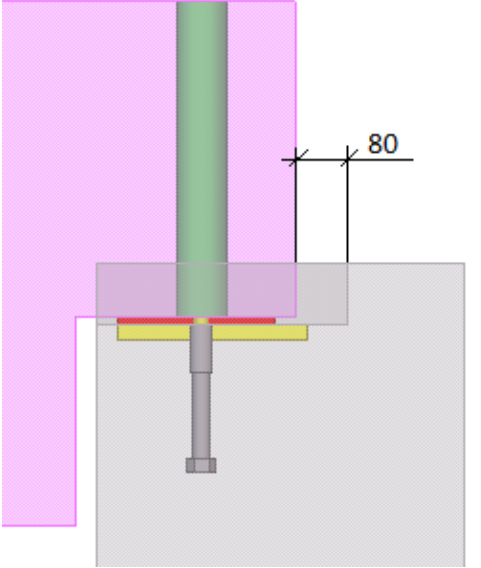
	<b>Description</b>	<b>Example</b>
<b>2</b>	Define the distance from the centerline of the secondary parts to the outer contour of the main part on the right side.	
<b>3</b>	Define the distance from the edge of the first secondary part to the centerline.	

	Description	Example
4	Define the distance from the edge of the second secondary part to the centerline.	 <p>The diagram shows a cross-section of a concrete joint. A vertical red line represents the centerline. A dimension line indicates a distance of 40 units from the centerline to the edge of the second secondary part. The joint is shown with a green vertical element and a yellow horizontal element, both embedded in a grey concrete base.</p>
5	Define the depth of the recess in the main part.	 <p>The diagram shows a 3D perspective view of a concrete joint. A purple block represents the main part, and a grey block represents the secondary part. A dimension line indicates a depth of 200 units for the recess in the main part. The joint is shown with a green vertical element and a yellow horizontal element, both embedded in the grey concrete base.</p>

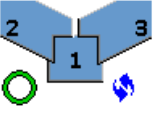
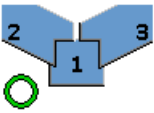
	Description	Example
6	Define the depth of the recess in the secondary part.	
7	Define the width of the recess in the first secondary part.	

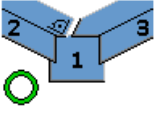

	Description	Example
8	Define the width of the recess in the second secondary part.	
9	Define the width of the neoprene.	
10	Define the distance from the edge of the neoprene to the edge of the main part.	

	Description	Example
11	Define the distance from the edge of the neoprene to the edge of the main part.	
12	Define the width of the steel plate.	
13	Define the distance from the edge of the steel plate to the edge of the main part.	

	Description	Example
14	Define the distance from the edge of the neoprene to the edge of the main part.	
15	Define the distance from the edge of the recess in the main part to the edge of the secondary part.	

**Fit secondaries perpendicular to**

Option	Description
	<p>Default</p> <p>Secondary parts are fitted perpendicular to the main part.</p> <p>AutoDefaults can change this option.</p>
	<p>Secondary parts are fitted perpendicular to the main part.</p>

Option	Description
	The top side of secondary parts is fitted perpendicular to secondary parts while the bottom side of secondary parts is fitted perpendicular to the main part.
	Both the top side and the bottom side secondary parts are fitted perpendicular to secondary parts.

### Parts tab

Use the **Parts** tab to control the neoprene and steel plate properties and how these parts are connected.

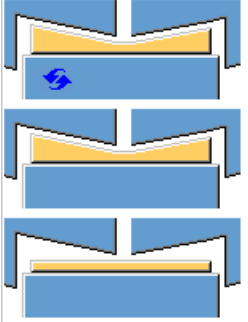
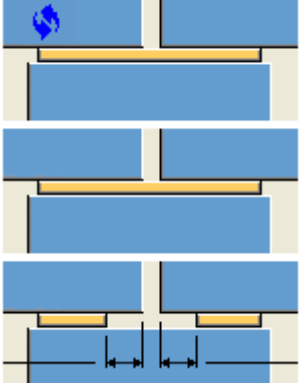
### Neoprene and steel plate

Option	Description
<b>Neoprene</b>	Define the neoprene thickness, width and height.
<b>Steel plate</b>	Define the steel plate thickness, width and height.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Comment</b>	Add a comment about the part.	

### Neoprene properties

A neoprene plate for absorbing shock and for damping sound can be used between the main and the secondary parts.

Option	Description
<b>Neoprene to</b>	<p>Define to which part the neoprene is connected. The neoprene can also be a loose part.</p> <p>In the second list, define how the neoprene is connected to the part.</p>
<b>Holes in Neoprene</b>	Define how the holes in the neoprene are created.
<b>Diameter of Holes in Neoprene</b>	Define the diameter of the holes in the neoprene.
	Define whether the neoprene is fitted to fill the cut space between the main part and the secondary part, or whether it is created in a rectangular shape.
	Define whether the neoprene is created as one single plate or as two plates, and the edge distance from the neoprene to the secondary parts.

### Steel plate properties

One or two additional steel plates can be used between the main and the secondary parts.

Option	Description
<b>Add steel plate to the primary by</b>	Define how the steel plate is connected to the main part.
<b>Negative volume around steel plate</b>	Define whether there is a negative volume around the steel plate.



### Anchors tab

Use the **Anchors** tab to control the properties of anchor rods, nuts, washers and the top and bottom tubes.

Option	Description
<b>Anchor rods</b>	Anchor rods can be used between the main and the secondary parts.  Select the anchor rod profile from the profile catalog. If you set the <b>Type of reinforcing bars</b> option to <b>Reinforcing bar</b> , select the reinforcing bar from the catalog.
<b>Nut</b>	Select the nut profile from the profile catalog.
<b>Washer</b>	Select the washer profile from the profile catalog.
<b>Tube top, Tube bottom</b>	Tubes can be used between the main and the secondary parts.  Select the profile from the profile catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Comment</b>	Add a comment about the part.	

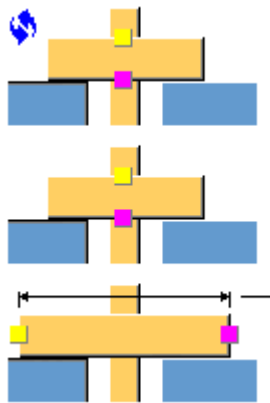
### Anchor rods

<b>Type of reinforcing bars</b>	Define the type of reinforcing bars.
---------------------------------	--------------------------------------

<b>Anchors to</b>	Define to which part the anchor rods are connected. The anchor rods can also be loose parts.  In the second list, define how the anchor rods are connected to the part.
<b>Anchors all the same L</b>	Define whether the anchor rods have the same length.
<b>Bottom section</b>	Define the type of profile in the bottom section.
<b>Anchors only in secondary</b>	Select whether anchor rods are included only in the secondary parts.

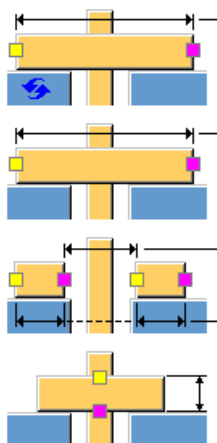
### Washer

Define the position of the washer handles.



### Washer plate

Define the position of the plate handles.



Option	Description
<b>Create washers symmetrically</b>	Define whether the washers on the anchors are created symmetrically (mirrored) to the washers on the anchors at the opposite beam side.
<b>Weld washer and nut to anchor</b>	Define whether the washers and nuts are welded to the plates.

### Tube top and tube bottom

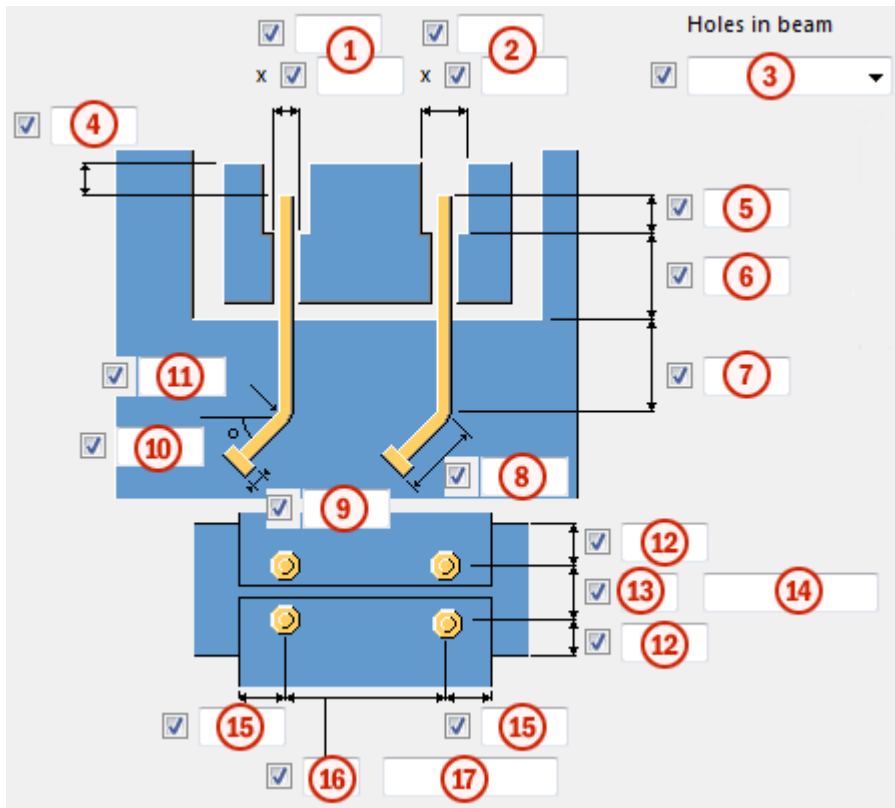
You can add a tubular embed for creating a round hole for the anchors. The tube top starts at the bottom level of the nut.

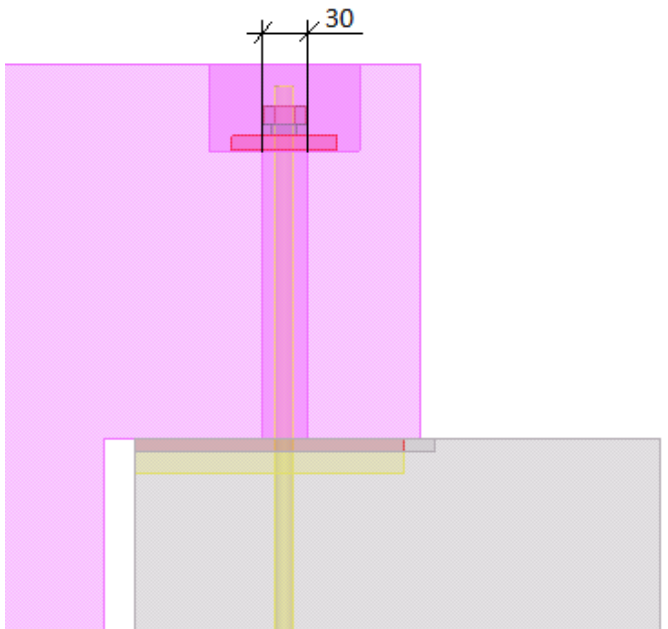
Option	Description
<b>Tubes around anchors to beam</b>	Define how to connect the tubes to the beam.
<b>Tubes all the same L</b>	Define whether the tubes have the same length.
<b>Tubes aligned with</b>	Select whether the tubes are aligned with the main part, or with the top or bottom of the secondary part.
<b>Create cuts around tubes</b>	Select whether cuts are created around the tubes.

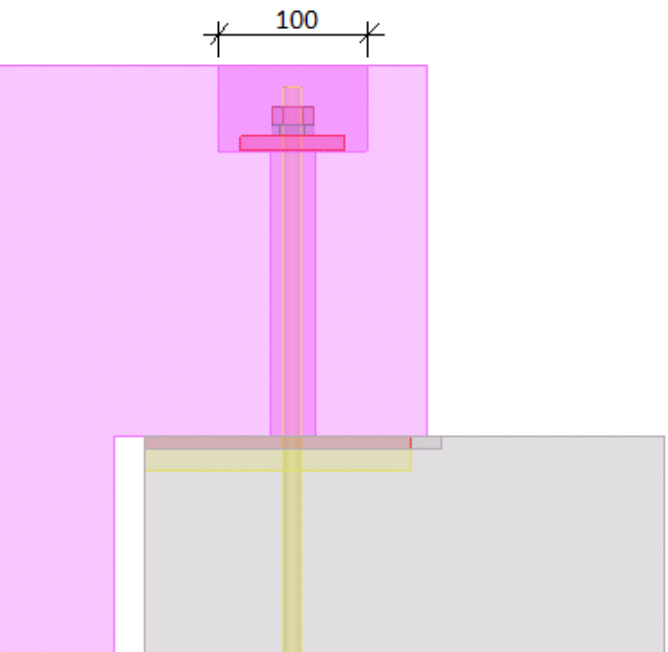
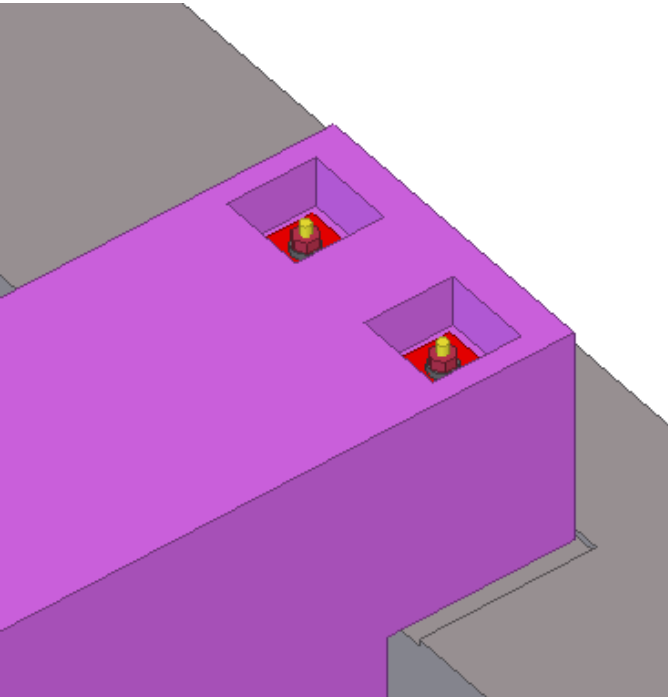
### Anchor rods tab

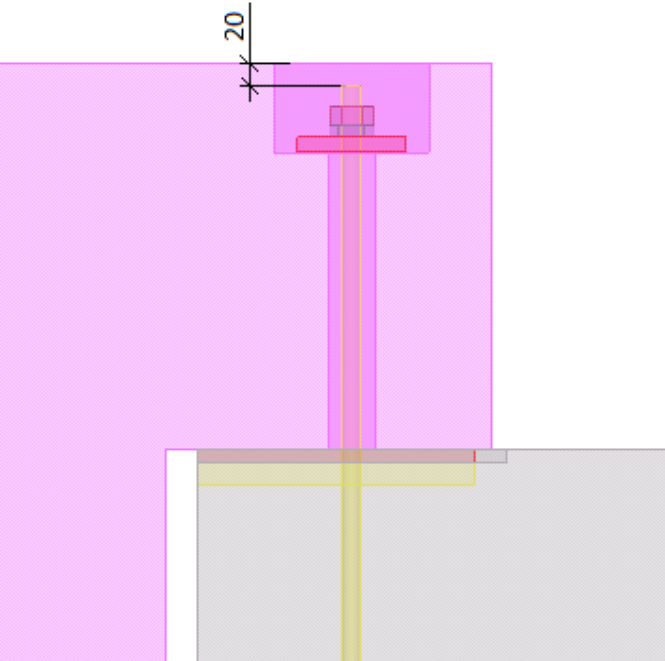
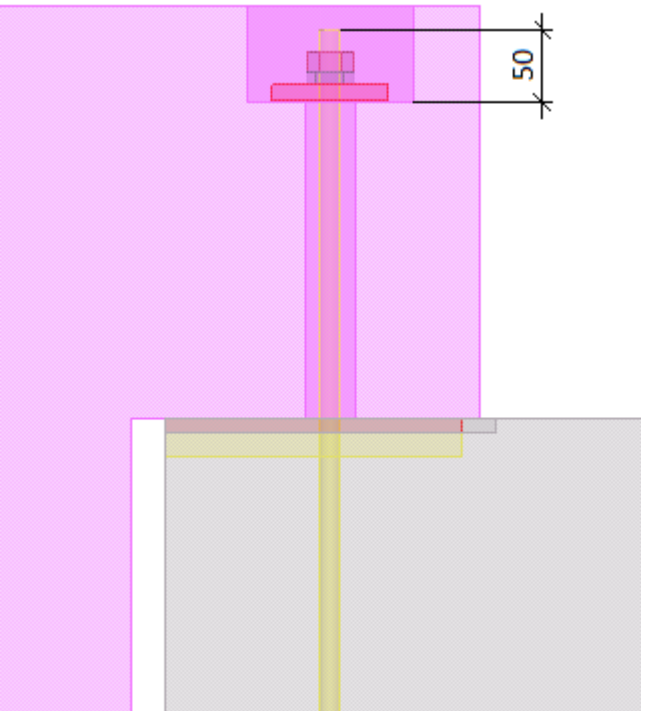
Use the **Anchor rods** tab to control the number, dimensions and position of the anchor rods and the dimensions of the recesses in the main and secondary parts.

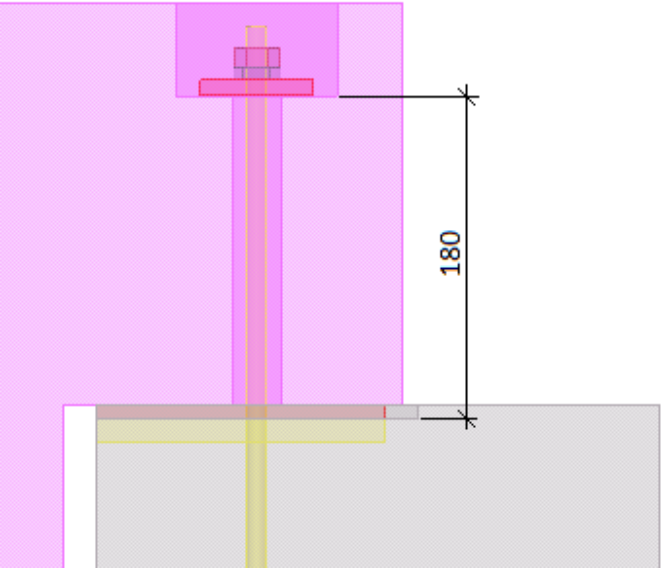
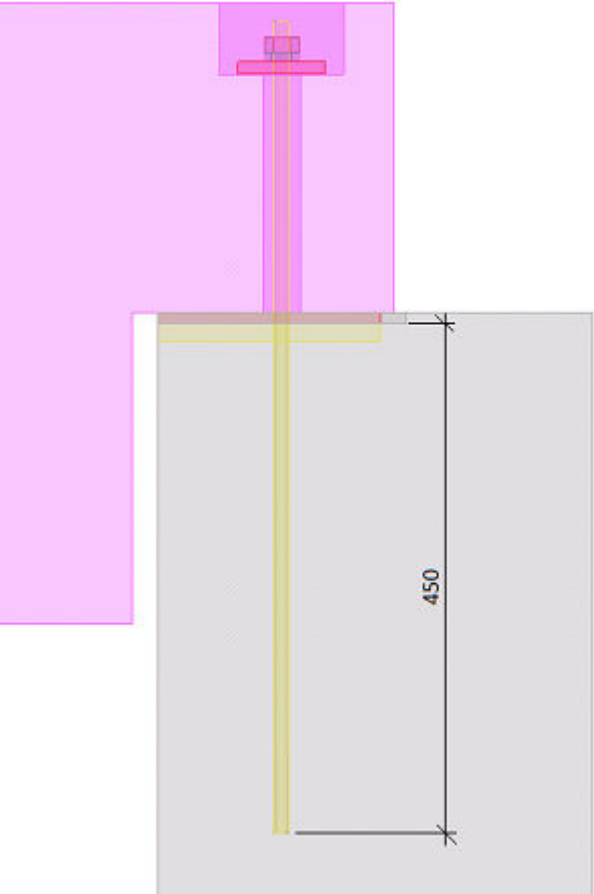
## Dimensions

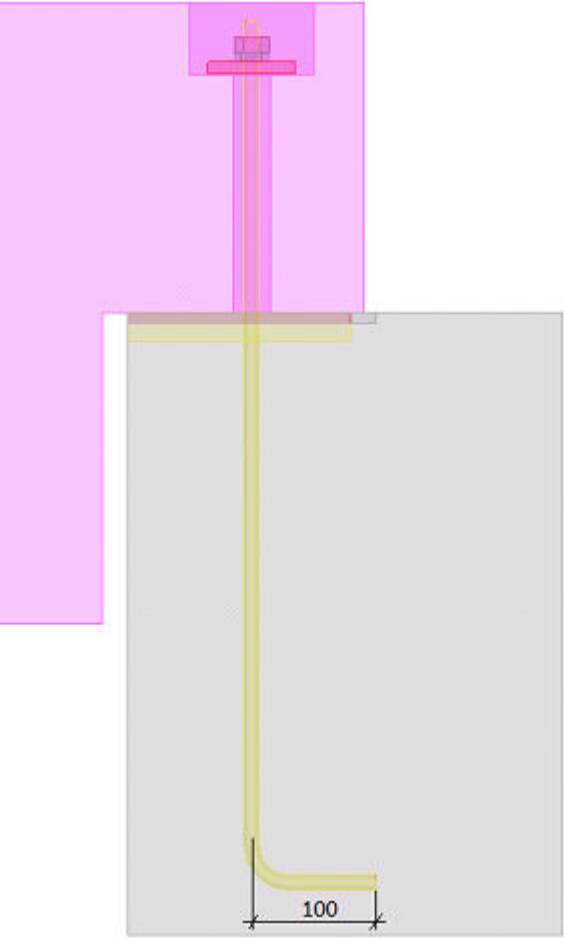


	Description	Example
1	Define the size of the holes in the beam.	 <p>The example diagram shows a cross-section of a concrete beam with a hole. A dimension line indicates a width of 30 for the hole.</p>

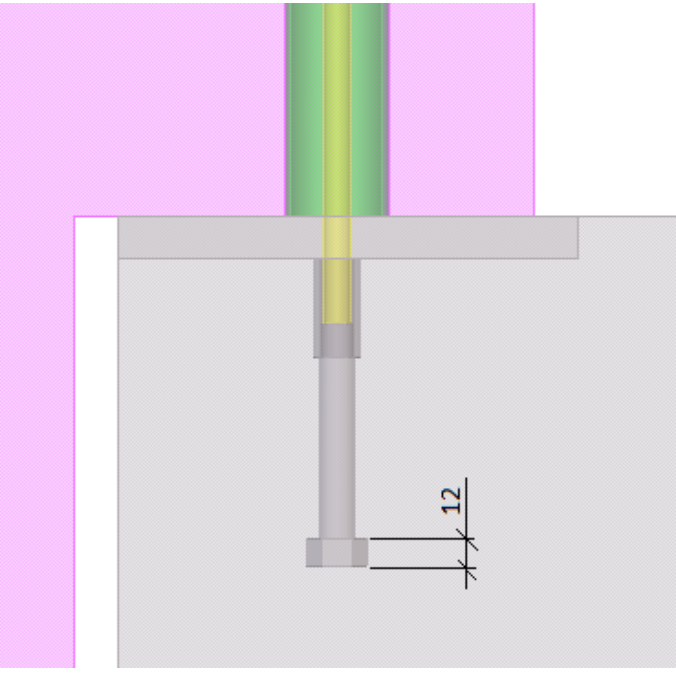
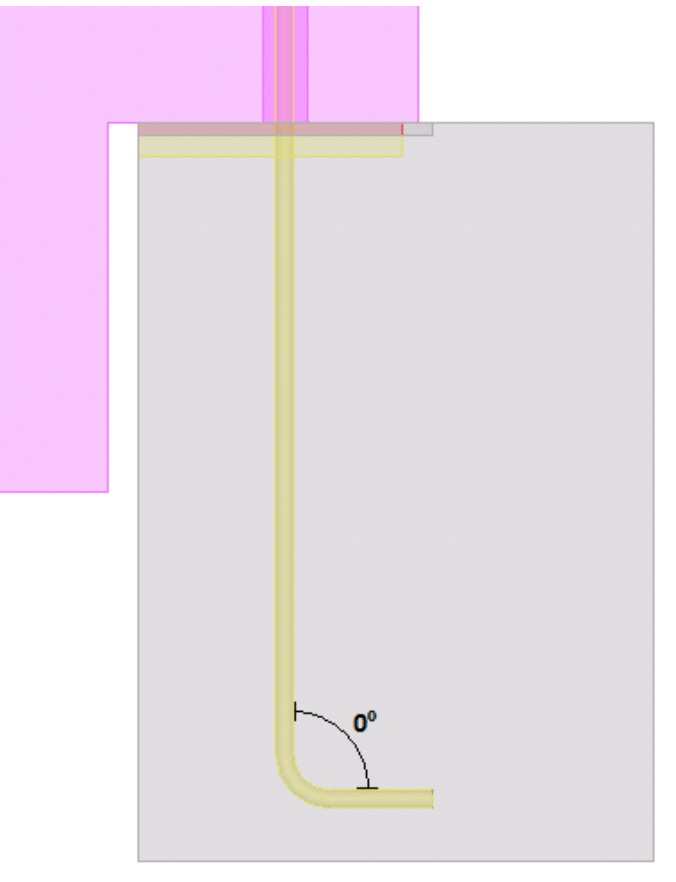
	<b>Description</b>	<b>Example</b>
<b>2</b>	Define the size of the recesses in the beam in both directions.	 <p>The diagram shows a cross-section of a concrete beam (pink) with a vertical rod (yellow) passing through it. A horizontal plate (red) is attached to the rod. A dimension line above the rod indicates a width of 100 units for the recessed area. The beam is shown in a grey background.</p>
<b>3</b>	Define the type of the holes in the beam.	 <p>The diagram shows a 3D perspective view of a concrete beam (purple) with two square holes. Each hole contains a red and yellow object, possibly representing a reinforcement or a specific type of hole.</p>

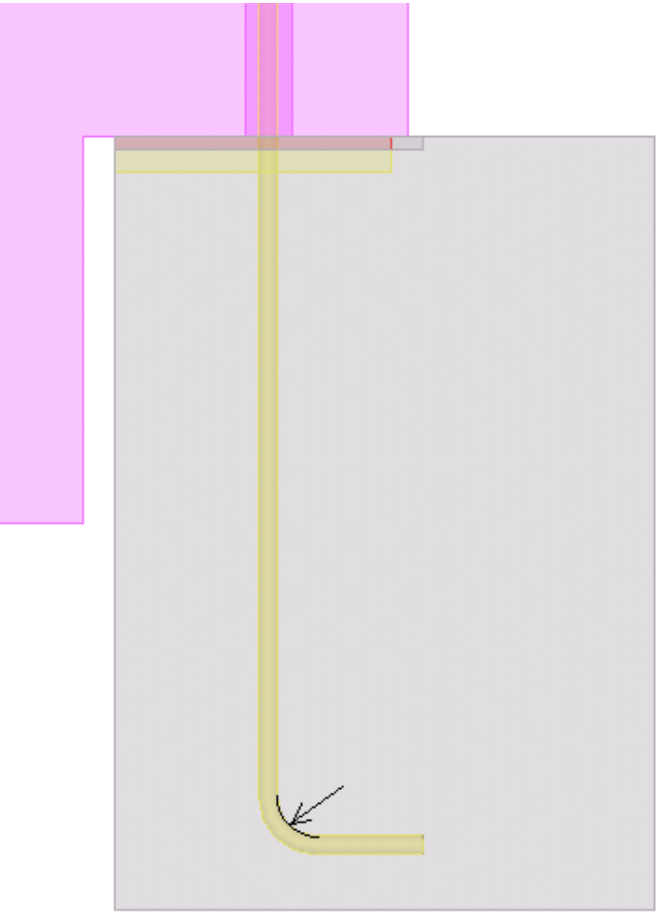
	<b>Description</b>	<b>Example</b>
<b>4</b>	Define the distance between the top of the anchor rod and the top of the beam.	
<b>5</b>	Define the distance between the bottom of the recess and the top of the anchor rod.	

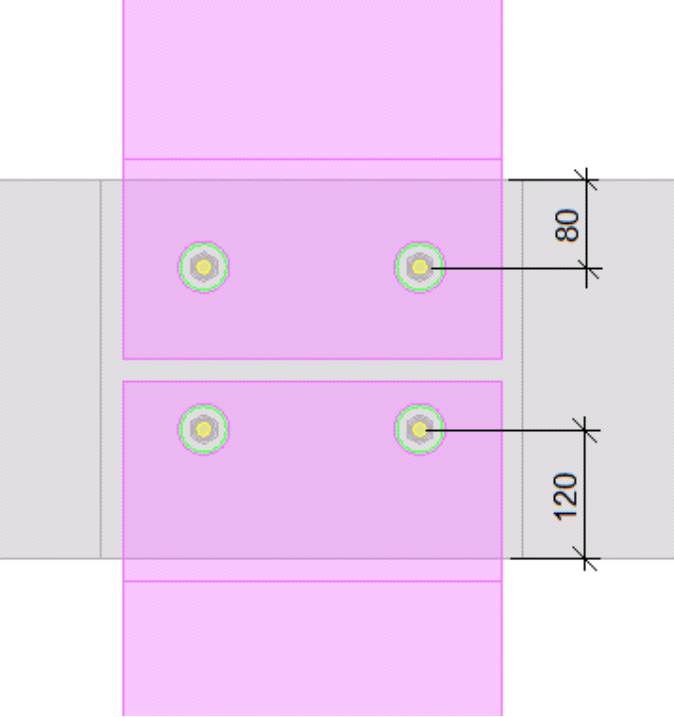
	<b>Description</b>	<b>Example</b>
<b>6</b>	Define the distance between the bottom of the recess in the main part and the bottom of the recess in the secondary part.	
<b>7</b>	Define the distance from the centerline of the secondary parts to the outer contour of the main part.	

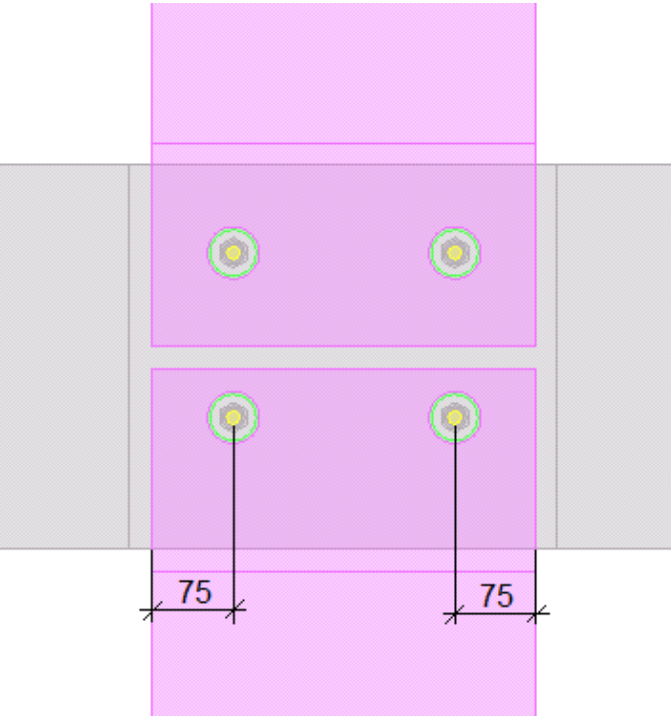
	Description	Example
8	Define the width of the anchor rod hook.	 <p>The diagram shows a cross-section of a concrete wall and a foundation. A yellow anchor rod is embedded in the concrete. The rod is vertical in the wall and has a hook at the bottom in the foundation. A dimension line at the bottom of the hook indicates a width of 100 mm. The top part of the wall is highlighted in pink, and the foundation is shaded in grey.</p>

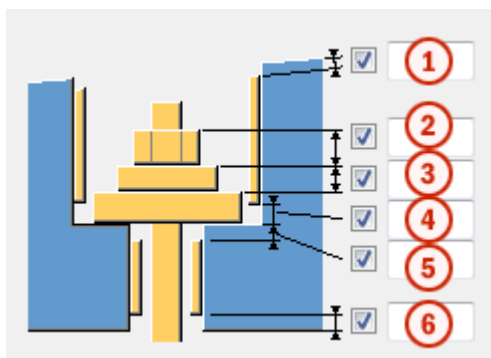


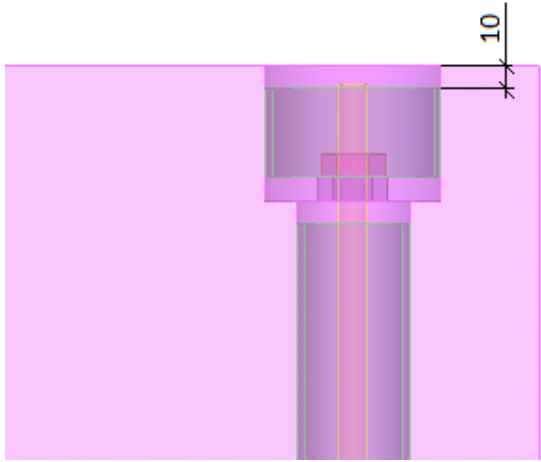
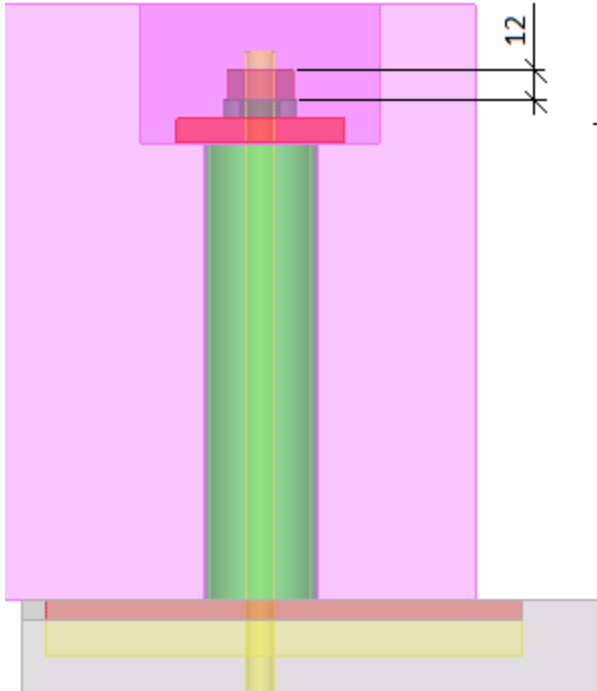
	Description	Example
9	Define the height of the anchor.	 <p>The diagram shows a cross-section of a concrete wall with a pink background. A vertical yellow rod passes through the wall. The portion of the rod that is embedded in the concrete is highlighted in green. A dimension line with arrows indicates the height of this embedded portion, which is labeled as 12.</p>
10	Define the angle of the anchor rod hook.	 <p>The diagram shows a cross-section of a concrete wall with a pink background. A yellow rod passes through the wall. The rod is bent into a hook shape at the bottom. The angle between the vertical part of the rod and the horizontal part of the hook is indicated by a curved arrow and labeled as 0°.</p>

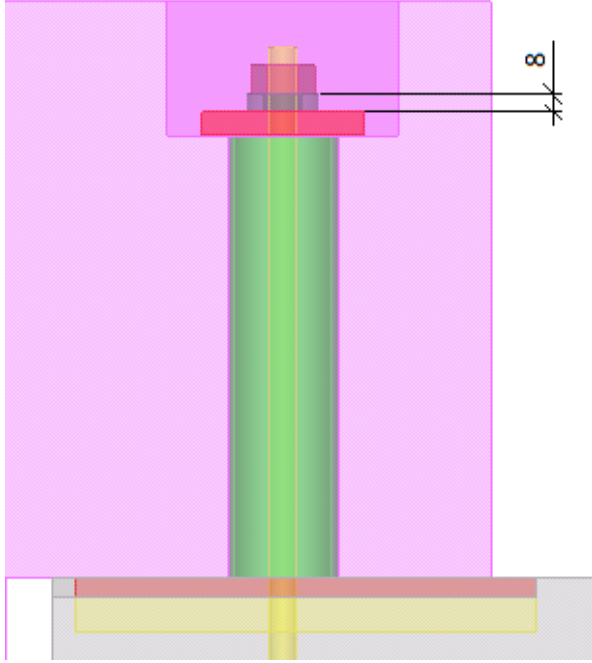
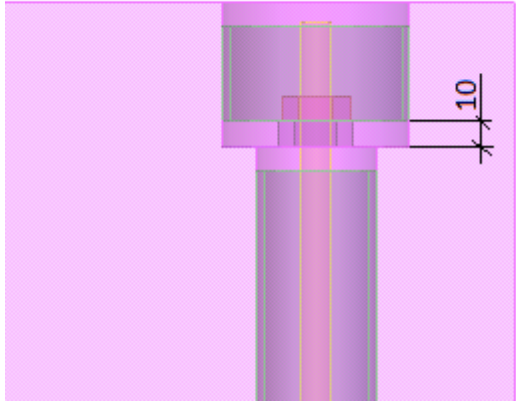
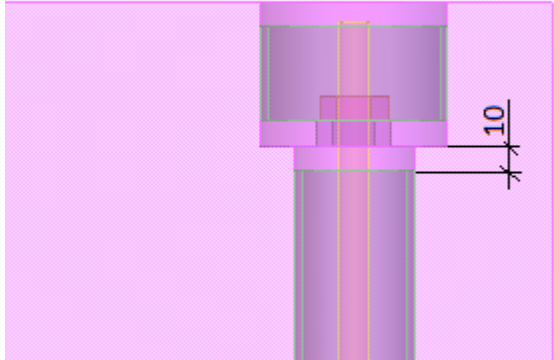
	<b>Description</b>	<b>Example</b>
<b>11</b>	Define the radius of the anchor rod hook in the main part in the vertical direction.	

	Description	Example
<b>12</b>	Define the anchor rod edge distances from the main part.	 <p>The diagram illustrates a cross-section of a concrete slab with two rows of anchor rods. The top row of rods is positioned 80 units from the right edge of the slab. The bottom row of rods is positioned 120 units from the right edge of the slab. The rods are shown as yellow circles with green outlines, and the concrete slab is shown in grey. The anchor rods are embedded in a pink rectangular area representing the main part of the slab.</p>
<b>13</b>	Define the number of anchor rods.	
<b>14</b>	Define the anchor rod spacing.  Use a space to separate anchor rod spacing values. Enter a value for each space between anchor rods. For example, if there are 3 anchor rod rows, enter 2 values.	

	Description	Example
15	Define the anchor rod edge distances from the secondary parts.	
16	Define the number of anchors rods.	
17	Define the anchor rod spacing.  Use a space to separate anchor rod spacing values. Enter a value for each space between anchor rods. For example, if there are 3 anchor rod rows, enter 2 values.	



	<b>Description</b>	<b>Example</b>
<b>1</b>	Define the distance between the top side of the top tube and the top of the part.	 <p>A cross-sectional diagram of a bolted joint. A central bolt is shown in purple, passing through a nut and a top tube. The top tube is also purple. The distance between the top surface of the top tube and the top surface of the nut is indicated by a dimension line with the number 10.</p>
<b>2</b>	Define the height of the nut.	 <p>A cross-sectional diagram of a bolted joint. A central bolt is shown in green, passing through a nut and a top tube. The top tube is purple. The nut is red. The height of the nut is indicated by a dimension line with the number 12. Below the top tube, there is a yellow layer and a grey base.</p>

	Description	Example
3	Define the height of the washer.	 <p>A cross-sectional diagram of a bolt and nut assembly. The bolt is green, the nut is purple, and the washer is red. The washer is positioned between the nut and a base. A dimension line on the right indicates the height of the washer is 8 units.</p>
4	Define the distance between the bottom side of the top tube and the bottom side of the recess.	 <p>A cross-sectional diagram of a bolt and nut assembly. The bolt is purple, the nut is purple, and the top tube is purple. The top tube is positioned above the nut. A dimension line on the right indicates the distance between the bottom side of the top tube and the bottom side of the recess is 10 units.</p>
5	Define the distance between the top side of the bottom tube and the bottom side of the recess.	 <p>A cross-sectional diagram of a bolt and nut assembly. The bolt is purple, the nut is purple, and the bottom tube is purple. The bottom tube is positioned below the nut. A dimension line on the right indicates the distance between the top side of the bottom tube and the bottom side of the recess is 10 units.</p>

	Description	Example
6	Define the distance between the bottom side of the bottom tube and the bottom side of the part.	

### Recesses

Define whether anchors and recesses are created.

Option	Description
	Anchors and recesses
	Anchors
	Recesses

In the list below the options, select whether the position of anchor rods is calculated in the coordinate system of the main part or the secondary part.

### Socket tab

Use the **Socket** tab to control the socket properties and how the sockets are connected. If you create the sockets on the **Socket** tab, the anchors on the **Anchors rods** tab are automatically considered as sockets.

## Sockets

Option	Description
<b>Create socket</b>	Select whether sockets are created and which parts are included.
<b>Connect socket to prim by</b>	Select how the sockets are connected to the main part.
<b>Connection rod-connector</b>	Select how to connect the rod connector.
<b>Type of reinforcing bars</b>	Select the rod type.
<b>Leg rotation</b>	Select the direction of the sockets. In the second list, define the angle of the sockets.

## Connecting profile, Rod

Option	Description
<b>Connecting profile</b>	Select the profile from the profile catalog.
<b>Rod</b>	Select the rod profile from the profile catalog. If you set the <b>Type of reinforcing bars</b> option to <b>Reinforcing bar</b> , select the reinforcing bar from the catalog.

Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Comment</b>	Add a comment about the part.	

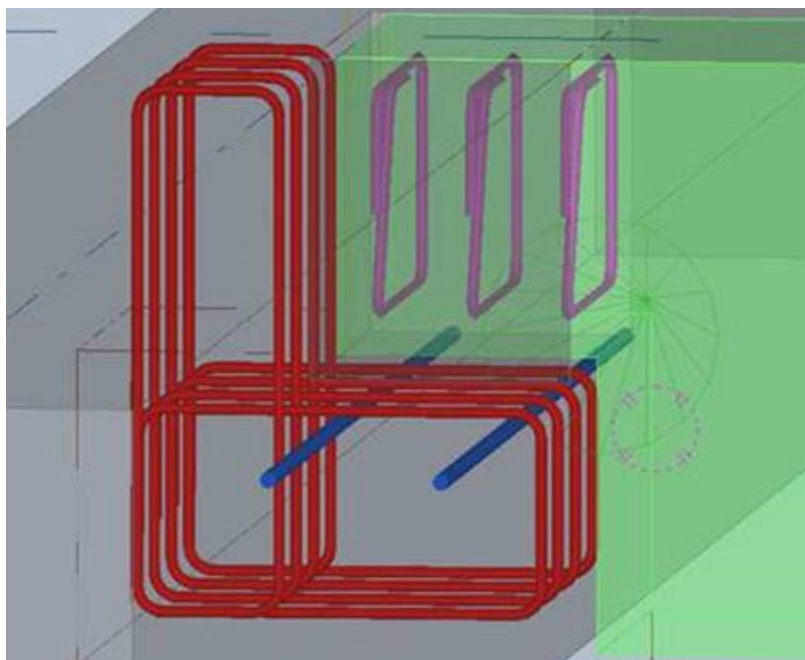


## Partname component

Option	Description
<b>Partname component</b>	If you use a custom component to create the socket, browse for the component and use the list of options to position the custom component.  To use saved custom component properties, select the saved properties file.

## Rebars in primary tab / Rebars in secondary tab

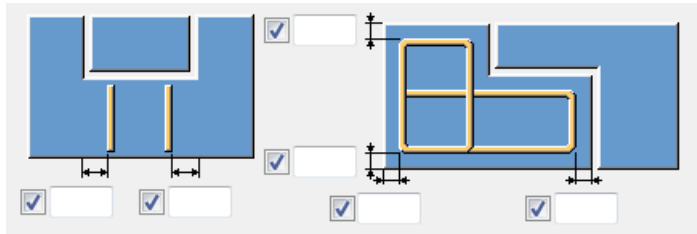
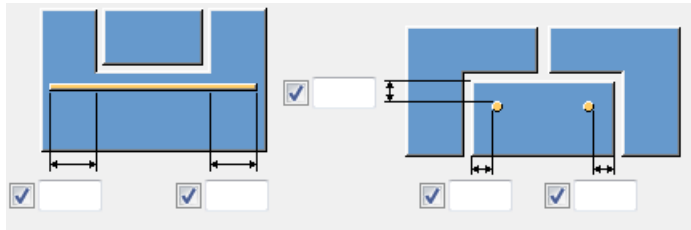
Use the **Rebars in primary** tab and **Rebars in secondary** tab to create reinforcing bars and stirrups at the connection position. On the **Rebars in primary** tab you can create longitudinal reinforcing bars and stirrups for the main part, and on the **Rebars in secondary** tab you can define stirrups for the secondary part.



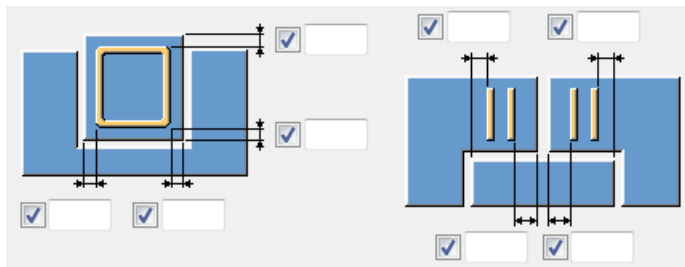
## Rebars in primary

Create the rebars for the main part either by defining the number of rebars, or by setting the spacing or the exact space.

Set the rebar properties, and define the cover thickness and leg length from the edge of the opening.



### Rebars in secondary



#### General tab

Click the link below to find out more:

[General tab](#)

#### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

## Panels and walls

This section introduces components that can be used in concrete panels and walls.

Click the links below to find out more:

- [Wall to wall connection \(page 2883\)](#)
- [Wall groove seam detail \(page 2889\)](#)
- [Anchor \(10\) \(page 2895\)](#)

- [Wall wall teeth \(12\) \(page 2909\)](#)
- [Electric box in wall \(84\) \(page 2917\)](#)
- [Sandwich and double wall \(page 2932\)](#)
- [Sandwich wall horizontal seam \(page 2960\)](#)
- [Sandwich wall vertical seam \(page 2968\)](#)
- [Sandwich wall window \(page 2975\)](#)
- [Wall layout tools \(page 2997\)](#)
- [Geometry detailing strip \(page 3030\)](#)

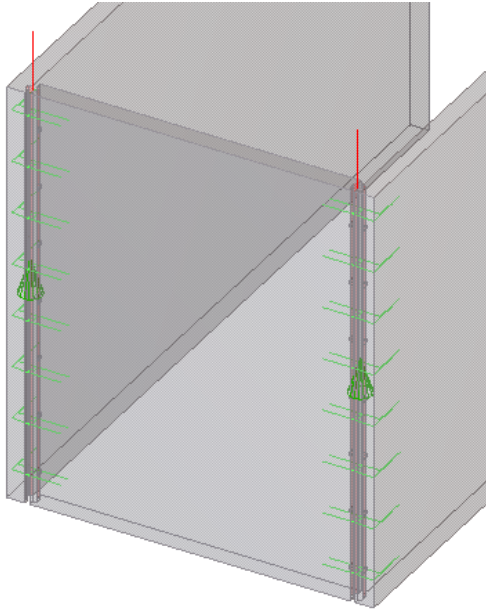
### ***Wall to wall connection***

**Wall to wall connection** creates a connection between two precast walls. The connection can contain a groove with or without additional shear teeth. Additionally, the connection can create reinforcing bar loops or embeds that work as connectors in the walls.

### **Objects created**

- Groove
- Shear teeth or shear cups
- U bars
- Embeds
- Long bar

## Use for

Situation	Description
	Wall to wall connection with groove, shear teeth, U bars and a loose bar.

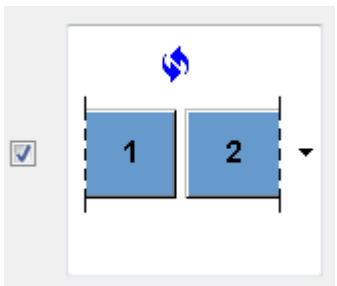
## Selection order

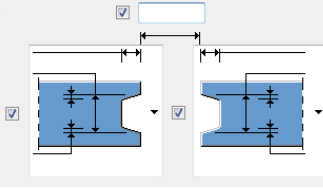
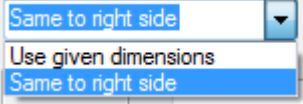
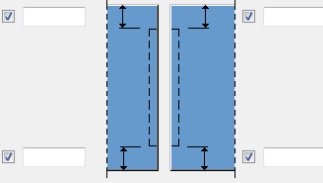
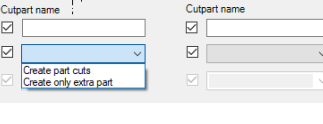
1. Select the first wall.
2. Select the second wall.

The connection is created automatically when the second wall is selected.

## Edge shape tab

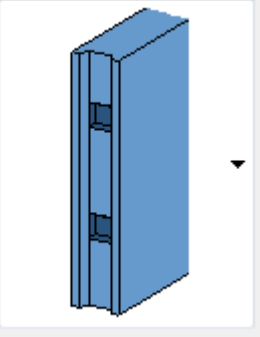
Use the **Edge shape** tab to select the wall framing type

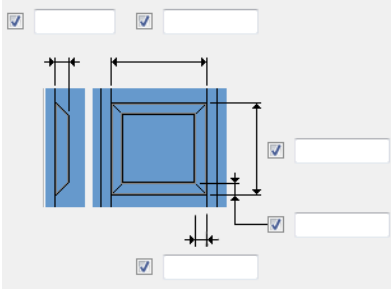
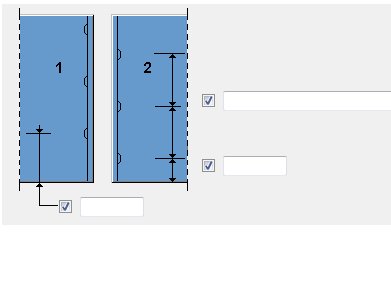
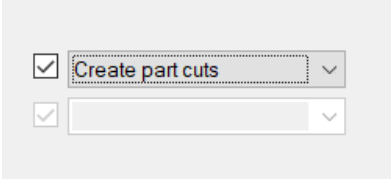
Option	Description
	<p>Wall framing type selection.</p> <p>Wall framing type selection affects the wall edge shape options.</p> <p>You can use the connection in three different modeling situations:</p> <ul style="list-style-type: none"><li>• end-to-end</li><li>• corner</li></ul> <p>With this option the first selected wall is fitted to align with the exterior face of the second selected wall.</p> <ul style="list-style-type: none"><li>• tee</li></ul>

Option	Description
	<p>Wall edge shape. Select the edge shape of each wall. Adjust the free space between two walls.</p>
	<p>Wall edge dimensions. To set the edge shape and dimensions independently for both walls, use the <b>Use given dimensions</b> option. To make the edge shape similar in both walls, use the <b>Same to right side</b> option.</p>
	<p>Groove start and end point. You can define the start point and the end point of the groove. If you do not enter a value, or enter 0, the groove is applied at full height of the wall.</p>
	<p>Select to create part cuts or only extra part cuts, and define the name of the cut. You can set this separately for both walls. For part properties of extra part cuts, select a saved settings file.</p>

### Extra teeth tab

Use the **Extra teeth** tab to define the properties for additional shear teeth.

Option	Description
	<p>Select whether additional shear teeth or shear cups are created. Teeth or cups can also be created when there is no groove.</p>

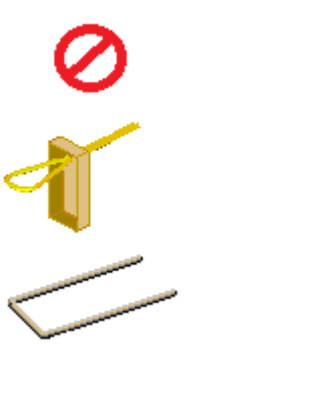
Option	Description
	<p>Dimensions of a single tooth or cup.</p>
	<p>Location of the first tooth or cup in the first wall and in the second wall, and the spacing between the teeth or cups.</p> <p>You can enter a list of spaces, for example 10*400, or just a single value. When you enter a single value, the number of teeth or cups is calculated automatically based on the height of the connection.</p>
	<p>Select to create part cuts or only extra part cuts, and define the name of the cut.</p>

### Connectors tab

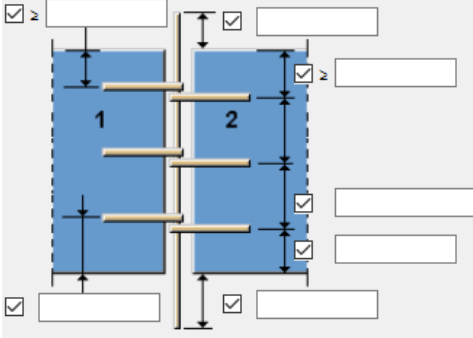
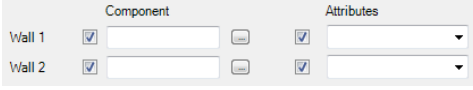
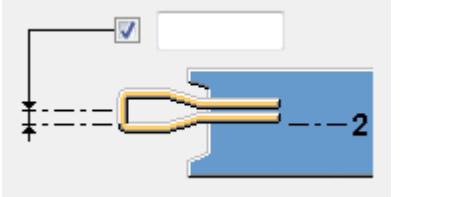
Use the **Connectors** tab to select the type of connectors created.

### Connector type

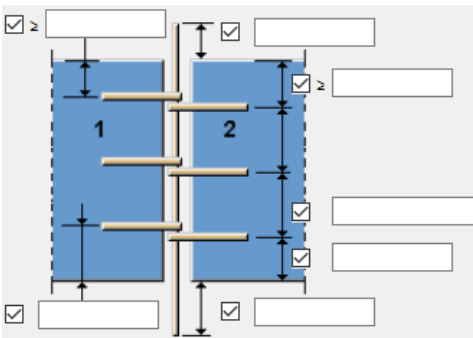
The content of the **Connectors** tab varies depending on the type of the selected connectors.

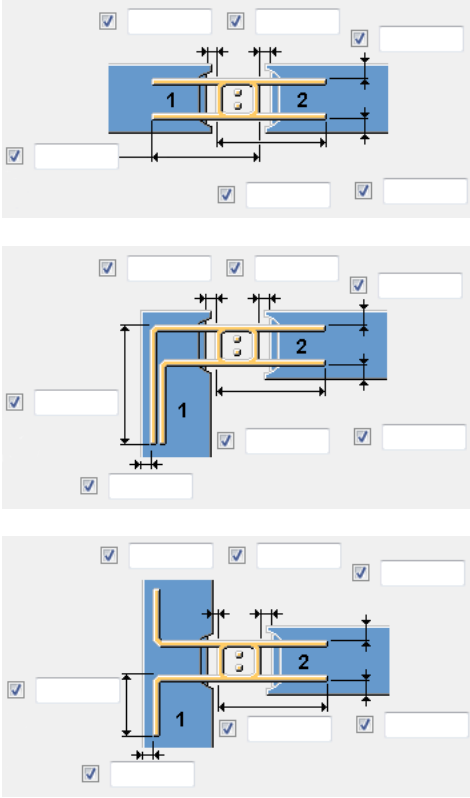
Option	Description
	<p>Connector type.</p> <ul style="list-style-type: none"> <li>No connectors. Only groove with or without shear teeth is created.</li> <li>Connectors are created by using the selected embed (custom part).</li> <li>Connectors are created by adding reinforcing bar loops. Reinforcing bar loop is formed depending on the wall framing type.</li> </ul> <p>In addition, the connector can optionally create one or more long reinforcing bars along the connection.</p>

## Embeds and loose rebar

Option	Description
	<p>Location of the first connector (embed) in the first wall and in the second wall, location of the last rebar/embed in the wall top edge, and the spacing between the connectors.</p> <p>You can enter a list of spaces, for example 10*400, or just a single value, for example 300. When you enter a single value, the number of connectors is calculated automatically based on the height of the connection.</p> <p>You can also define the extended length of the loose long bar.</p>
	<p>Select which embeds (custom parts) are created in each wall.</p> <p>If the embed has any saved attributes, select which attributes are used.</p>
	<p>Offset of the embed.</p> <p>By default, the embed input points are in the center of the wall.</p> <p>To add multiple connector embeds in the same height section, you can add additional offsets in the box. For example, -75 75 will create 2 connector embeds both located 75 mm from the panel's centerline.</p>

## U bars and loose rebar

Option	Description
	<p>Location of the first connector (reinforcing bar loop) in the first wall and in the second wall, and the spacing between the connectors.</p> <p>You can enter a list of spaces, for example 10*400, or just a single value, for example 300. When you enter a single value, the number of connectors is</p>

Option	Description
	<p>calculated automatically based on the height of the connection.</p> <p>You can also define the extended length of the loose long bar.</p>
	<p>Reinforcing bar loop dimensions.</p> <p>The available dimension options depend on the wall framing type selected on the <b>Edge shape</b> tab.</p> <p>Many of the dimensions have counter parts in the first wall and in the second wall. It is enough to enter one dimension and by default the counter part dimension gets the same value.</p>
<b>Number of bars</b>	<p>Number of long loose bars.</p> <p>If you do not want to create a loose long bar, enter 0 as the <b>Number of bars</b>.</p>

### Reinforcing bar properties

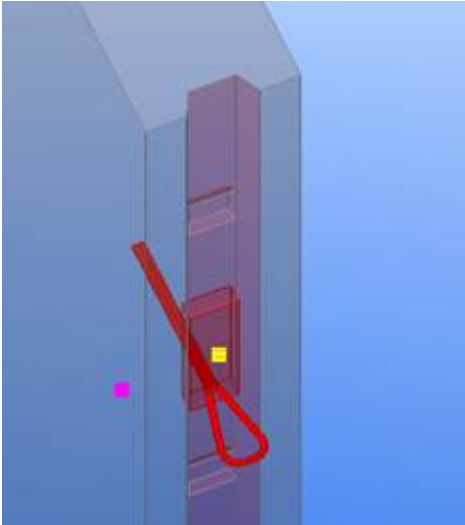
Enter the properties for reinforcing bar **Grade, Size, Name, Class, Prefix** and **Start Number**.

### Customization

If needed, you can create your own embed (custom part) and use it as a connector.

When creating the embed, ensure that the input points are defined so that they are compatible with **Wall to wall connection**. The image below shows examples of the input points.





### Thickening tab

Use the **Thickening** tab to create an extra thickening to one or both walls.

Option	Description
<p>The 'Option' column contains three diagrams illustrating thickening options. The top diagram shows a simple rectangular thickening tab on the left side of a wall. The middle diagram shows a stepped thickening tab with a horizontal dimension line and a vertical dimension line. The bottom diagram shows a stepped thickening tab with a horizontal dimension line and a vertical dimension line.</p>	<p>Select to which side of the wall the thickening will be created. The final location of the extra thickening depends on the actual framing case (end to end, L corner, T corner).</p> <p>Enter the name and class for the extra thickening. Leave the input box empty to use the wall name and/or class.</p>

### Wall groove seam detail

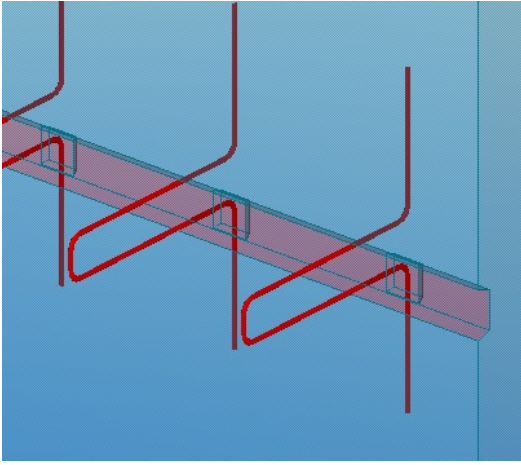
**Wall groove seam detail** creates a groove with optional shear teeth to a precast wall, a slab or a similar part. Additionally the connection can create reinforcing bar loops or embeds that work as connectors in the walls.

### Objects created

- Groove

- Shear teeth or shear cups
- U bars
- Embeds
- Long bar

**Use for**

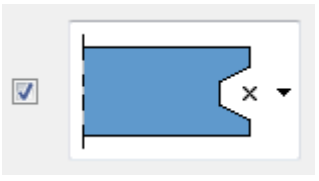
Situation	Description
	Groove with shear teeth and U bars.

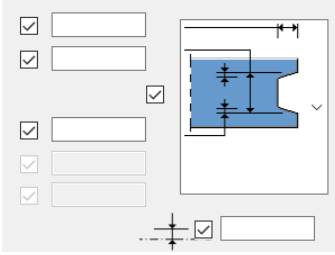
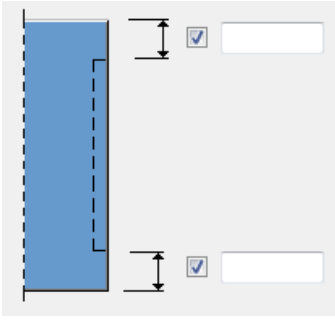
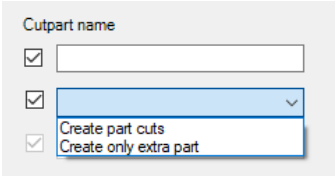
**Selection order**

1. Select the wall or slab.
2. Pick the start point of the groove.
3. Pick the end point of the groove.

**Edge shape tab**

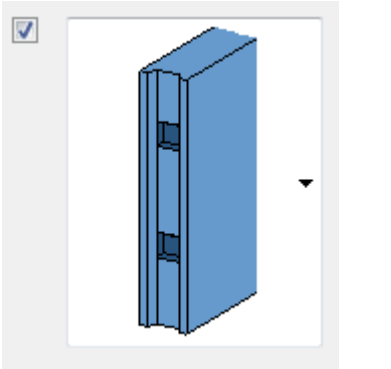
Use the **Edge shape** tab to select the orientation of the groove.

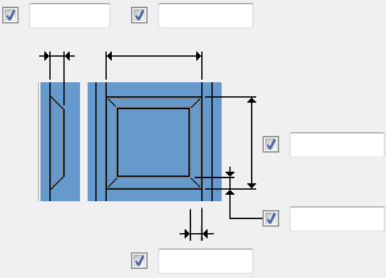
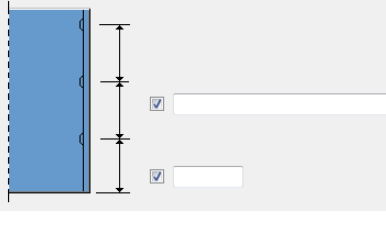
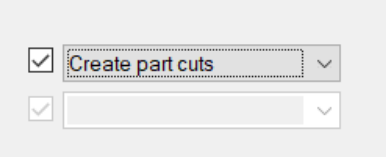
Option	Description
	Groove orientation selection. Define the orientation of the groove in relation to the input points.
<b>Create fitting</b>	Select whether the part end fitting is created.

Option	Description
	<p>Groove edge shape.</p>
	<p>Groove start and end point in relation to input points.</p> <p>You can define the start point and the end point of the groove. If you do not enter a value, or enter 0, the groove is applied at full height of the wall.</p>
	<p>Select to create part cuts or only extra part cuts, and define the name of the cut. For part properties of extra part cuts, select a saved settings file.</p>

### Extra teeth tab

Use the **Extra teeth** tab to define the properties for additional shear teeth.

Option	Description
	<p>Select whether additional shear teeth or shear cups are created.</p> <p>Teeth or cups can also be created when there is no groove.</p>


Option	Description
	<p>Dimensions of a single tooth or cup.</p>
	<p>Location of the first tooth or cup in the groove, and the spacing between the teeth or cups.</p> <p>You can enter a list of spaces, for example 10*400, or just a single value. When you enter a single value, the number of teeth or cups is calculated automatically based on the height of the detail.</p>
	<p>Select to create part cuts or only extra part cuts, and define the name of the cut.</p>

### Connectors tab

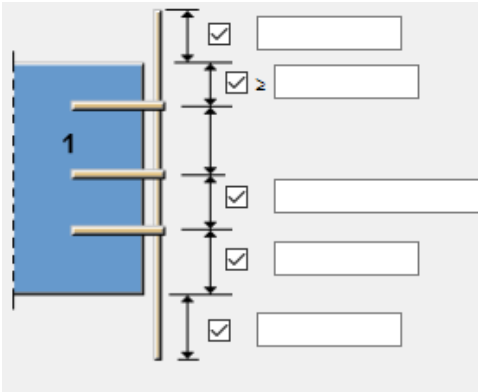

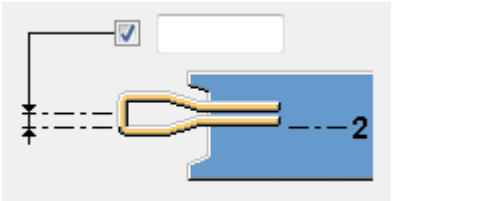
Use the **Connectors** tab to select the type of connectors.

### Connector type

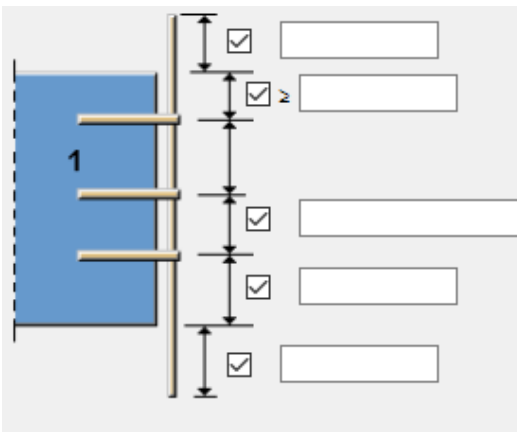
The content of the **Connectors** tab varies depending on the type of the selected connectors.

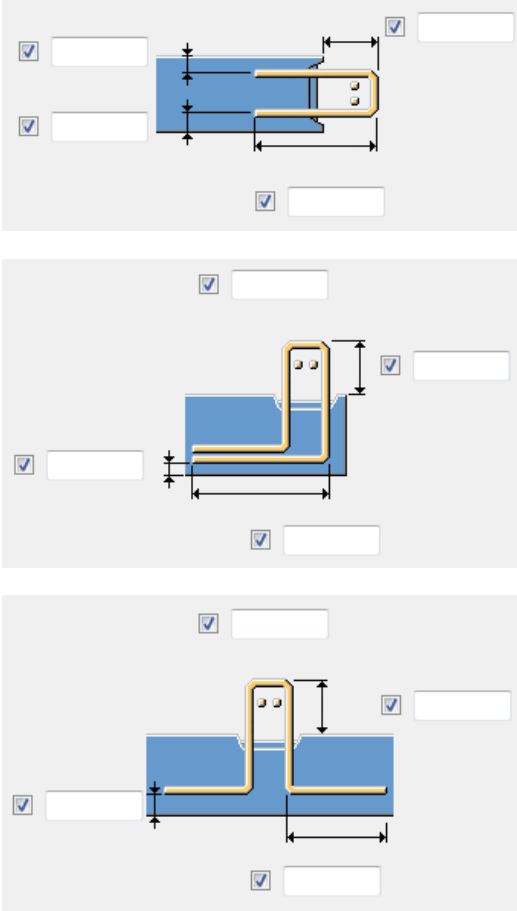
Option	Description
	<p>Connector type.</p> <ul style="list-style-type: none"> <li>No connectors. Only groove with or without shear teeth is created.</li> <li>Connectors are created by using the selected embed (custom part).</li> <li>Connectors are created by adding reinforcing bar loops. Reinforcing bar loop is formed depending on the framing type.</li> </ul> <p>In addition, the connector can optionally create one or more long reinforcing bars along the connection.</p>

## Embeds and loose rebar

Option	Description
	<p>Location of the first connector (embed) in the groove, location of the last rebar/ embed in the wall top edge, and the spacing between the connectors.</p> <p>You can enter a list of spaces, for example 10*400, or just a single value, for example 300. When you enter a single value, the number of connectors is calculated automatically based on the height of the detail.</p> <p>You can also define the extended length of the loose long bar.</p>
	<p>Select which embeds (custom parts) are created in each groove.</p> <p>If the embed has any saved attributes, select which attributes are used.</p>
	<p>Offset of the embed.</p> <p>By default, the embed input points are in the center of the groove.</p>

## U bars and loose rebar

Option	Description
	<p>Location of the first connector (reinforcing bar loop) in the groove, and the spacing between the connectors.</p> <p>You can enter a list of spaces, for example 10*400, or just a single value, for example 300. When you enter a single value, the number of connectors is calculated automatically based on the height of the detail.</p> <p>You can also define the extended length of the loose long bar.</p>

Option	Description
 <p>The first diagram shows a horizontal bar with a loop on the right side. It has three dimension lines: one for the loop height, one for the loop width, and one for the total bar length. There are three checkboxes, each next to a text input field.</p> <p>The second diagram shows a vertical bar with a loop on top. It has three dimension lines: one for the loop height, one for the loop width, and one for the total bar length. There are three checkboxes, each next to a text input field.</p> <p>The third diagram shows a vertical bar with a loop on top, similar to the second but with a different loop shape. It has three dimension lines: one for the loop height, one for the loop width, and one for the total bar length. There are three checkboxes, each next to a text input field.</p>	<p>Reinforcing bar loop dimensions.</p> <p>The available dimension options depend on the orientation of the groove selected on the <b>Edge shape</b> tab.</p>
<p><b>Number of bars</b></p>	<p>Number of long loose bars</p> <p>If you do not want to create a loose long bar, enter 0 as the <b>Number of bars</b>.</p>

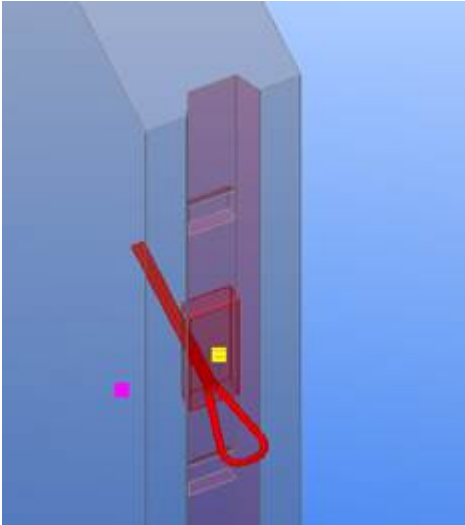
### Reinforcing bar properties

Enter the properties for reinforcing bar **Grade, Size, Name, Class, Prefix** and **Start Number**.

### Customization

If needed, you can create your own custom part (embed) and use it as a connector.

When creating the embed, ensure that the input points are defined so that they are compatible with **Wall groove seam detail**. The image below shows examples of the input points.



### Thickening tab

Use the **Thickening** tab to create an extra thickening to the wall.

Option	Description
<p>The 'Option' column contains three diagrams illustrating different thickening tab configurations. The top diagram shows a simple rectangular tab extending from the left side of a wall. The middle diagram shows a stepped tab with a horizontal dimension line and a vertical dimension line. The bottom diagram shows another stepped tab configuration with similar dimension lines.</p>	<p>Select to which side of the wall the thickening will be created. The final location of the extra thickening depends on the actual framing case (end to end, L corner, T corner).</p> <p>Enter the name and class for the extra thickening. Leave the input box empty to use the wall name and/or class.</p>

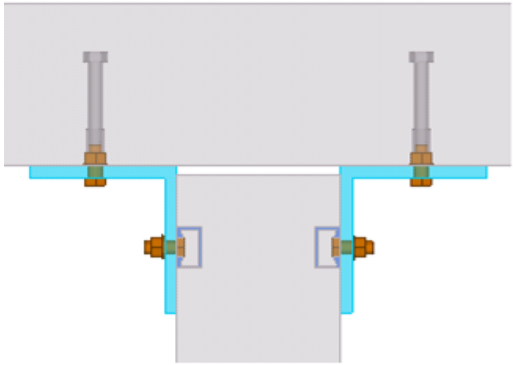

### Anchor (10)

**Anchor (10)** connects two precast concrete parts, for example, two panels or a column to a panel. The precast concrete parts are connected with L profiles and with embedded connection profiles that act as anchors, for example, custom component bolt anchors or cast-in channels. The bolt anchors and the cast-in channels can be single-sided or double-sided. Additionally, seams can be defined between the main part and the secondary parts.

### Objects created

- Anchors (bolt anchors or cast-in channels)
- L profiles
- Bolts

### Use for

Situation	Description
 <p>The diagram illustrates a connection between two concrete panels. A horizontal panel is shown at the top, and a vertical panel is shown below it. Two L-shaped profiles, colored light blue, are attached to the bottom edge of the horizontal panel. Each L-profile is secured to the concrete with a bolt anchor, shown as a grey bolt with a brown nut and washer. The vertical ends of the L-profiles are attached to the top edge of the vertical panel with nuts and washers. The connection is symmetrical.</p>	Connection with L profiles and bolt anchors.
 <p>The diagram illustrates a connection between two concrete panels. A horizontal panel is shown at the top, and a vertical panel is shown below it. An L-shaped profile, colored light blue, is attached to the bottom edge of the horizontal panel. The vertical end of the L-profile is attached to the top edge of the vertical panel with a nut and washer. The horizontal end of the L-profile is embedded in a green rectangular cast-in channel within the horizontal panel. The connection is asymmetrical.</p>	Connection with L profile and cast-in channel.

### Selection order

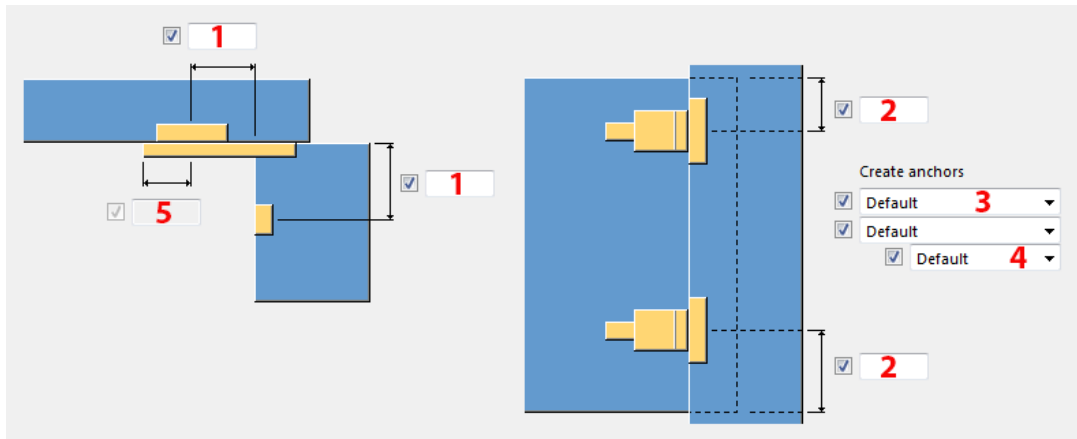
1. Select the main part (precast concrete panel or a column).
2. Select the secondary part (precast concrete panel).

The connection is created automatically when the secondary part is selected.

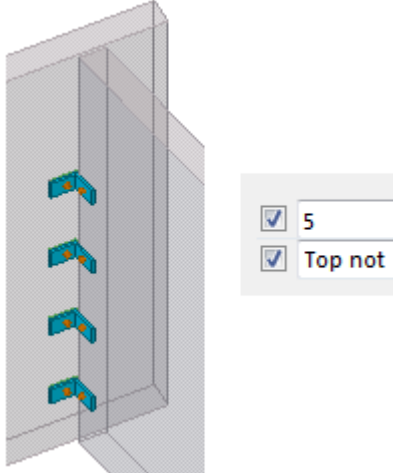
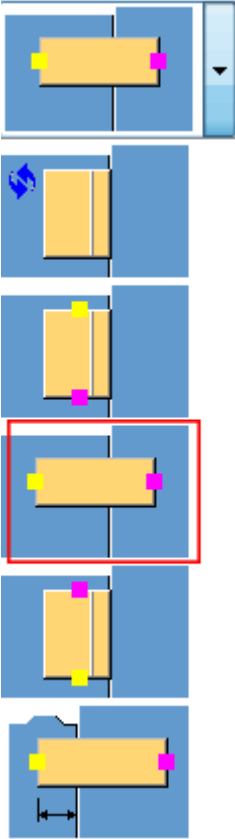
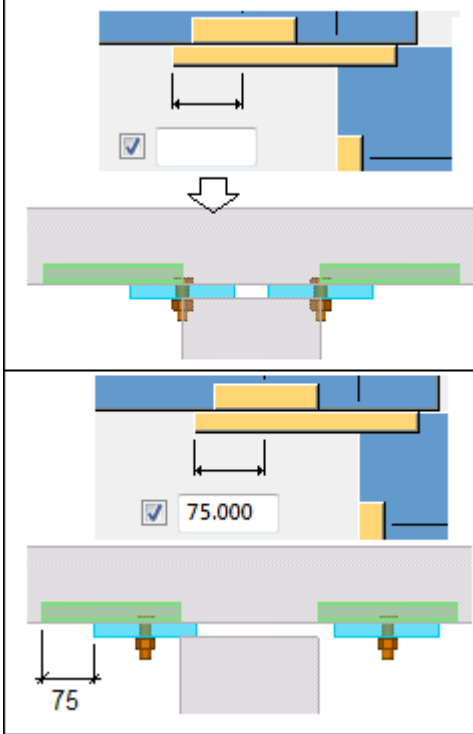


**Picture tab**

Use the **Picture** tab to define the number of anchors (bolt anchors or cast-in channel profiles), edge distances and plate embed offset.



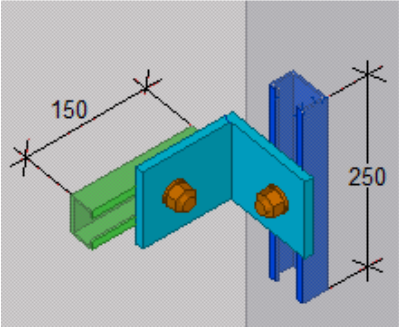
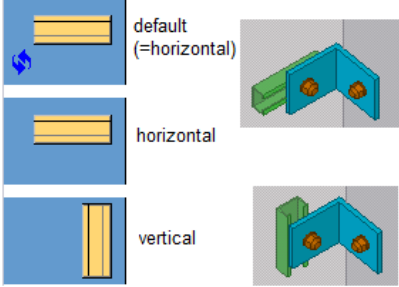
	Description	Example
1	Horizontal offset of the anchors. The offset can be defined for both concrete parts separately.	
2	Vertical offset of the anchors. The offset can be defined for the top and bottom side.	
3	Select how the anchors are distributed.	

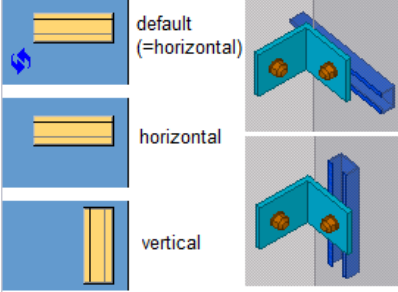
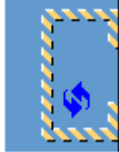



	Description	Example
4	<p>Select which of the anchors are omitted.</p>	
5	<p>Connection plate horizontal offset from the centerline of an anchor.</p> <p>This option is available only if you have set the orientation of the connection plate as follows on the <b>Conn profile</b> tab:</p> 	

## Anchors tab

Use the **Anchors** tab to define the properties, position and orientation of the anchors (bolt anchors or cast-in channel profiles).

	Description	Example
1	Anchor properties in the main part.	<p>Anchor panel Length of profile</p> <p><input checked="" type="checkbox"/> 150.000 <input checked="" type="checkbox"/></p>
2	Select on which side the anchors are created in the main part.	
3	Select whether a profile from the profile catalog is used as an anchor, or a custom part from the <b>Applications &amp; components</b> catalog.	

	Description	Example
4	Anchor properties in the secondary part.	<p>Anchor column Length of profile</p> <p><input checked="" type="checkbox"/> 250.000 <input checked="" type="checkbox"/></p> 
5	Select on which side the anchors are created in the secondary part.	
6	<p>Select whether a profile from the profile catalog is used as an anchor, or a custom part from the <b>Applications &amp; components</b> catalog.</p> <p>To use saved custom component properties, select the saved properties file.</p>	
7	<p>Select the connection method of the anchor.</p> <ul style="list-style-type: none"> <li>• <b>Default</b> (same as <b>Weld to element</b>)</li> <li>• <b>Weld to element</b></li> <li>• <b>Cast unit to element</b></li> <li>• <b>Not add to element</b> (bolt anchors or cast-in channels are loose parts)</li> <li>• <b>Sub-assembly</b></li> </ul>	
8	<p>Position and rotation of the anchors in the main concrete part.</p> <p>For the <b>Position in plane</b> and <b>Position in depth</b> options, an offset can be defined.</p>	
9	Orientation of the anchors in the main part.	

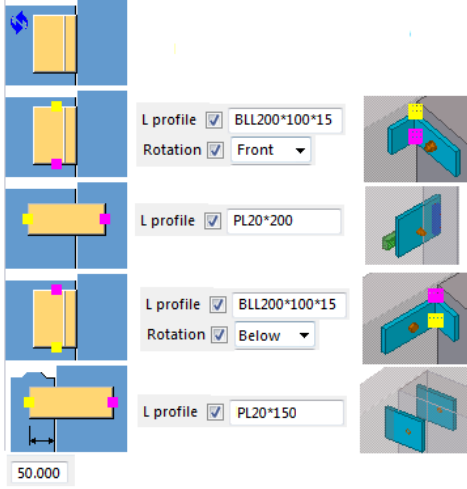
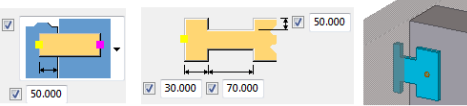
	Description	Example
10	Position and rotation of the anchors in the secondary concrete part. For <b>Position in plane</b> and <b>Position in depth</b> options, an offset can be defined.	
11	Orientation of the anchors in the secondary part.	 <p>default (=horizontal)</p> <p>horizontal</p> <p>vertical</p>
12	Select the cut-out method of the anchors.	 <p>Default, no cut</p>  <p>No cut</p>  <p>Cut-out shape is the exact profile contour of the bolt anchor or the cast-in channel</p>  <p>Box shape cut-out</p>

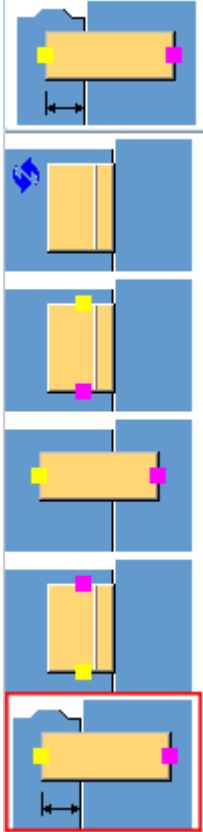
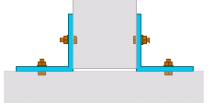
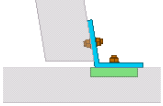
### Conn profile tab

Use the **Conn profile** tab to define the properties and position of the connection L profile.

The screenshot shows the 'Conn profile' configuration window. At the top, there are input fields for 'L profile' with dimensions 't', 'b', and 'h' (labeled 1), 'Pos\_No', 'Material', 'Name', 'Length of profile' (labeled 4), and 'Class'. Below this is a 'Default' dropdown (labeled 2). The 'Partname component' section has a 'Profiles' dropdown (labeled 3). The 'Position in plane' section has 'Right', 'Front', and 'Front' options (labeled 4). The 'Rotation' section has 'Front' and 'Front' options (labeled 5). The 'Position in depth' section has 'Front' and 'Front' options. The 'Add to' section has a 'nothing' option (labeled 7). The 'Connection profile as' section has a 'Libr profile' dropdown (labeled 8) and checkboxes for 'Right flange', 'Left flange', and 'Thickness'. A 3D model of an L-profile connection is shown with a yellow callout (labeled 6) pointing to a dimension line.

	Description	Example
1	Connection profile properties.	<p>Length of profile</p> <p><input checked="" type="checkbox"/> 125.000</p>
2	Select on which side the connection profiles are created.	<p><input checked="" type="checkbox"/> Create both</p>
3	Select whether a profile from the profile catalog is used as a connection profile, or a custom part	

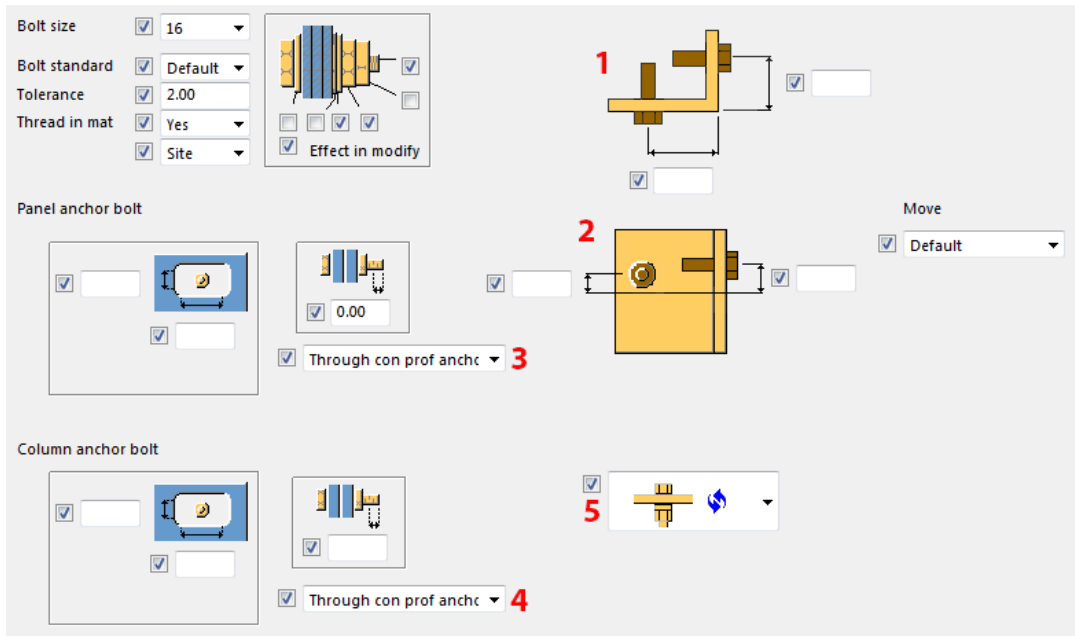
	Description	Example
	from the <b>Applications &amp; components</b> catalog.	
<b>4</b>	Position and rotation of the connection profiles.  For the <b>Position in plane</b> and <b>Position in depth</b> options, an offset can be defined.	
<b>5</b>	Orientation of the connection profile.	
<b>6</b>	Connection profile cuts.  These options are available only if you have set the orientation of the	

	Description	Example
	<p>connection profile as follows on the <b>Conn profile</b> tab:</p> 	
7	Select the connection method of the connection profile.	
8	<p>Select the connection profile type.</p> <ul style="list-style-type: none"> <li>• <b>Library profile</b> (define the profile using the L profile options).</li> <li>• <b>Folded plate</b> (define the dimensions using the options below).</li> </ul>	<div style="display: flex; justify-content: space-around;"> <div> <p>Connection profile as <input checked="" type="checkbox"/> Libr profile</p> <p>Right flange <input checked="" type="checkbox"/></p> <p>Left flange <input checked="" type="checkbox"/></p> <p>Thickness <input checked="" type="checkbox"/></p> </div> <div> <p>Connection profile as <input checked="" type="checkbox"/> Folded Plate</p> <p>Right flange <input checked="" type="checkbox"/> 150.000</p> <p>Left flange <input checked="" type="checkbox"/> 150.000</p> <p>Thickness <input checked="" type="checkbox"/> 15.000</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;">   </div>

### Bolts tab

Use the **Bolts** tab to define the bolt properties and offsets.





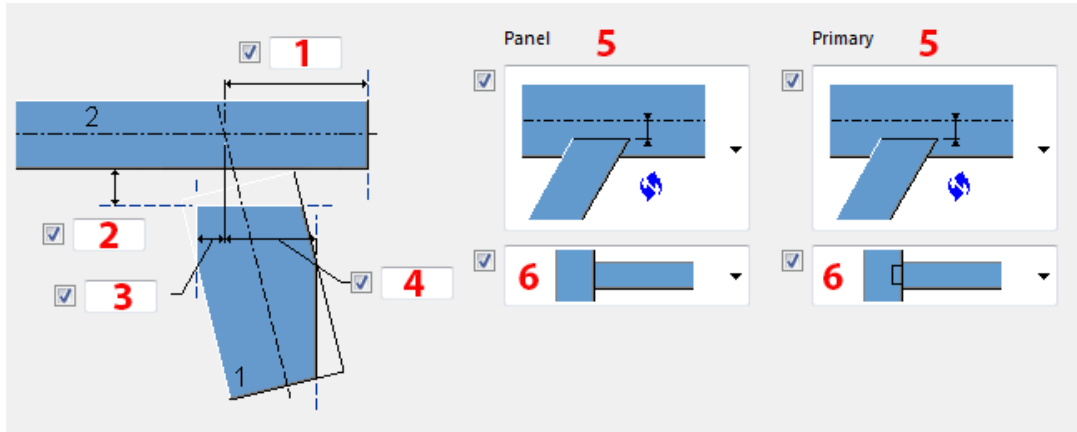
	Description
1	Horizontal bolt distances from the L profile edges. Default value is half of L profile flange width.
2	Vertical bolt offsets. Reference is the L profile centerline. Default value is 0 mm.
3	Select how the bolts are added in the main part.
4	Select how the bolts are added in the secondary part.
5	Bolting direction.

### Cuts tab

Use the **Cuts** tab to define the cuts and the seams in the main and secondary parts.


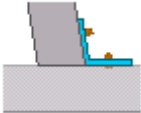
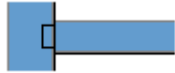


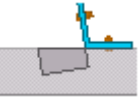
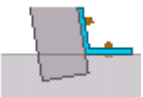
Additionally, the main part can be extended, or the secondary part thickness can be increased or decreased.

You can create a seam by defining a cut between the main part and the secondary part.



	Description	Example
1	<p>Extension of the main part.</p> <p>If you need to extend the part, enter a value. Ensure that you have also selected a cut method from the cut type list. If you select the <b>No cut</b> option, the part is not extended.</p>	
2	<p>Seam width.</p> <p>Reference is the L profile centerline. Default value is 0 mm.</p>	
3	<p>Left side cut along the secondary part.</p> <p>Reference is the part centerline.</p> <p>Part thickness is decreased.</p>	
4	<p>Right side cut along the secondary part.</p> <p>Reference is the part centerline.</p> <p>Part thickness is decreased.</p>	

	Description	Example
5	Cut reference for the main and secondary parts.	<div> </div> <p>Main part near side</p> <div> </div> <hr/> <div> </div> <p>Main part centerline</p> <div> </div> <hr/> <div> </div> <p>Main part far side</p> <div> </div>
6	Select the cut type.	<div> </div> <p>Default, no cut</p>

	Description	Example
		 <p>Reference is the main part. Secondary part will be adjusted to the main part using a fitting.</p> 
		 <p>Reference is the main part. Secondary part will be adjusted to the main part using a line cut.</p> 
		 <p>Reference is main part. Just like previous options, but the longest part of the panel will be removed using a line cut.</p> 
		<p>NO CUT</p> <p>No cut</p> 

**Default tab**

Use **Default** tab to define part distances.

### General tab

Click the link below to find out more:

[General tab](#)

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

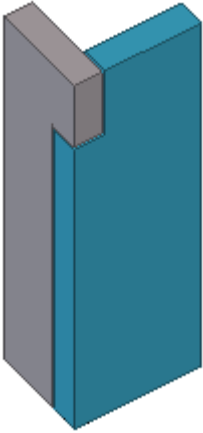
### **Wall wall teeth (12)**

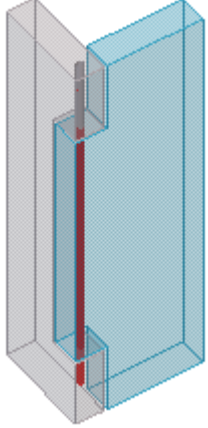
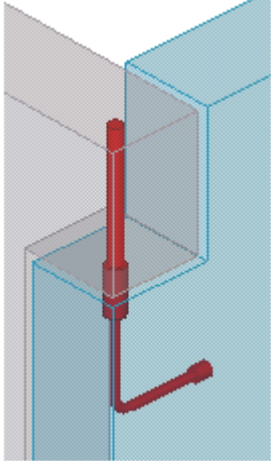
**Wall wall teeth (12)** connects two perpendicular concrete panels with a tooth-shaped connection. The number of teeth can be set. Injection tubes and connection bars can be added to the connection. The connection is created with or without seams.

### Objects created

- Tooth connection (2 or 3 teeth) between two panels
- Injection tubes
- Connection bars

### Use for

Situation	Description
	2-teeth connection between two panels. The height of the teeth can be modified and the clearance between the teeth can be set.

Situation	Description
	<p>3-teeth connection between two panels with connection bar.</p>
	<p>Tooth connection between two panels with connection bar and socket.</p>

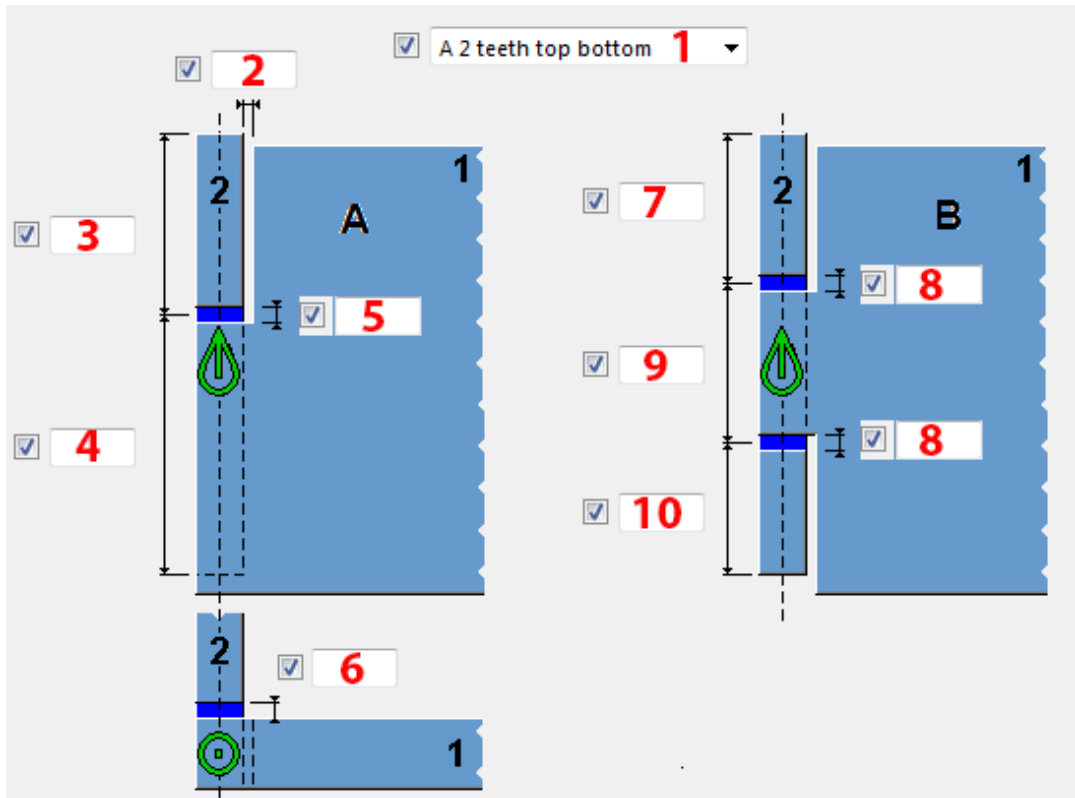
### Selection order

1. Select the main part (concrete panel).
2. Select the secondary part (concrete panel).

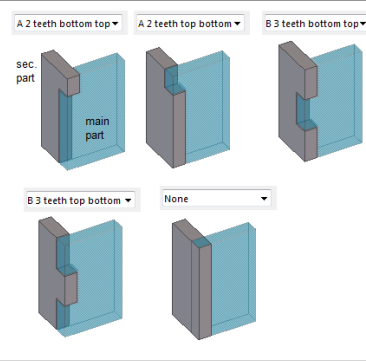
The connection is created automatically when the secondary part is selected.

### Picture tab

Use the **Picture** tab to define the number of teeth, the height of teeth, and seam widths. **Wall wall teeth (12)** has two main connection types: **A** (two teeth) and **B** (three teeth).



Description	
1	Select the number and position of teeth. <b>Standard is A 2 teeth bottom up.</b>
2	Horizontal seam width in the main part. For type <b>A</b> (2-teeth connection).
3	Secondary part tooth height. Reference is center of the seam. For type <b>A</b> (2-teeth connection).
4	Main part tooth height. Reference is center of the seam. For type <b>A</b> (2-teeth connection). This value has an effect only if the secondary part tooth height ( <b>3</b> ) has no value.
5	Vertical seam width between the teeth. For type <b>A</b> (2-teeth connection).
6	Horizontal seam width in the main part. For type <b>A</b> (2-teeth connection).



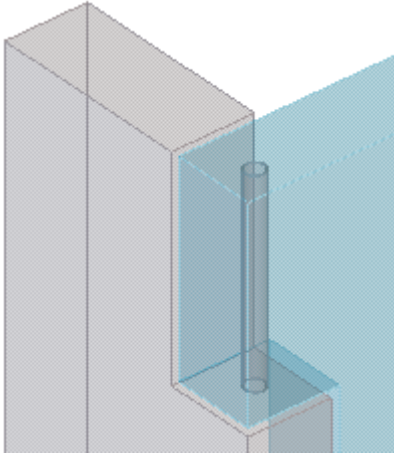
	<b>Description</b>
<b>7</b>	<p>Top tooth height. For type <b>B</b> (3 teeth connection).</p> <p>Reference is center of the seam.</p> <p>If there is no value, and the middle tooth height and the bottom tooth height are defined, then the top tooth gets the residual height distance.</p> <p>If none of the tooth heights are defined, then all three teeth get an equal height: <math>(\text{wall height} - \text{seam width}) / 3</math></p> <p>This value has lowest priority from the three tooth height-defining values.</p> <p>Example:</p> <p>Panel height is 1500mm. All three tooth heights are defined:</p> <ul style="list-style-type: none"> <li>• Top: 400mm</li> <li>• Middle: 700mm</li> <li>• Bottom: 600mm</li> </ul> <p>Total defined height of teeth = 1800mm. Result: top tooth gets height <math>1500 - 700 - 600 = 200\text{mm}</math></p>
<b>8</b>	Vertical seam width between the teeth. For type <b>B</b> (3-teeth connection).
<b>9</b>	<p>Bottom tooth height.</p> <p>Reference is center of the seam. For type <b>B</b> (3-teeth connection).</p> <p>If there is no value, and the top tooth and the middle tooth height are defined, then the bottom tooth gets the residual height distance.</p>

### **Parts tab**

Use the **Parts** tab to define the properties and dimensions of injection tubes and connection bars.



	t	b	h	Pos_No	Material	Name	Class	Comment
Injection tubes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/> No action <b>1</b>							
Top tooth	<input checked="" type="checkbox"/> Yes + weld							
Middle tooth	<input checked="" type="checkbox"/> No action							
Bottom tooth	<input checked="" type="checkbox"/> No action							
Connection bar	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/> No action <b>2</b>							
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	<b>3</b>							<b>4</b>
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	<b>5</b>							<b>6</b>
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	<b>7</b>							
Tooth part cut name	<input checked="" type="checkbox"/>							
Injection tubes part cut name	<input checked="" type="checkbox"/>							

Option	Description
<b>Injection tubes</b>	Injection tube properties. You can define the placing of the injection tubes separately for the top tooth, middle tooth and bottom tooth.
<b>1</b>	Select whether an injection tube is created. Example:  Default is <b>No action</b> .
<b>Top tooth</b> <b>Middle tooth</b> <b>Bottom tooth</b>	Select whether an injection tube is created in the teeth and select the connection method. Default is <b>Part cut</b> .

Option	Description
<b>Connection bar</b>	Connection bar properties. One connection bar can be created through the teeth.
<b>2</b>	Select whether a connection bar is created and the connection method. Default is <b>Yes + weld 1</b> .
<b>3</b>	Depth of a connection bar from the top of the top tooth. Default is <b>0</b> .
<b>4</b>	Depth of an injection tube from the top of the top tooth. Default is <b>0</b> .
<b>5</b>	Depth of a connection bar from the top of the bottom tooth. Default is <b>top tooth height + seam width</b> . If both values <b>5</b> and <b>7</b> are defined, then the value in the box <b>7</b> overwrites the value in the box <b>5</b> .
<b>6</b>	Depth of an injection tube from the bottom of the bottom tooth. Default is <b>0</b> .
<b>7</b>	Depth of a connection bar from the bottom of the bottom tooth. If both values <b>5</b> and <b>7</b> are defined, then the value in the box <b>7</b> overwrites the value in the box <b>5</b> .

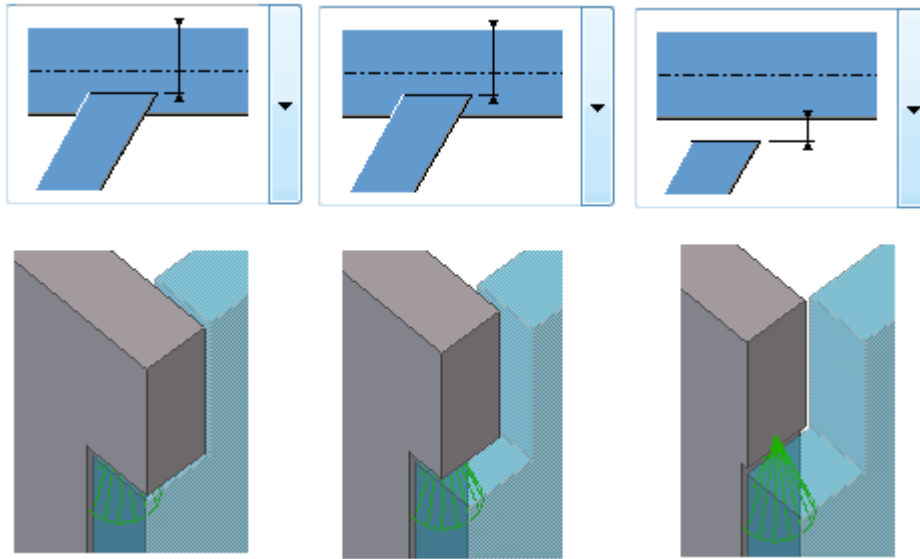
### **Cut sec tab**

Use the **Cut sec** tab to define the way the secondary concrete panel is cut.

By default the component creates a 2-teeth connection.

You can also define a fixed offset value for the cut.

If the concrete panels are not perpendicularly orientated, you can define how the secondary part is fitted to the main part.

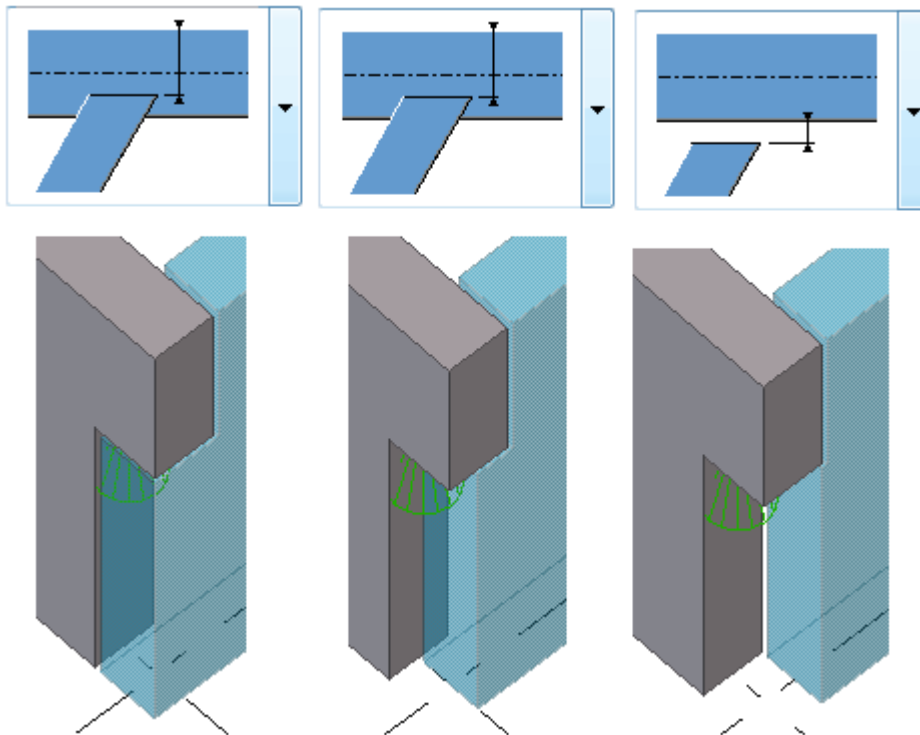


### Cut prim tab

Use the **Cut prim** tab to define the way the main concrete panel is cut.

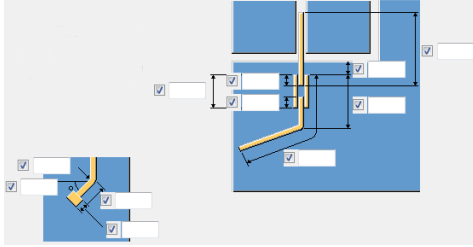
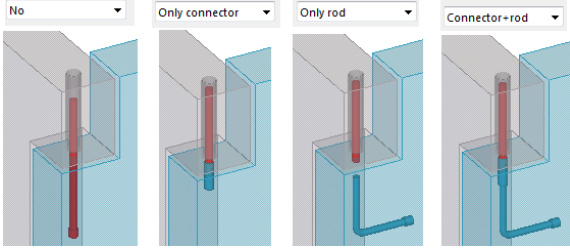
You can also define a fixed offset value for the cut.

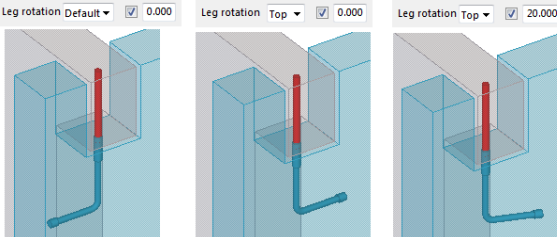
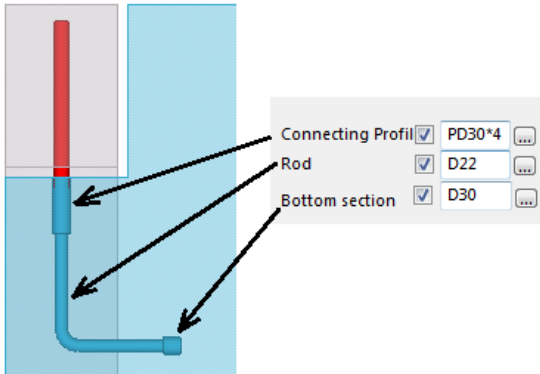
If the concrete panels are not perpendicularly orientated, you can define how the main part is fitted to the secondary part.



### Socket tab

Use the **Socket** tab to define whether socket anchors are created, how they are connected and the dimensions and position of the socket anchors. Sockets are created only if you have created connection bars.

Option	Description
	Dimensions for socket anchor, rod profile and connecting profile.
<b>Create socket</b>	<p>Select whether sockets are created and which parts are included.</p> <p>Note that a socket is created only if a connection bar has been created on the <b>Parts</b> tab.</p> <p>In the examples the red profile is the connection bar:</p> 
<b>Connect socket</b>	<p>Select how the sockets are connected to the main part.</p> <p>Default is <b>By cast unit</b>.</p>
<b>Connection rod-connector</b>	<p>Select the connection method between the rod and the connecting profile.</p> <p>Default is <b>Part add conn to rod</b>.</p>
<b>Rod type</b>	<p>Select the rod type.</p> <p>Default is <b>Poly-profile</b>.</p>
<b>Leg rotation</b>	<p>Select the direction of the rod. You can enter an angle in the box on the right.</p>

Option	Description
	<p>Default is <b>Front</b>.</p> 
<p><b>Connecting profile</b> <b>Rod</b> <b>Bottom section</b></p>	<p>Properties for the connecting profile, rod and bottom section.</p> <p>Note that the bottom section is part-added to the rod automatically.</p> <p>Example:</p> 
<p><b>Partname component</b></p>	<p>If you want to use a custom part to create the socket, select the <b>Custom part</b> option in the <b>Create socket</b> list.</p> <p>Then browse for the component, and use the list of options to position the custom part. To use saved custom component properties, select the saved properties file.</p>

**General tab**

Click the link below to find out more:

**Analysis tab**

Click the link below to find out more:

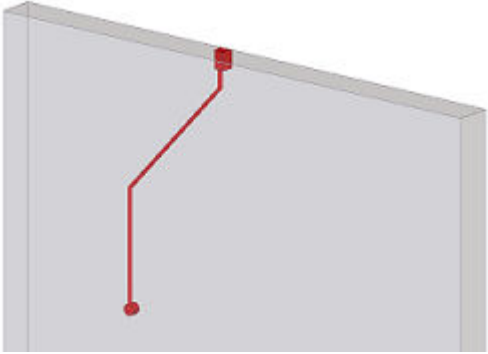
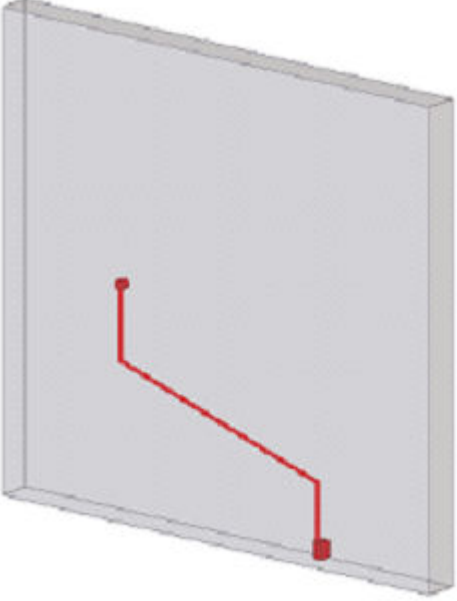
### ***Electric box in wall (84)***

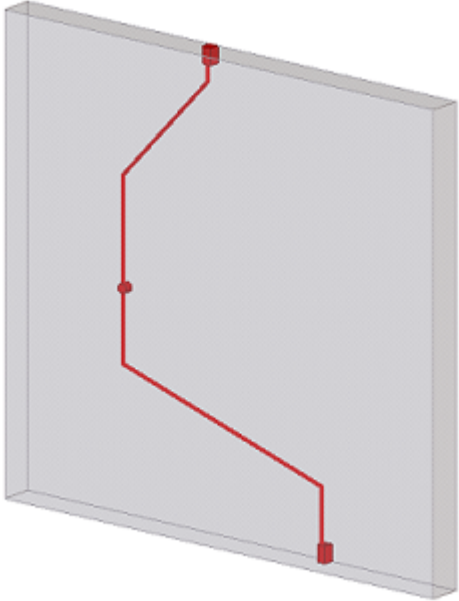
**Electric box in wall (84)** creates electric boxes in walls.

#### **Objects created**

- Electric boxes
- Tubes

#### **Use for**

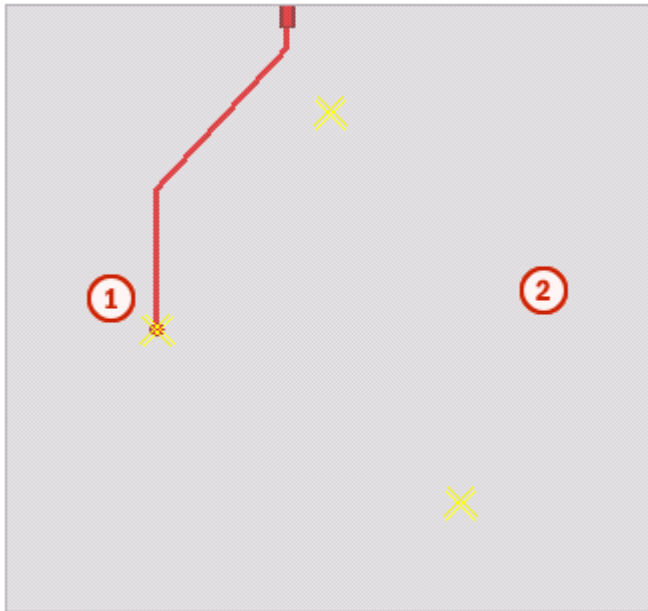
<b>Situation</b>	<b>Description</b>
	Electric box in a wall with top connection.
	Electric box in a wall with bottom connection.

Situation	Description
 A 3D perspective view of a grey concrete wall. A red line represents an electrical conduit. It starts at a red square connection point on the top edge of the wall, goes down, then left, then down again to a red dot (representing an electric box) on the wall's surface, then right, then down to a red square connection point on the bottom edge of the wall.	Electric box in a wall with top and bottom connections.

**Selection order**

1. Select a concrete panel.
  2. Pick a position for the electric box.
  3. Pick a position for the top connection.
  4. Pick a position for the bottom connection.
- The electric box and connections are created automatically.

### Part identification key



	Part
①	Electric box
②	Panel

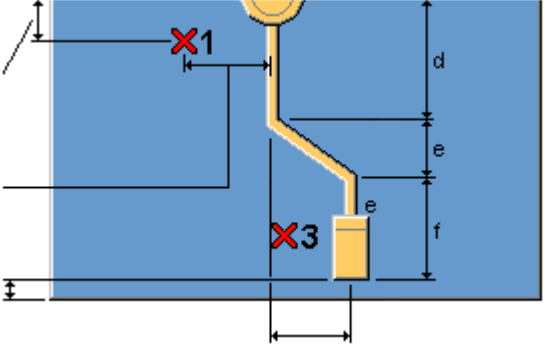
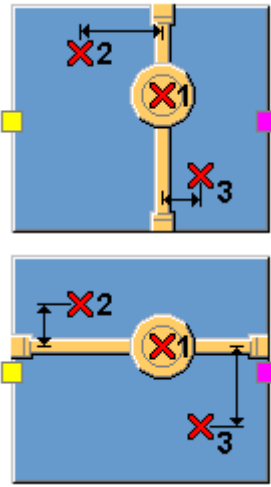


### Picture tab

Use the **Picture** tab to control the shape, number and position of the tubes and the position of the electric boxes.

### Tube direction

Option	Description
	Select the tube shape in the up direction.



Option	Description
	<p>Select the tube shape in the down direction.</p>
	<p>Select the tube direction in relation to the start point (yellow) and end point (magenta) of the wall.</p>
	<p>Select the number of tubes in the up direction.</p>
	<p>Select the number of tubes in the down direction.</p>

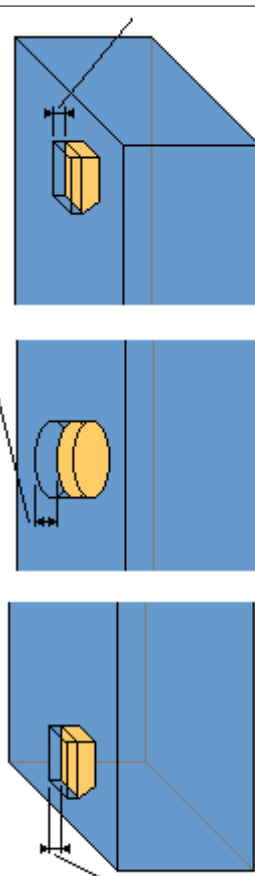
### Tubes to concrete / Electric parts to concrete

Select how the tubes and the electric parts are connected to the concrete part.

Option	Description
<b>As subassembly</b>	Add as a subassembly to the concrete part.
<b>By cast unit</b>	Add to the concrete part.

Option	Description
<b>Welds</b>	Weld to the concrete part.
<b>Not</b>	Do not connect to the concrete part.

### Tube and electric box positions

Option	Description
	Select the position of the up connection in the concrete part.
	Select the position of the electric box in the concrete part.
	Select the position of the down connection in the concrete part.

### Parts tab

Use the **Parts** tab to control the tube properties at the top and bottom of the concrete part and the position of the tube reference points.

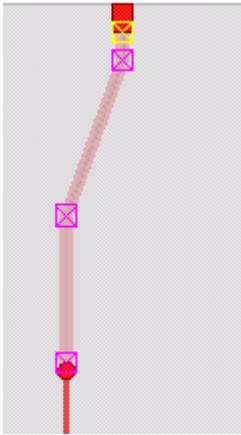
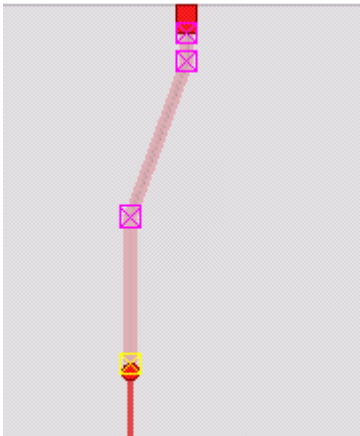
### Tube top / Tube bottom

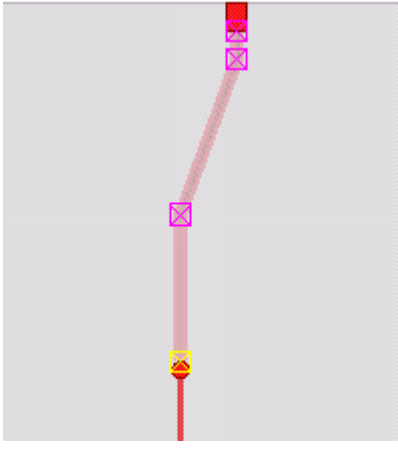
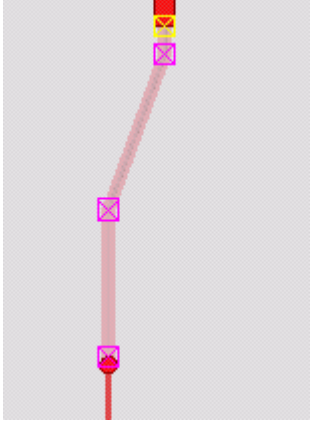
Option	Description	Default
<b>t, b, h</b>	Define the tube thickness, width and height.	D19
<b>Pos_No</b>	Define a prefix and a start number for the part position number.	ET 1
<b>Material</b>	Define the material grade.	PVC

Option	Description	Default
<b>Name</b>	Define a name for the tube.	E-tube
<b>Class</b>	Define the part class number for the tube.	2
<b>Comment</b>	Add a comment for the tube.	

### 1st reference point

Define a reference point for the tube. The reference point determines the position of the part mark in a drawing.

Option	Description	Example
<b>At top</b>	Start point is positioned at the top of the tube.	
<b>At bottom</b>	Start point is positioned at the bottom of the tube.	

Option	Description	Example
<b>At longest segment</b>	Start point is positioned at the longest segment of the tube.	
<b>At smallest segment</b>	Start point is positioned at the smallest segment of the tube.	

#### Electric box tab

Use the **Electric box** tab to control the shape, number and dimensions of the electric boxes and to define a possible connection piece (**Tube a**).

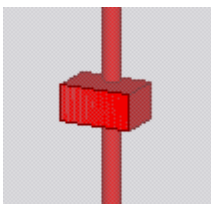
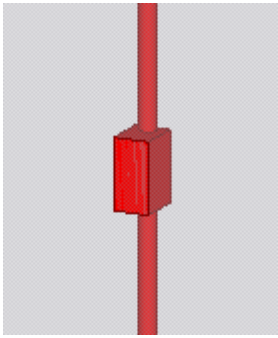
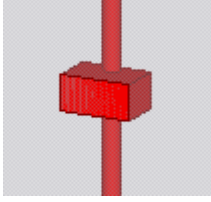
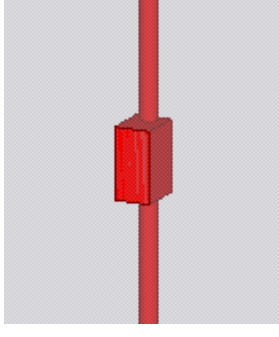
#### Electric box / Tube a

Option	Description	Default
<b>t, b, h</b>	Electric box and the connection piece ( <b>Tube a</b> ) thickness, width and height.	D19
<b>Pos_No</b>	Prefix and a start number for the part position number.	ET 1
<b>Material</b>	Material grade.	PVC
<b>Name</b>	Name for the electric box and the connection piece.	E-tube

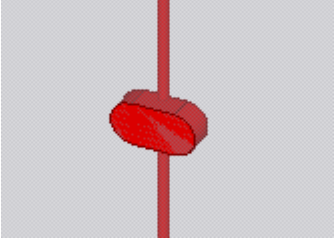
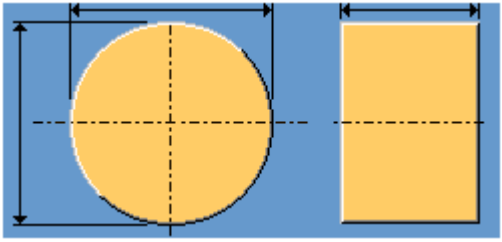
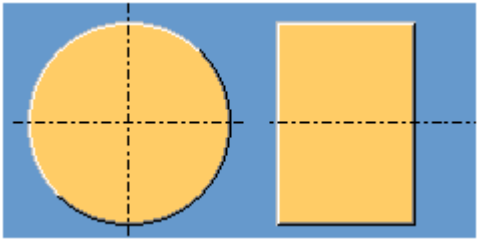
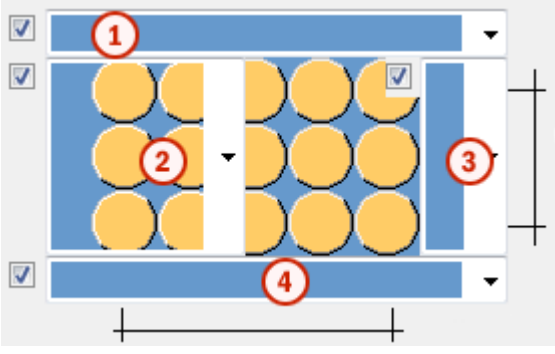
Option	Description	Default
<b>Class</b>	Part class number for the electric box and the connection piece.	2
<b>Comment</b>	Add a comment for the electric box and the connection piece.	

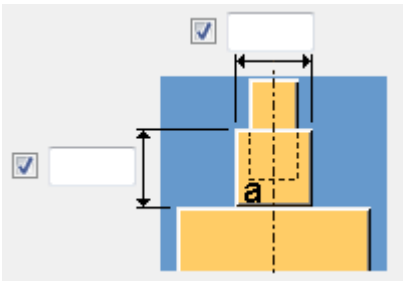
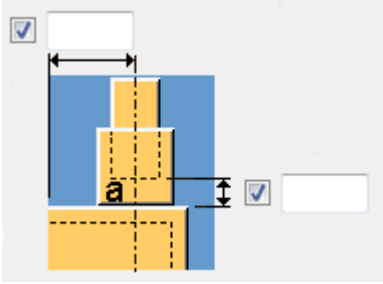

### Rotation

Control the rotation of the electric box and the connection piece.

Option	Example
<b>Front</b>	
<b>Top</b>	
<b>Back</b>	
<b>Below</b>	

## Electric box shape

Option	Description
<p><b>Profiles / Custom part</b></p> <p>Example custom part:</p> 	<p>You can use a profile from the profile catalog or select a custom component from the <b>Applications &amp; components</b> catalog.</p> <p>If you use a custom component, browse for the component and use the list of options to position the custom component.</p> <p>To use saved custom component properties, select the saved properties file.</p>
	<p>Select the shape of the electric box and define the dimensions for the electric box.</p>
	<p>Select an extra shape for creating several different types of electric boxes.</p> <p>This shape is visible in drawings and it indicates the front and back side of the electric box.</p>
<p><b>Number =</b></p>	<p>Number of electric boxes in horizontal or vertical direction.</p>
	
<p><b>1</b></p>	<p>Select the top connection pieces for the electric box.</p>
<p><b>2</b></p>	<p>Select the left side connection pieces for the electric box.</p>

Option	Description
3	Select the right side connection pieces for the electric box.
4	Select the bottom connection pieces for the electric box.
	Dimensions of the connection pieces.
	Positions of the connection pieces.
	Options to add the electric box to the part. <ul style="list-style-type: none"> <li>• Create electric box</li> <li>• Create electric box + cut electric box</li> <li>• Create electric box + cut bounding box</li> </ul>

**Top conn / Bottom conn tab**

Use the **Top conn** and **Bottom conn** tabs to control the shape and dimensions of the top and bottom connection boxes, and to define a possible connection piece (**Tube a**).

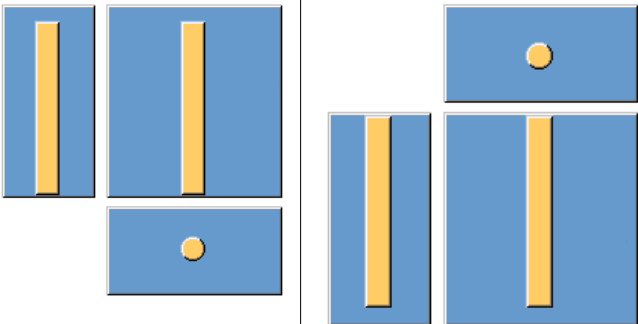
### Top box / Bottom box / Tube a

Option	Description
<b>t, b, h</b>	Top and bottom connection box and the connection piece ( <b>Tube a</b> ) thickness, width and height.
<b>Pos_No</b>	Prefix and a start number for the part position number.
<b>Material</b>	Material grade.
<b>Name</b>	Name for the connection box and the connection piece.
<b>Class</b>	Part class number for the connection box and the connection piece.
<b>Comment</b>	Add a comment for the connection box and the connection piece.

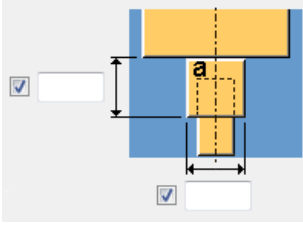
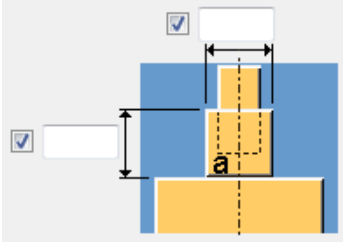
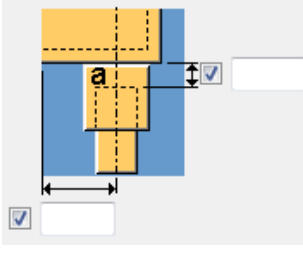
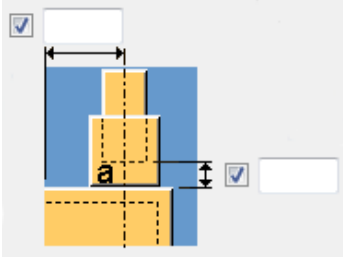

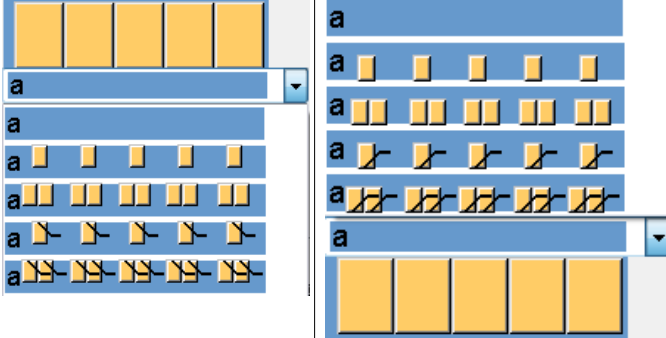
### Rotation

Control the rotation of the connection piece (**Tube a**).

### Connection box shape

Top conn	Bottom conn	Description
<b>Profiles / Custom part</b>		You can use a profile from the profile catalog or select a custom component from the <b>Applications &amp; components</b> catalog.  If you use a custom component, browse for the component and use the list of options to position the custom component.
		Select the shape of the connection box and define the dimensions for the box.



Top conn	Bottom conn	Description
 <p>Diagram showing the top connection box with dimensions. A vertical dimension line on the left is labeled 'a', and a horizontal dimension line at the bottom is also labeled 'a'. There are two small checkmarks in boxes, one on the left and one at the bottom right.</p>	 <p>Diagram showing the bottom connection box with dimensions. A horizontal dimension line at the top is labeled 'a', and a vertical dimension line on the left is also labeled 'a'. There are two small checkmarks in boxes, one at the top left and one on the left.</p>	<p>Dimensions of the connection box.</p>
 <p>Diagram showing the top connection box positioned within a larger structure. A vertical dimension line on the right is labeled 'a', and a horizontal dimension line at the bottom is also labeled 'a'. There are two small checkmarks in boxes, one on the right and one at the bottom left.</p>	 <p>Diagram showing the bottom connection box positioned within a larger structure. A horizontal dimension line at the top is labeled 'a', and a vertical dimension line on the left is also labeled 'a'. There are two small checkmarks in boxes, one at the top left and one on the right.</p>	<p>Position of the connection piece.</p>
 <p>Three options for adding the connection box to the part:</p> <ul style="list-style-type: none"> <li>Option 1: A blue rectangle with diagonal hatching.</li> <li>Option 2: A solid yellow rectangle.</li> <li>Option 3: A blue rectangle with a fine grid pattern.</li> </ul>		<p>Options to add the connection box to the part.</p> <ul style="list-style-type: none"> <li>• Create connection box</li> <li>• Create connection box + cut connection box</li> <li>• Create connection box + cut bounding box</li> </ul>
 <p>Two panels showing different connection piece options. Each panel has a dropdown menu with 'a' selected. The left panel shows a row of five yellow rectangles, followed by six rows of blue rectangles with yellow squares or triangles. The right panel shows a row of five yellow rectangles, followed by six rows of blue rectangles with yellow squares or triangles, and a final row of five yellow rectangles.</p>		<p>Select the connection pieces for the connection box.</p>

Top conn	Bottom conn	Description
		Select the number of connection boxes.

### Connect

Define how the connection box is connected.

### UDA tab

Use the **UDA** tab to add information in the parts' user-defined attributes (UDAs).

Option	Description		
<b>Part</b>	Select to which part the related information can be saved: <b>Nothing</b> <b>Tube top</b> <b>Tube bottom</b> <b>Tubes</b> <b>Electric box</b> <b>Top connection</b> <b>Bottom connection</b> <b>All</b>		
<b>UDA name</b>	Enter the name of the user-defined attribute. For example, to add a comment UDA, open the <code>objects.inp</code> file in a text editor and search for <code>comment</code> . The following attribute is shown: <pre>attribute("comment", "j_comment", string,</pre>	<b>UDA name:</b> <ul style="list-style-type: none"> <li>comment</li> <li>fabricator</li> <li>art_number</li> <li>type</li> </ul>	<b>UDA:</b> <ul style="list-style-type: none"> <li>Comment</li> <li>Fabricator name</li> <li>Article number</li> <li>Type</li> </ul>

Option	Description	
	<pre>"%s", no, none, "0.0", "0.0")</pre> <p>The first text between the quotation marks is the UDA name, <code>comment</code>. The entered name is case sensitive.</p>	
<b>Type</b>	Type of the user-defined attribute.	Use <b>String</b> for text, <b>Integer</b> for numbers, <b>Float</b> for numbers with decimals and <b>Option</b> for selecting an item in a list. You can find the UDA type in the <code>objects.inp</code> file
<b>Value</b>	Enter the value that is saved to the user-defined attribute.	

### Example

Part	UDA name	Type	Value
<input checked="" type="checkbox"/> Top conn	<input checked="" type="checkbox"/> art_number	<input checked="" type="checkbox"/> String	<input checked="" type="checkbox"/> EB_12345
<input checked="" type="checkbox"/> Electric box	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> String	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Electric box	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> String	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Electric box	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> String	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Electric box	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> String	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Electric box	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> String	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Electric box	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> String	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Electric box	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> String	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Electric box	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> String	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Electric box	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> String	<input checked="" type="checkbox"/>

Owner multi user	CC UDA	Calculation	Precast formslab	MAP coordinates	Unitechnik UDA	
Parameters	Status	End Conditions	Analysis	Userfields	IFC export	Numbering steel
Comment	<input checked="" type="checkbox"/>		<input type="text"/>			
Comment 2 (affects numbering)	<input checked="" type="checkbox"/>		<input type="text"/>			
Shorten	<input checked="" type="checkbox"/>		<input type="text"/>			
Camber	<input checked="" type="checkbox"/>		<input type="text"/>			
Preliminary mark	<input checked="" type="checkbox"/>		<input type="text"/>			
Preliminary assembly mark	<input checked="" type="checkbox"/>		<input type="text"/>			
Model number	<input checked="" type="checkbox"/>		<input type="text"/>			
Locked	<input checked="" type="checkbox"/>		<input type="text"/>			
Hold	<input checked="" type="checkbox"/>		<input type="text"/>			
User Phase (affects numbering)	<input checked="" type="checkbox"/>		<input type="text"/>			
Numbering Order	<input checked="" type="checkbox"/>		<input type="text"/>			
Control Number (Do not modify)	<input checked="" type="checkbox"/>		<input type="text"/>			
Control Number Status (Do not modify)	<input checked="" type="checkbox"/>		<input type="text"/>			
Fabricator name	<input checked="" type="checkbox"/>		<input type="text"/>			
Type	<input checked="" type="checkbox"/>		<input type="text"/>			
Nomination	<input checked="" type="checkbox"/>		<input type="text"/>			
Article number	<input checked="" type="checkbox"/>		<input type="text" value="EB_12345"/>			
Fixed drawing main view	<input checked="" type="checkbox"/>		<input type="text"/>			
Screw number	<input checked="" type="checkbox"/>		<input type="text"/>			
Drawing no. architect	<input checked="" type="checkbox"/>		<input type="text"/>			
Drawing no. engineer	<input checked="" type="checkbox"/>		<input type="text"/>			
Product code	<input checked="" type="checkbox"/>		<input type="text"/>			
Product description	<input checked="" type="checkbox"/>		<input type="text"/>			
Product weight	<input checked="" type="checkbox"/>		<input type="text"/>			
Product unit	<input checked="" type="checkbox"/>		<input type="text"/>			
Initial GUID	<input checked="" type="checkbox"/>		<input type="text"/>			

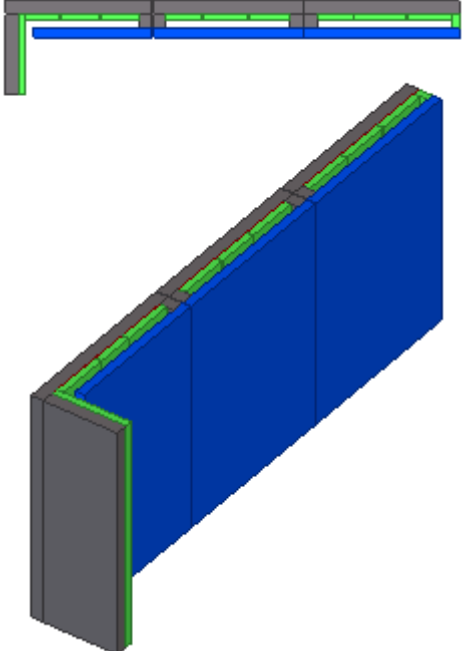
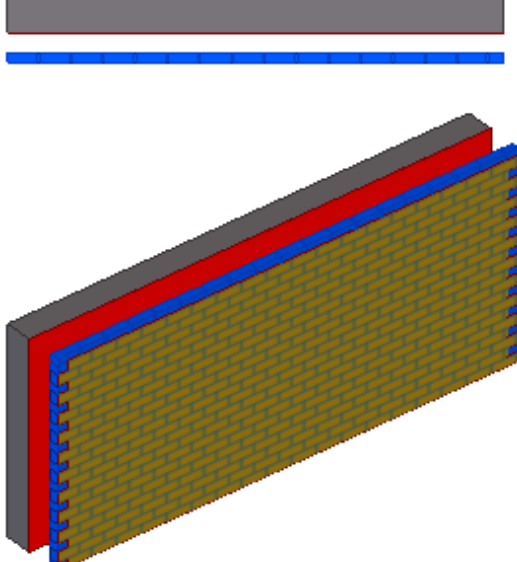
### ***Sandwich and double wall***

**Sandwich and double wall** creates a precast concrete wall. The wall consists of an inner shell, foil, insulation, and outer shell.

#### **Objects created**

- Inner shell
- Foil (optional)
- Insulation (optional)
- Outer shell (optional)

## Use for

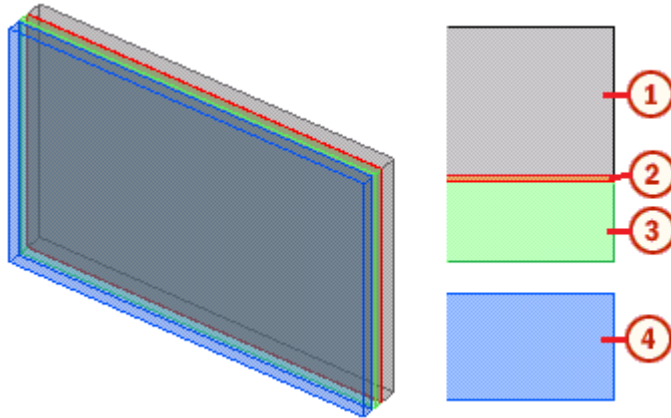
Situation	Description
	Sandwich wall, split shells.
	Sandwich wall, brick wall on outer shell as surface treatment.

## Selection order

1. Pick the first point.
2. Pick the second point.

The wall is created automatically when the second point is picked.

## Part identification key



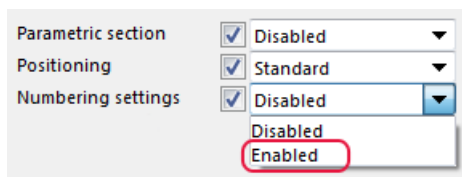
	Part
1	Inner shell
2	Foil
3	Insulation
4	Outer shell

### Parts tab

Use the **Parts** tab to control the dimensions and positioning of the sandwich wall inner shell, foil, insulation, and outer shell. The inner shell is always created.

### Numbering settings

Set **Numbering settings** to **Enabled** to show **Prefix** and **Start number** for all parts.



### Inner shell

Option	Description	Default
<b>Thickness</b>	Define the thickness of the inner shell.	150 mm

## Foil

Option	Description	Default
<b>Thickness</b>	Define the thickness of the foil.	1 mm
Create foil	Define whether the foil is created.	Yes and subassembly

## Insulation

Option	Description	Default
<b>Thickness</b>	Define the thickness of the insulation.	50 mm
Create insulation	Define whether the insulation is created.	Yes and subassembly
<b>Edge strips in split case</b>	Define different material and class properties for parts on the edge of the wall.	

## Outer shell

Option	Description	Default
<b>Thickness</b>	Define the thickness of the outer shell.	1 mm
Create outer shell	Define whether the outer shell is created.	Yes + cast unit

## Properties

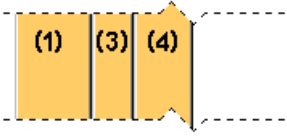
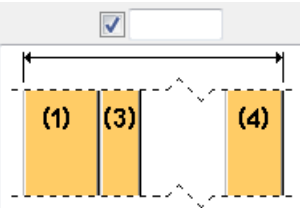
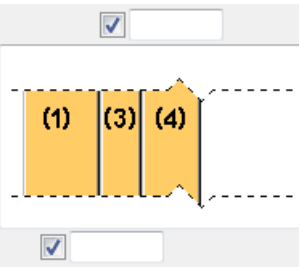
Option	Description	Default
<b>Pos_No</b>	Prefix and start number for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .

Option	Description	Default
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	
<b>Cast unit type</b>	Defines if the structure type of the part is <b>Precast</b> or <b>Cast in place</b> .  Set <b>Cast unit type</b> to <b>Enabled</b> to show <b>Cast unit type</b> for parts.	<b>Precast</b>

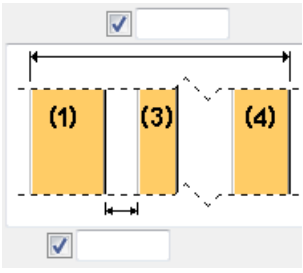
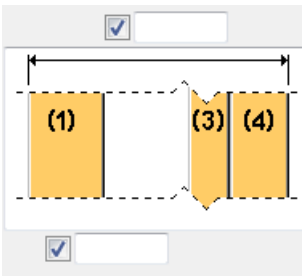
### Positioning

You can use **Standard** or **Advanced** positioning. With advanced positioning, there are more options for sandwich wall width and foil position.

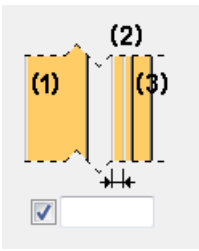
### Sandwich wall width

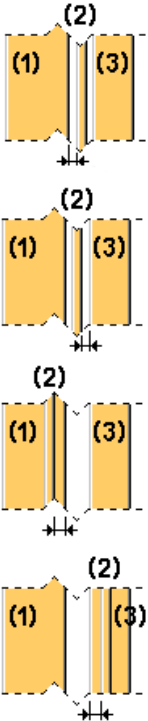
Option: Standard	Description
	No gaps between the parts. Sandwich wall thickness is the sum of all created parts.
	Define the total wall width. A gap is created between the outer shell and the insulation.
Option: Advanced	Description
	Define the total wall width and the gap between the inner shell and the insulation. Another gap is created between the outer shell and the insulation.



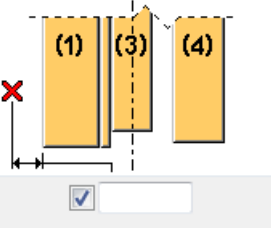
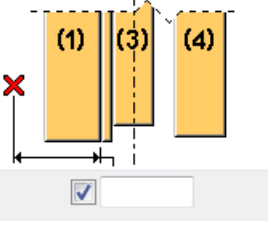
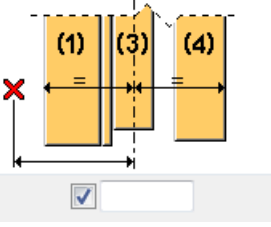
Option: Advanced	Description
	<p>Define the total wall width and the gap between the outer shell and the insulation.</p> <p>Another gap is created between the inner shell and the insulation.</p>
	<p>Define the total wall width and the gap between the inner shell and the insulation.</p> <p>No gap is created between the outer shell and the insulation.</p>

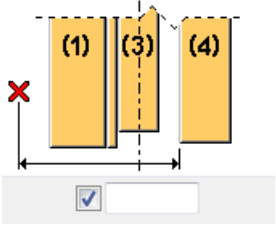
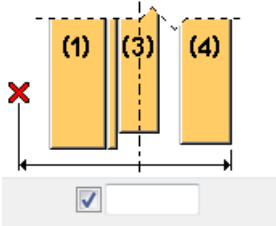
### Foil position

Option	Description
	<p>By default, the foil is placed on the outer side of the inner shell.</p>

Option	Description
	<p>Define another foil position. Set <b>Positioning</b> to <b>Advanced</b>.</p>

### Point offset

Option	Description
	<p>Define the offset from the outer face of the inner shell.</p>
	<p>Define the offset from the inner face of the inner shell.</p>
	<p>Define the offset from the center of the sandwich wall.</p>

Option	Description
	Define the offset from the inner face of outer shell.
	Define the offset from the outer face of outer shell.

### Parametric profile

Option	Description
<b>Parametric section</b>	Set to <b>Enabled</b> to define the prefix for the parametric profiles of the sandwich parts.
Prefix for the parametric profile	Select the prefix for the parametric profile: <ul style="list-style-type: none"> <li>• Position <math>h*b</math> and Position <math>b*h</math> to create plate profiles without a prefix.</li> </ul> If <b>Parametric section</b> is set to <b>Disabled</b> , the parts have an $h*b$ prefix, for example, 2000*100. <ul style="list-style-type: none"> <li>• Position <math>PLh*b</math> and Position <math>PLb*h</math> to create plate profiles whose prefix starts with <math>PL</math>.</li> <li>• Par. section <math>h*b</math> and Par. section <math>b*h</math> require you to enter a parametric plate profile prefix.</li> </ul>
<b>Par.section prefix</b>	Define the prefix of the parametric profile.

Profile notation		Example
Position h*b	⇒ no parametric prefix ⇒	<input checked="" type="checkbox"/> Shape 2000*100
Position b*h	⇒ no parametric prefix ⇒	<input checked="" type="checkbox"/> Shape 100*2000
Position PLh*b	⇒ PL prefix ⇒	<input checked="" type="checkbox"/> Shape PL2000*100
Position PLb*h	⇒ PL prefix ⇒	<input checked="" type="checkbox"/> Shape PL100*2000
Par. section h*b	<input checked="" type="checkbox"/> <div style="border: 1px solid gray; padding: 2px; display: inline-block;">           Parametric section  <input type="text" value="WOOD"/> </div> ⇒	<input checked="" type="checkbox"/> Shape WOOD100*2000
Par. section b*h	<input checked="" type="checkbox"/> <div style="border: 1px solid gray; padding: 2px; display: inline-block;">           Parametric section  <input type="text" value="WOOD"/> </div> ⇒	<input checked="" type="checkbox"/> Shape WOOD2000*100

**Select Profile**

Profile name: 2000\*150

Filter: \*

**Plate profiles**

- ANKER
- BL
- FL
- FLAT
- FOBI
- FOBU
- FPL
- GRATING
- HALF\_
- ISO
- NEOPRENE
- PL
- PLAT
- PLT
- PS
- RST
- SHIMPL
- SQUARE
- ST
- STRIP
- TEARPL
- TEFLON
- WOOD

↑ Type a parametric plate prefix

### Vertical section tab

Use the **Vertical section** tab to control the vertical level part properties. You can define both the top and the bottom level. The levels can be set as absolute levels, or vertically relative (displaced) to the points.

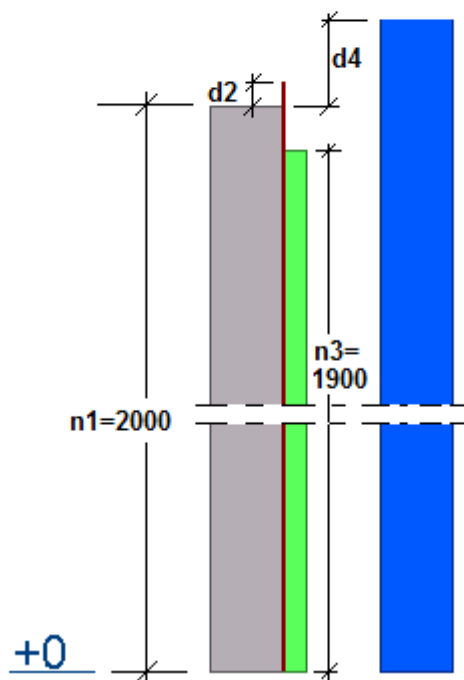
### Top level

Option	Description
n1, n2, n3, n4	Define the absolute top level height.

Option	Description
<b>h1, h2, h3, h4</b>	Define the part height from the bottom face.
<b>d2, d3, d4</b>	Define the vertical displacement from the adjacent part.

When you use relative levels, the levels of all other parts depend on the inner shell level.

	Inside Shell [1]	Foil [2]	Insulation [3]	Outside Shell [4]
Top level	<input checked="" type="checkbox"/> n1	<input checked="" type="checkbox"/> d2	<input checked="" type="checkbox"/> n3	<input checked="" type="checkbox"/> d4
	<input checked="" type="checkbox"/> 2000.000	<input checked="" type="checkbox"/> 50.000	<input checked="" type="checkbox"/> 1900.000	<input checked="" type="checkbox"/> 200.000

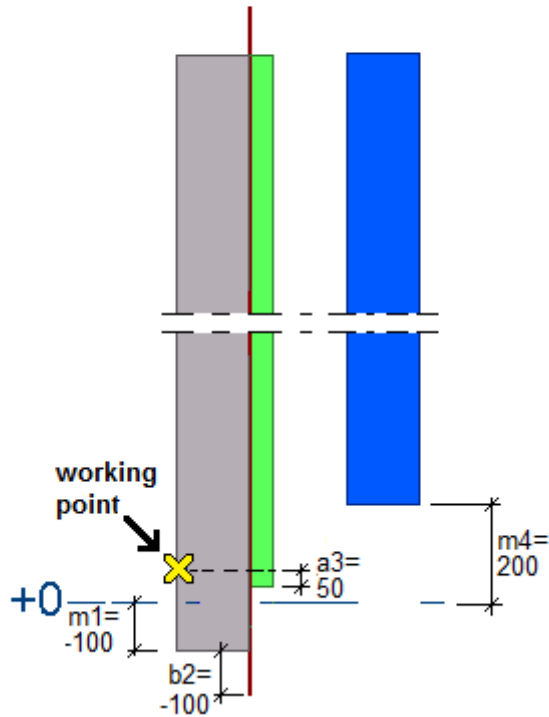


### Bottom level

Option	Description
<b>m1, m2, m3, m4</b>	Define the absolute bottom level height.
<b>a1, a2, a3, a4</b>	Define the bottom offset from the point.
<b>b2, b3, b4</b>	Define the vertical displacement from the adjacent part.


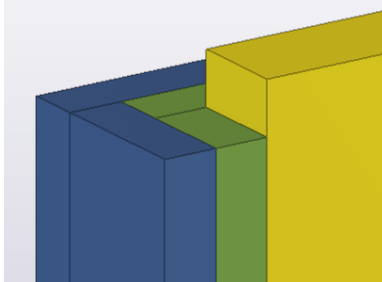
When you use relative levels, the levels of all other parts depend on the inner shell level.


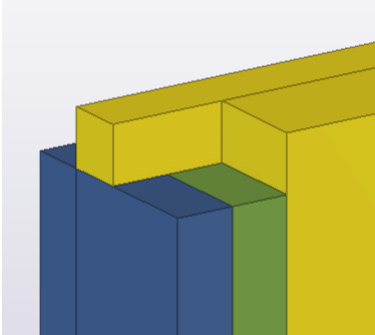
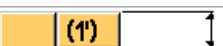
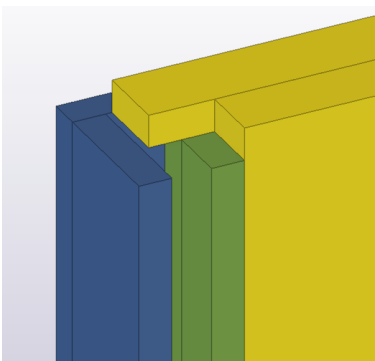
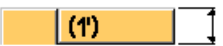
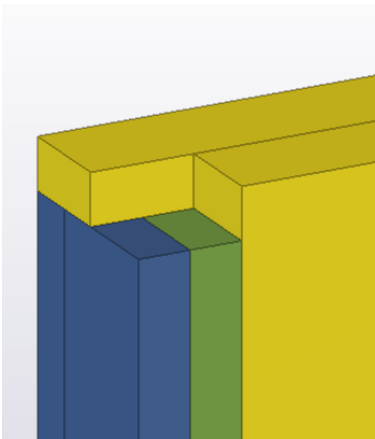
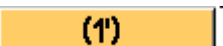
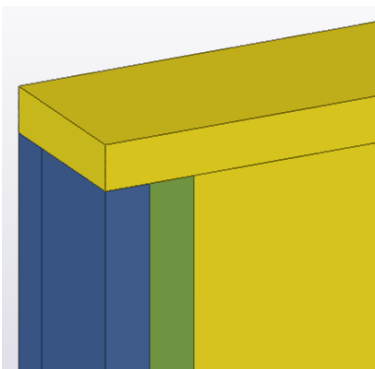
	Inside Shell	Foil	Insulation	Outside Shell
	[1]	[2]	[3]	[4]
Bottom level	<input checked="" type="checkbox"/> m1	<input checked="" type="checkbox"/> b2	<input checked="" type="checkbox"/> a3	<input checked="" type="checkbox"/> m4
	<input checked="" type="checkbox"/> -100.000	<input checked="" type="checkbox"/> -100.000	<input checked="" type="checkbox"/> 50.000	<input checked="" type="checkbox"/> 200.000

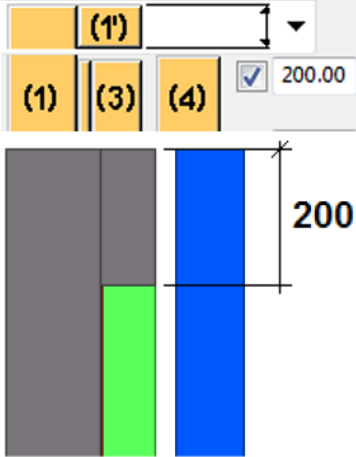
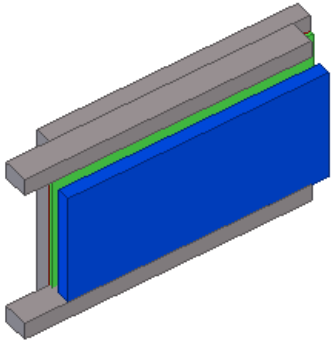


### Thicken innershell

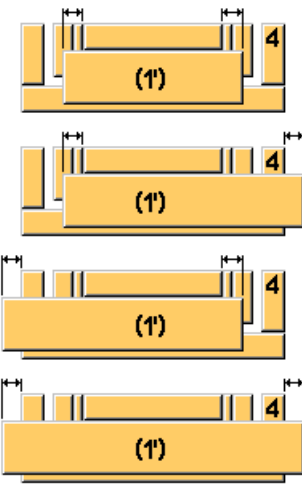
You can define a thickening for both the top and the bottom side of the inner shell.

Option	Description	Example
	Inner shell is not thickened.	

Option	Description	Example
	<p>Inner shell is thickened towards the outer face of the insulation.</p> <p>Define the insulation height to prevent collisions.</p>	
	<p>Inner shell is thickened to the inner face of the outer shell.</p>	
	<p>Inner shell is thickened to the outer face of the outer shell.</p> <p>Define the outer shell height to prevent collisions.</p>	
	<p>Inner shell covers the insulation and outer shell.</p>	

Option	Description	Example
Thickness	<p>Define the inner shell thickness.</p> <p>If you do not enter a value, the inner shell thickness defined on the <b>Parts</b> tab is used.</p>	
<b>Thickening parts</b>	<p>Select how the top and bottom thickening parts are added to the inner shell.</p>	
Gap in inner shell	<p>Enter a value to create a gap between the inside and the front of the inner shell at the bottom and the top.</p> <p>The gap is filled with insulation.</p>	
<b>Offset options</b>	<p>Select the offset options for the thickening parts. Offset</p>	



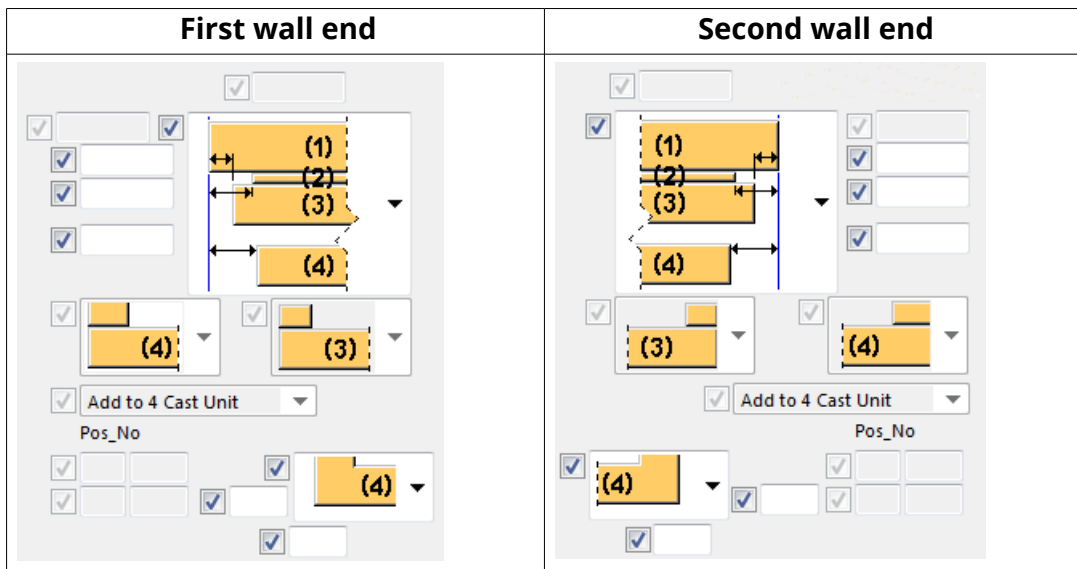
Option	Description	Example
	<p>can be defined for both wall ends.</p> 	

### Horizontal section tab

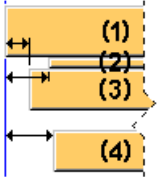
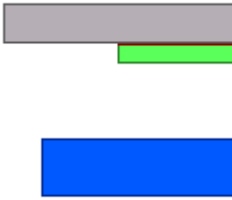
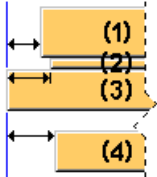
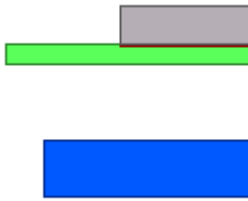
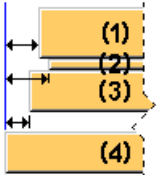
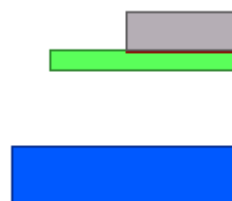
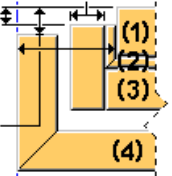
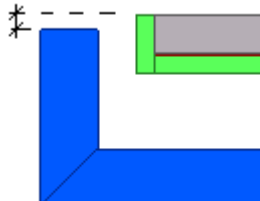
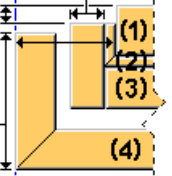
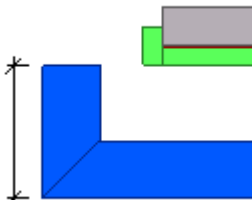
Use the **Horizontal section** tab to define the wall ends and to control how the wall parts are split in the horizontal direction.

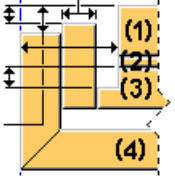
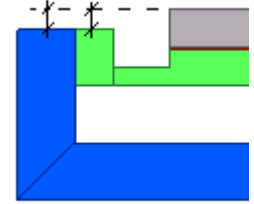
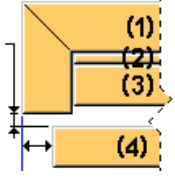
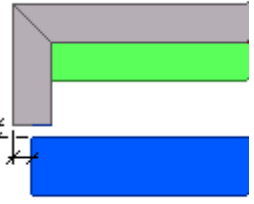
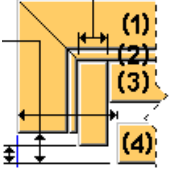
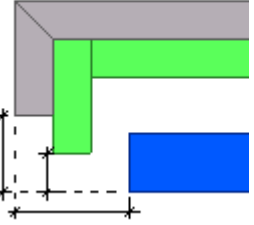
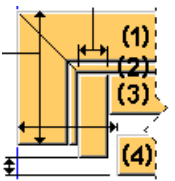
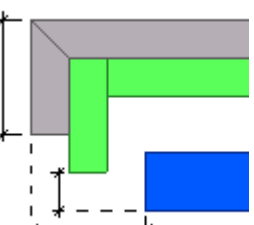
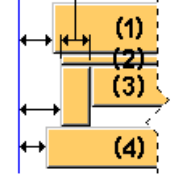
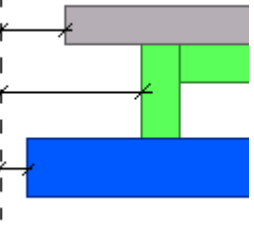
### Wall end

The wall end options are the same for both ends.

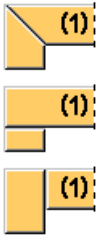

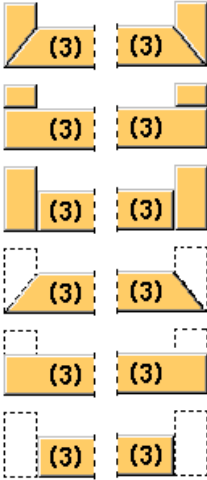


## Wall end offset

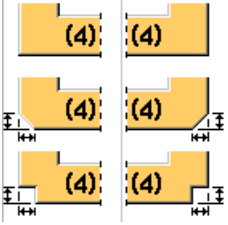
Option	Description	Example
	<p>Inner shell end is fixed.</p> <p>Define the offset for the ends of the foil, insulation, and outer shell.</p>	
	<p>Insulation end is fixed.</p> <p>Define the offset for the ends of the inner shell, foil, and outer shell.</p>	
	<p>Outer shell end is fixed.</p> <p>Define the offset for the ends of the inner shell, foil, and insulation.</p>	
	<p>Corner shape to the inside direction.</p> <p>For the outer shell angle, define the offset from the inner face of the inner shell. Insulation is along the inner shell.</p>	
	<p>Corner shape to the inside direction.</p> <p>Define the length of the outer shell angle.</p>	

Option	Description	Example
	<p>Corner shape to the inside direction.</p> <p>For the outer shell angle, define the offset from the inner face of the inner shell. Insulation is along the outer shell.</p>	
	<p>Corner shape to the outside direction.</p> <p>Define the horizontal offset for the outer shell. There is no gap between the insulation and the inner shell angle.</p> <p>The empty void between the front of the created corner part and the front of the insulation is by default filled with insulation.</p>	
	<p>Corner shape to the outside direction.</p> <p>Define the horizontal offset for the outer shell. For the inner shell angle, define the offset from the outer face of the inner shell.</p>	
	<p>Corner shape to the outside direction.</p> <p>Define the horizontal offset for the outer shell. For the inner shell angle, define the length.</p>	
	<p>Angled shells are not created.</p> <p>Define horizontal offset for the inner shell, insulation, and outer shell.</p>	

### Corner shape

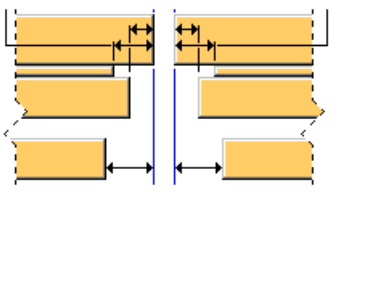
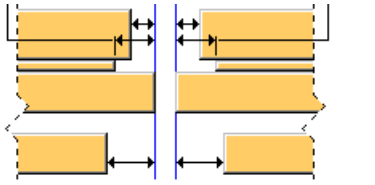
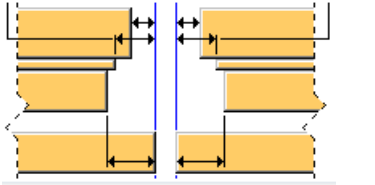
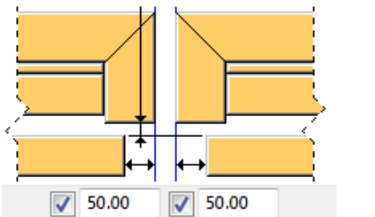
Option	Description
	<p>Select the inner shell corner shape.</p>
	<p>Select the outer shell corner shape.</p>
	<p>Select the insulation corner shape.</p>
<p>Add corner to main shell</p>	<p>Add the corner to the shell. The options are:</p> <ul style="list-style-type: none"> <li>• Add to 4 Cast Unit (4 = outer shell)</li> <li>• Add to 4 Sub assembly</li> <li>• Add to 1 Cast Unit (1 = inner shell)</li> <li>• Add to 1 Sub assembly</li> </ul>

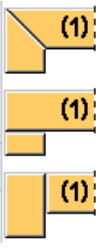
## Vertical chamfer

Option	Description
	<p>Define whether a vertical chamfer is created.</p> <p>Define the horizontal and vertical chamfer dimensions, and the part prefix and the start number.</p>


## Horizontal offset

To use the options, set the **Split Front view** option to **Enabled**.

Option	Description
	<p>Define the horizontal offset for the foil, insulation, and outer shell. The main gap between the inner shells is defined in the <b>Split Front view</b> section of the tab.</p>
	<p>Define the horizontal offset for the inner shell, foil, and outer shell. The main gap between the insulation parts is defined in the <b>Split Front view</b> section of the tab.</p>
	<p>Define the horizontal offset for the inner shell, foil, and insulation. The main gap between outer shells is defined in the <b>Split Front view</b> section of the tab.</p>
	<p>Define a 90-degree angle for the inner shell and the vertical offset towards the angled shell from the inner face of the outer shell. The main gap between the inner shells is defined in the <b>Split Front view</b> section of the tab.</p> <p>Additional options for the 90-degree angle:</p>




Option	Description
	<ul style="list-style-type: none"> <li>Define the corner shapes for the inner shell.</li> </ul>  <ul style="list-style-type: none"> <li>Define how the corner is added to the inner shell.</li> <li>Define the part prefix and the start number.</li> </ul>



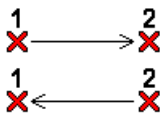
### Mirroring

Option	Description
	Define whether the sandwich wall is mirrored.

### Splitting parts

To split wall parts, set the **Split Front view** option to **Enabled**.

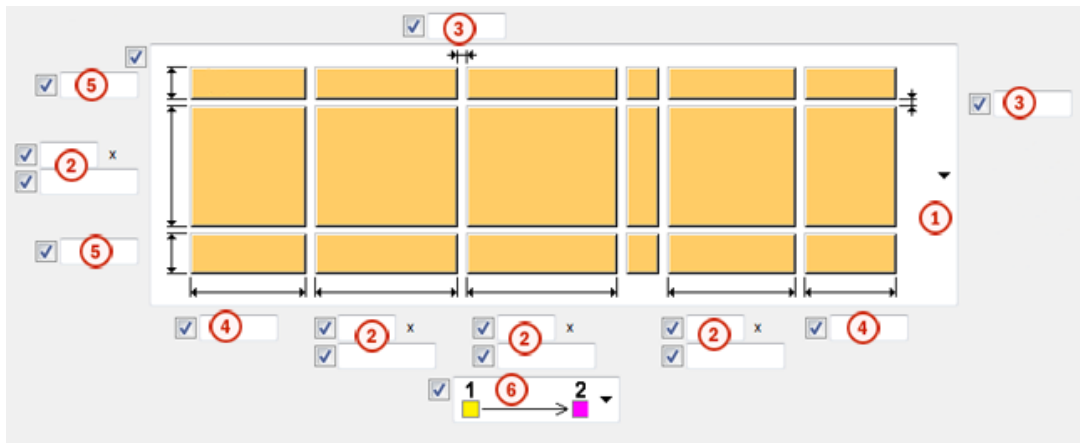
Option	Description
	Parts are not split. Define the horizontal offset for both wall ends using the points as reference points.
	Parts are split. Define the section width and the number of sections. First end offset is the reference for the first section width at the first wall end. Second end offset is the reference for the last section width at the second wall end.
	Parts are split. Define the section width and the number of sections. First end offset is the reference for the first section width at the first wall end. Point (2) is the reference of the last section width at the second wall end.



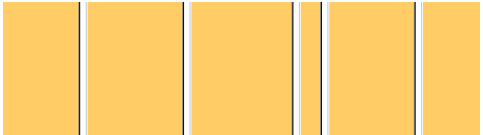
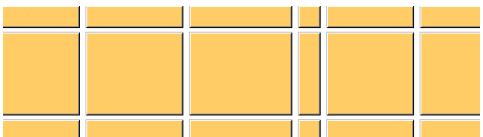


Option	Description
	<p>Parts are split. Define the section width and enter the number of sections.</p> <p>Point (1) is the reference of the start section at the first wall end.</p> <p>Second end offset is the reference for the last section width at the second wall end.</p>
	<p>Parts are split. Define the section width and enter the number of sections.</p> <p>Points (1, 2) are the references for the section width at both wall ends.</p>
Option	Description
	<p>Define the horizontal direction.</p>

### Foil tab

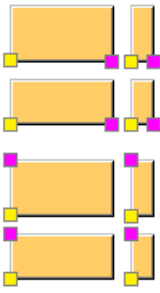
Use the **Foil** tab to control the vertical and/or horizontal splitting of the foil.

### Dimensions



Option	Description
<p><b>1</b></p>	<p>Define whether the foil is split:</p> <ul style="list-style-type: none"> <li>Foil is not split.            </li> <li>Foil is split in the horizontal direction.            </li> <li>Foil is split in the vertical direction.            </li> <li>Foil is split in the horizontal and vertical direction.            </li> </ul>
<p><b>2</b></p>	<p>Define the number and width of the middle sections.</p>
<p><b>3</b></p>	<p>Define the gap between the sections.</p>
<p><b>4</b></p>	<p>Define the width of the first and last section in the horizontal direction.</p>
<p><b>5</b></p>	<p>Define the height of the top and bottom section in the vertical direction.</p>
<p><b>6</b></p>	<p>Define which wall end is used for distributing the insulation sections.</p> <p>     </p>

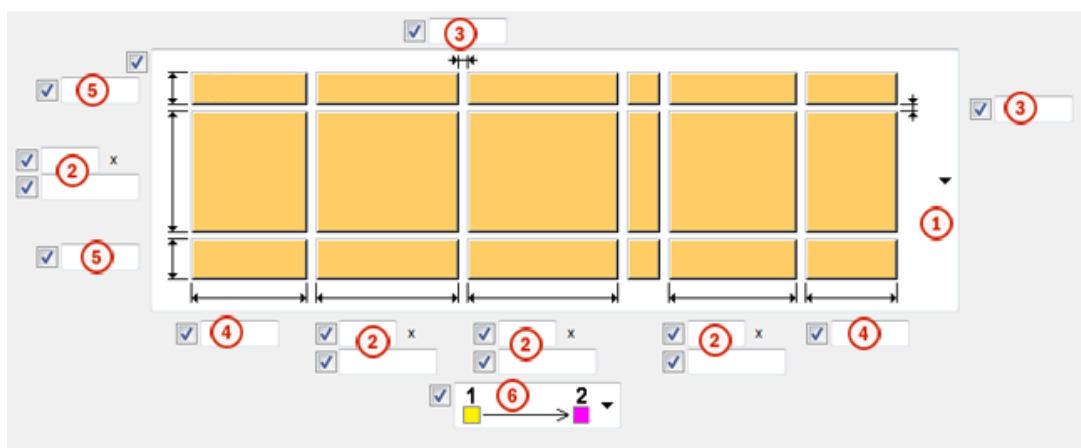



Option	Description
<p><b>Point direction</b></p>	<p>Define the direction of the points. The options are horizontal or vertical.</p>  <p>This option affects the representation of workshop drawings.</p>



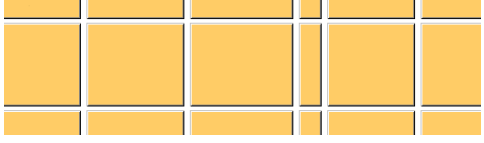
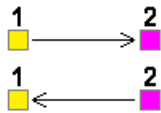
### Insulation tab

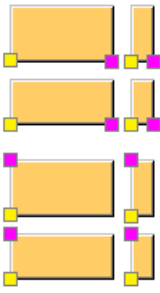
Use the **Insulation** tab to control the vertical and/or horizontal splitting of the insulation.

### Dimensions



Option	Description
<p><b>1</b></p>	<p>Define whether the insulation is split:</p> <ul style="list-style-type: none"> <li>Insulation is not split.</li> </ul> 

Option	Description
	<ul style="list-style-type: none"> <li>• Insulation is split in the horizontal direction.  </li> <li>• Insulation is split in the vertical direction.  </li> <li>• Insulation is split in the horizontal and vertical direction.  </li> </ul>
<b>2</b>	Define the number and width of the middle sections.
<b>3</b>	Define the gap between the sections.
<b>4</b>	Define the width of the first and last section in the horizontal direction.
<b>5</b>	Define the height of the top and bottom section in the vertical direction.
<b>6</b>	Define which wall end is used for distributing the insulation sections. 

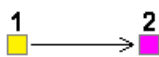

Option	Description
<p><b>Point direction</b></p>	<p>Define the direction of the points. The options are horizontal or vertical.</p>  <p>This option affects the representation of workshop drawings.</p>


**Outside Shell tab**

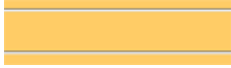

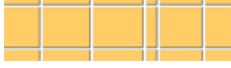
Use the **Outside shell** tab to control the vertical and/or horizontal splitting of the outer shell. You can also define chamfers and add a brick wall surface.

**Dimensions**

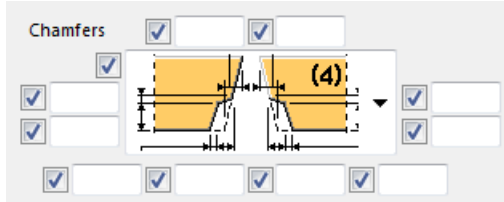


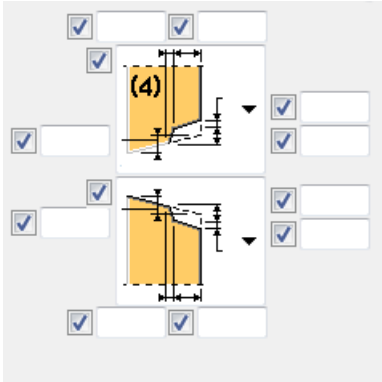
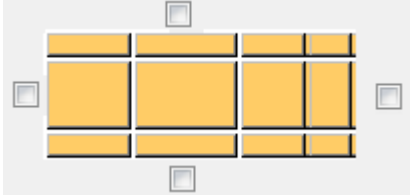

Option	Description
 	<p>Define the direction for the splitting.</p>

	Description
<p><b>1</b></p>	<p>Define whether the outer shell is split:</p> <ul style="list-style-type: none"> <li>Outer shell is not split.</li> </ul> 

	Description
	<ul style="list-style-type: none"> <li>Outer shell is split in the horizontal direction.  </li> <li>Outer shell is split in the vertical direction.  </li> <li>Outer shell is split in the horizontal and vertical direction.  </li> </ul>
2	Define the number and width of the middle sections.
3	Define the gap between the sections.
4	Define the width of the first and last section in the horizontal direction.
5	Define the height of the top and bottom section in the vertical direction.

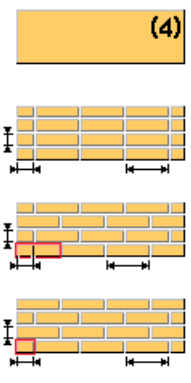
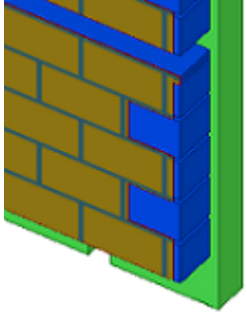
### Chamfering

Option	Description
<b>Vertical chamfers</b>	Define the vertical chamfers. Select a chamfer shape from the list and define the chamfer dimensions. 

Option	Description
<b>Horizontal chamfers</b>	<p>Define the horizontal chamfers. Select a chamfer shape from the list and define the chamfer dimensions.</p> 
<b>Chamfer side</b>	<p>Define the sides where the chamfers are created.</p>  <p>For example:</p> 

### Brick wall properties

Set the **Brick wall** option to **Enabled** to create a brick wall.

Option	Description	Example
	<p>Select the brick wall type for the outer shell and define the brick dimensions, mortar height and width.</p>	
<p><b>Wall edges</b></p>	<p>Define whether the wall edges are created as loose parts or whether they are added into an assembly.</p>	

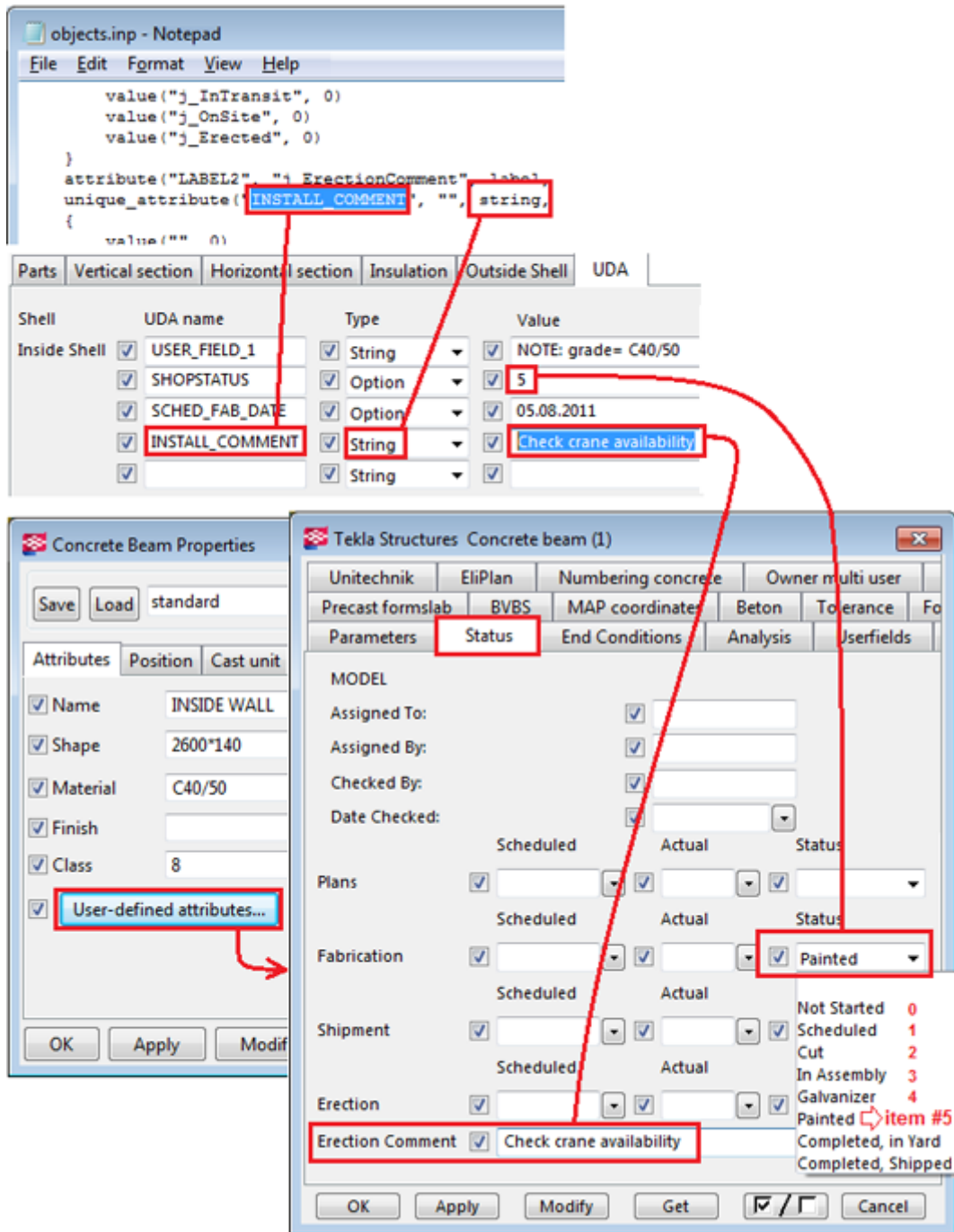
**UDA tab**

Use the **UDA** tab to define user-defined attributes for the inner shell, foil, insulation, and outer shell. You can define multiple UDAs for each part. UDAs can be used as filters, and they can be displayed in drawings and reports.

Option	Description		
<p><b>Shell</b></p>	<p>Select the shell for the user-defined attribute (UDA) that you are defining.</p> <p>You can set more than one UDA for a certain shell, if needed.</p>		
<p><b>UDA name</b></p>	<p>Enter the name of the user-defined attribute.</p> <p>For example, to add a comment UDA, open the <code>objects.inp</code> file in a text editor and search for <code>comment</code>. The following attribute is shown:</p> <pre>attribute("comment", "j_comment", string, "%s", no, none, "0.0", "0.0")</pre> <p>The first text between the quotation marks is the UDA name, <code>comment</code>. The entered name is case sensitive.</p>	<p><b>UDA name:</b></p> <ul style="list-style-type: none"> <li>• comment</li> <li>• fabricator</li> <li>• art_number</li> <li>• type</li> </ul>	<p><b>UDA:</b></p> <ul style="list-style-type: none"> <li>• Comment</li> <li>• Fabricator name</li> <li>• Article number</li> <li>• Type</li> </ul>

Option	Description	
<b>Type</b>	Type of the user-defined attribute.	Use <b>String</b> for text, <b>Integer</b> for numbers, <b>Float</b> for numbers with decimals and <b>Option</b> for selecting an item in a list. You can find the UDA type in the <code>objects.inp</code> file
<b>Value</b>	Enter the value that is saved to the user-defined attribute.	

For example:



### ***Sandwich wall horizontal seam***

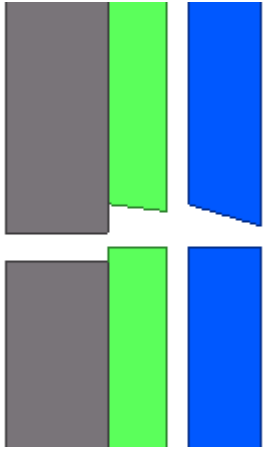
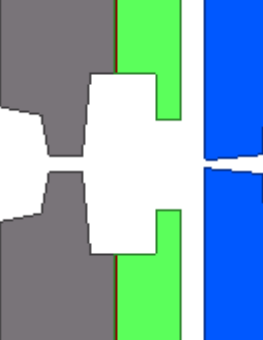
**Sandwich wall horizontal seam** creates a horizontal seam between two sandwich walls. Seam dimensions and rabbets can be defined for all layers: inner shell, foil, insulation, and outer shell. In addition, you can define an extra foil layer.




## Objects created

- Seams
- Rabbits
- Foil
- Insulation
- Extra foil layer

## Use for

Situation	Description
	Seams between sandwich wall shells.
	Seams with additional rabbits.

## Before you start

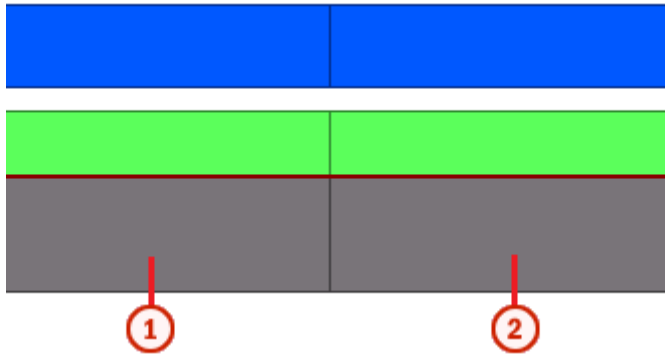
To be able to select the needed parts, activate the **Select objects in components**  switch.

## Selection order

1. Select the inner shell of the first sandwich wall.
2. Select the inner shell of the second sandwich wall.

The seam is created automatically when the secondary part is selected.

## Part identification key



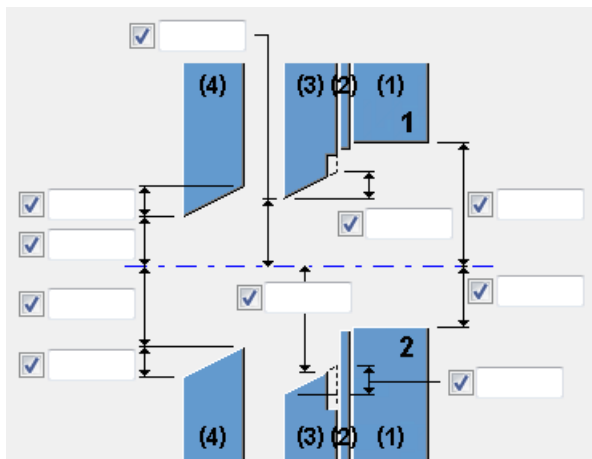
	Part
1	Concrete part (wall, column, beam, slab)
2	Point Multiple points can be picked.

## Picture tab

Use the **Picture** tab to control the horizontal seam properties.

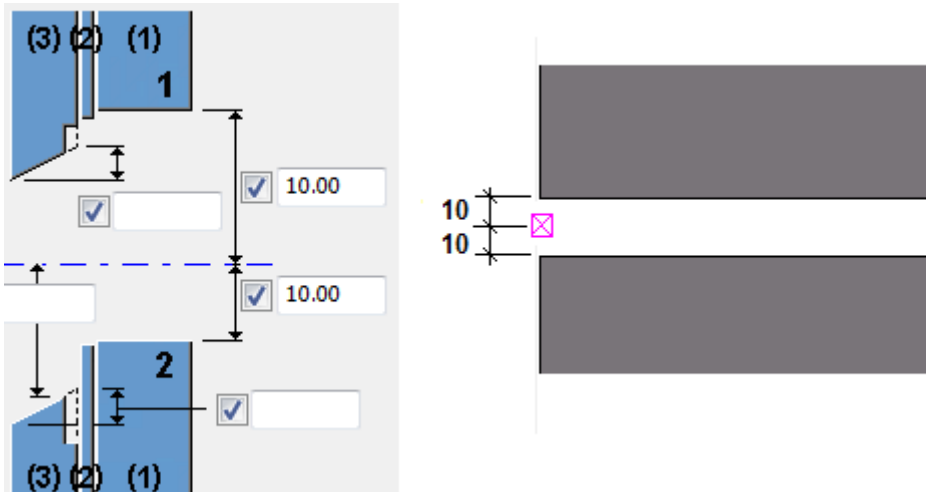
## Seam position

Seams can be defined for inner shells, insulation and outer shells. Draft angles can be defined for the outer shells.

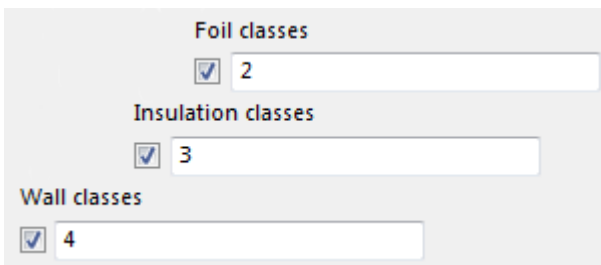


Define the seam position between the sandwich wall shells. The middle line between the walls is used as a reference when the seam position is calculated.

Example:



### Shell classes



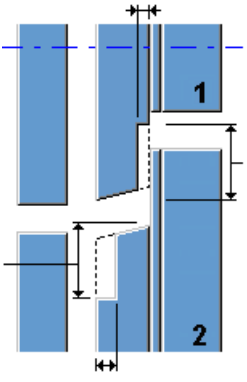
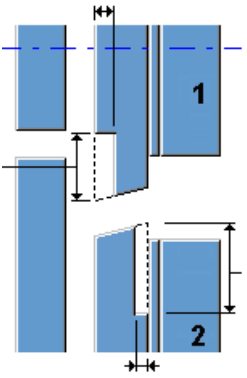
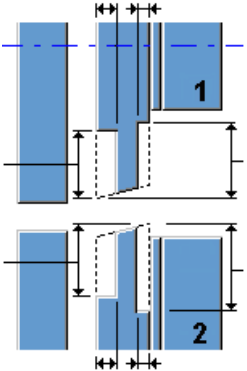
Define the part classes to be applied to the seams. By default, the **Sandwich Wall Horizontal Seam** component creates inner shells with class 1, foil with class 2, insulation with class 3, and outer shells with class 4. Use these classes to apply seams.

To prevent the creation of seams between foils, insulation shells and outer shells, leave the **Insulation classes** box empty.

### Rabbets in insulation

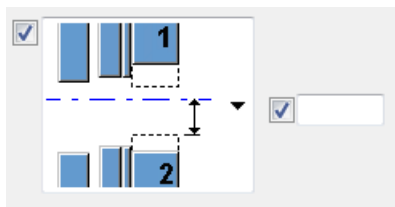
You can create rabbets in the insulation layer.

Option	Description
	<p>No rabbet for the insulation layer.</p>

Option	Description
	<p>One side rabbet for the top and bottom of the insulation layer.</p> <p>Rabbet depth and width can be defined.</p>
	<p>Mirrored one side rabbet for the top and bottom of the insulation layer.</p> <p>Rabbet depth and width can be defined.</p>
	<p>Two sided rabbets for the top and bottom of the insulation layer.</p> <p>Rabbet depth and width can be defined.</p>

### Offset

You can define offset for the seam.



### Rabbets tab

Use the **Rabbets** tab to define rabbets in inner shells, insulation layers and outer shells.

### Rabbet side

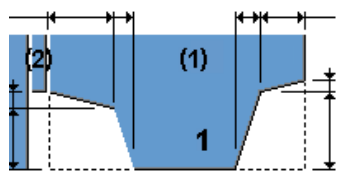
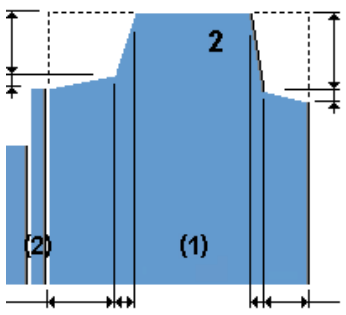
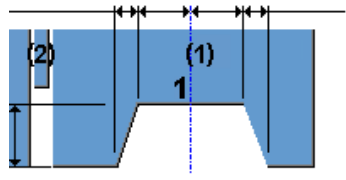
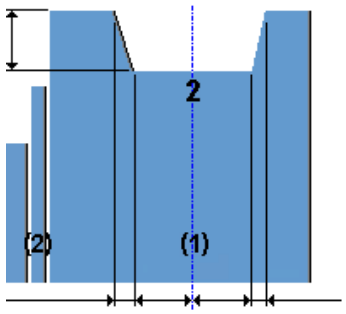
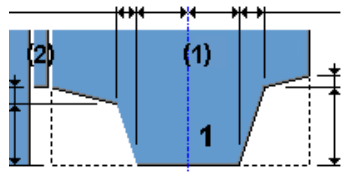
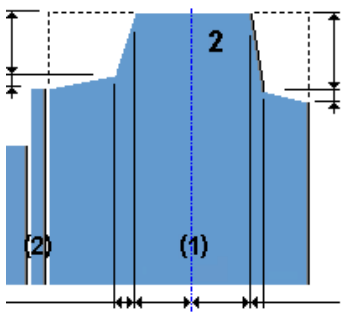
Select to which side of the sandwich wall the rabbets are applied. You can define the rabbets separately for both sides.

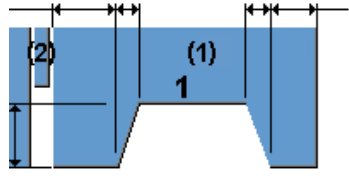
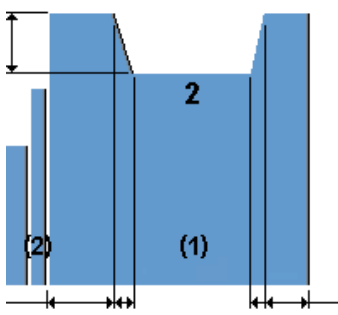
The options are:

- **Top side**
- **Bottom side**
- **Both sides**

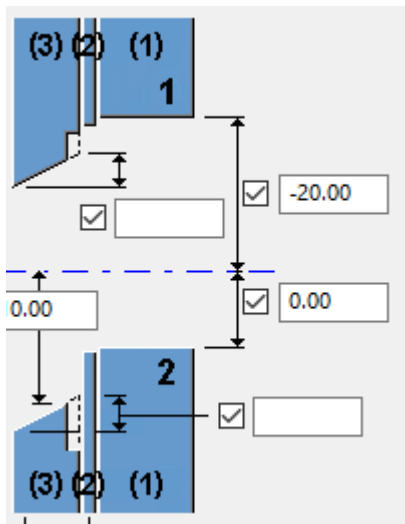
### Connection type

You can select a tongue or groove joint connection for both sides.

Option	Option	Description
		Tongue joint connection, based on the outer geometry
		Groove joint connection, based on the center line
		Tongue joint connection, based on the center line

Option	Option	Description
		Groove joint connection, based on the outer geometry

If you create one tongue and one groove joint, it is possible to overlap the parts. This is defined on the **Picture** tab with seam position values. Enter negative values to move the parts closer together.



#### Extra Foils tab

Use the **Extra foils** tab to define an extra foil layer in the seam.

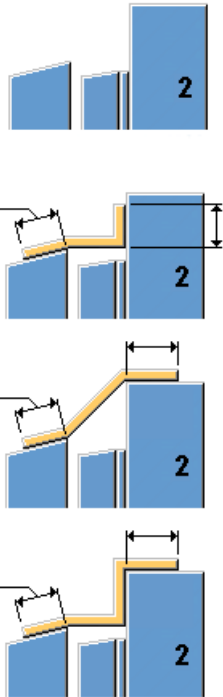
#### Foil

Option	Description	Default
<b>t</b>	Define the extra foil thickness.	1 mm
<b>Pos_No</b>	Prefix and start number for the part position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the

Option	Description	Default
		<b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options .</b>
<b>Name</b>	Name for the extra foil.	FOIL
<b>Class</b>	Part class number for the extra foil layer.	
<b>Comment</b>	Add a comment for the extra foil layer.	

### Connection method

Option	Description
<b>No connection</b>	Select how the extra foil is attached to the sandwich wall. <ul style="list-style-type: none"> <li>• <b>No connection</b> (foil is a loose part)</li> <li>• <b>Weld</b></li> <li>• <b>Cast unit</b></li> <li>• <b>As subassembly</b></li> </ul>
<b>At Inside shell</b>	Select the profile to which the extra foil is connected. <ul style="list-style-type: none"> <li>• <b>At inside shell</b></li> <li>• <b>At outside shell</b></li> </ul>
<b>Position h*b</b>	Select a prefix for the foil layer. <ul style="list-style-type: none"> <li>• <b>Position h*b</b> and <b>Position b*h</b> create a profile without a prefix.</li> <li>• <b>Position PLh*b</b> and <b>Position PLb*H</b> create a profile which start with <b>PL</b> prefix.</li> <li>• <b>Par. section h*b</b> and <b>Par. section b*h</b>: enter a prefix in the box below.</li> </ul>
<b>Auto</b>	Select the rotation of the foil layer. <ul style="list-style-type: none"> <li>• <b>Auto</b></li> <li>• <b>Below</b></li> <li>• <b>Front</b></li> <li>• <b>Top</b></li> <li>• <b>Back</b></li> </ul>

Option	Description
<b>Foil shape</b>	Define shape of the extra foil. 

### General tab

Click the link below to find out more:

[General tab](#)

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

### ***Sandwich wall vertical seam***

**Sandwich wall vertical seam** creates a vertical seam between two sandwich walls. Seam dimensions and rabbets can be defined for all layers: inner shell, foil, insulation, and outer shell.

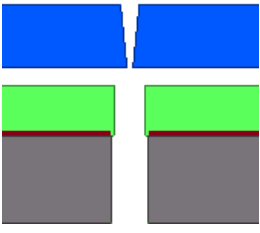

### Objects created

- Seam
- Rabbets
- Foil



- Insulation


### Use for

Situation	Description
	Seams between sandwich wall shells.
	Seams with additional rabbets.

### Limitations

The component works only if the sandwich walls are parallel.

### Before you start

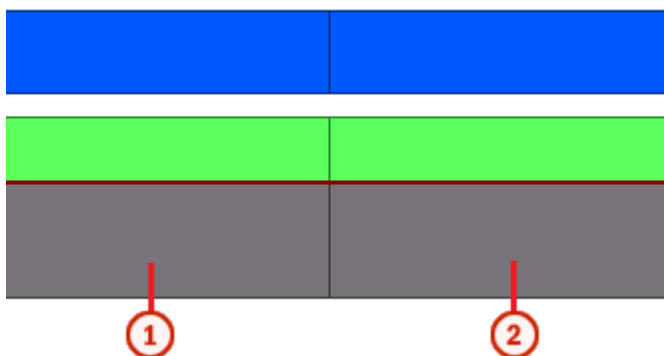
To be able to select the needed parts, activate the **Select objects in components**  switch.

### Selection order

1. Select the inner shell of the first sandwich wall.
2. Select the inner shell of the second sandwich wall.

The seam is created automatically when the secondary part is selected.

### Part identification key



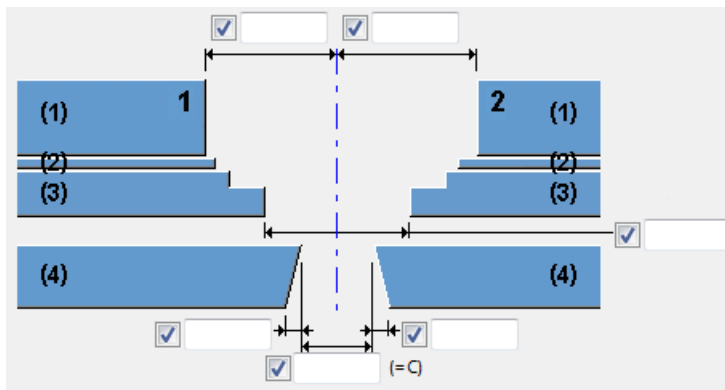
	Part
1	Inner shell of the first sandwich wall
2	Inner shell of the second sandwich wall

### Picture tab

Use the **Picture** tab to control the vertical seam properties.

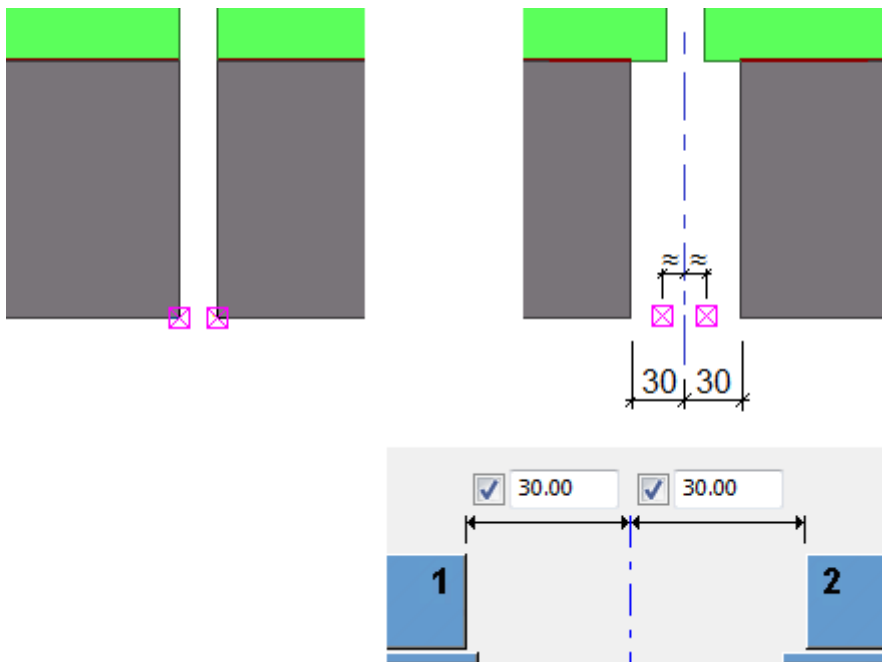
### Seam position

Seams can be defined for inner shells, insulation and outer shells. Draft angles can be defined for the outer shells.



Define the seam position between the sandwich wall shells. The middle line between the walls is used as a reference when the seam position is calculated.

Example:



## Shell classes

Foil classes	<input checked="" type="checkbox"/>	2
Insulation classes	<input checked="" type="checkbox"/>	3
Wall classes	<input checked="" type="checkbox"/>	4

Define the part classes to be applied to the seams. By default, the **Sandwich Wall Vertical Seam** component creates inner shells with class 1, foil with class 2, insulation with class 3 and outer shells with class 4. Use these classes to apply seams.

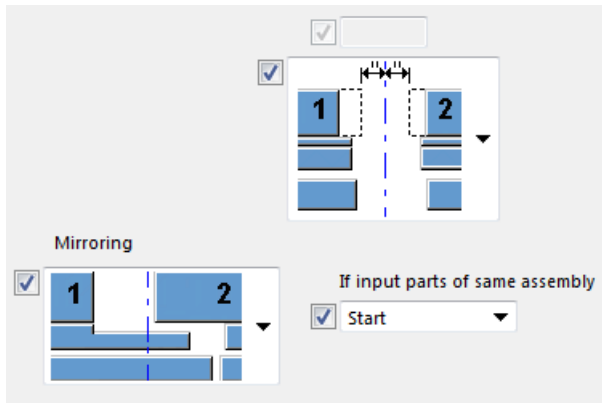
For example, to prevent the creation of seams between foils, insulation shells and outer shells, leave the **Insulation classes** box empty.

## Asymmetrical seams

You can create asymmetrical seams and/or rabbets in the insulation layer.

Option	Description
	<p>Symmetrical seams. No rabbet for the insulation layer.</p>
	<p>Symmetrical seams. Rabbet depth can be defined for the insulation layer.</p>
	<p>Asymmetrical seams for the insulation layer and outer shell. No rabbet for the insulation layer.</p>
	<p>Asymmetrical seams for the insulation layer and outer shell. Rabbet depth can be defined for the insulation layer.</p>

## Offset / Mirror



You can define offset for the seam.

### Rabbets tab

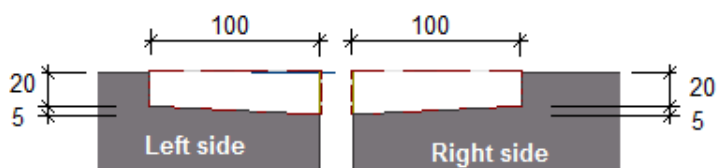
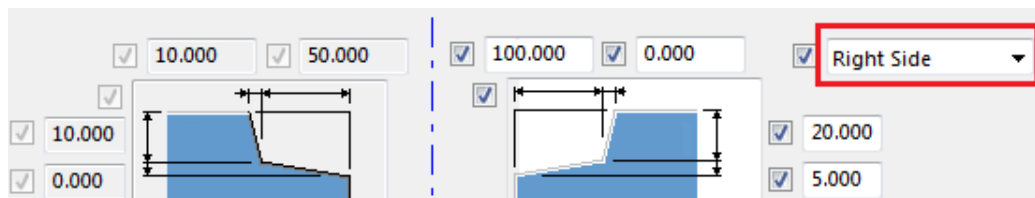
Use the **Rabbets** tab to define rabbets in inner shells, insulation layers and outer shells.

### Rabbit side

Select to which side of the sandwich wall the rabbets are applied.

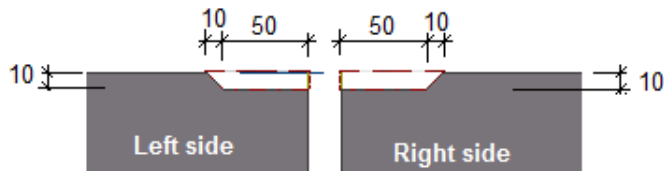
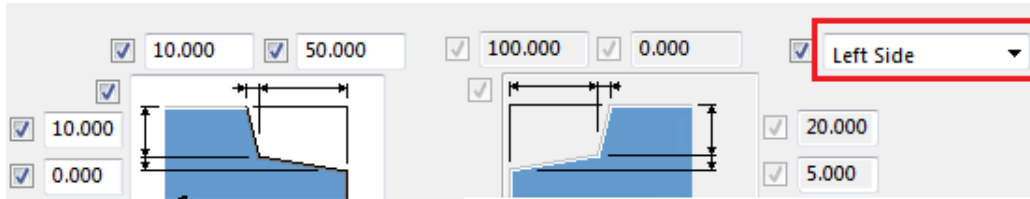
- **Right side**

Rabbets are equal on both sides, but the rabbet dimensions on the right side are applied to both sides.



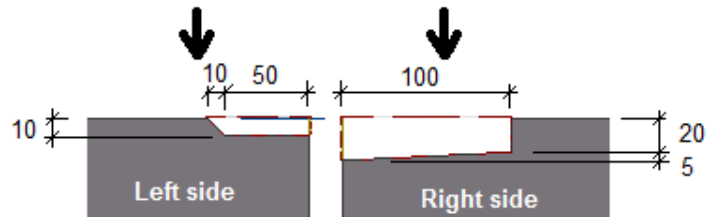
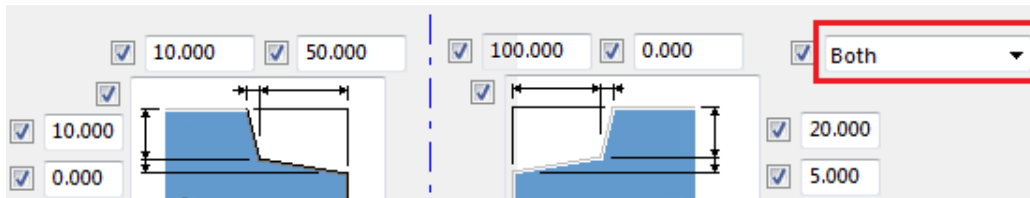
- **Left side**

Rabbets are equal on both sides, but the rabbet dimensions on the left side are applied to both sides.



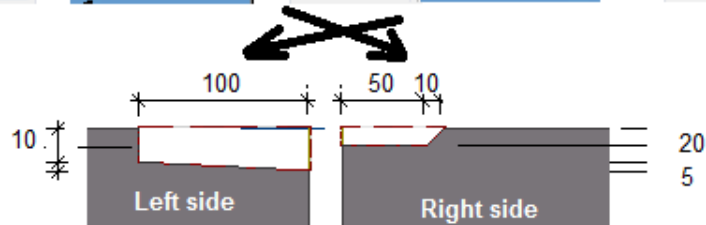
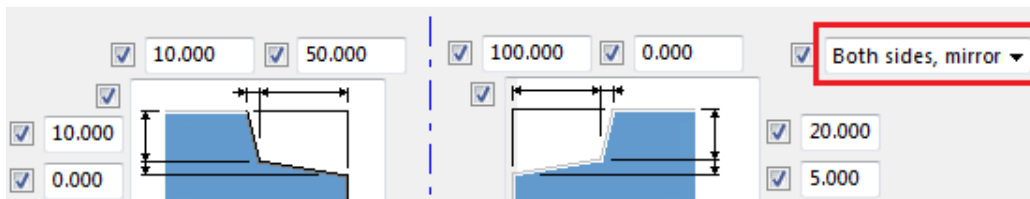
- **Both sides**

Rabet dimensions can be defined separately for both sides.



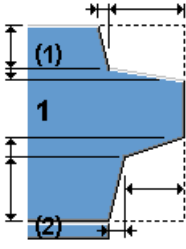
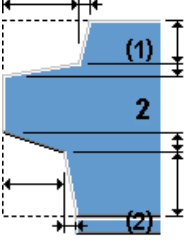
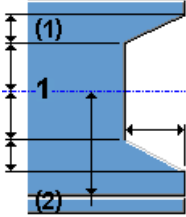
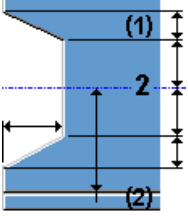
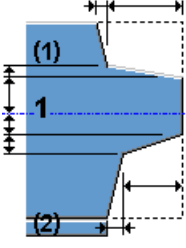
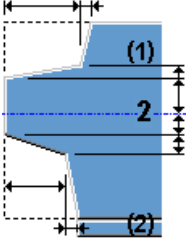
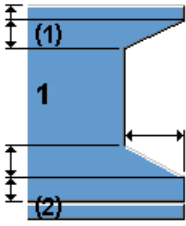
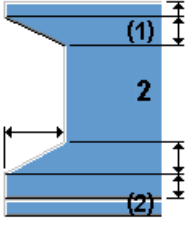
- **Both sides mirrored**

Rabet dimensions can be defined separately for both sides, but sides are mirrored.



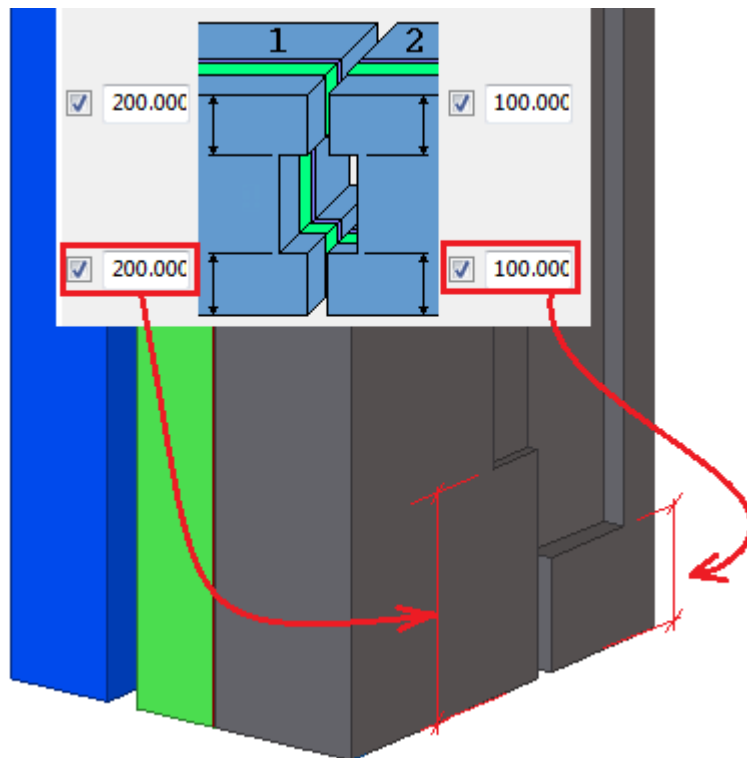
### Connection type

You can select a tongue or groove joint connection for both sides.

Option	Option	Description
		Tongue joint connection, based on the outer geometry
		Groove joint connection, based on the center line
		Tongue joint connection, based on the center line
		Groove joint connection, based on the outer geometry

### Rabbet position

Typically the vertical seams go from the top to the bottom of the sandwich wall. Define the seam offsets for the top and bottom sides. Offsets are applied only to the inner and outer shells.



### General tab

Click the link below to find out more:

[General tab](#)

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

### ***Sandwich wall window***

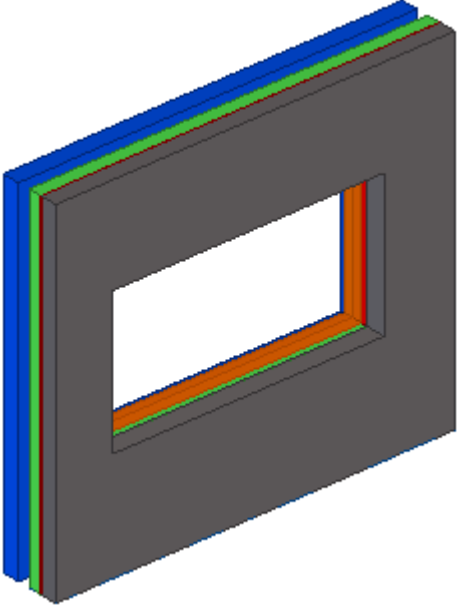
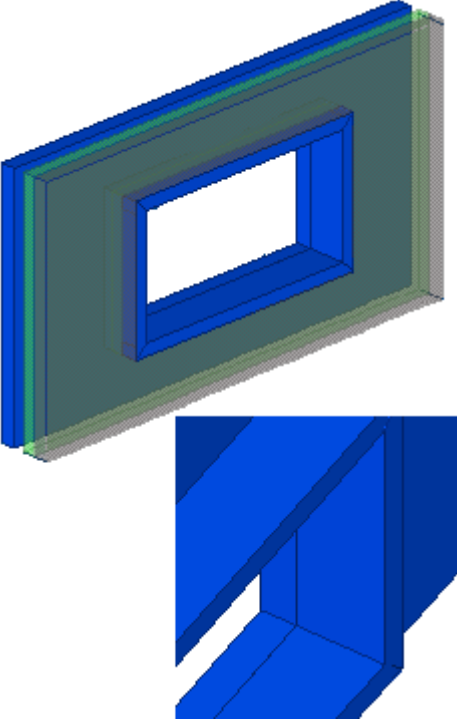
**Sandwich wall window** creates a rectangular window opening in a sandwich wall, or alternatively, a window and a door opening. The opening is created through up to four parts (inner shell, foil, insulation, and outer shell). You can select whether the foil is created. A frame can be created, as well as extra foils and additional parts. The frame can be a wooden frame or a concrete border, added to the inner shell.

### Objects created

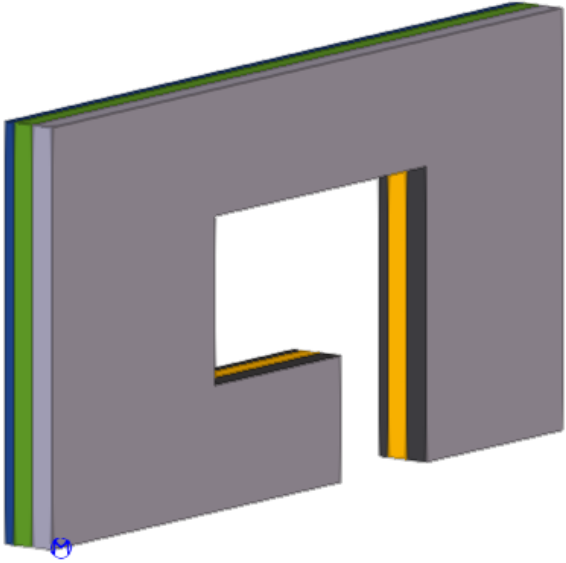
- Rectangular opening
- Wooden frame or concrete border
- Extra foils

- Additional parts

**Use for**

Situation	Description
	<p>Opening in a sandwich wall, with a wooden frame and foil layers.</p>
	<p>Opening in a sandwich wall, with a concrete border in the inner shell.</p>



Situation	Description
	<p>Opening in a sandwich wall, with a door opening.</p>

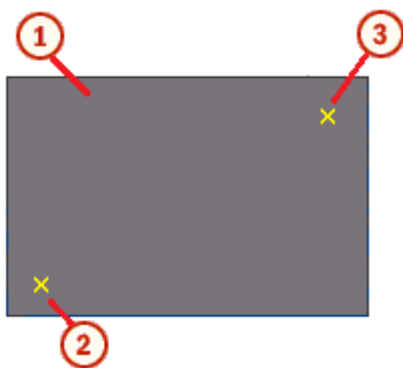
### Selection order

1. Select the inner shell of the sandwich wall.
2. Pick the first position.
3. Pick the second position.

The second position point is needed to complete the input also if you have selected an option for only one input point in the component dialog box. In this case, the second point location does not matter.

The opening is created automatically when the second position is picked.

### Part identification key



	Part
1	Sandwich wall element
2	First picked position

	Part
3	Second picked position

### Picture tab

Use the **Picture** tab to control the dimensions and parts of the opening.

### Dimensions

Option	Dimensions
Create <b>Window</b>	
Create <b>Window + Door</b> Set the <b>Door location</b> to <b>Right side</b> or <b>Left side</b> . The options on the <b>Door side detail</b> tab and <b>Door bottom detail</b> tab are available when you set the <b>Create</b> option to <b>Window + Door</b> .	

Option	Description
1	<p>Set the points for the opening:</p> <ul style="list-style-type: none"> <li>• <b>Bottom and top corner points</b> Pick two points to create the opening (points 2 and 3 in the image).</li> <li>• <b>Bottom corner point, and width and height</b> Pick two points to create the opening. With this option, point 2 shown in the image is the reference point. Point 3 is only</li> </ul>

Option	Description
	<p>needed to complete the input. Define the width and height of the opening.</p> <ul style="list-style-type: none"> <li>• <b>Top corner point, and width and height</b> Pick two points to create the opening. With this option, point 3 shown in the image is the reference point. Define the width and height of the opening.</li> <li>• <b>Bottom and top corner points, and height</b> Pick two points to create the opening (points 2 and 3 in the image). Define the height of the opening.</li> </ul>
2	<p>Vertical offset from the insertion point.</p> <p>When you create <b>Window + Door</b>, this is the vertical offset for the window.</p>
3	Horizontal offset from the insertion point.
4	<p>Width of the opening.</p> <p>When you create <b>Window + Door</b>, this is the width of the window.</p>
5	Height of the window.
6	Width of the door.
7	Vertical offset for the door.

### Select other layers

Option	Description
<b>Insulation, Wall</b>	<p>Parts where the opening is created.</p> <p>To create the opening to the insulation and the external layer parts, enter the class numbers.</p> <p>If you do not enter any numbers, the opening is only created to the part you selected when applying the component.</p>
<b>Parts not in cast unit</b>	Select <b>Yes</b> to create the opening to the parts that do not belong to the cast unit.
<b>Foil</b>	<p>You can use <b>Sandwich wall window</b> both for sandwich panels with a foil and for sandwich panels without a foil (default). If you have a sandwich panel with a foil, select <b>Yes</b> and enter the class number of the foil.</p> <p>The frame shape options shown on the <b>Bottom detail</b>, <b>Left detail</b>, <b>Right detail</b>, and <b>Top detail</b> tabs depend on whether the foil is created or not.</p>
<b>Swap sides when only one layer</b>	You can enable that the side of the window frame is swapped when the input cast unit contains only one single panel. The default value is <b>No</b> .

**Bottom detail tab / Left detail tab / Right detail tab**

Use the **Bottom detail** tab, **Left detail** tab, and **Right detail** tab to control the size, position and shape of the opening bottom, left side, and right side, and the frame size and properties. On the **Right detail** tab, you can select that the right detail is created the same as the left detail.

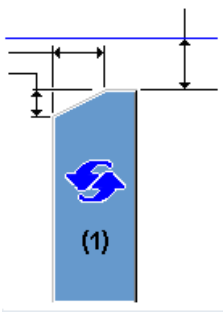
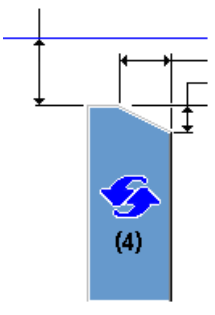
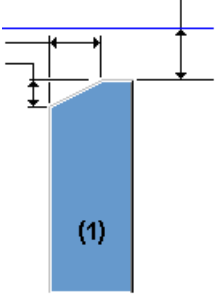
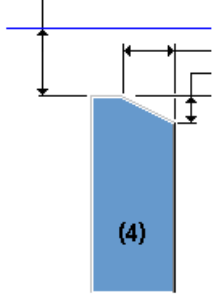
**Frame**

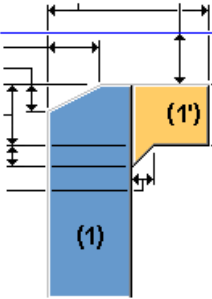
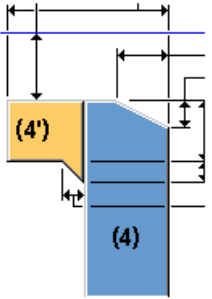
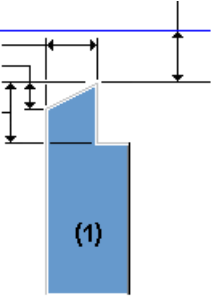
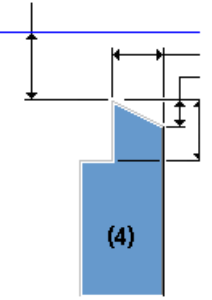
Part	Description	Default
Frame	Define the frame profile by selecting the profile from the profile catalog.	50*50

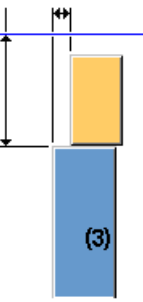
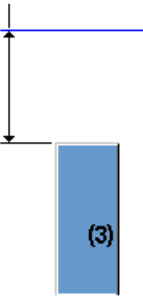
Option	Description
Pos_No	Prefix and start number for the part position number. You can enter the assembly position number on the second row.
Material	Material grade.
Name	Name that is shown in drawings and reports.
Class	Part class number.

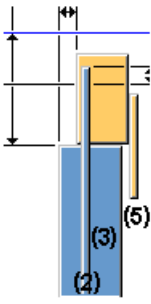
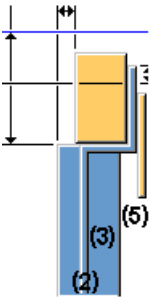
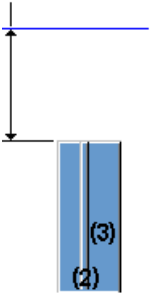
**Frame shape**

The options for inner and outer frame are the same regardless of whether the foil is created or not.

Inner	Outer	Description
		Default Cut or extension is not created. AutoDefaults can change this option. Any of the three options is used depending on the frame size.
		Cut or extension is not created.

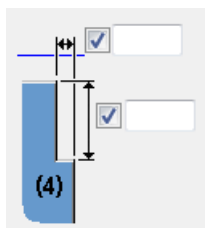
Inner	Outer	Description
		<p>Extension is created.</p> <p>If the frame is narrower than the insulation, the concrete part is extended to fill the gap.</p>
		<p>Cut is created.</p> <p>If the frame is wider than the insulation, the concrete part is cut so that the frame fits.</p>

Middle	Description
	<p>This option is available when the <b>Foil</b> option is set to <b>Do not create</b> on the <b>Picture</b> tab.</p> <p>Frame is created.</p>
	<p>This option is available when the <b>Foil</b> option is set to <b>Do not create</b> on the <b>Picture</b> tab.</p> <p>Frame is not created.</p>


Middle	Description
	<p>This option is available when you select <b>Yes</b> in the <b>Foil</b> option on the <b>Picture</b> tab.</p> <p>Frame is created.</p>
	<p>This option is available when you select <b>Yes</b> in the <b>Foil</b> option on the <b>Picture</b> tab.</p> <p>Frame is created.</p>
	<p>This option is available when you select <b>Yes</b> in the <b>Foil</b> option on the <b>Picture</b> tab.</p> <p>Frame is not created.</p>

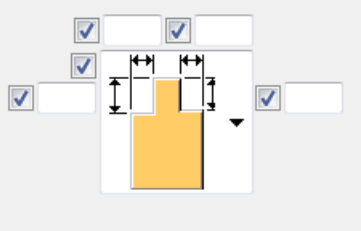
### Additional recess

Define the vertical and horizontal dimensions for the additional recess. By default, the recess is not created.



### Frame corner cuts

Option	Description
	<p>Frame corners are not cut.</p>

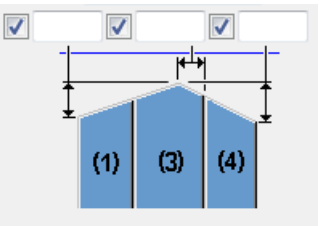
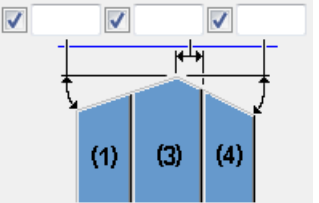
Option	Description
	Define the horizontal and vertical dimensions of the frame corner cuts.

### Create filler parts as insulation

Select whether filler parts are created as shells or as insulation.

### Continuous slope

Select whether frame edges are sloped.

Option	Description
	<b>By length</b>
	<b>By angle</b>

You can set the length or the angle for both sides separately.

The default is that frame edges are not sloped.

### Top detail tab

Use the **Top detail** tab to control the size, position, number, and shape of the opening top side.

### Part

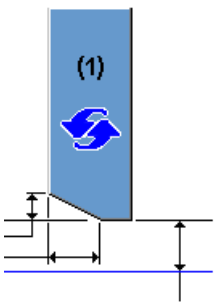
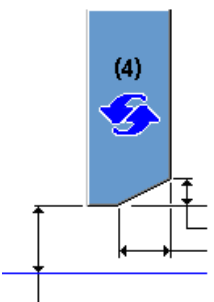
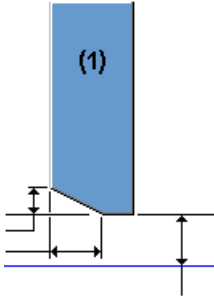
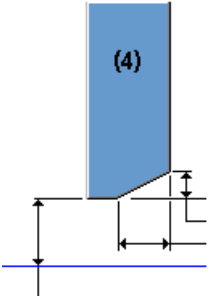
Part	Description	Default
<b>Frame</b>	Define the frame profile by selecting the profile from the profile catalog.	50*50

Part	Description	Default
<b>Foil2</b>	<b>Foil2</b> is the additional foil created only on the top side.  Define the thickness.	

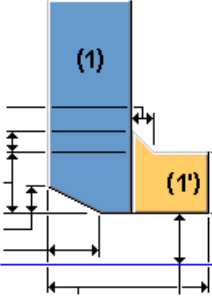
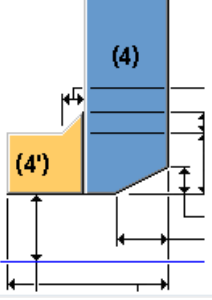
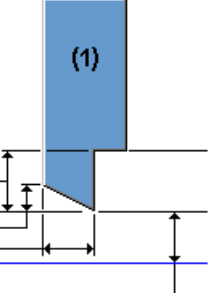
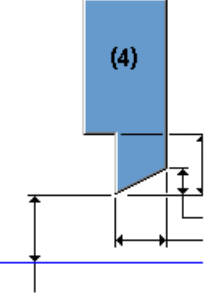
Option	Description
<b>Pos_No</b>	Prefix and start number for the part position number.  You can enter the assembly position number on the second row.
<b>Material</b>	Material grade.
<b>Name</b>	Name that is shown in drawings and reports.
<b>Class</b>	Part class number.

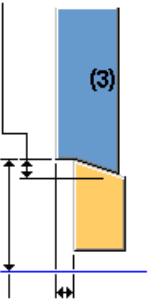
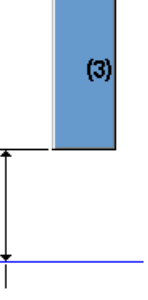
### Top frame shape

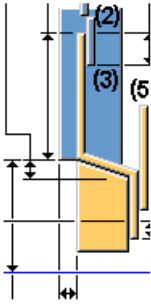
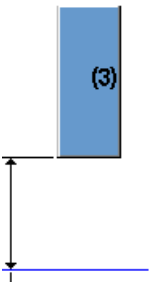
The options for inner and outer frame are the same regardless of whether the foil is created or not.

Inner	Outer	Description
		Default Cut or extension is not created.  AutoDefaults can change this option. Any of the three options is used depending on the frame size.
		Cut or extension is not created.



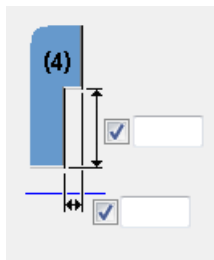
Inner	Outer	Description
 <p>Diagram showing an inner frame (1) and insulation (1') with an extension. The frame is narrower than the insulation, so the concrete part is extended to fill the gap.</p>	 <p>Diagram showing an outer frame (4) and insulation (4') with an extension. The frame is narrower than the insulation, so the concrete part is extended to fill the gap.</p>	<p>Extension is created. If the frame is narrower than the insulation, the concrete part is extended to fill the gap.</p>
 <p>Diagram showing an inner frame (1) with a cut. The frame is wider than the insulation, so the concrete part is cut so that the frame fits.</p>	 <p>Diagram showing an outer frame (4) with a cut. The frame is wider than the insulation, so the concrete part is cut so that the frame fits.</p>	<p>Cut is created. If the frame is wider than the insulation, the concrete part is cut so that the frame fits.</p>

Middle	Description
 <p>Diagram showing a middle frame (3) with a frame created. The frame is wider than the insulation, so the concrete part is cut so that the frame fits.</p>	<p>This option is available when the <b>Foil</b> option is set to <b>Do not create</b> on the <b>Picture</b> tab. Frame is created.</p>
 <p>Diagram showing a middle frame (3) with a frame not created. The frame is wider than the insulation, so the concrete part is cut so that the frame fits.</p>	<p>This option is available when the <b>Foil</b> option is set to <b>Do not create</b> on the <b>Picture</b> tab. Frame is not created.</p>


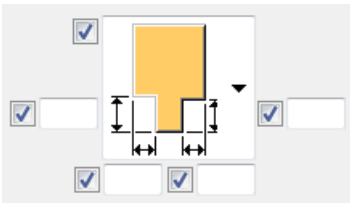
Middle	Description
	<p>This option is available when you select <b>Yes</b> in the <b>Foil</b> option on the <b>Picture</b> tab.</p> <p>Frame is created.</p>
	<p>This option is available when you select <b>Yes</b> in the <b>Foil</b> option on the <b>Picture</b> tab.</p> <p>Frame is not created.</p>

### Additional recess

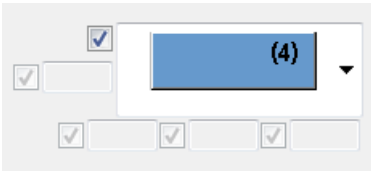
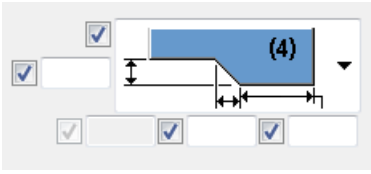
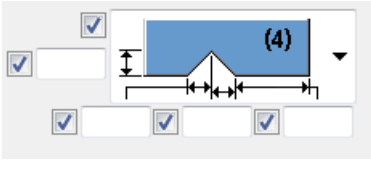
Define the vertical and horizontal dimensions for the additional recess. By default, the recess is not created.



### Frame corner cuts

Option	Description
	<p>Frame corners are not cut.</p>
	<p>Horizontal and vertical dimensions of the frame corner cuts.</p>

## Drip mold

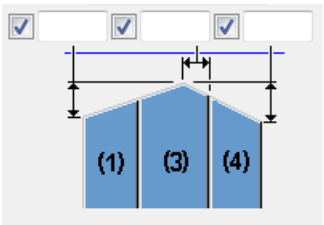
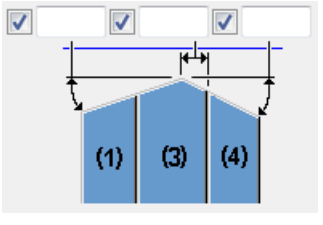
Option	Description
	Drip mold is not created.
	Drip mold is created. Define the mold dimensions.
	<p>Drip mold is created. Define the mold dimensions.</p> <p>The drip mold can be created to any of the shape options. For example, if the shape has a bevel, the drip mold is created at the same angle as the bevel.</p>

## Create filler parts as insulation

Select whether filler parts are created as shells or as insulation.

## Continuous slope

Select whether frame edges are sloped.

Option	Description
	<b>By length</b>
	<b>By angle</b>

You can set the length or the angle for both sides separately.

The default is that frame edges are not sloped.

### Extra foils tab

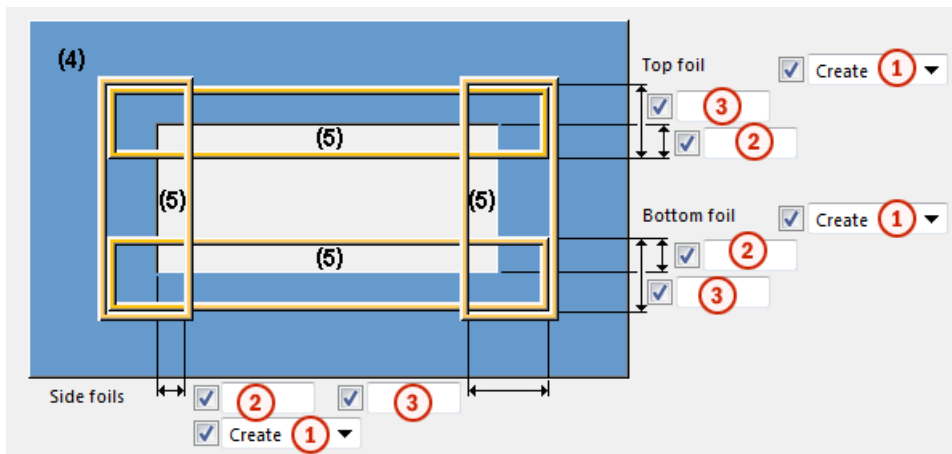
Use the **Extra foils** tab to control the creation of extra foils on the top, bottom, right side, and left side of the opening.

### Part

Part	Description	Default
Extra foil	Thickness of the foil.	50*50

Option	Description
Pos_No	Prefix and start number for the part position number. You can enter the assembly position number on the second row.
Material	Material grade.
Name	Name that is shown in drawings and reports.
Class	Part class number.


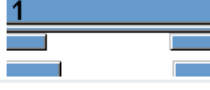


### Extra foil dimensions



	Description
1	Define whether extra foils are created.
2	Define the inside offset.
3	Define the foil width.

### Shells to cut

Option	Description
	All shells are cut.

Option	Description
	The inner shell is not cut.
	The inner shell and the foil are not cut.
	The inner shell and the foil are not cut. An insulation extension is created. Define the width and the material grade of the insulation extension.
	The outer shell is cut.

### Additional parts tab

Use the **Additional parts** tab to control the size, position, number, and alignment of additional parts.

### Parts

Select whether additional parts, custom component parts, or no additional parts are created.

Part	Description	Default
<b>Parts</b>	Define the profile of the additional parts by selecting the profile from the profile catalog.	D5
<b>Custom component parts</b>	Define the custom component parts by selecting the component from the <b>Applications &amp; components</b> catalog. You can also use a configuration file to define the properties.	

Option	Description
<b>Pos_No</b>	Prefix and start number for the part position number. You can enter the assembly position number on the second row.
<b>Material</b>	Material grade.
<b>Name</b>	Name that is shown in drawings and reports.
<b>Class</b>	Part class number.

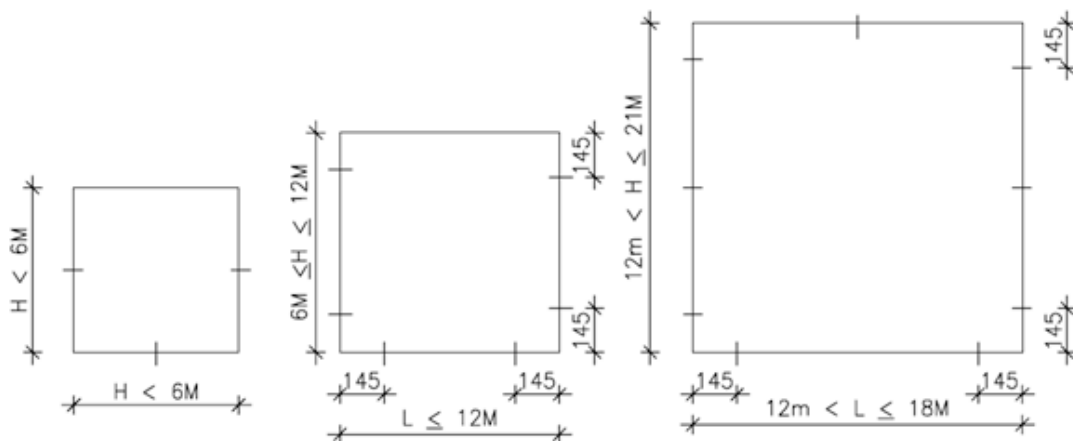
## Define distances

Select whether to define the distances between the parts by entering the distance dimensions on this tab or by using an external text file. You can use an external file to automate the creation of additional parts when window sizes differ.

The name of the external file is

`SandwichPanelWindowAdditionalParts.dat`. The file is located in the `..\Environments\Common\system` folder.

The image below shows an example of a local standard for creating additional parts. M is a module that is 100 mm.



The `SandwichPanelWindowAdditionalParts.dat` configuration file that contains the needed specifications for the example above is as follows:

```

BOTTOM;
0;599;1;1
600;1200;1;2;145
1201;1800;1;3;145
TOP;
1201;1800;1;1
LEFT;
0;599;1;1
600;1200;1;2;145
1201;2100;1;3;145
RIGHT;
0;599;1;1
600;1200;1;2;145
1201;2100;1;3;145

```

The keywords `BOTTOM`, `TOP`, `LEFT` and `RIGHT` define the side of the window the settings are applied to.

The syntax in the file is as follows: `bmin;bmax;cm;nd;dmax;d1;d2;d3`.

<code>bmin</code>	Smallest window dimension to apply the setting.
<code>bmax</code>	Biggest window dimension to apply the setting.
<code>cm</code>	Creation method: <ul style="list-style-type: none"> <li>1 means use the number of parts for <code>nd</code>.</li> </ul>

	<ul style="list-style-type: none"> <li>• 2 means use maximum spacing for <math>n_d</math>.</li> </ul>
$n_d$	Depending on the creation method ( $c_m$ ): <ul style="list-style-type: none"> <li>• Number of parts, when <math>c_m</math> is 1.</li> <li>• Maximum allowed distance between parts, when <math>c_m</math> is 2.</li> </ul>
$d_1$	Distance from the start point to the first additional part (optional).
$d_2$	Distance from the first additional part to the second (optional).
$d_3$	Distance from the second additional part to the third (optional).

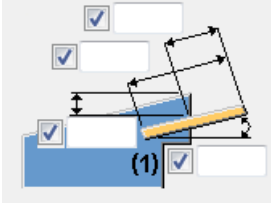
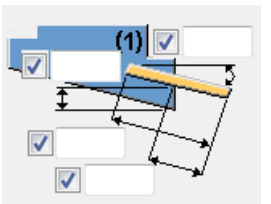
The additional parts are placed symmetrically, so distances  $d_1$ ,  $d_2$  and  $d_3$  are also used from the end point. If the optional distances  $d_1$ ,  $d_2$  and  $d_3$  are not defined, the parts are placed at equal distances.

In the image above  $0; 599; 1; 1$  means that when the window width is equal or bigger than 0, but equal or less than 599, the creation method is by number of parts and 1 part should be created.

$600; 1200; 2; 300; 145$  would mean that when the window width is equal or bigger than 600, but equal or less than 1200, the creation method is use maximum spacing. The maximum allowed spacing between additional parts is 300 mm. The first part (and last part) distance is 145 mm. If the window width is 1200, three more parts are needed  $(1200 - 2 \times 145) / 300 = 3.03$ . The spacing between the additional parts will then be  $(1200 - 2 \times 145) / 4 = 227.5$  mm.

### Placement

Select whether additional part placement is the same or different on each side.

Option	Description
	Placement dimensions for the bottom, left side, and right side.  If additional part placement is the same on each side, define the bottom dimensions only.
	Placement dimensions for the top side.

### Door edge options

The options for controlling door edges are available when you set the **Create** option to **Window + Door** on the **Picture** tab, and the **Placement** option to **Different each side** on the **Additional parts** tab.

Option	Description
Create on door side	No, Same as window side, Same as door side
Create in bottom detail	No, Same as bottom

### Connections tab

Use the **Connections** tab to control how the wooden frame, additional parts, extra foil, and extensions are connected to the shells.

### Add

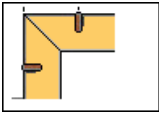
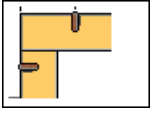
Option	Description
<b>Wooden frame to, Additional parts, Extra foil to</b>	<p>Select to which part the wooden frame, additional parts, and extra foil are connected.</p> <p>You can create the frame as an assembly. To add window and door frames to a shell as one subassembly, select <b>Subassembly</b> for <b>Wooden frame to</b>.</p> <p>The <b>Extra foil to</b> option is shown if you have selected to create the foil on the <b>Picture</b> tab.</p>

### Connect extensions to their shells

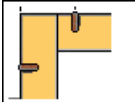
Option	Description
<b>Inside shell extension, Outside shell extension, Insulation shell extension, Foil extension</b>	<p>Select how the extension parts are connected to their main parts.</p> <p>The <b>Foil extension</b> option is shown if you have selected to create the foil on the <b>Picture</b> tab.</p>

### Edge connection

Define the corner connection type for wooden frames.

Option	Description
	Cut both frames in a 45-degree angle.
	Extend horizontal frames.



Option	Description
	Extend vertical frames.

#### Door side detail tab / Door bottom detail tab

Use the **Door side detail** tab and **Door bottom detail** tab to control the size, position, and shape of the door side and bottom, and the frame size and properties.

#### Create door

The options on the **Door side detail** tab and **Door bottom detail** tab are available when you set the **Create** option to **Window + Door** on the **Picture** tab.

#### Same as options

- **Same as** on the **Door side detail** tab:
  - Select the door short side detail.
  - **None**
  - **Same as window side** follows the side setting of the window side.
  - **Same as door side** follows the door side setting.

The door long side detail follows the setting of the corresponding window side.

- **Same as bottom** on the **Door bottom detail** tab:
  - Yes** follows the setting of the bottom window.

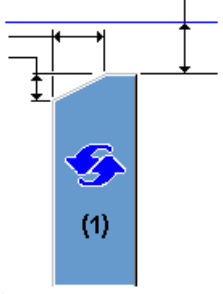
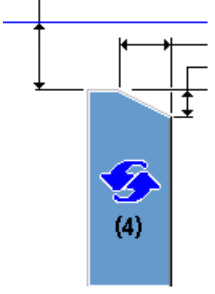
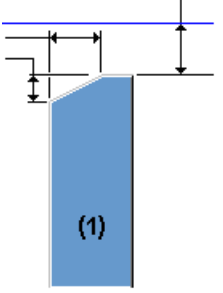
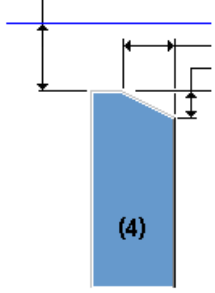
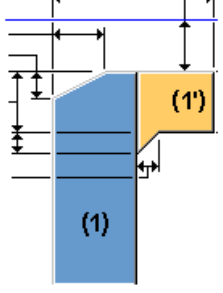
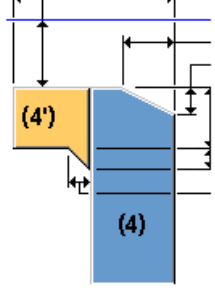
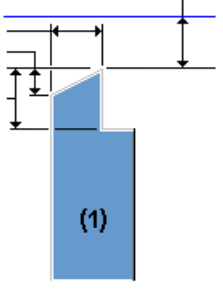
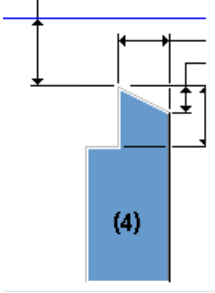
#### Frame

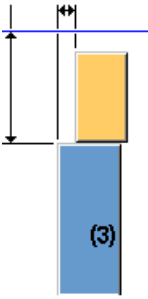
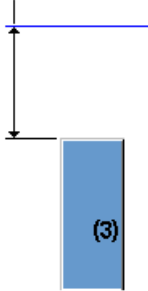
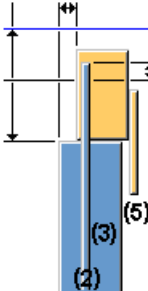
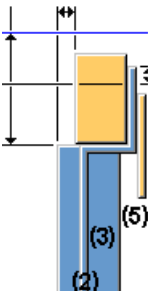
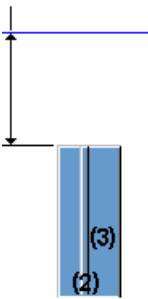
Part	Description	Default
<b>Frame</b>	Define the frame profile by selecting the profile from the profile catalog.	50*50

Option	Description
<b>Pos_No</b>	Prefix and start number for the part position number. You can enter the assembly position number on the second row.
<b>Material</b>	Material grade.
<b>Name</b>	Name that is shown in drawings and reports.
<b>Class</b>	Part class number.

## Frame shape

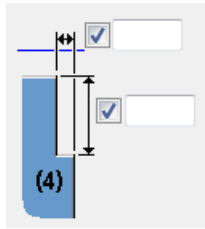
The options for inner and outer frame are the same regardless of whether the foil is created or not.

Inner	Outer	Description
 <p>(1)</p>	 <p>(4)</p>	<p>Default</p> <p>Cut or extension is not created.</p> <p>AutoDefaults can change this option. Any of the three options is used depending on the frame size.</p>
 <p>(1)</p>	 <p>(4)</p>	<p>Cut or extension is not created.</p>
 <p>(1)</p> <p>(1')</p>	 <p>(4)</p> <p>(4')</p>	<p>Extension is created.</p> <p>If the frame is narrower than the insulation, the concrete part is extended to fill the gap.</p>
 <p>(1)</p>	 <p>(4)</p>	<p>Cut is created.</p> <p>If the frame is wider than the insulation, the concrete part is cut so that the frame fits.</p>


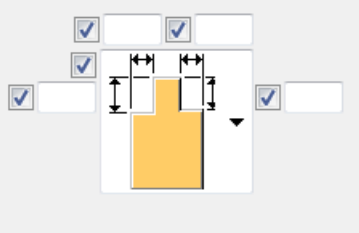
Middle	Description
	<p>This option is available when the <b>Foil</b> option is set to <b>Do not create</b> on the <b>Picture</b> tab.</p> <p>Frame is created.</p>
	<p>This option is available when the <b>Foil</b> option is set to <b>Do not create</b> on the <b>Picture</b> tab.</p> <p>Frame is not created.</p>
	<p>This option is available when you select <b>Yes</b> in the <b>Foil</b> option on the <b>Picture</b> tab.</p> <p>Frame is created.</p>
	<p>This option is available when you select <b>Yes</b> in the <b>Foil</b> option on the <b>Picture</b> tab.</p> <p>Frame is created.</p>
	<p>This option is available when you select <b>Yes</b> in the <b>Foil</b> option on the <b>Picture</b> tab.</p> <p>Frame is not created.</p>

### Additional recess



Define the vertical and horizontal dimensions for the additional recess. By default, the recess is not created.



### Frame corner cuts

Option	Description
	Frame corners are not cut.
	Define the horizontal and vertical dimensions of the frame corner cuts.

### Door side frame extension

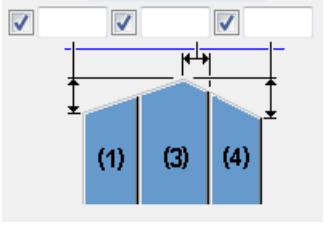
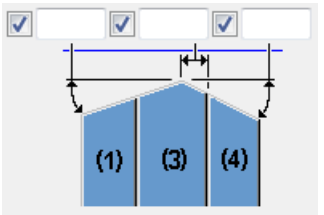
Option	Description
	Frame on the door side is created only to the bottom level of the window.
	Frame on the door side is extended to the top level of the window. Enter the extension distance in the box.

### Create filler parts as insulation

Select whether filler parts are created as shells or as insulation.

### Continuous slope

Select whether frame edges are sloped.

Option	Description
	By length
	By angle

You can set the length or the angle for both sides separately.

The default is that frame edges are not sloped.

### **Wall layout tools**

**Wall Layout** tools is a set of components that you can use for creating and modifying all common types of concrete walls, such as solid precast panels from single layers to double walls and sandwich walls, and different wall structures that are cast on the site. The wall structure may contain several layers, for example, structural layers, insulation, void, and surface treatments. You can use direct modification to flexibly change the wall geometry, layer offsets, openings, and seam lines.

**Wall layout** is the main component in the set and it is used for defining the wall layout. **Wall layout** is available on the **Concrete** tab, click **Panel** --> **Wall layout**, and in the **Applications & components** catalog.

The other **Wall Layout** tools are available in the **Applications & components** catalog:

- **Wall layout connector** connects the walls to each other.
- **Wall layout T connector** connects walls to each other with T connections. **Wall layout T connector** can also create a seam at the connection location.
- **Wall layout opening** sets the default values for openings. Use direct modification to create and modify openings.
- **Wall layout seam** divides the wall segment into two or more cast units by adding seams. Use direct modification to create seams.
- **Wall layout elementation** divides the wall into elements according to length, height, number, weight, or crane lifting capacity.
- **Wall layout layer swapper** is intended for swapping the casting order of layers in a double wall. Only certain properties of the two layers are

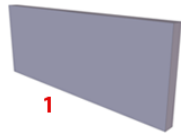
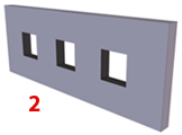
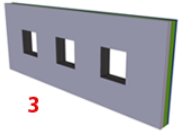
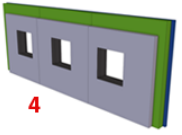
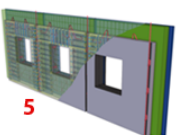
swapped, such as name, class, numbering settings, and all UDAs. The geometry of the layers is not swapped. If one layer is created using the layer creation option **Add as sub-assembly** (shell 2), and the other layer is defined as **Add to cast unit** (shell 1), these properties are also swapped.

### Convert a wall panel to wall layout


You can use the **Convert to layout component** tool to convert wall panels to **Wall layout** components, see [Convert to layout component \(page 3029\)](#) for instructions.

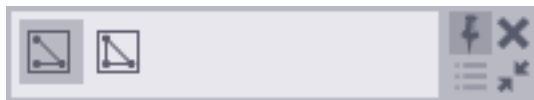
#### Wall layout


**Wall layout** creates a single wall or multiple straight wall segments. The wall can be a single-layer solid wall, a double wall, or a sandwich wall that has any number of layers.

Design workflow with Wall layout tools				
 1	 2	 3	 4	 5
<ol style="list-style-type: none"><li>1. You can build a shape.</li><li>2. You can build a shape and create openings.</li><li>3. You can create wall type definitions.</li><li>4. You can create wall elementation and define detailed wall geometry.</li><li>5. You can define detailed connections, openings, embeds, and reinforcement.</li></ol>				


### Selection order

1. Ensure that the **Direct modification**  switch is active.
2. On the **Concrete** tab, click **Panel** --> **Wall layout**.
3. Select the appropriate command on the contextual toolbar:



- To create one or more straight wall segments, click , and then pick two or more points.

Note that you can finish the creation to the first picked point to create a closed wall structure.

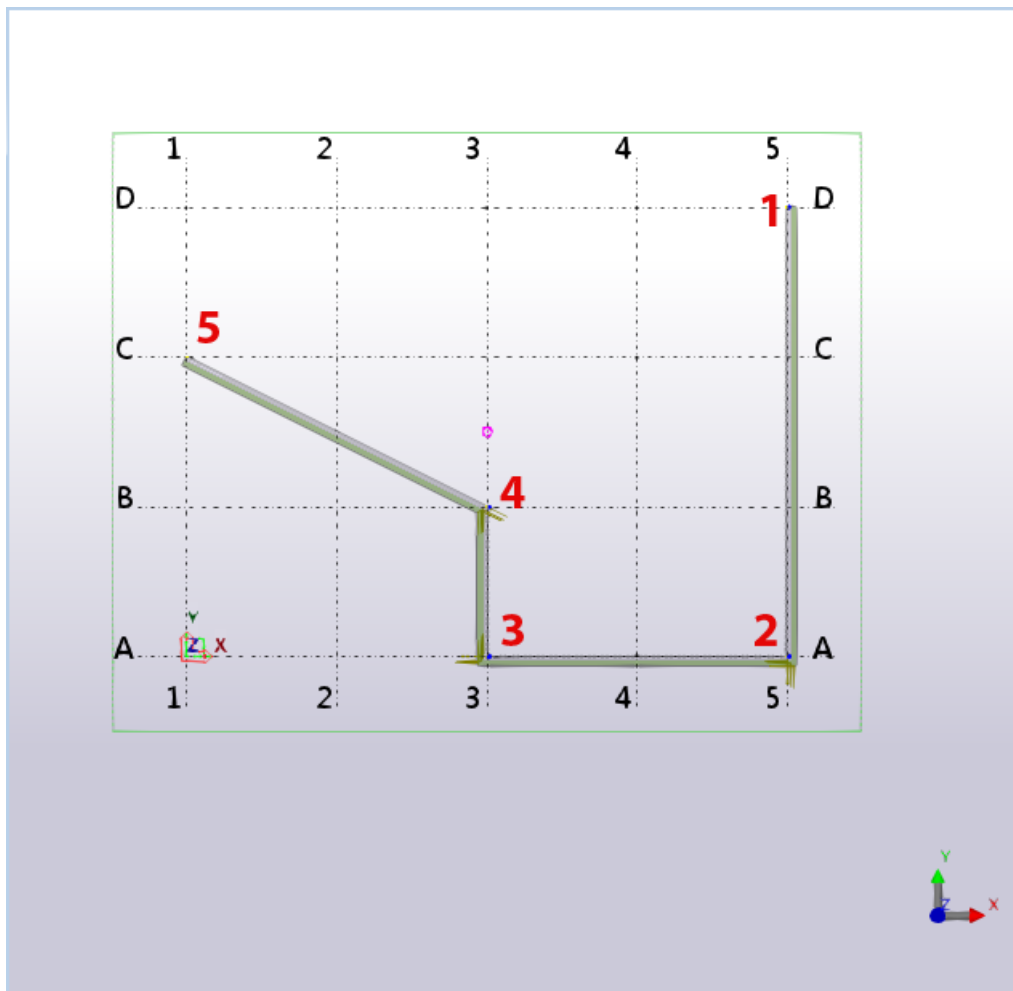
- To create the wall layout as a closed wall, click , and then pick two or more points.

**Wall layout** will automatically connect the first and the last point that you have picked.

- Click the middle mouse button to create the wall.

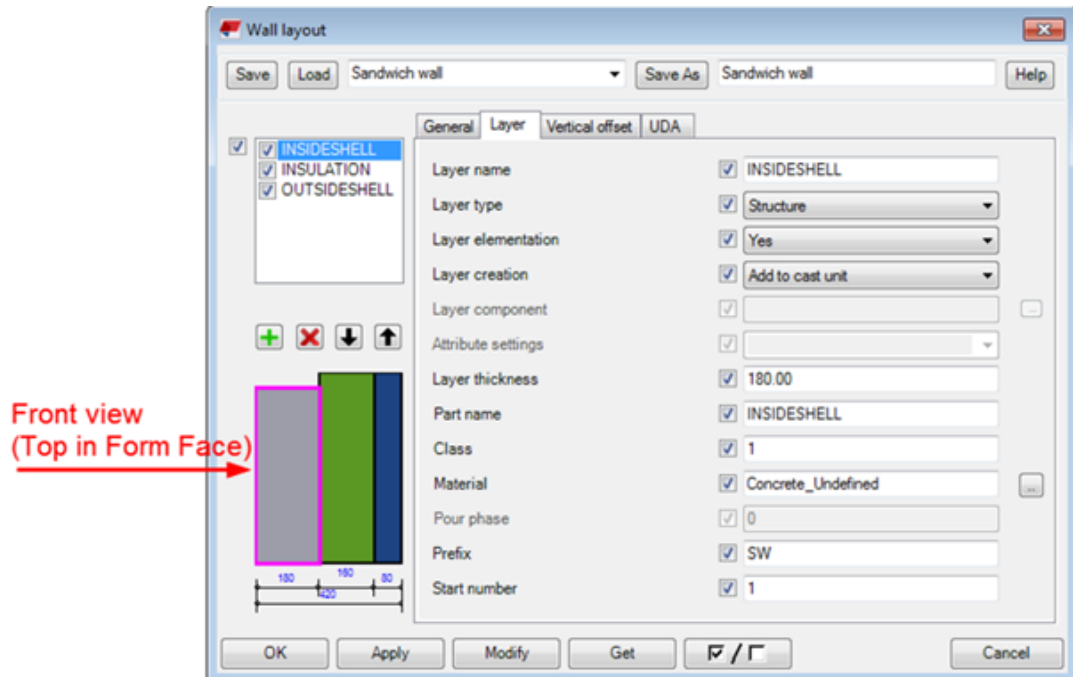
Depending on how many points you pick and how you pick the points, one or more straight wall segments or a closed wall is created in the model. Each created straight segment is a separate instance of the **Wall layout** component that you can modify separately. When you create two or more wall segments, an instance of the **Wall layout connector** component is added between each wall segment.

In the image below, there are four wall segments in an open shape between the picked points, 1 - 5, and three wall layout connectors at points 2, 3 and 4. If you had created a closed wall, there would be a fifth wall segment between points 5 and 1.



The modeling direction of the wall layout determines which face of the wall layout is shown in the front view of a cast unit drawing when the cast unit drawing coordinate system is set to **Fixed**.

In the image below, the top-in-form face is not set by **Wall layout**. The image shows an example of sandwich wall settings that you should use when the outside shell is cast against the pallet, and the inside shell is the uppermost shell in the casting.



Alternatively, you can set the top-in-form face with **Wall layout**. Set `Walllayout.Udas.dat` to have the top-in-form face property by adding the following row:

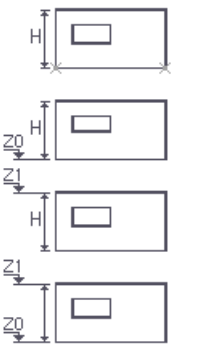
```
option FixedMainView j_FixedDrawingMainView
```

The `Walllayout.Udas.dat` file can be located in the model folder or any of the system folders.

### General tab

Use the **General** tab to define the basic properties for the whole **Wall layout** component. The properties on all other tabs are layer-specific, and apply to the layer that you have currently selected in the layer list.

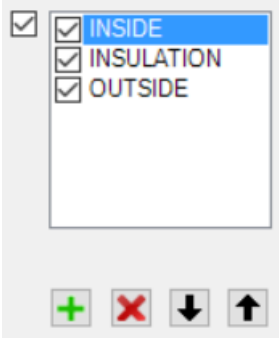




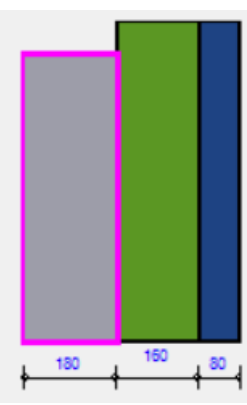


Option	Description
<p><b>H, Z1, Z0</b></p> 	<p>You have four options for defining the height and the global Z coordinates:</p> <ul style="list-style-type: none"> <li>Define the wall bottom level according to the creation points, and the <b>Position in depth</b> option and value. Define the height with the <b>H</b> option.</li> <li>Define the wall bottom level with the <b>Z0</b> option (global Z coordinate), and the height with the <b>H</b> option.</li> <li>Define the wall top level with the <b>Z1</b> option (global Z coordinate), and the height with the <b>H</b> option.</li> <li>Define the wall bottom level with the <b>Z0</b> option (global Z coordinate), and the wall top level with the <b>Z1</b> option (global Z coordinate).</li> </ul> <p>You can use the <b>H</b> option to modify the height of rectangular walls. If you change the wall shape so that it is not rectangular, you cannot define height with this option. Use direct modification instead.</p>
<p><b>Total thickness</b></p>	<p>Enter the total thickness of the wall layout. Layer thickness is calculated based on the total thickness.</p> <p>Use the total thickness for double walls where the thickness of the void layer or the CIP layer is often flexible. This means that <b>Wall layout</b> can adjust the thickness so that the total thickness is as defined.</p> <ul style="list-style-type: none"> <li>If there are no flexible layers in the wall layout, you can leave the total thickness option empty. Total thickness is not used if there are no flexible layers.</li> <li>If there is more than one flexible layer, the thickness is divided equally between those layers.</li> </ul>
<p><b>Cast unit name</b></p>	<p>Enter a name for the cast unit.</p>
<p><b>Prefix</b></p>	<p>Enter a prefix for the cast unit.</p>
<p><b>Start number</b></p>	<p>Enter a start number for the cast unit.</p>
<p><b>Main part layer</b></p>	<p>Select which layer part is set as the main part of the cast unit. The <b>Default</b> option sets the structural part with the greatest volume as the main part.</p>
<p><b>Position in plane</b></p>	<p>Define the wall layout location in relation to the line between the input points.</p> <p>Enter the offset distance, if needed.</p>
<p><b>Position in depth</b></p>	<p>Define the wall layout vertical location in relation to the line between the input points.</p> <p>Enter the offset distance, if needed.</p>

## Layer tab


Use the **Layer** tab to define the properties of a single layer. Select the layer in the layer list, or in the preview image.

### Layer list

Layers	Description	Example
	<p>The layer list shows the layers of the wall.</p> <p>Use the buttons to control the number and the order of the layers:</p> <ul style="list-style-type: none"><li>• Click  to add a new layer.</li><li>• Click  to remove the selected layer.</li><li>• Click   to change the order of the layers by moving the selected layer up or down in the list.</li></ul> <p>Use the check box in front of the layer name to control whether the properties of the selected layer are modified.</p> <p>Use the leftmost check box to control whether the number of layers and the order of the layers are modified when you modify the <b>Wall layout</b> component.</p>	<p>The example image below shows a preview of the wall layers. The image is automatically updated when you change the layer type. The selected layer is highlighted with a magenta frame.</p> 

### Layer properties

Option	Description
<b>Layer name</b>	<p>Enter a name for the layer. This name is shown in the layer list.</p> <p>Layer names are also shown on the contextual toolbar when you modify wall boundary offsets. You can select which layer to modify.</p> <p>Layer names are not visible in reports or drawings.</p>
<b>Layer type</b>	<ul style="list-style-type: none"> <li>• <b>Structure:</b> Typically used for solid walls, double walls, and the concrete layers of sandwich walls. Use this type if you want to create a cast-in-place layer between double wall layers instead of a void.</li> <li>• <b>Insulation:</b> Insulation layer in a sandwich wall. Insulation gets a different density in <b>Wall layout elementation</b> (100 kg/m<sup>3</sup>).</li> <li>• <b>Void:</b> Void between double wall layers. Use this type if you do not want to create any parts for the layer.</li> <li>• <b>Foil:</b> Typically a very thin layer which is not detailed in the corners.</li> <li>• <b>Surface:</b> Surface treatment on top of a structural layer. Typically, a surface layer is the first and/or the last layer.</li> <li>• <b>Component:</b> Layer is not created as a part. Instead, an instance of the component selected in the <b>Layer component</b> option is added.</li> </ul>
<b>Layer elementation</b>	<p>Select whether the layer is split into two pieces using seams.</p>
<b>Layer creation</b>	<p>Select how the layer is created to the precast cast unit:</p> <ul style="list-style-type: none"> <li>• <b>Add to cast unit:</b> All layer parts are added to a single main cast unit.</li> <li>• <b>Add as sub-assembly:</b> The layer part is added as a sub-assembly to the main cast unit.</li> <li>• <b>Do not add to cast unit:</b> The layer part is not added to the main cast unit. It will be its own assembly or cast unit. This option changes the concrete type from precast to <b>cast in place</b>.</li> </ul>
<b>Layer component</b>	<p>Select a component when you have set the layer type to <b>Component</b>. Instead of creating the layer as a part, an instance of the component is created.</p> <p>You can control some of the component properties from <b>Wall layout</b> properties.</p> <p>Define the property names in the component accordingly:</p>

Option	Description
	<ul style="list-style-type: none"> <li>• P_Height - Layer height (maximum height of the layer part)</li> <li>• P_Thickness - Layer thickness</li> <li>• P_Name - Layer part name</li> <li>• P_Class - Layer part class</li> <li>• P_Material - Layer material</li> <li>• P_Prefix - Layer part prefix</li> <li>• P_StartNo - Layer part start number</li> </ul> <p>The creation points of the component are in the same locations as when creating the layer as a part.</p> <p>If the custom part or component property names are not the same as the default names, you can define the parameters in the <code>xxxxx.LayerComponentInfo.xml</code> file where <code>xxxxx</code> is the component name.</p> <p>In this file you can also specify the mapping for other layer properties so that the values given in the attribute file will be overridden with the layer properties defined in the <b>Wall layout</b> dialog box. For an example of the file, see the <b>Customize the wall layout</b> section.</p>
<b>Attribute settings</b>	<p>Select an attribute file for the layer component.</p> <p>If you need specific component properties for the layer component, you can define the properties in the component dialog box and save them as an attribute file.</p>
<b>Layer thickness</b>	<p>Enter the layer thickness.</p> <p>You can leave the layer thickness empty to let <b>Wall layout</b> set the layer thickness so that the total thickness is correct as defined on the <b>General</b> tab. The void layer or the CIP layer in a double wall can often have a flexible thickness.</p> 
<b>Part name, Class, Material, Pour</b>	<p>Define the name, class, material, part prefix and start number of the layer part. Define the pour phase for CIP</p>

Option	Description
<b>phase, Surface treatment, Prefix, Start number</b>	layers. Select the surface treatment when you have set the layer type to <b>Surface</b> .

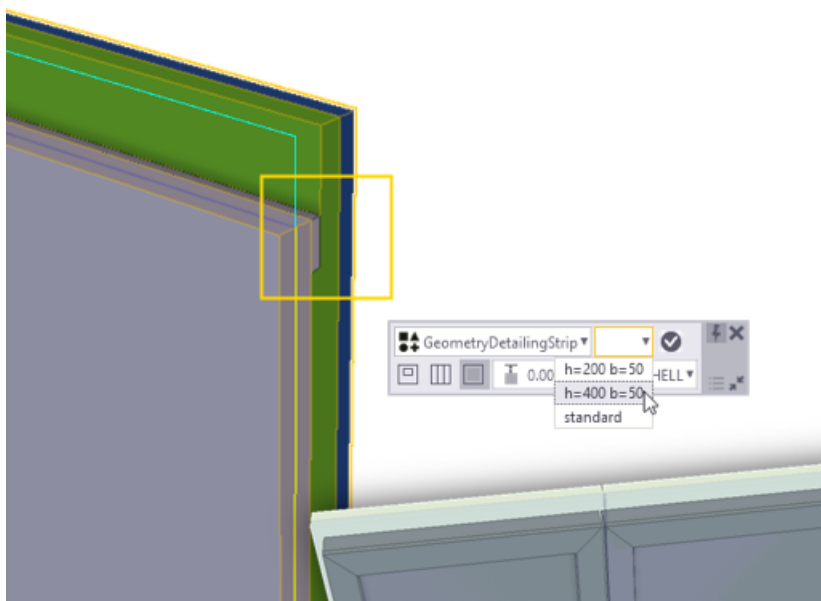
### Vertical offset tab

Use the **Vertical offset** tab to define the vertical offsets of each layer at the top and bottom horizontal edges of the wall layout.

Note that you can define the offsets at any other edge by using direct modification and seams.

Option	Description
<b>Offset</b>	Define the vertical offset at each layer.
<b>Component name</b>	Select a component for detailing the offsets.  For example, you can use the <b>Geometry detailing strip</b> component to create thickenings for sandwich walls. You can create different settings for <b>Geometry detailing strip</b> and select the appropriate settings for each situation.
<b>Component attributes</b>	Select the appropriate component settings.

You can also add detailing to an edge of a wall layout. Select the wall layout and activate the editing by selecting **Modify wall boundary offsets** on the contextual toolbar. Select the wall layout edge to which you want to add the component. Select the detailing component and the settings that you want to use, and click  to confirm.



## Properties tab

Use the **Properties** tab to define the IFC4 export entities and concrete cover thickness for rebar sets. You can define these properties for each layer separately.

Option	Description
<b>IFC export</b>	<p>You can define IFC4 entities for parts and cast units. The cast unit values are used for main part layers, cast-in-place layers, and sub-assembly layers. The values for each layer are taken from the main part of the cast unit to which the layer belongs.</p> <p>Select an <b>IFC entity</b> and a <b>Subtype (IFC4)</b>. If you select <b>USERDEFINED</b> as the IFC4 subtype, you can define the <b>User-defined type (IFC4)</b>.</p>
<b>Concrete covers for rebar sets</b>	<p>You can define the concrete cover thickness on the part level.</p> <p>Select whether to use the global or local coordinate system, and define the coordinates according to your selection.</p>

## UDA tab


Use the **UDA** tab to define the user-defined attributes of each layer part in the wall layout.

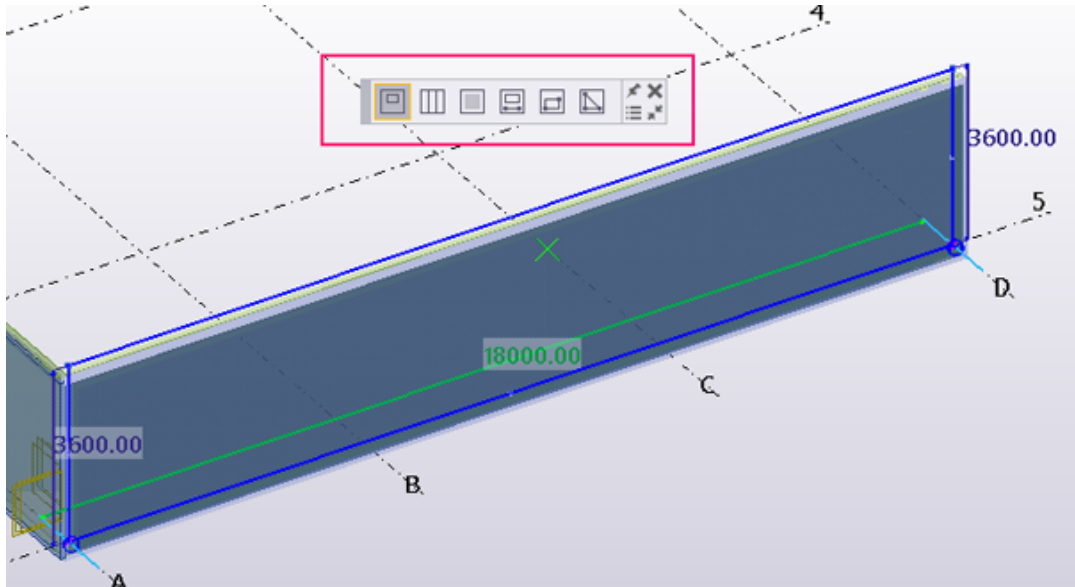
Note that the content of the **UDA** tab may vary depending on your Tekla Structures environment. You can customize the content of the **UDA** tab.

## Modify the wall layout

### Modify the geometry of the wall layout

You can use direct modification to modify the wall layout. Before you start,

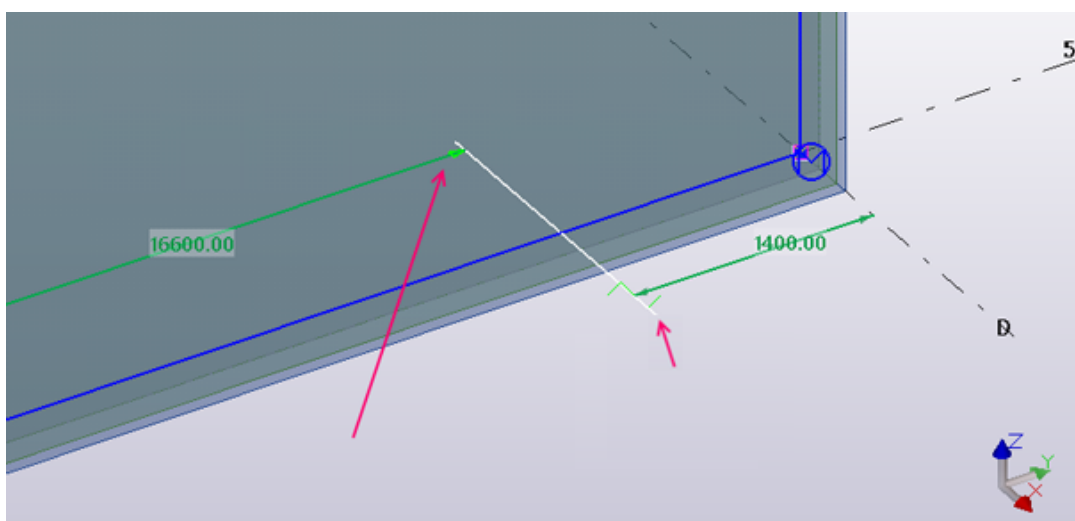
ensure that the **Direct modification**  switch is active. Select the wall layout to display the contextual toolbar. To modify the wall layout, select the appropriate command from the toolbar.



You can modify the outer edges of the wall layout by dragging the edges and corner handles. You can also insert vertices by dragging the edge midpoint handles, and delete vertices by selecting a corner handle or edge, and pressing the **Delete** key.

In addition to the standard polygon modification, you can drag the special line handles at the ends of the wall layout to make the wall layout shorter or longer. You can also drag the line handle perpendicular to the wall layout by holding down the **Alt** key while dragging.

As an alternative to dragging the line handle, you can drag the dimension arrowhead. If you know how much you want to shorten or lengthen the wall layout, select the dimension arrowhead and enter the value by which you want the dimension to change. Note that you can use the dimension arrowheads and line handles in a plan view whereas polygon modification is possible only in 3D or section views.



## Modify the offset at layer edges

Use the **Modify wall boundary offsets** command on the contextual toolbar to modify the offsets of the layers at the outer edges of the wall layout, or at the edges of the openings or seams. Select the layer that you are going to modify from the list on the toolbar.



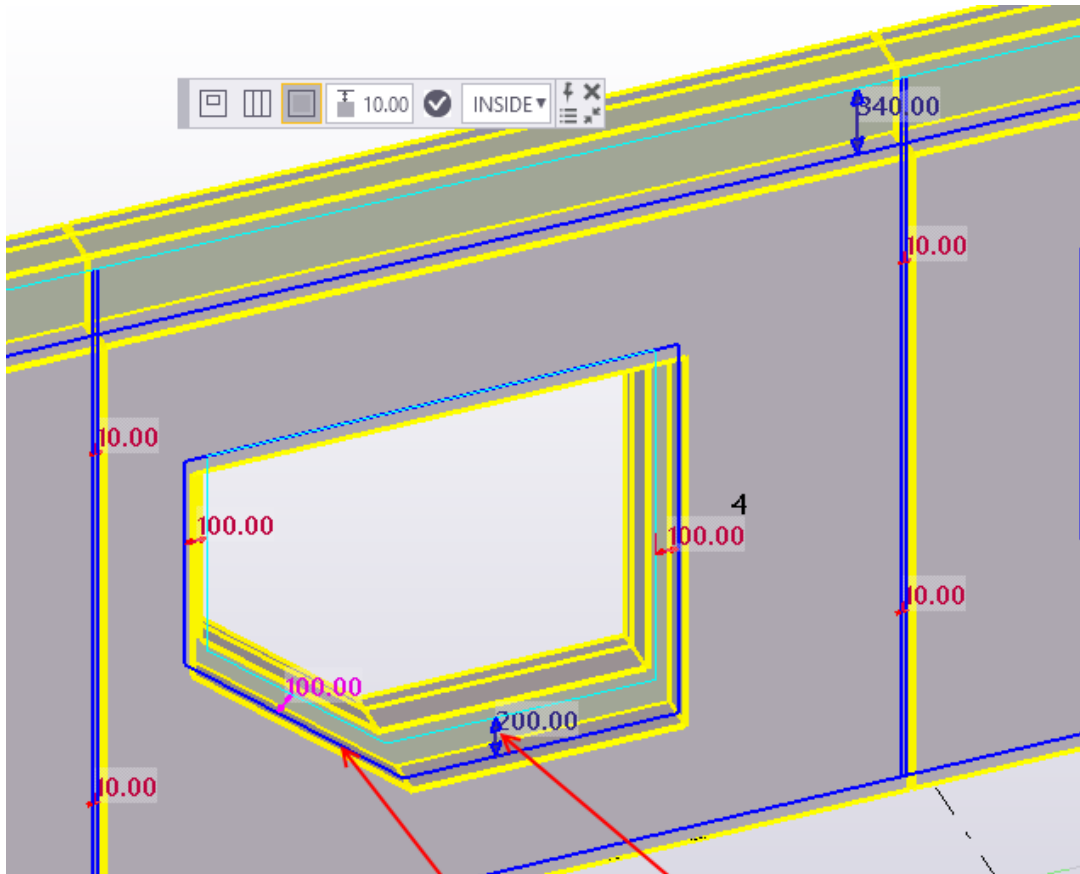
You have three options for modifying the offset at a particular edge:

- Drag the line handle at the edge. You can only drag the line handle perpendicular to the edge.
- Drag the dimension arrowhead and enter the measurement value.
- Select the line handle and enter a new offset value.

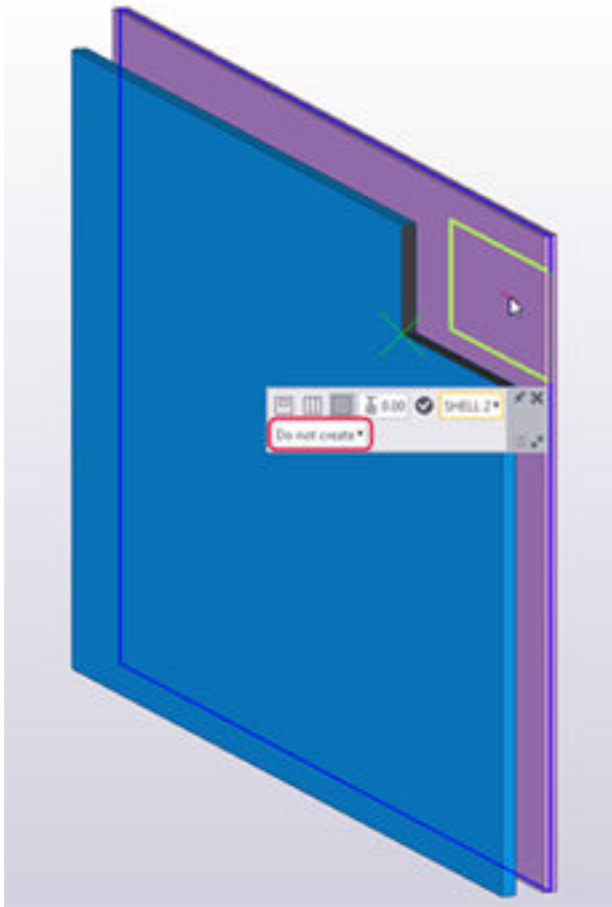
You can select two or more line handles by holding down the **Shift** key when selecting the handles.

You can modify the top and bottom offsets at the outer edges in the **Wall layout** dialog box, and the seam offsets in the **Wall layout seam** dialog box.





You can define that a certain layer is not cut with the opening. First select the opening. On the contextual toolbar, select the layer and then **Do not create**.



### Wall layout opening

Use direct modification to add openings to wall layouts. Before you start,

ensure that the **Direct modification**  switch is active.


To add an opening, select the wall layout and then select the appropriate direct modification command. You can create rectangular, polygonal and circular openings.


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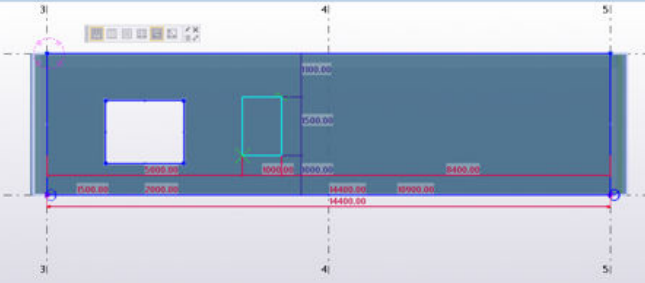

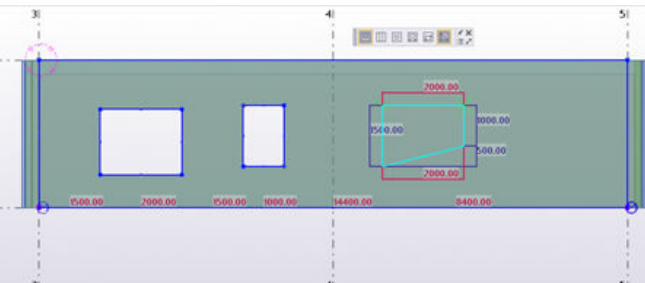

**NOTE** You can use the **Wall layout opening** tool from the **Applications & components** catalog to define the settings applied to the openings. You can define the opening dimensions and select to apply detailing by using an opening component.

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### Add an opening to a wall layout

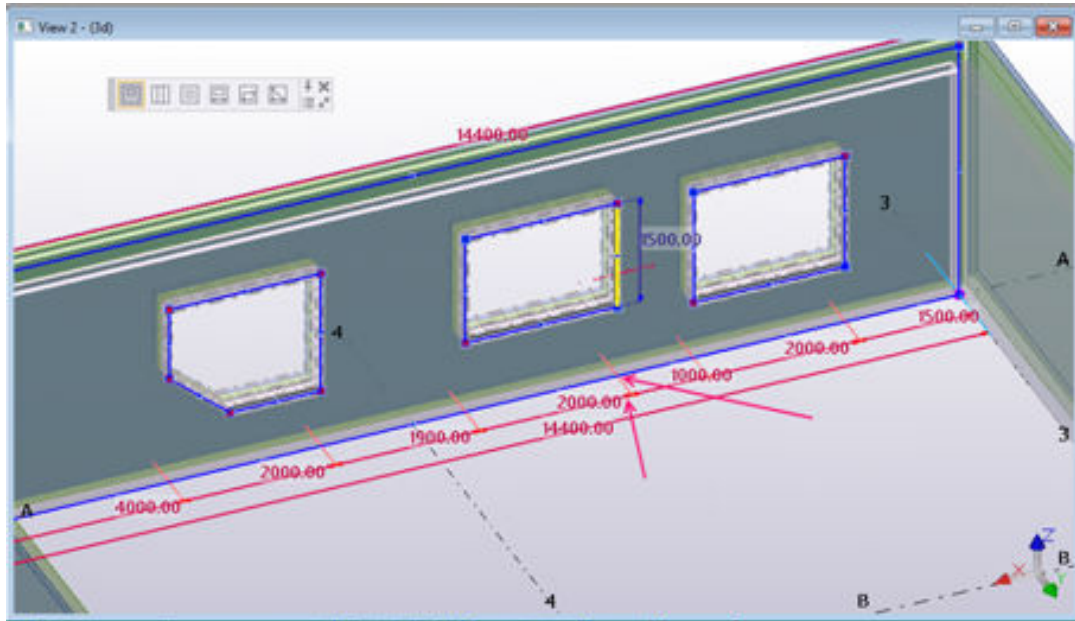
Option	Description
	<p>Add an opening by picking the opening length in the wall. There are five different dimension options to define the opening bottom and top level. To cycle through the options, click the</p>

Option	Description
	<p>opening dimension button  until it shows the wanted option.</p> <p>The five options are:</p> <ul style="list-style-type: none"> <li>• Enter the distance between the bottom of the wall and the bottom of the opening, 800.00 in this example, and the height of the opening, 2400.00. If <b>Position in depth</b> values are used, the bottom distance is measured from the creation points.</li> <li>• Enter the distance between the bottom of the wall and the bottom of the opening, and the distance between the bottom of the wall and the top of the opening. If <b>Position in depth</b> values are used, the bottom distance is measured from the creation points.</li> <li>• Enter the global Z coordinate of the opening bottom level, and the height of the opening.</li> <li>• Enter the height of the opening, and the global Z coordinate of the opening top level.</li> <li>• Enter the global Z coordinate of the opening bottom level, and the global Z coordinate of the opening top level.</li> </ul> <p>You can use an architectural drawing as a reference model where you can pick the opening width and the location.</p> <p>You can select the layer to be cut on the contextual toolbar. This makes it easier to model different layer geometries to walls with multiple layers. The default option <b>All layers</b> creates the opening to all layers. To change the opening creation for a layer, click the <b>Modify wall boundary offsets</b> command. Select the layer and either <b>Create</b> or <b>Do not create</b>.</p>

Option	Description
	<p>Add a rectangular opening by picking two points.</p> 
	<p>Add a polygonal opening by picking three or more points.</p> 
	<p>Add a circular opening by picking the center point and the radius point for the opening.</p> <p>When you change the layer and edge specific offsets, you can set a single offset for the circular opening. Circular openings enable fast creation of HVAC reservations.</p>

### Modify an opening in a wall layout

### Modify the geometry of an opening

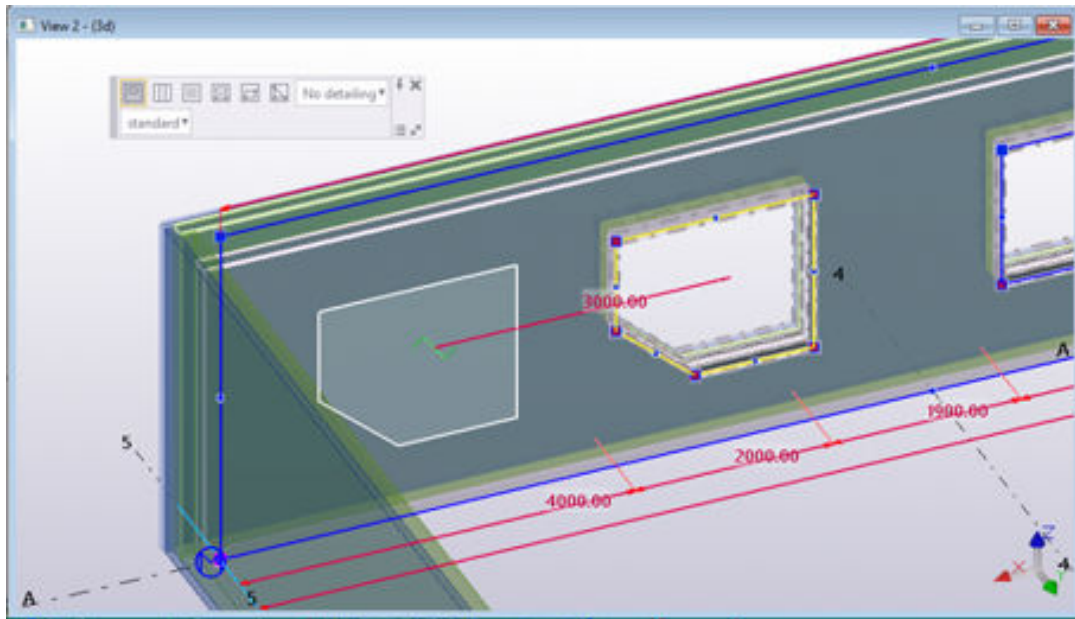


You can modify an opening in the same way as the outer edges of the wall layout by using the appropriate direct modification command. You can:

- Drag the edges.
- Drag the corner handles.
- Insert vertices by dragging the edge midpoint handles.
- Delete vertices by selecting the corner handle or edge, and pressing the **Delete** key.

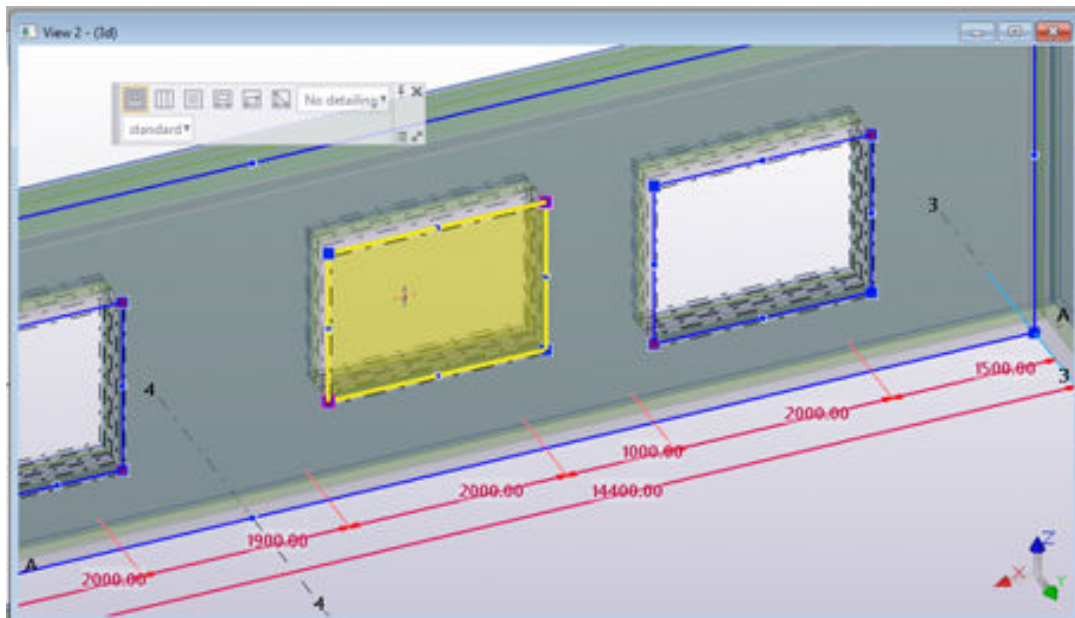
In addition, you can modify the start or the end of the opening by dragging the line handles, or by using the dimension arrowheads.

### **Move and copy an opening**



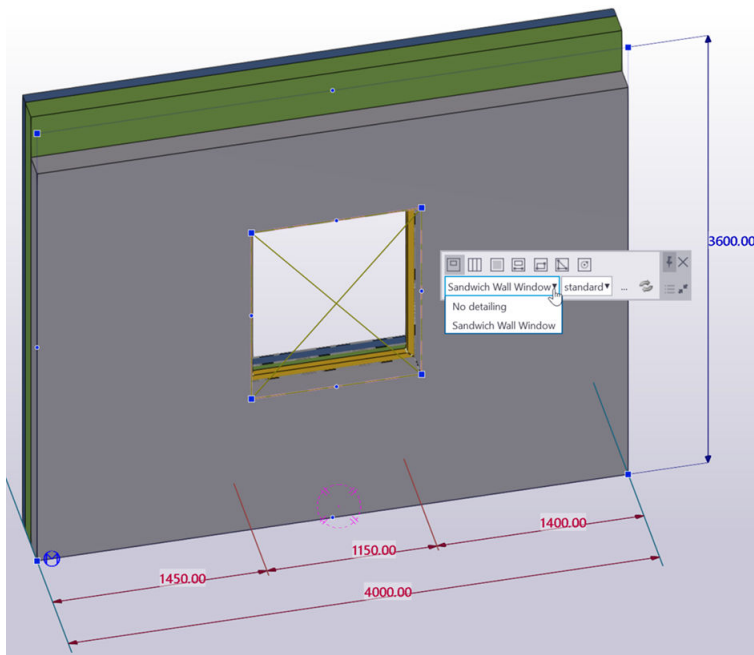
1. Select an opening by selecting a face inside the opening.
2. Start dragging the selected face.
3. To create a copy of the opening, hold down the **Ctrl** key.  
To move an opening without changing the shape of the opening, drag the face handle to the desired location.

### Delete an opening



Select a face inside the opening and press the **Delete** key.

### Modify the opening detailing



You can create an opening with or without details. To detail an opening, select the window and select the predefined detailing component from the list. Note that you can use the **Sandwich wall window** component for rectangular openings, and for openings that connect a window and a door with the same top edge line.

To define new detailing components to the list, select the opening and double-click to open the **Wall layout opening** dialog box or click the button with the three dots in the contextual toolbar.

1. In **Apply detailing**, select **Yes**.
2. In **Component name**, do one of the following:
  - Select a component from the list. Click **Edit** if you want to modify some of the opening properties.  
If you edit the properties and give a new name to a component, the edited component is added to the **Component name** list.
  - If you want to use a component that is not in the list, click **New** to select a component from the **Applications & components** catalog and define the opening component properties. You can use a custom component that you have created, for example.

In the **Opening component info** dialog box, define the following:

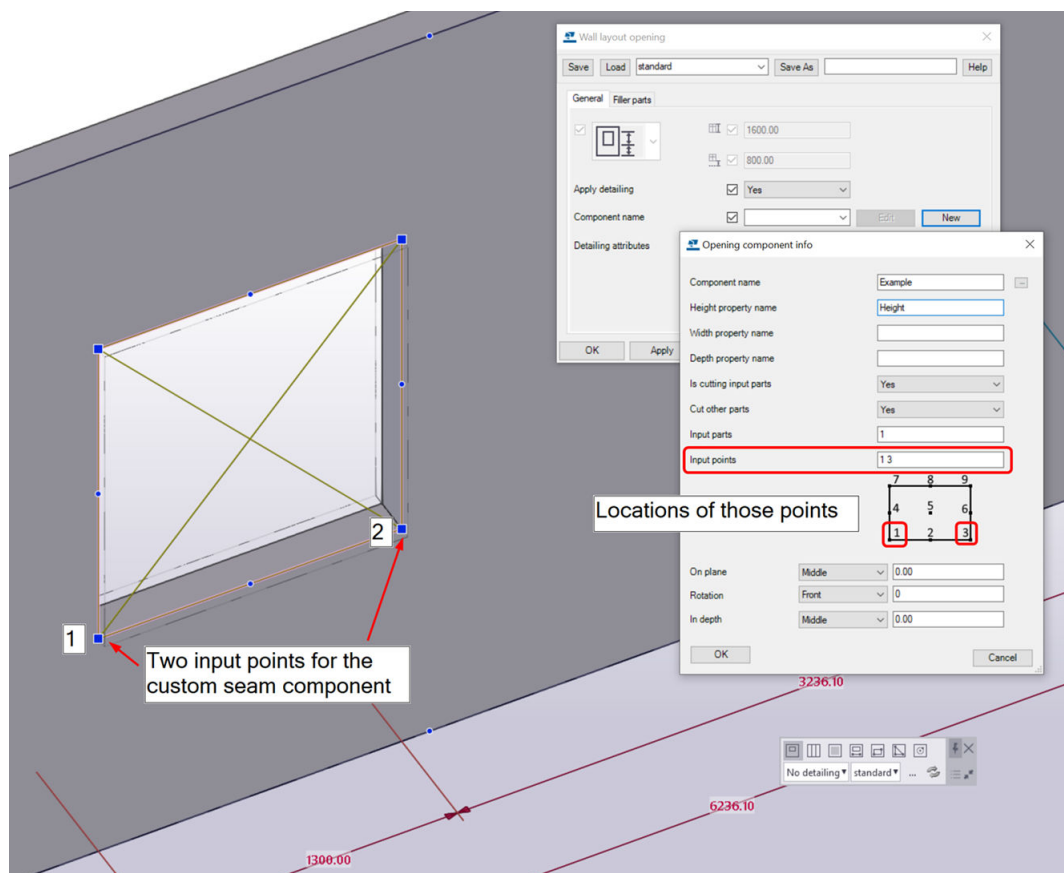
<b>Component name</b>	Select the sub-component for the opening detailing.
-----------------------	---

<b>Height property name</b>	Name of the property that defines the height in the component (for custom components, P1, for example).
<b>Width property name</b>	Name of the property that defines the width in the component (for custom components, P2, for example).
<b>Depth property name</b>	Name of the property that defines the depth in the component (for custom components, P3, for example).

Note that all of the dimensions may not be needed in the property name.

If you use a custom seam type custom component, we recommend that you have two input points to define the width of the opening. When you bind the opening details to the component input points in the custom component editor, you do not need to define the **Width property name**.

In the example image below, the bottom corner points are mapped to the opening corners, setting the values 1 3 to map the location.



**Is cutting input parts**

Controls the input parts of the seam.

- **No:** The detailing component does not create the cut, instead, **Wall**



	<p><b>layout</b> will create a rectangular opening cut.</p> <ul style="list-style-type: none"> <li>• <b>Yes: Wall layout</b> does not create a rectangular opening cut.</li> </ul>
<b>Cut other parts</b>	<p>Use for other layer parts (if any) which are not input parts for the seam component. This property is used when the wall has more than one layer.</p> <ul style="list-style-type: none"> <li>• <b>Yes: Wall layout</b> creates the cut.</li> <li>• <b>No: Wall layout</b> does not create a separate cut for other than input parts (if any).</li> </ul>
<b>Input parts</b>	<p>Input parts expected by the sub-component.</p> <p>If the sub-component is built to create details for a sandwich wall, for example, and it expects three parts as input, type 1 2 3. Those are the layers and order defined for the wall type in <b>Wall layout</b>.</p>
<b>Input points</b>	<p>If the sub-component has two input points for defining the size of the opening, those points are mapped here to the opening corners.</p> <p>See the example image above for how to map the bottom corner points.</p>
<b>On plane</b> <b>Rotation</b> <b>In depth</b>	<p>On plane, rotation and depth properties only apply to components that have position parameters (custom part).</p>

You can also add filler parts to the openings on the **Filler parts** tab. Select a layer in the example image in the dialog box. Then select whether the layer is cut and a filler part created to the layer. Select the appropriate filler part attributes. Note that the filler parts use contour plate properties in **Filler part attributes**.


You can also activate detailing on the contextual toolbar by selecting the detailing component that you want to use.

### Wall layout seam

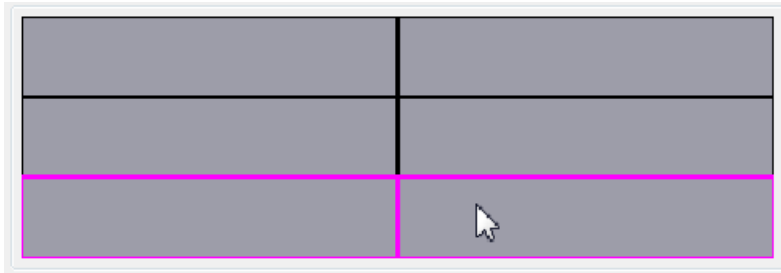
When you create a wall layout, it is at first a single precast wall. **Wall layout seam** divides the wall layout into two or more precast wall pieces. In the wall

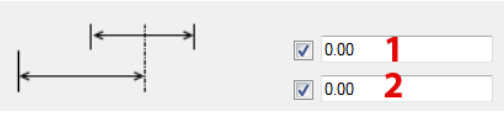
layout, the wall layout layers that have the **Layer elementation** option set to **Yes** in the **Wall layout** dialog box are divided.

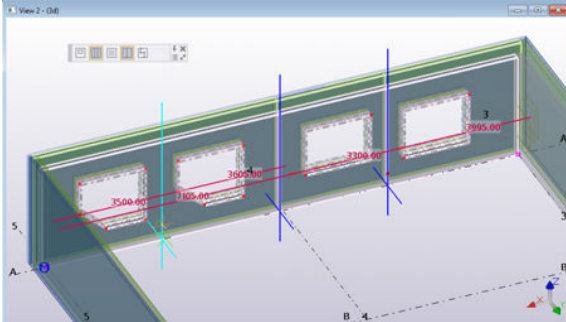

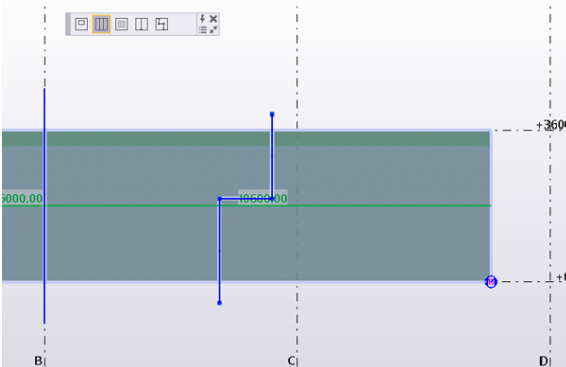

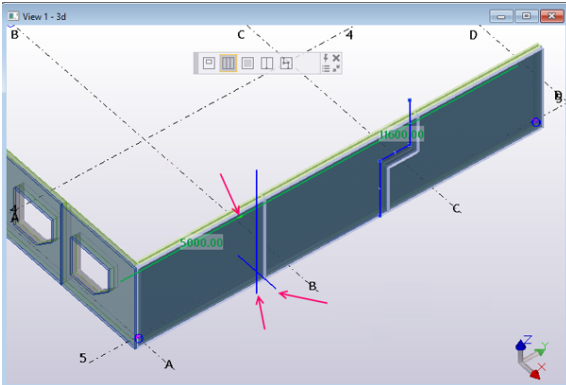
### Add and modify wall layout seams


Use the **Modify seams**  command on the contextual toolbar to add and modify seams. **Modify seams** opens the **Wall layout seam** dialog box where you can define the seam properties for each wall layer separately.

Select the layer in the preview image and define the properties.



Option	Description
	<ol style="list-style-type: none"> <li>1. Define the gap dimension at the seam.</li> <li>2. Define the gap offset from the seam input position.</li> </ol>
<b>Create a connection component</b>	<p>Select <b>Yes</b> to create a connection between the two layer parts at the seam.</p> <p>When you select <b>Yes</b>, you can define the other component options.</p>
<b>Component name</b>	Select a connection component from the <b>Applications &amp; components</b> catalog.
<b>Component attributes</b>	Select the attribute file for the connection.
<b>Component primary input</b>	Select which wall piece is the first input part for the connection, seam, or other components created at the seam.

Option	Description
<p><b>Add a vertical seam</b></p> 	<p>Use the <b>New seam</b>  command to add a vertical seam. Pick a point to create the seam.</p> <p>Note that <b>New seam</b> is selected automatically when you use the <b>Modify seams</b> command and the wall layout does not have any seams yet.</p>
<p><b>Add a polyseam</b></p> 	<p>Use the <b>New polyseam</b>  command to add a polyseam. Pick two or more points to create the seam.</p> <p>Polyseams can contain vertical, horizontal, and sloping segments. Extend the start and the end of the polyseam to make it clearly cross the edges of the wall it is dividing.</p>
<p><b>Move a seam</b></p> 	<p>Move a vertical seam by dragging the seam.</p> <p>You can also move vertical seams by dragging the horizontal line handle or the dimension arrowhead.</p> <p>Move and modify a polyseam like any other polygonal object.</p>
<p><b>Copy a seam</b></p>	<p>Copy a vertical seam or a polyseam by holding down the <b>Ctrl</b> key and dragging the seam.</p>
<p><b>Delete a seam</b></p>	<p>Delete a vertical seam by selecting the seam handle and pressing the <b>Delete</b> key.</p> <p>Delete a polyseam by deleting all segments of the polyseam.</p>

Option	Description
<b>Modify the seam properties</b>	<ol style="list-style-type: none"> <li>1. Select a vertical seam or a segment of a polyseam. When you select the first seam, the current properties of the seam are loaded into the <b>Wall layout seam</b> dialog box.</li> <li>2. Select two or more seams. Hold down the <b>Shift</b> key and then select the vertical seams, or the segments of a polyseam.</li> <li>3. When you have selected the seams, modify the properties in the dialog box and click <b>Modify</b>.</li> </ol>
<b>Split the wall layout at selected seam</b>	Use the <b>Split the wall layout at selected seam</b> command  to split the wall layout into separate components.




### Wall layout connector

Use **Wall layout connector** to apply a connection between two wall layouts. **Wall layout connector** fits the layer parts at the corners. You can control the corner gaps by extending or shortening the layers of the walls, and by adding connections between the connected layer parts. **Wall layout connector** can also add connections between the layer parts when you are using a connection component at the corners.

Note that if you have created several wall layouts at one go using the **Wall layout** tool, wall layout connectors are automatically added between the wall layouts. Wall layout connector is updated automatically when you change the wall type.

If you create a wall layout and later add another next to it, you can add a connection between them using the **Wall layout connector** component in the **Applications & components** catalog. Select the two wall layouts to create the connection. Ensure that you select the wall layout component instance, not a single object created by the wall layout. The connector is created when you select the second wall layout.

## Wall layout connector properties


Option	Description
	<p>Define how the layer parts are fitted.</p> <p>Click the button three times to cycle through the three different corner set-up options.</p>
	<p>Define whether the panel ends are square or sloped.</p> <p>You can use this option to set a typical corner detail for double walls.</p> <p>This option is also applied in a connection component used between the layer parts.</p>
	<p>Define how the parts forming the turning corner are modeled.</p> <p>You can select this option separately at each layer.</p> <p>When you select this option, <b>Wall layout connector</b> creates an additional part that is added to the cast unit.</p> <p>The turning corner part is created with the first name given in the system file <code>SandwichWallCornerPartNames.dat</code>. If the file does not exist or if it is empty, the main part name is used. This way the turning corner area gets automatically calculated into the custom quantity <code>CUSTOM.WALL_CORNER_AREA</code>.</p> <p>Click the button three times to cycle through the three different corner set-up options.</p>
<p><b>Free space A</b></p>	<p>Define the gap between the two layer parts.</p> <p>The preview image shows where the gap is located. The gap location depends on the corner set-up.</p> <hr/> <p><b>TIP</b> If you are using a connection component, use property name <code>FreeSpace</code> in the</p>


Option	Description
	custom connection to control that value from <b>Wall layout connector</b> directly.
<b>End offset B</b>	<p>Define the end offset of the longer part.</p> <p>The preview image shows where the offset is located. The offset depends on the corner set-up.</p> <p><b>TIP</b> If you are using a connection component, use property name <code>EndOffset</code> in the custom connection to control that value from <b>Wall layout connector</b> directly.</p>
<b>Connection</b>	<p>Select a connection component that is created between the two layer parts.</p> <p>If you do not select a connection, only fittings are added according to the gap and the end offsets. If you want to view the current connector properties, select the wall layout connector or double-click the fitting created by the connector.</p>
<b>Attributes</b>	If you have added a connection, select an attribute file for it.
<b>Connection main part</b>	If you have added a connection, set the connection main part.

### Wall layout T connector

Use **Wall layout T connector** to apply a T connection between two wall layouts. **Wall layout T connector** can create a seam at the connection location. Note that if you remove the connection, the seam is not automatically removed. Modify the main part to remove the seam.

### Wall layout T connector properties

Option	Description
	<p>Define how the wall layout parts are fitted.</p> <p>Click the button three times to cycle through the three different corner set-up options.</p> <p>Select the wall layout in the preview image and define the connection properties.</p>

Option	Description
	<p>Define whether the panel ends are square or sloped.</p> <p>This option is applied in a connection component used between the wall layout parts.</p>
<b>Add seam</b>	<p>Select whether to add a seam. You can also select to only split the first layer into two parts.</p> <p><b>No</b> does not split the first layer part but creates a cut that breaks the part into two solid objects.</p>
<b>Seam offset</b>	Enter the seam offset.
<b>Free space</b>	<p>Define the gap between the wall layouts.</p> <p>The preview image shows where the gap is located. The gap location depends on the corner set-up.</p>
<b>Create component</b>	Select whether to use a component to connect the wall layouts.
<b>Component name</b>	Select a connection component that is created between the wall layouts.
<b>Component attributes</b>	If you have added a connection, select an attribute file for it.
<b>Component primary input</b>	If you have added a connection, set the connection main part.

### Wall layout elementation

**Wall layout elementation** automatically adds new seams to divide the wall layout into two or more precast wall pieces.


Openings are taken into account when adding the seams. Openings may affect the final seam position so that the final length or weight of the precast wall is less than the target value.

---

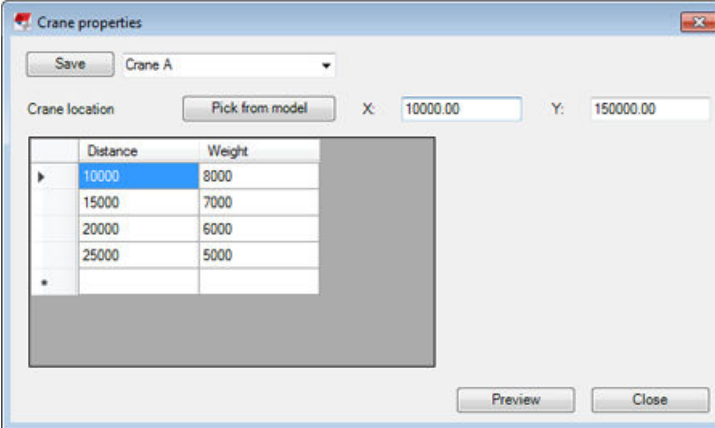
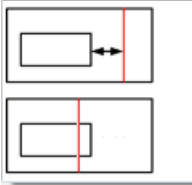
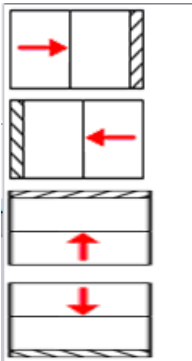
**NOTE** Weight calculations are based on the wall layout geometry. Any other additional parts in the walls are not taken into account in the calculation. The density in weight calculation is 2500 kg/m<sup>3</sup> for the structural layer type and 100 kg/m<sup>3</sup> for the insulation layer.

---

Option	Description
<b>Create seams</b>	<ul style="list-style-type: none"> <li><b>By length:</b> Enter one or more desired lengths. If it is not possible divide the wall using the first length, <b>Wall layout elementation</b> tries to use the next length you have entered, and so on.</li> </ul>

Option	Description
	<ul style="list-style-type: none"> <li>• <b>By number:</b> Enter the number of walls you want to create.</li> <li>• <b>By weight:</b> Enter the desired weight of a wall piece. The wall layout is divided so that the weight of the precast walls is as close to the desired weight as possible.</li> <li>• <b>By crane lifting weight:</b> Divides the wall layout so that the weight of the precast walls is as close to the maximum lifting capacity as possible.</li> </ul>
<b>Max height</b>	<p>Enter the maximum height of a wall piece.</p> <p>If the value you enter is smaller than the height of the wall, <b>Wall layout elementation</b> will first create the horizontal seams with the given height and settings. After that it creates the vertical seams using the vertical seam settings and all other settings in the dialog box.</p>
<b>Min length</b>	Enter the minimum length of a wall piece.
<b>Max length</b>	<p>Enter the maximum length of a wall piece.</p> <p>This value is used with all creation methods.</p>
<b>Max weight</b>	<p>Enter the maximum weight of a wall piece.</p> <p>This value is used with all creation methods.</p>
<b>Max crane lifting weight</b>	<p>Select the crane used for erection.</p> <p>When the crane is selected, the maximum weight of the walls is always less than the lifting capacity of the crane.</p> <p>To define a crane set-up, open the <b>Crane properties</b> dialog box by clicking the  button on the right:</p> <ol style="list-style-type: none"> <li>1. Pick the crane location in the model, or enter the X and Y values.</li> <li>2. Enter the crane lifting capacity data in the table. Enter the distance in the from-near-to-far order.</li> <li>3. Save the crane set-up.</li> </ol> <p>You can use the crane name when saving the set-up.</p> <p>To modify and review the existing crane set-up, select the crane set-up from the list in the <b>Crane properties</b> dialog box. Click <b>Preview</b> to see the crane location on the lifting graph visualized in the model view.</p>




Option	Description
	
<p><b>Avoid openings</b></p> 	<p>Select whether the seams may cross the opening. If the seams may not cross the opening, enter the minimum distance from the opening.</p>
<p><b>Distribution direction</b></p> 	<p>Select the direction of the seams, and the start end at the wall layout.</p> <p>You can add both vertical and horizontal seams.</p>
<p><b>Vertical seam settings</b></p> <p><b>Horizontal seam settings</b></p>	<p>Select the seam attributes used for new seams.</p> <p>Ensure that the layer offsets are set properly as they may affect the weight and length of the wall.</p>
<p><b>Create to selected walls</b></p>	<p>Select the wall layout and click the <b>Create to selected walls</b> button to insert the seams. You can select one or multiple wall layouts.</p>

### Wall layout layer swapper

Use **Wall layout layer swapper** to swap the structural precast layers of one single wall in a wall layout, typically a double wall. You can swap the order of

some individual walls in the same wall line if they need to be cast in a different order.

To swap layers, select **Wall layout layer swapper** in the **Applications & components** catalog, then select a wall layout and the wall part that you want to swap.

When you use the swapper tool, a triangular handle  is shown at each location of the tool. You can drag these handles to modify the wall to be swapped. To swap another wall in the layout, you can copy the swapper to another location by holding down the **Ctrl** key while dragging.

You can delete the swapper instances by selecting the swapper handles and pressing the **Delete** key.

## Customize the wall layout

### UDA tab content

You can customize the content of the **UDA** tab by using the `WallLayout.Udas.dat` file. The `WallLayout.Udas.dat` file can be located in any of the folders set in the `XS_FIRM`, `XS_PROJECT` or `XS_SYSTEM` advanced options, or in the model folder.

You can use the file to control which user-defined properties of the created layer parts can be used in the wall layout. We recommend that you only use UDAs that are typically common for all precast walls in one wall layout.

You can add the `tab`, `label`, and `endlabel` data types in the file to organize the content of the **UDA** tab according to specific workflows.

You can define that layer UDA values are not swapped when the **Wall layout layer swapper** tool is used. Add `NoSwap` at the end of the line (fourth field):  
`string comment j_comment NoSwap.`

The sample file shown below contains a full description of all the settings and the format of the file. The lines starting with `//` are comment lines.

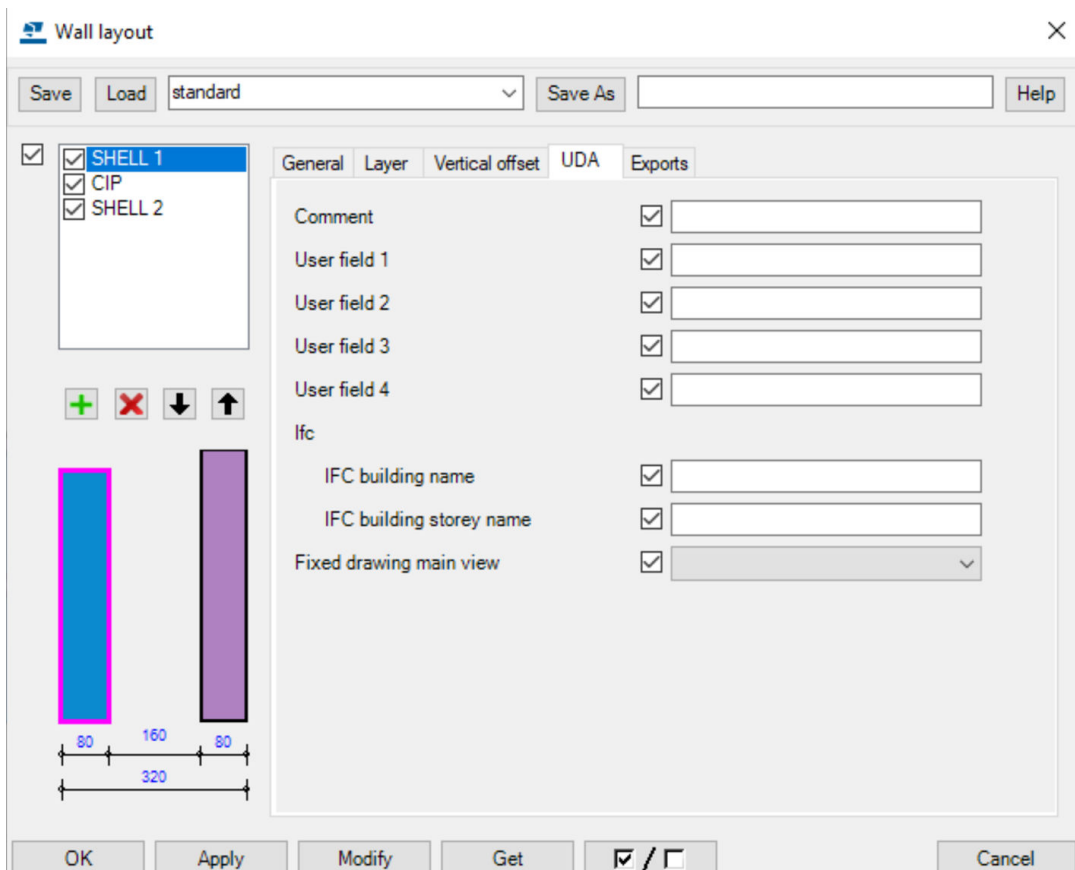
```
// Customized user defined attributes (UDA) for layer parts created by
wall layout component
//
// Each row shall contain 2 or 3 fields separated by tab(s) or semicolon.
// Please note that all uda names shall be unique
//
// Field 1: The data type of the attribute. Valid values are 'distance',
'float', 'option', 'integer', 'string', 'tab*', and 'label'*
//      'integer' and 'string' compatible with the actual user
defined attributes as
//      specified in objects.inp
// Field 2: UDA name. This is the name of the user defined attribute set
for the layer part.
// Field 3: Label. This text is shown in the attributes dialog. It can be
a translatable label (albl_) or any text.
//      leaving this field empty will use the original translation
strings.
// Field 4: 'NoSwap' if you do not want the 'Wall layout layer swapper'
to swap the values.
```

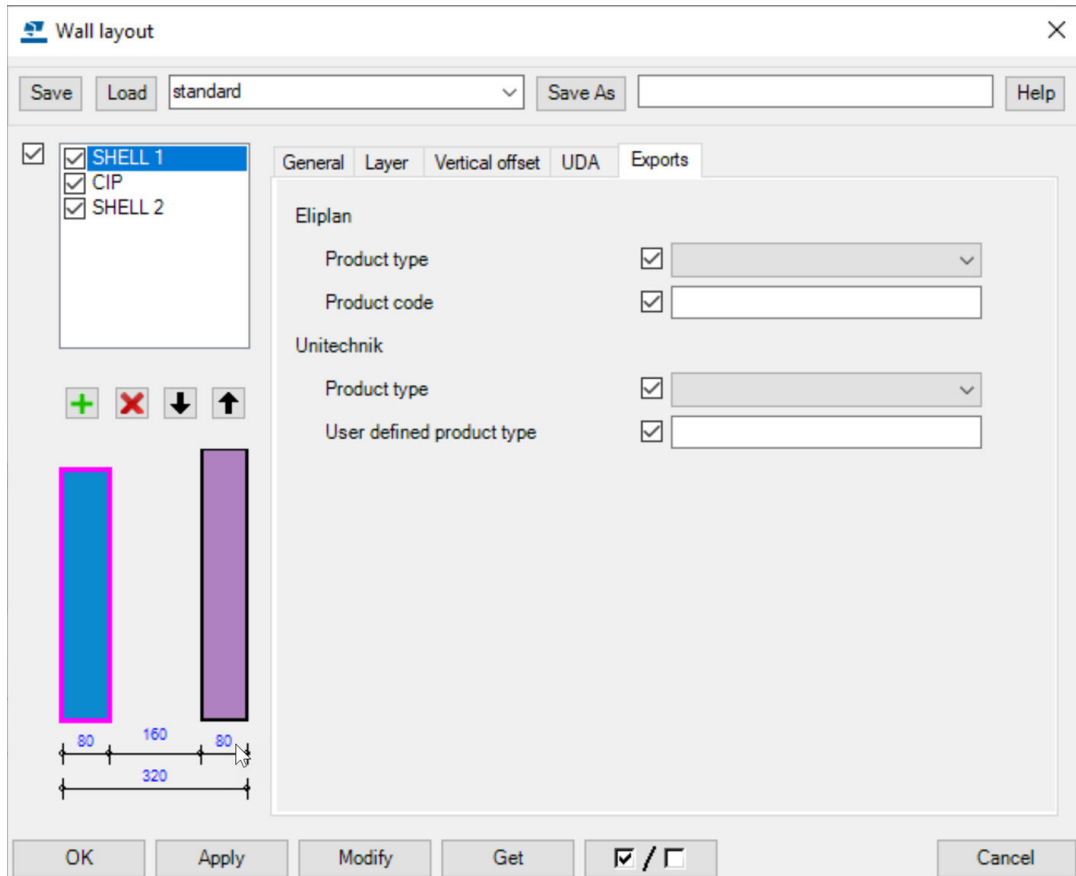
```

//
// *Attribute 'tab' will place all the UDAs below to a new tab. In field
// 2 the name of the tab can be set.
// *Attribute 'label' will create a valueless label and will indent the
// UDAs below. In field 2 the name of the label can be set.
// Optional: to close the label use 'endlabel' to return to
// unindented UDAs.
string      comment                j_comment
string      USER_FIELD_1
string      USER_FIELD_2
string      USER_FIELD_3
string      USER_FIELD_4
label       Ifc
string      IFC_BUILDING           j_IFC_building
string      IFC_BUILDING_STOREY    j_IFC_building_storey
endlabel
option      FixedMainView          j_FixedDrawingMainView
// new tab
tab         Exports
label       Eliplan
option      EP_TYPE                 j_Product_type
string      EP_CODE                 j_Product_code
label       Unitechnik
option      UT_product_type         j_UT_product_type
integer     UT_UD_product_type      j_user_defined_product_type

```

The images below show how the settings defined in the example file are created in the **Wall layout** dialog box.





## Layer component

If the custom part or component property names are not the same as the default names, you can define the parameters in the `xxxxx.LayerComponentInfo.xml` file where `xxxxx` is the component name.

In this file you can also specify the mapping for other layer properties so that the values given in the attribute file will be overridden with the layer properties defined in the **Wall layout** dialog box.

An example of the file is shown below.

```
<?xml version="1.0" encoding="utf-8"?>
<LayerComponentInfo xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <ComponentName>CMUWall</ComponentName>
  <!--Leave the property name empty if you don't want anything to be set
by Wall layout -->
  <HeightMaxProperty>WallHeight</HeightMaxProperty>
  <Height1Property></Height1Property>
  <Height2Property></Height2Property>
  <ThicknessProperty></ThicknessProperty>
  <NameProperty>Name</NameProperty>
  <ClassProperty></ClassProperty>
  <MaterialProperty>Material</MaterialProperty>
  <PrefixProperty>AsmPfx</PrefixProperty>
  <StartNoProperty>AsmStNo</StartNoProperty>
  <!--Do not specify anything for custom part position if you want to
control these with saved settings only.-->
```

```

<CustomPartPosition>
  <PlaneOffset>0</PlaneOffset>
  <DepthOffset>0</DepthOffset>
  <RotationOffset>0</RotationOffset>
  <Plane>LEFT</Plane>
  <Depth>BEHIND</Depth>
  <Rotation>FRONT</Rotation>
</CustomPartPosition>
</LayerComponentInfo>

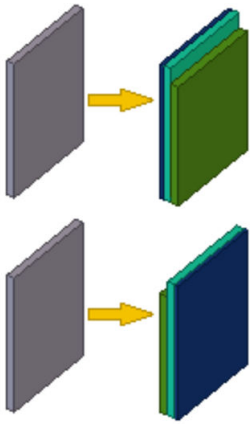
```

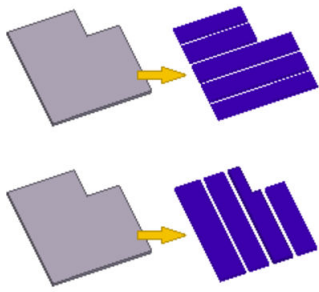
### **Convert to layout component**

Use **Convert to layout component** to convert slabs, wall panels, and IFC objects into **Wall layout** or **Floor layout** components.

You can find the **Convert to layout component** tool in the **Applications & components** catalog.

### **Conversion settings**

<b>Option</b>	<b>Description</b>
<b>Layout component</b>	Select the type of layout that you want to convert to. The options are: <ul style="list-style-type: none"> <li>• <b>Wall layout</b></li> <li>• <b>Floor layout</b></li> </ul>
<b>Attribute settings</b>	Select the desired saved settings for the layout component. The layout component is first created using these saved settings.  You can modify the settings afterwards by modifying the layout directly.
<b>Direction</b>	You can control the layout direction. <ul style="list-style-type: none"> <li>• For a <b>Wall layout</b>, you can switch the depth direction of the layers in a multi layer wall layout.</li> </ul> 

Option	Description
	<ul style="list-style-type: none"> <li>For a <b>Floor layout</b>, you can control the direction of the floor slabs.</li> </ul> 
<b>Convert selected</b>	<p>Select the model objects that you want to convert and click the <b>Convert selected</b> button to convert the selected objects. The objects can be slabs, wall panels, IFC slabs, or IFC walls.</p> <p>When the object selection contains native Tekla Structures slabs or wall panels that were converted successfully, Tekla Structures shows a message about whether to delete the original objects or not. Note that IFC objects are never deleted.</p> <p><b>Convert to layout component</b> uses the Conversion as extrusion functionality when converting the IFC objects. This means the IFC has to be of type Coordination view 2.0. Surface geometry is not supported.</p>

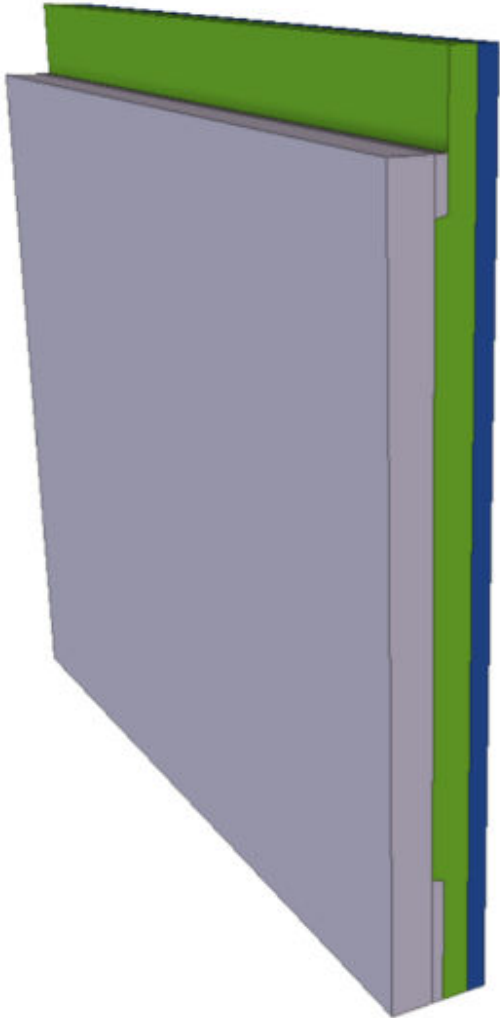
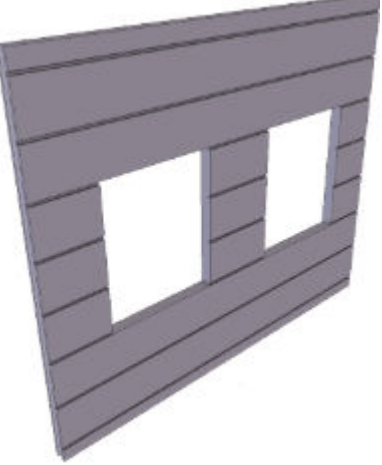
### ***Geometry detailing strip***

**Geometry detailing strip** allows modeling of wall edge thickenings, recess patterns, wall corbels, mock joints, and facade protrusions. Note that this component is for precast use only.

**Geometry detailing strip** can be used for adding detailed geometry to any object. You can create different settings for **Geometry detailing strip** and select the appropriate settings for each situation.

The tool uses irregular concrete profile catalog profiles. If these profiles are not found in your Tekla Structures environment, download them to your model from the [Tekla Warehouse](#) local content.

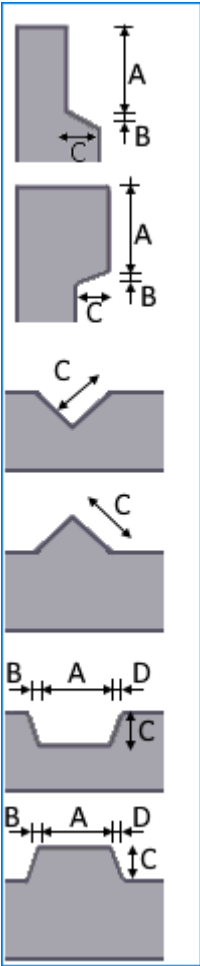
**Use for**

 <p>A 3D perspective diagram showing a cross-section of a wall. It consists of a thick, light grey concrete slab. On top of this slab, there is a thin, green layer. On the right side of the slab, there is a thin, blue layer. The diagram illustrates how these layers are added to the existing wall structure to increase its thickness and provide additional insulation or protection.</p>	<p>Sandwich wall thickening</p>
 <p>A 3D perspective diagram showing a cross-section of a wall with a rectangular opening. The wall is made of a grey material with horizontal lines, suggesting a brick or block pattern. The opening is defined by a recessed frame, where the wall material is set back from the opening, creating a shadowed area around the hole.</p>	<p>Recess patterns in a wall</p>


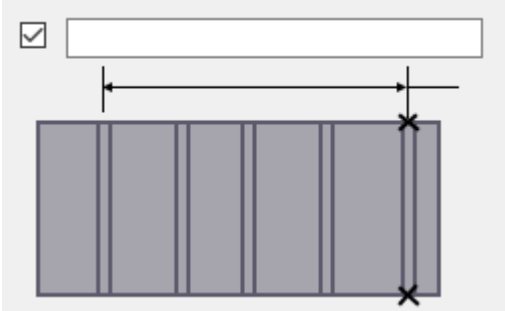
### Selection order

1. Select the part face.
2. Pick two or more points to indicate the location.
3. Click the middle mouse button to create the geometry strip.

### Geometry detailing strip properties

Option	Description
 <p>The diagram illustrates seven different geometry strip options. The first two options show a vertical strip with a horizontal cutout, with dimensions A (height), B (width of the cutout), and C (width of the strip). The next two options show a horizontal strip with a vertical cutout, with dimensions A (height), B (width of the cutout), and C (width of the strip). The last three options show a horizontal strip with a trapezoidal cutout, with dimensions A (width of the cutout), B (width of the strip), C (height of the cutout), and D (width of the strip).</p>	<p>Select the geometry. You can create thickenings, recesses, and protrusions.</p> <p>Define the A, B, C and D dimensions for the selected option.</p>
<p><b>Add to cast unit, Attach to part</b></p>	<p>Select how to add the geometry to the selected part: Attach to part or Add objects to cast unit.</p>
<p><b>Cut only, Cut and part, Part only</b></p>	<p>Select how the cut is modeled.</p>
<p><b>Use main part properties</b></p>	<p>You can control the properties of the created part. With the <b>Use main part properties</b> option, the added part gets the properties of the main part. Otherwise, you can select the saved</p>



Option	Description
	<p>standard attributes for the concrete beam.</p> <p>Note that if you change the saved properties afterwards, you need to modify the geometry detailing strip to get the properties of the added part updated.</p>
<b>Middle. Left, Right</b>	Select a position for the geometry.
	Define the strip offset from the input line.
	Define the spacing of recesses and protrusions. For example, enter 40*400 to create 40 recesses with a spacing of 400, measured from the center of the recess.
<b>Extend detailing strip</b>	<p>Define whether the detailing strip is extended over the whole part face when the geometry detail strip is created as a single line.</p> <p>Set to <b>Yes</b> to extend and fit the detail in both directions of the input line to the edge of the applied face.</p>

## Formwork placing tools

This section introduces formwork placing tools.

Click the links below to find out more:

- [Formwork placing tools - Walls](#)
- [Formwork placing tools - Walls: configuration](#)
- [Formwork placing tools - Slabs \(page 3091\)](#)
- [Formwork placing tools - Slabs: configuration \(page 3099\)](#)

### **Formwork placing tools - Walls**

**Formwork placing tools - Walls** is a set of components that helps in detailed modeling of different wall panel formwork systems. These components are

placing tools, and therefore you need to have all relevant formwork products such as wall panels, corner conditions, clamps, and pouring platforms available in the **Applications & components** catalog.

You can get the formwork products provided by formwork suppliers from **Tekla Warehouse**, for example. In addition, **Formwork placing tools - Walls** requires additional configuration files that contain the necessary information about the formwork product components. These configuration files may come with the formwork product catalogs provided by formwork suppliers, but you can create the configuration files yourself as well.

**Formwork placing tools - Walls** contains tools to place and modify the following formwork elements:

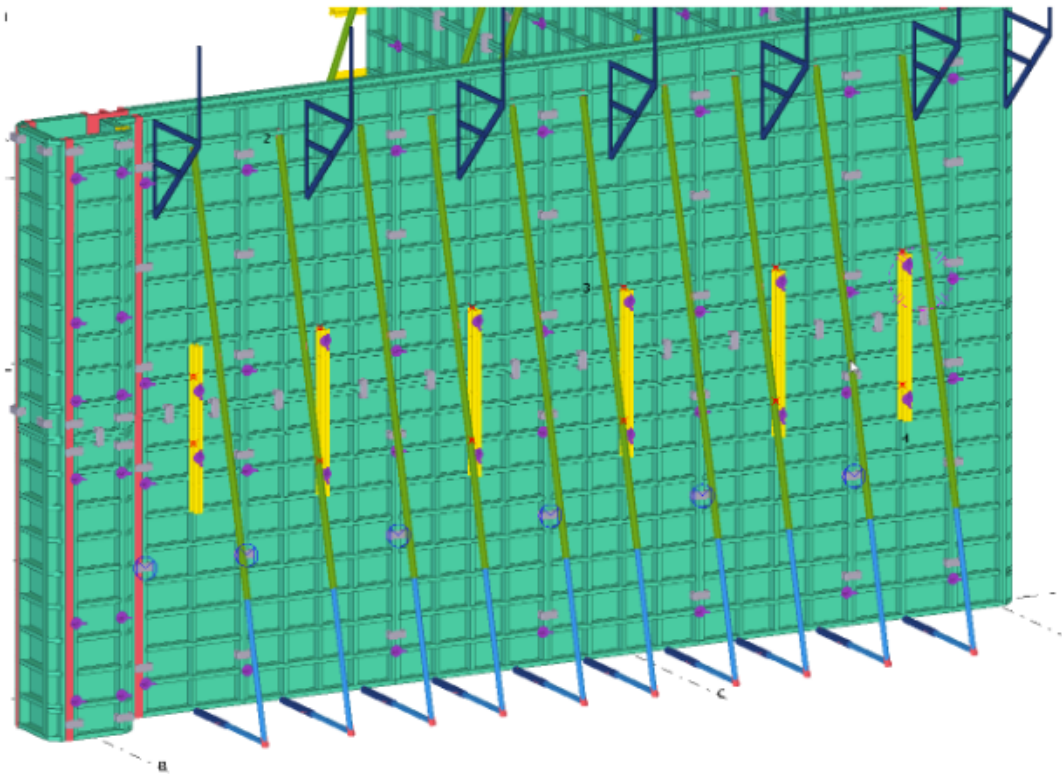
- formwork wall panels typically appearing as two-dimensional arrays covering a certain area
- different kinds of corner conditions
- an array of ties between two formwork panels
- an array of clamps, locks, or brackets at the joining edge between two formwork panels to keep the formwork together
- supporting braces for a single formwork panel
- an array of pouring platforms at the top edge of formwork panels
- fillers to fill the gaps between two formwork panels

Because **Formwork placing tools - Walls** consists of a set of sub-tools which are combined in one dialog box, each tab is an individual sub-tool. Both the **Formwork placing tools - Walls** and the sub-tools are available in **Applications and components** catalog.

Most of the settings in the components are preset. You can control the different settings by selecting a suitable options in the dialog box. These preset settings are organized according to the formwork supplier and the product families.

However, if you create your own configuration files, you can use the values in the configuration files instead of the preset values.

You can access the **Formwork placing tools - Walls** in the **Concrete Contractor, General Contractor** and **Rebar Detailer** roles in the **Default** environment.



### Panel tab

Use the **Panel** tab to model an array of formwork panels on one side or on two sides of a cast-in-place wall.

The actual formwork panels are custom parts. In addition to the custom parts, some additional data of the products is needed from the configuration files.

1. On the **Panel** tab, in the **Formwork supplier** and **Product family** list, select the suitable options.

The options vary depending on which catalogs and tool configurations you have in use.

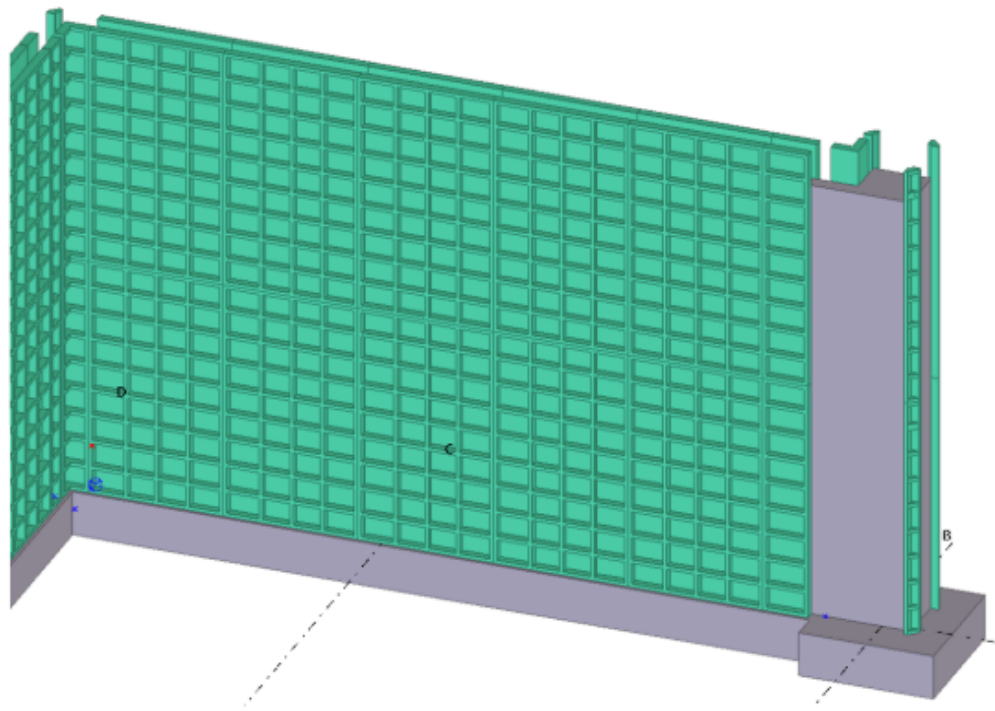
2. Select the panel size in the **Formwork panel** list, and set the other panel properties such as the layout, height, and fill location.

3. Click **Apply** and **Insert new** to start placing the wall panels.

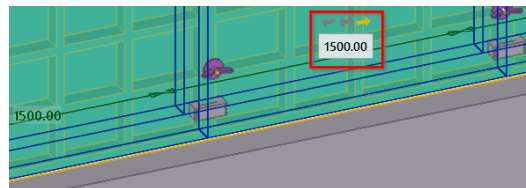
Move the mouse pointer over pour objects or concrete parts to select a suitable location.

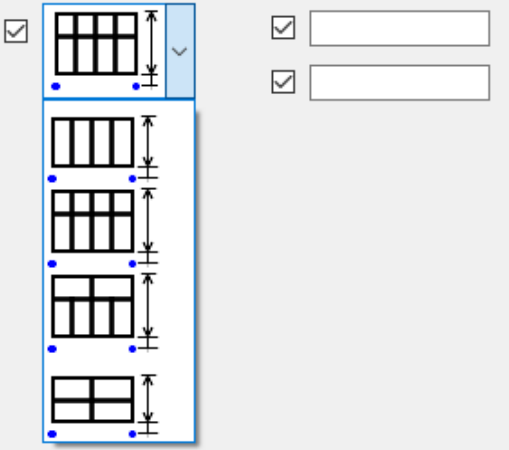
4. Pick the start point and the end point of the formwork wall panel.

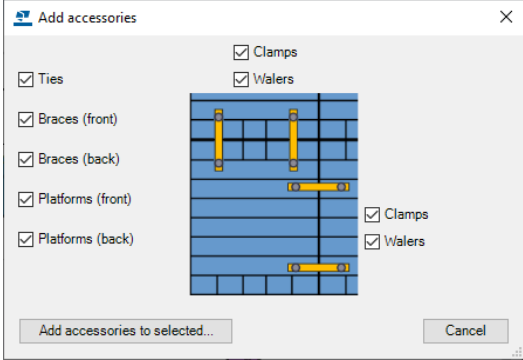
A preview of what the panels would look like after being placed is shown and you can decide which panels should be created. You can also change the panel layout afterwards by using direct modification.



Option	Description
<b>Formwork supplier</b> <b>Product family</b>	Select the formwork supplier and the product family.
<b>Formwork panel</b>	Select the panel size.  If the total length of the panel array does not match with the panel width, smaller panels with the same height are automatically placed in the array near the fill location (start/middle/end of the array).
<b>Avoid panels</b>	Define which panels are avoided during the automatic insertion.
<b>Panel layout</b>	Override the default panel widths.  When you insert the array for the first time, leave the value empty and modify the panel widths by using direct modification.



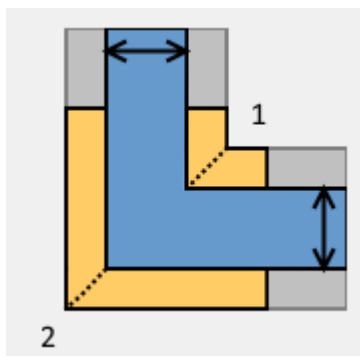
Option	Description
<input checked="" type="checkbox"/> 	<p>Select the layout of the panel array.</p> <p>Enter the offset from the wall bottom and the total height of the panel array.</p>
<p><b>One side</b></p> <p><b>Two sides</b></p>	<p>Select whether the panels are created on one side or on both sides of the wall.</p> <p>You can modify the wall thickness. When the walls are inserted, the applied wall thickness is overridden with the actual wall thickness.</p>
<p><b>Fill location</b></p>	<p>Use the <b>Fill location</b> option to control where the empty space for the filler is located.</p>
<p><b>Add to pour unit</b></p>	<p>Select whether the panels and all accessories related to the panels are added to the pour or not.</p>
<p><b>Select new pour...</b></p>	<p>The initial pour is identified automatically when the panels are inserted. To change the selected pour, click the <b>Select new pour...</b> button and select a new pour.</p> <p>Note that there is no automatic recognition of a new pour if you decide to move the formwork panels, or if you add pour breaks which change the pours.</p>
<p><b>Insert new</b></p>	<p>Click the <b>Insert new</b> button to start inserting new formwork panel arrays.</p>

Option	Description
<p><b>Add accessories to selected</b></p>	<p>Add various accessories automatically to the selected panels.</p> <div style="border: 1px solid gray; padding: 5px;">  </div> <p>Select the check boxes for the accessories you want to add. Note that for clamps and walers you can control separately the creation at horizontal and/or vertical edges.</p>

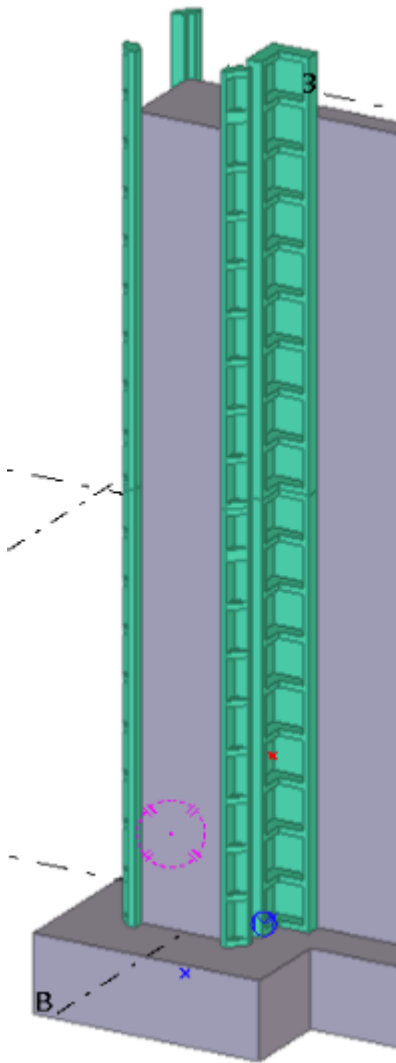
### Conditions tab

A condition is a set of formwork components, such as custom parts, parts or other items, designed for special geometries in the wall. Conditions create the formwork at special locations in the walls, such as L, T, and X corners, bulkhead at the end of a wall, or pilasters at pour ends or at the middle of the wall. Each different type of a special geometry is its own condition type.

Each condition consists of two or more sub-assemblies of the formwork components, depending on the condition type. For example, the L corner contains the inner corner assembly **(1)** and the external corner assembly **(2)**. When inserted in the model, the location of these assemblies is controlled with the main insertion points and the two wall thickness parameters.



Use the **Conditions** tab to create a condition that consists of two or more sub-assemblies of formwork components.

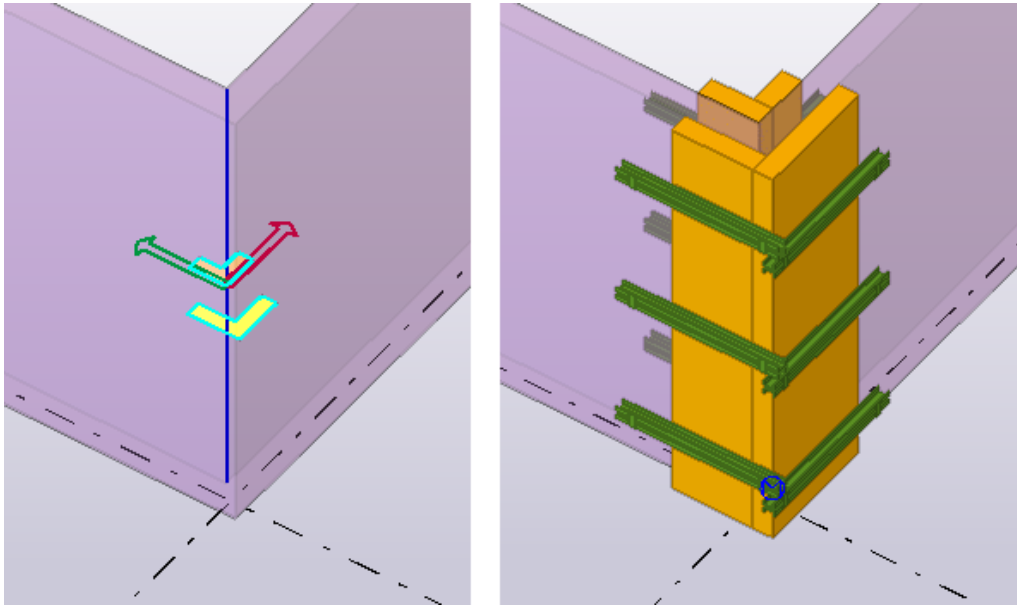


1. On the **Conditions** tab, select what type of condition to use by clicking the condition icon, and set the values to be applied for the selected condition.
2. Click **Apply** and **Insert new** to start placing the conditions.
3. Move the mouse pointer on the corner edges, pilaster edges, or ends of the pours or parts.

**Formwork placing tools - Walls** automatically recognizes the condition type and wall thickness properties.

Two arrows and a preview of the condition parts to be created is shown. The red arrow indicates the first direction and the green arrow indicates the second direction.

In the example below, the longer panel becomes parallel to the red arrow, and the shorter panel will be parallel to the green arrow. Depending on the case, you may switch the arrows by moving the mouse on the other side of the edge.

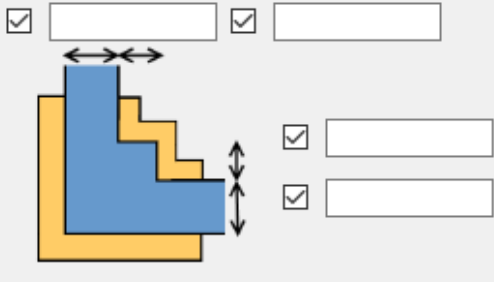
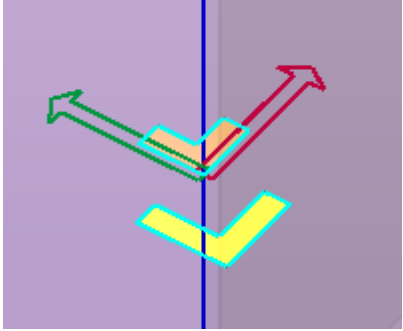


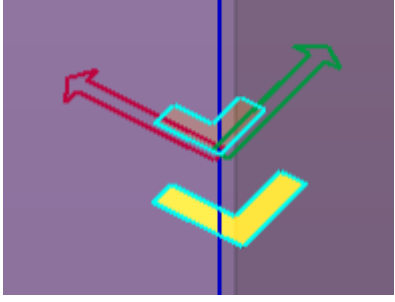
4. Click to place the conditions.

In some cases the condition tool may not recognize the condition type correctly. For example, if you want to insert an L corner to a location where the other side of the wall is very short it may happen that the condition tool is trying to insert a corner pilaster.

Option	Description
<input checked="" type="checkbox"/> Height=2.70m	Select the condition to be created. The selection is specific for each type of condition.  Click the condition icon to select the condition type to be used.
<input checked="" type="checkbox"/> Standard corner 500	
<input checked="" type="checkbox"/> Standard Tee 500	
<input checked="" type="checkbox"/> Standard Cross 500	
<input checked="" type="checkbox"/> Standard Pilaster 500	
<input checked="" type="checkbox"/> Standard Corner Pilaster 500	
<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	



Option	Description
	<p>Modify the dimensions that control the location of condition sub-items in relation to the insertion point.</p> <p>When you insert a new condition, these dimensions are overridden by the calculated values based on the actual insertion location and condition type.</p>
<p><b>Offset from bottom</b></p>	<p>Define the vertical offset for the condition from the bottom of the wall.</p>
<p><b>Number of stacked conditions</b></p>	<p>To insert two or more vertically stacked conditions, enter the number of stacked conditions.</p>
<p><b>Height</b></p>	<p>Height of one stack when the conditions are stacked.</p>
<p><b>Left/right corner</b></p>	<p>Select how the conditions are inserted if you use the left-hand side placement.</p> <p>If you select <b>Rotate</b>, the condition always switches the red/green axis to a right-hand side placement.</p> <p>If you select <b>Mirror</b>, the left-hand side placement is allowed.</p> <p>Right-hand side placement:</p>  <p>Left-hand side placement:</p>




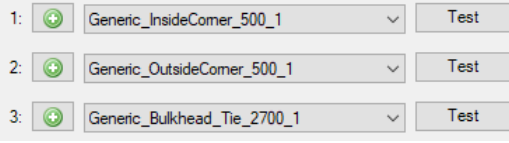

Option	Description
	
<b>Filler configuration</b>	Define which filler type is used when you place a condition which includes a filler.
<b>Configure</b>	Open the <b>Condition setup</b> dialog box to modify the existing conditions or to define new conditions.

### Define a new condition

Defining a new condition has two phases. First, you need create the needed sub-assemblies. Once you have all the needed sub-assemblies available, you can define a new condition by giving it a name and defining which sub-assemblies are used in the new condition.

To define a new condition or to modify existing condition definitions, click the **Configure** button. The **Condition setup** dialog box opens where you can do the needed modifications.

Option	Description
<b>Condition setup file</b>	Conditions are saved in external data files (xxxx.FormworkTools.Conditions.csv).  Select the file to add, modify or delete the defined conditions.
<b>Save</b> <b>Save as</b> <b>New</b>	Click <b>Save</b> or <b>Save as</b> to save any changes.  Click <b>New</b> to create a new empty file.
<b>Condition type</b>	In the list, select the condition type to be modified.  The list shows the existing conditions if there are any. If you have one or more existing conditions of the selected type, you can select the current condition in the list. When the condition is selected, the current

Option	Description
	<p>definition values are shown and can be set or modified on the right-hand side of the dialog box.</p> <p>Click  to create a new condition.</p> <p>Click  to copy the selected condition.</p> <p>Click  to delete the condition.</p>
<p><b>Formwork supplier</b></p> <p><b>Product family</b></p> <p><b>Condition</b></p>	<p>The condition has the supplier and the family properties. The conditions are available only when the supplier and the family are matching.</p> <p>The condition names need to be unique. Decide about naming conventions so that the names are as descriptive as possible.</p>
	<p>The condition can have 2-5 sub-conditions, depending on the condition type. One condition must have at least one sub-condition defined as otherwise it does not create anything.</p> <p>Click  to open a sub-assembly wizard dialog box to create a new sub-assembly.</p> <p>Click the <b>Test</b> button to verify the output of the selected sub-assembly.</p> <p>To test the sub-assembly, pick a point in the model. The tool creates a sample wall and the sub-conditions with right side and left side placement.</p> <p>After you have done the testing, you can delete model objects that were created for testing purposes.</p>
<p><b>Total height for stacking</b></p>	<p>The total height of the condition can be calculated automatically based on the selected sub-conditions, or you can give the height.</p> <p>The total height is used as the spacing value when two or more conditions</p>


Option	Description
	are stacked vertically. If the condition contains some parts sticking out and this part is overlapping in the stack, you may need to enter the total height manually.
<b>Left/right corner</b>	Test and verify how the <b>Mirror</b> and <b>Rotate</b> options affect the output of the condition.
<b>Test condition</b>	<p>Test and verify the output of the whole condition, including all sub-conditions.</p> <p>To test the condition, pick a point in the model. The tool creates a sample wall and two conditions with right side and left side placement.</p> <p>After you have done the testing, you can delete the model objects that were created for testing purposes.</p>

### Create a new corner sub-assembly

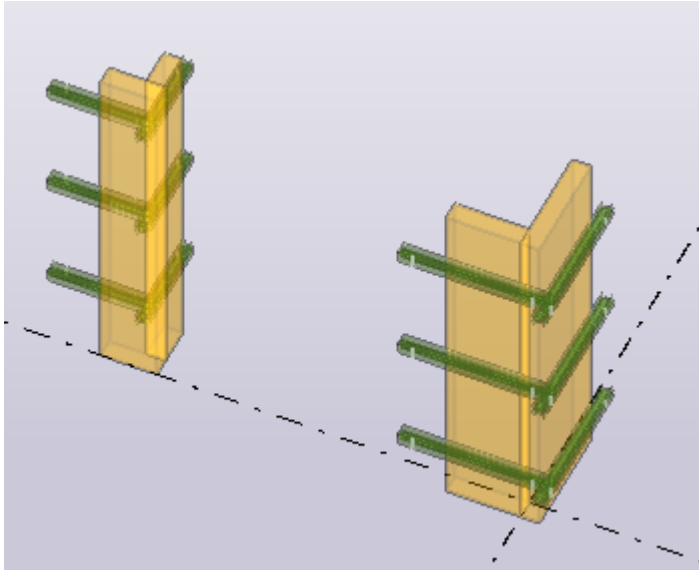
The corner sub-assemblies are created using **Formwork corner sub-assembly wizard**.

Typically, the corner sub-assembly contains formwork products at one side (inner or external) of the corner, or at some corner in a pilaster.

The outcome of the wizard is stored in an external file with a name.

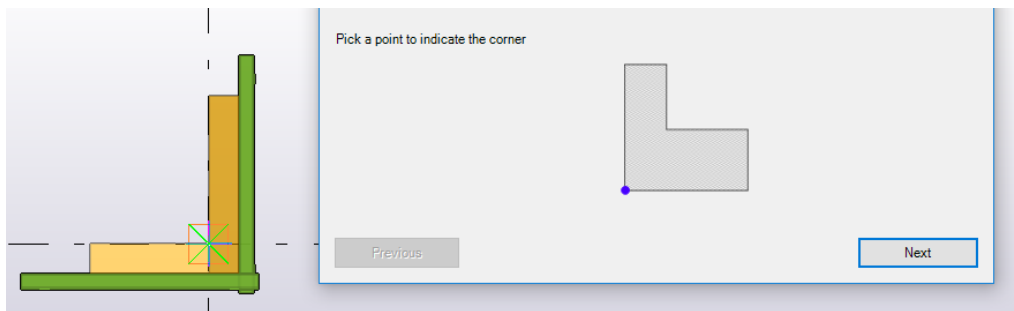
To open the dialog box, click  in the **Condition setup** dialog box on a condition that requires a corner sub-assembly. Alternatively, you can search for the **Formwork corner sub-assembly wizard** in the **Applications and components** catalog.

Before you can start creating the corner sub-assemblies, you need to have an external or inner corner formwork in the model. When you have created the corner formwork, you can start the wizard.

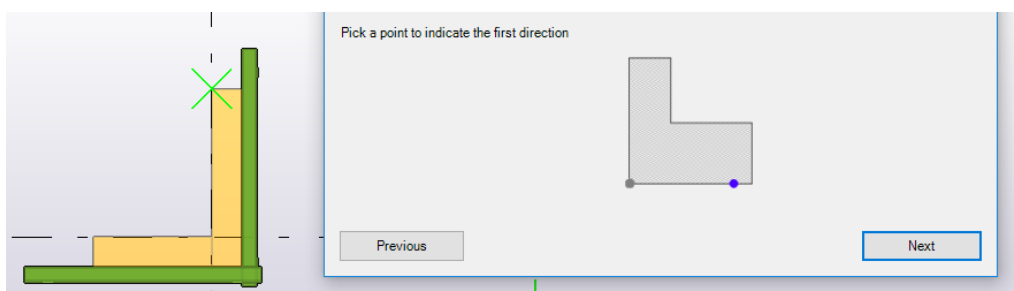


1. Pick the first corner point.

This point will be placed exactly to the external or to the internal corner of the concrete in the wall in the final condition placement. Note that after you have picked the point, the wizard steps forward automatically. You can step back to re-pick a new point.

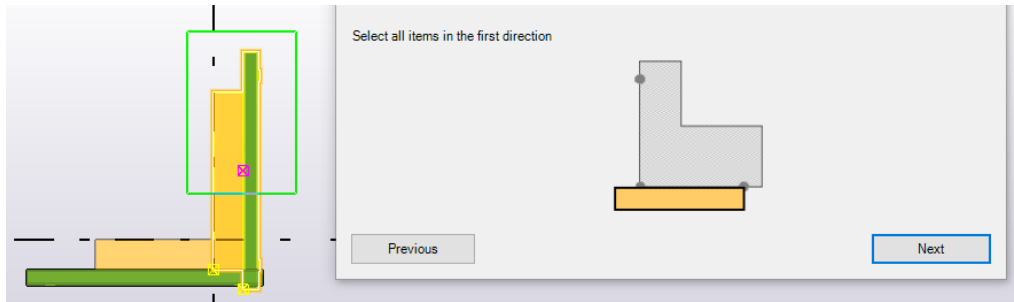


2. Pick a point showing the direction of the first wall.  
This is typically the red arrow in condition placing.



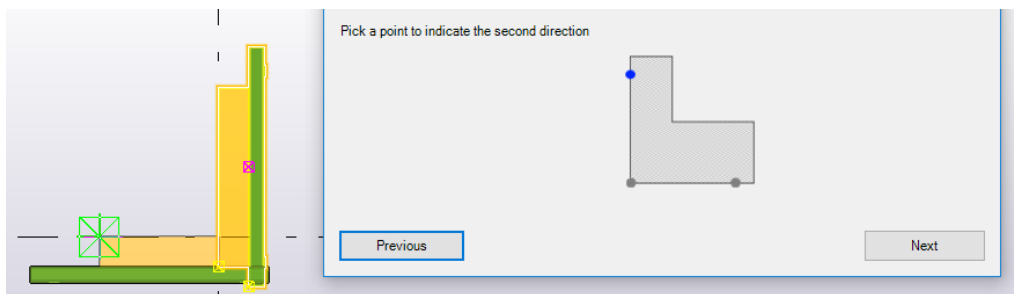
3. Select all formwork items belonging to the first wall.

In practice, these formwork items will be parallel to the first wall when placing the sub-assembly of the condition.



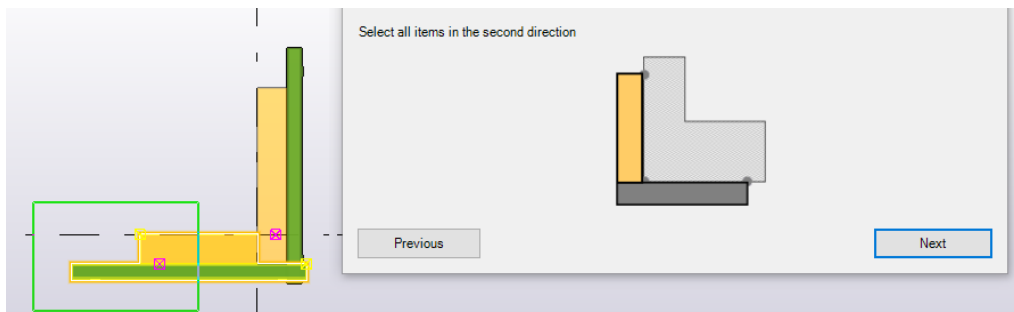
- Pick a point showing the direction of the second wall.

This is typically the green arrow in condition placing, and perpendicular to the first wall.

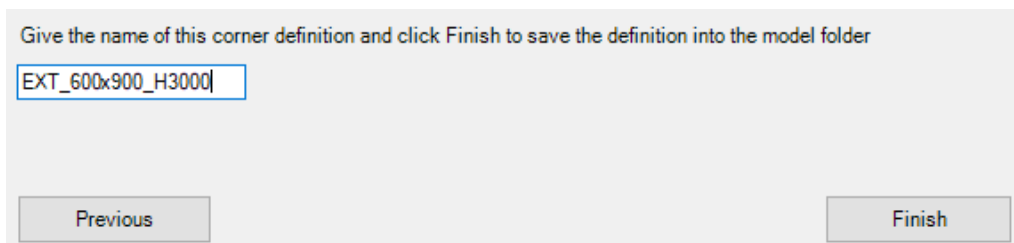


- Select all formwork items belonging to the second wall.

Typically, these formwork items will be parallel to the second wall when placing the sub-assembly of the condition.



- Enter a file name to save the corner sub-assembly. Click **Finish** to close the wizard.




All corner sub-assemblies are saved in the `Formwork tools` folder in the model folder.

If you want to use the conditions in other models, you can copy or move the files and the condition setup files to any of the system folders. To ensure that the conditions work in other models, all custom components that the conditions use must exist in the **Applications and components** catalog.

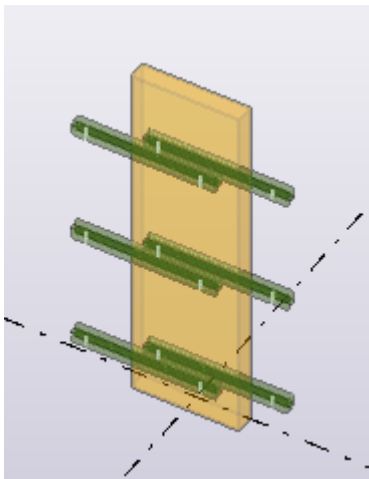
### Create a new panel sub-assembly

The panel sub-assemblies are created using **Formwork panel sub-assembly wizard**.

The outcome of the wizard is stored in an external file with a name.

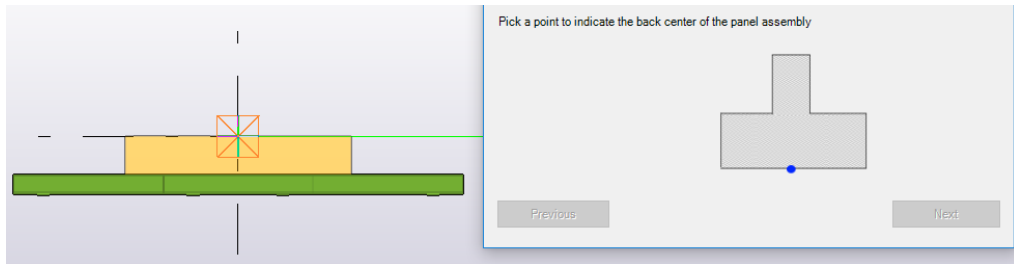
To open the dialog box, click  in the **Condition setup** dialog box on a condition that requires a panel sub-assembly. Alternatively, you can search for the **Formwork panel sub-assembly wizard** in the **Applications and components** catalog.

Before you can start creating the panel sub-assemblies, you need to have a formwork panel and all necessary accessories in the model. When you have created the formwork structure, you can start the wizard.

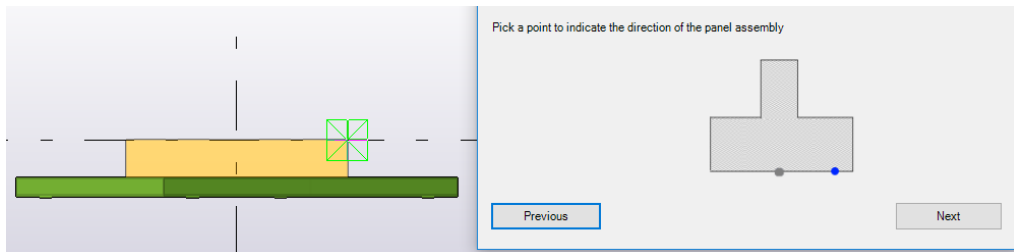


1. Pick the center point of the panel sub-assembly.

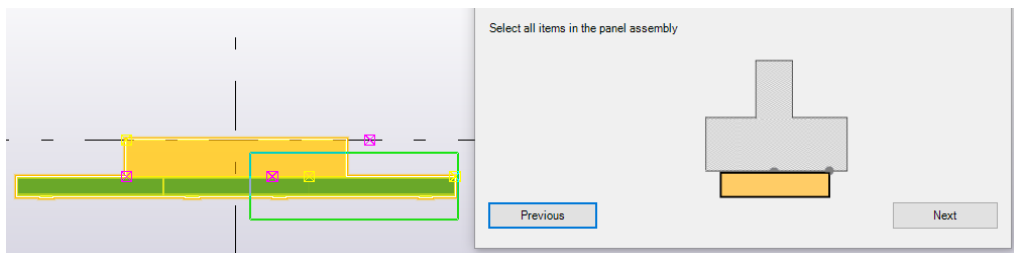
This point will be placed exactly to the center of the concrete wall in the final condition placement. Note that after you have picked the point, the wizard steps forward automatically. You can step back to re-pick a new point.



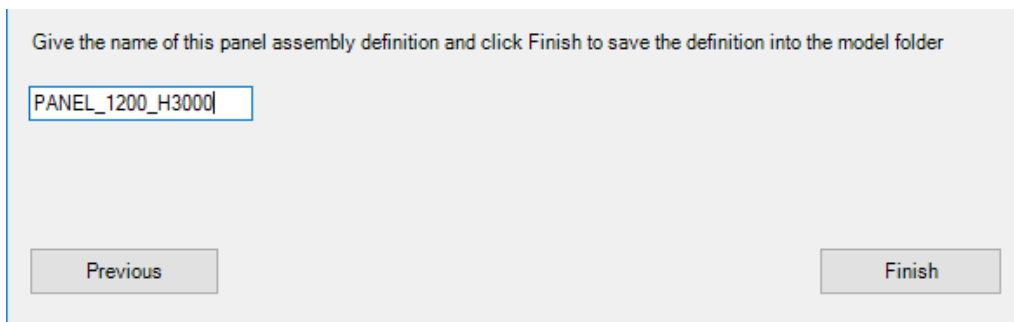
2. Pick a point showing the direction of the wall.



3. Select all formwork items belonging to the panel sub-assembly, and click **Next**.



4. Enter a file name to save the panel sub-assembly. Click **Finish** to close the wizard.



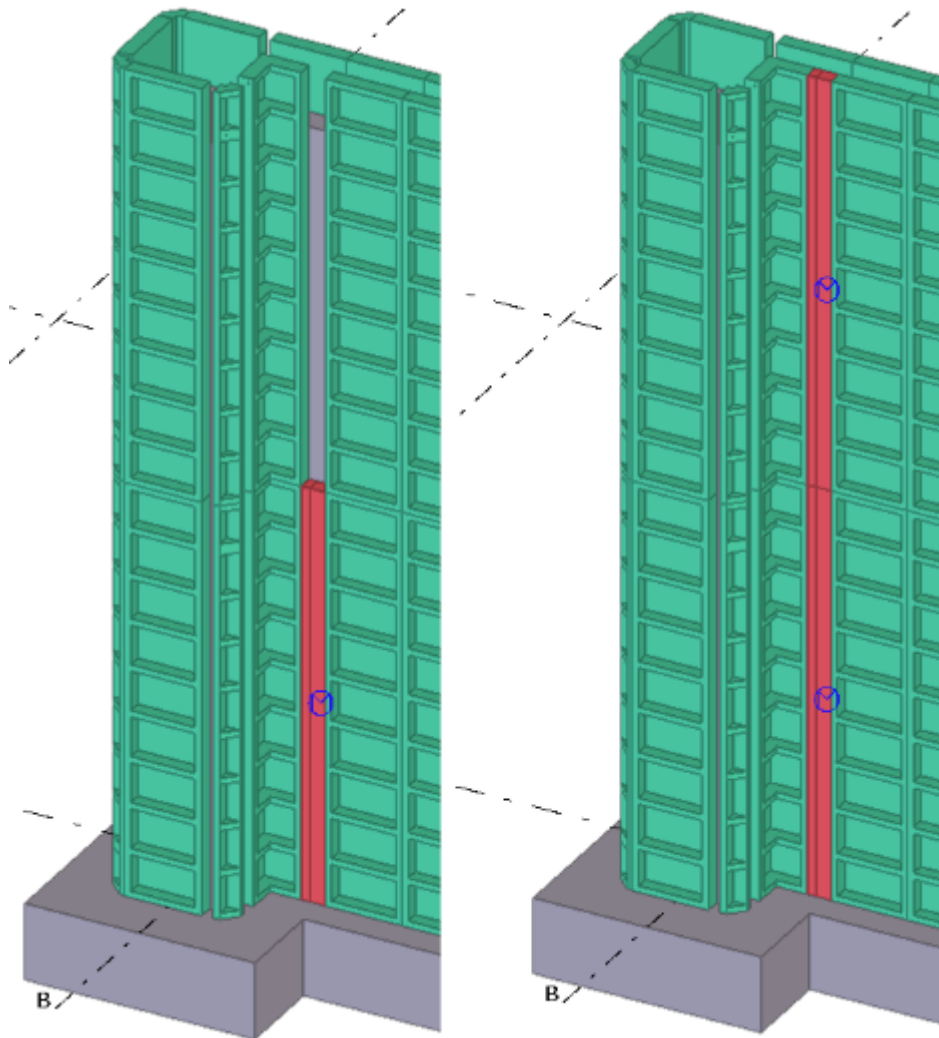
All panel sub-assemblies are saved in the `Formwork tools` folder in the model folder.

If you want to use the conditions in other models, you can copy or move the files and the condition setup files to any of the system folders. To ensure that the conditions work in other models, all custom components that the conditions use must exist in the **Applications and components catalog**.



## Fillers tab

Use the **Fillers** tab to create filler items to fill the gaps between two formwork panels.



Note that this functionality does not work between condition and a panel, meaning that the gap at the end of the wall cannot be filled with this setup.

1. On the **Fillers** tab, select the filler in the **Filler configuration** list, and set the other filler properties.
2. Click **Apply** and either **Select single panel** or **Select two panels**, depending on how you want to insert the fillers.
  - To insert the filler by selecting a single panel, select the formwork panel and a point to indicate the location (left, right, top, bottom of the panel) and the width of the filler.
  - To insert the filler by selecting two adjacent panels, select the first formwork panel, and then select the second formwork panel.

### Ties tab

Use the **Ties** tab to insert an array of ties between two formwork panels on the opposite sides of the wall.

1. On the **Ties** tab, select the tie in the **Tie type** list, and set the other tie properties.
2. To add ties manually, set **Tie layout** to **Single tie, Left side**, or **Right side**.
3. Click **Apply** and **Insert new** to start placing ties.
4. In the model, hover your mouse pointer over the panel and pick the points where you want to add ties.
5. Alternatively, to add ties automatically, set **Tie layout** to **Preset array**. Select the panel, click **Apply** and **Add to selected**. The ties are placed automatically.
6. If you want modify ties:
  - a. To adjust tie position, select a tie array, and drag the handle to move the tie to the position you want.
  - b. To add new ties, duplicate the existing ones. Hold down the **Ctrl** key, and drag a tie to a new position.
  - c. To delete individual ties, select a tie and press the **Delete** key.
  - d. To change the properties, spacing and/or start distances, modify the properties in the dialog box and click **Modify**.

### Clamps tab

Use the **Clamps** tab to insert a linear array of clamps, locks, or brackets at the joining edges between two formwork panels to keep the formwork together. Clamp placing works in the same way as the tie placing.

1. On the **Clamps** tab, select the clamp in the **Clamp type** list, and set the other clamp properties.
2. To add clamps manually, set **Clamp layout** to **Single clamp**. With the **Custom array** option you can set the offset and spacing.
3. Click **Apply** and **Insert new** to start placing clamps.
4. In the model, hover your mouse pointer over the panel, and pick the points where you want to add clamps.
5. Alternatively, to add clamps automatically, set **Clamp layout** to **Preset array**. Select the panel, click **Apply** and **Add to selected**.

The **Add accessories** dialog box opens where you can select which accessories are added with the clamps. Click **Add accessories to selected**. The clamps and other accessories are placed automatically to the selected panels.

6. If you want modify clamps:
  - a. To adjust a clamp position, select a clamp, and drag the handle to move the clamp to the position you want.
  - b. To add new clamps, duplicate the existing ones. Hold down the **Ctrl** key, and drag a clamp to a new position.
  - c. To delete individual clamps, select a clamp and press the **Delete** key.
  - d. To change the properties, spacing and/or start distances, modify the properties in the dialog box and click **Modify**.

### **Walers tab**

Use the **Walers** tab to insert walers to formwork panels. Typically, a waler is used to connect two panels on top of each other but it can also be placed in one single panel. The waler typically consists of the waler beam and two lock devices fixing the waler to the panel.

1. On the **Walers** tab, select the waler in the **Waler type** list, and set the other waler properties.
2. Enter the longitudinal offset. Leave the value empty to get the waler beam centered between the input points.
3. Click **Apply** and **Insert new** to start placing walers.
4. In the model, hover your mouse pointer over the panel and pick the first preset point. This is the first input point of the waler beam and the location for the first lock device.
5. Move the mouse pointer on the next panel and pick the second preset point. This is the end point of the waler beam and the location for the second lock device.

If you did not enter the longitudinal offset value, the waler beam is centered between the picked points. Otherwise, the waler beam starts at the given offset from the first picked point.

Alternatively, to add walers automatically, click **Apply** and **Add to selected**. The **Add accessories** dialog box opens where you can select which accessories are added with the walers. Click **Add accessories to selected**. The walers and other accessories are placed automatically to the selected panels.

6. If you want modify walers:
  - a. To adjust a waler position, select a waler, and drag the point handle to move the waler to the position you want.  
  
By holding down the **Alt** key, you can drag the point anywhere, even to a different panel.
  - b. To change the longitudinal offset, drag the point handle between the picked points.

- c. To add new walers, hold down the **Ctrl** key, and drag a main handle of a waler to a new position.

### **Braces tab**

Use the **Braces** tab to insert supporting braces for a single formwork panel.

1. On the **Braces** tab, select the brace layout in the **Brace layout** list, and set the other brace properties.

To add braces manually, set **Braces layout** to **Single brace**. With the **Custom array** option you can set the offset and spacing.

2. Click **Apply** and **Insert new** to start placing braces.
3. In the model, hover your mouse pointer over the panel and pick the points where you want to add braces.
4. Alternatively, to add braces automatically, set **Brace layout** to **Preset array**. Select the panel, click **Apply** and **Add to selected**. The **Add accessories** dialog box opens where you can select which accessories are added with the braces. Click **Add accessories to selected** and the braces and other accessories are placed automatically to the selected panels.

### **Platforms tab**

Use the **Platforms** tab to insert an array of pour platforms at the top edge of formwork panels.

1. On the **Platforms** tab, select the platform type in the **Platform type** list, and set the platform spacing and vertical and horizontal offset.
2. Click **Apply** and **Insert new** to start placing platforms.
3. In the model, hover your mouse pointer over the panel and pick the start and end points to create a linear array of platforms along the top edge of the panel.
4. Alternatively, to add platforms automatically, select the panel and click **Add to selected**. Platforms are added automatically to the selected panels.

### ***Formwork placing tools - Walls: configuration***

You can set up your own configuration files for **Formwork placings tools - Walls**.

The configuration is done by using comma separated files (.csv), which can be edited with Microsoft Excel or any standard text editor. Each separate formwork sub-tool component has its own configuration file.

The configuration files can be located in any of the system folders, or in the sub-folder called `Formwork tools` in the current model folder.

Example configuration files are located in the `...\Trimble\Tekla Structures\<>version>\Environments\common\system\CIP\Formwork` folder.

The configuration files are typically named by the formwork supplier and/or the product families. There can be any number of files, and the files are identified with a specific suffix. Each of the files controls one of the sub-tools in the component. The files contain varying number of columns.

Use the following configuration files for **Formwork placings tools - Walls** to set up

- panels: `xxxx.FormworkTools.Panels.csv`
- ties for the tie placing tool: `xxxx.FormworkTools.Ties.csv`
- tie spacers placed by the tie placing tool:  
`xxxx.FormworkTools.TieSpacers.csv`
- clamps: `xxxx.FormworkTools.Clamps.csv`
- braces: `xxxx.FormworkTools.Braces.csv`
- pouring platforms: `xxxx.FormworkTools.Platforms.csv`
- walers: `xxxx.FormworkTools.Walers.csv`
- conditions (corners, pilasters and bulkheads):  
`xxxx.FormworkTools.Conditions.csv`
- fillers: `xxxx.FormworkTools.Fillers.csv`

### **Accessories in formwork placing tools**

You can set up any formwork accessory to be created as a beam, an item, or as a custom part. For beams and items you can additionally set up any of the beam or items properties or UDAs either in the configuration file by adding new columns, or as property files.

Each configuration file contains a header row and data rows. The header row is the first row that is not a comment row, and it gives the configuration parameter names (column name). Each data row gives one product and defines the parameters used when placing the beam, item or custom part.

In addition to header row and data rows the file can contain comment rows. A comment row is any row starting with text `//`.

You can define the distance unit by adding a row:

```
DISTANCE_UNIT=MM
```

When the distance unit is defined using the above setting, all distance values can be given as decimal values in the specified units. The supported units are: `MM, DN, CM, M, INCH, FEET`.

The following accessories are available for different **Formwork placings tools - Walls** product types. For example, for a brace you can specify `Brace`, `Bracket1` and `Bracket2` accessories.

<b>Product type</b>	<b>Accessory</b>
Panel	Panel
Tie	Part1, the actual tie rod Part2, the front lock Part3, the back lock
Tie spacer	SpacerTube StartCone EndCone
Clamp	Part1
Brace	Brace Bracket1 Bracket2
Platform	Part1 Part2
Waler	Beam Clamp1 Clamp2
Filler	Timber Stud Plywood Part1 Part2 - Part10

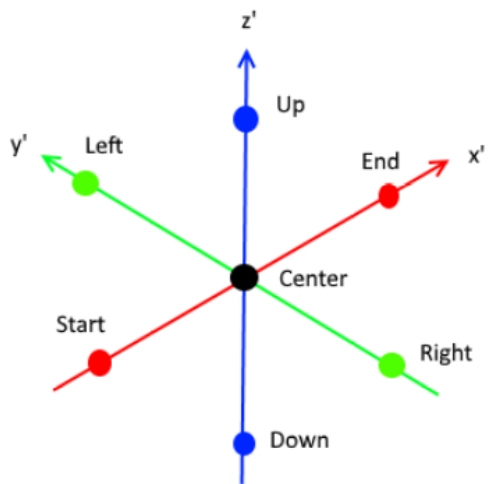
### Common configuration parameter fields

To configure the accessories in any of the formwork product types, define the following fields in the `.csv` configuration file.

The text `[Accessory]` in the following table denotes the accessory in question.

<b>Column name in the .csv file</b>	<b>Description</b>
<code>[Accessory].Profile</code> <code>[Accessory].Item</code> <code>[Accessory].CustomPart</code>	Formwork placing tools can place either beams, items, or custom parts to the model.  If all products are of the same model object type you can use one of the

Column name in the .csv file	Description
	<p>three field names and give the corresponding data value.</p> <p>The field name specifies the model object default type but you can also override the model object type by adding the prefix <code>BEAM:</code>, <code>ITEM:</code> or <code>CUSTOMPART:</code> for the actual value.</p> <p>The actual value for <code>BEAM:</code> is a valid profile string, for <code>ITEM:</code> a valid item shape name, and for <code>CUSTOMPART:</code> a valid custom part name.</p>
[Accessory].Attributes	Saved property file used to set either part, item or custom part properties.
[Accessory].Name	Name of the part or the item, or the <b>Name</b> property of the custom part.
[Accessory].Class	Class of the part or the item, or the <b>Class</b> property of the custom part.
[Accessory].Material	Material of the part or the item, or the <b>Material</b> property of the custom part.
[Accessory].AssPrefix	Part or item numbering assembly prefix, or the <b>AssPrefix</b> property of the custom part.
[Accessory].AssStartNo	Part or item assembly start number, or the <b>AssStartNo</b> property of the custom part.
[Accessory].PartPrefix	Part or item numbering part prefix, or the <b>PartPrefix</b> property of the custom part.
[Accessory].PartStartNo	Part or item part start number, or the <b>PartStartNo</b> property of the custom part.
[Accessory].Finish	Finish of the part or the item, or the <b>Finish</b> property of the custom part.
[Accessory].InputOrder	<p>Set the final locations of the input points in relation to the default generic start and end points.</p> <p>The possible values are:</p> <ul style="list-style-type: none"> <li>• <code>StartEnd</code>: default if no other value is specified.</li> <li>• <code>EndStart</code>: reverses the default start/end points.</li> </ul>

Column name in the .csv file	Description
	<ul style="list-style-type: none"> <li>• <code>CenterStart</code>: the first input point is at the center of the start/end point and the second point is at the start point.</li> <li>• <code>CenterEnd</code>: the first input point is at the center of the start/end point and the second point is at the end point.</li> <li>• <code>CenterLeft</code>: the first input point is at the center of the start/end point and the second point is at the left point.</li> <li>• <code>CenterRight</code>: the first input point is at the center of the start/end point and the second point is at the right point.</li> <li>• <code>CenterUp</code>: the first input point is at the center of start/end point and the second point is up from the center point.</li> <li>• <code>CenterDown</code>: the first input point is at the center of the start/end point and the second point is down from the center point.</li> </ul> <p>Note that if the <code>.csv</code> file does not contain any value, the default value <code>StartEnd</code> is used.</p> 



Column name in the .csv file	Description
[Accessory].PlanePosition	<p>This is <b>Position in plane</b> when the beam, item, or custom part is inserted in the plane view.</p> <p>The options are <b>MIDDLE, LEFT, and RIGHT.</b></p>
[Accessory].PlaneOffset	<p>Offset on plane. The default value is 0.</p>
[Accessory].Rotation	<p>This is <b>Rotation</b> when the custom part is inserted in the plane view.</p> <p>The options are <b>FRONT, TOP, BACK, and BELOW.</b></p>
[Accessory].RotationOffset	<p>Rotation offset in degrees. The default value is 0.</p>
[Accessory].DepthPosition	<p>This is <b>Position at depth</b> when the beam, item, or custom part is inserted in the plane view.</p> <p>The options are <b>MIDDLE, FRONT, and BEHIND.</b></p>
[Accessory].DepthOffset	<p>Offset at depth. The default value is 0.</p>
[Accessory].StartOffset	<p>Offset of the actual start point from the generic start point in the local coordinate system.</p> <p>Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.</p>
[Accessory].EndOffset	<p>Offset of the actual end point from the generic end point in the local coordinate system.</p> <p>Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.</p>
[Accessory].UDA.XXXXXX	<p>Define additional UDA values applied to the model objects. You can introduce as many UDA values as needed.</p> <p>Note that the UDA name (XXXXX) must be the internal name, not the</p>

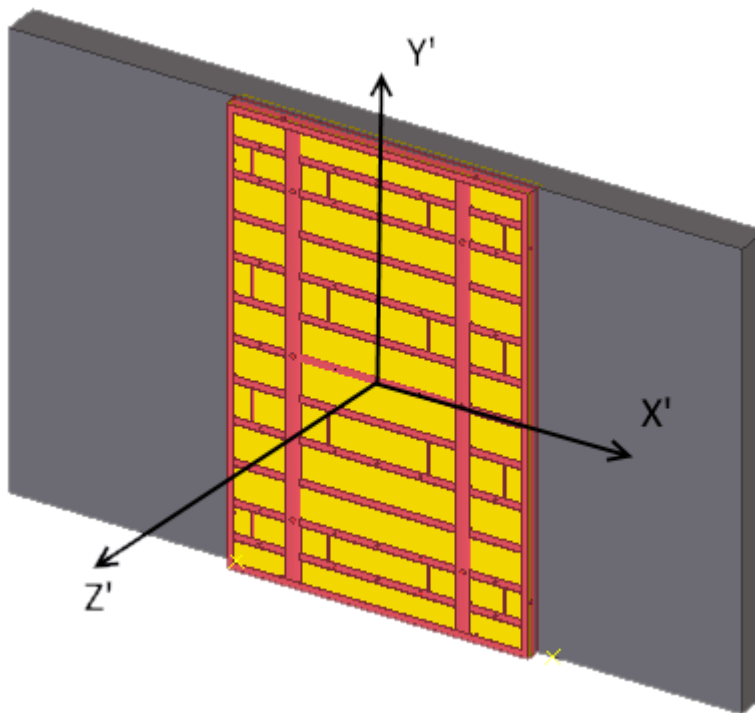
Column name in the .csv file	Description
	localized name shown in the user interface.

### Configure the panel placing tool

.FormworkTools.Panels.csv

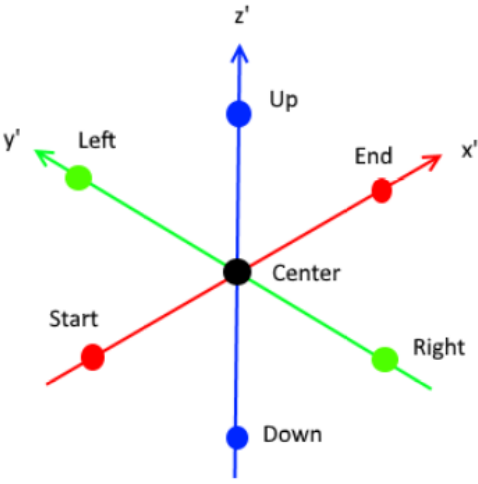
Add or modify one row for each panel.

The configuration of all accessories that can be added to panels is done in the local coordinate system of the panel. The origin of the panel is located at the center point of the panel.



Definition	Description
Supplier	Supplier name, this is typically the same for all rows. The name is shown in the <b>Formwork supplier</b> list.
Family	Family name, which is shown in the <b>Product family</b> list.
Name	Unique panel name, which is shown in the <b>Formwork panel</b> list.
PanelName	Name of the custom part that will be inserted in the model.

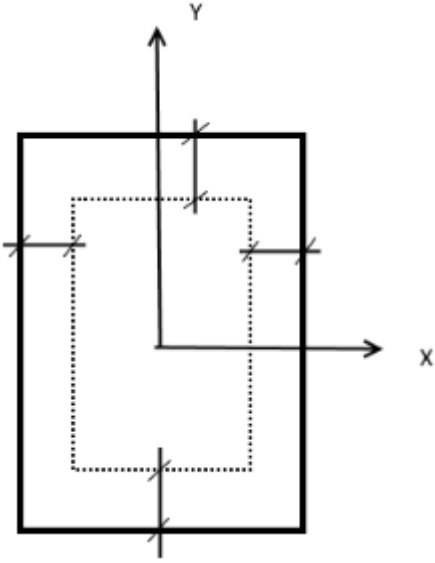
Definition	Description
PanelAttributes	Property file saved in the component dialog box to be used when the custom part will be inserted in the model.
PanelInputOrder	<p>Define the orientation of the custom part panels by specifying where the start and end handles of the custom part will go.</p> <p>Set the final locations of the input points in relation to the default generic start and end points.</p> <p>The possible values are:</p> <ul style="list-style-type: none"> <li>• <code>StartEnd</code>: default if no other value is specified.</li> <li>• <code>EndStart</code>: reverses the default start/end points.</li> <li>• <code>CenterStart</code>: the first input point is at the center of the start/end point and the second point is at the start point.</li> <li>• <code>CenterEnd</code>: the first input point is at the center of the start/end point and the second point is at the end point.</li> <li>• <code>CenterLeft</code>: the first input point is at the center of the start/end point and the second point is at the left point.</li> <li>• <code>CenterRight</code>: the first input point is at the center of the start/end point and the second point is at the right point.</li> <li>• <code>CenterUp</code>: the first input point is at the center of start/end point and the second point is up from the center point.</li> <li>• <code>CenterDown</code>: the first input point is at the center of the start/end point and the second point is down from the center point.</li> </ul>

Definition	Description
	<p>Note that if the <code>.csv</code> file does not contain any value, the default value <code>StartEnd</code> is used.</p> 
PanelPlanePosition	<p>Use the following position values to define the custom part's position, offset and rotation in relation to the custom part start and end points.</p> <p>Use <b>Position in plane</b> to insert the custom part in plane view.</p> <p>The options are <b>MIDDLE, LEFT, and RIGHT.</b></p>
PanelPlaneOffset	<p>Offset on plane. The default value is 0.</p>
PanelRotation	<p>Use <b>Rotation</b> to insert the custom part in the plane view.</p> <p>The options are <b>FRONT, TOP, BACK, and BELOW.</b></p>
PanelRotationOffset	<p>Rotation offset in degrees. The default value is 0.</p>
PanelDepthPosition	<p>Use <b>Position at depth</b> to insert the custom part in plane view.</p> <p>The options are <b>MIDDLE, FRONT, and BEHIND.</b></p>
PanelDepthOffset	<p>Offset at depth. The default value is 0.</p>
PanelStartOffset	<p><code>PanelStartOffset</code> and <code>PanelEndOffset</code> change the</p>

Definition	Description
	<p>location of the actual start and end handles of the custom part.</p> <p><code>PanelStartOffset</code> is the offset of the actual start point from the generic start point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.</p>
<code>PanelEndOffset</code>	<p><code>PanelEndOffset</code> is the offset of the actual end point from the generic end point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.</p>
<code>HeightProperty</code>	<p>Name of the height property in the custom part. If the height is fixed, this is empty.</p>
<code>HeightValue</code>	<p>Height of the panel.</p> <p>Note that the height value is read from the <code>.csv</code> file.</p>
<code>WidthProperty</code>	<p>Name of the width property in the custom part. If the width is fixed, this is empty.</p>
<code>WidthValue</code>	<p>Width of the panel.</p> <p>Note that the width value is read from the <code>.csv</code> file.</p>
<code>ThicknessProperty</code>	<p>Name of the thickness property in the custom part. If the thickness is fixed, this is empty.</p>
<code>ThicknessValue</code>	<p>Thickness of the panel.</p> <p>Note that the thickness value is read from the <code>.csv</code> file.</p>
<code>TieX</code>	<p><code>TieX</code> specifies the x locations of the ties. Values must be enclosed in parentheses () and separated by spaces.</p>
<code>TieY</code>	<p><code>TieY</code> specifies the y locations of the ties. Values must be enclosed in</p>

Definition	Description
	parentheses () and separated by spaces.
<p>TiePickX TiePickY or TiePickXY</p>	<p>Define the possible x and y locations of the ties when placing and picking a single tie. You can either specify the x and y values separately in two value fields to define a regular grid of locations, or if your panels require an irregular pattern, you can specify a list of x and y value pairs.</p> <p>Always define the x and y values in two separate fields (TiePickX and TiePickY), or x and y value pairs in one field (TiePickXY).</p> <p>Values must be enclosed in parentheses () and separated by spaces.</p>
ClampX	ClampX specifies the x locations of the clamps at the horizontal top/bottom edges. Values must be enclosed in parentheses () and separated by spaces.
ClampY	ClampY specifies the y locations of the clamps at the vertical left/right edges. Values must be enclosed in parentheses () and separated by spaces.
<p>ClampPickX ClampPickY or ClampPickXY</p>	<p>Define the possible x and y locations of the clamps when placing and picking a single clamp. You can either specify the x and y values separately in two value fields to define a regular grid of locations, or if your panels require an irregular pattern, you can specify a list of x and y value pairs.</p> <p>Always define the x and y values in two separate fields (ClampPickX and ClampPickY), or x and y value pairs in one field (ClampPickXY).</p> <p>Values must be enclosed in parentheses () and separated by spaces.</p>

Definition	Description
BraceX BraceY or BraceXY	<p>Define the preset pattern for the braces. You can either specify the x and y values separately in two value fields to define a regular grid of locations, or if your panels require an irregular pattern, you can specify a list of x and y value pairs.</p> <p>Always define the x and y values in two separate fields (BraceX and BraceY), or x and y value pairs in one field (BraceXY).</p> <p>Values must be enclosed in parentheses () and separated by spaces.</p>
BraceTiltedX BraceTiltedY or BraceTiltedXY	<p>Define the preset pattern for the braces when the panel is tilted. You can either specify the x and y values separately in two value fields to define a regular grid of locations, or if your panels require an irregular pattern, you can specify a list of x and y value pairs.</p> <p>Always define the x and y values in two separate fields (BraceTiltedX and BraceTiltedY), or x and y value pairs in one field (BraceTiltedXY).</p> <p>Values must be enclosed in parentheses () and separated by spaces.</p>
BracePickX BracePickY or BracePickXY	<p>Define the possible x and y locations of the braces when placing and picking a single brace in a panel. You can either specify the x and y values separately in two value fields to define a regular grid of locations, or if your panels require an irregular pattern, you can specify a list of x and y value pairs.</p> <p>Always define the x and y values in two separate fields (BracePickX and</p>

Definition	Description
	<p>BracePickY), or x and y value pairs in one field (BracePickXY).</p> <p>Values must be enclosed in parentheses () and separated by spaces.</p>
<p>BraceTiltedPickX BraceTiltedPickY or BraceTiltedPickXY</p>	<p>Define the possible x and y locations of the braces when placing and picking a single brace in a tilted panel. You can either specify the x and y values separately in two value fields to define a regular grid of locations, or if your panels require an irregular pattern, you can specify a list of x and y value pairs.</p> <p>Always define the x and y values in two separate fields (BraceTiltedPickX and BraceTiltedPickY), or x and y value pairs in one field (BraceTiltedPickXY).</p> <p>Values must be enclosed in parentheses () and separated by spaces.</p>
<p>WalerEdgeOffset</p>	<p>Offset of the waler input point (=location of the clamp 1 and/or clamp 2) from the panel edge when the walers are placed automatically.</p> 

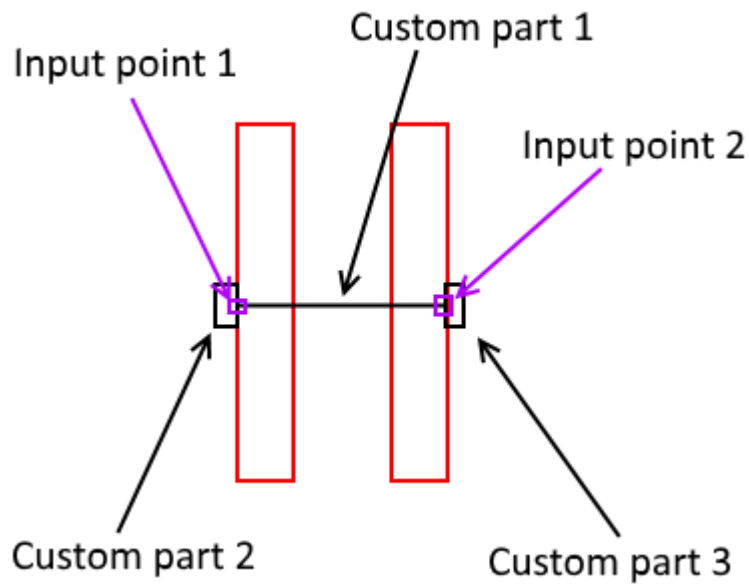


Definition	Description
WalerX	X locations used for placing walers automatically at horizontal top/bottom edges. The vertical (y) location is defined by <code>WalerEdgeOffset</code> from the top/bottom edge. Values must be enclosed in parentheses () and separated by commas or spaces.
WalerY	Y locations used for placing walers automatically at vertical left/right edges. The horizontal (x) location is defined by <code>WalerEdgeOffset</code> from left/right edge. Values must be enclosed in parentheses () and separated by commas or spaces.
WalerPickX	Define the possible x locations of the walers when placing and picking a single waler. Values must be enclosed in parentheses () and separated by commas or spaces.
WalerPickY	Define the possible y locations of the walers when placing and picking a single waler. Values must be enclosed in parentheses () and separated by commas or spaces.

### Configure the tie placing tool

`xxxx.FormworkTools.Ties.csv`

A generic tie consists of three custom components: a bolt that usually goes through the wall, and two locks on both sides of the formwork.



Add or modify one row for each tie.

Definition	Description
Supplier	Supplier name, which is typically the same for all rows. The name is shown in the <b>Formwork supplier</b> list.
Family	Family name, which is shown in the <b>Product family</b> list.
Name	Tie name, which is shown in the <b>Tie type</b> list. This name can be unique, or multiple tie configurations may have the same name. When multiple tie configurations have the same name, the tool automatically selects the first suitable tie based on the wall thickness.
MaxLength	Maximum length of the tie, measured from outer faces of the two formwork panels on opposite sides.
LengthProperty	If the tie custom part is parametric and has a parameter controlling the effective length, this is the name of the <b>Length</b> property.

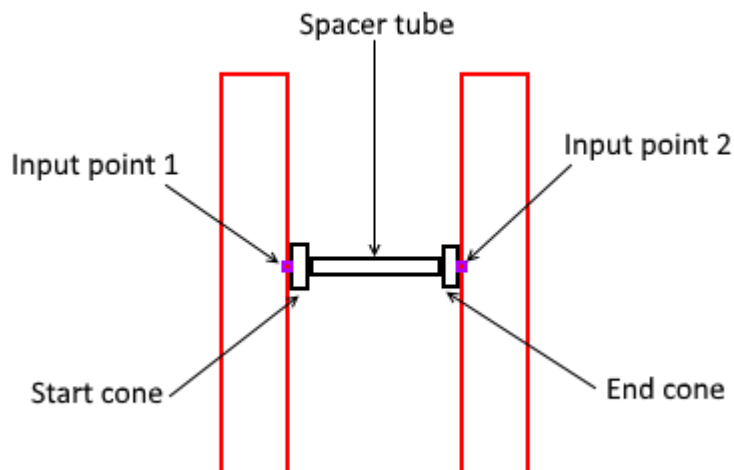
Definition	Description
Part1Name	Name of the custom part 1 that will be inserted in the model (=bolt).
Part1Attributes	Property file saved in the component dialog box to be used when the custom part is inserted in the model.
Part1PlanePosition	This is <b>Position in plane</b> when the custom part is inserted in the face view of the main formwork panel.
Part1PlaneOffset	This is <b>Offset on plane</b> value when the custom part is inserted in the face view of the main formwork panel.
Part1Rotation	This is <b>Rotation</b> when the custom part is inserted in the face view of the main formwork panel.
Part1RotationOffset	This is <b>Rotation offset</b> when the custom part is inserted in the face view of the main formwork panel.
Part1DepthPosition	This is <b>Position at depth</b> when the custom part is inserted in the face view of the main formwork panel.
Part1DepthOffset	This is <b>Offset at depth</b> when the custom part is inserted in the face view of the main formwork panel.
Part1StartOffset	Offset of the first insertion point in relation to <b>Input point 1</b> .
Part1EndOffset	Offset of the first insertion point in relation to <b>Input point 2</b> .
Part2Name	Name of the custom part 2, which typically is the lock on the front side of the main formwork panel.
Part2Attributes	Property file saved in the component dialog box to be used when the custom part will be inserted in the model.
Part2StartOffset	Offset of the second insertion point in relation to <b>Input point 1</b> .
Part2EndOffset	Location of the second insertion point in relation to the <b>Input point 1</b> .
Part2...	For custom part 2, you can specify the same fields as for custom part 1.
Part3Name	Name of the custom part 3, which typically is the lock on the back side of the main formwork panel.

Definition	Description
Part3Attributes	Property file saved in the component dialog box to be used when the custom part will be inserted in the model.
Part3StartOffset	Offset of the first insertion point in relation to <b>Input point 2</b> .
Part3EndOffset	Location of the second insertion point in relation to the <b>Input point 2</b> .
Part3...	For custom part 3, you can specify the same fields as for custom part 1.

### Configure the spacers for the tie placing tool

xxxx.FormworkTools.TieSpacers.csv

A generic tie spacer consists of three custom components: a tube that usually goes through the wall, and two optional cones at each side of the wall.



Add or modify one row for each tie spacer.

Definition	Description
Supplier	Supplier name, which is typically the same for all rows. The name is shown in the <b>Formwork supplier</b> list.
Family	Family name, which is shown in the <b>Product family</b> list.

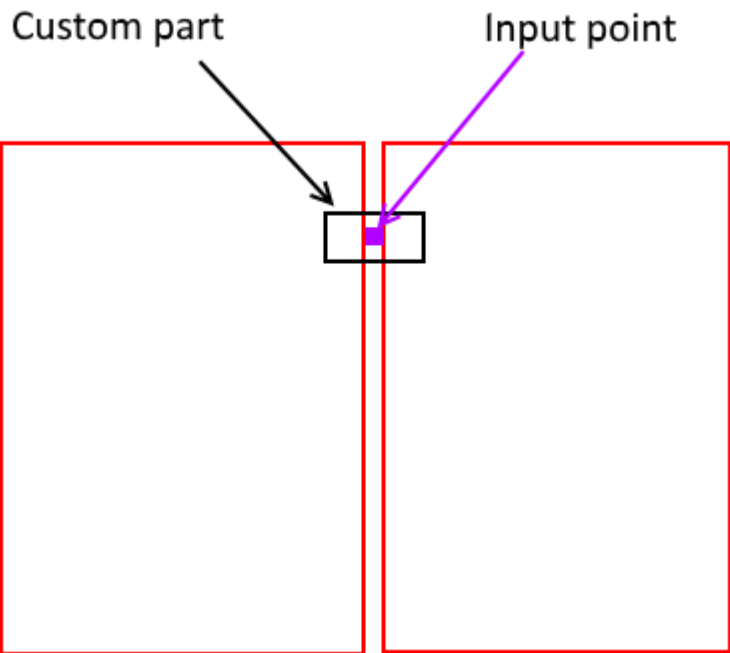
Definition	Description
Name	<p>Spacer name, which is shown in the <b>Spacer name</b> list.</p> <p>This name can be unique, or multiple tie spacer configurations may have the same name. When multiple tie spacer configurations have the same name, the tool automatically selects the first suitable tie spacer based on the wall thickness.</p>
MinLength	<p>Minimum possible length of the tube, measured from the inner faces of the two formwork panels on the opposite sides.</p>
MaxLength	<p>Maximum possible length of the tube, measured from the inner faces of the two formwork panels on the opposite sides.</p>
LengthProperty	<p>If the tie spacer custom part is parametric and has a parameter controlling the effective length, this is the name of the <b>Length</b> property.</p>
SpacerTubeName	<p>Name of the custom part (=tube).</p>
SpacerTubeAttributes	<p>Property file saved in the component dialog box to be used when the custom part will be inserted in the model.</p>
SpacerTubePlanePosition	<p>This is <b>Position in plane</b> when the custom part is inserted in the face view of the main formwork panel.</p>
SpacerTubePlaneOffset	<p>This is <b>Offset in plane</b> when the custom part is inserted in the face view of the main formwork panel.</p>
SpacerTubeRotation	<p>This is <b>Rotation</b> when the custom part is inserted in the face view of the main formwork panel.</p>
SpacerTubeRotationOffset	<p>This is <b>Rotation offset</b> when the custom part is inserted in the face view of the main formwork panel.</p>
SpacerTubeDepthPosition	<p>This is <b>Position in depth</b> when the custom part is inserted in the face view of the main formwork panel.</p>

Definition	Description
SpacerTubeDepthOffset	This is <b>Offset in depth</b> when the custom part is inserted in the face view of the main formwork panel.
SpacerTubeStartOffset	Offset of the first insertion point in relation to <b>Input point 1</b> .
SpacerTubeEndOffset	Offset of the first insertion point in relation to <b>Input point 2</b> .
StartConeName	Name of the custom part, which typically is the cone on the front side of the main formwork panel.
StartConeAttributes	Property file saved in the component dialog box to be used when the custom part is inserted in the model.
StartConeStartOffset	Offset of the first insertion point in relation to <b>Input point 1</b> .
StartConeEndOffset	Location of the second insertion point in relation to the <b>Input point 1</b> .
StartCone...	For custom part 2, you can specify the same fields as for custom part 1.
EndConeName	Name of the custom part which typically is the cone on the back side of the main formwork panel.
EndConeAttributes	Property file saved in the component dialog box to be used when the custom is be inserted in the model.
EndConeStartOffset	Offset of the first insertion point in relation to <b>Input point 2</b> .
EndConeEndOffset	Location of the second insertion point in relation to the <b>Input point 2</b> .
EndCone...	For custom part 3, you can specify the same fields as for custom part 1.

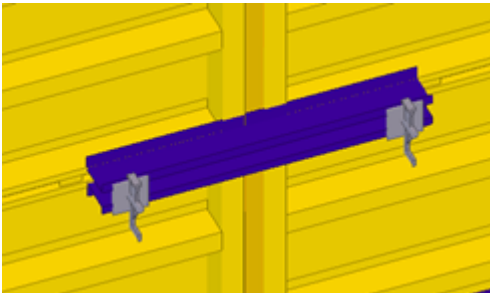
### Configure the clamp placing tool

xxxx.FormworkTools.Clamps.csv

The generic clamp contains one custom part. The input points are at the edges of the two panels and thus the clamp can be parametric in terms of the filler space, if needed.



Note that to create the brackets with some additional bolts or locks, you need to make a new custom part containing both the bracket and all necessary fittings:



Definition	Description
Supplier	Supplier name, which is typically the same for all rows. The name is shown in the <b>Formwork supplier</b> list.
Family	Family name, which is shown in the <b>Product family</b> list.
Name	Unique clamp name.
CenterInput	When YES, the first insertion point is in the middle of the seam of the two panels. If the value is NO, the insertion

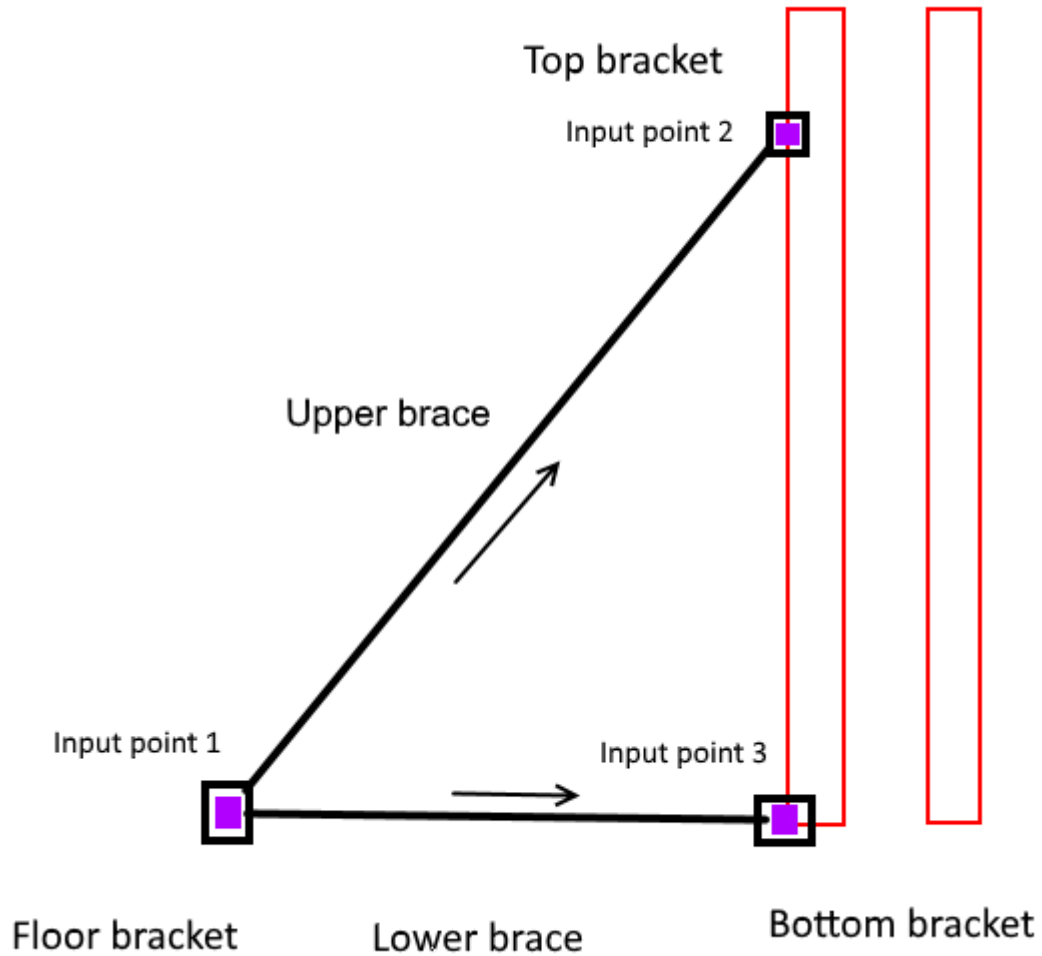
Definition	Description
	points are offset from the edge of the panels.
FillerGapProperty	If the clamp custom part is parametric, and the parameter can adjust the gap between two panels, this is the name of that parameter. This field is empty if the clamp is not parametric.
MaxFillerGap	This value is used when clamps or walers are added automatically along with a formwork filler. If the free space (=width of the filler) is less or equal to the given MaxFillerGap, clamps will be inserted. If the free space is greater than the given MaxFillerGap, walers will be inserted.
Part1Name	Name of the clamp custom part 1.
Part1Attributes	Property file saved in the component dialog box to be used when the custom part is inserted in the model.
Part1PlanePosition	This is <b>Position in plane</b> when the custom part is inserted in the face view of the main formwork panel.
Part1PlaneOffset	This is <b>Offset in plane</b> when the custom part is inserted in the face view of the main formwork panel.
Part1Rotation	This is <b>Rotation</b> when the custom part is inserted in the face view of the main formwork panel.
Part1RotationOffset	This is <b>Rotation offset</b> when the custom part is inserted in the face view of the main formwork panel.
Part1DepthPosition	This is <b>Position in depth</b> when the custom part is inserted in the face view of the main formwork panel.
Part1DepthOffset	This is <b>Offset in depth</b> when the custom part is inserted in the face view of the main formwork panel.
Part1StartOffset	Offset of the first insertion point in relation to <b>Input point 1</b> .
Part1EndOffset	Location of the second insertion point in relation to the <b>Input point 1</b> .



### Configure the brace placing tool

xxxx.FormworkTools.Braces.csv

A generic brace may consists of five custom parts, which are inserted in the model by using three input points. You can select the upper and lower braces separately. In the brace configuration file, the upper and lower braces are defined separately; they both have own rows.



Definition	Description
Supplier	Supplier name, which is typically the same for all rows. The name is shown in the <b>Formwork supplier</b> list.
Family	Family name, which is shown in the <b>Product family</b> list.

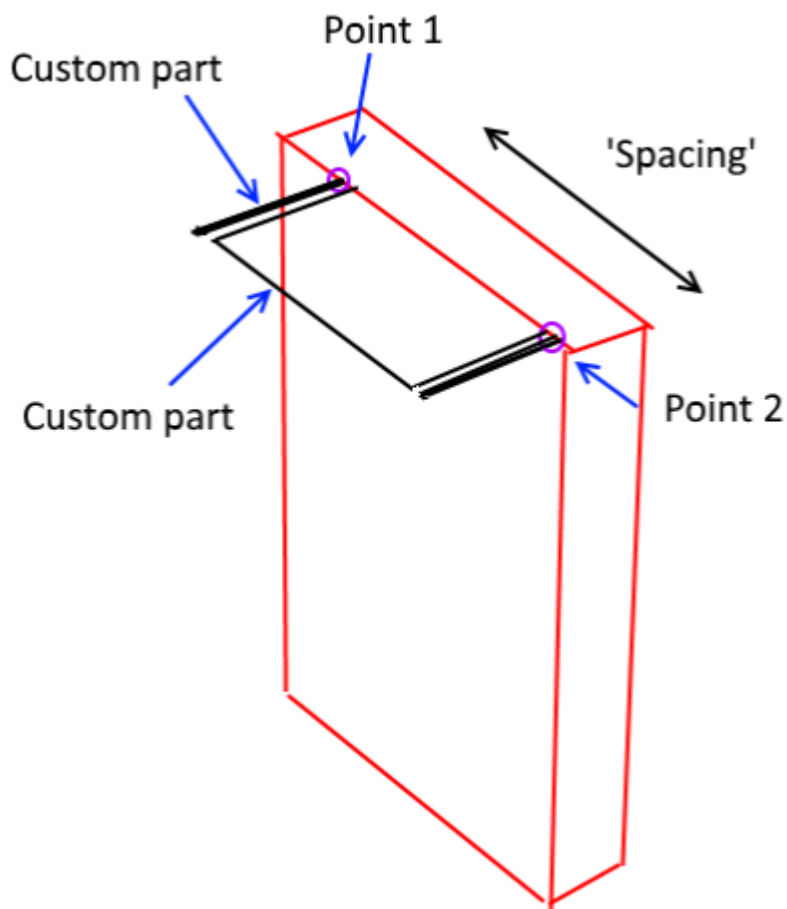
Definition	Description
Name	Brace name which is shown in the list. If you have several rows with the same name, the tool automatically selects the suitable brace based on the minimum and maximum length.
Type	Type of the brace. The options are Upper or Lower.
MinLength	Minimum possible length of the main brace measured from <b>Input point 1</b> to <b>Input point 2</b> .
MaxLength	Maximum possible length of the main brace measured from <b>Input point 1</b> to <b>Input point 2</b> .
LengthProperty	If the brace custom part is parametric and has a parameter controlling the effective length, this is the name of the <b>Length</b> property. At insertion it will get the actual length value between <b>Input point 1</b> and <b>Input point 2</b> .
BraceName	Name of the custom part for the upper or lower brace which will be inserted into the model.
BraceAttributes	Property file saved in the component dialog box to be used when the custom part is inserted in the model.
BracePlanePosition	This is <b>Position in plane</b> when the custom part is inserted in plane view.
BracePlaneOffset	This is <b>Offset in plane</b> when the custom part is inserted in plane view.
BraceRotation	This is <b>Rotation</b> when the custom part is inserted in plane view.
BraceRotationOffset	This is <b>Rotation offset</b> when the custom part is inserted in plane view.
BraceDepthPosition	This is <b>Position in depth</b> when the custom part is inserted in plane view.
BraceDepthOffset	This is <b>Offset in depth</b> when the custom part is inserted in plane view.
BraceStartOffset	Offset of the first insertion point in relation to <b>Input point 1</b> .
BraceEndOffset	Offset of the first insertion point in relation to <b>Input point 2</b> .

Definition	Description
Bracket1Name	Name of the custom part for the top bracket (upper brace) or bottom bracket (lower brace) which will be inserted into the model.
Bracket1Attributes	Property file saved in the component dialog box to be used when the custom part is inserted in the model.
Bracket1StartOffset	Offset of the first insertion point in relation to <b>Input point 1</b> .
Bracket1EndOffset	Location of the second insertion point in relation to the <b>Input point 3</b> .
Bracket1...	For custom part 2, you can specify the same fields as for custom part 1.
Bracket2Name	Name of the custom part for the floor bracket which will be inserted into the model.  If both upper and lower brace have a definition for the bracket, the bracket defined for the lower brace will be created.
Bracket2Attributes	Property file saved in the component dialog box to be used when the custom part will be inserted in the model.
Bracket2StartOffset	Offset of the first insertion point in relation to <b>Input point 2</b> .
Bracket2EndOffset	Location of the second insertion point in relation to the <b>Input point 2</b> .
Bracket2...	For custom part 3, you can specify the same fields as for custom part 1.

### Configure the pouring platform placing tool

xxxx.FormworkTools.Platforms.csv

A generic pouring platform contains two custom parts, which are inserted in the model as a linear array of custom parts.



Definition	Description
Supplier	Supplier name, which is typically the same for all rows. The name is shown in the <b>Formwork supplier</b> list.
Family	Family name, which is shown in the <b>Product family</b> list.
Name	Unique pouring platform name.
Type	The type of the platform (A or B). The length of the array is defined with start and end points of the platform. The custom part placing has two methods: <ul style="list-style-type: none"> <li>Type A: the length of one platform custom part is fixed, and the custom parts are inserted sequentially.</li> </ul>

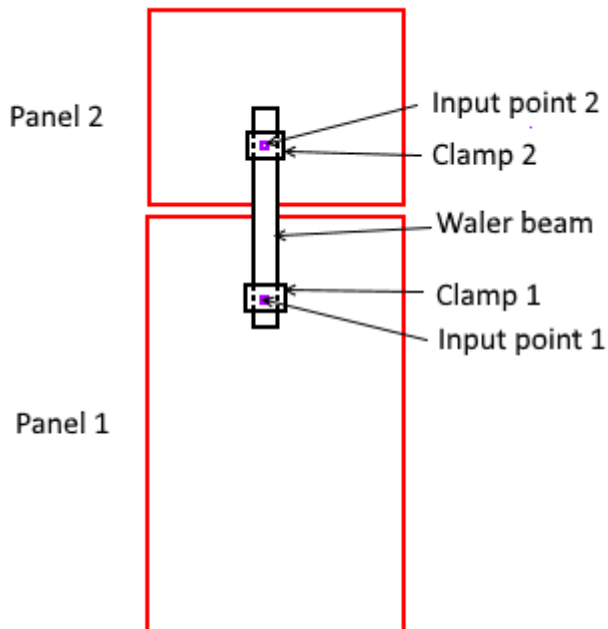
Definition	Description
	<ul style="list-style-type: none"> <li>Type B: the first custom part is a support, which is placed at start, intermediate and end points of the array. The second custom part is placed between the main support parts.</li> </ul>
Length	Effective length of one platform element.
Width	Width of the platform.
Spacing	Spacing between the custom parts in the array.
Part1Name	Name of the custom part 1.
Part1Attributes	Property file saved in the component dialog box to be used when the custom part is inserted in the model.
Part1PlanePosition	This is <b>Position in plane</b> when the custom part is inserted in the face view of the main formwork panel.
Part1PlaneOffset	This is <b>Offset in plane</b> when the custom part is inserted in the face view of the main formwork panel.
Part1Rotation	This is <b>Rotation</b> when the custom part is inserted in the face view of the main formwork panel.
Part1RotationOffset	This is <b>Rotation offset</b> when the custom part is inserted in the face view of the main formwork panel.
Part1DepthPosition	This is <b>Position in depth</b> when the custom part is inserted in the face view of the main formwork panel.
Part1DepthOffset	This is <b>Offset in depth</b> when the custom part is inserted in the face view of the main formwork panel.
Part1StartOffset	Offset of the first insertion point in relation to <b>Input point 1</b> .
Part1EndOffset	Offset of the first insertion point in relation to <b>Input point 1</b> .
Part2Name	Name of the custom part 2.
Part2Attributes	Property file saved in the component dialog box to be used when the custom part is inserted in the model.

Definition	Description
Part2StartOffset	Offset of the first insertion point in relation to <b>Input point 1</b> .
Part2EndOffset	Location of the second insertion point in relation to the <b>Input point 1</b> .
Part2...	For custom part 2, you can specify the same fields as for custom part 1.

### Configure the waler placing tool

xxxx.FormworkTools.Walers.csv

A generic waler consists of three custom parts, the waler beam and two clamp devices. The generic input points are located in the outer face of the panel.



Definition	Description
Supplier	Supplier name, which is typically the same for all rows. The name is shown in the <b>Formwork supplier</b> list.
Family	Family name, which is shown in the <b>Product family</b> list.
Name	Waler name, which is shown in the <b>Waler type</b> list. This name can be unique, or multiple tie waler configurations may have the same name. When multiple waler

Definition	Description
	<p>configurations have the same name, the tool automatically selects the shortest waler based on the actual length measured between the input points.</p> <p>Typically, you can specify the same waler with a unique name and a common name. This way you can select the common name and let the system select the waler based on the input length. By selecting the unique name you can force the usage of a certain waler configuration.</p>
MaxLength	Maximum possible effective length of the waler, measured from the first input point to the second input points (=clamp locations), typically little less than the physical length.
MinLength	Minimum length of a waler with variable length. For fixed length walers, leave the value empty or give same value as for the maximum length.
BeamName	Name of the clamp custom part 1.
BeamAttributes	Property file saved in the component dialog box to be used when the custom part is inserted in the model.
BeamPlanePosition	This is <b>Position in plane</b> when the custom part is inserted in the face view of the main formwork panel.
BeamPlaneOffset	This is <b>Offset in plane</b> when the custom part is inserted in the face view of the main formwork panel.
BeamRotation	This is <b>Rotation</b> when the custom part is inserted in the face view of the main formwork panel.
BeamRotationOffset	This is <b>Rotation offset</b> when the custom part is inserted in the face view of the main formwork panel.
BeamDepthPosition	This is <b>Position in depth</b> when the custom part is inserted in the face view of the main formwork panel.

Definition	Description
BeamDepthOffset	This is <b>Offset in depth</b> when the custom part is inserted in the face view of the main formwork panel.
BeamStartOffset	Offset of the first insertion point in relation to <b>Input point 1</b> .
BeamEndOffset	Location of the second insertion point in relation to the <b>Input point 1</b> .
Clamp1Name	Name of the clamp 1 custom part.
Clamp1Attributes	Property file saved in the component dialog box to be used when the custom part will be inserted in the model.
Clamp1StartOffset	Offset of the first insertion point in relation to <b>Input point 1</b> .
Clamp1EndOffset	Location of the second insertion point in relation to the <b>Input point 1</b> .
Clamp1...	For custom clamp 1, you can specify the same fields as for waler beam custom part.
Clamp2Name	Name of the clamp 2 custom part.
Clamp2Attributes	Property file saved in the component dialog box to be used when the custom part is inserted in the model.
Clamp2StartOffset	Offset of the first insertion point in relation to <b>Input point 1</b> .
Clamp2EndOffset	Location of the second insertion point in relation to the <b>Input point 1</b> .
Clamp2...	For custom clamp 2, you can specify the same fields as for waler beam and clamp 1 custom parts.

### Configure the conditions for condition placing tool

`xxxx.FormworkTools.Conditions.csv`

A condition in the context of the formwork tools covers the L, T and X corners, pilasters, pour stops and columns. The final condition formwork is divided into two or more sub-assemblies depending on the condition type.

If you define condition configurations manually:

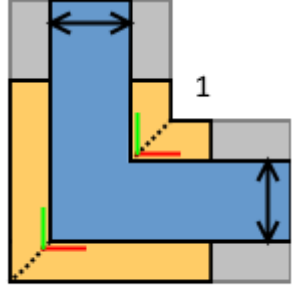
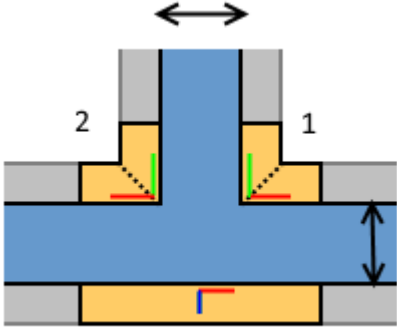
1. Model the full condition assembly using the custom parts, beams and/or filler tools.
2. Create the necessary sub-assemblies using the two wizards. Split the content of the complete condition to named sub-assemblies. When these

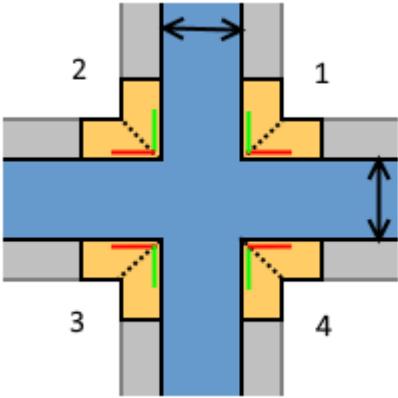
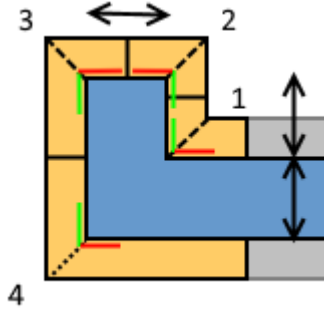


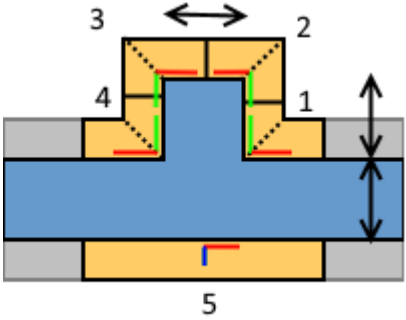
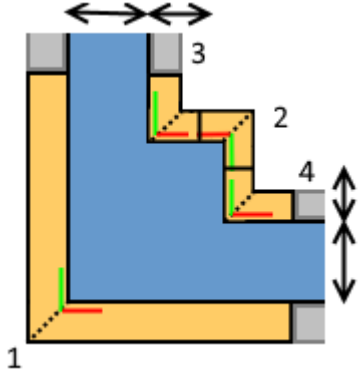
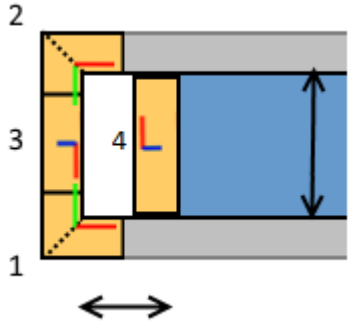
sub-assemblies are inserted in the model, the final location is parametric in the sense that the location depends on the actual geometry of the concrete structure.

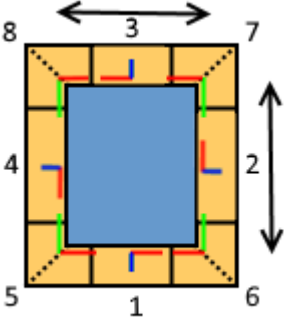
3. Insert a new condition specification in the condition configuration file.

The formwork condition placing tool supports the following condition types:

Definition	Description
L corner (L)	<p>For L corner, you can specify the inner corner sub-assembly (1) and the exterior corner sub-assembly (2).</p>  <p>The corner sub-assembly is defined with the <b>Corner sub-assembly wizard</b>.</p> <p>With the wizard you can specify two sets of formwork items, which will be rotated according to the joining walls when the corner is placed in the model. The two corner sub-assemblies 1 and 2 are inserted according to the thickness of the joining walls.</p>
T corner (T)	<p>For T corner, you can specify two inner corners (1+2) and the back panel (3).</p> 

Definition	Description
	<p>The corner sub-assembly is defined with the <b>Formwork corner sub-assembly wizard</b>.</p> <p>The back panel sub-assembly is defined with the <b>Formwork sub-assembly wizard</b>, and it contains a single insertion point + direction.</p> <p>When the T corner is placed in the model, the insertion point of the panel sub-assembly is located at the intersection of the joining wall center line and the exterior face of the horizontal wall.</p>
X corner (X)	<p>For X corner, you can specify the four inner corners (1-4).</p> 
Corner pilaster (CP)	<p>For corner pilaster, you can specify one inner corner sub-assembly (1) and three external corner sub-assemblies (2-4).</p> 
Pilaster (P)	<p>For pilaster, you can specify two inner corners (1 and 4), two external</p>

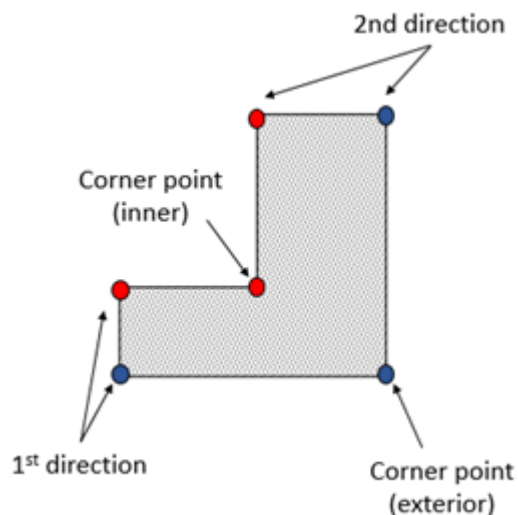
Definition	Description
	<p>corners (2 and 3), and the back panel (5).</p> 
Pilaster inside corner (IP)	<p>For inner pilaster, you can specify one external corner (1) and three inner corners (2-3).</p> 
Bulkhead (B)	<p>For bulkhead, you can specify two external corners (1 and 2) and two middle panels (3 and 4). Panel 4 will be located at end of pour and all other sub-items will be offset by the given dimension.</p> 

Definition	Description
Column (COL)	<p>For column, you can specify four panel assemblies and/or four corner assemblies.</p> 

### Create a corner sub-assembly

Corner sub-assembly is the building block for one side of the L corner or any of the inner corners in the T and X corners.

1. First model all the needed formwork objects. Only beams and/or custom parts can be used for modeling, so if you have other components, you need to explode them.
2. Decide which object should rotate with the first direction, and which objects should rotate with the second edge at the corner if/when the corner angle varies.
3. Start the **Formwork corner sub-assembly wizard** tool.
4. Pick the corner point as shown below.



5. Pick a point to identify the first direction.

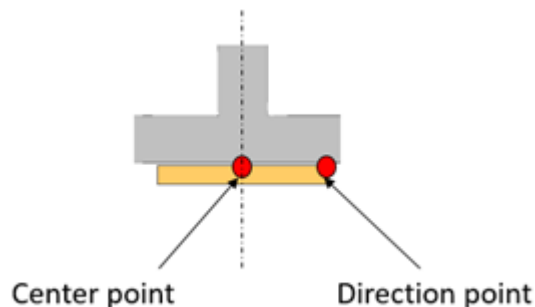
6. Select the corner parts (custom parts and/or beams) at the first side of the corner.
7. Pick a point to identify the second direction.
8. Select the corner parts (custom parts and/or beams) at the second side of the corner.
9. Enter a name and click **Finish** to save the detailed half of the corner into an external file.

Note that the wizard should be run separately for the inner corner (red dots) and external corner (blue dots). Ensure that you do not include same objects twice as that would lead to duplicate objects in the model.

### Create a panel sub-assembly

The panel sub-assembly is the building block of the formwork at the back side of the T corner and at pilasters.

1. First model all the needed formwork objects (custom parts and/or beams).
2. Start the **Formwork sub-assembly wizard** tool.
3. Pick the center point of the object at the back of the wall as shown below. This will be used as the insertion point when this panel sub-assembly is inserted in an actual T corner.

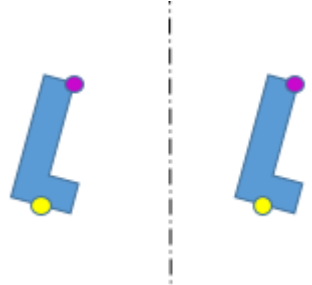
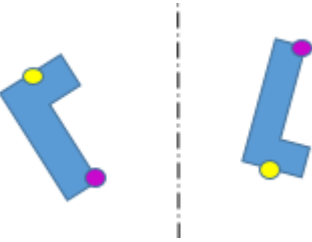
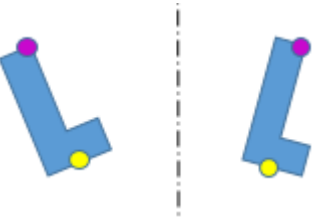
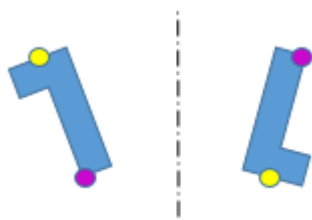


4. Pick a point to identify the direction.
5. Select the formwork parts (custom parts and/or beams) forming the panel sub-assembly.
6. Enter a name and click **Finish** to save the detailed panel and accessories into an external file.

### Control the behavior of conditions with mirroring

When you define the corner sub-assemblies, it can be that the left-hand side corner needs to be placed in a right-hand side location. When this happens, the corner sub-assembly needs to be mirrored. Mirroring custom parts or formwork items is not always possible, especially when the part is not symmetric in any direction. The condition placing tool can use four different methods for mirroring. With the configuration file

xxxxx.SubAssemblyItems.ini you can control which method will be used for a certain corner sub-assembly case. The file contains the mirroring method keyword, and after the keyword you can introduce the names of the items or partial name tags to identify multiple matching items.

Mirroring method	Description
<p>Move</p> 	<p>Default method.</p> <p>The custom part or formwork item is moved by an offset measured from the mirroring line to the center of the custom part or formwork item.</p>
<p>RotateAroundZ</p> 	<p>Input points are rotated 180 degrees around the center point at the mirroring line.</p>
<p>RotateAroundAxis</p> 	<p>Input points are first rotated 180 degrees around the mirroring line and then the custom part is rotated 180 degrees around the input axis.</p>
<p>Mirror</p> 	<p>Input point locations are mirrored and then the start and end points are swapped.</p>
<p>FlipLocalXY</p>	<p>Custom part or formwork item is moved and the local x and y axis at center are flipped (=rotated around local z 180 degrees).</p>

Mirroring method	Description
FlipLocalXZ	Item or custom part is moved and local x and z axis at center are flipped (=rotated around local y 180 degrees).
FlipLocalYX	Item or custom part is moved and local y and z axis at center are flipped (=rotated around local x 180 degrees).
TurnUpSideDown	Item or custom part is moved and the mirroring is done by turning the component upside down in the global vertical direction.

An example of the content in a configuration `xxxxx.SubAssemblyItems.ini` file.

```
// This file allows you to define how items and custom parts in corner
sub assemblies
// are handled when placing the right handed corner into left handed
situation or vice versa.
//
// By default items are just moved and no true mirroring happens. In
following lines you can specify
// the mirroring methods used for certain items or custom parts. You can
introduce full names or partial names.
//
// The possible methods are:
// #Mirror - input points are mirrored
// #RotateAroundAxis - input points are mirrored and the item/custom
part is rotated 180 degrees around the axis:
// #RotateAroundZ - input points are rotated 180 degrees around the
center point
// #FlipLocalXY - the item/custom part is moved and local X and Y axis's
at center are flipped (=rotated around local Z 180 degrees)
// #FlipLocalXZ - the item/custom part is moved and local X and Z axis's
at center are flipped (=rotated around local Y 180 degrees)
// #FlipLocalYZ - the item/custom part is moved and local Y and Z axis's
at center are flipped (=rotated around local X 180 degrees)
// #TurnUpSideDown - the item/custom part is moved and "mirroring" is
done by turning the component up-side.down
//
// Just list the names or partial names following the method keyword. Do
not change the key words.
//

#Mirror
_FIXING_BOLT

#RotateAroundAxis
DOKA-3D-583002000

#RotateAroundZ
_INSIDE
_OUTSIDE
_CORNER
_LEFT
_RIGHT

#FlipLocalXY

#FlipLocalXZ
```

#FlipLocalYX

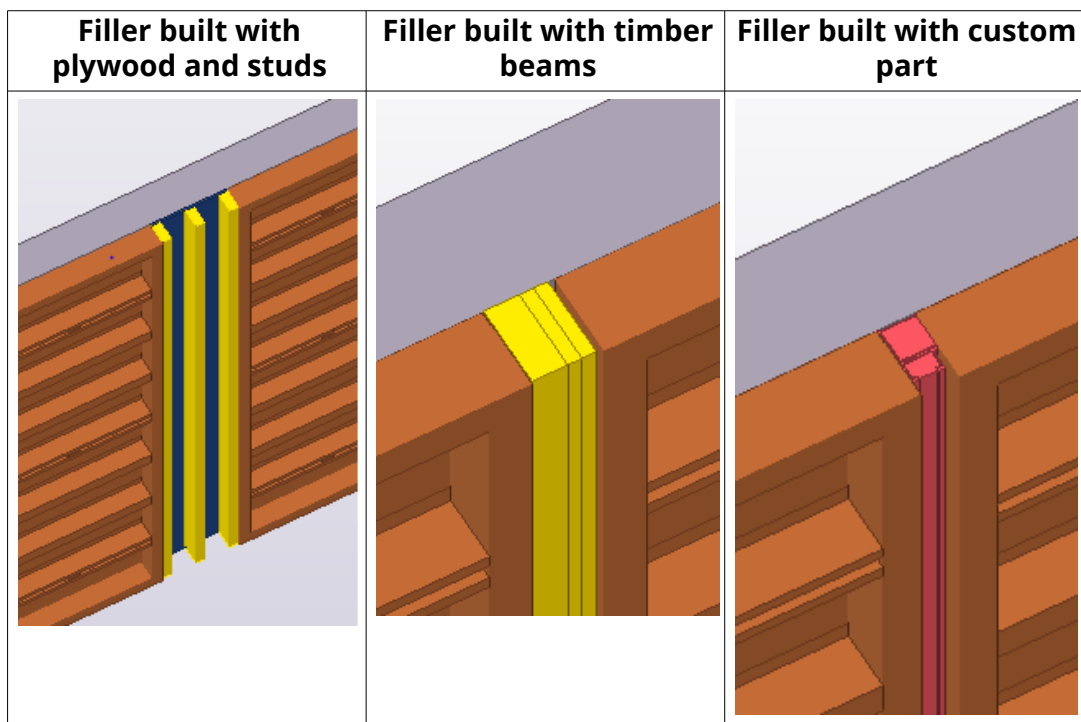
#TurnUpSideDown

### Configure the fillers for the filler placing tool

xxxx.FormworkTools.Fillers.csv

With the filler placing tool you can create a filler by inserting timber beams or plywood and timber studs, and/or specific custom parts in the model. The creation of these model objects depends on the actual space to be filled. The basic principle of the creation of the various filler items is the following:

- If the space to be filled is larger than the given minimum plywood width, the filler tool will create the plywood (=contour plate) and the timber studs.
- If the space to be filled is smaller than the minimum plywood width, or plywood is not specified, the actual space is filled by one or more timber beams or custom parts. The target is to fill the actual space as completely as possible. The largest beams and/or custom parts are preferred and smaller pieces are created only when the space is smaller than the size of the larger pieces.



To configure the filler tool, you can specify the properties for timber beam, plywood, and settings for one to ten alternatives of custom parts.



Definition	Description
Supplier	Supplier name, which is typically the same for all rows. The name is shown in the <b>Formwork supplier</b> list.
Family	Family name, which is shown in the <b>Product family</b> list.
Name	Unique filler name.
TimberWidths	List of available timber beam widths (10 20 50 100).
TimberDepth	Depth of the timber beam.
TimberAssPrefix	Assembly prefix.
TimberAssStartNo	Assembly start number.
TimberPartPrefix	Part prefix.
TimberPartStartNo	Part start number.
TimberName	Name of the timber beam.
TimberClass	Class of the timber beam.
TimberFinish	Finish of the timber beam.
TimberMaterial	Material of the timber beam.
StudWidth	Width of the timber stud.
StudDepth	Depth of the timber stud.
StudAssPrefix	Assembly prefix.
StudAssStartNo	Assembly start number.
StudPartPrefix	Part prefix.
StudPartStartNo	Part start number.
StudName	Name of the timber stud.
StudClass	Class of the stud.
StudFinish	Finish of the stud.
StudMaterial	Material of the stud.
PlywoodWidth	Minimum width of the plywood. The actual width depends on the actual space to be filled.
PlywoodThickness	Thickness of the plywood.
PlywoodAssPrefix	Assembly prefix.
PlywoodAssStartNo	Assembly start number.
PlywoodPartPrefix	Part prefix.
PlywoodPartStartNo	Part start number.
PlywoodName	Name of the plywood part.

Definition	Description
PlywoodClass	Class of the plywood part.
PlywoodFinish	Finish of the plywood part.
PlywoodMaterial	Material of the plywood part.
Part1Name	Name of the custom part 1.
Part1Attributes	Property file saved in the component dialog box to be used when the custom part is inserted in the model.
Part1PlanePosition	This is <b>Position in plane</b> when the custom part is inserted in the face view of the main formwork panel.
Part1PlaneOffset	This is <b>Offset in plane</b> when the custom part is inserted in the face view of the main formwork panel.
Part1Rotation	This is <b>Rotation</b> when the custom part is inserted in the face view of the main formwork panel.
Part1RotationOffset	This is <b>Rotation offset</b> when the custom part is inserted in the face view of the main formwork panel.
Part1DepthPosition	This is <b>Position in depth</b> when the custom part is inserted in the face view of the main formwork panel.
Part1DepthOffset	This is <b>Offset in depth</b> when the custom part is inserted in the face view of the main formwork panel.
Part1StartOffset	Offset of the first insertion point in relation to <b>Input point 1</b> .
Part1EndOffset	Offset of the first insertion point in relation to <b>Input point 2</b> .
Part1Length	Length of the custom part which is also the space to fill if/when this custom part is added to the model.
Part1Height	Height of the custom part.
Part1LengthProperty	Name of the length property of the custom part, if you are using a custom part whose length/width can be can be varying and/or parametric.  The fields can be set also for Part2, Part3, and so on. You can configure multiple parts with separate additional rows. You need to keep the

Definition	Description
	Supplier, Family, and Name the same as on the first row.
Part1LengthMin	<p>Minimum length/width (the free gap to fill) the product can fill, if you are using a custom part whose length/width can be can be varying and/or parametric.</p> <p>The fields can be set also for Part2, Part3, and so on. You can configure multiple parts with separate additional rows. You need to keep the Supplier, Family, and Name the same as on the first row.</p>
Part1LengthMax	<p>Maximum length/width the product can fill, if you are using a custom part whose length/width can be can be varying and/or parametric.</p> <p>The fields can be set also for Part2, Part3, and so on. You can configure multiple parts with separate additional rows. You need to keep the Supplier, Family, and Name the same as on the first row.</p>
Part1HeightProperty	<p>Name of the height property of the custom part, if you are using a custom part whose length/width can be can be varying and/or parametric.</p> <p>The fields can be set also for Part2, Part3, and so on. You can configure multiple parts with separate additional rows. You need to keep the Supplier, Family, and Name the same as on the first row.</p>
Part2... Part3... Part10...	<p>In addition to the custom part 1, you can specify up to nine other custom parts. In practice, at least the PartXLength needs to be different for all specified custom parts. The tool selects the part with the most suitable length depending on the actual space to be filled.</p>

### ***Formwork placing tools - Slabs***

**Formwork placing tools - Slabs** is a set of components that helps in detailed modeling of typical slab formwork. These components are placing tools, and therefore you need to have all relevant formwork products such as panels, girders, and shuttering props available in the **Applications & components** catalog.

You can get the formwork products provided by formwork suppliers from **Tekla Warehouse**, for example. In addition, **Formwork placing tools - Slabs** requires additional configuration files that contain the necessary information about the formwork product components. These configuration files may come with the formwork product catalogs provided by formwork suppliers, but you can create the configuration files yourself as well.

**Formwork placing tools - Slabs** contains tools to place and modify the following formwork elements:

- formwork slab panels typically appearing as two-dimensional arrays covering a certain area
- cross and main girders supporting the slab panels
- shuttering props supporting the girders or slab panels directly depending on the formwork system
- stop ends on top of slab panels
- safety railings in the outer edges of the slab panel area

Because **Formwork placing tools - Slabs** consists of a set of sub-tools which are combined in one dialog box, each tab is an individual sub-tool. Both the **Formwork placing tools - Slabs** and the sub-tools are available in **Applications and components** catalog.

Most of the settings in the components are preset. You can control the different settings by selecting a suitable options in the dialog box. These preset settings are organized according to the formwork supplier and the product families.

However, if you create your own configuration files, you can use the values in the configuration files instead of the preset values.

You can access the **Formwork placing tools - Slabs** in the **Concrete Contractor**, **General Contractor** and **Rebar Detailer** roles in the **Default** environment.

#### **Panel tab**

Use the **Panel** tab to model an area of formwork panels for slabs.

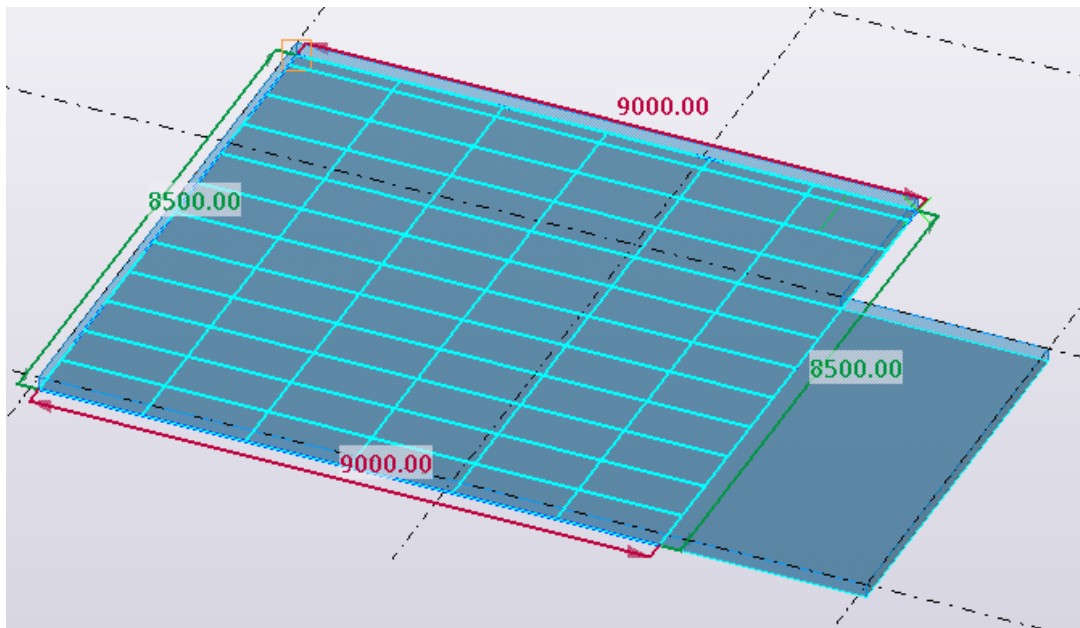
1. On the **Panel** tab, in the **Formwork supplier** and **Product family** list, select the suitable options.

The options vary depending on which catalogs and tool configurations you have in use.

2. Select the panel size in the **Formwork panel** list, and set the other panel properties.
3. Click **Apply** and **Insert new** to start placing the slab panels.
4. Hover the mouse pointer on top of the slab to identify the bottom surface.
5. Select the slab and pick three or more points to identify the area on the surface. A preview of the panels is shown while you pick the points.

Alternatively, hold down the **Alt** key and select the surface to create panels on the whole surface.

6. To finish, click the middle mouse button.
7. If you need to modify the panel, drag the corner points.



### Cross girders and Main girders tabs

Use the **Cross girders** and **Main girders** tabs to create cross and main girders in two directions, or only main girders, or no girders at all.

1. On the **Cross girders** or on the **Main girders** tab, select the girder in the **Girder name** list.
2. Enter an **Overlap** value. If you leave the value empty, the tool sets it automatically.
3. Enter the girder **Length**, if the girder length is not fixed. Use space as a separator if you need to have girders with different lengths.
  - a. To create girders at once, select the panel area, and click **Apply** and **Add to selected**.

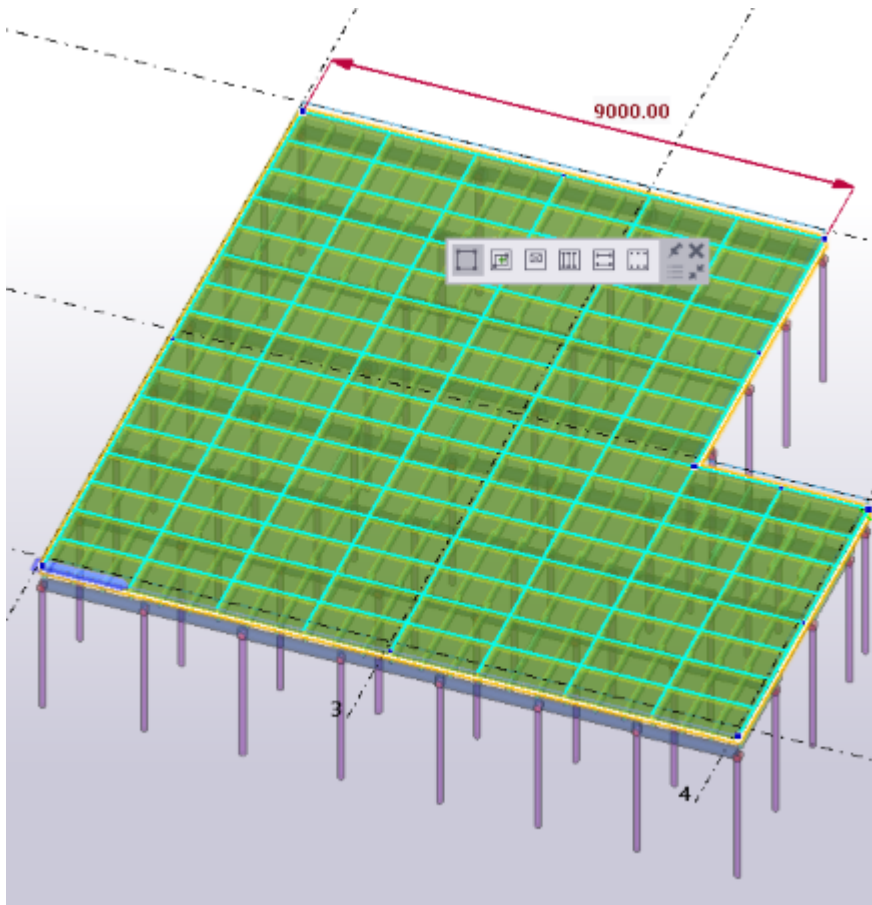
The **Add shoring** dialog box opens.

- b. Set the girder offset and spacing.  
You can also select the option whether to create girders at the panel area edges, and the girder layout at the panel seam.
- c. Click **Create**.
  - a. To create a single line of girders, click **Apply** and **Insert new**.
  - b. Pick the girder points.
  - c. To finish, click the middle mouse button.

### **Shuttering tab**

Use the **Shuttering** tab to create shuttering props, shuttering bases, and shuttering heads.

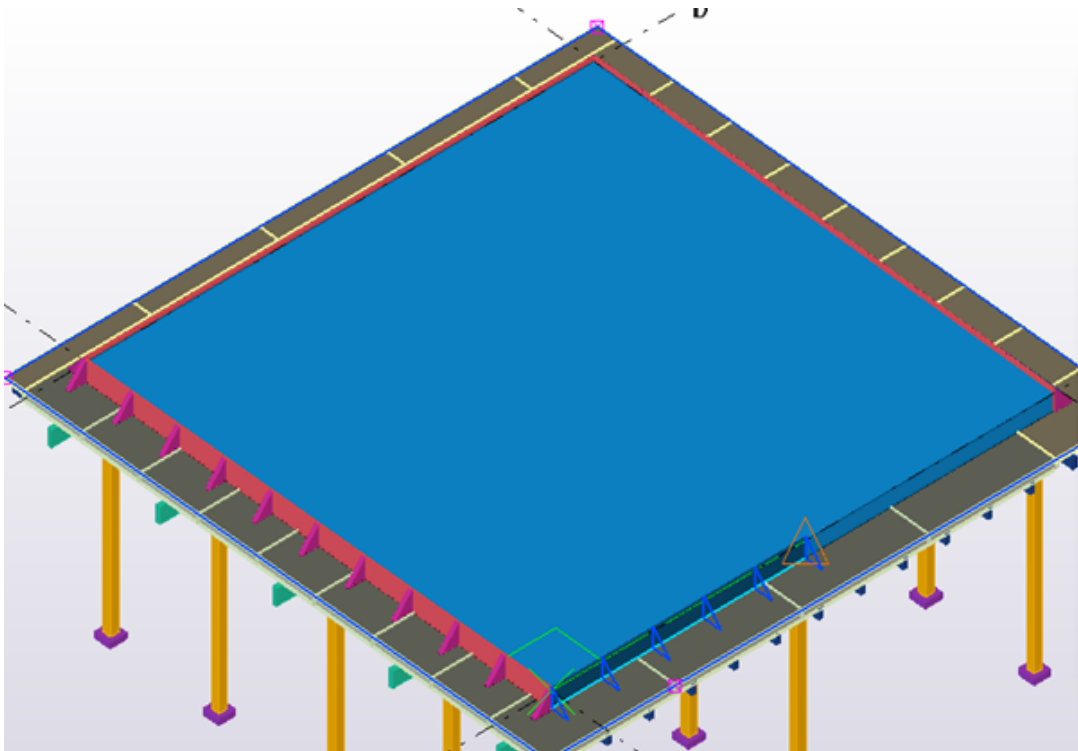
1. On the **Shuttering** tab, select the prop name in the **Girder name** list, the prop head name in the **Head name** list, and the prop base name in the **Base name** list.
2. Enter the total height for the prop.
  - To create multiple shuttering props, select the panel area and click **Apply** and **Add to selected**.  
The shuttering props are created.
  - To create a single shuttering prop, click **Apply** and **Insert new**. Pick the shuttering prop location.



### Stop ends tab

Use the **Stop ends** tab to create stop ends around the slab panel.

1. On the **Stop ends** tab, select the stop end name in the **Stop end name** list.
2. Enter the offset and spacing for the stop ends.
3. Click **Apply** and **Insert new** to start inserting the stop ends.
  - If no panel is selected, first select the slab panel.
  - If you have already selected the slab panel, you do not need to do it again.
4. Pick the start point and the end point for the stop end.
5. To finish, click the middle mouse button.

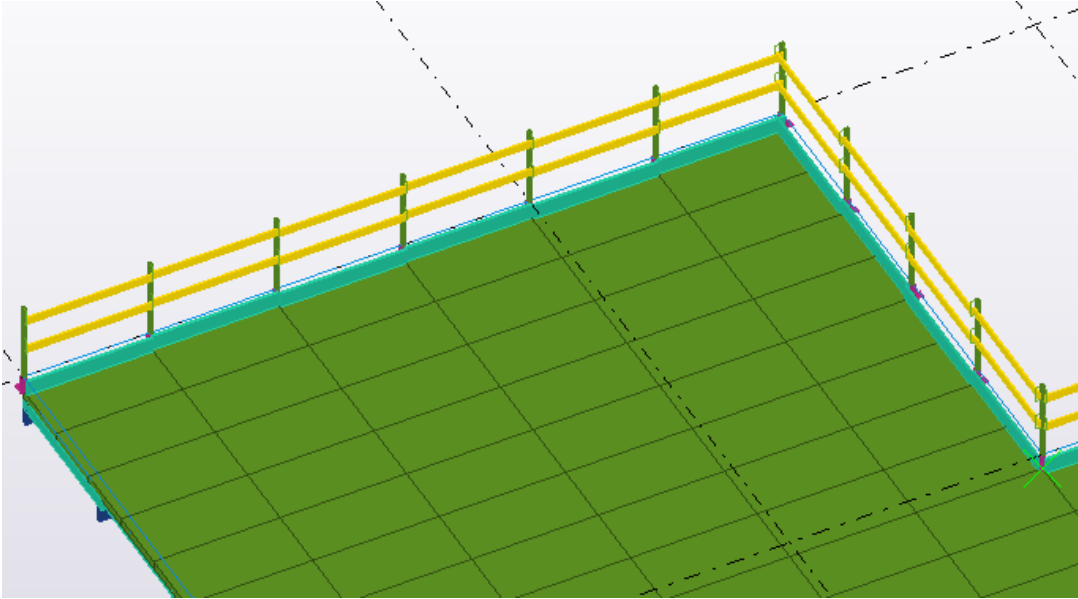


### Railings tab

Use the **Railings** tab to create railings around the slab.

1. On the **Railings** tab, select the railing name in the **Railing name** list.
2. Enter the offset and spacing for the railings.
3. Click **Apply** and **Insert new** to start inserting the railings.
4.
  - If the panel is selected, first select the slab panel.  
Depending on the railing type, you may need to select the top face of the slab, side face of the wall, or the slab panels.
  - If you have already selected the slab panel, you do not need to do it again.
5. Pick the start point and the end point for the railing.
6. To finish picking, click the middle mouse button.


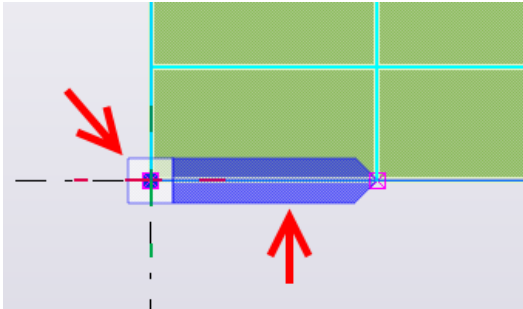





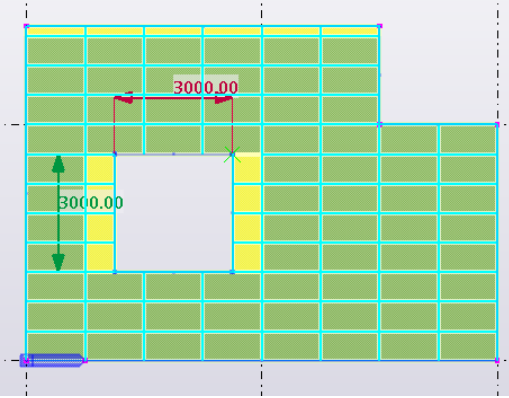


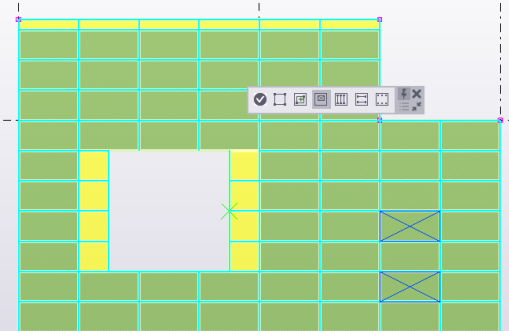





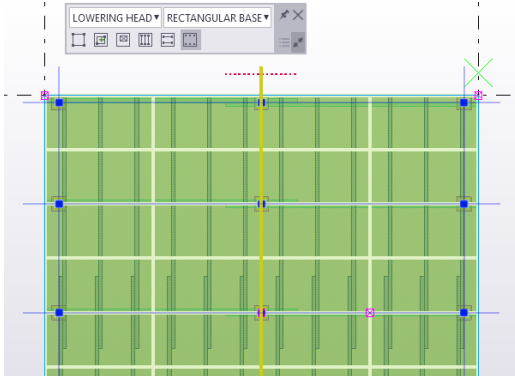
### Contextual toolbar for formwork slab panel

When you select a slab panel, the following contextual toolbar appears and you can modify the parts:



Option	Description
	<p>Modify the boundary of the panel area and openings. Move edges or points by dragging, or insert new points by dragging the insertion points at the middle of the edges.</p> <p>In addition, you can move the start point, which is the corner of the panel, and direction of the panel by dragging the handles.</p> 

Option	Description
	<p>Modify the panel width and length in the panel array.</p>
	<p>Add new rectangular openings in the panel area. After adding a rectangular opening, you can edit the opening to any shape.</p> <p>Typically, the openings are larger areas where the panels are not needed. To replace the regular panel with some special infill parts, use the single panel removal tool .</p> 
	<p>Remove or restore single panels in the area. Select the panels to be removed and click .</p> <p>Select multiple panels by holding down the <b>Shift</b> key when clicking the panels. Hold down the <b>Ctrl</b> key to unselect the panels.</p> 
	<p>Modify cross girders.</p> <p>To modify a single girder line, select the line to modify it.</p>

Option	Description
	<p>Modify main girders.</p> <p>To modify a single girder line, select the line to modify it.</p>
	<p>Modify shuttering props in the panel area.</p> <p>You can</p> <ul style="list-style-type: none"> <li>• move the individual props by dragging the handles. Hold down the <b>Ctrl</b> key to create a copy of the prop.</li> <li>• move a whole line of props by dragging the line handles. Hold down the <b>Ctrl</b> key to create a copy of all the props in the line.</li> <li>• change the shuttering prop head or base for shuttering props on all selected points and/or lines.</li> </ul> <p>Note that props created for the girder lines can only be moved/copied along the girder line.</p> 

### ***Formwork placing tools - Slabs: configuration***

You can set up your own configuration files for **Formwork placings tools - Slabs**.

The configuration is done by using comma separated files (.csv), which can be edited with Microsoft Excel or any standard text editor. Each separate formwork sub-tool component has its own configuration file.

The configuration files can be located in any of the system folders, or in the sub-folder called `Formwork tools` in the current model folder.

Example configuration files are located in the `...\ProgramData\Trimble\Tekla Structures\<version>\Environments\common\system\CIP\Formwork` folder.

The configuration files are typically named by the formwork supplier and/or the product families. There can be any number of files, and the files are identified with a specific suffix. Each of the files controls one of the sub-tools in the component. The files contain a varying number of columns.

Use the following configuration files for **Formwork placings tools - Slabs** to set up

- panels: `xxxx.FormworkTools.SlabPanels.csv`
- girders: `xxxx.FormworkTools.Girders.csv`
- prop parts of shuttering props: `xxxx.FormworkTools.Props.csv`
- prop bases of shuttering props: `xxxx.FormworkTools.PropBases.csv`
- prop heads of shuttering props: `xxxx.FormworkTools.PropHeads.csv`
- stop ends: `xxxx.FormworkTools.StopEnds.csv`
- safety railings: `xxxx.FormworkTools.Railings.csv`

#### Accessories in formwork placing tools

You can set up any formwork accessory to be created as a beam, an item, or as a custom part. For beams and items you can additionally set up any of the beam or items properties or UDAs either in the configuration file by adding new columns, or as property files.

Each configuration file contains a header row and data rows. The header row is the first row that is not a comment row, and it gives the configuration parameter names (column name). Each data row gives one product and defines the parameters used when placing the beam, item or custom part.

In addition to header row and data rows the file can contain comment rows. A comment row is any row starting with text `//`.

You can define the distance unit by adding a row:

```
DISTANCE_UNIT=MM
```

When the distance unit is defined using the above setting, all distance values can be given as decimal values in the specified units. The supported units are: MM, DN, CM, M, INCH, FEET.

The following accessories are available for different **Formwork placings tools - Slabs** product types.

Product type	Accessory
Panel	Panel
	Part

Product type	Accessory
Girder	Girder Beam
Prop	Prop
Base	Base
Head	Head
Stop end	Sheet Angle
Railing	Post Shoe ToeBoard GuardRail

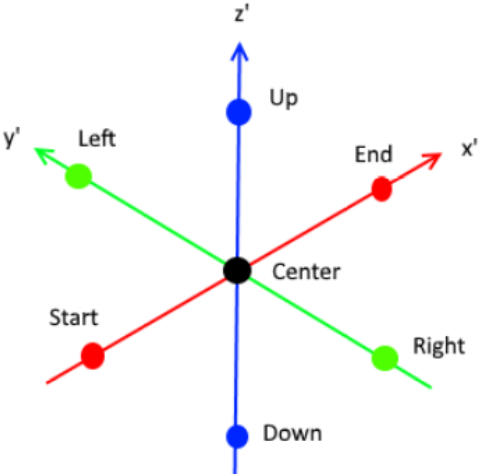
### Common configuration parameter fields

To configure the accessories in any of the formwork product types, define the following fields in the .csv configuration file.

The text [Accessory] in the following table denotes the accessory in question.

Column name in the .csv file	Description
[Accessory].Profile [Accessory].Item [Accessory].CustomPart	Formwork placing tools can place either beams, items, or custom parts to the model.  If all products are of the same model object type you can use one of the three field names and give the corresponding data value.  The field name specifies the model object default type but you can also override the model object type by adding the prefix BEAM:, ITEM: or CUSTOMPART: for the actual value.  The actual value for BEAM: is a valid profile string, for ITEM: a valid item shape name, and for CUSTOMPART: a valid custom part name.
[Accessory].Attributes	Saved property file used to set either part, item or custom part properties.
[Accessory].Name	Name of the part or the item, or the <b>Name</b> property of the custom part.

Column name in the .csv file	Description
[Accessory].Class	Class of the part or the item, or the <b>Class</b> property of the custom part.
[Accessory].Material	Material of the part or the item, or the <b>Material</b> property of the custom part.
[Accessory].AssPrefix	Part or item numbering assembly prefix, or the <b>AssPrefix</b> property of the custom part.
[Accessory].AssStartNo	Part or item assembly start number, or the <b>AssStartNo</b> property of the custom part.
[Accessory].PartPrefix	Part or item numbering part prefix, or the <b>PartPrefix</b> property of the custom part.
[Accessory].PartStartNo	Part or item part start number, or the <b>PartStartNo</b> property of the custom part.
[Accessory].Finish	Finish of the part or the item, or the <b>Finish</b> property of the custom part.
[Accessory].InputOrder	<p>Set the final locations of the input points in relation to the default generic start and end points.</p> <p>The possible values are:</p> <ul style="list-style-type: none"> <li>• <b>StartEnd</b>: default if no other value is specified.</li> <li>• <b>EndStart</b>: reverses the default start/end points.</li> <li>• <b>CenterStart</b>: the first input point is at the center of the start/end point and the second point is at the start point.</li> <li>• <b>CenterEnd</b>: the first input point is at the center of the start/end point and the second point is at the end point.</li> <li>• <b>CenterLeft</b>: the first input point is at the center of the start/end point and the second point is at the left point.</li> <li>• <b>CenterRight</b>: the first input point is at the center of the start/end point and the second point is at the right point.</li> </ul>

Column name in the .csv file	Description
	<ul style="list-style-type: none"> <li>CenterUp: the first input point is at the center of start/end point and the second point is up from the center point.</li> <li>CenterDown: the first input point is at the center of the start/end point and the second point is down from the center point.</li> </ul> <p>Note that if the .csv file does not contain any value, the default value StartEnd is used.</p> 
[Accessory].PlanePosition	<p>This is <b>Position in plane</b> when the beam, item, or custom part is inserted in the plane view.</p> <p>The options are <b>MIDDLE, LEFT, and RIGHT.</b></p>
[Accessory].PlaneOffset	<p>Offset on plane. The default value is 0.</p>
[Accessory].Rotation	<p>This is <b>Rotation</b> when the custom part is inserted in the plane view.</p> <p>The options are <b>FRONT, TOP, BACK, and BELOW.</b></p>
[Accessory].RotationOffset	<p>Rotation offset in degrees. The default value is 0.</p>

Column name in the .csv file	Description
[Accessory].DepthPosition	This is <b>Position at depth</b> when the beam, item, or custom part is inserted in the plane view.  The options are <b>MIDDLE</b> , <b>FRONT</b> , and <b>BEHIND</b> .
[Accessory].DepthOffset	Offset at depth. The default value is 0.
[Accessory].StartOffset	Offset of the actual start point from the generic start point in the local coordinate system.  Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.
[Accessory].EndOffset	Offset of the actual end point from the generic end point in the local coordinate system.  Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.
[Accessory].UDA.XXXXXX	Define additional UDA values applied to the model objects. You can introduce as many UDA values as needed.  Note that the UDA name (XXXXXX) must be the internal name, not the localized name shown in the user interface.

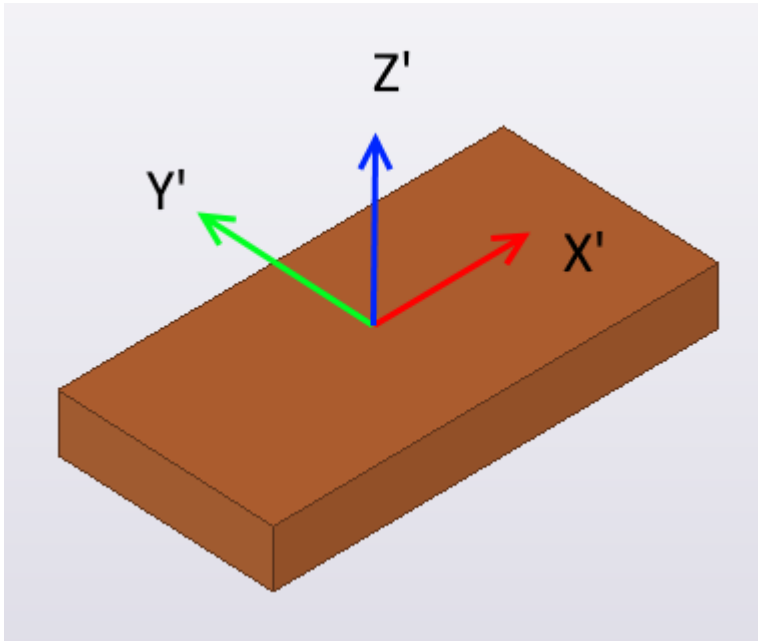
### Configure the slab panel placing tool

.FormworkTools.SlabPanels.csv

Add one row for each panel. Specify columns as follows. For a slab panel, you can specify one custom part that is placed if the panel is a full panel, and part properties used for placing a filler part at locations where the panel is not a full panel.

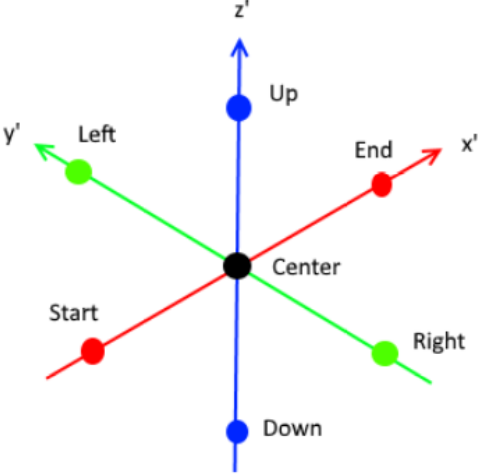
The configuration is done in the local coordinate system of the panel. The origin of the panel is located at the center point of the top of the panel.





Row	Definition
Supplier	Supplier name, this is typically the same for all rows. The name is shown in the <b>Formwork supplier</b> list.
Family	Family name, which is shown in the <b>Product family</b> list.
Name	Unique panel name, which is shown in the <b>Formwork panel</b> list.
PanelName	Name of the custom part that will be inserted in the model. This is the custom part that the panel configuration will use.
PanelAttributes	Property file saved in the component dialog box to be used when the custom part is inserted into model.
PanelInputOrder	Define the orientation of the custom part panels by specifying where the start and end handles of the custom part will go. Set the final locations of the input points in relation to the default generic start and end points. The possible values are:

Row	Definition
	<ul style="list-style-type: none"> <li>• <code>StartEnd</code>: default if no other value is specified.</li> <li>• <code>EndStart</code>: reverses the default start/end points.</li> <li>• <code>CenterStart</code>: the first input point is at the center of the start/end point and the second point is at the start point.</li> <li>• <code>CenterEnd</code>: the first input point is at the center of the start/end point and the second point is at the end point.</li> <li>• <code>CenterLeft</code>: the first input point is at the center of the start/end point and the second point is at the left point.</li> <li>• <code>CenterRight</code>: the first input point is at the center of the start/end point and the second point is at the right point.</li> <li>• <code>CenterUp</code>: the first input point is at the center of start/end point and the second point is up from the center point.</li> <li>• <code>CenterDown</code>: the first input point is at the center of the start/end point and the second point is down from the center point.</li> </ul> <p>Note that if the <code>.csv</code> file does not contain any value, the default value <code>StartEnd</code> is used.</p>

Row	Definition
	
PanelPlanePosition	<p>Use the following position values to define the custom part's position, offset and rotation in relation to the custom part start and end points.</p> <p>Use <b>Position in plane</b> to insert the custom part in the plane view.</p> <p>The options are <b>MIDDLE, LEFT</b> and <b>RIGHT</b>.</p>
PanelPlaneOffset	Offset on plane. The default value is 0.
PanelRotation	<p>Use <b>Rotation</b> to insert the custom part in the plane view.</p> <p>The options are <b>FRONT, TOP, BACK,</b> and <b>BELOW</b>.</p>
PanelRotationOffset	Rotation offset in degrees. The default value is 0.
PanelDepthPosition	<p>Use <b>Position at depth</b> to insert the custom part in the plane view.</p> <p>The options are <b>MIDDLE, FRONT,</b> and <b>BEHIND</b>.</p>
PanelDepthOffset	Offset at depth. The default value is 0.
PanelStartOffset	<p>PanelStartOffset and PanelEndOffset change the location of the actual start and end handles of the custom part.</p> <p>PanelStartOffset is the offset of the actual start point from the generic start point in the local coordinate</p>

Row	Definition
	system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.
PanelEndOffset	PanelEndOffset is the offset of the actual end point from the generic end point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.
LengthProperty	The name of the length property in the custom part. If the length is fixed, this is empty.
LengthValue	Length of the panel. Note that the length value is read from the .csv file.
WidthProperty	The name of the width property in the custom part. If the width is fixed, this is empty.
WidthValue	Width of the panel. Note that the width value is read from the .csv file.
ThicknessProperty	The name of the thickness property in the custom part. If the thickness is fixed, this is empty.
ThicknessValue	Thickness of the panel. Note that the thickness value is read from the .csv file.
CrossGirderX	The girder values control the default spacing of the girders visible in the <b>Add shoring</b> dialog box. The values in the .csv file are taken from the center of the panel.  CrossGirderX specifies the default x locations of the cross girders. Values must be enclosed in parentheses () and separated by spaces.
MainGirderY	MainGirderY specifies the default y locations of the main girders. Values

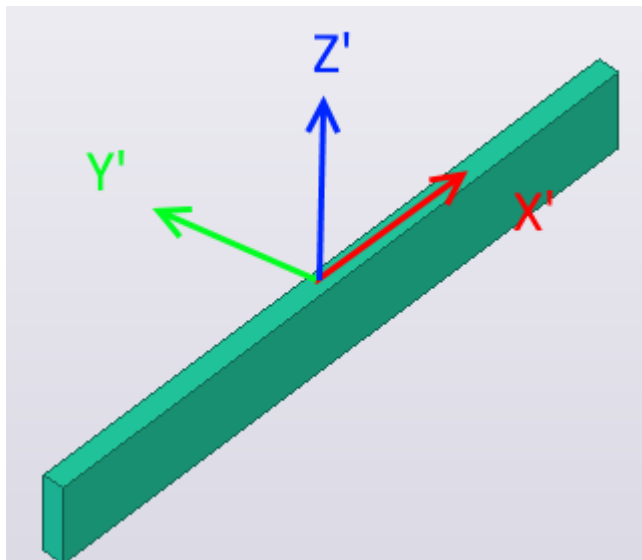
Row	Definition
	must be enclosed in parentheses () and separated by spaces.
PartName	The following part properties refer to the properties of the defined filler parts used when the custom parts cannot fill the whole slab area.  Name of the panel part (contour plate).
PartClass	Class of the part.
PartFinish	Finish of the part.
PartMaterial	Material of the part.
PartThickness	Thickness of the part.
PartAssPrefix	Assembly prefix.
PartAssStartNo	Assembly start number.
PartPartPrefix	Part prefix.
PartPartStartNo	Part start number.

### Configure the girder line tool

.xxxx.FormworkTools.Girders.csv

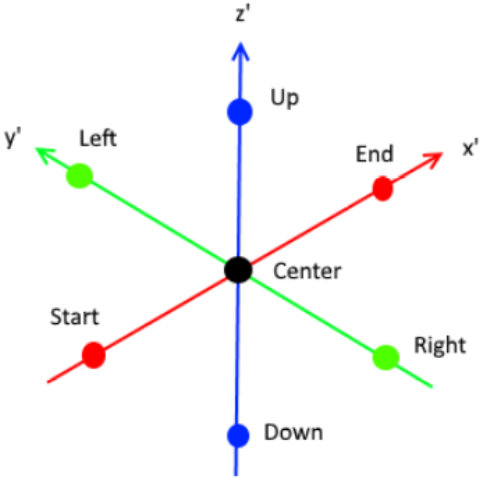
For a girder, you can specify either a custom part or a beam which is placed in the model.

The position settings are given in the local coordinate system of the girder.



Row	Definition
Supplier	Supplier name, which is typically the same for all rows. The name is shown in the <b>Formwork supplier</b> list.
Family	Family name, which is shown in the <b>Product family</b> list.
Name	Girder name, which is shown in the <b>Girder name</b> list. This name can be unique, or you can specify two or more girders with the same name. If one girder name has two or more specifications, the placing tool may create a line containing girders with variable lengths.
Type	The type of the girder. The type defines the list in which the girder is shown. The options are: CROSS, MAIN and ANY.
Length	Length (x) of the girder. Note that the length value is read from the .csv file.
Width	Width (y) of the girder. Note that the value is read from the .csv file.
Depth	Depth (z) of the girder. Note that the depth value is read from the .csv file.
MinLength	If the length varies, this is the minimum length of the girder.
MaxLength	If the length varies, this is the maximum length of the girder.
MinOverlap	When two or more girders are placed in one girder line, the girders can overlap to achieve the exact start and end for the line. The MinOverlap value controls the minimum overlap.
MaxOverlap	When two or more girders are placed in one girder line, the girders can overlap to achieve the exact start and end for the line. The MaxOverlap value controls the maximum overlap.

Row	Definition
	If the girders should not overlap, enter 0 as the value.
InputPointLocation	<p>The depth location of girder input points. The options are:</p> <ul style="list-style-type: none"> <li>• CrossGirderBottom (only for main girders)</li> <li>• SlabBottom</li> <li>• SlabTop</li> </ul>
GirderName	<p>Name of the custom part that will be inserted in the model.</p> <p>This is the custom part that the girder configuration will use.</p>
GirderAttributes	Property file saved in the component dialog box to be used when the custom part is inserted into model.
GirderInputOrder	<p>Define the orientation of the custom part girders by specifying where the start and end handles of the custom part will go.</p> <p>Set the final locations of the input points in relation to the default generic start and end points.</p> <p>The possible values are:</p> <ul style="list-style-type: none"> <li>• StartEnd: default if no other value is specified.</li> <li>• EndStart: reverses the default start/end points.</li> <li>• CenterStart: the first input point is at the center of the start/end point and the second point is at the start point.</li> <li>• CenterEnd: the first input point is at the center of the start/end point and the second point is at the end point.</li> <li>• CenterLeft: the first input point is at the center of the start/end point and the second point is at the left point.</li> <li>• CenterRight: the first input point is at the center of the start/end</li> </ul>

Row	Definition
	<p>point and the second point is at the right point.</p> <ul style="list-style-type: none"> <li>• <code>CenterUp</code>: the first input point is at the center of start/end point and the second point is up from the center point.</li> <li>• <code>CenterDown</code>: the first input point is at the center of the start/end point and the second point is down from the center point.</li> </ul> <p>Note that if the <code>.csv</code> file does not contain any value, the default value <code>StartEnd</code> is used.</p> 
GirderPlanePosition	<p>Use the following position values to define the custom part's position, offset and rotation in relation to the custom part start and end points.</p> <p>Use <b>Position in plane</b> to insert the custom part in the plane view.</p> <p>The options are <b>MIDDLE, LEFT, and RIGHT</b>.</p>
GirderPlaneOffset	<p>Offset on plane. The default value is 0.</p>
GirderRotation	<p>Use <b>Rotation</b> to insert the custom part in the plane view.</p> <p>The options are <b>FRONT, TOP, BACK, and BELOW</b>.</p>



<b>Row</b>	<b>Definition</b>
GirderRotationOffset	Rotation offset in degrees. The default value is 0.
GirderDepthPosition	Use <b>Position at depth</b> to insert the custom part in the plane view.  The options are <b>MIDDLE, FRONT, and BEHIND</b> .
GirderDepthOffset	Offset at depth. The default value is 0.
GirderStartOffset	GirderStartOffset and GirderEndOffset change the location of the actual start and end handle points of the custom part.  GirderStartOffset is the offset of the actual start point from the generic start point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.
GirderEndOffset	GirderEndOffset is the offset of the actual end point from the generic end point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.
GirderLengthProperty	The name of the length property in the custom part. If the length is fixed, this is empty.
GirderWidthProperty	The name of the width property in the custom part. If the width is fixed, this is empty.
GirderDepthProperty	The name of the depth property in the custom part. If the width is fixed, this is empty.
BeamName	Name of the girder part (beam).
BeamProfile	Profile of the beam. If this is empty, the beam is not created.
BeamClass	Class of the girder part.
BeamFinish	Finish of the girder part.
BeamMaterial	Material of the girder part.

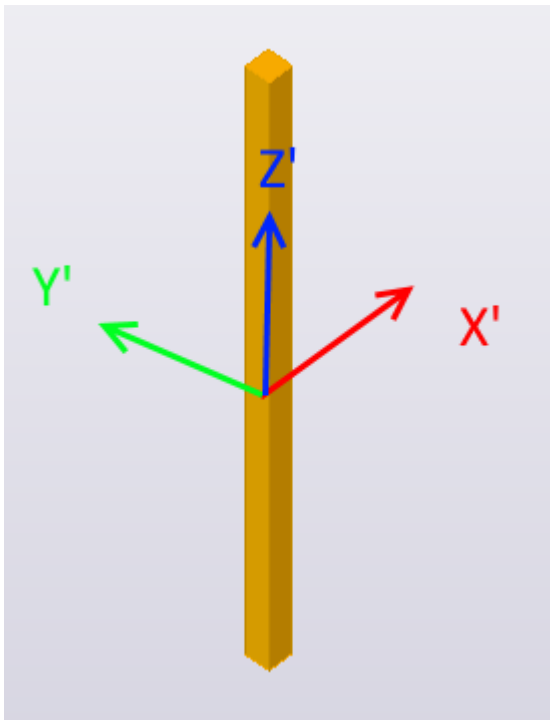
Row	Definition
BeamThickness	Thickness of the girder part.
BeamAssPrefix	Assembly prefix.
BeamAssStartNo	Assembly start number.
BeamPartPrefix	Part prefix.
BeamPartStartNo	Part start number.

### Configure the shuttering prop placing tool

`xxxx.FormworkTools.Props.csv`

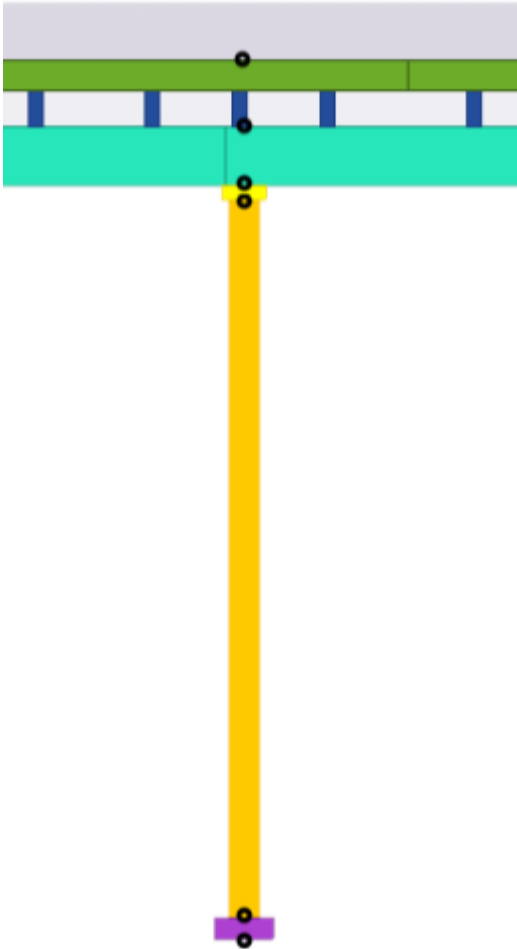
For a prop, you can specify a custom part that is placed in the model. In addition, a shuttering prop may contain the base and head parts, but these are configured in separate files (`xxxx.FormworkTools.PropBases.csv` and `xxxx.FormworkTools.PropHeads.csv`).

The position settings are given in the local coordinate system of the prop.

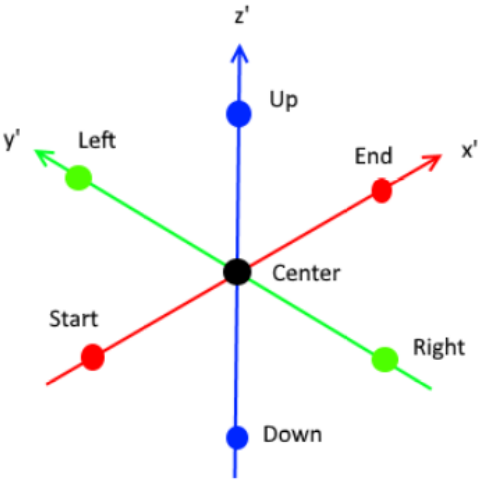


Row	Definition
Supplier	Supplier name, which is typically the same for all rows. The name is shown in the <b>Formwork supplier</b> list.
Family	Family name, which is shown in the <b>Product family</b> list.

Row	Definition
Name	Prop name, which is shown in the <b>Prop name</b> list. This name can be unique, or you can specify two or more props with the same name. If one prop name has two or more specifications, the placing tool can select the suitable prop based on the effective height of the shuttering.
MinHeight	The height of the prop from the bottom of the base prop to the bottom of the concrete slab.  If the length varies, this is the minimum length. For a prop with fixed height the MinHeight and MaxHeight are same.
MaxHeight	If the length varies, this is the maximum length.
PropInputPoint	The location of the first input point of the custom part. The options are: <ul style="list-style-type: none"> <li>• BaseBottom</li> <li>• BaseTop</li> <li>• HeadBottom</li> <li>• GirderBottom</li> <li>• GirderTop</li> <li>• SlabBottom</li> </ul>

Row	Definition
	
PropInputPoint2	<p>The location of the second input point of the custom part.</p> <p>If you use value <code>None</code>, the second input point is calculated as an offset <code>PropEndOffset</code> from the first input point.</p>
PropHeightProperty	<p>The name of the prop height property in the custom part. This is empty if the height is not parametric.</p>
PropName	<p>The name of the custom part that will be inserted in the model.</p> <p>This is the custom part that the prop configuration will use.</p>
PropAttributes	<p>Property file saved in the component dialog box to be used when the custom part is inserted into model.</p>

Row	Definition
PropInputOrder	<p>Define the orientation of the custom part prop by specifying where the start and end handles of the custom part will go.</p> <p>Set the final locations of the input points in relation to the default generic start and end points.</p> <p>The possible values are:</p> <ul style="list-style-type: none"> <li>• <code>StartEnd</code>: default if no other value is specified.</li> <li>• <code>EndStart</code>: reverses the default start/end points.</li> <li>• <code>CenterStart</code>: the first input point is at the center of the start/end point and the second point is at the start point.</li> <li>• <code>CenterEnd</code>: the first input point is at the center of the start/end point and the second point is at the end point.</li> <li>• <code>CenterLeft</code>: the first input point is at the center of the start/end point and the second point is at the left point.</li> <li>• <code>CenterRight</code>: the first input point is at the center of the start/end point and the second point is at the right point.</li> <li>• <code>CenterUp</code>: the first input point is at the center of start/end point and the second point is up from the center point.</li> <li>• <code>CenterDown</code>: the first input point is at the center of the start/end point and the second point is down from the center point.</li> </ul> <p>Note that if the <code>.csv</code> file does not contain any value, the default value <code>StartEnd</code> is used.</p>

Row	Definition
	
PropPlanePosition	<p>Use the following position values to define the custom part's position, offset and rotation in relation to the custom part start and end points.</p> <p>Use <b>Position in plane</b> to insert the custom part in the plane view.</p> <p>The options are <b>MIDDLE, LEFT</b>, and <b>RIGHT</b>.</p>
PropPlaneOffset	<p>Offset on plane. The default value is 0.</p>
PropRotation	<p>Use <b>Rotation</b> to insert the custom part in the plane view.</p> <p>The options are <b>FRONT, TOP, BACK</b>, and <b>BELOW</b>.</p>
PropRotationOffset	<p>Rotation offset in degrees. The default value is 0.</p>
PropDepthPosition	<p>Use <b>Position at depth</b> to insert the custom part in the plane view.</p> <p>The options are <b>MIDDLE, FRONT</b>, and <b>BEHIND</b>.</p>
PropDepthOffset	<p>Offset at depth. The default value is 0.</p>
PropStartOffset	<p>PropStartOffset and PropEndOffset change the location of the actual start and end handle points of the custom part.</p> <p>PropStartOffset is the offset of the actual start point from the generic start point in the local coordinate</p>

Row	Definition
	system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.
PropEndOffset	<p>PanelEndOffset is the offset of the actual end point from the generic end point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.</p> <p>If the PropEndOffset value is not given, or the value None is used, PropEndOffset is an offset from the first input point to the second input point.</p>

### Configure the base parts of the shuttering prop placing tool

`xxxx.FormworkTools.PropBases.csv`

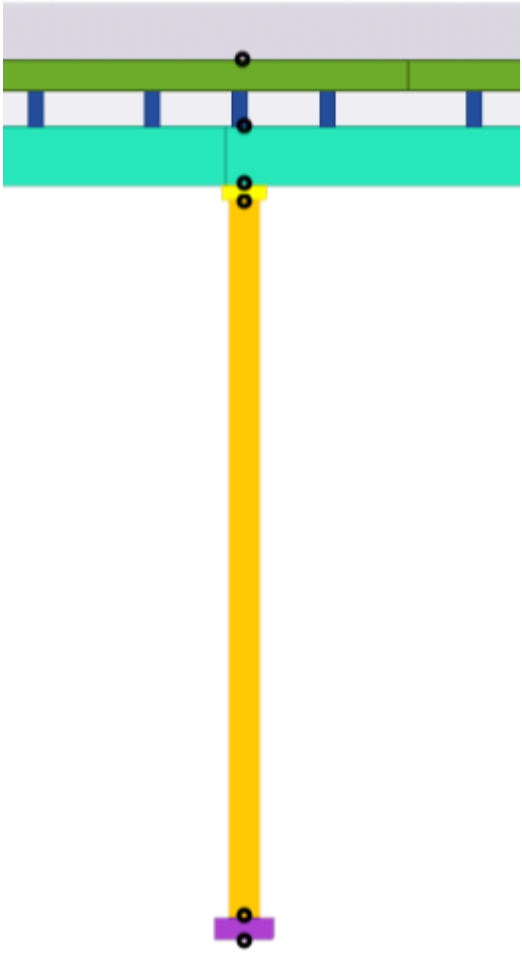
For a shuttering prop, you can specify an additional custom part that is placed in the model at the bottom end of the prop.

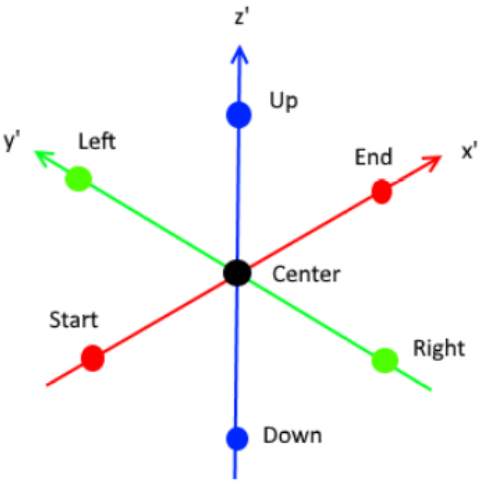
The position settings are given in the local coordinate system of the prop.

Row	Definition
Supplier	<p>Supplier name, which is typically the same for all rows.</p> <p>The name is shown in the <b>Formwork supplier</b> list.</p>
Family	<p>Family name, which is shown in the <b>Product family</b> list.</p>
Name	<p>Unique prop base name, which is shown in the <b>Base name</b> list.</p>
PropInputPoint	<p>The location of the first input point of the custom part. The options are:</p> <ul style="list-style-type: none"> <li>• BaseBottom</li> <li>• BaseTop</li> <li>• HeadBottom</li> <li>• GirderBottom</li> <li>• GirderTop</li> </ul>

Row	Definition
	<ul style="list-style-type: none"> <li>• SlabBottom</li> </ul>
PropOffset	Automatic offset (shortening) of the prop if the base part is created.
BaseName	Name of the custom part that will be inserted in the model.
BaseAttributes	Property file saved in the component dialog box to be used when the custom part is inserted into model.
BaseInputPoint	<p>The location of the first input point of the custom part. The options are:</p> <ul style="list-style-type: none"> <li>• BaseBottom</li> <li>• BaseTop</li> <li>• HeadBottom</li> <li>• GirderBottom</li> <li>• GirderTop</li> <li>• SlabBottom</li> </ul> <p>The second input point of the custom part is calculated as an offset <code>BaseEndOffset</code> from the first input point.</p>



Row	Definition
	
PropInputOrder	<p>Set the final locations of the input points in relation to the default generic start and end points.</p> <p>The possible values are:</p> <ul style="list-style-type: none"> <li>• <code>StartEnd</code>: default if no other value is specified.</li> <li>• <code>EndStart</code>: reverses the default start/end points.</li> <li>• <code>CenterStart</code>: the first input point is at the center of the start/end point and the second point is at the start point.</li> <li>• <code>CenterEnd</code>: the first input point is at the center of the start/end point and the second point is at the end point.</li> </ul>

Row	Definition
	<ul style="list-style-type: none"> <li>• <code>CenterLeft</code>: the first input point is at the center of the start/end point and the second point is at the left point.</li> <li>• <code>CenterRight</code>: the first input point is at the center of the start/end point and the second point is at the right point.</li> <li>• <code>CenterUp</code>: the first input point is at the center of start/end point and the second point is up from the center point.</li> <li>• <code>CenterDown</code>: the first input point is at the center of the start/end point and the second point is down from the center point.</li> </ul> <p>Note that if the <code>.csv</code> file does not contain any value, the default value <code>StartEnd</code> is used.</p> 
BasePlanePosition	<p>Use the following position values to define the custom part's position, offset and rotation in relation to the custom part start and end points.</p> <p>Use <b>Position in plane</b> to insert the custom part in the plane view.</p> <p>The options are <b>MIDDLE, LEFT, and RIGHT</b>.</p>
BasePlaneOffset	Offset on plane. The default value is 0.

Row	Definition
BaseRotation	Use <b>Rotation</b> to insert the custom part in the plane view. The options are <b>FRONT, TOP, BACK,</b> and <b>BELOW</b> .
BaseRotationOffset	Rotation offset in degrees. The default value is 0.
BaseDepthPosition	Use <b>Position at depth</b> to insert the custom part in the plane view. The options are <b>MIDDLE, FRONT,</b> and <b>BEHIND</b> .
BaseDepthOffset	Offset at depth. The default value is 0.
BaseStartOffset	BaseStartOffset is the offset of the actual start point from the generic start point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.
BaseEndOffset	BaseEndOffset specifies the location of the second input point of the custom part in relation to the first input point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, zero offset (100 0 0) is used.

### Configure the head parts of the shuttering prop placing tool

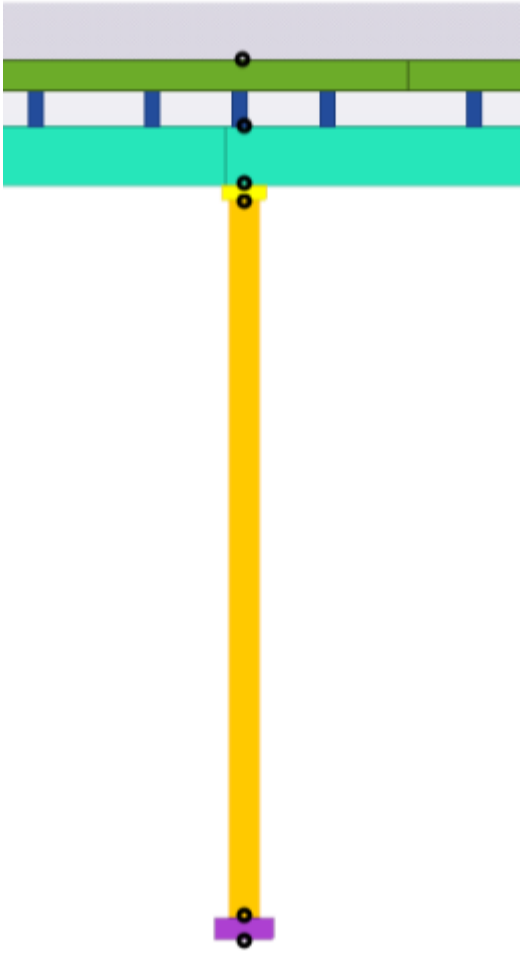
xxxx.FormworkTools.PropHeads.csv

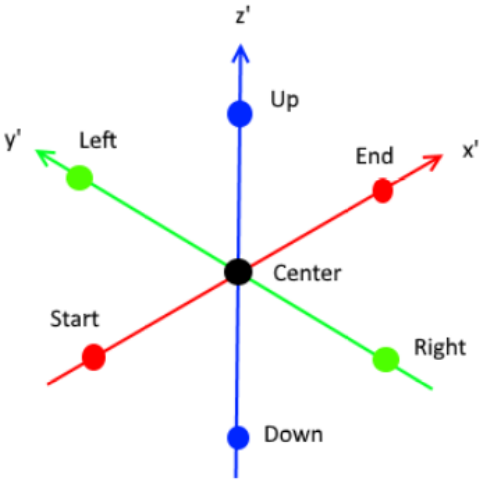
For a shuttering prop, you can specify an additional custom part that is placed in the model at the top end of the prop.

The position settings are given in the local coordinate system of the prop.

Row	Definition
Supplier	Supplier name, which is typically the same for all rows. The name is shown in the <b>Formwork supplier</b> list.
Family	Family name, which is shown in the <b>Product family</b> list.

Row	Definition
Name	Unique prop head name, which is shown in the <b>Head name</b> list.
PropOffset	Automatic offset (shortening) of the prop if the head part is created.
AutoRotate	<p>Control whether the head part is rotated automatically 90 degrees around the prop axis when the head is located at the overlap of two girders.</p> <p>Set this value to YES to get the head rotated 90 degrees. Note that this only controls the rotation when you have not given any specific value for the rotation in the dialog box.</p>
HeadName	Name of the custom part that will be inserted in the model.
HeadAttributes	Property file saved in the component dialog box to be used when the custom part is inserted into model.
HeadInputPoint	<p>The location of the first input point of the custom part. The options are:</p> <ul style="list-style-type: none"> <li>• HeadBottom</li> <li>• HeadTop</li> <li>• HeadBottom</li> <li>• GirderBottom</li> <li>• GirderTop</li> <li>• SlabBottom</li> </ul> <p>The second input point of the custom part is calculated as an offset <code>HeadEndOffset</code> from the first input point.</p>

Row	Definition
	
HeadInputOrder	<p>Set the final locations of the input points in relation to the default generic start and end points.</p> <p>The possible values are:</p> <ul style="list-style-type: none"> <li>• <code>StartEnd</code>: default if no other value is specified.</li> <li>• <code>EndStart</code>: reverses the default start/end points.</li> <li>• <code>CenterStart</code>: the first input point is at the center of the start/end point and the second point is at the start point.</li> <li>• <code>CenterEnd</code>: the first input point is at the center of the start/end point and the second point is at the end point.</li> </ul>

Row	Definition
	<ul style="list-style-type: none"> <li>• <code>CenterLeft</code>: the first input point is at the center of the start/end point and the second point is at the left point.</li> <li>• <code>CenterRight</code>: the first input point is at the center of the start/end point and the second point is at the right point.</li> <li>• <code>CenterUp</code>: the first input point is at the center of start/end point and the second point is up from the center point.</li> <li>• <code>CenterDown</code>: the first input point is at the center of the start/end point and the second point is down from the center point.</li> </ul> <p>Note that if the <code>.csv</code> file does not contain any value, the default value <code>StartEnd</code> is used.</p> 
HeadPlanePosition	<p>Use the following position values to define the custom part's position, offset and rotation in relation to the custom part start and end points.</p> <p>Use <b>Position in plane</b> to insert the custom part in the plane view.</p> <p>The options are <b>MIDDLE, LEFT, and RIGHT</b>.</p>
HeadPlaneOffset	Offset on plane. The default value is 0.

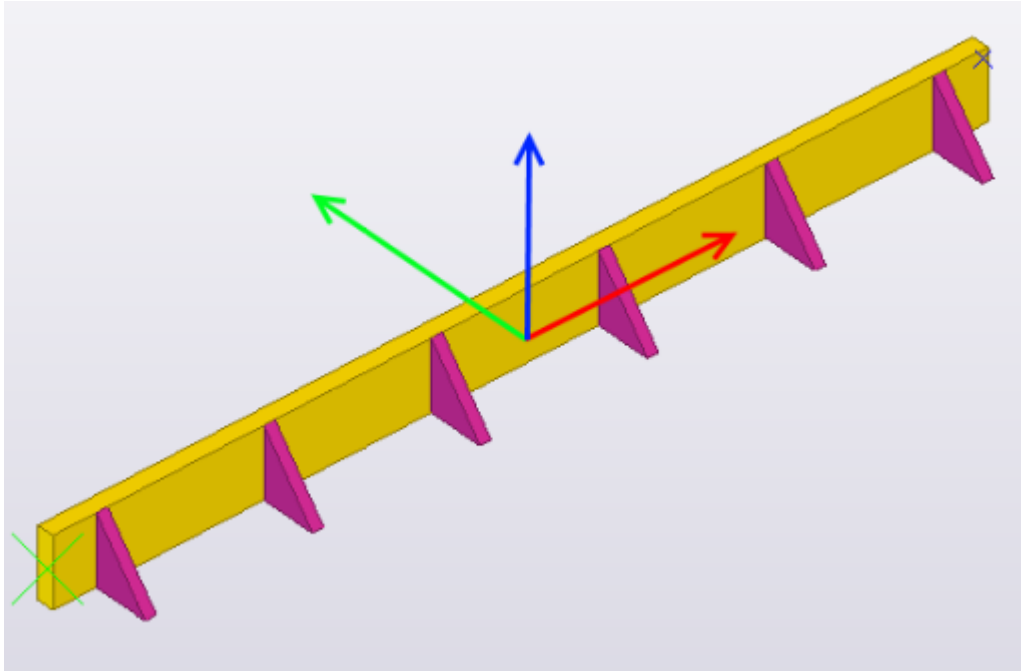
Row	Definition
HeadRotation	Use <b>Rotation</b> to insert the custom part in the plane view. The options are <b>FRONT, TOP, BACK,</b> and <b>BELOW</b> .
HeadRotationOffset	Rotation offset in degrees. The default value is 0.
HeadDepthPosition	Use <b>Position at depth</b> to insert the custom part in the plane view. The options are <b>MIDDLE, FRONT,</b> and <b>BEHIND</b> .
HeadDepthOffset	Offset at depth. The default value is 0.
HeadStartOffset	HeadStartOffset is the offset of the actual start point from the generic start point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.
HeadEndOffset	HeadEndOffset specifies the location of the second input point of the custom part in relation to the first input point in the local coordinate system. The offset is given as x, y and z values separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, zero offset (100 0 0) is used.

### Configure the stop end custom parts for the stop end placing tool

`xxxx.FormworkTools.StopEnds.csv`

For a stop end, you can specify two custom parts: a sheet and an angle. The sheet is typically the actual form piece, and the angles are placed with a spacing to support the sheet.

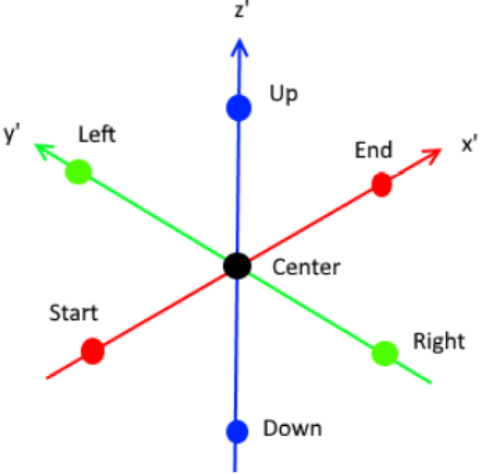
The position settings are given in the local coordinate system of the stop end.



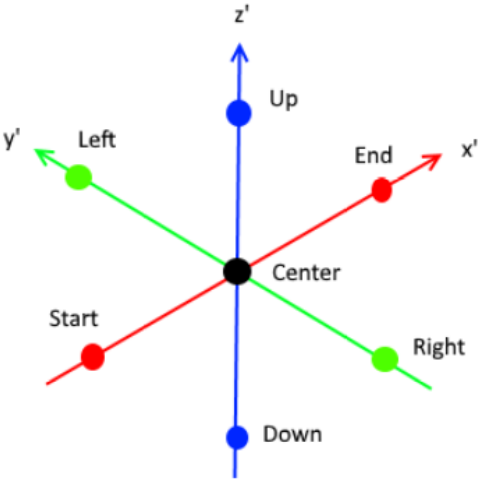
Row	Definition
Supplier	Supplier name, this is typically the same for all rows. The name is shown in the <b>Formwork supplier</b> list.
Family	Family name, which is shown in the <b>Product family</b> list.
Name	Unique stop end name, which is shown in the <b>Stop end name</b> list.
MinLength	Minimum length of the stop end sheet part.
MaxLength	Maximum length of the stop end sheet part.
Width	Total width of the stop end including the angles.
Depth	Total depth of the stop end.
AngleSpacing	Default spacing of the angle parts. This will be used if you do not specify any value for the spacing.
SheetName	Name of the custom part that will be inserted in the model.
SheetAttributes	Property file saved in the component dialog box to be used when the custom part is inserted into model.



Row	Definition
SheetInputOrder	<p>Set the final locations of the input points in relation to the default generic start and end points.</p> <p>The possible values are:</p> <ul style="list-style-type: none"> <li>• <code>StartEnd</code>: default if no other value is specified.</li> <li>• <code>EndStart</code>: reverses the default start/end points.</li> <li>• <code>CenterStart</code>: the first input point is at the center of the start/end point and the second point is at the start point.</li> <li>• <code>CenterEnd</code>: the first input point is at the center of the start/end point and the second point is at the end point.</li> <li>• <code>CenterLeft</code>: the first input point is at the center of the start/end point and the second point is at the left point.</li> <li>• <code>CenterRight</code>: the first input point is at the center of the start/end point and the second point is at the right point.</li> <li>• <code>CenterUp</code>: the first input point is at the center of start/end point and the second point is up from the center point.</li> <li>• <code>CenterDown</code>: the first input point is at the center of the start/end point and the second point is down from the center point.</li> </ul> <p>Note that if the <code>.csv</code> file does not contain any value, the default value <code>StartEnd</code> is used.</p>

Row	Definition
	
SheetPlanePosition	<p>Use the following position values to define the custom part's position, offset and rotation in relation to the custom part start and end points.</p> <p>Use <b>Position in plane</b> to insert the custom part in the plane view.</p> <p>The options are <b>MIDDLE, LEFT</b>, and <b>RIGHT</b>.</p>
SheetPlaneOffset	<p>Offset on plane. The default value is 0.</p>
SheetRotation	<p>Use <b>Rotation</b> to insert the custom part in the plane view.</p> <p>The options are <b>FRONT, TOP, BACK</b>, and <b>BELOW</b>.</p>
SheetRotationOffset	<p>Rotation offset in degrees. The default value is 0.</p>
SheetDepthPosition	<p>Use <b>Position at depth</b> to insert the custom part in the plane view.</p> <p>The options are <b>MIDDLE, FRONT</b>, and <b>BEHIND</b>.</p>
SheetDepthOffset	<p>Offset at depth. The default value is 0.</p>
SheetStartOffset	<p>SheetStartOffset is the offset of the actual start point from the generic start point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.</p>

Row	Definition
SheetEndOffset	SheetEndOffset specifies the location of the second input point of the custom part in relation to the first input point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, zero offset (100 0 0) is used.
AngleName	Name of the custom part that will be inserted in the model.
AngleInputOrder	<p>Set the final locations of the input points in relation to the default generic start and end points.</p> <p>The possible values are:</p> <ul style="list-style-type: none"> <li>• StartEnd: default if no other value is specified.</li> <li>• EndStart: reverses the default start/end points.</li> <li>• CenterStart: the first input point is at the center of the start/end point and the second point is at the start point.</li> <li>• CenterEnd: the first input point is at the center of the start/end point and the second point is at the end point.</li> <li>• CenterLeft: the first input point is at the center of the start/end point and the second point is at the left point.</li> <li>• CenterRight: the first input point is at the center of the start/end point and the second point is at the right point.</li> <li>• CenterUp: the first input point is at the center of start/end point and the second point is up from the center point.</li> <li>• CenterDown: the first input point is at the center of the start/end</li> </ul>

Row	Definition
	<p>point and the second point is down from the center point.</p> <p>Note that if the .csv file does not contain any value, the default value StartEnd is used.</p> 
AnglePlanePosition	<p>Use the following position values to define the custom part's position, offset and rotation in relation to the custom part start and end points.</p> <p>Use <b>Position in plane</b> to insert the custom part in the plane view.</p> <p>The options are <b>MIDDLE, LEFT, and RIGHT.</b></p>
AnglePlaneOffset	<p>Offset on plane. The default value is 0.</p>
AngleRotation	<p>Use <b>Rotation</b> to insert the custom part in the plane view.</p> <p>The options are <b>FRONT, TOP, BACK, and BELOW.</b></p>
AngleRotationOffset	<p>Rotation offset in degrees. The default value is 0.</p>
AngleDepthPosition	<p>Use <b>Position at depth</b> to insert the custom part in the plane view.</p> <p>The options are <b>MIDDLE, FRONT, and BEHIND.</b></p>
AngleDepthOffset	<p>Offset at depth. The default value is 0.</p>
AngleStartOffset	<p>AngleStartOffset is the offset of the actual start point from the generic</p>

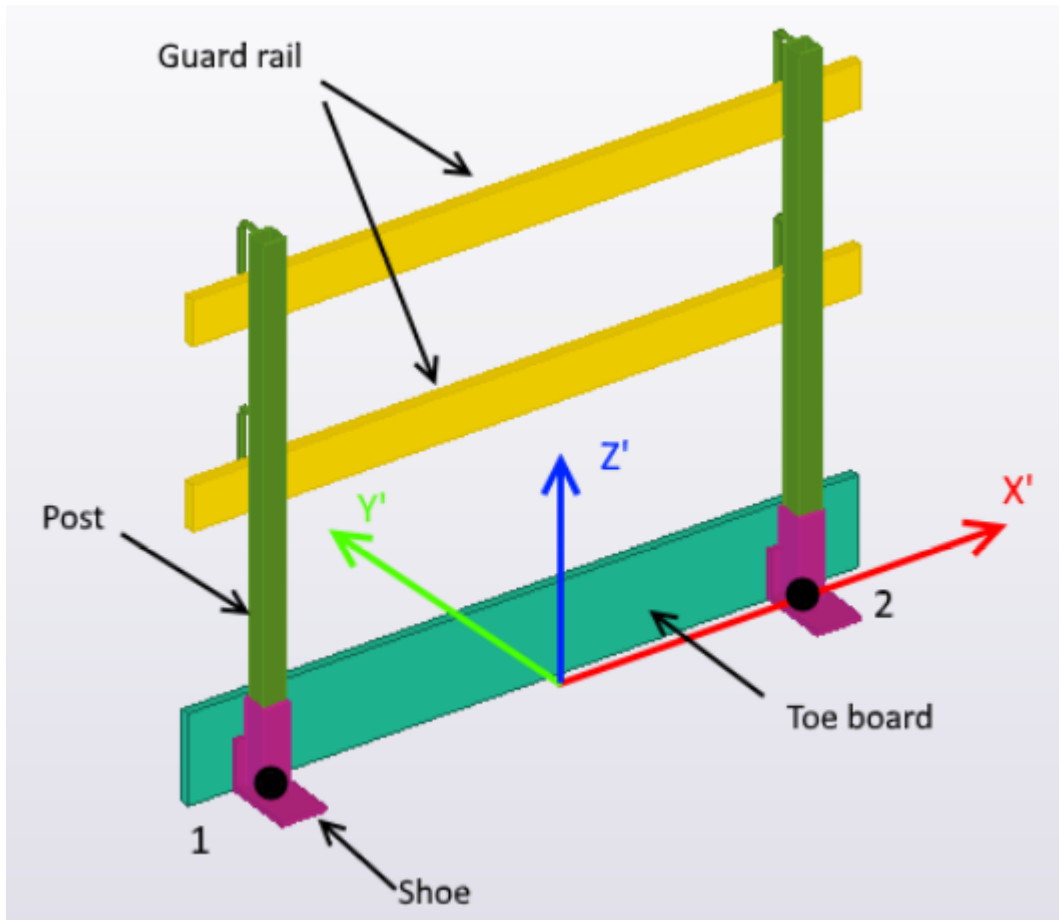
Row	Definition
	start point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.
AngleEndOffset	<p>This offset specifies the location of the second input point (of the custom part) in relation to the first input point in the local coordinate system. The offset is given as x, y and z values separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, zero offset (100 0 0) is used.</p> <p>AngleEndOffset specifies the location of the second input point of the custom part in relation to the first input point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, zero offset (100 0 0) is used.</p>

### Configure the railing custom parts for the railing placing tool

`xxxx.FormworkTools.Railings.csv`

For a railing, you can specify four custom parts. The post and the shoe parts are placed along the input line with the defined start distance and spacing. The toe board and one or more guard rail parts are placed between two posts. If the toe board and/or the guard rail part is long enough compared to the post spacing, they can span over three or more posts.

The position settings are given in the local coordinate system of the railing.



Row	Definition
Supplier	Supplier name, this is typically the same for all rows. The name is shown in the <b>Formwork supplier</b> list.
Family	Family name, which is shown in the <b>Product family</b> list.
Name	Railing type name, which is shown in the <b>Railing name</b> list. You can specify multiple railings with the same name when you have two or more alternatives with different lengths for the toe board and/or guard rail. When you have alternative lengths for the toe board and/or guard rail, the placing tool selects the part automatically based on the post spacing.

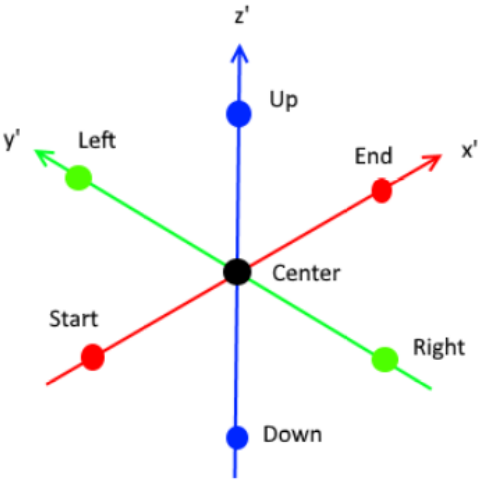
Row	Definition
MasterInput	<p>The location of the first input point when placing the railing. The options are:</p> <ul style="list-style-type: none"> <li>• PanelTop: the first input is the slab panel component, and the railing is fitted on top of the panels.</li> <li>• SlabTop: the first input is the slab or pour top face.</li> <li>• SlabEdge: the first input is the slab or pour top face, and the railing location is the nearest edge.</li> <li>• WallSide: the first input is the wall side face. The railing is fitted on the wall side face.</li> </ul> <p>Note that if the .csv file does not contain any value, the default value PanelTop is used.</p>
MainOffset	<p>The common offset of all parts (post, shoe, and so on). The offset is a vector with components x, y, z given in the local coordinate system of the railing.</p>
PostSpacing	<p>Default spacing of the posts if no spacing is specified.</p>
PostSpacing	<p>Height of the post.</p>
ToeBoardOverlap	<p>Minimum overlap of toe boards.</p>
ToeBoardOverlapOffset	<p>Offset (x, y, z) of the toe boards when they are overlapping.</p>
GuardOverlap	<p>Minimum overlap of guard rails.</p>
GuardOverlapOffset	<p>Offset (x, y, z) of the guard rails when they are overlapping.</p>
GuardPositions	<p>The railing can include one or more rows of guard rails. This setting specifies the height (z) positions of the guard rail parts measured from the input line. Multiple values must be separated by a space or a colon, and enclosed in parentheses (450 650 850).</p>
PostName	<p>Name of the custom part that will be inserted in the model.</p>

Row	Definition
PostAttributes	Property file saved in the component dialog box to be used when the custom part is inserted in the model.
PostPlanePosition	<p>Use the following position values to define the custom part's position, offset and rotation in relation to the custom part start and end points.</p> <p>Use <b>Position in plane</b> to insert the custom part in the plane view.</p> <p>The options are <b>MIDDLE, LEFT, and RIGHT.</b></p>
PostPlaneOffset	Offset on plane. The default value is 0.
PostRotation	<p>Use <b>Rotation</b> to insert the custom part in the plane view.</p> <p>The options are <b>FRONT, TOP, BACK, and BELOW.</b></p>
PostRotationOffset	Rotation offset in degrees. The default value is 0.
PostDepthPosition	<p>Use <b>Position at depth</b> to insert the custom part in the plane view.</p> <p>The options are <b>MIDDLE, FRONT, and BEHIND.</b></p>
PostDepthOffset	Offset at depth. The default value is 0.
PostStartOffset	<i>PostStartOffset</i> is the offset of the actual start point from the generic start point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.
PostEndOffset	<i>PostEndOffset</i> specifies the location of the second input point of the custom part in relation to the first input point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, zero offset (100 0 0) is used.
ShoeName	Name of the custom part that will be inserted in the model.

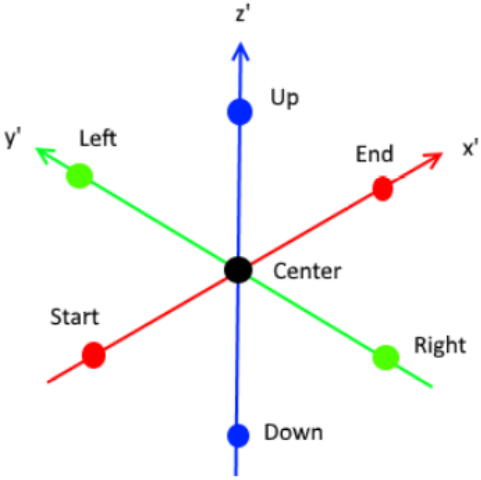


Row	Definition
ShoeAttributes	Property file saved in the component dialog box to be used when the custom part is inserted in the model.
ShoePlanePosition	<p>Use the following position values to define the custom part's position, offset and rotation in relation to the custom part start and end points.</p> <p>Use <b>Position in plane</b> to insert the custom part in the plane view.</p> <p>The options are <b>MIDDLE, LEFT, and RIGHT.</b></p>
ShoePlaneOffset	Offset on plane. The default value is 0.
ShoeRotation	<p>Use <b>Rotation</b> to insert the custom part in the plane view.</p> <p>The options are <b>FRONT, TOP, BACK, and BELOW.</b></p>
ShoeRotationOffset	Rotation offset in degrees. The default value is 0.
ShoeDepthPosition	<p>Use <b>Position at depth</b> to insert the custom part in the plane view.</p> <p>The options are <b>MIDDLE, FRONT, and BEHIND.</b></p>
ShoeDepthOffset	Offset at depth. The default value is 0.
ShoeStartOffset	ShoeStartOffset is the offset of the actual start point from the generic start point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.
ShoeEndOffset	ShoeEndOffset specifies the location of the second input point of the custom part in relation to the first input point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, zero offset (100 0 0) is used.
ToeBoardName	Name of the custom part that will be inserted in the model.

Row	Definition
ToeBoardAttributes	Property file saved in the component dialog box to be used when the custom part is inserted in the model.
ToeBoardLength	The effective length of the toe board part.
ToeBoardInputOrder	<p>Set the final locations of the input points in relation to the default generic start and end points.</p> <p>The possible values are:</p> <ul style="list-style-type: none"> <li>• <code>StartEnd</code>: default if no other value is specified.</li> <li>• <code>EndStart</code>: reverses the default start/end points.</li> <li>• <code>CenterStart</code>: the first input point is at the center of the start/end point and the second point is at the start point.</li> <li>• <code>CenterEnd</code>: the first input point is at the center of the start/end point and the second point is at the end point.</li> <li>• <code>CenterLeft</code>: the first input point is at the center of the start/end point and the second point is at the left point.</li> <li>• <code>CenterRight</code>: the first input point is at the center of the start/end point and the second point is at the right point.</li> <li>• <code>CenterUp</code>: the first input point is at the center of start/end point and the second point is up from the center point.</li> <li>• <code>CenterDown</code>: the first input point is at the center of the start/end point and the second point is down from the center point.</li> </ul> <p>Note that if the <code>.csv</code> file does not contain any value, the default value <code>StartEnd</code> is used.</p>

Row	Definition
	
ToeBoardPlanePosition	<p>Use the following position values to define the custom part's position, offset and rotation in relation to the custom part start and end points.</p> <p>Use <b>Position in plane</b> to insert the custom part in the plane view.</p> <p>The options are <b>MIDDLE, LEFT</b>, and <b>RIGHT</b>.</p>
ToeBoardPlaneOffset	<p>Offset on plane. The default value is 0.</p>
ToeBoardRotation	<p>Use <b>Rotation</b> to insert the custom part in the plane view.</p> <p>The options are <b>FRONT, TOP, BACK</b>, and <b>BELOW</b>.</p>
ToeBoardRotationOffset	<p>Rotation offset in degrees. The default value is 0.</p>
ToeBoardDepthPosition	<p>Use <b>Position at depth</b> to insert the custom part in the plane view.</p> <p>The options are <b>MIDDLE, FRONT</b>, and <b>BEHIND</b>.</p>
ToeBoardDepthOffset	<p>Offset at depth. The default value is 0.</p>
ToeBoardStartOffset	<p>ToeBoardStartOffset is the offset of the actual start point from the generic start point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.</p>

Row	Definition
ToeBoardEndOffset	ToeBoardEndOffset specifies the location of the second input point of the custom part in relation to the first input point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, zero offset (100 0 0) is used.
GuardRailName	Name of the custom part that will be inserted in the model.
GuardRailAttributes	Property file saved in the component dialog box to be used when the custom part is inserted into model.
GuardRailLength	The effective length of the guard rail part.
GuardRailInputOrder	<p>Set the final locations of the input points in relation to the default generic start and end points.</p> <p>Note that the generic start and end points are located in the local z direction based on the setting.</p> <p>The possible values are:</p> <ul style="list-style-type: none"> <li>• StartEnd: default if no other value is specified.</li> <li>• EndStart: reverses the default start/end points.</li> <li>• CenterStart: the first input point is at the center of the start/end point and the second point is at the start point.</li> <li>• CenterEnd: the first input point is at the center of the start/end point and the second point is at the end point.</li> <li>• CenterLeft: the first input point is at the center of the start/end point and the second point is at the left point.</li> <li>• CenterRight: the first input point is at the center of the start/end</li> </ul>

Row	Definition
	<p>point and the second point is at the right point.</p> <ul style="list-style-type: none"> <li>• <code>CenterUp</code>: the first input point is at the center of start/end point and the second point is up from the center point.</li> <li>• <code>CenterDown</code>: the first input point is at the center of the start/end point and the second point is down from the center point.</li> </ul> <p>Note that if the <code>.csv</code> file does not contain any value, the default value <code>StartEnd</code> is used.</p> 
GuardRailPlanePosition	<p>Use the following position values to define the custom part's position, offset and rotation in relation to the custom part start and end points.</p> <p>Use <b>Position in plane</b> to insert the custom part in the plane view.</p> <p>The options are <b>MIDDLE, LEFT, and RIGHT</b>.</p>
GuardRailPlaneOffset	<p>Offset on plane. The default value is 0.</p>
GuardRailRotation	<p>Use <b>Rotation</b> to insert the custom part in the plane view.</p> <p>The options are <b>FRONT, TOP, BACK, and BELOW</b>.</p>

Row	Definition
GuardRailRotationOffset	Rotation offset in degrees. The default value is 0.
GuardRailDepthPosition	Use <b>Position at depth</b> to insert the custom part in the plane view.  The options are <b>MIDDLE, FRONT, and BEHIND</b> .
GuardRailDepthOffset	Offset at depth. The default value is 0.
GuardRailStartOffset	GuardRailStartOffset is the offset of the actual start point from the generic start point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, a zero offset (0 0 0) is used.
GuardRailEndOffset	GuardRailEndOffset specifies the location of the second input point of the custom part in relation to the first input point in the local coordinate system. Give the offset as x, y and z values that are separated by a space or a colon, and enclosed in parentheses (0 100 0). If no value is given, zero offset (100 0 0) is used.

## Openings

This section introduces components that can be used in concrete openings.

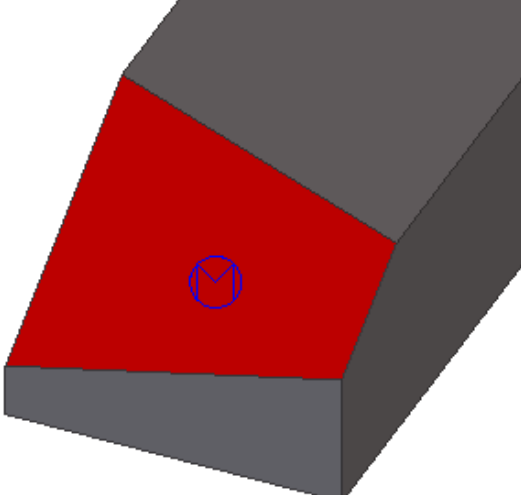
Click the links below to find out more:

- [3D cut \(10\) \(page 3142\)](#)
- [Opening in wall \(40\) \(page 3144\)](#)
- [Hole Generation \(32\) \(page 3151\)](#)
- [Polygon Hole Generation \(33\) \(page 3153\)](#)

### 3D cut (10)

The **3D cut (10)** component creates a 3D cut to a concrete part. The cutplane is determined by picking three points on the (concrete) part edges. The cut direction can be set. Also an cut offset can be set.

#### Use for

Situation	More information
	<p>This component creates a cut through three points.</p> <p>The side to be removed can be defined.</p>

#### Before you start

Before applying the macro, create the following part:

- Concrete part (panel, column, strip footing)

#### Defining properties

The component contains only one tab, named **Picture**.

Tab	Content
<b>Picture</b>	Defining the cut direction. Possibly set an cutplane offset.

#### Picking order

1. Concrete part.
2. Three points to determine the cut plane.

## Picture tab

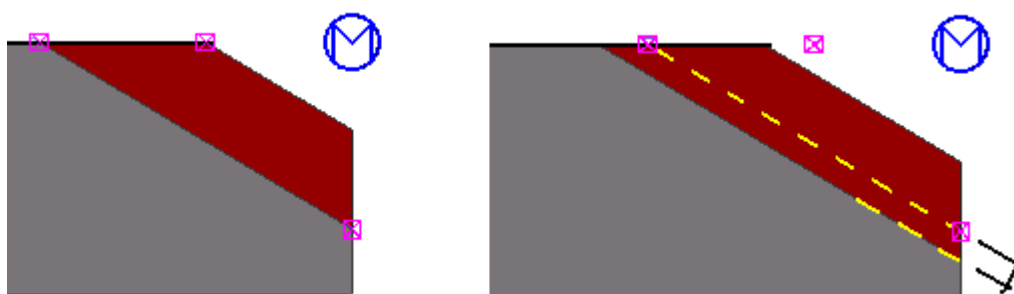
You can define the following settings on the **Picture** tab.

### Cut type

Option	Description
<b>Cut right</b>	The parts' right side from the cut plane will be removed.
<b>Cut left</b>	The parts' left side from the cut plane will be removed.
<b>Fit plane</b>	The removed part is the shortest part (from fit plane to part's end).
<b>No cut</b>	No cut is applied.

### Offset

You can define the offset for the cut plane. The offset distance is always perpendicular to the cut plane.



### Explode component

You can select to explode the component if you do not need to modify the component after applying it. If you plan to modify the component later, select not to explode it.

### ***Opening in wall (40)***

**Opening in wall (40)** creates an opening in a concrete wall of adjustable size, shape and position. Can also add an insulation panel to the wall.

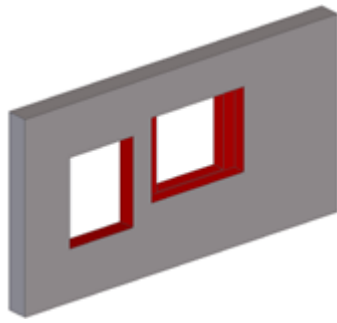
### Objects created

- Opening
- Insulation (optional).

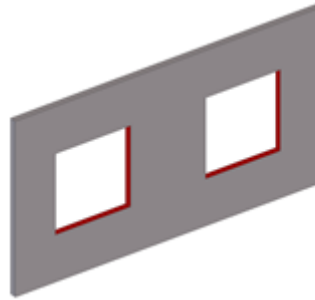
### Use for

Square or circular opening in a wall and adding insulation to the wall.

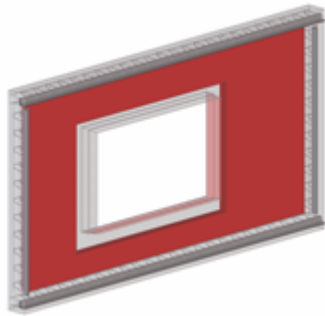




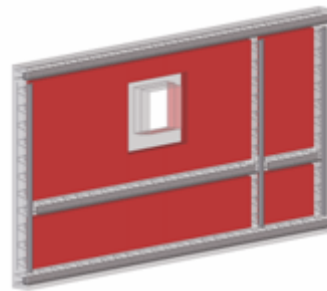
**define rabbet**



**several openings**



**adding insulation**



**braced girders**

---

**TIP** You can use [Hole Generation \(32\) \(page 3151\)](#) to create an opening with an irregular shape.

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### **Before you start**

Create the wall for example as a concrete panel or column.

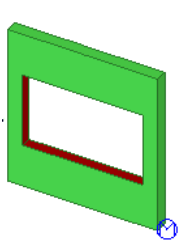
### **Opening tab**

Use the **Opening** tab to define the shape and size of the opening.

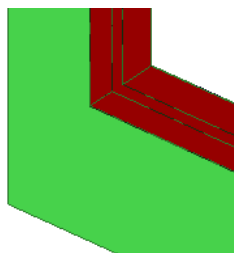
### **Type**

First you can define the type of the opening. The options are:

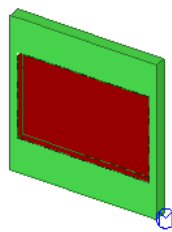
- Opening
- Opening no rabbet
- Opening with rabbet
- Opening only outside
- Opening only inside



Opening



Opening with rabbet

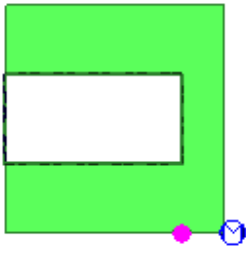
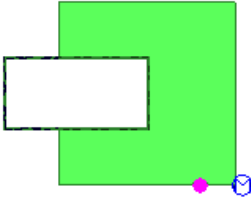
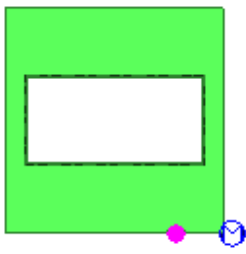
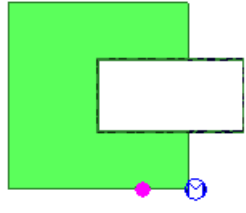


Opening only outside

### Horizontal position

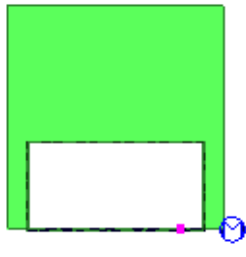
The horizontal reference point for creating the opening can be selected from a picklist. In the table below are the available options.

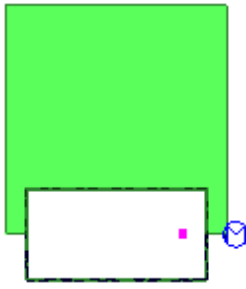
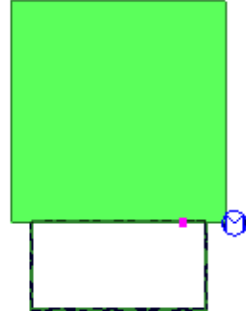
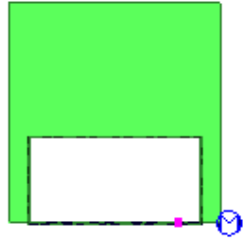
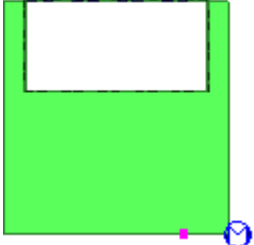
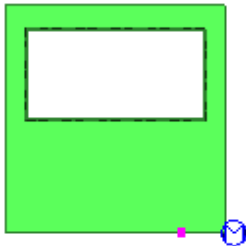
Option	Description	Example
Point is left side opening	The opening is created on the left side from the component insertion point.	
Point is middle side opening	The middle of the opening is created from the component insertion point.	
Point is right side opening	The opening is created on the right side from the component insertion point.	
Start panel	The opening is created from the startpoint of the wall.	

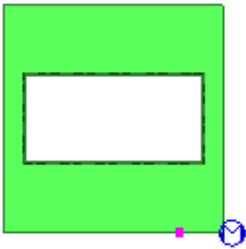
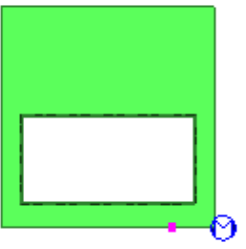
Option	Description	Example
End panel	The opening is created from the endpoint of the wall.	
Middle panel = left opening	The center of the wall is referencepoint. The opening is created to the left side.	
Middle panel = middle opening	The center of the wall is referencepoint. The opening is also created from the middle.	
Middle panel = right opening	The center of the wall is referencepoint. The opening is created to the right side.	

### Vertical position

The horizontal reference point for creating the opening can be selected from a picklist. In the table below are the available options.

Option	Description	Example
Pos point bottom opening	The opening is created on the left side from the component insertion point.	

Option	Description	Example
Point is middle opening	The middle of the opening is created from the component insertion point.	
Pos point top opening	The opening is created on the right side from the component insertion point.	
Bottom panel	The opening is created from the startpoint of the wall.	
Top panel	The opening is created from the endpoint of the wall.	
Middle panel = bottom opening	The center of the wall is referencepoint. The opening is created to the left side.	

Option	Description	Example
Middle panel = middle opening	The center of the wall is referencepoint. The opening is also created from the middle.	
Middle panel = top opening	The center of the wall is referencepoint. The opening is created to the right side.	

### Horizontal/Vertical offset

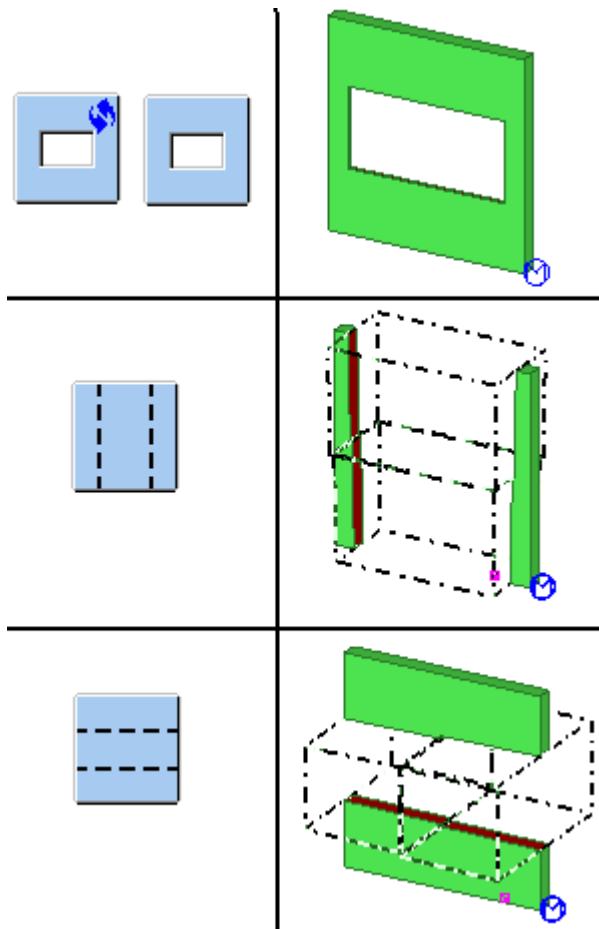
The opening can be moved vertically and horizontally by using these two offset value fields.

### Rabbit - side

With this picture picklist you can define the side where the rabbit is created.

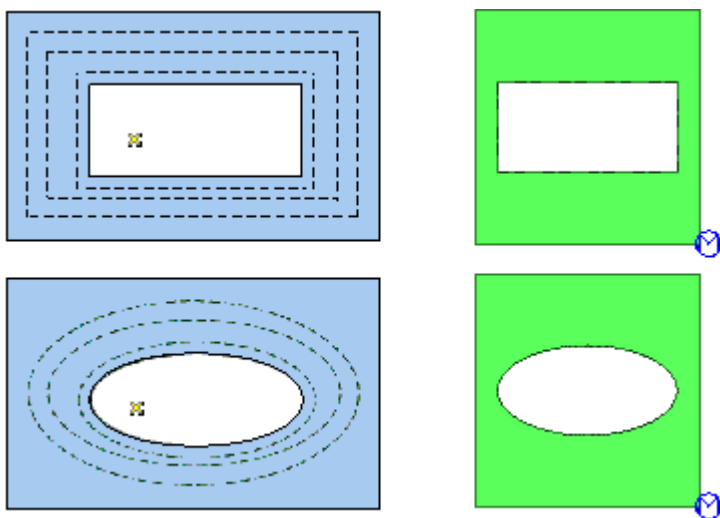
### Cut - rotation

With this picture-picklist you can define the rotation of the cut.



### Shape of the opening

With the picklist you can choose the general shape of the opening in the wall. The default shape is a rectangular opening. The other shape is the circular shape.



### Insulation tab

Use the **Insulation** tab to define insulation thickness, offset and creation of partcut.

The option 'Cut opening size' can be used to define if the insulation should be cut at the opening in the wall.

Option	Description
<b>t b h</b>	Define the thickness, width, and height of the part.
<b>Pos_No</b>	Define a prefix and a starting number for the part position number.  Enter the assembly position number on the second row.  The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Define the material grade.  The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Define a name that is shown in drawings and reports.
<b>Class</b>	Enter a number to group the parts that the component creates. By default, the class number affects the color in which the part is shown in model views.

### Parameters tab

Use the **Parameters** tab to create assembly panel insulation.

Possibility to weld the insulation to the panel to get an assembly.

Three options available: **Default**, **Yes** and **No**. **Default** option is same as **Yes**.

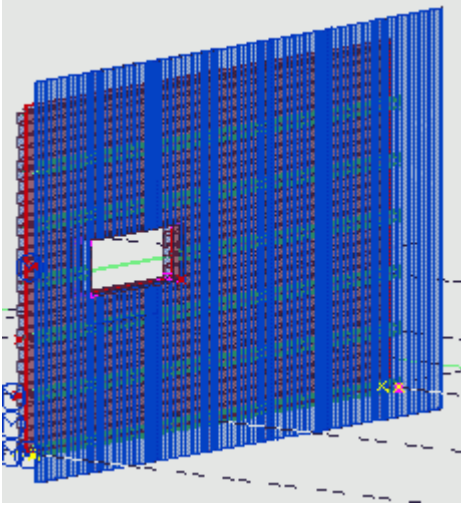
### **Hole Generation (32)**

**Hole Generation (32)** creates a hole in the object, or splits the object in two if the hole cuts the whole object. Use this component, for example, in welded profiles, slabs, or panels generated with a component.

## Objects created

- Cuts

## Use for

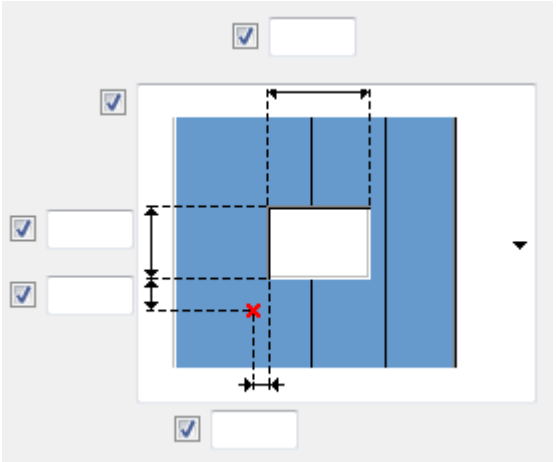
Situation	Description
 A 3D perspective view of a blue concrete slab. A rectangular hole is being defined in the center. The hole's boundaries are shown with red dashed lines. A green line indicates the hole's depth. A red 'X' marks the point where the hole is being created. The slab is supported by a grid of blue vertical rebar.	A hole is created when a point is picked.

## Selection order

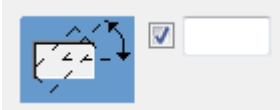

1. Select the part or object created by a component to be cut.
2. Click the middle mouse button.
3. Pick the position relative to the hole being generated.

## Parameters tab

Use the **Parameters** tab to control the hole properties.

Option	Description
 A screenshot of the software's Parameters tab for creating a hole. It features a central diagram of a blue square with a white rectangular hole. Dashed lines and arrows indicate the hole's dimensions: width, height, and offset from the edges. A red 'X' marks the center of the hole. Surrounding the diagram are several checkboxes, all of which are checked, and empty input fields for numerical values.	Define the hole dimensions and the location of the picked point.  The selected <b>Partcut</b> option affects which of these dimensions are available.



Option	Description
	To rotate the hole, define the rotation angle.
	Define the recess depth.
<b>Partcut</b>	Select the hole type. The options are: <ul style="list-style-type: none"> <li>• <b>Rectangular</b> creates a rectangular hole using width and height.</li> <li>• <b>Circular</b> creates a round hole using height as a diameter.</li> <li>• <b>Profile</b> creates a cut using the selected profile. You can use this option to create a hole with an irregular shape.</li> </ul>
<b>Profile</b>	If you selected <b>Profile</b> as the hole type, select a suitable profile from the <b>Profile Catalog</b> .
<b>Coordination system</b>	Select the coordination system. The options are: <ul style="list-style-type: none"> <li>• <b>Use global xy-plane</b> creates the hole according to the global coordinate system.</li> <li>• <b>Use local</b> creates the hole according to the work plane.</li> </ul> If the part is sloped or skewed, the <b>Use local</b> option is used automatically.
<b>Cutpart name</b>	Define a name for the cut part.
<b>Rotated</b>	Select whether the cut is rotated 90 degrees in the XY plane.

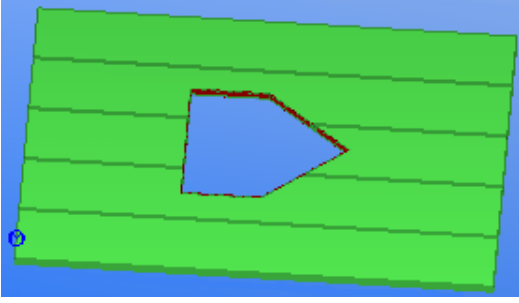
### ***Polygon Hole Generation (33)***

**Polygon Hole Generation (33)** creates a polygon-shaped hole in the object. Use this component, for example, in welded profiles, slabs, or panels generated with a component.

## Objects created

- Cut

## Use for

Situation	Description
	A polygon-shaped hole in concrete slabs, created by picking five points.

## Selection order

To create a polygon-shaped hole:

1. Select the part or object (component) to be cut.

---

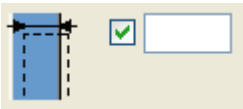
**TIP** You can cut other components, such as **Modeling of floor bay (66)** with this component.

---

2. Click the middle mouse button to end selecting.
3. Pick the corner points of the polygon-shaped hole.
4. Click the middle mouse button to end picking.

## Parameters tab

Use the **Parameters** tab to control the cuts created.

Field	Description
	Cutting depth

## Flooring

This section introduces components that can be used in concrete floors.

Click the links below to find out more:

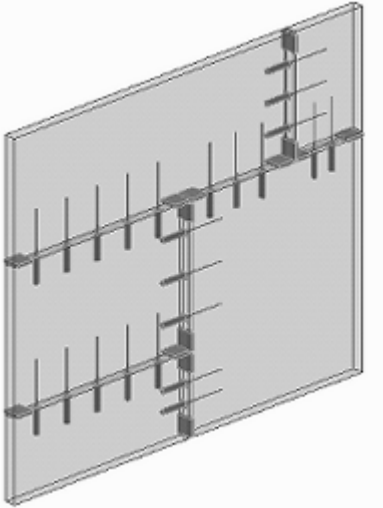
- [Automatic seam recognition \(30\) \(page 3155\)](#)
- [Seam Applicator \(page 3156\)](#)
- [Modeling of floor bay \(66\) \(page 3158\)](#)

- [Sloping slab drainage \(page 3166\)](#)
- [Hollow Core Opening Tool \(page 3170\)](#)
- [Hollow Core Lifting Loops \(page 3174\)](#)
- [Floor layout \(page 3177\)](#) (recommended for floor modeling)
- [Floor Tool \(page 3210\)](#)

### ***Automatic seam recognition (30)***

**Automatic seam recognition (30)** is used to add predefined custom seams between parallel parts, such as slabs or wall elements. This tool is useful when you add seams for warped floors.

#### **Use for**

<b>Situation</b>	<b>More information</b>
	<p>Use to connect parts with predefined custom seams.</p>

#### **Before you start**

Create parallel parts, for example, concrete slabs or walls.

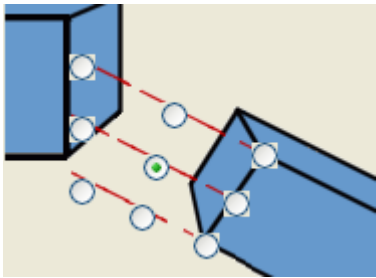
Create custom seam.

#### **Selection order**

1. Select the main part.
2. Select secondary parts. Click the middle mouse button to create the seams between the parts.

#### **Parameters tab**

Use the **Parameters** tab to define seam properties.

Property	Description
<b>Seam name</b>	Enter the seam name, or use the browse button (...) to locate the seam in the <b>Select component</b> dialog box.
<b>Seam property file</b>	Enter the name, or use the browse button (...) to locate the name of the seam attribute file (optional).
<b>Seam direction</b>	Select to change the direction.
<b>Seam input part order</b>	Select to reverse the main and secondary part. You may need to change the <b>Seam up direction</b> too.
<b>Seam up direction</b>	Define the direction of the seam.
<b>Re-calculate seam points for</b>	Use to re-calculate the seam points for all parts or only for warped parts. <ul style="list-style-type: none"> <li>• <b>All parts:</b> use for fully or partially warped decks or floors. This option creates all seam points in the same way, no matter, if the slab is warped or not.</li> <li>• <b>Warped parts:</b> use for wall panels and other situations, where warping is not used, or the <b>All parts</b> option does not give desired result.</li> </ul>
<b>Position of re-calculated points</b>	Control the location of the re-calculated seam points. The options in the list box are same as the circles in the following image. 

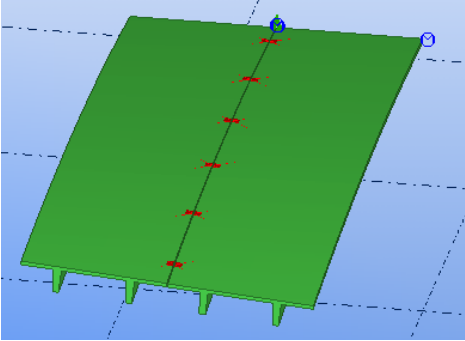
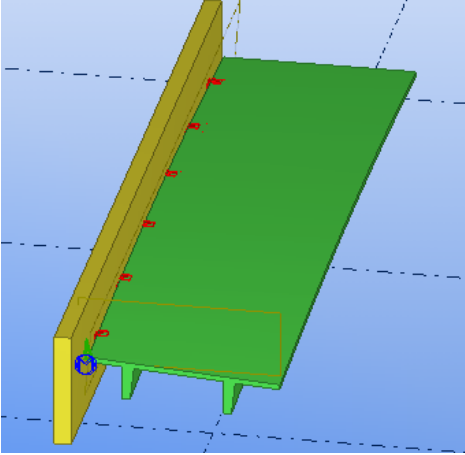
### ***Seam Applicator***

**Seam Applicator** creates a seam between two double tee slabs, or between a double tee slab and a wall or a spandrel. The double tees can also be warped and/or cambered. To be able to use **Seam Applicator** you need to have a custom seam. The custom seam can be created in the model, or it can be imported to the model.

## Objects created

- Seams

## Use for

Situation	Description
 A 3D perspective view of two green double tee slabs joined by a central seam. The slabs are supported by green columns. Red arrows point to the seam, and blue circles indicate selection points.	Two double tee slabs with seams
 A 3D perspective view of a green double tee slab and a yellow wall joined by a seam. The slab is supported by green columns. Red arrows point to the seam, and blue circles indicate selection points.	Double tee slab and wall with seams

## Before you start

Create a custom seam.

**NOTE** When you define the custom seam in **Custom Component Wizard**, make sure that you select the **Allow multiple instances of connection between same parts** checkbox on the **Advanced** tab.

## Selection order

1. Select the main part.
2. Select the secondary part.

The seam is created automatically when the secondary part is selected.

One of the selected parts must be a double tee slab and the other part can be a double tee slab, a wall, or a spandrel.

---

**NOTE** If the seam cannot be created between the selected parts for some reason, a dummy beam is created instead. The beam indicates that the seam creation did not succeed.

---

### Parameters tab

Use the **Parameters** tab to control the properties of the seam.

Option	Description
<b>Seam name</b>	Define the custom seam that connects the parts by selecting it from the <b>Applications &amp; components</b> catalog.
<b>Seam property file</b>	Select the attribute file for the custom seam.
<b>Seam direction</b>	Seam direction in relation to the main and the secondary part.
<b>Seam up direction</b>	Seam rotation.
<b>Offset start point</b>	Seam start point offset from the edge of the double tee slab start point.
<b>Offset end point</b>	Seam end point offset from the edge of the double tee slab end point.
<b>Number of copies</b>	Number of seams.
<b>Distance to first seam</b>	Distance between the double tee slab edge and the first seam start point.
<b>Spacing values</b>	Space between the seams.
<b>Copy at equal distances (Ignore spacing values)</b>	Define whether seams are created at equal distances.  If you select <b>Yes</b> , the values in <b>Spacing values</b> field are ignored.

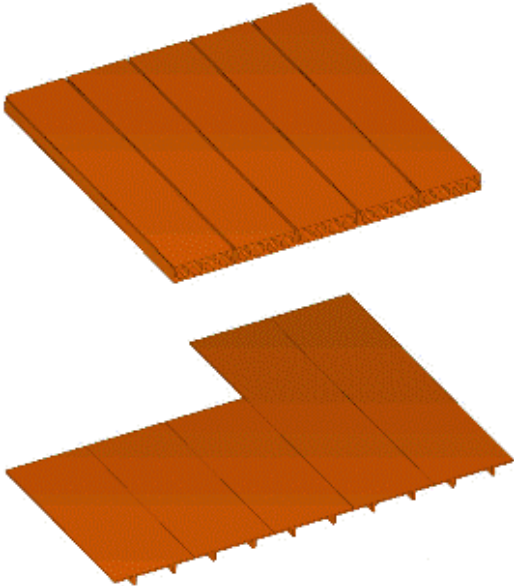
### **Modeling of floor bay (66)**

**Modeling of floor bay** creates an area of concrete slabs between two support lines that you define, for example, between two main frames. Support lines can be polylines or sloped.

### **Parts created**

Concrete slabs.

## Where to use

Situation	More information
	Slab area created between two support lines.

### Before you start

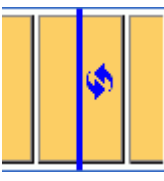
Create two support lines with two or more points.

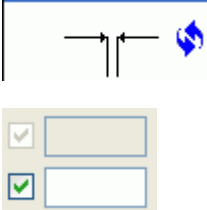
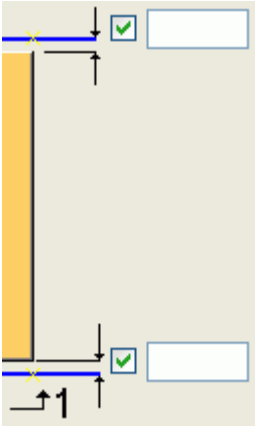
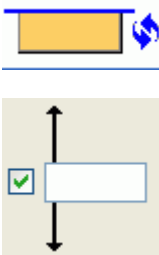
### Picking order

1. Pick points to define the first support line. To finish, middle-click away from the last point picked.
2. Pick points to define the second support line. To finish, middle-click away from the last point picked.
3. Pick a point to indicate the origin of the slabs.
4. Pick a point to indicate the direction of the slabs.

### Parameters tab

Use the **Parameters** tab to define the position of the slab.

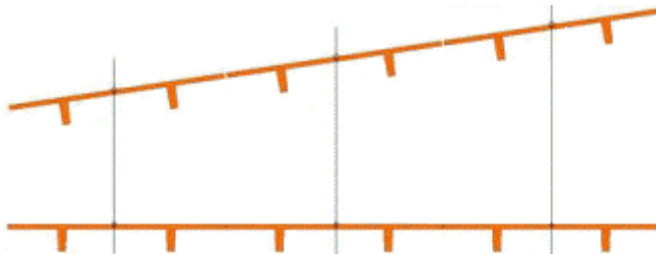
Property	Description
	The position of the slab relative to the origin line picked when creating the slab.  The options are <b>center of profile</b> (default) or <b>center of seam</b> .

Property	Description
	<p>Select the slab spacing and enter the appropriate dimension. The options are <b>seam</b> (default) or <b>center to center</b>.</p> <p>If you select the seam option, the bottom dimension is enabled. If you select the center-to-center option, the upper dimension is enabled.</p>
	<p>Slab offsets from support lines 1 and 2.</p>
	<p>Vertical position of the slab.</p> <p>The options are <b>Top</b> (default), <b>Center</b> or <b>Bottom</b>.</p> <p>Enter an optional offset value.</p>
<p><b>Projection type</b></p>	<p>Defines how the slabs are spaced on a sloping floor bay.</p>

### Projection type

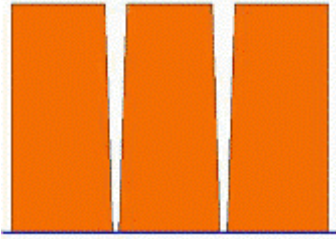
Use the **Projection type** field to define how to handle slab spacing or seams on a sloping floor bay. The options are **Global** (default), **Support line 1**, **Support line 2**, or **Both support lines**.

- **Global:** the centers of the slabs remain constant, seam spacing adjusts.

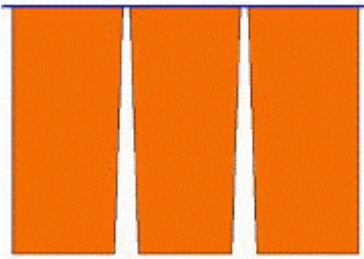




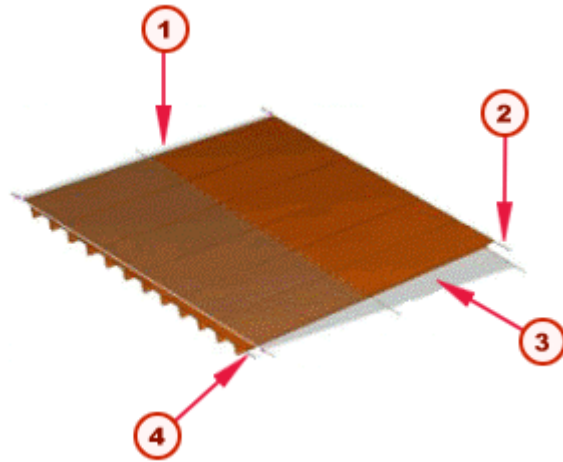
- **Support line 1:** Seam spacing on support line 1 does not adjust (effect exaggerated here):



- **Support line 2:** Seam spacing on support line 2 does not adjust (effect exaggerated here):



- **Both support lines:** Seam spacing is calculated at the average plane position between both support lines



- ① Along this line, center to center and seam width are exactly as entered in the dialog box.
- ② Support line 2
- ③ Plane between support lines 1 and 2
- ④ Support line 1

### Profiles tab

Use the **Profiles** tab to define the properties of the slab profiles.

### Index list

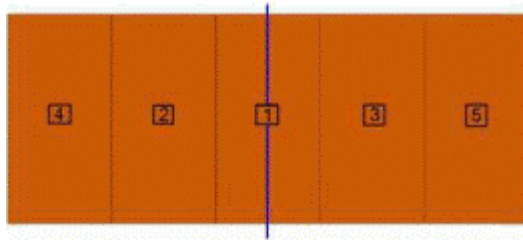
Use the **Index list** to specify different profiles, seam width, and various cutting options for specific slabs or seams.

Input the values individually, or in a list:

Index List	
<input checked="" type="checkbox"/>	1
<input checked="" type="checkbox"/>	3 5 9

### Examples for slabs

If the origin point is the center of slab:

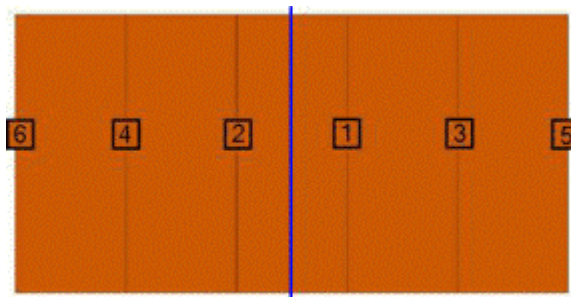


If the origin point is the center of seam:

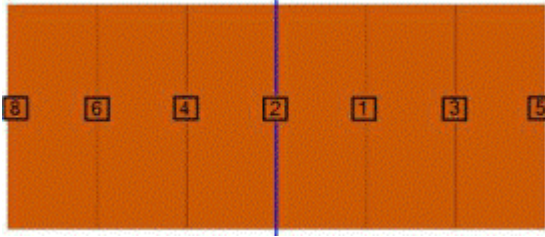


### Examples for seams

If the origin point is the center of slab:



If the origin point is the center of seam:



### Adjustment type

Use the **Adjustment type** to define the type of adjustment for the selected slab. The options are:

- **Default** - Use the default slab profile.
- **Profile** - Use the specific slab profile.
- **Cut left side** - Cut the left side of the profile. If no profile is defined, uses the default slab profile.
- **Cut right side** - Cut the right side of the profile. If no profile is defined, uses the default slab profile.
- **Cut both sides** - Cut both sides of the profile. If no profile is defined, uses the default slab profile.
- **Seam width** - Adjust the seam width.

### Profile/Seam Width

Depending on which adjustment type option you choose, defines:

- The width of the default slab profile.
- The width of the specified profile.
- Seam width.

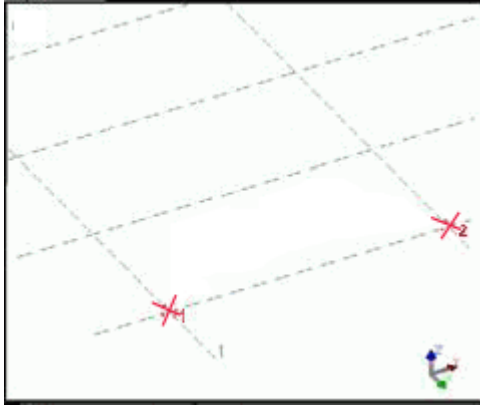
### Examples

These examples show how to use the **Modeling of floor bay (66)** component.

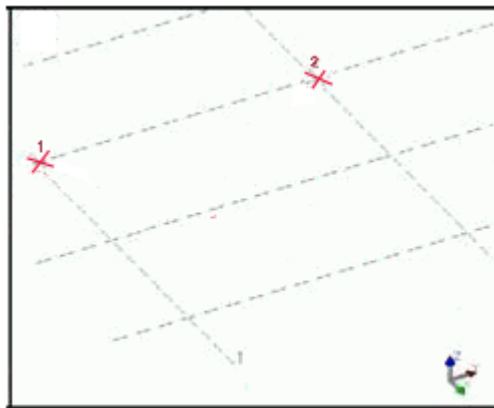
#### Example 1:

1. Pick 2 points (1, 2) to define support line 1.

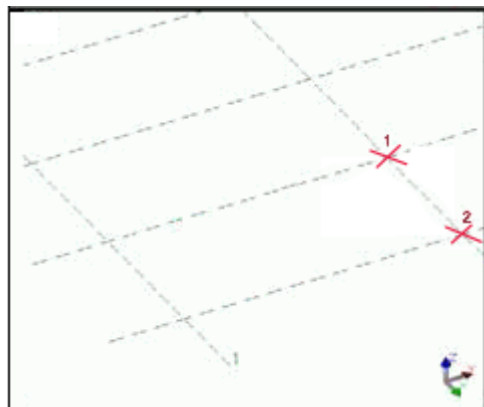
2. To finish, middle-click.



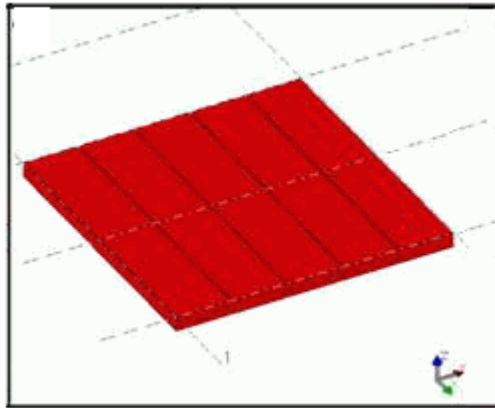
3. Pick 2 points to define support line 2.
4. To finish, middle-click.



5. Pick a point to indicate the origin of the slab.
6. Pick a point to indicate the direction of the slab.

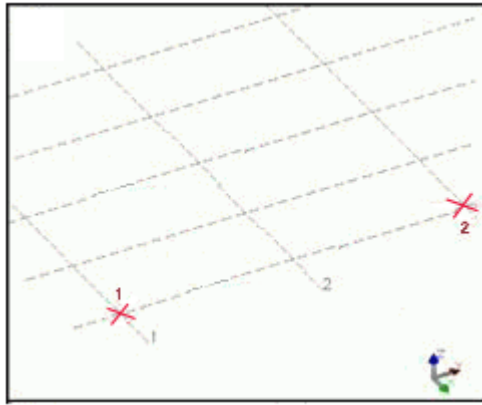


Tekla Structures creates the floor bay.

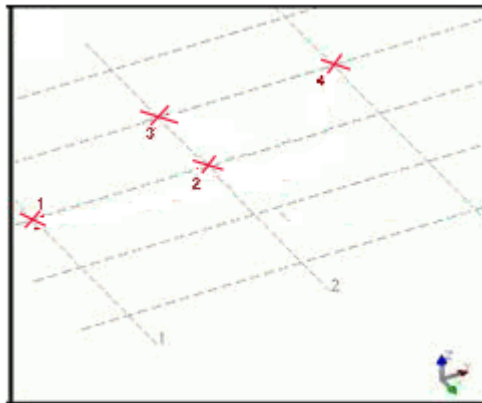


**Example 2:**

1. Pick 2 points to define support line 1.
2. To finish, middle-click.

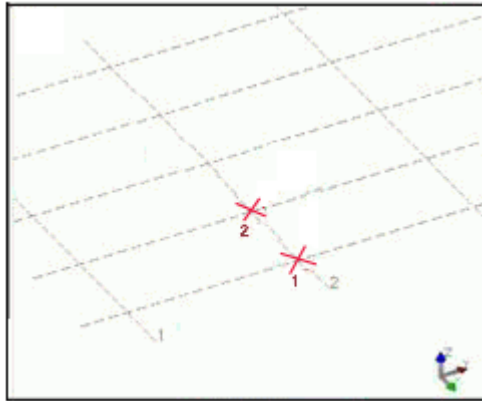


3. Pick 4 points to define support line 2.

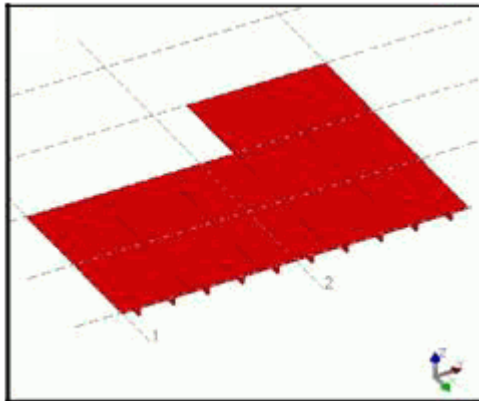


4. To finish, middle-click.
5. Pick a point to indicate the origin of the slab.

6. Pick a point to indicate the direction of the slab.



Tekla Structures creates the floor bay.



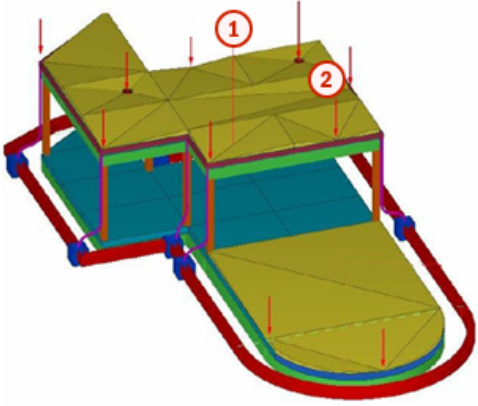
### ***Sloping slab drainage***

**Sloping slab drainage** creates a concrete slab topping and a drainage hole.

#### **Objects created**

- Drainage hole

## Use for

Situation	Description
	Drainage holes with valley <b>1</b> and hip <b>2</b> created.

## Limitations

Slab topping does not adapt to slab chamfers. You need to define the slab chamfers and topping chamfers separately.

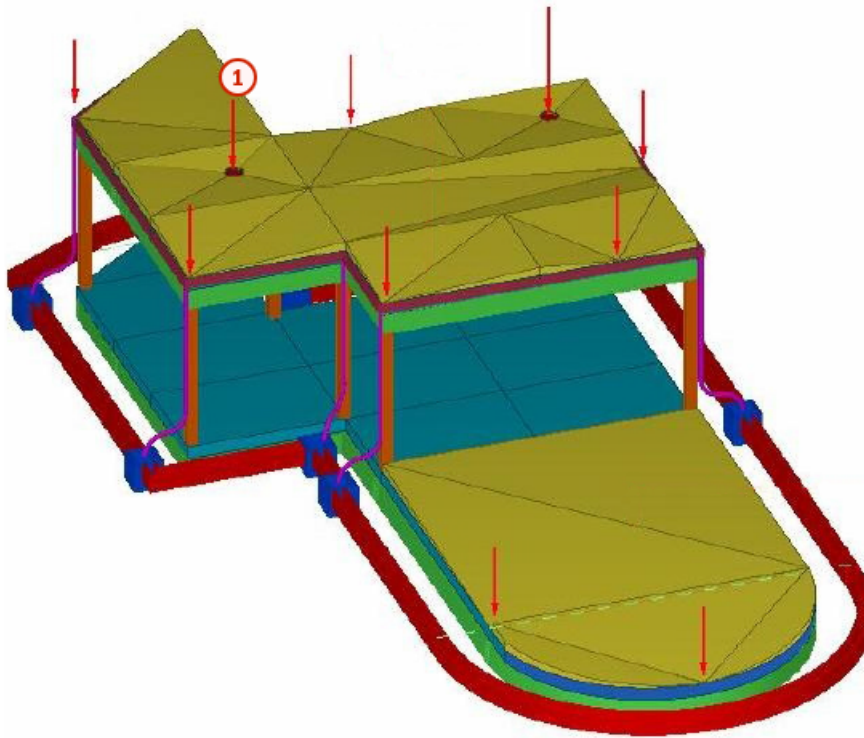
## Before you start

Create or split the slabs so that there is one drainage point in each slab.

## Selection order

1. Select the main part (slab).
2. Pick a point to create the drainage hole.  
The drainage hole is created automatically when the point is picked.

## Part identification key






	Part
1	Drainage hole

### Parameters tab

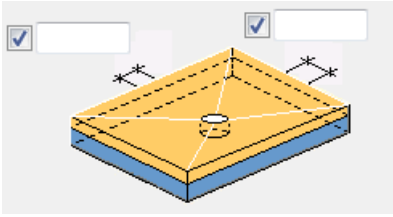
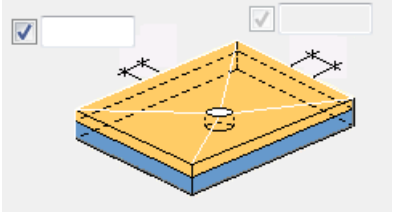
Use the **Parameters** tab to control the type, dimensions and properties of the drainage hole.

### Drainage hole type

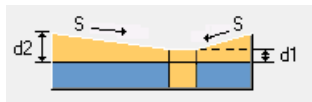
Option	Description
	A drainage hole is not created.
	A rectangular drainage hole is created.
	A round drainage hole is created.



## Drainage hole dimensions

Option	Description
	Define the side dimensions of the rectangular drainage hole.
	Define the diameter of the round drainage hole.

## Drainage hole properties



Option	Description
<b>Define slab inclination by</b>	Select how the slab is inclined, by a combination of slope (S) or slope percentage (S%), and topping thicknesses (d1, d2).  The <b>Slope</b> , <b>d1</b> , and <b>d2</b> options are available accordingly.
<b>Slope</b>	Slope of the topping, for example, 0.01 (S) or 2 (S%).
<b>d1</b>	Thickness of the topping at the drainage point or at the hole.
<b>d2</b>	Thickness of the topping at the edge of the slab or at the hip.
<b>Create cast unit</b>	Select how the cast unit is created: <ul style="list-style-type: none"> <li>• <b>Yes</b> Topping is part of the slab cast unit.</li> <li>• <b>No</b> Each part of the topping forms a cast unit.</li> </ul>

Option	Description
	<ul style="list-style-type: none"> <li><b>Topping</b> Topping is a separate cast unit.</li> </ul>
<b>Material</b>	Define the material of the topping by selecting it from the material catalog.
<b>Type</b>	Select whether a valley or a hip is created. If you select <b>Hip</b> , you can only pick slab corners.
<b>Cast unit type</b>	Select the cast unit type.
<b>Pour phase</b>	Enter the pour phase.
<b>Class</b>	Define the class of the slab.

### ***Hollow Core Opening Tool***

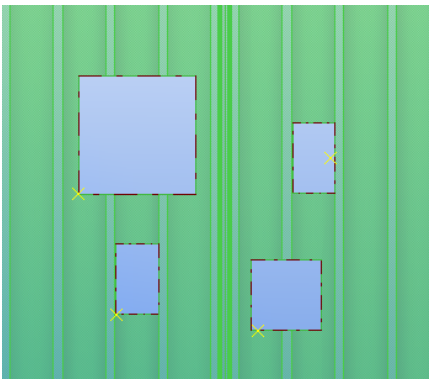
**Hollow Core Opening Tool** creates holes and recesses to hollow core slabs.

**Hollow Core Opening Tool** works with single hollow core slabs, or with floors that are created with the **Modeling of floor bay (66)** modeling tool.

#### **Objects created**

- Holes and recesses

#### **Use for**

Situation	Description
	Hollow core slab with small and large openings

#### **Limitations**

**Hollow Core Opening Tool** calculates the location for the openings based on the given values and the slab profile data. If needed, you can use an external configuration file in XML format to provide different rules for the openings and the slab profile data.

You can define small and large openings. Small openings are placed in the middle of the hollow cores so that no webs are broken. Large openings break webs.

### Before you start

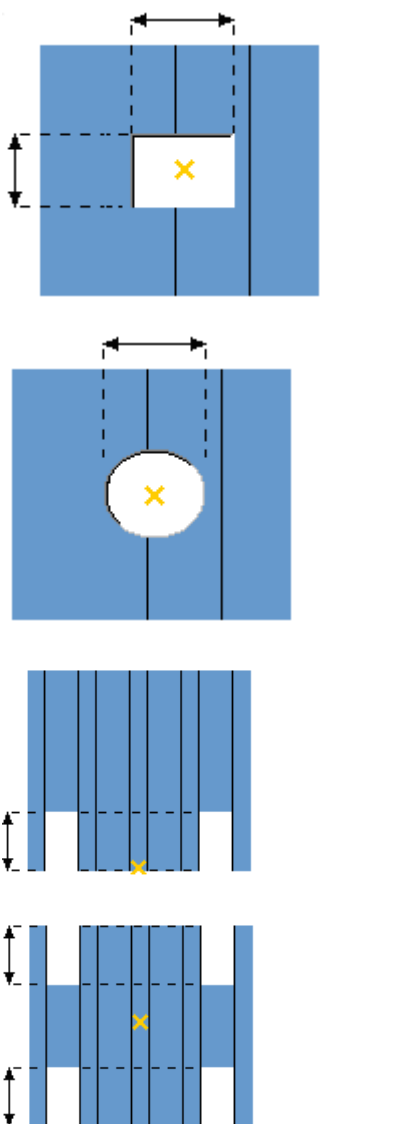
Create a hollow core slab.

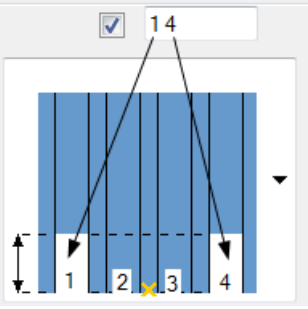
### Selection order

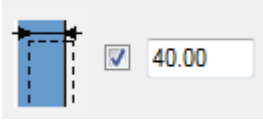
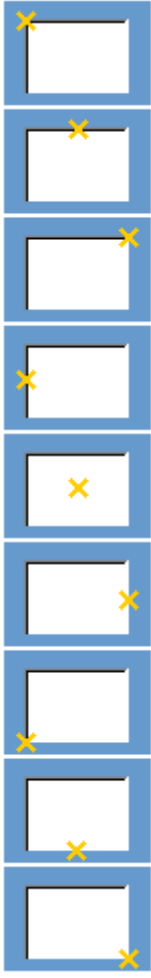
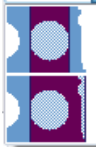
1. Select the main part (slab).
2. Pick a position for the opening.

### Hollow Core Opening Tool properties

Use the **Hollow Core Opening Tool properties** to control the properties of the openings and recesses.

Option	Description
 <p>The 'Option' column contains four diagrams illustrating different hollow core slab opening configurations. Each diagram shows a blue slab with a yellow 'X' marking the opening location. The first diagram shows a square opening in the middle of the slab. The second diagram shows a round opening in the middle of the slab. The third diagram shows a square opening at one end of the slab. The fourth diagram shows a square opening at both ends of the slab. Dashed lines and arrows indicate the dimensions and positions of the openings.</p>	<p>Select the shape of the openings and recesses.</p> <ul style="list-style-type: none"><li>• Square - in the middle of the slab</li><li>• Round - in the middle of the slab</li><li>• At one end of the slab</li><li>• At both ends of the slab</li></ul>

Option	Description
<b>Hollow positions</b>	<p>If you select to add openings or recesses at one end or at both ends of a slab, enter the positions of the hollows that are cut.</p> <p>The positions are numbered from left to right at the start of the part. The part is viewed from the top in the start-to-end direction. The openings and recesses are created in the same voids at the end of the part.</p> 
<b>Size</b>	<p>Define the size of the opening in longitudinal and cross direction, or the diameter for a round opening.</p> <p>Opening width defines whether the opening is small or large.</p>
<b>Opening Type</b>	<p>Select the type of the opening.</p>
<b>Place exactly by point</b>	<p>Select whether the opening is created exactly to the picked position.</p>
<b>Centralize in zone</b>	<p>Select how the center of an opening is centered</p> <ul style="list-style-type: none"> <li>• <b>By hollow:</b> The opening is centered to the hollow core.</li> <li>• <b>By web:</b> The opening is centered to the web.</li> </ul>
<b>Cut full width of hollow</b>	<p>Select whether the opening is cut based on the minimum width of hollows or the number of hollows.</p> <p>To use this option, center the opening <b>By hollow</b> in the <b>Centralize in zone</b> option.</p>
<b>Rules file (XML)</b>	<p>Select the external XML file where you have defined the opening and slab profiles.</p>
<b>Cutpart name</b>	<p>Define a name for the cut part.</p>

Option	Description
	Define the recess depth.
	Define the alignment for the opening.
	Select whether the thick side part of the opening is removed.

### Configuration file example

Use an external .xml file to define the openings and the slab profiles.

### Example

An example Zones.xml file is located in ..\ProgramData\Trimble\Tekla Structures\<version>\environments\common\system.

## Zones

```
<ZoneRules>
  <!--Profile element has name and NumberOfSmall attributes which define number of small
  zones in width direction. Profile name corresponds to TS profile name prefix that is P27, P32
  etc. despite actual profile can be "P27(265x1200)" for example-->
  <Profile Name="P27" NumberOfSmall="5">
    <!--SmallZone element describes its parameters and must be the only in each
    profile. -->
    <SmallZone Start="77" width="150" Interval="73" />
    <!--LargeZone element describes large zone (which breaks webs). There must be as
    many LargeZone elements as large zones supposed to be defined for a given
    profile. -->
    <LargeZone Start="325" width="550" />
    <LargeZone Start="775" width="425" />
    <LargeZone Start="0" width="425" />
  </Profile>
  <Profile Name="P32" NumberOfSmall="4">
    <SmallZone Start="90" width="180" Interval="95" />
    <LargeZone Start="375" width="450" />
    <LargeZone Start="675" width="525" />
    <LargeZone Start="0" width="525" />
  </Profile>
</ZoneRules>
```

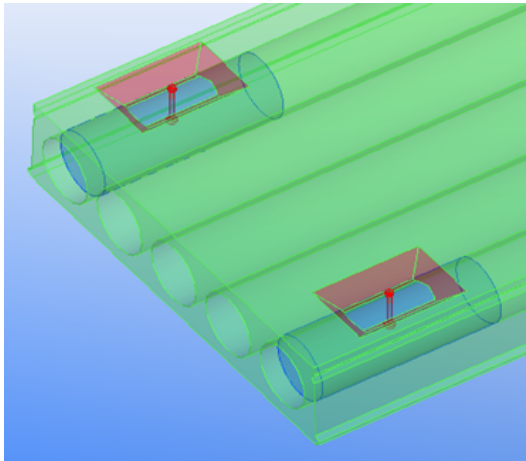
### ***Hollow Core Lifting Loops***

**Hollow Core Lifting Loops** creates lifters for hollow core slabs. **Hollow Core Lifting Loops** works with single hollow core slabs, or with floors that are created with **Modeling of floor bay (66)** modeling tool.

#### **Objects created**

- Lifters

#### **Use for**

Situation	Description
	Hollow core slab with recesses, hollow core fillings and lifting devices.

#### **Limitations**

You also need a lifting device. The lifting device can be created as a custom part, or it can be imported to the model. Alternatively, you can use an external configuration file in XML format to define the properties for the recess, the lifting device and the slab.

## Before you start

Create a hollow core slab and a lifting device.

## Selection order

1. Select the main part (slab).  
The recess and hollow core fillings are created.

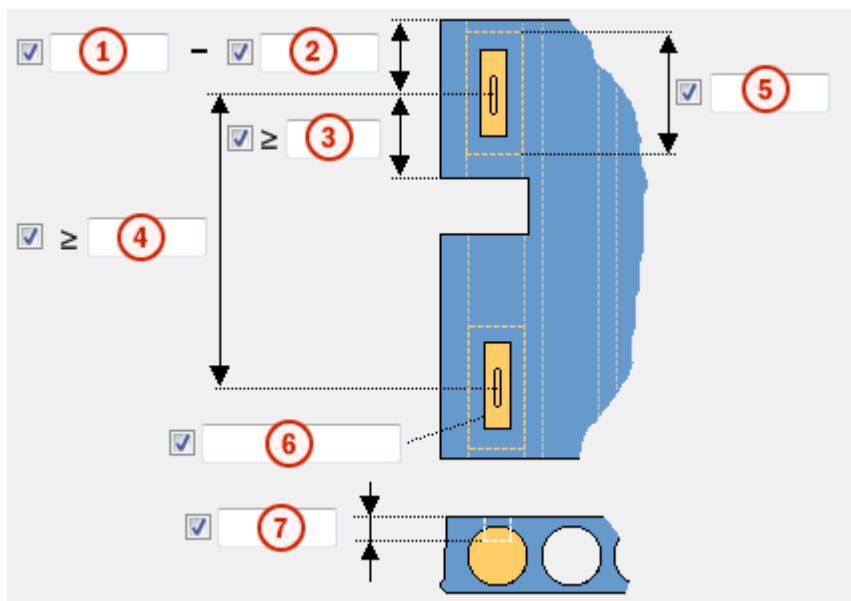
## Basic settings tab

Use the **Basic settings** tab to control the properties of the lifters and hollow core fillings.

## Configuration file

Option	Description
<b>Configuration file</b>	Select the external XML file where you have defined the recess, the lifting device, channel and grouting profiles, and the slab profile properties.
<b>Override</b>	Define whether the values on the <b>Basic settings</b> and <b>Lifting device settings</b> tabs override the properties defined in the external XML file.

## Dimensions

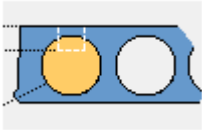
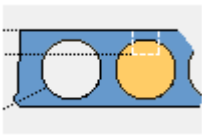
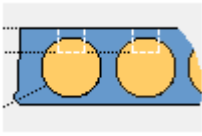


Option	Description
<b>1</b>	Define the minimum distance from the lifter insertion point to the end of the slab.
<b>2</b>	Define the maximum distance from the lifter insertion point to the end of the slab.

Option	Description
3	Define the minimum distance from the lifter insertion point to the edge of an opening.
4	Define the minimum distance between two lifter insertion points.
5	Define the length of the hollow core filling.
6	Define the profile of the recess.
7	Define the depth of the recess.

### Channel numbers

Select the channel numbers:

Option	Description
	At the first channel Default
	At the second channel
	At all channels

### Hollow core filling

Option	Description
<b>Use automatic fill profile</b>	Define whether the automatic hollow core filling profile is used.
<b>Profile</b>	Define the hollow core filling profile.
<b>Prefix</b>	Prefix for the part position number.
<b>Start Number</b>	Start number for the part position number.
<b>Name</b>	Define a name for the lifter. Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use <b>Class</b> to group the lifters. For example, you can display lifters of different classes in different colors.



### Lifting device settings tab

Use the **Lifting device settings** tab to control the properties of the lifting device.

Move individual lifters in the x and y direction with direct modification.

Change the lifter type from the contextual toolbar.

### Properties

Option	Description
<b>Lifter component</b>	Define the custom part that represents the actual lifting device.
<b>Saved properties to use</b>	Select which saved properties to use for the lifting device custom part.
<b>Lifter max load</b>	Define the maximum load for the lifting device.
<b>Rotation</b>	Select the rotation of the lifting device custom part around its axis.
<b>Angle</b>	Define the rotation angle of the lifting device custom part.
<b>Up Direction</b>	Select the lifting device up direction in relation to the local coordinate system.
<b>Offset</b>	Define the offset of the lifting device in relation to the local coordinate system in the corresponding directions.

### Configuration file example

Use an external XML file to define the lifting device, the lifter, and the slab properties.

### Example

configuration file

```
<LiftingsConfiguration>
  </LiftingDevices>
  <Lifter Name="Lifter2" AttrFile="standard" MaxLoad="3000"
    RecessProfile="PRMD300*200-200*100"
    RecessDepth="60" UpDirection="+Z"
    Rotation="0" OffsetX="0" OffsetY="0" OffsetZ="0" />
  <Lifter Name="Lifter3" AttrFile="standard" MaxLoad="3000"
    RecessProfile="PRMD250*200-150*100" RecessDepth="50"
    UpDirection="+Z" Rotation="0" OffsetX="0" OffsetY="0" OffsetZ="0" />
</LiftingDevices>
<Profiles>
  <Profile Name="P27" MinEdgeDistance="200" MaxEdgeDistance="300"
    MinOpeningDistance="200" MinLiftersDistance="400"
    SideCoreDistance="0" CoreFillingLength="500" />
  <Profile Name="P32" MinEdgeDistance="200" MaxEdgeDistance="300"
    MinOpeningDistance="200" MinLiftersDistance="400"
    SideCoreDistance="0" CoreFillingLength="500" />
</Profiles>
</LiftingsConfiguration>
```

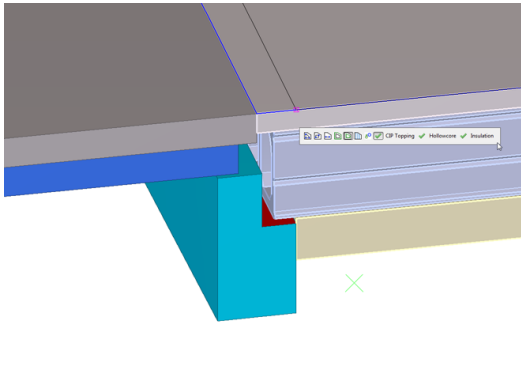
## Floor layout

**Floor Layout** creates floors built of precast filigree, double-tee, and hollow core and solid slabs. The floors may contain several layers, such as precast slabs, insulation and a cast-in-place topping. **Floor Layout** is most useful for non-rectangular floors that contain one or more openings that split slabs into many pieces, and when slab widths are not constant on the whole floor area. You can modify the floors using direct modification.

### Objects created

- Slabs
- Insulation
- Cast-in-place topping

### Use for

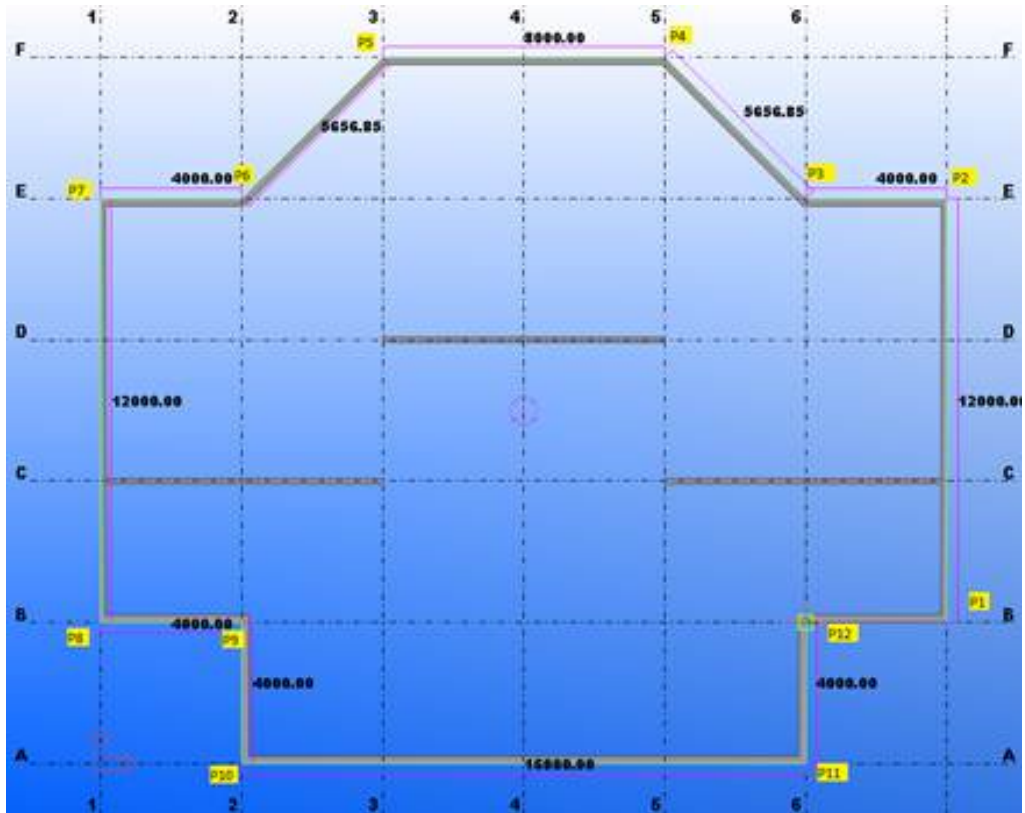
Situation	Description
	Create floor structures that have layers, for example, hollow core slabs at the bottom, insulation as the middle layer, and cast-in-place topping.

### Selection order

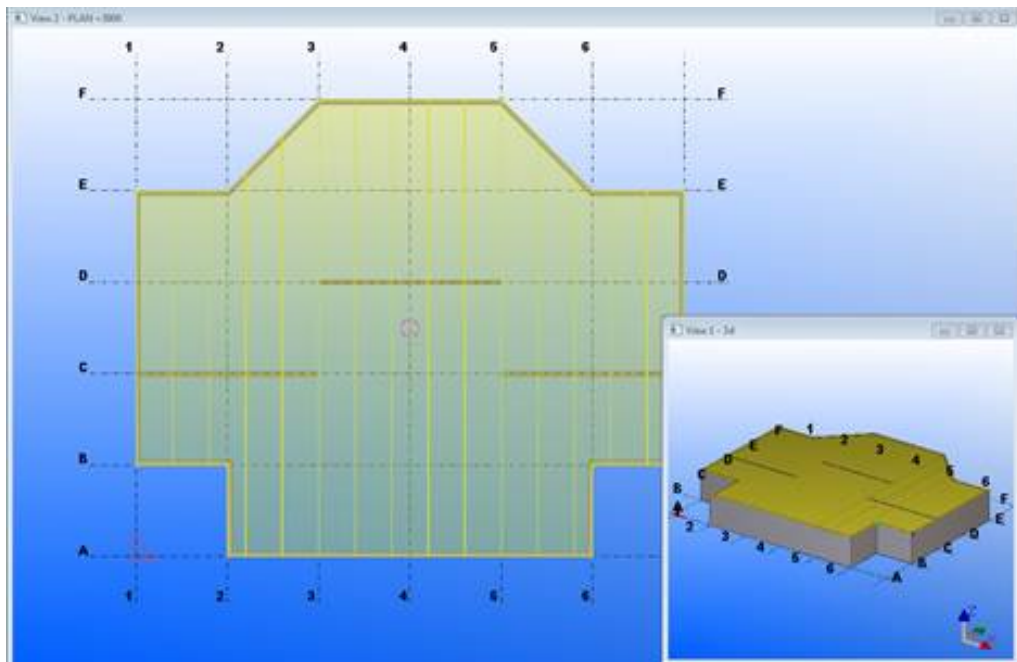
1. On the **Concrete** tab, click **Slab** --> **Floor layout** .
2. Pick the corner points of the floor.

You can pick the points at grid lines or the reference points of supporting parts. You can change the offsets later.

The default slab direction is from the first (P1) point to the second (P2) point. You can change this later if needed.



3. Click the middle mouse button to create the floor.



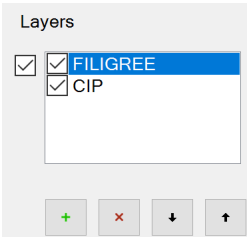




## Convert a slab to floor layout

You can use the **Convert to layout component** tool to convert slabs to **Floor layout** components, see [Convert to layout component \(page 3029\)](#) for instructions.

### Layer tab


Use the **Layer** tab to control the layer type, profile, and how the layer is created.

### Layer list

Layers	Description
	<p>The layer list shows the current layers of the floor. The first layer in the list is the top layer and the last layer is the bottom layer. In the example image on the left, the <code>FILIGREE</code> layer is the top layer and the <code>CIP</code> layer is the bottom layer.</p> <p>Use the buttons to do the following:</p> <ul style="list-style-type: none"> <li>• Click  to add a new layer.</li> <li>• Click  to remove the selected layer.</li> <li>• Click   to change the order of the layers by moving the selected layer up or down in the list.</li> </ul> <p>Use the check box in front of the layer name to control whether the properties of the selected layer are modified.</p> <p>Use the leftmost check box to control if the number of the layers and the order of the layers are modified when you modify the <b>Floor layout</b> component.</p>

### Layer properties

Select a layer in the layer list to define the layer properties.

Option	Description
<b>Layer name</b>	Enter a name for the layer. This is the layer name shown in the layer list. The name is also shown in the direct modification toolbar when you are modifying offsets  . This name is not visible in the model so you can enter any suitable name.
<b>Layer type</b>	Select the layer type. The <b>Precast</b> layer is the primary layer and any insulation parts are added to precast units.

Option	Description
	The parts created for a <b>Cast in place</b> layer are not added to any other cast unit.
<b>Create layer as</b>	Select how the layer parts are created: as beam parts, custom parts, or a single part.
<b>Layer component</b> <b>Component attributes</b>	When the layer parts are created as custom parts, you can select a component and the component attributes.
<b>Layer thickness or profile</b>	When the layer parts are created as beam parts or as a single part, you can select the profile or thickness of the layer parts.  With parametric profiles, you can replace the width of the profile with the text [W]. When you do this, the beam is never cut but the desired width is achieved by setting the profile name based on the slab width.  For example, the profile could be BL80*[W].
<b>Rotation</b>	Select the rotation of the layer parts.
<b>Part name</b> <b>Class</b> <b>Material</b> <b>Pour phase</b> <b>Part prefix, Start no</b> <b>Cast unit prefix, Start no</b>	Define the name, class, material, part prefix and start number of the layer parts. Define the pour phase for CIP layers.

#### General tab

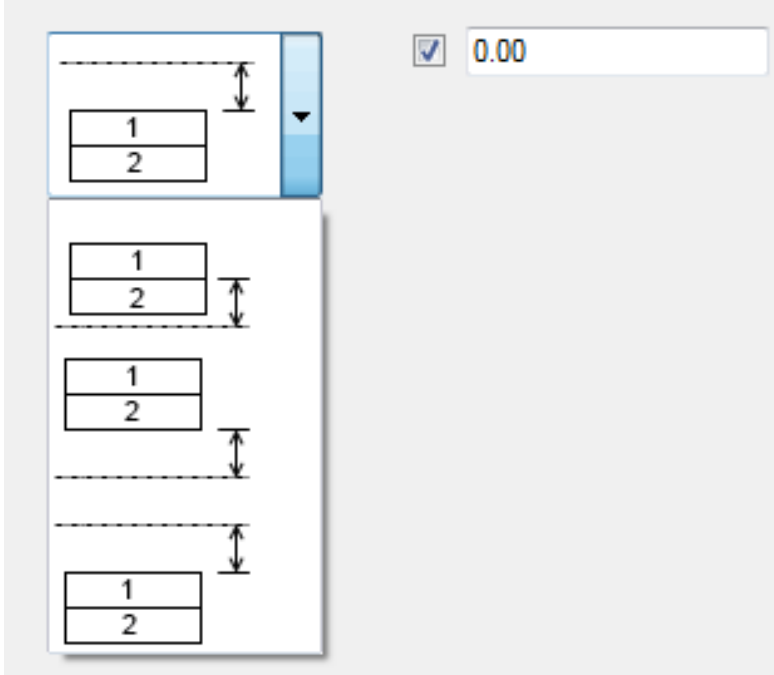
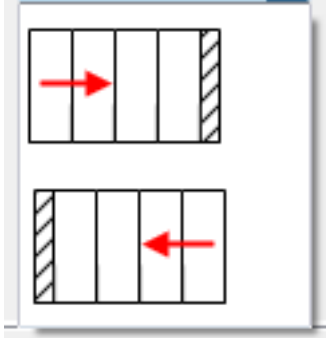
Use the **General** tab to control the default part and gap width, depth position of the layers, and the direction for lining up the slabs.

Select to create slabs and parts by width or number of them from the **Default part width** dropdown list. The options are:

Option	Description
<b>Default part width</b>	Enter the default width for the slabs in the primary layer.  If you define the width of an individual slab in the slab part properties, the Default part width value is not used.

Option	Description
<b>Max part width</b>	<p>Enter the maximum part width.</p> <p><b>Floor layout</b> calculates the slab width by dividing the entire floor width by the maximum width.</p> <p><b>Floor layout</b> then gets the number of slabs that are used to divide the entire floor width to get the optimal slab width taking the seam gap values into account in the calculation.</p> <p>Note that this setting is only recommended for profiles with parametric width (See also <b>Layer thickness or profile</b> in <b>Layer properties</b>), or for slab objects.</p>
<b>Number of parts</b>	<p>Enter the number of parts to be created.</p> <p><b>Floor layout</b> calculates the slab width automatically by dividing the entire floor width by the number of parts.</p> <p>Note that this setting is only recommended for profiles with parametric width (See also <b>Layer thickness or profile</b> in <b>Layer properties</b>), or for slab objects.</p>

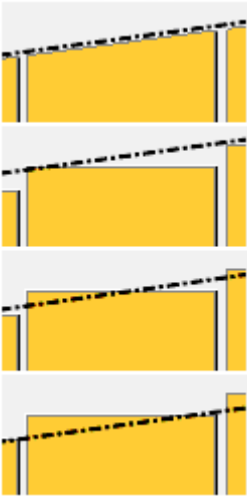
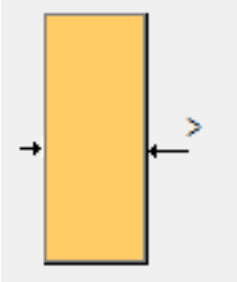
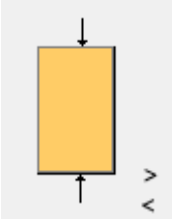
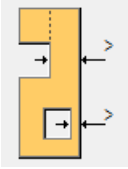
Option	Description
<b>Default gap width</b>	<p>Enter the default seam gap width in the primary layer.</p> <p>If you define the width of an individual gap, the <b>Default gap width</b> value is not used.</p>
<b>Same gap for all</b>	<p>Set the gap width at first and last edges.</p> <p><b>Same gap for all</b> creates gaps that are half of the default gap width.</p> <p><b>No gap at first and last</b> does not create gaps.</p>

Option	Description
<b>Depth position</b>	<p>Select how the layers are positioned in relation to the plane of input points.</p>  <p>The screenshot shows a software interface for the 'Depth position' option. On the left, there are four diagrams illustrating different ways to position two slab layers, labeled '1' and '2', relative to a horizontal dashed line representing the input plane. The first diagram shows layer 1 above layer 2, both below the plane. The second shows layer 1 above the plane and layer 2 below it. The third shows layer 1 above the plane and layer 2 below it, with a larger gap between them. The fourth shows layer 1 above the plane and layer 2 below it, with a very large gap. To the right of these diagrams is a checked checkbox and a text input field containing the value '0.00'.</p>
<b>Line up direction</b>	<p>Select the direction for the slabs. By default, the width of the last slab may differ from the width of the other slabs.</p>  <p>The diagram shows two slab layouts. The top layout consists of four vertical rectangular slabs of equal width, with a red arrow pointing to the right from the first slab. The bottom layout consists of four vertical rectangular slabs of equal width, with a red arrow pointing to the left from the last slab. The right edge of the last slab in the bottom layout is shaded with diagonal lines, indicating a boundary or wall.</p>

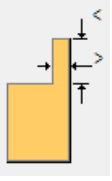
**Advanced tab**

Use the **Advanced** tab to control the minimum angles, and the width and length of the slabs.

Option	Description
<b>Minimum end angle</b> <b>Minimum start angle</b>	<p>Controls how the slab ends are modeled.</p> <p>When the angle of the floor edge is smaller than the minimum angle, you can select a suitable option from the list to make the slab end straight.</p>

Option	Description
	
<p><b>Slab width and cut zone settings</b></p>	<p>Use this setting to select the <code>FloorLayout.ini</code> file that the component is using. The <b>Default</b> option is the file named as <code>FloorLayout.ini</code>.</p> <p>You can customize the allowed slab width, and the allowed locations of cuts and lengths in the <code>FloorLayout.ini</code> file. You can create multiple settings and save these settings in your own <code>xxx_FloorLayout.ini</code> file, for example, <code>MyOtherSetting_Floorlayout.ini</code>.</p>
	<p>Minimum slab width. Slabs narrower than the minimum width are not created.</p>
	<p>Minimum slab length. Slabs shorter than the minimum length are not created.</p> <p>Maximum slab length. Slabs longer than the maximum length are not created.</p>
	<p>Minimum required width of a single neck on either side of the slab when there is a large opening in the slab.</p> <p>If either of the necks on the sides of the opening is smaller than the defined neck width, the neck is cut off completely. In addition, the total width of the necks must be bigger than the minimum slab middle zone neck</p>



Option	Description
	width, otherwise the slab is split into two separate slabs (the width of the actual opening is the same as the width of the slab).
	Minimum end nose width and length. If there are noses on both sides of the slab, these two end noses are checked separately and cut off if the width of the single nose gets smaller than the given minimum required nose width.
<b>Align openings by allowed widths</b>	Select <b>Yes</b> to re-align the opening/cut longitudinal edges to match the allowed width zones. The default value is <b>No</b> .
<b>Create cut-outs</b>	Select to create cut-outs for notches or openings. Selecting to create cut-outs does not affect whether the slab is split.
<b>Extra narrowing</b>	Define the gap increase between the slabs when the other slab is cut inside the layout. The default value is 0.
<b>Classes or names of parts to cut out</b>	Creates automatic cut-outs for parts going through the floor layout. Enter the names or classes for parts that need cut-outs.

### Customize allowed slab width and length

You can customize the allowed slab width, and the allowed locations of cuts and lengths in the `FloorLayout.ini` file. This file can be located under the model folder, or in any of the folders defined in the `XS_FIRM`, `XS_PROJECT`, or `XS_SYSTEM` advanced options.

If the file contains any values for a profile, these values are used and they override the minimum and maximum values entered in the **Floor layout** dialog box. In the **Floor layout** dialog box, you can define the slab width on the **General** tab and the slab length on the **Advanced** tab.

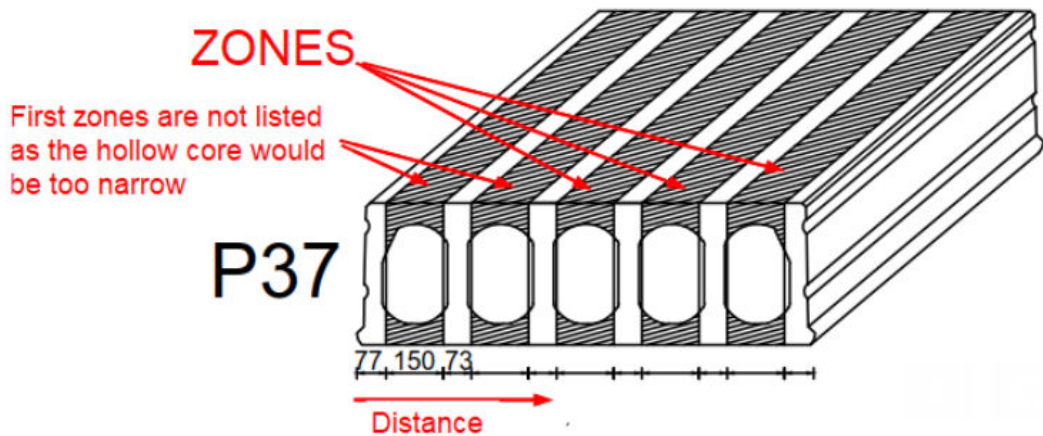
The images below show examples of the `FloorLayout.ini` file and allowed zones:

```
//
// configuration file for "Floor Layout" component
//
// Slab not listed below can have any width. Slab listed below can only
// have width inside the given range.
// User input values will be rounded down to the nearest allowed value.
//
//           Zone 1      Zone 2      Zone 3      Zone 4
Zone 5
// Slab widths  Profile    min. max.    min. max.    min. max.    min.
max.    min. max.
SLAB WIDTH    P15 (150X1200)  345-435    485-575    625-715
765-855    905-995    1045-1135
SLAB_WIDTH    P18 (175X1200)  392-492    549-649    706-806
```

863-963	1020-1120			
SLAB_WIDTH	P20 (200X1200)	270-370	450-560	640-750
830-930	1020-1120			
SLAB_WIDTH	P27 (265X1200)	320-440	540-660	760-880
980-1110				
SLAB_WIDTH	P32 (320X1200)	380-560	660-830	930-1110
SLAB_WIDTH	P32R (320X1200)	380-560	660-830	930-1110
SLAB_WIDTH	P37 (370X1200)	320-440	540-660	760-880
980-1120				
SLAB_WIDTH	P40 (400X1200)	400-530	670-800	950-1080
SLAB_WIDTH	P50 (500X1200)	390-530	670-810	950-1080

```
//Allowed zones to place a cut
//
// Zone 1      Zone 2      Zone 3      Zone 4
Zone 5
// Cut zones  Profile      min. max.      min. max.      min. max.      min.
max.      min. max.
CUT_ZONES  P15 (150X1200)  325-455      465-595      605-735
745-875    885-1015      1025-1155
CUT_ZONES  P18 (175X1200)  372-512      529-669      686-826
843-983    1000-1140
CUT_ZONES  P20 (200X1200)  250-390      430-580      620-770
810-950    1000-1140
CUT_ZONES  P27 (265X1200)  300-460      520-680      740-900
960-1130
CUT_ZONES  P32 (320X1200)  360-580      620-850      910-1130
CUT_ZONES  P32R (320X1200) 360-580      620-850      910-1130
CUT_ZONES  P37 (370X1200)  300-460      520-680      740-900
960-1140
CUT_ZONES  P40 (400X1200)  380-550      650-820      930-1100
CUT_ZONES  P50 (500X1200)  370-550      650-830      930-1100
/
// Min/max lengths by slab profile & width min/max
//
// Profile      Width min/max      Length min/max
SLAB_LENGTH  P15 (150X1200)      0-1200      1000-8000
SLAB_LENGTH  P18 (175X1200)      0-1200      1000-9000
SLAB_LENGTH  P27 (265X1200)      0-1200      1000-12000
SLAB_LENGTH  P32 (320X1200)      0-830       1000-13000
SLAB_LENGTH  P32 (320X1200)      830-1200    1000-14000
SLAB_LENGTH  P32R (320X1200)     0-1200      1000-14500
SLAB_LENGTH  P37 (370X1200)      0-660       1000-14000
SLAB_LENGTH  P37 (370X1200)      660-1200    1000-15000
SLAB_LENGTH  P40 (400X1200)      0-800       1000-16000
SLAB_LENGTH  P40 (400X1200)      800-1200    1000-17000
SLAB_LENGTH  P50 (500X1200)      0-810       1000-19000
SLAB_LENGTH  P50 (500X1200)      810-1200    1000-20000
```

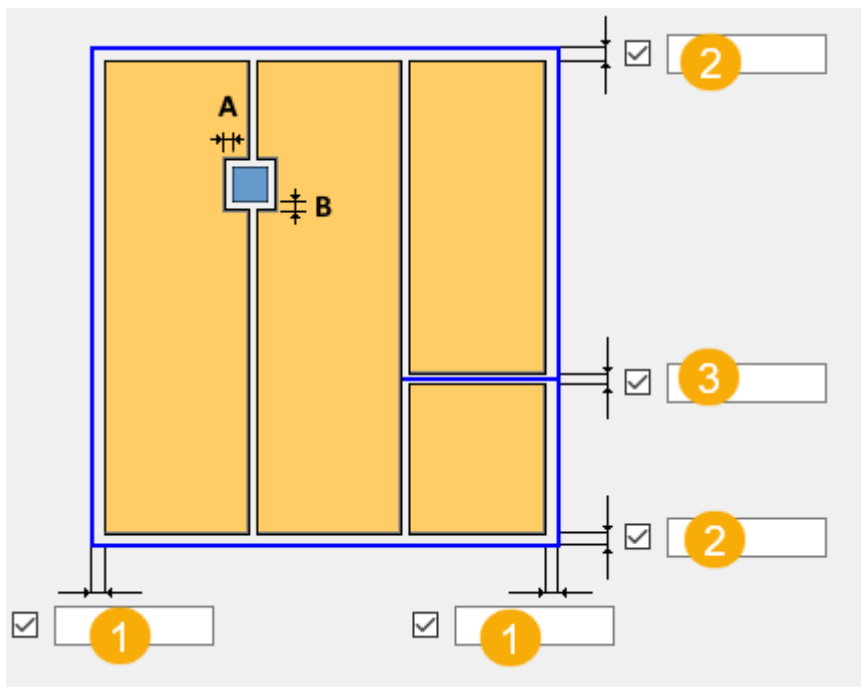
For example, in the following image, zone 1 is: 523-673 (77+150+73+150+73 - (+150)).



You can create multiple settings and save these setting in your own xxx\_FloorLayout.ini file, for example, MyOtherSetting\_Floorlayout.ini.

### Default offsets

Use the **Default offsets** tab to set the default offsets for each layer. These default offsets will be used whenever a specific value is not given for the edge.



	Description
1	Default offset for the side offset. Offset that is parallel to the bearing direction.

	Description
<b>2</b>	Default offset for the end offset. All other offsets that are not side offsets.
<b>3</b>	Default offset for the break line. The default value is 10. If the break line value is 0, the objects are not split.
<b>A</b> <b>B</b>	Define offsets for the automatically created cut-outs. You can define separate offsets for every layer.
<b>Cutting around</b>	Define how the automatic cut-outs are made in the selected layer: <b>By rectangle</b> or <b>By shape</b> . With <b>By shape</b> , the cut shape is the same as the shape of the part. For example, when the column is round, a round cut is created. You can also select not to create the cut. When you select <b>Do not create</b> , automatic cut-outs are not created in the layer.


### Detailing tab

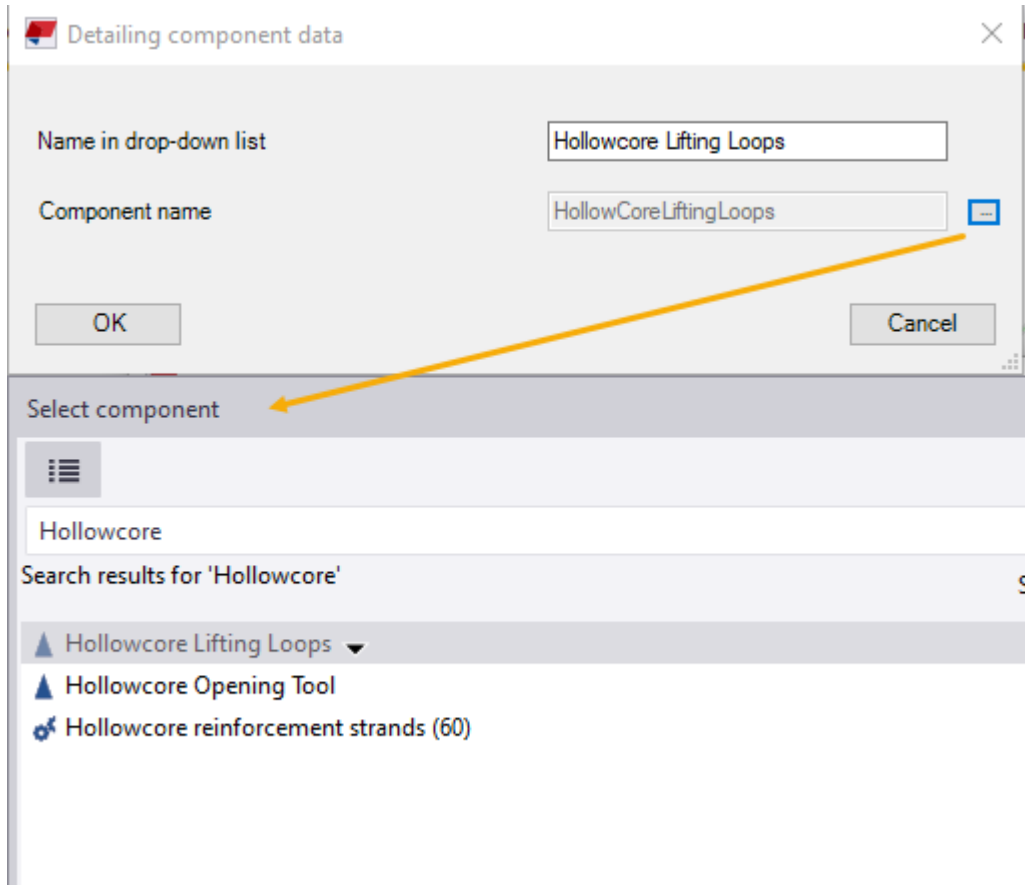
Use the **Detailing** tab to select the components that are applied to all slabs in the floor.

Option	Description
<b>Component name</b>	Select a component that is applied to the slabs in the floor.
<b>Component attr file name</b>	Select the settings that are used with the component you have selected.  The list contains all the files that are available for the selected component.

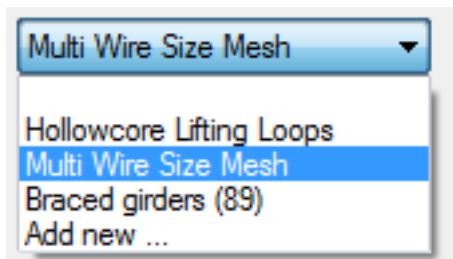
### Adding a component to the component name list

The component name list is empty by default. You can add components to the list:

1. Select **Add new** from the list.  
The **Detailing component data** dialog box is displayed.
2. Enter a suitable name in the **Name in dropdown** box.
3. Click  to open the **Applications & components** catalog.
4. Select a component and click **OK**.  
The component name or number is added to the **Component name** box.
5. Click **OK**.



When you have added the needed components, the names of the components are shown in the component name list as shown in the example image below. Select a component from the list:



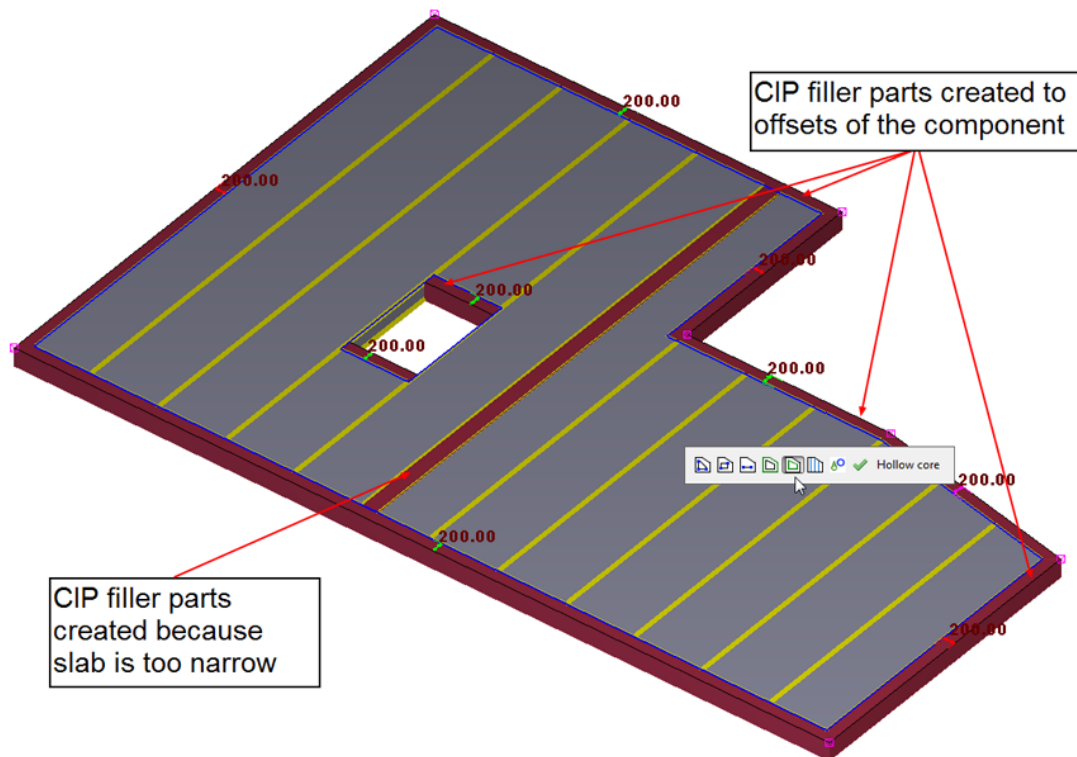
The list is stored in the `\attributes` folder under the model folder.

If you want to predefine the list to contain your favorite components in any new models, you can copy the `LayoutConfiguration.datx` file from the `\attributes` folder under the model folder to any of the folders defined in the `XS_FIRM`, `XS_PROJECT` or `XS_SYSTEM`.

### **CIP filler part tab**

Use the **CIP filler part** tab to create CIP filler parts into the empty areas in floors created with **Floor layout**. The empty areas are spaces created by

offsets around the exterior and interior boundaries. There may also be empty areas when the slab is too narrow to be created with **Floor layout**.



CIP filler parts can also be created when:

- The allowed slab width is smaller than the needed width.
- The opening is larger than needed because of allowed width zones.
- The slab is split into two because of a large opening.
- The slab nose is not created because it is too narrow.

### CIP filler part properties

Option	Description
<b>Create filler parts</b>	Select whether CIP filler parts are created, or whether the filler parts are created using the same material as the layer.
<b>Minimum width</b>	Minimum width of the part. If the empty space is smaller than this width, the part is not created in this location.

Option	Description
<b>Cast unit prefix</b>	Cast unit prefix of the CIP filler part
<b>Start no</b>	Cast unit start number of the CIP filler part
<b>Name</b> <b>Class</b> <b>Material</b> <b>Finish</b> <b>Pour phase</b>	Define the name, class, material, finish and pour phase of the CIP filler parts.
<b>Fill seam gaps</b>	Select whether seam gaps are filled.

### Properties tab

Use the **Properties** tab to define the IFC4 export entities and concrete cover thickness for rebar sets. You can define these properties for each layer separately.

### Properties

Option	Description
<b>IFC export</b>	<p>You can define IFC4 entities for parts and cast units. The cast unit values are used for main part layers, cast-in-place layers, and sub-assembly layers. The values for each layer are taken from the main part of the cast unit to which the layer belongs.</p> <p>Select an <b>IFC entity</b> and a <b>Subtype (IFC4)</b>. If you select <b>USERDEFINED</b> as the IFC4 subtype, you can define the <b>User-defined type (IFC4)</b>.</p>
<b>Concrete covers for rebar sets</b>	<p>You can define the concrete cover thickness on the part level.</p> <p>Select whether to use the global or local coordinate system, and define the coordinates according to your selection.</p>

### User defined tab

Use the **User defined** tab to set the user-defined attribute values for the slabs.

If you have defined the user-defined attributes in the part properties dialog box and want to use those values, leave the **User defined** tab empty.

The content of the tab may vary depending on your environment, see below how to customize the content.

### Customizing the User defined tab

You can customize the content of the **User defined** tab using the `floorlayout.objects.inp` file. Note that you cannot create new user-defined attributes with the file. The user-defined attributes on the tab are existing user-defined attributes that have been defined in the `objects.inp` file. The `floorlayout.objects.inp` file has the same format as the `objects.inp` file.


The `floorlayout.objects.inp` file can be located in any of the folders set in the `XS_FIRM`, `XS_PROJECT` or `XS_SYSTEM` advanced options, or in the model folder.

Below is an example of the `floorlayout.objects.inp` file:

```
part(0,"Part")
{
  tab_page("Parameters")
  {
    attribute("comment", "j_comment", string, "%s", no, none, "0.0",
"0.0")
    {
      value("", 0)
    }
    attribute("xs_shorten", "j_xs_shorten", distance, "%d", yes,
none, "0.0", "0.0")
    {
      value("0.0", 0)
    }
    attribute("USER_FIELD_1", "j_user_field_1", string, "%s", no,
none, "0.0", "0.0")
    {
      value("", 0)
    }
    attribute("USER_FIELD_2", "j_user_field_2", string, "%s", no,
none, "0.0", "0.0")
    {
      value("", 0)
    }
    attribute("USER_FIELD_3", "j_user_field_3", string, "%s", no,
none, "0.0", "0.0")
    {
      value("", 0)
    }
    attribute("USER_FIELD_4", "j_user_field_4", string, "%s", no,
none, "0.0", "0.0")
    {
      value("", 0)
    }
  }
}
```













## Modifying a floor

You can use direct modification to modify the floor. Before you start, ensure that the **Direct modification**  switch is active. Select the floor to display the direct modification toolbar.

To modify the floor, select the appropriate command from the toolbar.



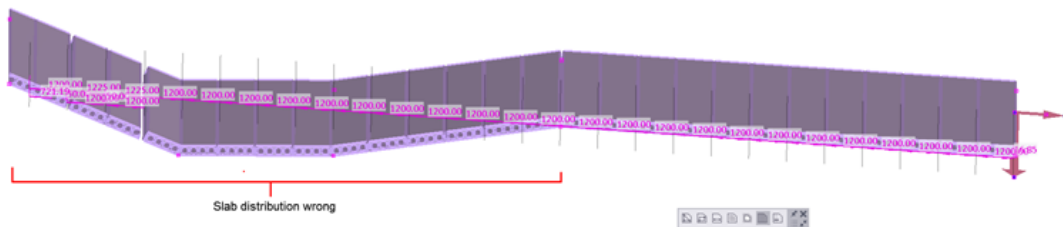
Button	Description
	Add a polygonal opening.
	Add a rectangular opening.
	Add a circular opening.
	Add a break line to split the slab into two slabs.
	Modify the openings or exterior boundary of the floor. This command is active by default. Make the floor warped by offsetting one or more vertices of the exterior boundary polygon from the plane.
	Modify the offsets at floor boundaries.
	Modify the layout of the floor: <ul style="list-style-type: none"><li>• Modify the width or profile of any of the slabs in the floor.</li><li>• Modify the side of the cut when the slab is cut to a smaller width.</li><li>• Modify the gaps between the slabs.</li><li>• Modify the direction of the slabs.</li><li>• Modify the order of slabs when the slabs do not have the same width or profiles.</li></ul> You can click the  button to reset all seam gaps and slab distribution to the initial default values that were used when the floor layout was created.
	Add or modify the detailing components that are only applied to certain slabs in the floor layout. The detailing components are listed on the <b>Detailing</b> tab. You can apply the same detailing component settings to all slabs in the floor layout using the floor layout attributes.

Button	Description
	Click the refresh command to rerun the component. For example, if you have new parts that should cut holes around them, the refresh command ensures that the cuts are shown correctly.


### Known limitations

**Floor layout** is not designed to work with floors where the layout is not in one plane. Edges can be offset from the plane only to warp the floor, not to make floors that have several planes.

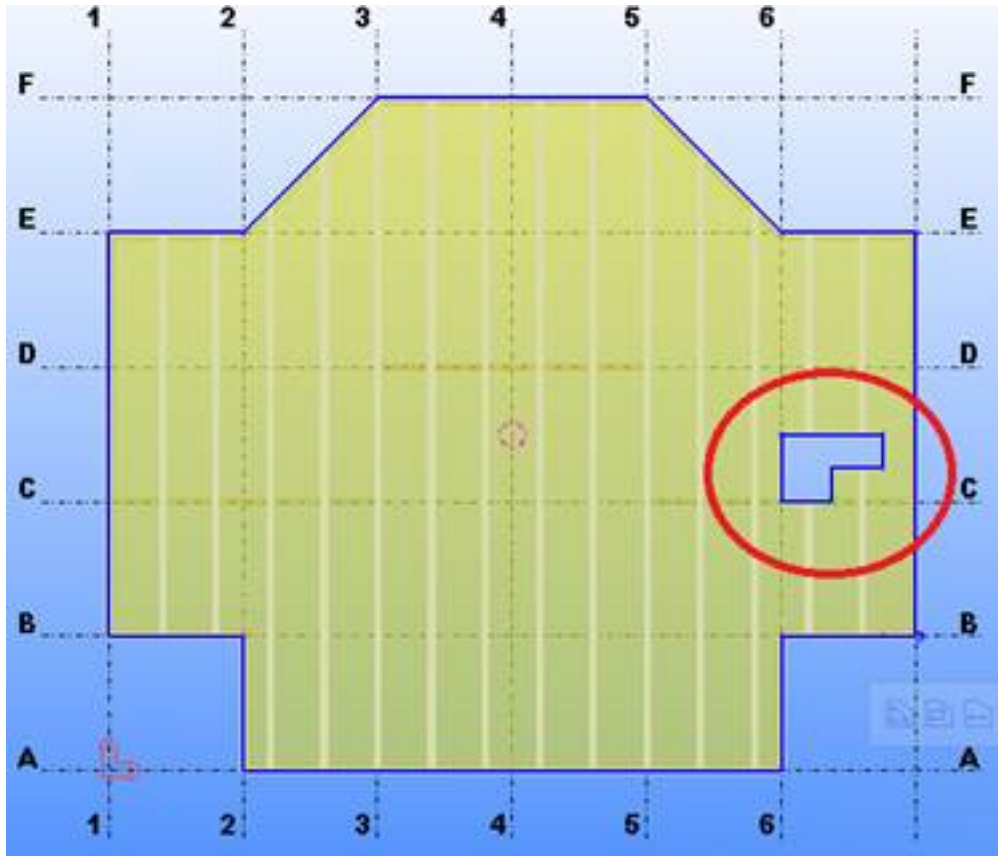
The image below shows an example where **Floor layout** has been used to create several planes. If precast slabs are used in this way, the outcome is not correct. Use multiple **Floor layout** components to create precast floors with several planes.




### Add a polygonal opening

1. Click .
2. Pick the corner points of the opening.

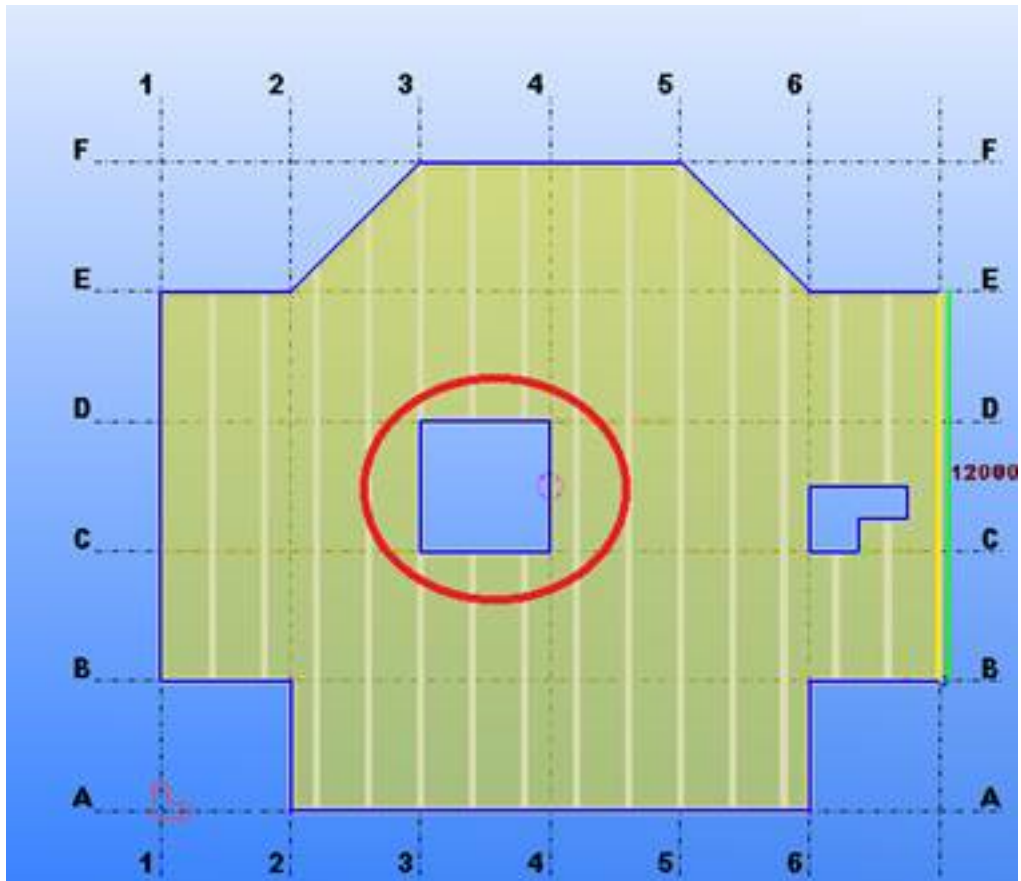
You can pick the points at grid lines or you can pick the reference points of supporting parts. You can change the offsets later.




### Add a rectangular opening

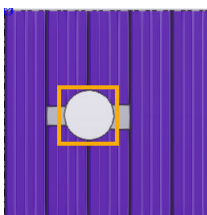
1. Click .
2. Pick the corner points of the opening.

You can pick the points at grid lines or you can pick the reference points of supporting parts. You can change the offsets later.



### Add a circular opening

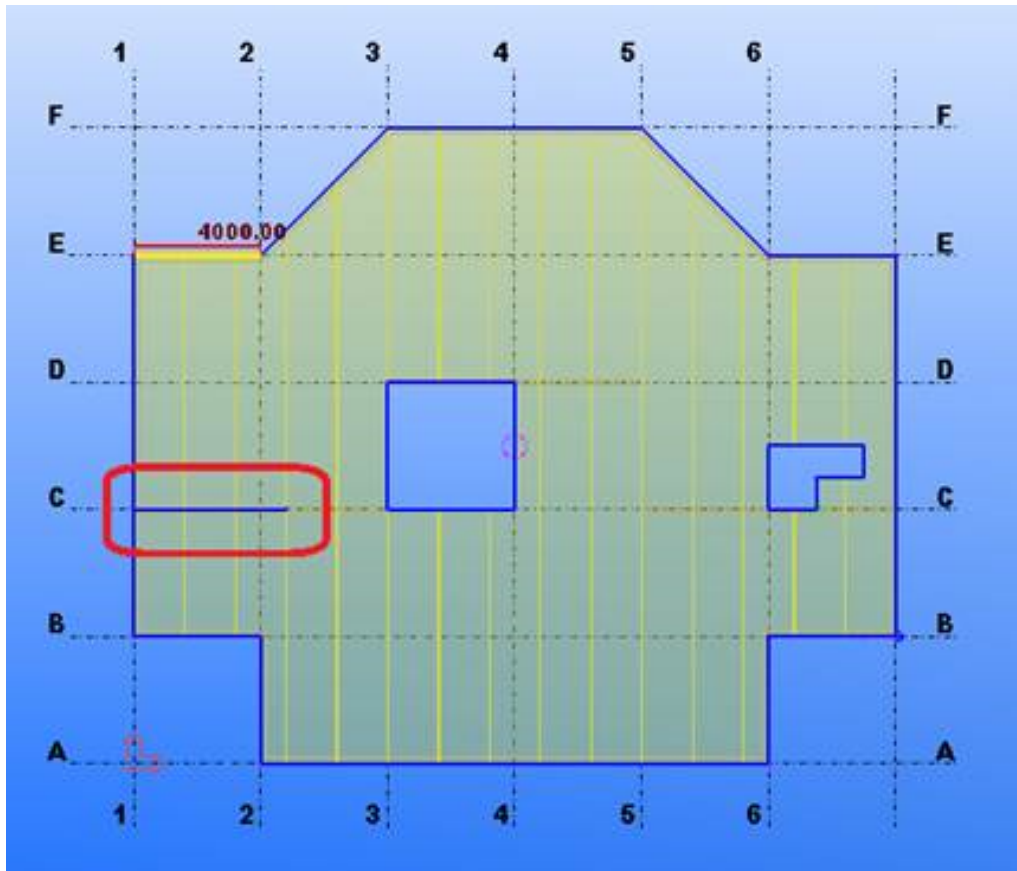
1. Click .
2. Pick the center point of the opening.
3. Pick the radius of the opening.




### Add a break line to split the slab into two slabs

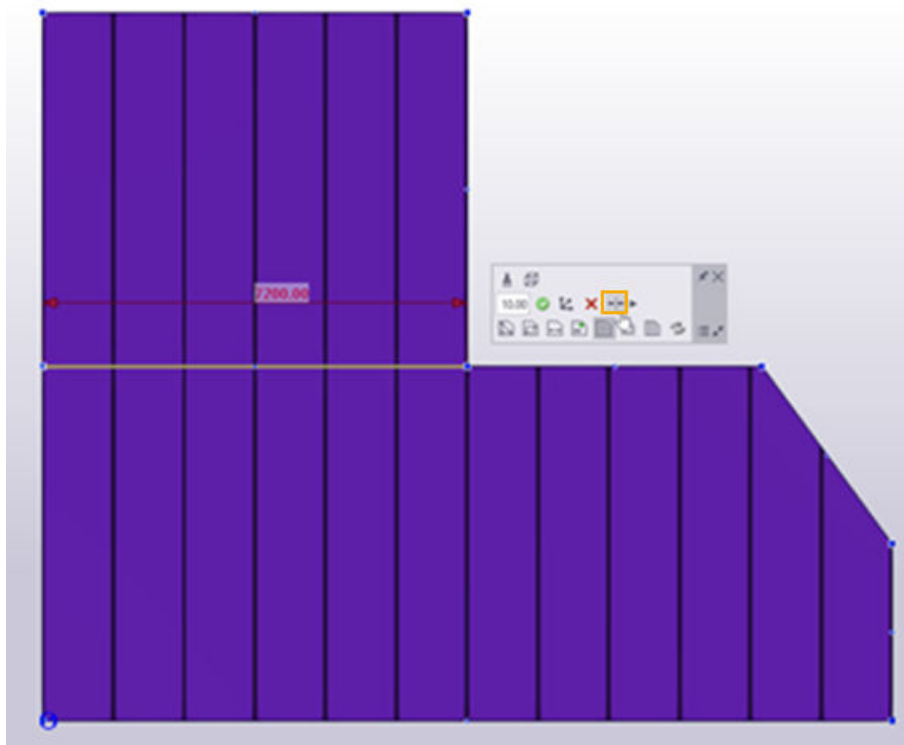
1. Click .

2. Pick the end points of the break line.




### Split the floor layout to two separate floor layouts

1. Select either a seam or a break line.
2. Click  on the contextual toolbar.



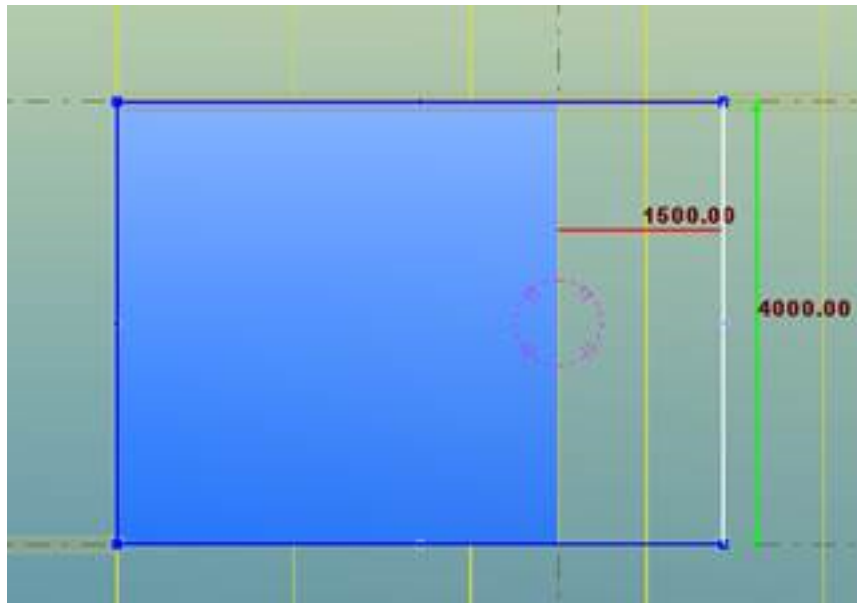
After the splitting, you can modify both layouts independently. Note that splitting cannot be reverted, and you cannot combine the two layouts again.

### **Modify the openings and exterior boundary of the floor**

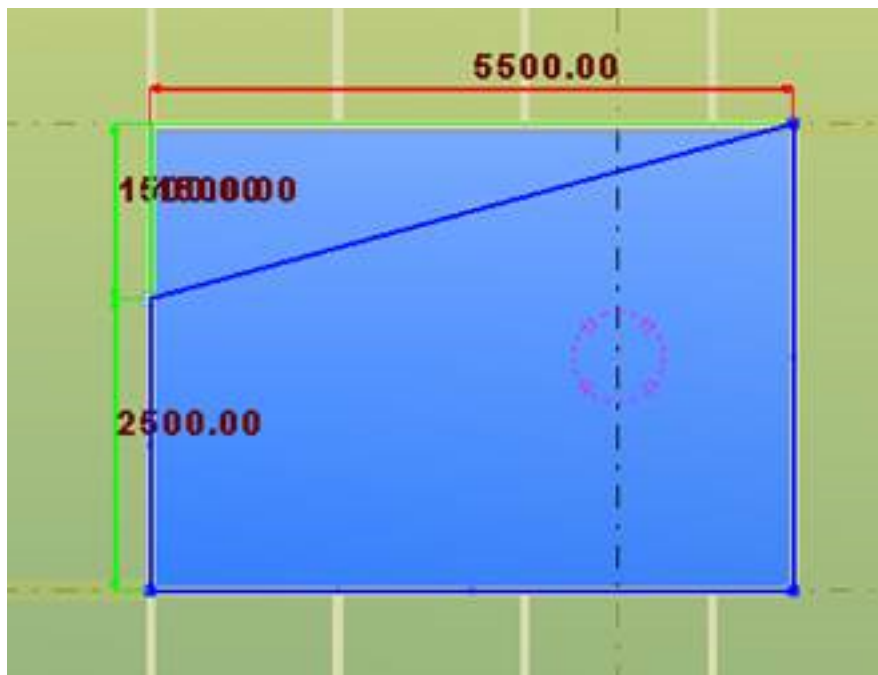
1. The  button is active by default.  
The handles are shown for the exterior boundary and for all openings in the floor.

2. Do any of the following:

- To move an edge, drag any of the edge lines. Hold down the left mouse button when dragging.



- To move a corner point, drag the handle in the corner.

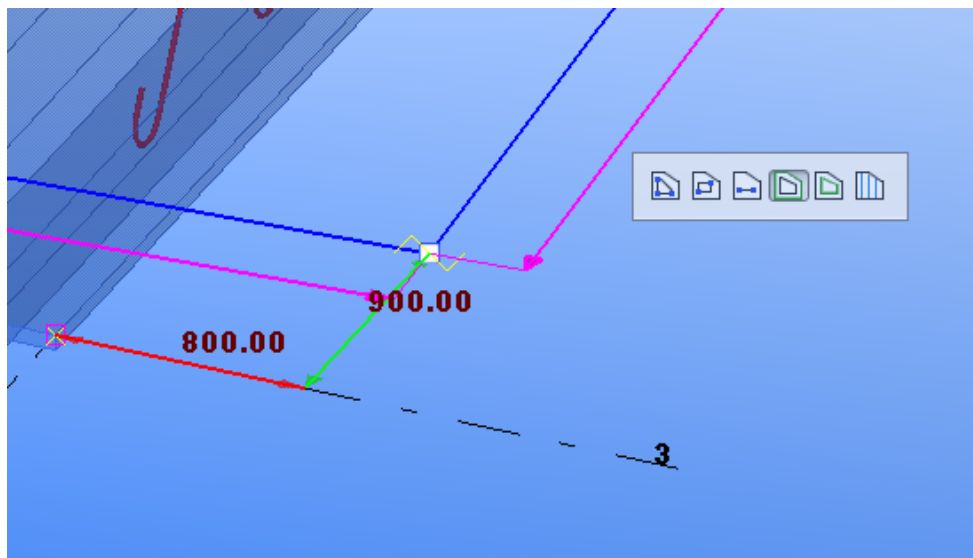


- To add new points to the edge, drag the handle in the middle of the edge.



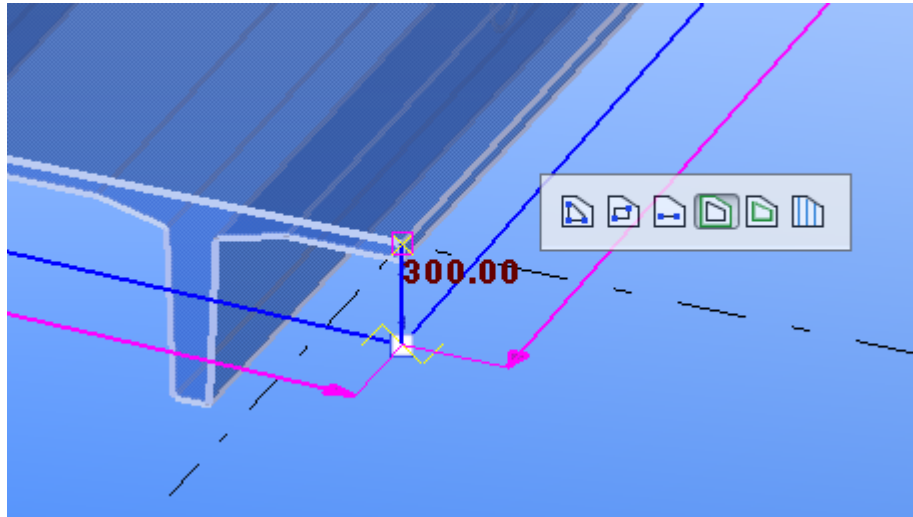
- To delete any of the points, select the handle in the corner and press the **Delete** key.
- To make the floor warped, offset the vertices of the exterior boundary so that all vertices are not in the same plane.

Drag a handle normally to move the vertices in the original floor plane.

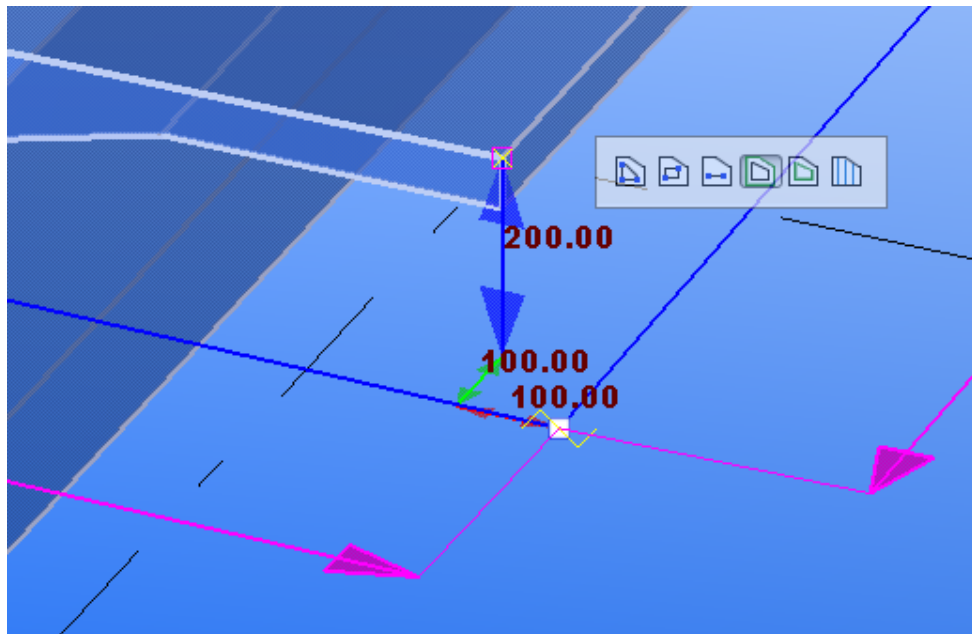


Hold down the **Alt** key while dragging to move the vertex perpendicular to the floor plane.





Hold down the **Alt** and **Shift** keys to move the vertex both in the plane and off from the plane by snapping to any point in the model.



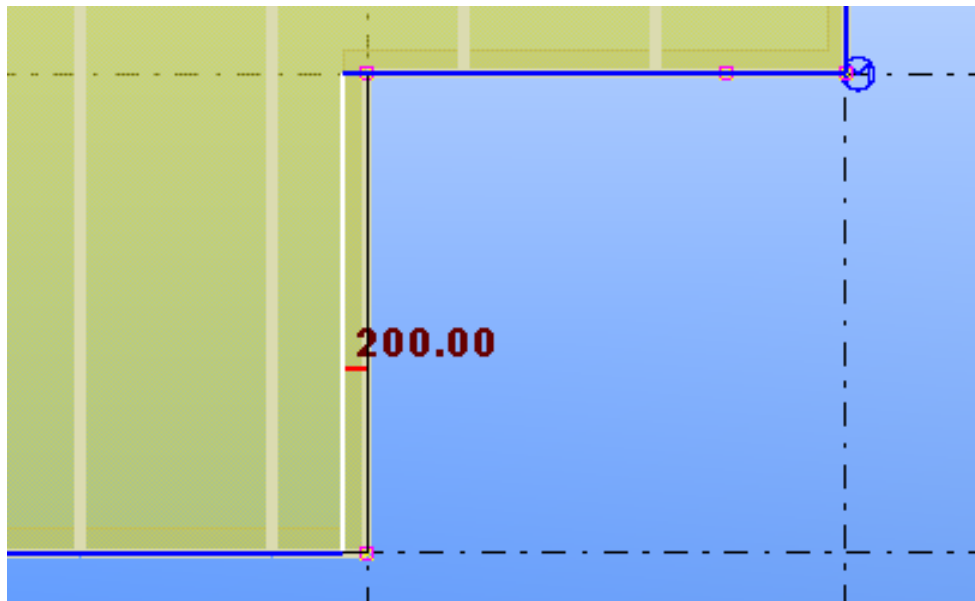
### Modify the offset at floor boundaries


1. Click .

The handles for modifying the offset are shown. If there are offsets, the offset dimensions are also shown.

2. To adjust the offset, do one of the following:

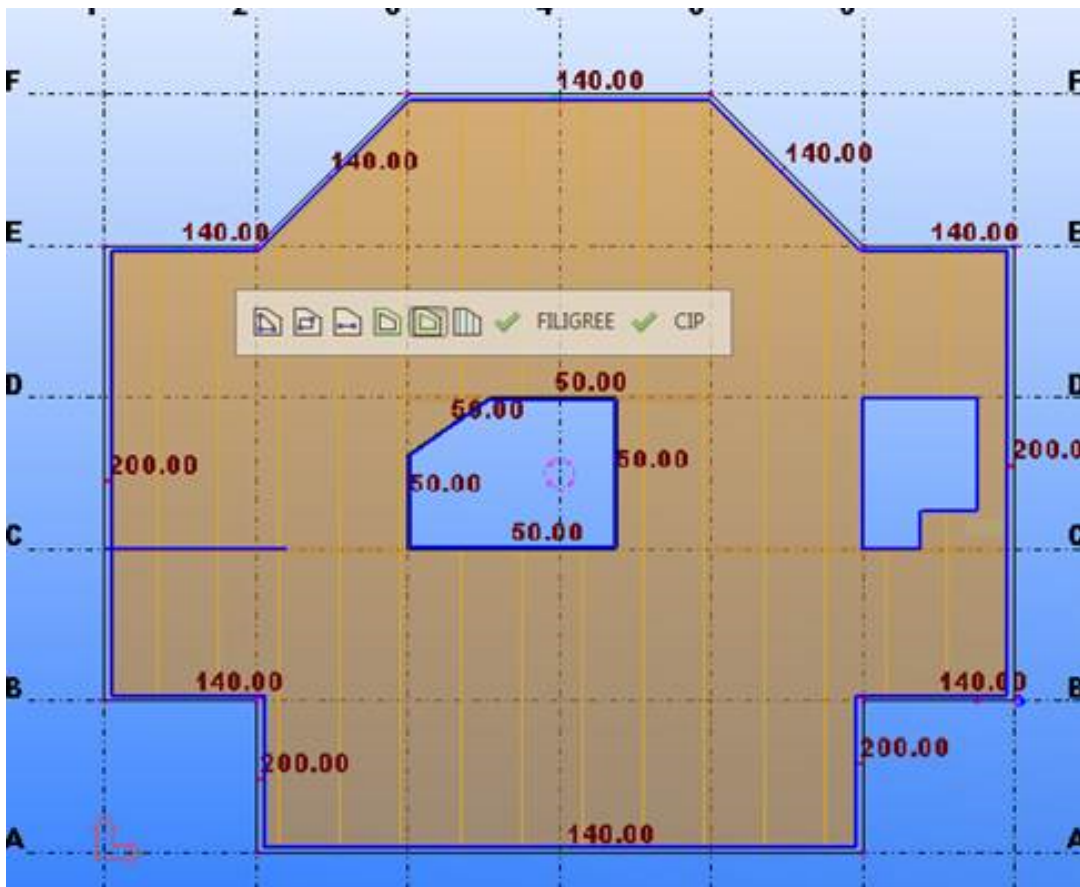
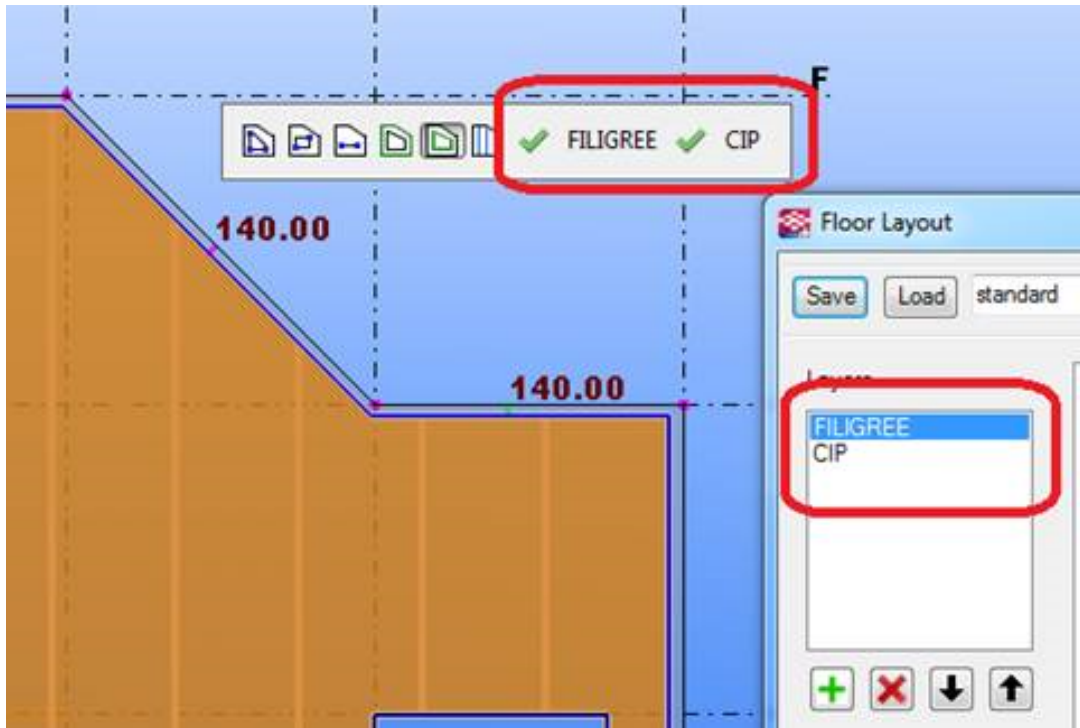
- Drag the edge offset lines.



- Select one or more offset lines by holding down the **Shift** key. When you have the offset lines selected, right-click on any of the selected lines. Enter the offset value to the toolbar that is displayed and click .



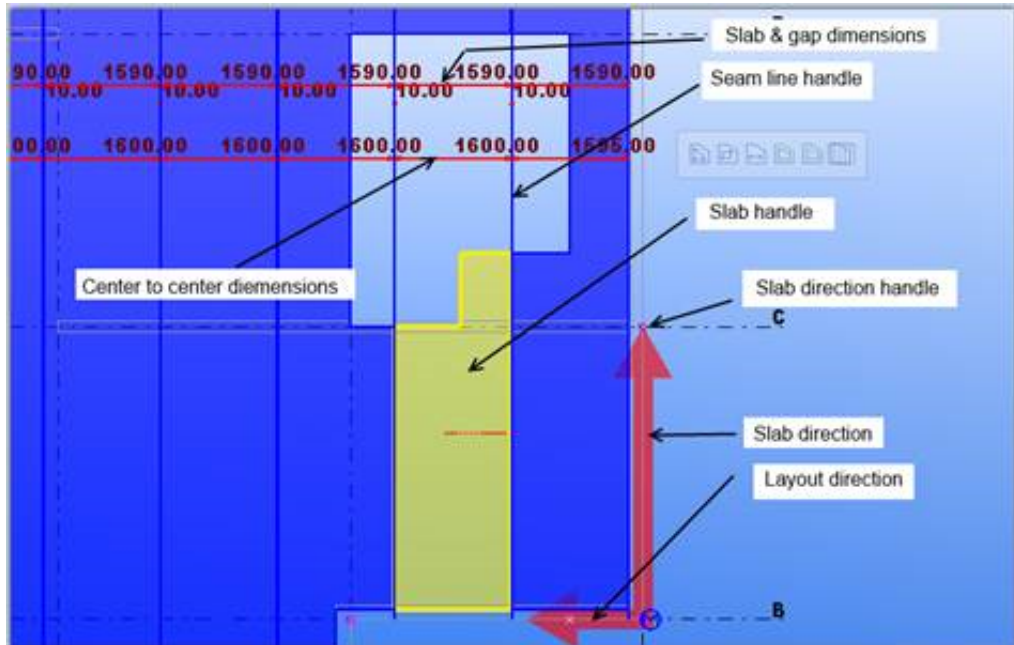
Note that when you use the offset command, the direct modification toolbar shows the floor layout layers. Each layer may have different offsets. You can select which layers to modify. The simplest way is to select all layers and have the offsets equal in each layer.



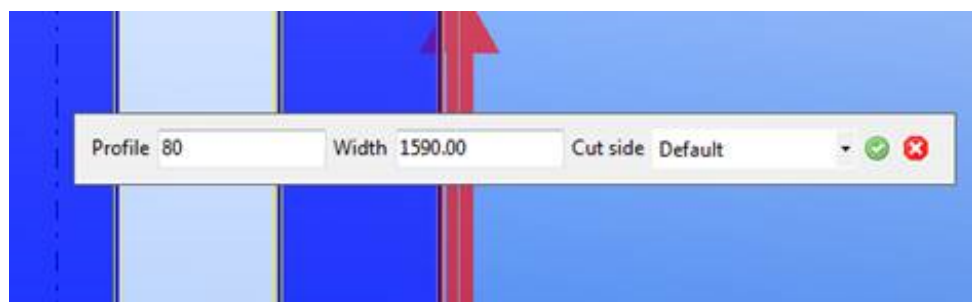
## Modify the layout of the floor

1. Click .

The following direct modification elements are shown:




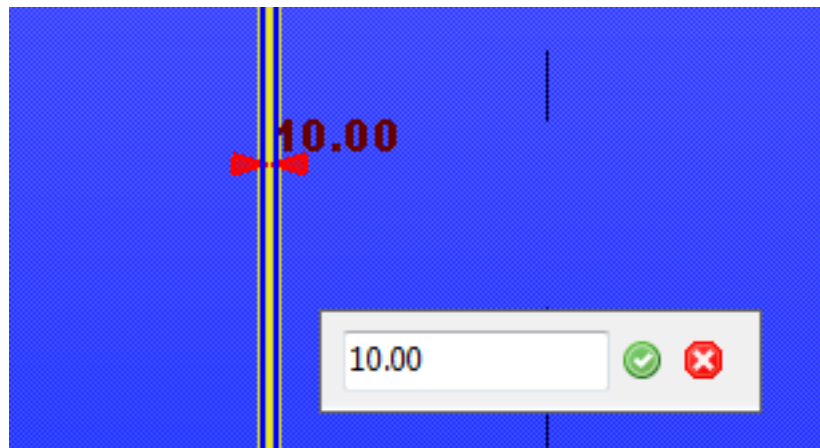
2. To modify the layout of the floor, do any of the following:
  - To modify slab width, do one of the following:
    - To move all seams, select one seam and start dragging.
    - To add a new seam, select a seam, hold down the **Ctrl** key and start dragging. When you stop dragging and release the mouse key, a new seam is added to that location.
    - To make one slab smaller, select a seam, hold down the **Alt** key and start dragging. The slab on the left or right side is made smaller and all slabs on the other side will move with the seam.
  - To modify the profile, width, and cut side of a slab, right-click the slab handle.



When the profile of the slab is fixed (not parametric), the slab is cut on either side when the width is smaller than the original width. The **Default** cut side is leading edge for the first slab and trailing edge for all others in relation to the layout direction.

You can modify the properties of multiple slabs at the same time by holding down the **Shift** key when selecting slabs.

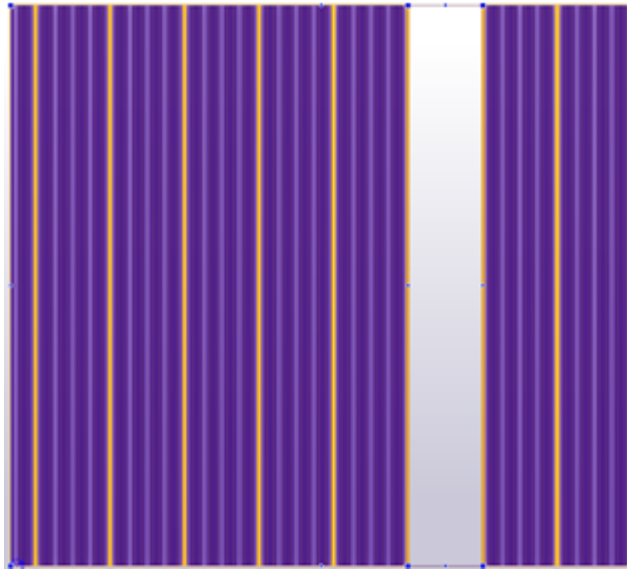
- To modify the gap width between the slabs, do one of the following:
  - Drag the end of the gap dimension.
  - Right-click a seam line handle, enter the width and click .



You can modify multiple gaps at same time by holding down the **Shift** key when selecting seam line handles.

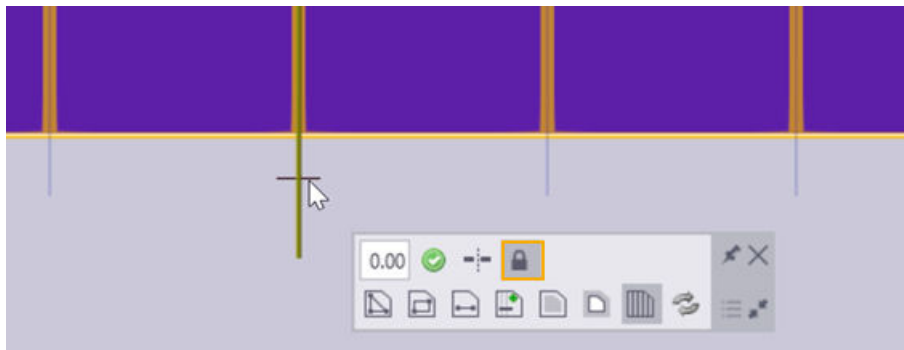



- To remove a slab from the layout, create a rectangular opening to the layout by picking the corner points for the opening.




### Lock and unlock seams

You can lock and unlock seams on the contextual toolbar.



1. Select a seam.
2. Click  to lock the seam.

The button changes to  when the seam is locked. Click the button again to unlock.

When a seam is locked and you are dragging the seams (with or without the **Alt/Ctrl** key pressed), only the seams in the range between the locked seams are changed. The first and last seams in the layout are always locked.

Locked seams keep their location, and new slabs are created or removed inside the locked range if you change the slab width, seam gap or seam center measures, or remove any of the slabs with narrowed width.

### Add and modify property strips

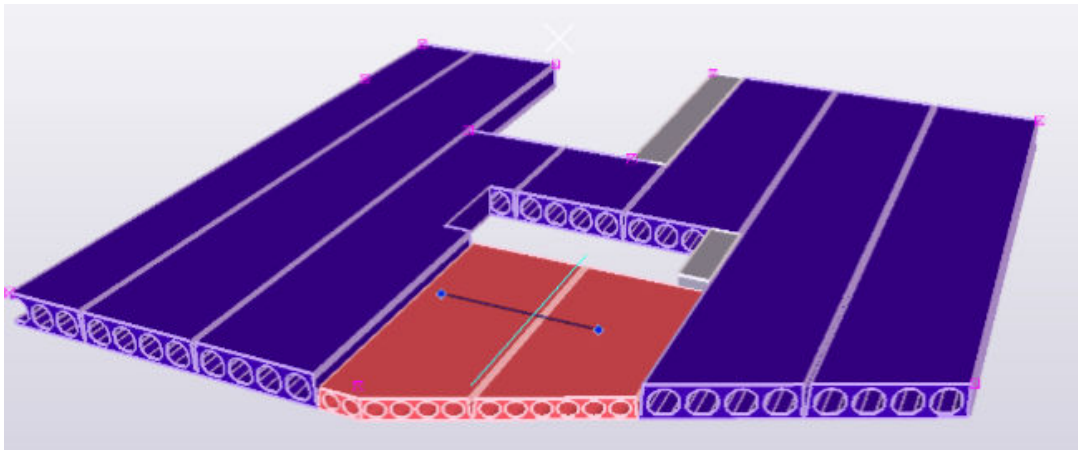
You can use property strips to control the properties and detailing components of individual slabs in the floor layout.

### Property strips


You can define property strips that have certain properties and detailing components, and use the property strips according to your needs in the floor layout. For example, you can change the profile and class of the individual hollow core slabs. Note that property strips only affect the main layer parts.

Property strips are added as lines in the floor layout plane. Property strips affect the parts that they are touching. You can also set property strips so that they affect through the slab line.

The image below shows an example of a property strip. The two slabs in the floor layout have a different class and profile because of the property strip.



To create a property strip in the floor layout:

1. On the contextual toolbar of **Floor layout**, click  to open a dialog box for defining the property strip.
2. On the **Properties** tab, define the individual slab properties.

Option	Description
<b>Effect in layout</b>	Select how the parts in the floor layout are affected: <ul style="list-style-type: none"><li>• <b>Hit slabs only:</b> The property strip only affects the parts it is touching.</li><li>• <b>All slabs in line:</b> All slab parts in the line are affected if one slab line is split to two or more individual parts.</li></ul>



Option	Description
<b>Layer thickness or profile</b>	Change the thickness or profile of the layer.
<b>Depth position</b>	If the profile height is different, you can adjust the alignment according to: <ul style="list-style-type: none"> <li>• <b>Bottom</b> face aligned with other slabs.</li> <li>• <b>Top</b> face aligned with other slabs.</li> </ul>
<b>Part name</b> <b>Class</b> <b>Material</b> <b>Pour phase</b> <b>Part prefix</b> <b>Cast unit prefix</b> <b>Start no</b>	Define the name, class, material, part prefix and start number of the layer parts. Define the pour phase for CIP layers.

3. On the **Detailing** tab, select the detailing component that you want to use.

Option	Description
<b>Component name</b>	Select the detailing component from the list.  The list of detailing components shows the components that you have added on the <b>Detailing</b> tab in the <b>Floor layout</b> dialog box.  The content of the list may vary depending on your environment.  You can also add new components to the list by selecting the <b>Add new</b> option. Note that you can only add detailing components that use one input part.
<b>Component attr file name</b>	Select the detailing component attributes that are used for the slab.  Note that the content of the list varies depending on the component that you have selected.

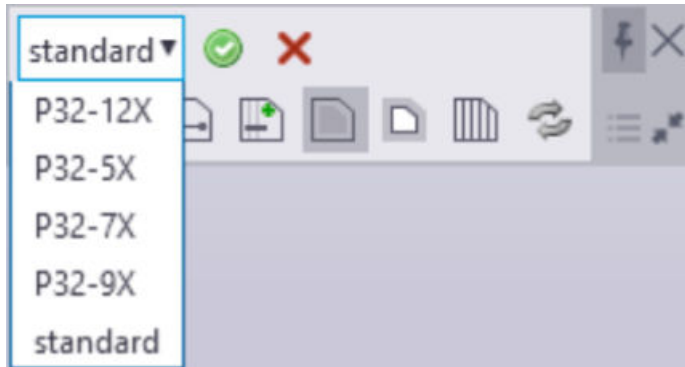
- On the **User defined** tab, set the user-defined attribute values for the slabs.

If you have defined the user-defined attributes in the part properties dialog box and want to use those values, leave the **User defined** tab empty.



- Pick the start and end points for the property strip in the floor layout.

### Modify the property strip

You can also use saved attribute settings from the contextual toolbar.



Use the  and  buttons on the toolbar as follows:

	<p>Modify the detailing component and/or attribute file of the property strip.</p> <p>Select the property strip and select the component name and/or attribute file from the list. Click the button to modify the selected property strips.</p> <p>You can select multiple strips by holding down the <b>Shift</b> key.</p>
	<p>Delete a property strip. Select the strip that you want to delete.</p> <p>You can select multiple strips by holding down the <b>Shift</b> key.</p>

You can also add new property strips by dragging an existing strip and holding down the **Ctrl** key.

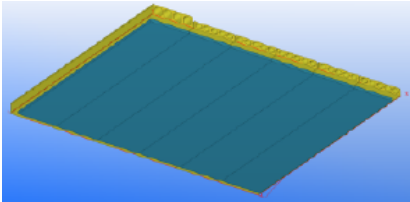
### **Floor Tool**

**Floor Tool** creates a floor bay with optional insulation.

## Objects created

- Hollow core slabs

## Use for

Situation	Description
	Floor bay with insulation

## Selection order

Make sure that you have defined the slab properties.

1. Pick the contour points of the floor bay.

The floor bay is automatically created when you close the polygon.

---

**NOTE** The list of picked contour points on the **Bay contour** tab and the list of slabs on the **Slab list** tab are created when the slabs are created.

---

## Slab properties tab

Use the **Slab properties** tab to control the profile, material and location of the hollow core slabs.

## Slab attributes

Option	Description
<b>Profile</b>	Define the profile by selecting it from the profile catalog.
<b>Name</b>	Define a name for the slab.
<b>Material</b>	Define the material grade by selecting it from the material catalog.
<b>Class</b>	Define the part class number.
<b>Prefix</b>	Define the part prefix.
<b>Start number</b>	Define the start number for the cast unit.
<b>Cut slab ends</b>	Define whether the slab ends are cut or not. If you select <b>Yes</b> , define the minimum end angle for the slabs.
<b>Rotation</b>	Select an option to rotate the slab.
<b>Vertical location</b>	Define the offset location in the vertical direction.
<b>Offset</b>	Define the offset in the vertical direction.

Option	Description
<b>Minimum end angle</b>	Define the minimum end angle for the slabs. If the line to which the slab ends has a bigger angle than the defined minimum end angle, the part will be aligned to the line.

### Additional attributes

Option	Description
<b>Exposure Class</b>	Define the exposure class for the hollow core slab. The exposure class will be saved as a user-defined attribute.
<b>Relative strength</b>	Define the relative strength of the hollow core slab. The relative strength will be saved as a user-defined attribute.
<b>Fire rating</b>	Define the fire rating for the hollow core slab. The fire rating will be saved as a user-defined attribute.
<b>User-defined attributes</b>	User-defined attributes are located in the <code>FloorTool.ini</code> file.

### Slab direction

Option	Description
<b>Slab direction</b>	Define the direction of the slab. If you select <b>Angle</b> , you need to pick points in the model to define the new direction. The angle you have picked is shown in the <b>Angle</b> field. You can also define the angle directly in the field to rotate the slabs.  Note that picking two points does not change the local +X direction.

### Insulation tab

Use the **Insulation** tab to control the insulation properties of the hollow core slabs.

First define whether to create insulation or not. Insulation is created separately for each slab.

### Insulation

Option	Description
<b>Name</b>	Define a name for the insulation.
<b>Material</b>	Define a material grade by selecting it from the material catalog.
<b>Thickness</b>	Define the thickness of the insulation.
<b>Class</b>	Define the part class number.
<b>Offset at slab start/end</b>	Define the offset between the slab start/end positions and the corresponding positions in the insulation parts.
<b>Left/Right offset</b>	Define the offset between the slab and the insulation for the rightmost and leftmost slab.

### Bay contour tab

Use the **Bay contour** tab to control the coordinates of the picked contour points and the horizontal offset of the lines connecting the contour points. If the coordinates are not visible on the tab, click the **Get** button.

You need to create the hollow core slabs before using the **Bay contour** tab.

### Bay contour properties

Option	Description
<b>XY-constant Z</b>	Define the Z coordinate for all contour points at the same specific height.
<b>XYZ (sloping floor)</b>	Define the Z constant for each contour point separately. The floor may be sloped.
<b>Offset method</b>	Define the offset method.
<b>Default end offset</b>	Define the default end offset.
<b>Default side offset</b>	Define the default side offset.

### Bay contour table

The table lists the contour points showing their X, Y, and Z coordinates. You can modify the Z coordinate in the table only if you have selected **XYZ (sloping floor)**. You can modify the **Horizontal offset** on all rows of the table.

The table also shows the lines connecting the points. You can only modify the **Horizontal offset**. Entering a positive value enlarges the slab area and entering a negative value shrinks the slab area.

### Slab list tab

Use the **Slab list** tab to list all the hollow core slabs created. If the slab list is not visible on the tab, click the **Get** button.

### Slab properties

Option	Description
<b>Slab number</b>	Shows the order of the hollow core slabs starting from the first picked point.
<b>Width</b>	Shows the width of a narrowed slab.
<b>Narrowed from</b>	Define whether the slab is narrowed. The options are: <ul style="list-style-type: none"><li>• not narrowed (default)</li><li>• <b>Right side</b></li><li>• <b>Left side</b></li></ul>
<b>Type</b>	Define the slab type. <ul style="list-style-type: none"><li>• Use <b>Slab</b> for normal hollow core slabs.</li><li>• Use <b>PIP</b> for a precast infill piece.</li><li>• Use <b>GAP</b> for an empty space between the slabs. You do not need to define a profile when you select this option.</li><li>• Use <b>CIP</b> to create a concrete part using the width defined in the <b>Width</b> column. The width range that you can use is defined in the <code>FloorTool.ini</code> file.</li></ul> <p>The slabs listed in the <code>FloorTool.ini</code> file can only have a width that is inside the defined range. The slabs that are not listed can have any width. The value you give is rounded down to the nearest allowed value.</p>

Option	Description
<b>Profile</b>	Define the profile by selecting it from the profile catalog.

You can **Add** and **Delete** slabs, and move them **Up** and **Down** in the list by using the buttons on the left. To restore the default values, click **Restore defaults**.

## Concrete stairs

Tekla Structures includes the following tools you can use to create concrete stairs and stairwells:

- [Concrete stairs \(65\) \(page 3215\)](#)
- [Stairwells and elevator shafts \(90\) \(page 3230\)](#)
- [Reinforced concrete stair \(95\) \(page 3233\)](#)

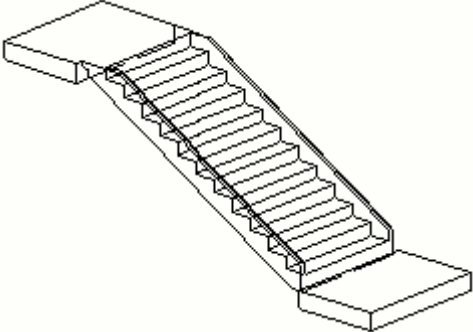
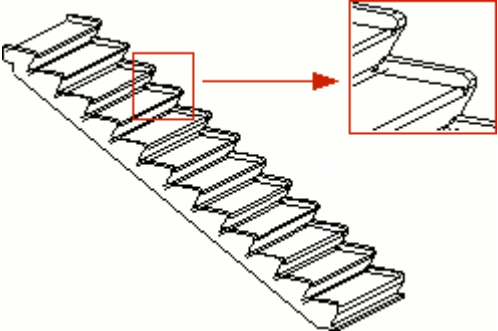
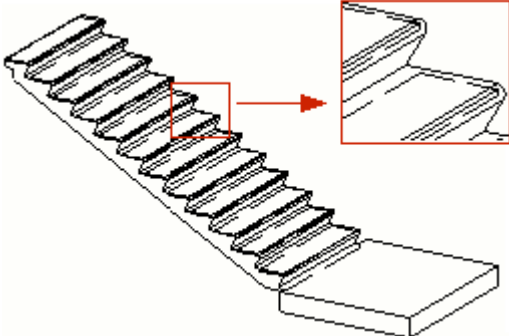
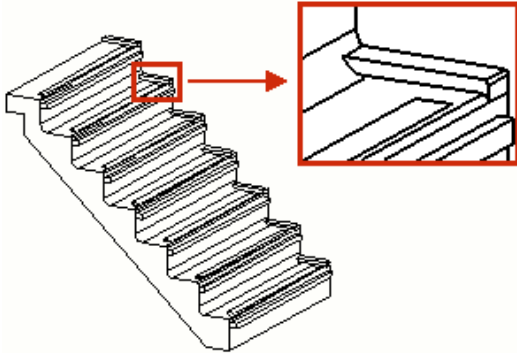
### **Concrete stairs (65)**

**Concrete stairs (65)** creates precast stairs with optional landings, ridges, stringers, and anti-skid and kick plate profiles. It contains five different step shapes and options to create round or chamfered step edges.

### **Objects created**

- Stairs
- Landings
- Ridges
- Stringers
- Anti-skid
- Kick plate

**Use for**

Situation	Description
	<p>Staircase with</p> <ul style="list-style-type: none"> <li>• square step shape</li> <li>• stringers on both sides</li> <li>• top and bottom landings</li> </ul>
	<p>Staircase with</p> <ul style="list-style-type: none"> <li>• chamfered step corners</li> <li>• ridges on both sides</li> </ul>
	<p>Staircase with</p> <ul style="list-style-type: none"> <li>• rounded step corners</li> <li>• anti-skid profile</li> <li>• bottom landing</li> </ul>
	<p>Staircase with</p> <ul style="list-style-type: none"> <li>• square step shape</li> <li>• rounded step corners</li> <li>• ridges on both sides</li> <li>• anti-skid and kick plate profiles</li> </ul>

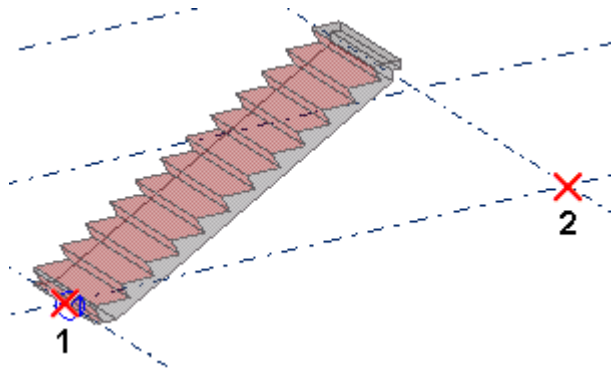


## Selection order

Selection order depends on the selected **Creation method** option on the **Stairs** tab.

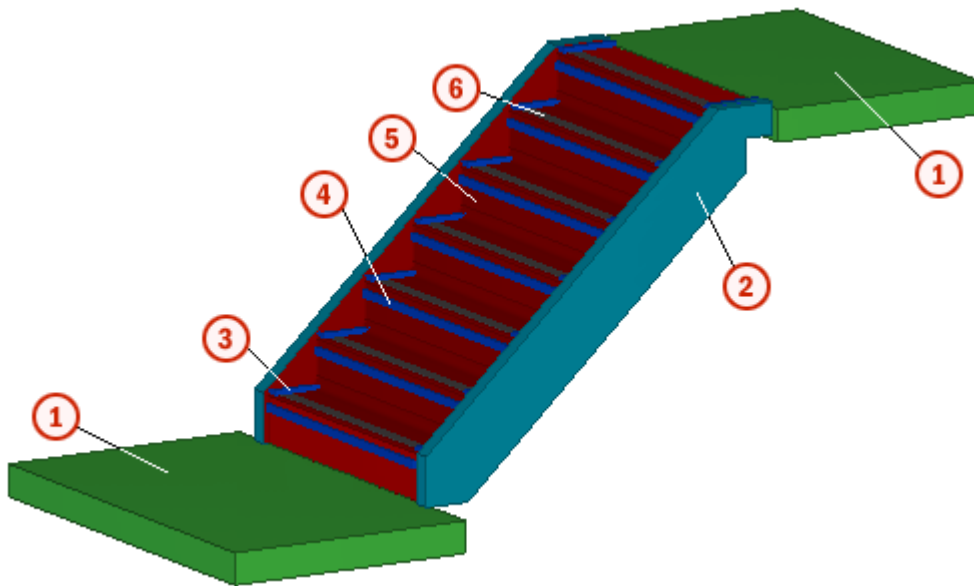
When **Creation method** is set to **Default**:

1. Pick the first point to indicate the start point of stairs.
2. Pick the second point to indicate the direction of stairs.



The stairs are created automatically.

## Part identification key



	Part
1	Landings
2	Stringers
3	Ridges
4	Kick plates
5	Steps

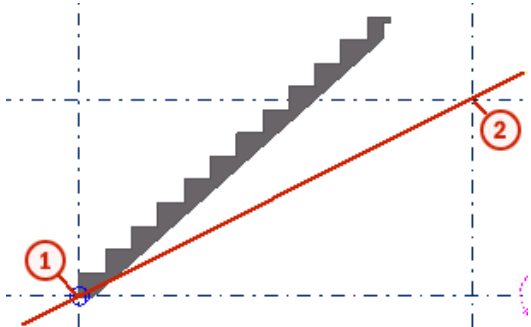
	<b>Part</b>
<b>6</b>	Anti-skids

### Stairs tab

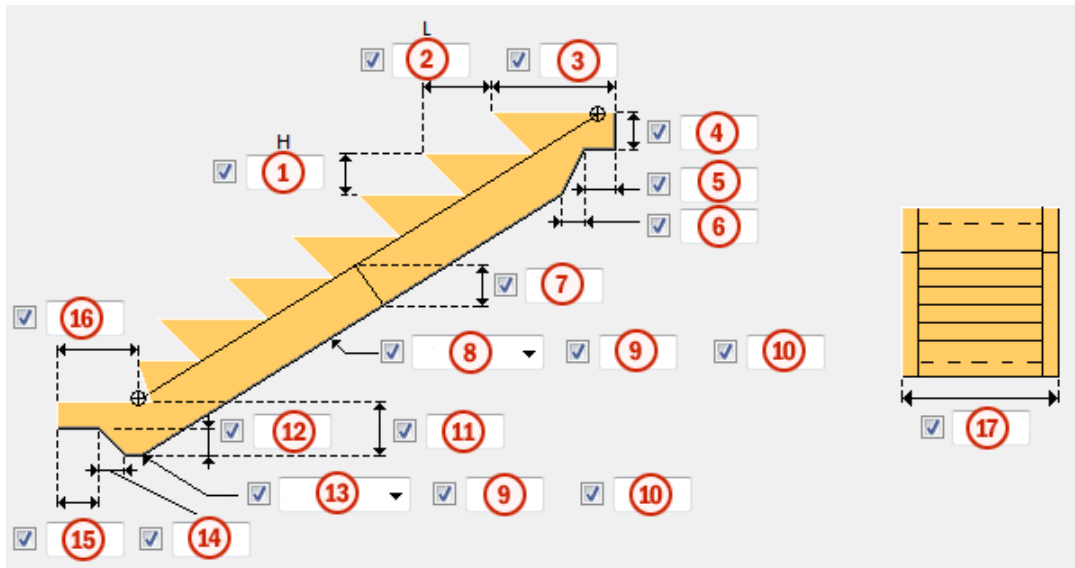
Use the **Stairs** tab to define how the stairs are created and what are the dimensions of the stairs.

### Creation method

Option	Description
<b>Creation method</b>	<p>Select the creation method of the stairs. <b>Creation method</b> defines how many and which points you need to pick when you create the stairs.</p> <ul style="list-style-type: none"> <li>• <b>Default</b> Number of steps is calculated automatically using the vertical distance between the two input points.</li> <li>• <b>One point - N &amp; L &amp; H:</b> define N, L, and H (number, length, and height of the steps).</li> <li>• <b>Two points - N &amp; L:</b> define N and L.  Height of the steps is calculated automatically using the vertical distance between the two input points.</li> <li>• <b>Two points - N &amp; H:</b> define N and H.  Length of the steps is calculated automatically using the horizontal distance between the two input points.</li> <li>• <b>Two points - L &amp; H:</b> define L and H.  Number of steps is calculated automatically using the vertical distance between the two input points.</li> <li>• <b>Two points - N:</b> define N.  Height and length of steps is calculated automatically using the</li> </ul>

Option	Description
	horizontal and vertical distance between the two input points. You can define the length of the top step.
<b>No of steps, N</b>	Define the number of steps, if the <b>Two points - L &amp; H</b> option is not selected.
<b>Position</b>	Define the horizontal position of the staircase, relative to the line joining the picked points.
<b>Distance</b>	Enter a distance to move the stairs in the horizontal direction from the line joining the picked points. The selected <b>Position</b> option has an effect on this dimension.
<b>Rotation</b>	Define the angle between the line joining the steps and the line joining the selected points. 
<b>Cast unit type</b>	Select the cast unit type: <ul style="list-style-type: none"> <li>• <b>Precast</b></li> <li>• <b>Cast in place</b></li> </ul>

## Stair dimensions



	Description
1	Height of the step.
2	Length of the step.
3	Length of the top step.
4	Height of the top step.
5	Width of the top corbel.
6	Slope from the corbel to the underside of the stairs.
7	Thickness of the slab.
8	Chamfering for the underside of stairs.
9	Chamfer or radius values.
10	
11	Height of the bottom step.
12	Height of the stair foot.
13	Chamfering for the bottom of stairs.
14	Slope from the foot nose to the foot base.
15	Length of the bottom cut.
16	Length of the stair foot.
17	Width of the staircase, including stringers.

### Create foot

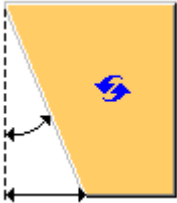
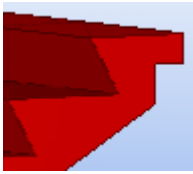

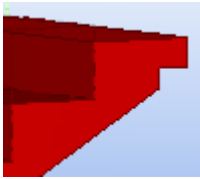
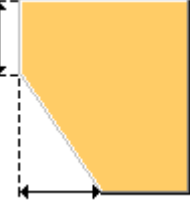
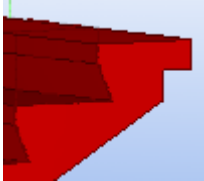
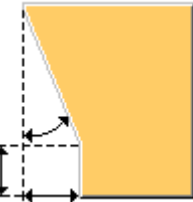
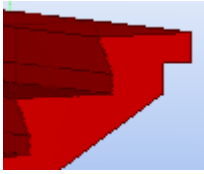
Define whether a foot is created at the bottom of the stairs.

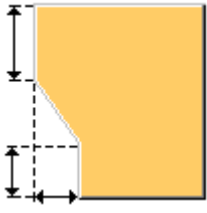

### Step shapes tab

Use the **Step shapes** tab to define the shape of steps.

### All other steps/Last step at foot

Select the step shape. You can define the shape of the last step at the bottom if you set **Last step same as other step** to **No**.

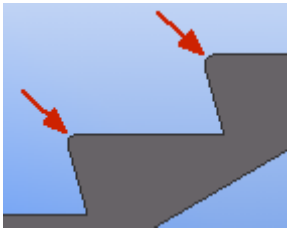
Option	Description
	<p>Default Beveled</p> <p>From the list below the step shape options, select whether you want to enter a dimension or an angle.</p> <p>AutoDefaults can change this option.</p> 
	<p>Straight step</p> 
	<p>Top straight, bottom beveled</p> <p>Enter two dimensions.</p> 
	<p>Top beveled, bottom straight</p> <p>Enter the vertical dimension and then select whether you want to enter an angle or a horizontal dimension.</p> 

Option	Description
	<p>Top and bottom straight</p> <p>Enter vertical dimensions and then select whether you want to enter an angle or a horizontal dimension.</p> 

### out

Select the shape of the step front edge and enter the required dimensions.

- **Default**
- **Radius:** Creates rounded edge.

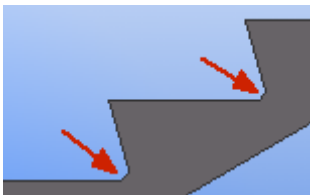


- **Chamfer:** Creates chamfered edge.
- **No:** Creates square edge.

### in

Select the shape of the step inner corner and enter the required dimensions.

- **Default**
- **Radius:** Creates rounded inner corner.



- **Chamfer:** Creates chamfered inner corner.
- **No:** Creates square inner corner.

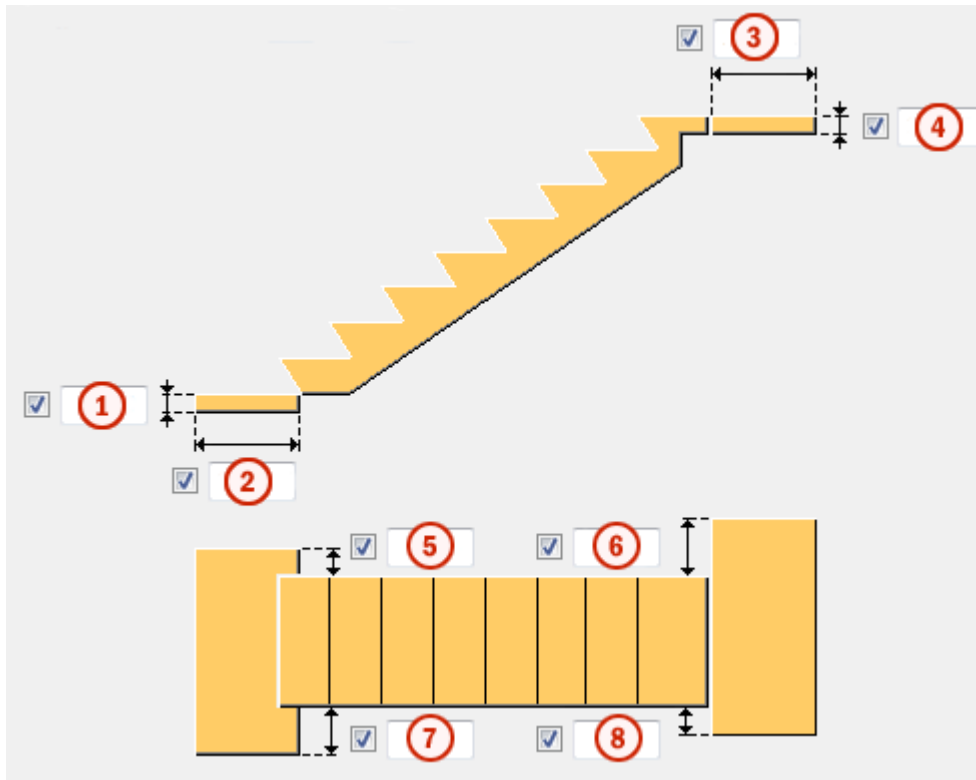
### Landings tab

Use the **Landings** tab to create top and/or bottom landings.

## Create landings

Define whether one or two landings are created, or whether there are no landings.

## Landing dimensions and extensions

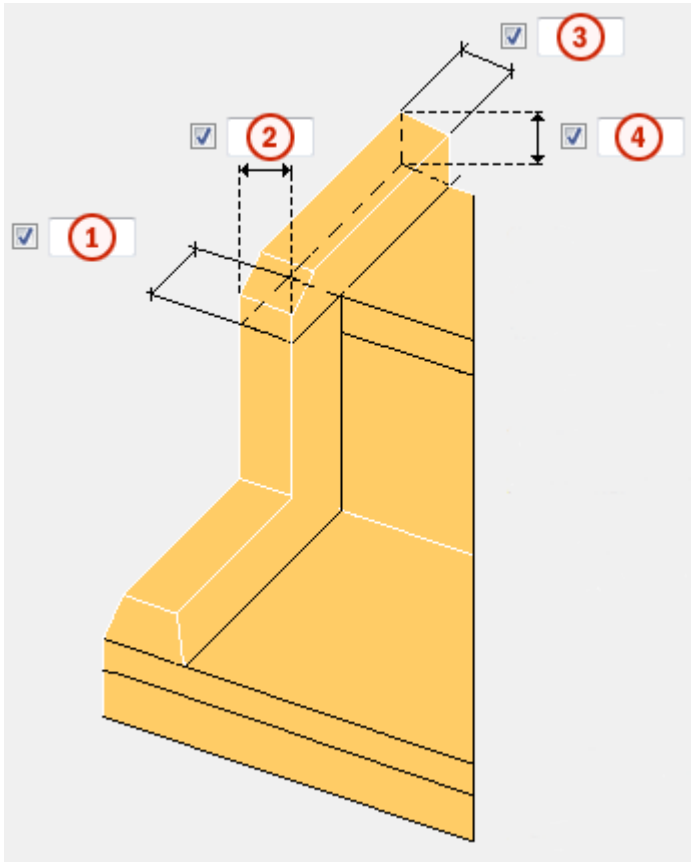


	Description
1	Thickness of the bottom landing.
2	Length of the bottom landing.
3	Length of the top landing.
4	Thickness of the top landing.
5	Left and right extensions of the bottom landing.
7	
6	Left and right extensions of the top landing.
8	

## Ridges tab

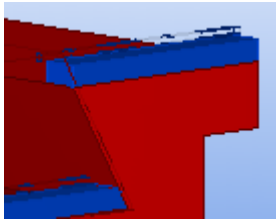
Use the **Ridges** tab to create horizontal and/or vertical ridges on both sides or only on the other side of the stairs.

## Dimensions



	Description
1	Thickness of the vertical ridge.
2	Width of the vertical ridge.
3	Width of the horizontal ridge.
4	Thickness/height of the horizontal ridge.

## Horizontal ridges

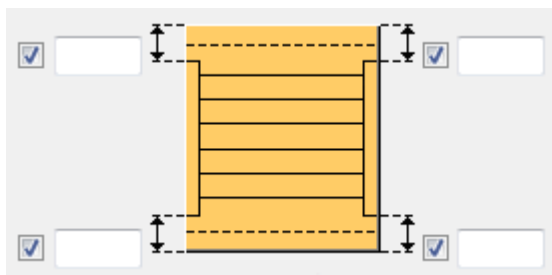
Part	Description
<b>Create</b>	Define whether horizontal ridges are created. 



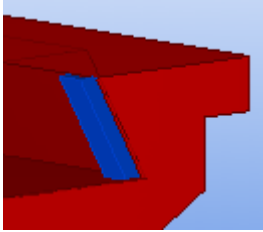
Part	Description
<b>Create at foot</b>	Define whether horizontal ridges are created at the foot of the stairs.  This option works in the same way as the <b>Create</b> option.
<b>Inside chamfer</b> 1	Select the type of the inside chamfer and enter the required dimensions.
<b>Corner chamfer</b> 2	Select the type of the corner chamfer and enter the required dimensions.
<b>Slope</b> 3	Set the slope as an angle or a dimension. The slope makes the ridge inclined.
<b>Foot corner chamfer</b>	Define whether corner chamfers are created at the stair foot.

### Top and foot ridges

Define the horizontal ridge length at the stair top step and at the stair foot. When no foot is created, vertical ridges continue to the bottom level of the stairs.





## Vertical ridges

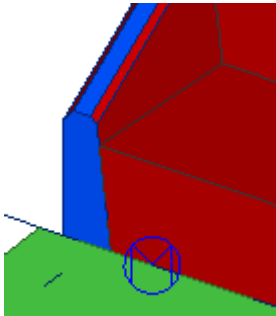
Part	Description
<b>Create</b>	Define whether vertical ridges are created. 
<b>Slope</b>	Set the slope as an angle or a dimension. The slope makes the ridge inclined.

### Stringers tab

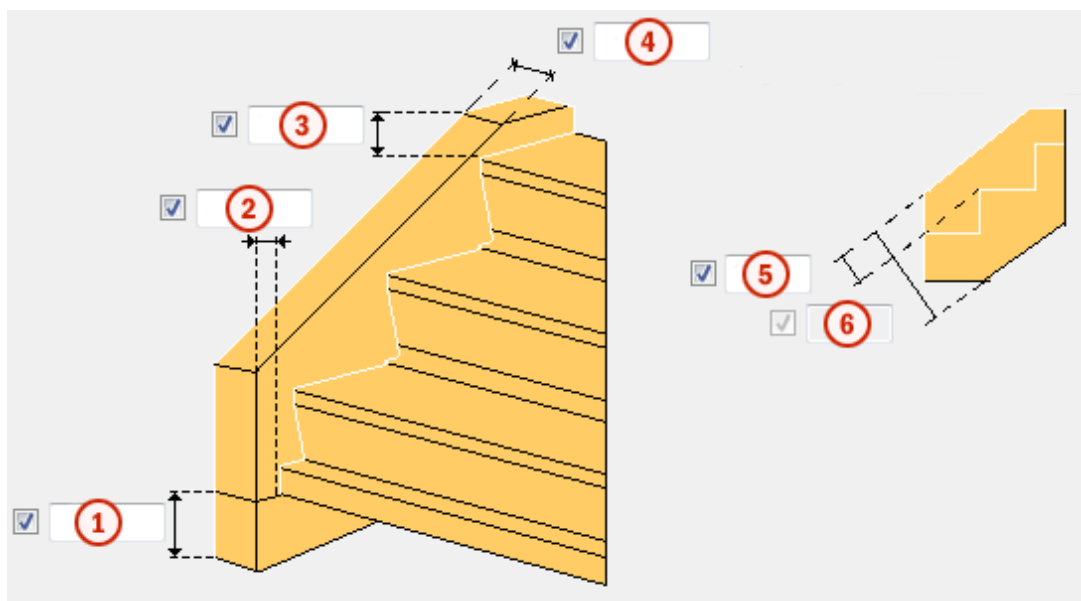
Use the **Stringers** tab to create stringers and ridges on the left, right, or both sides of the stairs.

### Parts

Part	Description
<b>Create stringers</b>	Define whether stringers are created.
<b>Create top ridge</b>	Select an option to create top ridges. 
<b>Create bottom ridge</b>	Select an option to create bottom ridges. 

Part	Description
<b>Slope</b>	Use to incline the inner surface of the stringers.  You can define the slope using an angle or a dimension.
<b>Inside chamfer</b>	Define whether the inside edge of stringer is chamfered or not.
<b>Outside chamfer</b>	Define whether the outside edge of stringer is chamfered or not.
<b>Stringer height</b>	Define how the stringer height is determined.

### Dimensions



	Description
<b>1</b>	Height of the stringer bottom ridge.
<b>2</b>	Horizontal offset of the bottom ridge from the bottom step.
<b>3</b>	Height of the stringer top ridge.

	Description
4	Width of the stringer.
5	Difference in height that is the perpendicular distance between the step edge and stringer edge. You can enter this dimension if <b>Stringer height</b> is <b>Diff in height</b> .
6	Total height of the stringer. You can enter this dimension if <b>Stringer height</b> is <b>Default</b> or <b>Total height</b> .

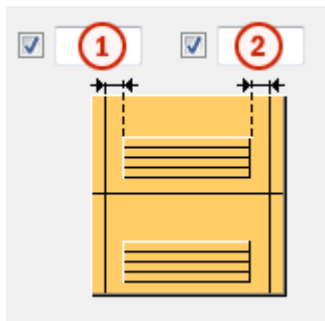
### Anti-skid/Kick plate tab

Use the **Anti-skid** and **Kick plate** tabs to create slip resistant surfaces.

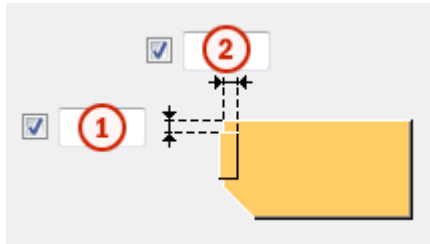
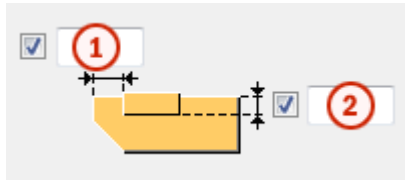
### Parts

Part	Description
<b>Creation anti-skid</b> <b>Creation kick plate</b>	Define whether anti-skids or kick plates are created.
<b>Create anti-skid on foot</b>	Define whether anti-skids are created at the stair foot.
<b>Create cutout</b>	Define whether you want to create cutouts with the anti-skid profile. By default, the cutouts are not created.
<b>Include in cast unit</b>	Define whether anti-skids or kick plates are included in cast unit.
<b>Profile</b>	Define the anti-skid or kick plate profile by selecting it from the profile catalog.
<b>Rotation</b>	Select an option to rotate the anti-skid or kick plate profile.

### Anti-skid/kick plate position



	Description
1	Anti-skid or kick plate distance from the left edge of the step.
2	Anti-skid or kick plate distance from the right edge of the step.



	Description
1	Distance from the step front edge.
2	Depth for the anti-skid or kick plate.

#### Attributes tab

Use the **Attributes** tab to control the properties of different stair parts.

#### Part attributes

Option	Description	Default
<b>Pos_No</b>	<b>Prefix</b> and <b>Start number</b> for the part position number.  Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Material</b>	Material grade.	The default material is defined in the <b>Part material</b> box in the <b>Components</b> settings in <b>File menu --&gt; Settings --&gt; Options</b> .
<b>Name</b>	Name that is shown in drawings and reports.	
<b>Class</b>	Part class number.	

### UDA tab

Use the **UDA** tab to provide additional information about the parts created.

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**TIP** The user-defined attributes are case sensitive. Check the correct spelling of an attribute from the `objects.inp` file.

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### ***Stairwells and elevator shafts (90)***

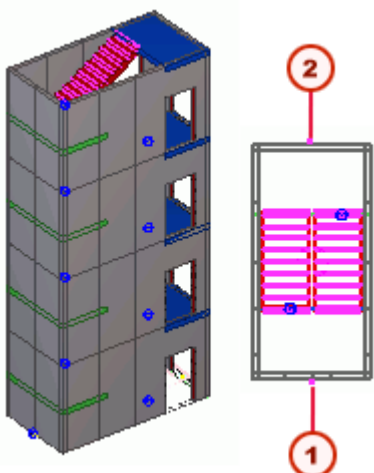
**Stairwells and elevator shafts (90)** creates a rectangular stairwell or elevator shaft to represent the structure in the design stage.

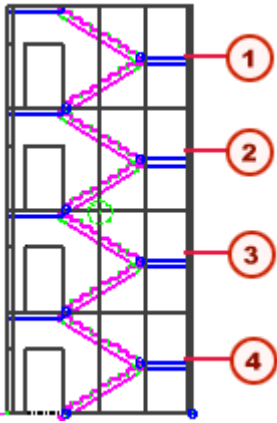
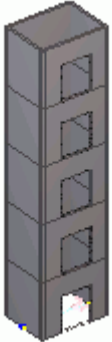
When you detail the structure, you can apply seams, connections, and reinforcement to complete the details of a stairwell or elevator shaft. This component uses the [Concrete stairs \(65\) \(page 3215\)](#) component for creating stairs.

### Parts created

- Wall panels
- Landings (optional)
- Flights of stairs (optional)
- Roof slab (optional)
- Openings (optional)

### Where to use

Situation	More information
	<p>A stairwell over four floors created using the default options.</p> <p>As shown, the points picked and the dimensions on the <b>Stairs and landings</b> tab determine the length of the stairwell.</p> <p>Walls consist of one or more precast concrete panels.</p> <p><b>1</b> First point picked <b>2</b> Second point picked</p>

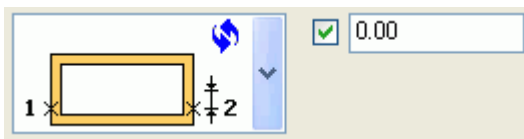
Situation	More information
	<p>Stairwells always contain a first floor and a top floor. Indicate the number of additional floors on the <b>Plan view</b> tab, <b>Levels</b> field. This stairwell has 2 additional floors, for a total of 4 floors.</p> <p><b>1</b> Top floor  <b>2</b> Additional floor  <b>3</b> Additional floor  <b>4</b> 1st or ground floor</p>
	<p>Elevator shaft created by selecting the <b>Elevator shaft</b> option on the <b>Stairs and landings</b> tab, <b>Type</b> field, for all floors.</p>

### Limitations

The minimum floor height between floors is 200 mm.

### Picking order

1. On the **Plan view** tab, check the **Position** option. The default is in the middle of walls 3 and 4.



2. Pick a point to indicate the position of wall 3.
3. Pick a point to indicate the position of wall 4.

### Plan view tab

Use the **Plan view** tab to define the properties of the stairwell or elevator shaft.

To define the number of levels and floor heights, enter a height for each floor level in the **Levels** field, for example:

 0.00 3300.00 6600.00 9900.00 13200.00

You can also define negative floor levels, for example:

 -6600.00 -3300.00 0.00 3300.00 6600.00

You can also use multiplier to define many floors, as in the following US imperial example:

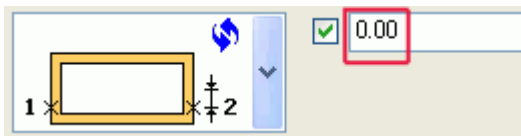
 0' 15" 10' 9" 59/64

Tekla Structures also uses these values to calculate the total height of the stairwell.

To create the stairwell or elevator shaft, you pick two points in the model. Use the **Position** field to define the location of the stairwell or elevator shaft relative to these points. The options are:

- Middle (default)
- Left
- Right

Enter the offset distance from the selected position. Here, the offset is from the middle of wall.

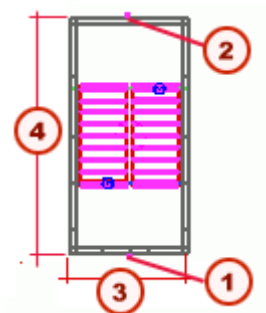
 0.00

To manually define the total length and total width of the stairwell or elevator shaft, enter the following values:

L - total length

W - total width

Leave both fields blank to have Tekla Structures automatically calculate these dimensions from the the points picked:





	Description
1	First point picked.
2	Second point picked.
3	Total width, W
4	Total length, L

**NOTE** The dimensions defined on the **Stairs and landings** tab may override the total length or width that is automatically calculated or that you manually enter.

#### Openings tab

Use the **Openings** tab to define opening dimensions for each wall panel and for the first, additional, and top floors.

Each wall may have a single opening, or no opening.

#### Stairs and landings tab

Use the **Stairs and landings** tab to define the stair and landing properties and dimensions.

Select to create an elevator shaft from the **Type** list.

#### Attributes tab

Use the **Attributes** tab to define basic part properties for walls, stairs, and landings.

You can also use the save properties from the [Concrete stairs \(65\) \(page 3215\)](#) component for the first, additional, and top stairs.

Option	Description
<b>Pos_No</b>	To ensure correct numbering, define a <b>Prefix</b> and a <b>Start number</b> for the part position number of stair parts. Enter the assembly position number of the stair parts on the second row.
<b>Material</b>	Define the material grade.
<b>Name</b>	Define a name that is shown in drawings and reports.
<b>Class</b>	Define the part class number.

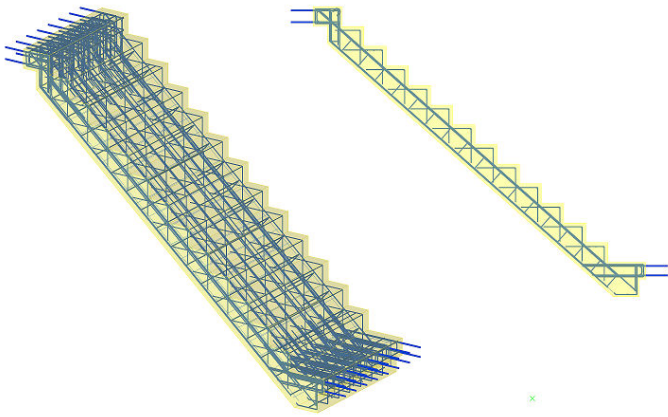
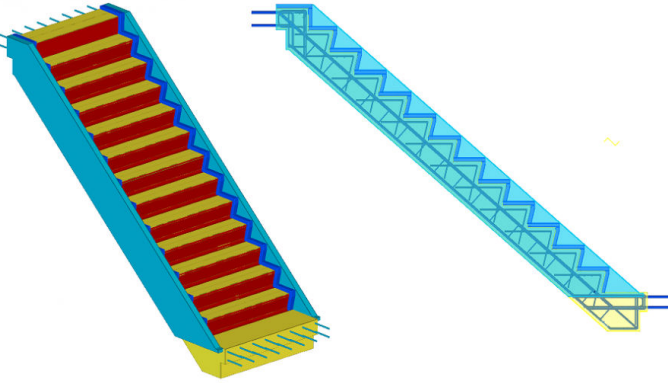
#### **Reinforced concrete stair (95)**

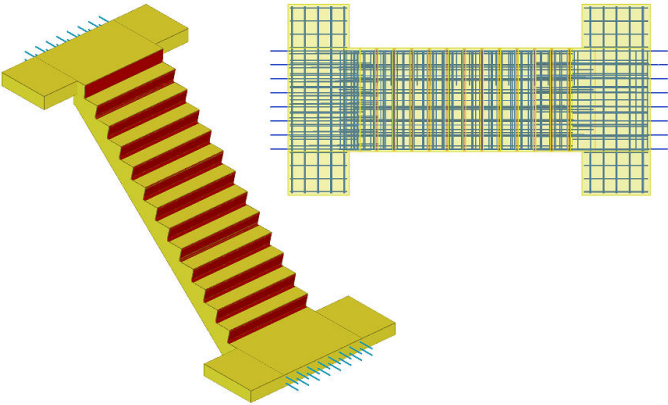
**Reinforced Concrete Stair (95)** creates reinforced concrete stairs.

## Objects created

- Stairs
- Landings (optional)
- Ridges (optional)
- Stringers (optional)
- Anti-skid (optional)
- Main bars and stirrups of stair reinforcement (**Bar A - Bar L tabs**) (optional)
- Meshes in stairs and landings (optional)
- Mesh bars (optional)
- Anchor bars (optional)
- Landing end bars (optional)

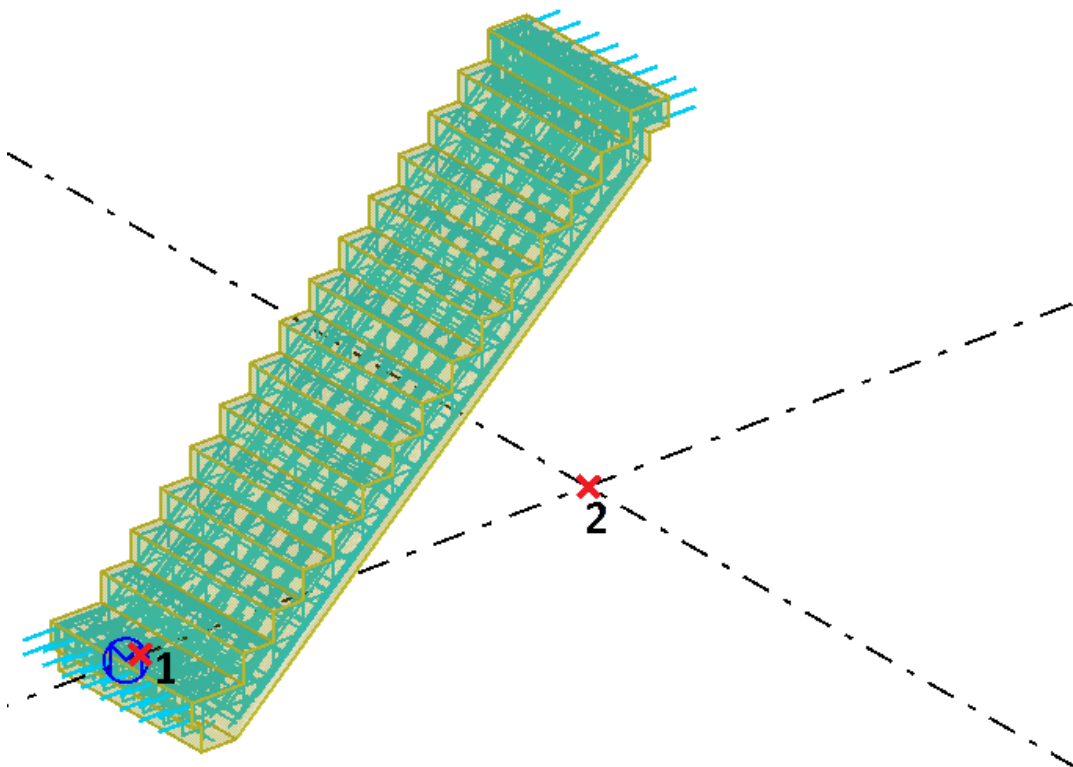
## Use for

Situation	Description
	Reinforced concrete stairs.
	Reinforced concrete stairs with chamfered steps, ridges and stringers.

Situation	Description
	Reinforced concrete stairs with reinforced landings.

### Selection order

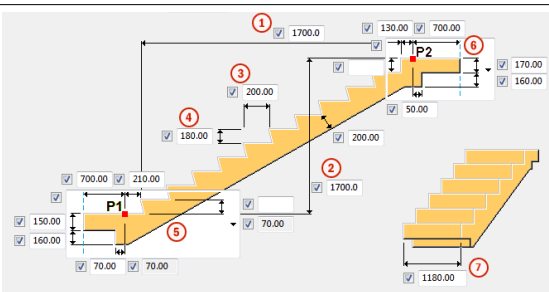
1. Pick the first point to indicate the start point of the stairs.
2. Pick the second point to indicate the direction of the stairs.
3. Select any number of parts to be cut by the stairs (optional).
4. Click the middle mouse button to create the stairs.



### Parameters tab

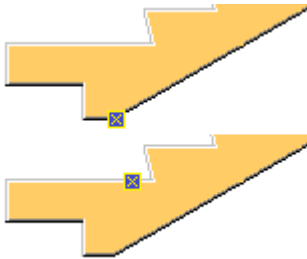
Use the **Parameters** tab to control the shape of the stairs, number of steps, stair creation method and the stairs width.

### Stair dimensions

		Description
	1	Horizontal dimension of the steps area
	2	Vertical dimension of the steps area
	3	Step length
	4	Step height
	5	Shape options for stair bottom
	6	Shape options for stair top
	7	Stair width

### Start point position

Select the start point position of the polygon shape.



**NOTE** Start point position affects the bounding box of the cast-unit. Therefore it will affect drawing view orientation and numbering.

### Stair creation method

Option	Description
<b>P1 P2 step length</b>	Create stairs between points P1 and P2. Stair dimension are defined by the distance between P1 and P2 and step length.
<b>P1 P2 step height</b>	Create stairs between points P1 and P2. Stair dimension are defined by the distance between P1 and P2 and step height.
<b>P1 step length step height N steps</b>	Create stairs from point P1 to point P2. Stair dimensions are defined by P1 and step height, length and number of steps.

Option	Description
<b>P2 step length step height N steps</b>	Create stairs from point P1 to point P2. Stair dimensions are defined by P2 and step height, length and number of steps.
<b>P1 horizontal and vertical step distance</b>	Create stairs from point P1 to point P2. Stair dimensions are defined by P1 and horizontal and vertical step distance.
<b>P2 horizontal and vertical step distance</b>	Create stairs from point P1 to point P2. Stair dimensions are defined by P2 and horizontal and vertical step distance.

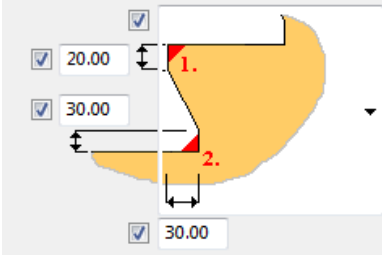
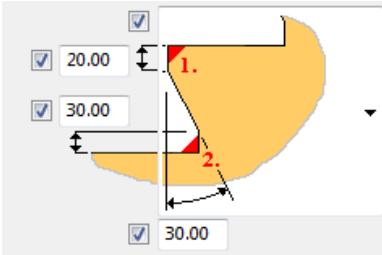
#### Parts tab

Use the **Parts** tab to control the material, name, class, positioning, cast unit type and step chamfering.

#### Step chamfer settings

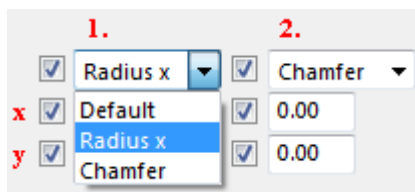
Option	Description
<b>Middle for all</b>	All steps are chamfered according to the <b>Middle steps</b> settings.
<b>Bottom different</b>	Bottom step is chamfered according to the <b>1st step at bottom</b> settings. All other steps are chamfered according to the <b>Middle steps</b> settings.
<b>Top different</b>	Top step is chamfered according to the <b>Last top step</b> settings. All other steps are chamfered according to the <b>Middle steps</b> settings.
<b>Bottom and top different</b>	Bottom step is chamfered according to the <b>1st step at bottom</b> settings. Top step chamfered are according to the <b>Last top step</b> settings. All other steps are chamfered according to the <b>Middle steps</b> settings.

Step chamfer settings are set in the same way for **1st step at bottom**, **Middle steps** and **Last top step**.

Option	Description
	Size of step cut is defined by the distance.
	Size of step cut is defined by the angle.

### Corner chamfer types

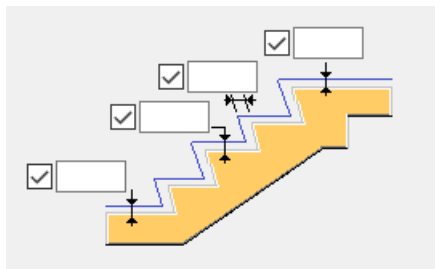
Corner chamfers **1.** and **2.** can be defined by the **Radius x** or by the sides of the **Chamfer x, y.**



### Create finished floor level

Select whether to create finished floor level. The finished floor level is defined by a polygon created from an offset stairs polygon and it is used for drawings.

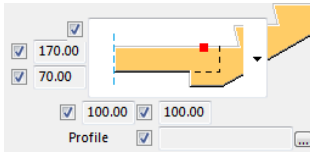
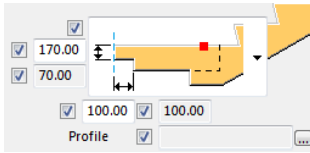
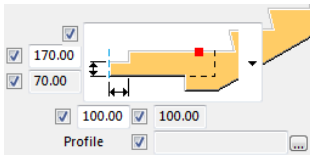
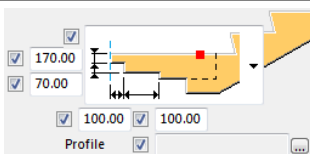
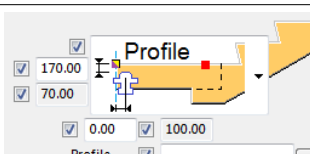
Define the profile, properties and offsets of the dummy part that is created at each polygon vertex, and the position in depth. You can define different offsets for floor level profiles for the steps, and the top and bottom landing, and the vertical cover thickness.



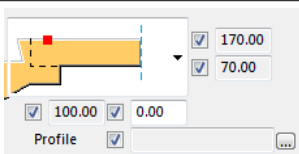
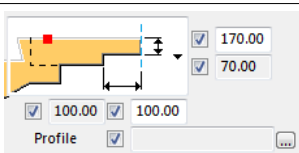
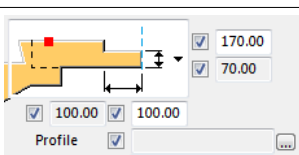
### Stairs and landings tab

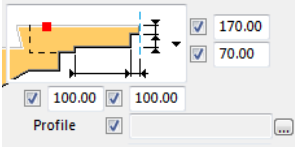
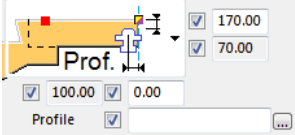
Use the **Stairs and landings** tab to control the size and type of the bottom landing and the top landing.

## Bottom landing cut option

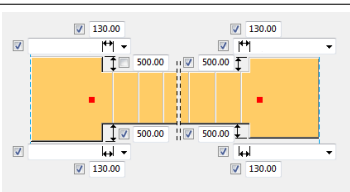
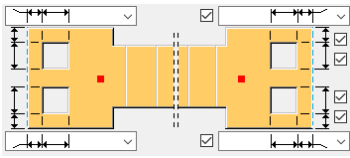
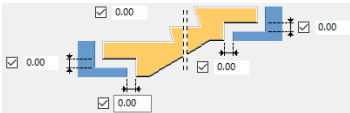
Option	Description
	Bottom landing with no cut.
	Bottom landing with cut defined by its length and distance from the top side of landing.
	Bottom landing with cut defined by its length and distance from the bottom side of landing.
	Bottom landing with L shape cut defined by its three dimensions and distance from the top side of landing.
	Bottom landing cut defined by a profile and its position in landing.

## Top landing cut option





Option	Description
	Top landing with no cut.
	Top landing with cut defined by its length and distance from the top side of landing.
	Top landing with cut defined by its length and distance from the bottom side of landing.

Option	Description
	Top landing with L shape cut defined by its three dimensions and distance from the top side of landing.
	Top landing cut defined by a profile and its position in landing.

### Landing dimensioning and openings

	Description
	Use the top view setting to define the dimensions of the bottom landing and the top landing.
	Use the top view setting to define two openings for the bottom and the top landing. The following rebars avoid the created openings: anchor and Z anchor bars, mesh bars, landing end bars, and A, B, C, E, G, K bars.
<b>Extra landings</b>	Define an individual name and class for the extra landing parts.
	Define the gaps on the sides of the landings.

### Recesses and holes

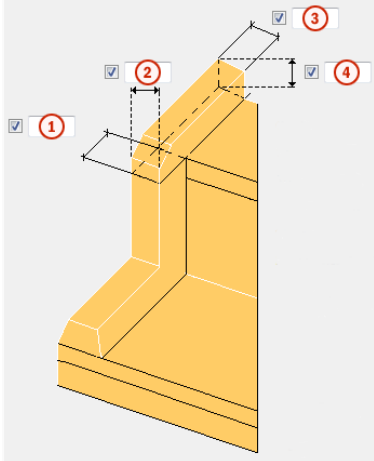
Option	Description
	No hole or recess
	Hole
	Recess at the top face
	Recess at the bottom face



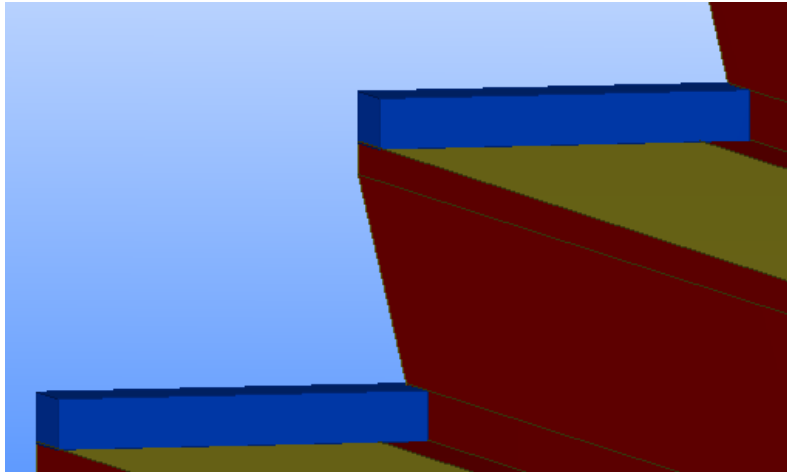
### Ridges tab

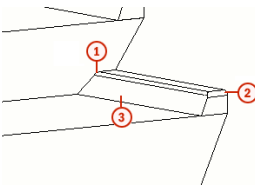
Use the **Ridges** tab to create horizontal and/or vertical ridges on both sides or only on one side of the stairs.

### Dimensions

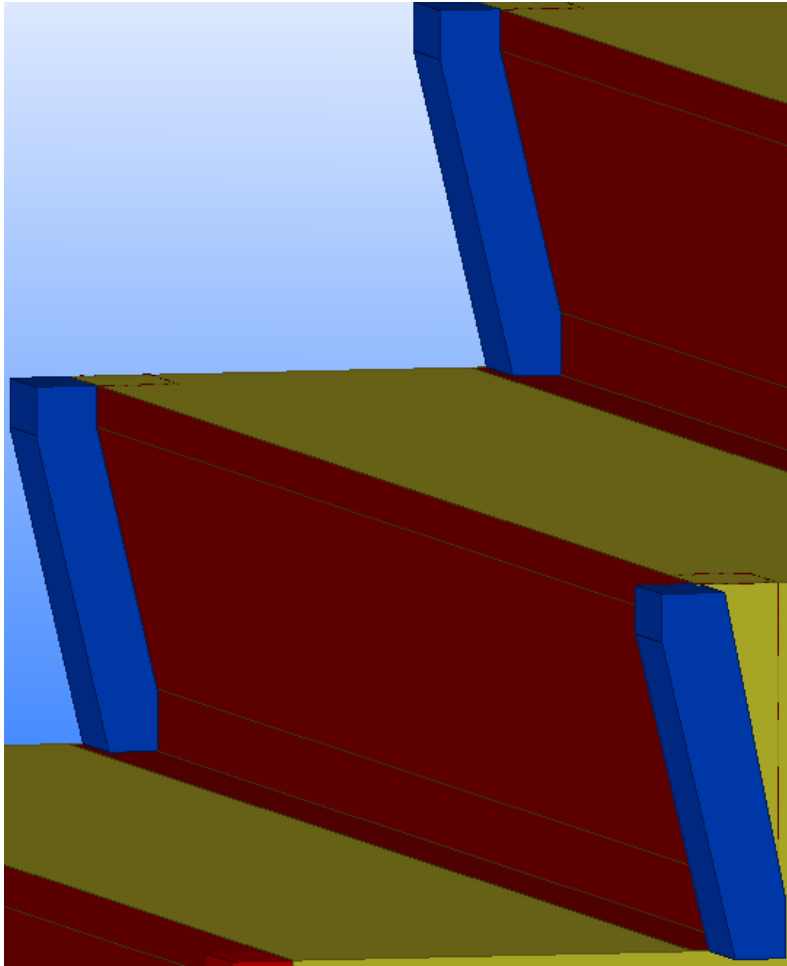
		Description
	1	Thickness of the vertical ridge.
	2	Width of the vertical ridge.
	3	Width of the horizontal ridge.
	4	Thickness/height of the horizontal ridge.

### Horizontal ridges

Option	Description
<b>Create</b>	Define whether horizontal ridges are created. 
<b>Create at foot</b>	Define whether horizontal ridges are created at the foot of the stairs. This option works in the same way as the <b>Create</b> option.

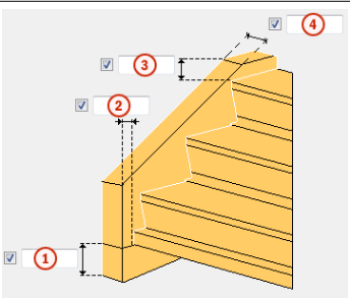

Option	Description
<p>Chamfering</p> 	<p><b>1 Inside chamfer:</b> Select the type of the inside chamfer and enter the required dimensions.</p> <p><b>2 Corner chamfer:</b> Select the type of the corner chamfer and enter the required dimensions.</p> <p><b>3 Slope:</b> Set the slope as an angle or a dimension. The slope makes the ridge inclined.</p>
<p><b>Foot corner chamfer</b></p>	<p>Define whether corner chamfers are created at the stair foot.</p>

### Vertical ridges

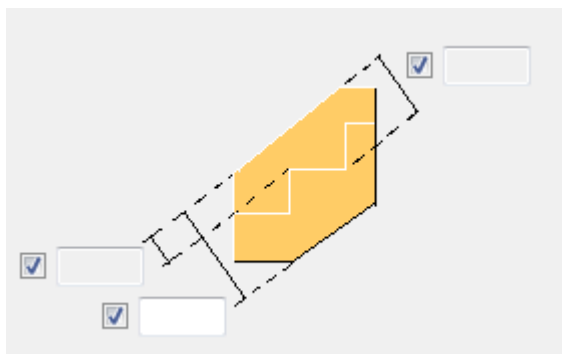
Option	Description
<p><b>Create</b></p>	<p>Define whether vertical ridges are created.</p> 
<p><b>Slope</b></p>	<p>Set the slope as an angle or a dimension. The slope makes the ridge inclined.</p>

### Stringers tab

Use the **Stringers** tab to create the stringers and ridges on the left, right, or both sides of the stairs.

	Description
	<b>1</b> Height of the stringer bottom ridge.
	<b>2</b> Horizontal offset of the bottom ridge from the bottom step.
	<b>3</b> Height of the stringer top ridge.
	<b>4</b> Width of the stringer.
<b>Slope</b>	Use to incline the inner surface of the stringers.  You can define the slope using an angle or a dimension.
<b>Inside chamfer</b>	Define whether the inside edge of stringer is chamfered or not.
<b>Outside chamfer</b>	Define whether the outside edge of stringer is chamfered or not.

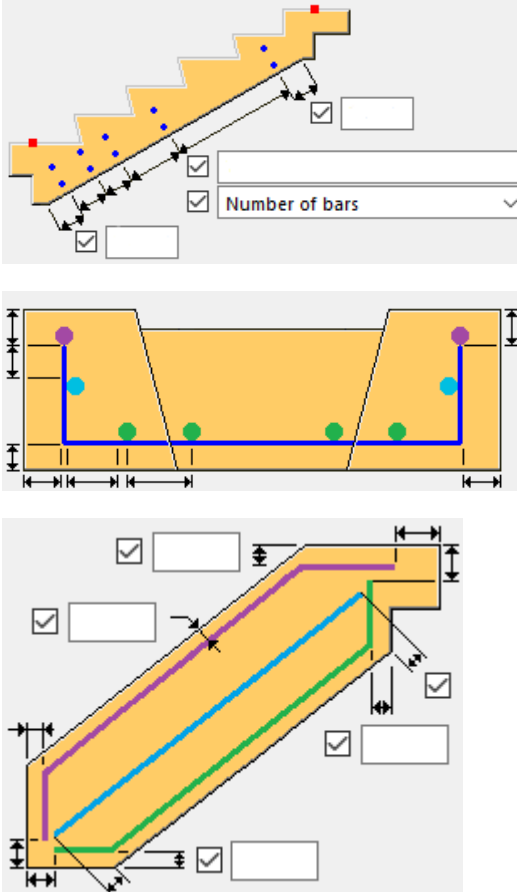
### Stringer height



Stringer height based on the total height or distance from inner/outer step corner.

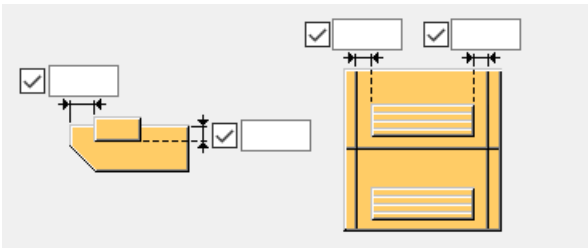
### Stringer bars tab

Use the **Stringer bars** tab to create reinforcements in the stringers.

Option	Description
	<p>Define the spacing of bars and the concrete cover thicknesses.</p>
<b>Create</b>	Select to create the group of bars.
<b>Grade</b>	Strength of the steel used in the reinforcing bars.
<b>Size</b>	Diameter of the reinforcing bar.
<b>Radius</b>	Internal radius of the bends in the bar.
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.
<b>Class</b>	Use <b>Class</b> to group reinforcement.
<b>Name</b>	Tekla Structures uses the name in drawings and reports.

### Anti-skid tab

Use the **Anti-skid** tab to create slip resistant surfaces.

Option	Description
<b>Creation anti-skid</b>	Define whether anti-skids are created.
<b>First bottom anti-skid</b>	Define the material, name and class of the anti-skid profile at the bottom.
<b>Last top anti-skid</b>	Define the material, name and class of the anti-skid profile at the top.
<b>Create anti-skid on foot/top</b>	Define whether anti-skids are created at the stair foot/top.
<b>Create cutout</b>	Define whether you want to create cutouts with the anti-skid profile. By default, the cutouts are not created.
<b>Include in cast unit</b>	Define whether anti-skids are included in the cast unit.
<b>Profile</b>	Define the anti-skid profile by selecting it from the profile catalog.
<b>Rotation</b>	Select an option to rotate the anti-skid profile.
Offsets	Define the anti-skid profile offsets on the steps. 

**Bar A tab**

Use the **Bar A** tab to define the geometry, concrete cover thickness, reinforcing bar spacing and reinforcing bar properties of a stair reinforcing bar group.

Option	Description
	Geometry and concrete cover thickness.
	Spacing, number of bars and concrete cover thickness of the reinforcing bar group.

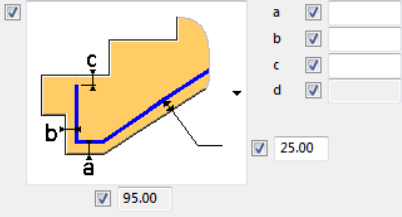
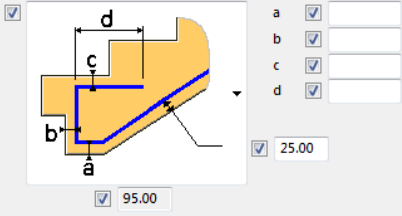
### Bar B tab

Use the Bar B tab to define the geometry, concrete cover thickness, reinforcing bar spacing and reinforcing bar properties of a stair reinforcing bar group.

### Bar B bottom ending options

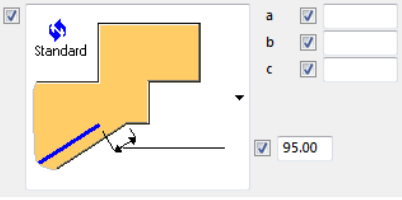
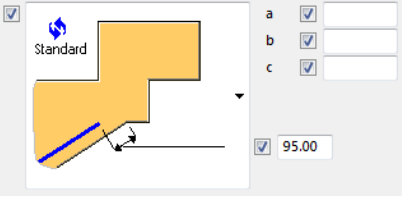
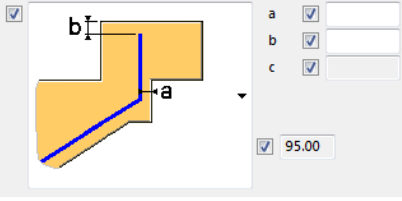
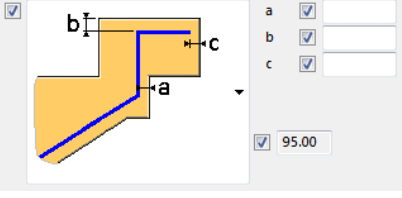
Define geometry and concrete cover thickness of the bar B bottom ending.

Option	Description
	Bar B simple bottom ending.
	Bar B bottom ending bent once to fit the bottom footing of the stairs.

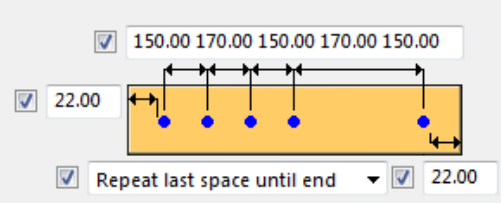
Option	Description
	Bar B bottom ending bent twice to fit the bottom footing of the stairs.
	Bar B bottom ending bent up to three times to fit the bottom footing of the stairs.

### Bar B top ending options

Define geometry and concrete cover thickness of the bar B top ending.

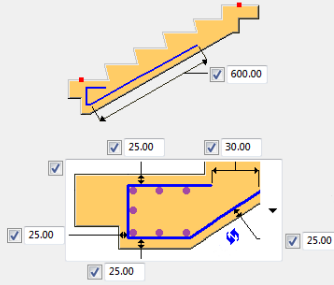
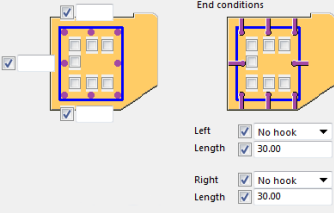
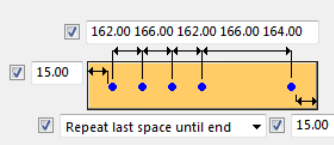
Option	Description
	Bar B simple top ending.
	Bar B top ending bent once to fit the top geometry of the stairs.
	Bar B top ending bent twice to fit the top geometry of the stairs. Last leg length is defined by the cover thickness.
	Bar B top ending bent twice to fit the top geometry of the stairs.

## Reinforcing bar spacing

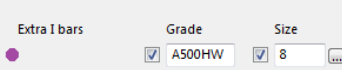
Option	Description
	<p>Spacing, number of bars and concrete cover thickness of the reinforcing bar group.</p>

## Bar C tab

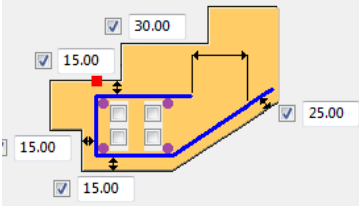
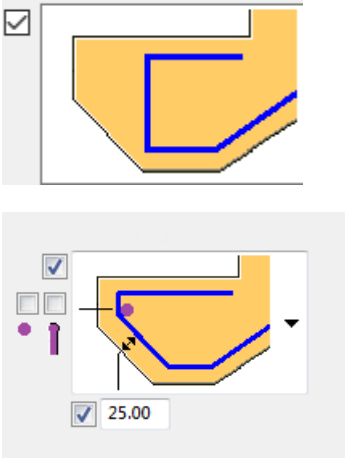
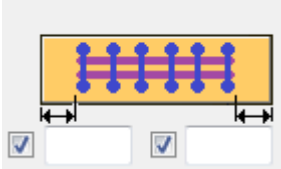
Use the **Bar C** tab to define the geometry, concrete cover thickness, reinforcing bar spacing and reinforcing bar properties of a stair reinforcing bar group.

Option	Description
	<p>Geometry and concrete cover thickness.</p>
	<p>Define which extra side bars are created, their end conditions, and the concrete cover.</p>
	<p>Spacing, number of bars and concrete cover thickness of the reinforcing bar group.</p>

## Extra I bars

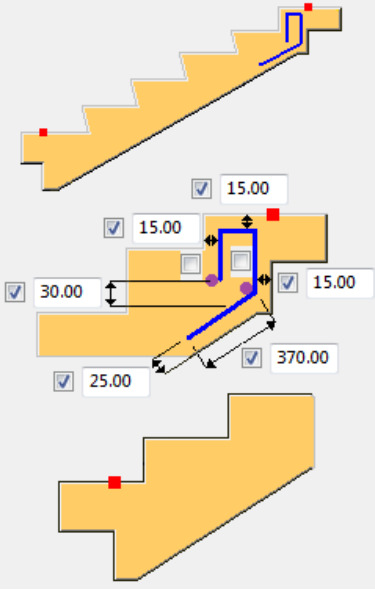
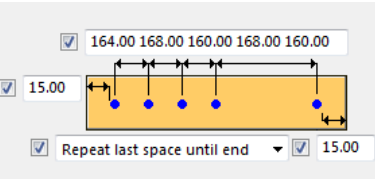
Option	Description
	<p>The purple color in the dialog box represents the extra I bars.</p>



Option	Description
 <p>The diagram shows a cross-section of a stair with a blue reinforcement path. Dimensions are indicated with arrows and values: 30.00, 15.00, 15.00, 15.00, and 25.00. Several checkboxes are present, some of which are checked.</p>	<p>Define whether to create the extra I bars. Select the check boxes next to the purple points.</p>
<p><b>Nose shape adaptation</b></p>  <p>The top diagram shows a cross-section with a blue reinforcement path and a checked checkbox on the left. The bottom diagram shows a similar cross-section with a checked checkbox and a value of 25.00.</p>	<p>Select the nose shape adaptation. The first check box (the dot on the left) creates the extra I bar and the second creates a hook on it.</p>
 <p>The diagram shows a rectangular cross-section with multiple blue reinforcing bars. Dimensions for cover thickness are indicated with arrows and checkboxes.</p>	<p>Cover thickness of the reinforcing bars.</p>

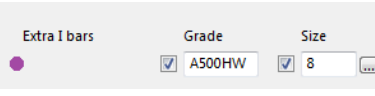
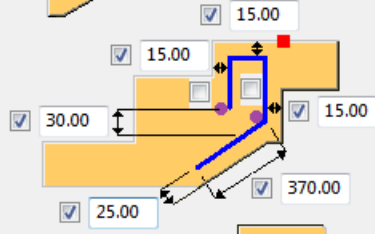
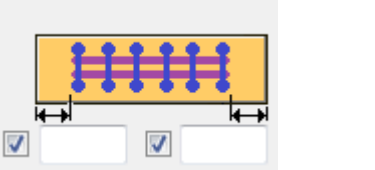
### Bar D tab

Use the **Bar D** tab to define the geometry, concrete cover thickness, reinforcing bar spacing and reinforcing bar properties of a stair reinforcing bar group.

Option	Description
	Geometry and concrete cover thickness.
	Spacing, number of bars and concrete cover thickness of the reinforcing bar group.

### Extra I bars

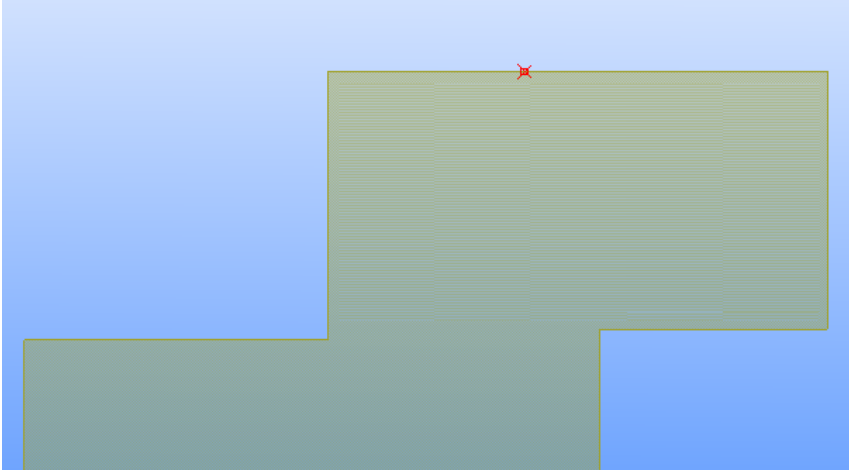
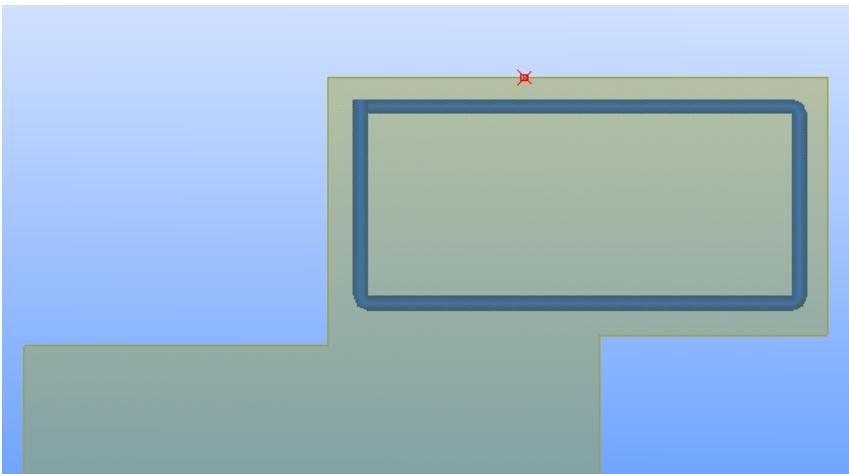
Extra I bars are straight bars crossing bar D. You can create up to four extra I bars.

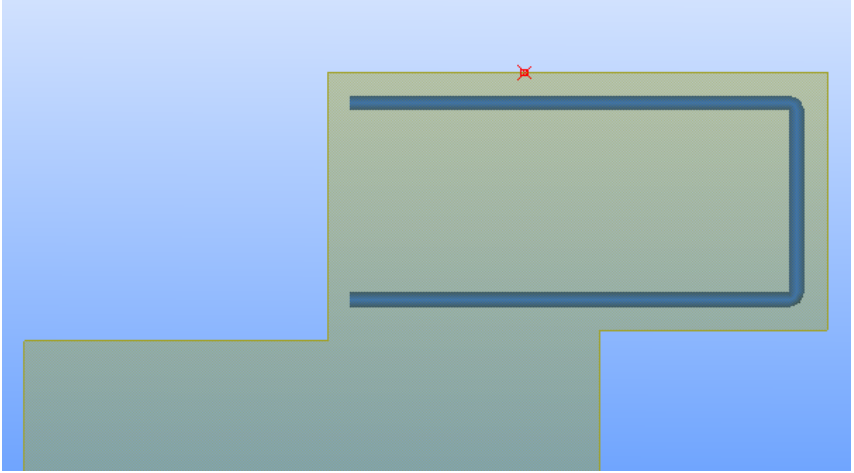
Option	Description
	The purple color in the dialog box represents the extra I bars.
	Define whether to create the extra I bars. Select the check boxes next to the purple points.
	Cover thickness of the reinforcing bars.

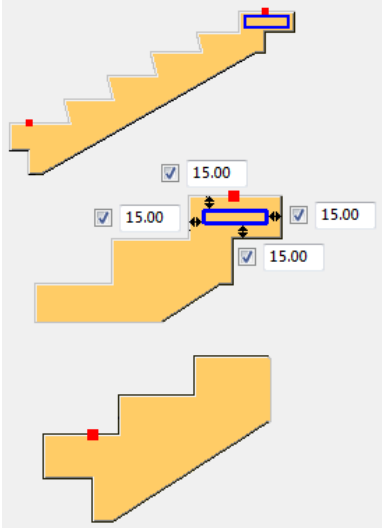
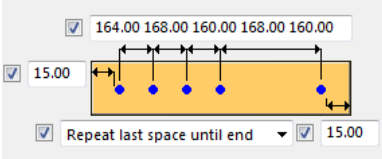
**Bar E tab**

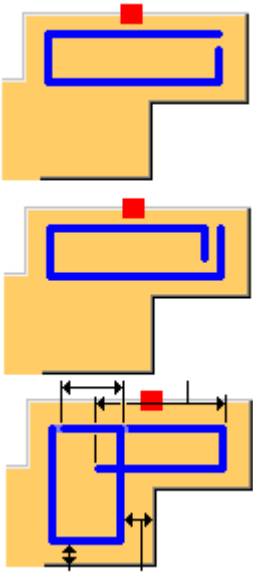
Use the Bar E tab to define the geometry, concrete cover thickness, reinforcing bar spacing and reinforcing bar properties of a stair reinforcing bar group.

**Create options**

<b>Option</b>	<b>Description</b>
<b>No</b>	Bar is not created. 
<b>Stirrup</b>	Bar is created as stirrup. 

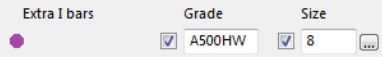
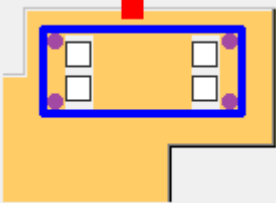
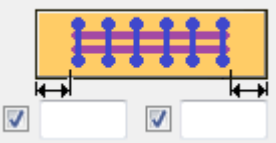
Option	Description
Pin	<p>Bar is created as pin.</p> 

Option	Description
	<p>Geometry and concrete cover thickness.</p>
	<p>Spacing, number of bars and concrete cover thickness of the reinforcing bar group.</p>

Option	Description
	Shape of the stirrups.
<b>Parallel with step slope</b>	<b>Yes</b> Create parallel with sloped step shape.
	<b>No</b> Create as a rectangle.

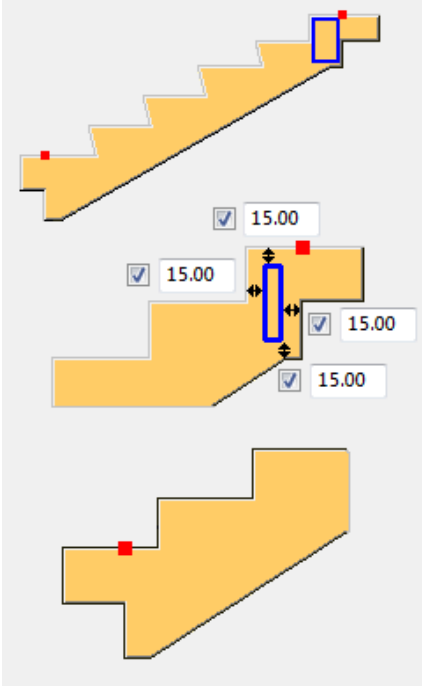
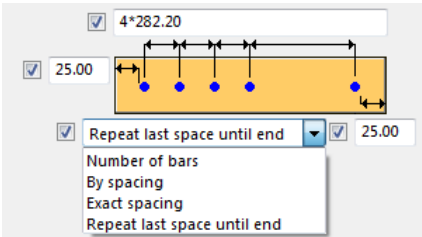
### Extra I bars

Extra I bars are straight bars crossing bar D. You can create up to four extra I bars.

Option	Description
	The purple color in the dialog box represents the extra I bars.
	Define whether to create the extra I bars. Select the check boxes next to the purple points.
	Cover thickness of the reinforcing bars.

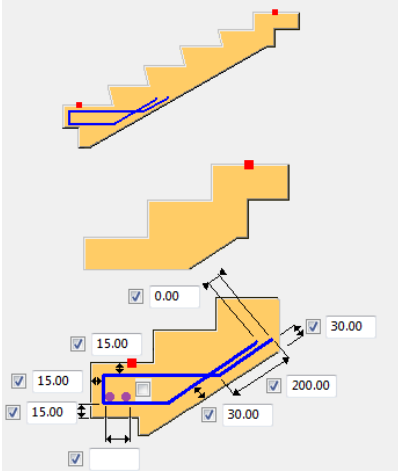
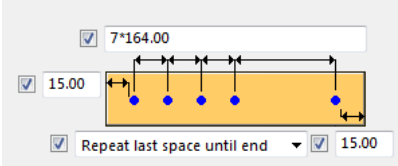
**Bar F tab**

Use the **Bar F** tab to define the geometry, concrete cover thickness, reinforcing bar spacing and reinforcing bar properties of a stair reinforcing bar group.

Option	Description
	<p>Geometry and concrete cover thickness.</p>
	<p>Spacing, number of bars and concrete cover thickness of the reinforcing bar group.</p>

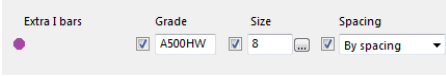
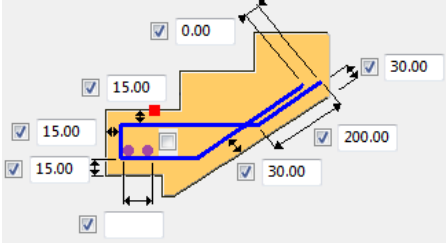
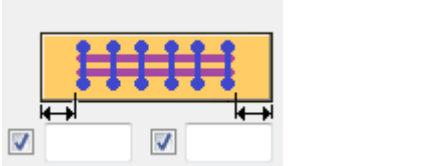
**Bar G tab**

Use the **Bar G** tab to define the geometry, concrete cover thickness, reinforcing bar spacing and reinforcing bar properties of a stair reinforcing bar group.

Option	Description
	Geometry and concrete cover thickness.
	Spacing, number of bars and concrete cover thickness of the reinforcing bar group.

### Extra I bars

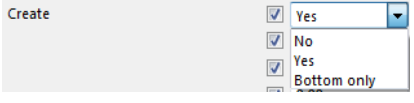
Extra I bars are straight bars crossing bar G. You can create up to four extra I bars.

Option	Description
	The purple color in the dialog box represents the extra I bars.
	Define whether to create extra I bars. Select the check boxes next to the purple points.
	Cover thickness of the reinforcing bars.

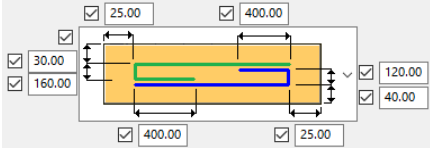
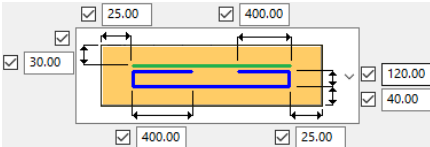
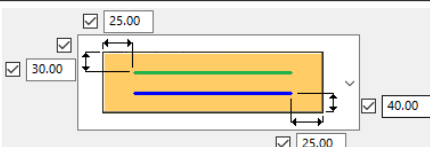
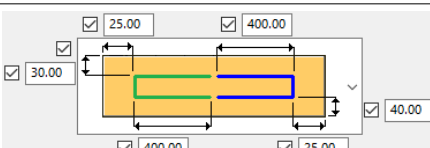
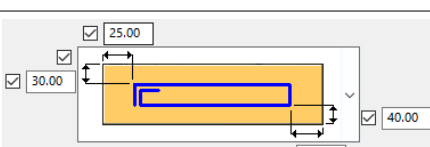
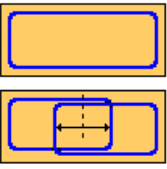
### Bar H tab

Use the **Bar H** tab to define the geometry, concrete cover thickness, reinforcing bar spacing and reinforcing bar properties of a stair reinforcing bar group.

## Create option

Option	Description
	<ul style="list-style-type: none"> <li>Do not create bar H</li> <li>Create bar H</li> <li>Create only bottom bar H reinforcing bar group</li> </ul>

## Bar H geometry option

Option	Description
	Two bent reinforcing bar groups. Define geometry and concrete cover thickness.
	Top reinforcing bar group is straight, bottom reinforcing bar group is bent on both sides. Define geometry and concrete cover thickness.
	Two straight reinforcing bar groups. Define geometry and concrete cover thickness.
	Two reinforcing bar groups. Define geometry and concrete cover thickness.
	<p>Reinforcing bar group that is bent on one side. Define the concrete cover thickness and whether to create hooks.</p> <p>You can create multiple overlapping stirrups in a row. Define the overlap dimension and the number of stirrups.</p>
	

## Properties

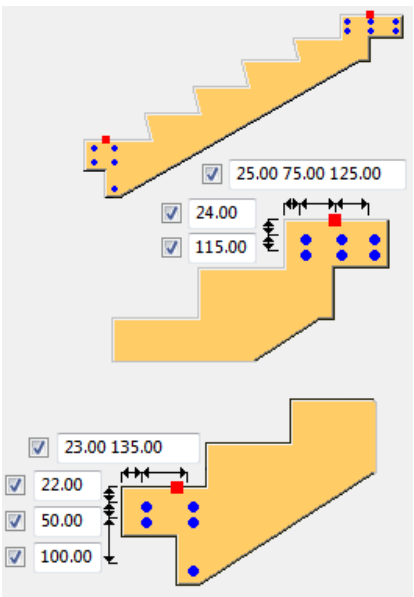
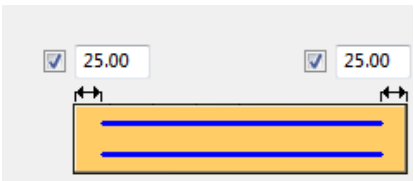
You can define separate properties for bottom and top rebars.



Option	Description
<b>Name</b>	Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use <b>Class</b> to group reinforcement.
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.

### Bar I tab


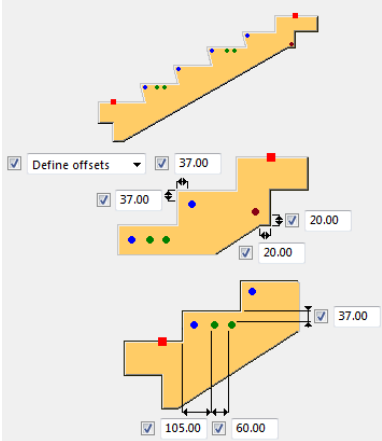
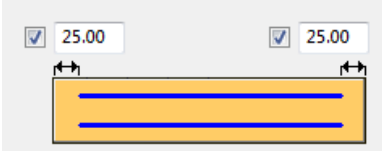
Use the **Bar I** tab to define the geometry, concrete cover thickness, reinforcing bar spacing and reinforcing bar properties of a stair reinforcing bar group.

Option	Description
	Positioning, spacing and concrete cover thickness.
	Concrete cover thickness of the reinforcing bar groups.

### Bar J tab

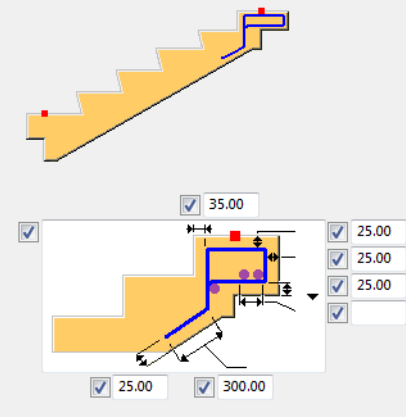
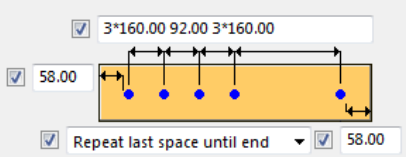
Use the **Bar J** tab to define the geometry, concrete cover thickness, reinforcing bar spacing and reinforcing bar properties of a stair reinforcing bar group. You can create several bar J reinforcing bar groups. Each group has its own color representation on the **Bar J** tab.

## Color group options

Option	Description
	<p>Use the color group option to define which combination of bar J reinforcing bar groups (blue, green, brown) is created.</p>
	<p>Positioning and concrete cover thickness for reinforcing bar groups based on the color representation.</p>
	<p>Concrete cover thickness for all reinforcing bar groups.</p>

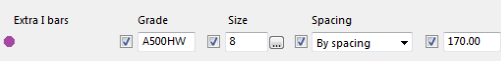
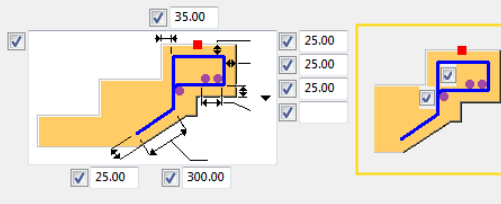
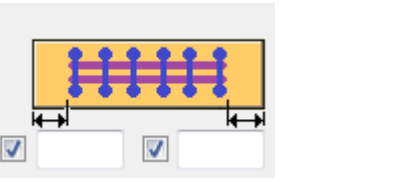
### Bar K tab

Use the **Bar K** tab to define the geometry, concrete cover thickness, reinforcing bar spacing and reinforcing bar properties of a stair reinforcing bar group.

Option	Description
	<p>Select the geometry and define the concrete cover thickness.</p>
	<p>Spacing, number of bars and concrete cover thickness of the reinforcing bar group.</p>

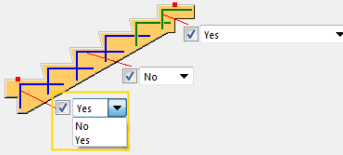
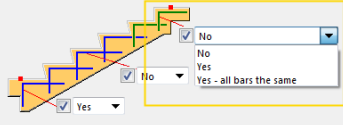
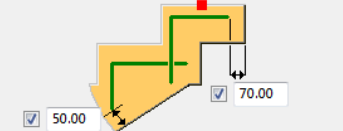
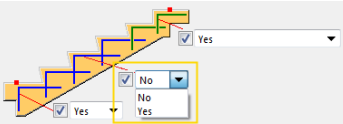
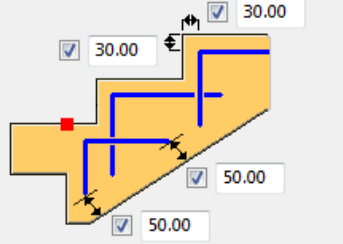
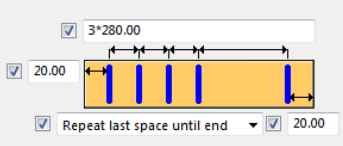
### Extra I bars

Extra I bars are straight bars crossing bar K. You can create up to three extra I bars.

Option	Description
	<p>The purple color in the dialog box represents the extra I bars.</p>
	<p>Define whether to create extra I bars by selecting the check boxes next to the purple points.</p>
	<p>Cover thickness of the reinforcing bars.</p>


### Bar L tab

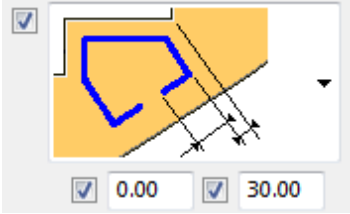
Use the **Bar L** tab to define the geometry, concrete cover thickness, reinforcing bar spacing and reinforcing bar properties of a stair reinforcing bar group.

Option	Description
	Define whether an L shaped reinforcing bar group is created at the stair footing.
	Define whether an L shaped reinforcing bar group is created at the stair top or whether all bars are created with the same geometry.
	Define offsets for the reinforcing bar groups in the two top steps.
	Define whether reinforcing bars are created between the top and bottom step.
	Define geometry for reinforcing bar groups in all steps, except for the two top steps.
	Spacing, number of bars and concrete cover thickness of the reinforcing bar group.

### Bar L geometry options

The geometry options affect the middle and the bottom steps.

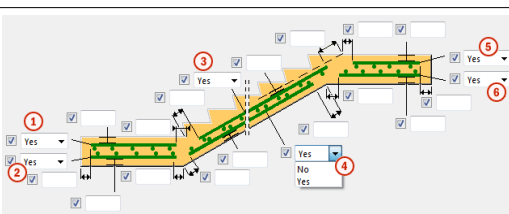
Option	Description
	L shape reinforcing bar groups.

Option	Description
	L shape reinforcing bar groups with hooks.

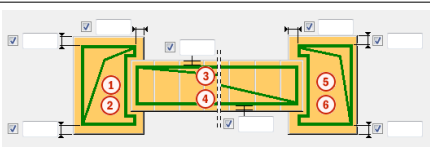
### Mesh picture tab

Use the **Mesh picture** tab to define bottom landing meshes, stair meshes and top landing meshes.

### Side view

	Description
	<b>1</b> Bottom landing mesh (top). Define offsets and cover thickness of the mesh.
	<b>2</b> Bottom landing mesh (bottom). Define offsets and cover thickness of the mesh.
	<b>3</b> Stair mesh (top). Define offsets and cover thickness of the mesh.
	<b>4</b> Stair mesh (bottom). Define offsets and cover thickness of the mesh.
	<b>5</b> Top landing mesh (top). Define offsets and cover thickness of the mesh.
	<b>6</b> Top landing mesh (bottom). Define offsets and cover thickness of the mesh.







### Top view

	Description
	<b>1</b> Cover thickness of bottom landing mesh (top).
	<b>2</b> Cover thickness of bottom landing mesh (bottom).
	<b>3</b> Cover thickness of stair mesh (top).
	<b>4</b> Cover thickness of stair mesh (bottom).



		Description
	5	Cover thickness of top landing mesh (top).
	6	Cover thickness of top landing mesh (bottom).

### Mesh attributes tab

Use the **Mesh attributes** tab with the **Mesh picture** tab to define the properties, positioning and creation type of bottom landing meshes, stair meshes and top landing meshes.

	Grade	Size	Spacing type	Spacing	Offset	Mesh pos
<b>Bottom landing meshes</b>						
Top primary bars	<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> 10	<input checked="" type="checkbox"/> By spacing	<input checked="" type="checkbox"/> 150.00	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> 
Top secondary bars	<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> 8	<input checked="" type="checkbox"/> By spacing	<input checked="" type="checkbox"/> 150.00	<input checked="" type="checkbox"/>	Class <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> Bar group
Bottom primary bars	<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> 8	<input checked="" type="checkbox"/> By spacing	<input checked="" type="checkbox"/> 150.00	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> 
Bottom secondary bars	<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> 8	<input checked="" type="checkbox"/> By spacing	<input checked="" type="checkbox"/> 150.00	<input checked="" type="checkbox"/>	Class <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> Bar group
<b>Stair meshes</b>						
Top primary bars	<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> 8	<input checked="" type="checkbox"/> By spacing	<input checked="" type="checkbox"/> 150.00	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> 
Top secondary bars	<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> 8	<input checked="" type="checkbox"/> By spacing	<input checked="" type="checkbox"/> 150.00	<input checked="" type="checkbox"/>	Class <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> Bar group
Bottom primary bars	<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> 8	<input checked="" type="checkbox"/> By spacing	<input checked="" type="checkbox"/> 150.00	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> 
Bottom secondary bars	<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> 8	<input checked="" type="checkbox"/> By spacing	<input checked="" type="checkbox"/> 150.00	<input checked="" type="checkbox"/>	Class <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> Bar group
<b>Top landing meshes</b>						
Top primary bars	<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> 8	<input checked="" type="checkbox"/> By spacing	<input checked="" type="checkbox"/> 150.00	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> 
Top secondary bars	<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> 8	<input checked="" type="checkbox"/> By spacing	<input checked="" type="checkbox"/> 150.00	<input checked="" type="checkbox"/>	Class <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> Bar group
Bottom primary bars	<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> 8	<input checked="" type="checkbox"/> By spacing	<input checked="" type="checkbox"/> 150.00	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> 
Bottom secondary bars	<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> 8	<input checked="" type="checkbox"/> By spacing	<input checked="" type="checkbox"/> 150.00	<input checked="" type="checkbox"/>	Class <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> Bar group

### Cross bar location

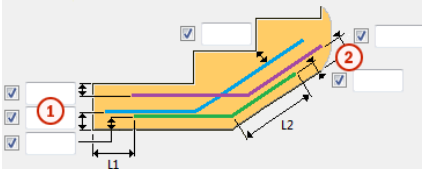
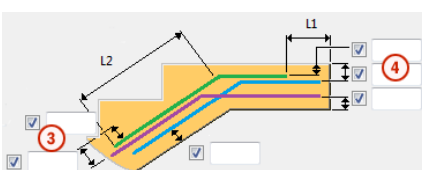
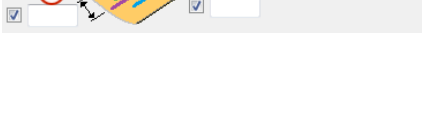

	Description
<input checked="" type="checkbox"/> 	Cross bar above.
<input checked="" type="checkbox"/> 	Cross bar below.

### Creation type

	Description
<input checked="" type="checkbox"/> Mesh	Create mesh as reinforcement mesh.
<input checked="" type="checkbox"/> Bar group	Create mesh as two independent reinforcing groups.

### Mesh bars tab

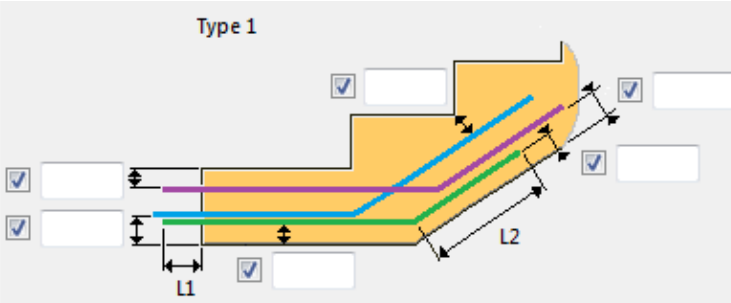
Use the **Mesh bars** tab to define the geometry, concrete cover thickness, reinforcing bar spacing, and reinforcing bar properties of the mesh bars in the top and bottom landing. You can create up to three reinforcing bar groups.

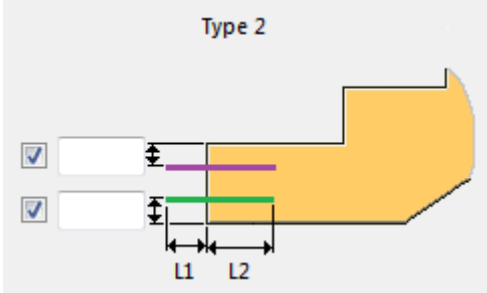
		<b>Description</b>
	<b>1</b>	Cover thicknesses of all mesh bar groups in the stair bottom landing. Use the color representation in the dialog box.
	<b>2</b>	Vertical cover thicknesses of all mesh bar groups in the stair bottom landing. Use the color representation in the dialog box.
	<b>3</b>	Cover thicknesses of all mesh bar groups in the stair top landing. Use the color representation in the dialog box.
	<b>4</b>	Vertical cover thicknesses of all mesh bar groups in the stair top landing. Use the color representation in the dialog box.

### Bottom anchor bars tab

Use the **Bottom anchor bars** tab to define the geometry, concrete cover thickness, reinforcing bar spacing, and reinforcing bar properties of the bottom anchor bars. You can create up to three reinforcing bar groups.

#### Creation type

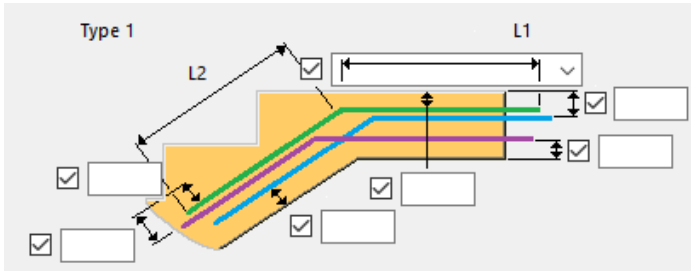
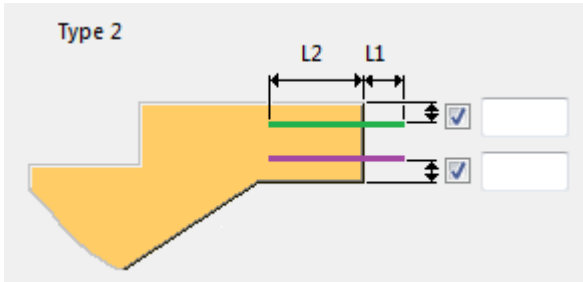
<b>Option</b>	<b>Description</b>
<b>No</b>	No reinforcing bar group created.
<b>Type1</b>	L shape anchor reinforcing bar group. 

Option	Description
<b>Type2</b>	Simple straight anchor reinforcing bar group. 

**Top anchor bars tab**

Use the **Top anchor bars** tab to define the geometry, concrete cover thickness, reinforcing bar spacing, and reinforcing bar properties of the top anchor bars. You can create up to three reinforcing bar groups.

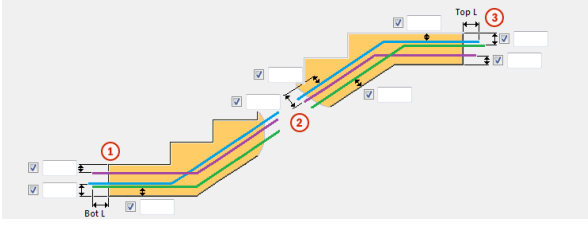
**Creation type**

Option	Description
<b>No</b>	No reinforcing bar group created.
<b>Type1</b>	L shape anchor reinforcing bar group. 
<b>Type2</b>	Simple straight anchor reinforcing bar group. 

**Z anchor bars tab**

Use the **Z anchor bars** tab to define the geometry, concrete cover thickness, reinforcing bar spacing, and reinforcing bar properties of the Z anchor bars. You can create up to three reinforcing bar groups.



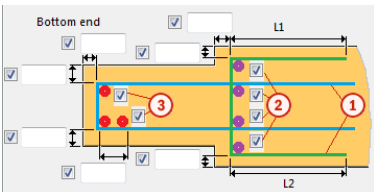
		<b>Description</b>
	<b>1</b>	Cover thicknesses of all Z anchor bar groups in the stair bottom landing.  Use the color representation in the dialog box.
	<b>2</b>	Vertical cover thicknesses of all Z anchor bar groups in the stair main part.  Use the color representation in the dialog box.
	<b>3</b>	Cover thicknesses of all Z anchor bar groups in the stair top landing.  Use the color representation in the dialog box.
	<b>Bot L</b>	Length of the Z anchor bars that extend from the stair bottom landing.
	<b>Top L</b>	Length of the Z anchor bars that extend from the stair top landing.

### Landing end bars tab

Use the **Landing end bars** tab to reinforce the stair landings and to define the geometry, concrete cover thickness, reinforcing bar spacing, and bar properties of the landing end bars.

### Bottom end

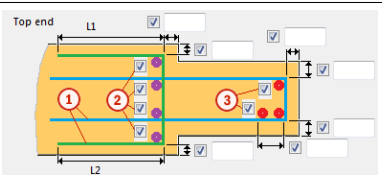
Reinforcement of bottom landing.

		<b>Description</b>
	<b>1</b>	Landing end bars. U-shape geometry follows the shape of the landing based on the defined cover thicknesses.  Color representation in the picture: blue, green.
	<b>2</b>	Define whether to create extra cross bars. Select the check boxes next to the purple points.

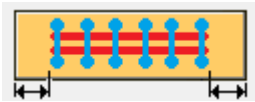
		<b>Description</b>
	<b>3</b>	Define whether to create extra cross bars. Select the check boxes next to the red points.

### Top end

Reinforcement of top landing.

		<b>Description</b>
	<b>1</b>	Landing end bars. U-shape geometry follows the shape of the landing based on defined cover thicknesses.  Color representation in the picture: blue, green.
	<b>2</b>	Define whether to create extra cross bars. Select the check boxes next to purple points.
	<b>3</b>	Define whether to create extra cross bars. Select the check boxes next to red points.

### Side cover thickness

Option	Description
	Side cover thickness of all reinforcing bar groups defined on the <b>Landing end bars</b> tab.

### UDA tab

Use the **UDA** tab to define user-defined attributes for the stairs. You can define multiple UDAs. UDAs can be used as filters, and they can be displayed in drawings and reports.

### Configuration tab

Use the **Configuration** tab to define the default cover thicknesses and bending radiuses of all reinforcing bars created by **Reinforced Concrete Stair (95)**.

### Cover thickness for reinforcing bar groups A - C

Define the default cover thickness for reinforcing bar groups A - C.

Option	Description
<b>Value</b>	Default cover thickness defined by a value.
<b>Rebar diameter</b>	Default cover thickness multiplied by reinforcing bar diameter.

### General cover thickness bars D - L

Define the default cover thickness for reinforcing bar groups D - L and all reinforcing bars except the reinforcing bar groups A - C and meshes.

Option	Description
<b>Value</b>	Default cover thickness defined by a value.
<b>Rebar diameter</b>	Default cover thickness multiplied by reinforcing bar diameter.

### Bending radius

Define the default bending radius of all reinforcing bars.

Option	Description
<b>Rebar_database.inp</b>	Default bending radius defined by <code>rebar_database.inp</code> file.
<b>Relative to diameter</b>	Default bending radius according to the reinforcing bar diameter.
<b>Bending radius</b>	Default bending radius defined by value.

### Mesh cover thickness

Define the default cover thickness for the meshes created by **Reinforced Concrete Stair (95)**.

## Foundations

This section introduces components that can be used in concrete foundations.

Click the links below to find out more:

- [Precast foundation block \(1028\) \(page 3267\)](#)
- [Concrete foundation \(1030\) \(page 3274\)](#)

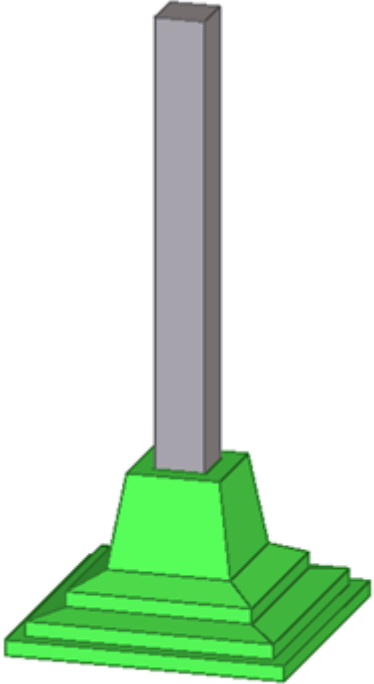
### ***Precast foundation block (1028)***

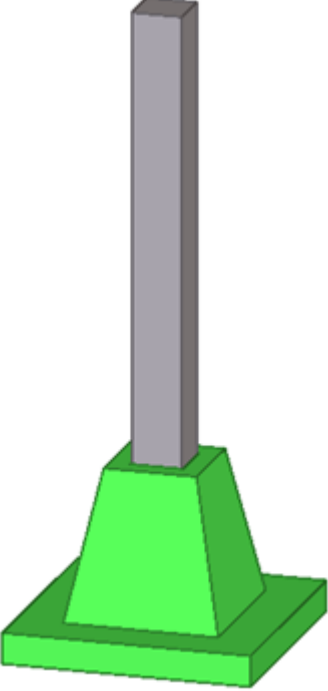
**Precast foundation block (1028)** creates a concrete foundation block. The block can be divided in three sections. All three sections can be dimensioned separately.

#### **Parts created**

- Foundation block
- Embed
- Regulator

**Use for**

<b>Situation</b>	<b>Description</b>
	Precast foundation block with three sections.

Situation	Description
 A 3D perspective view of a precast foundation block. The block is green and consists of a wide, flat base with a trapezoidal section rising from the center. A vertical, grey rectangular column is attached to the top of this trapezoidal section.	Precast foundation block with one section.

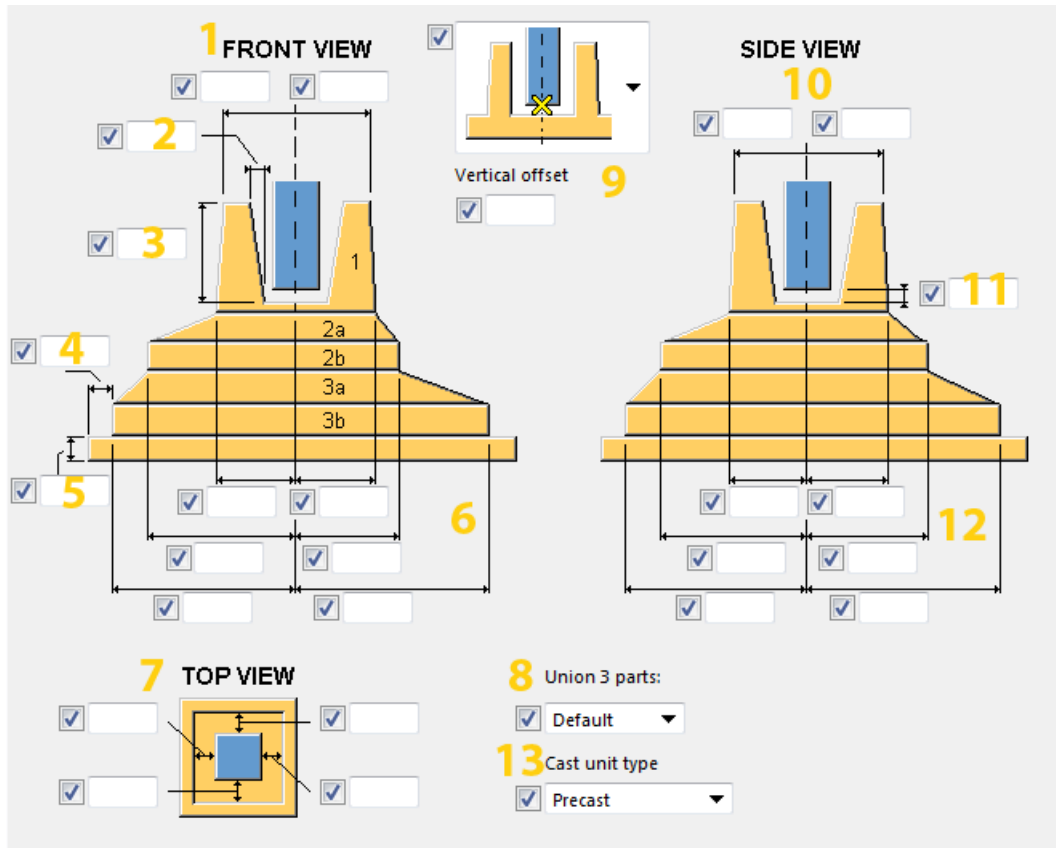
**Selection order**

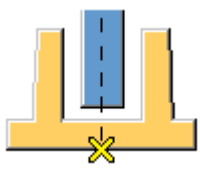
1. Select the main part (concrete column).
2. Pick a position.  
The detail is created automatically.

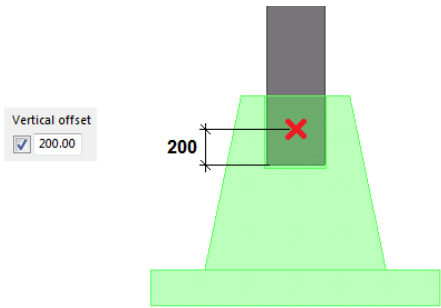
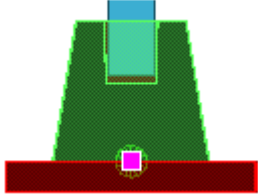
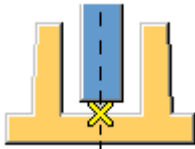
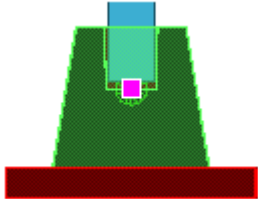

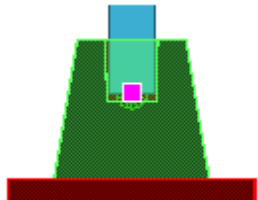
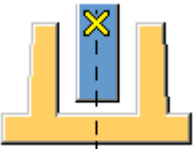
**Picture tab**

Use the **Picture** tab to dimension the foundation block.

The foundation block can be dimensioned in both the front view and in the side view.



	Description	
1	Width of the top chord in section 1 (in front view).	
2	Width of the inclined column cut-out.	
3	Height of the column cut-out.	
4	Offset of the plate that is under the block. The offset is relative to the foundation block.	
5	Thickness of the plate under the block.	
6	Width of the bottom chord in section 1 (in front view). Width of section 2 and section 3 (in front view).	
7	Distance between the foundation block and the sides of the column.	
8	Select how the sections in the foundation block are connected.	
9		Component insertion point is at the bottom side of the foundation block.

Description	
<p>Additionally, you can set the vertical offset:</p> 	<p>Note that the red part (additional plate under the block) is not taken into account.</p> 
	<p>Component insertion point is at the bottom side of the cut-out of the column.</p> 
	<p>Component insertion point is at the bottom side of the column.</p> 
	<p>Component insertion point is at the top of the foundation block.</p>
<b>10</b>	Width of the top chord in section 1 (in side view).
<b>11</b>	Distance from the bottom of the column to the foundation block.
<b>12</b>	Width of the bottom chord in section 1 (in side view). Width of section 2 and section 3 (in side view).
<b>13</b>	Select the cast unit type.

### Parts tab

Use the **Parts** tab to define the profiles for the foundation block, embed and regulator, and the embed dimensions.

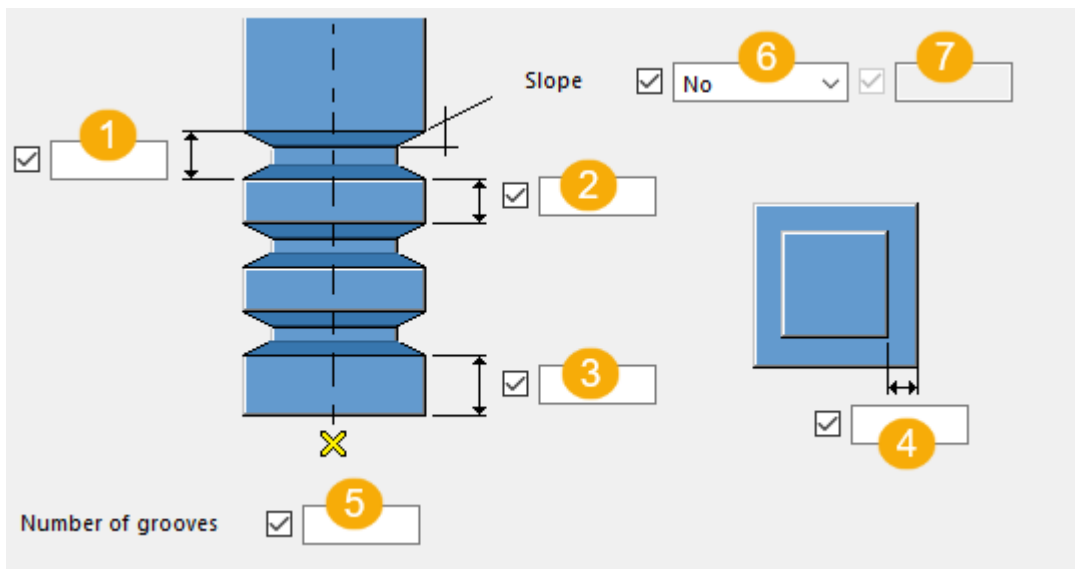
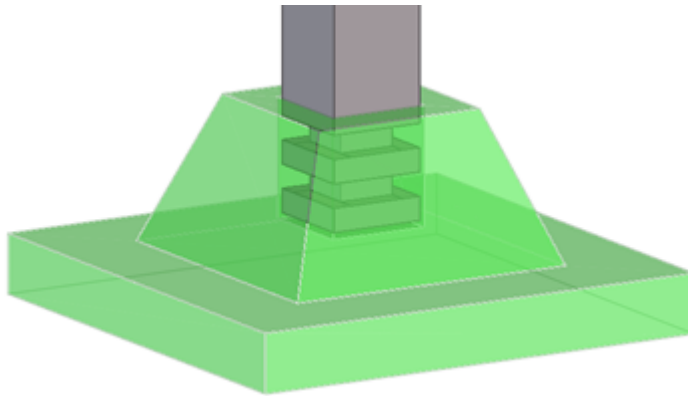
Option	Description
1	Foundation block profiles, regulator and embed properties. If you do not select any material, <b>Precast foundation block (1028)</b> uses the same material as the column. Select <b>Yes</b> in <b>Create filling</b> to create a filling between the column and the first created block.
2	Select whether the regulator and the embed is created, and how they are connected to the foundation block.
3	Dimensions of the three sections of the foundation block. Additionally, you can define the column cut-out in the upper section. For sections 2 and 3 you can define the height of the inclined plane.
4	Dimensions of the embed.

### Grooves tab

Use the **Grooves** tab to define the grooves.



Example:



	Description
1	Height of the groove.
2	Distance between the grooves.
3	First distance related to the bottom of the column.
4	Depth for the grooves.
5	Number for the grooves.
6	Select whether to define a slope angle or dimension for the grooves.
7	Define the slope angle or dimension value.

### General tab

Click the link below to find out more:

### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

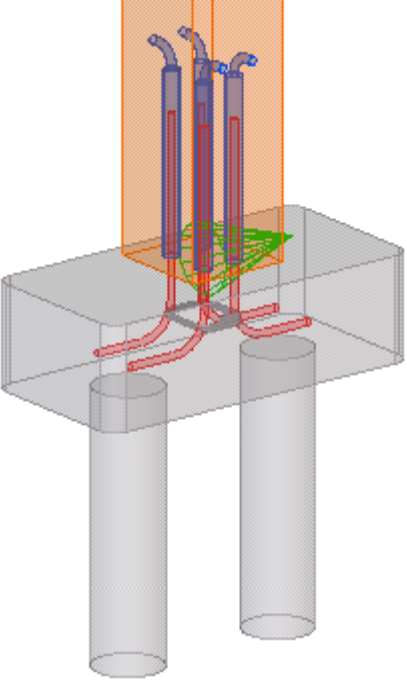
### **Concrete foundation (1030)**

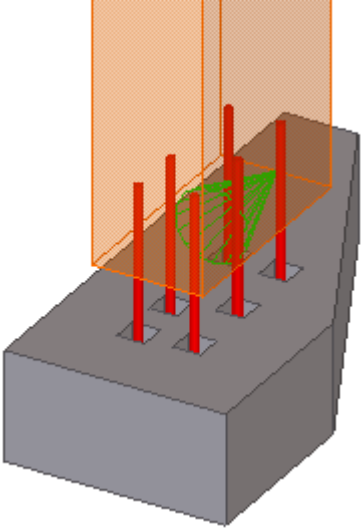
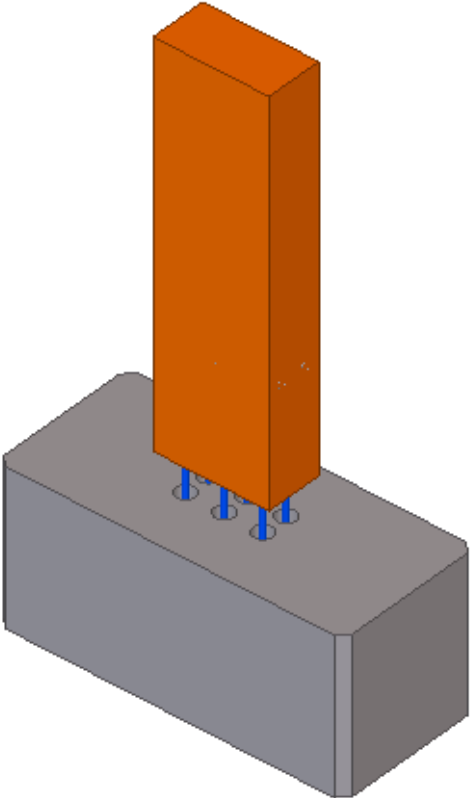
**Concrete foundation (1030)** creates a concrete foundation plate at the bottom of a selected concrete column.

### Objects created

- Concrete foundation plate
- Injection tubes and injection hoses in concrete column
- Up to 4 concrete piles under the foundation plate (optional)
- Stirrups for the reinforcing bars

### Use for

Situation	Description
 A 3D cutaway diagram showing a concrete foundation plate (a rectangular slab) resting on two vertical concrete columns. Inside the plate, there are three vertical injection tubes extending upwards. Curved injection hoses connect these tubes to the bottom of the plate. Below the plate, there are two concrete piles. Reinforcing bars and stirrups are visible within the plate and columns.	Concrete foundation plate with chamfers, piles, injection tubes with curved injection hoses, reinforcing bars and stirrups.

Situation	Description
	<p>Concrete foundation plate with more than 4 edges, recesses in the foundation plate, and multiple reinforcing bars.</p>
	<p>Concrete foundation plate with multiple reinforcing bars.</p>

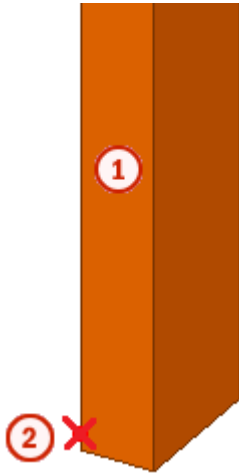
**Selection order**

1. Select a concrete column.

2. Pick a point.

The concrete foundation plate is created automatically when the point is picked.

### Part identification key

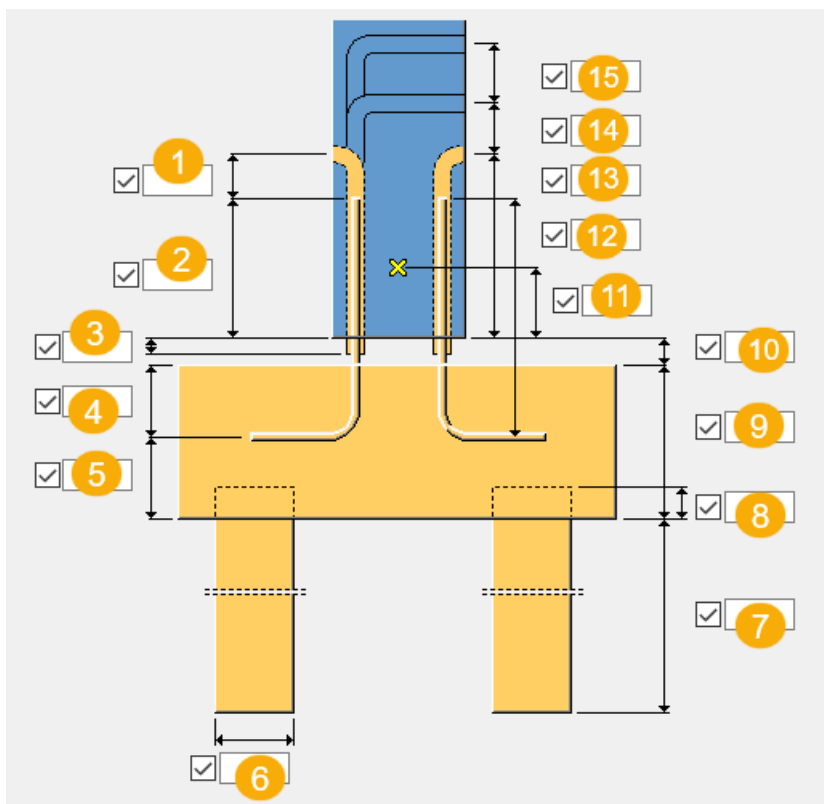


	Part
1	Concrete column
2	Point The point defines the new bottom level of the column.

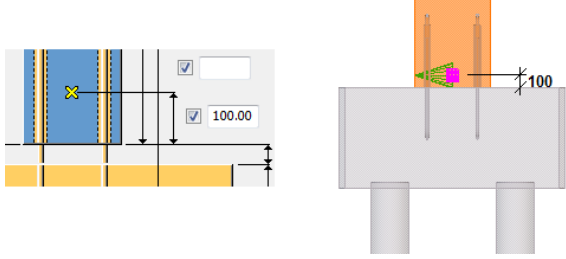
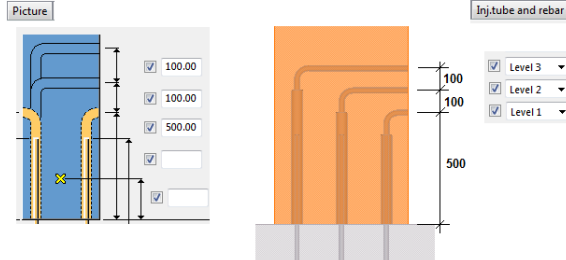
### Picture tab

Use the **Picture** tab to control the dimensions of the reinforcing bars and injection tubes.

## Dimensions

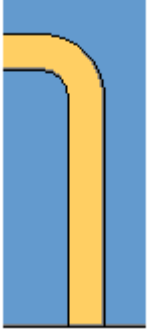
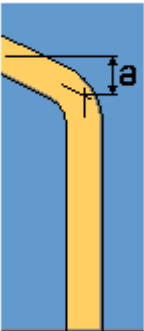
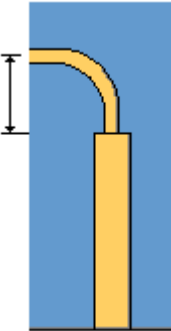
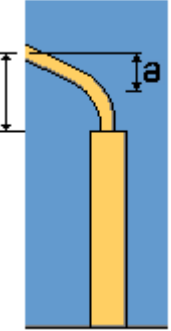


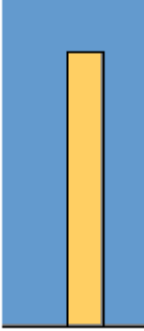
	Description	Default
1	Length of the injection tube extension from the top of the reinforcing bar.	180 mm
2	Reinforcing bar height in the column.	400 mm
3	Offset of the injection tube from the bottom of the column.	
4	Reinforcing bar top and bottom cover thickness.	0,5 * foundation plate thickness
5	The bottom cover thickness is used only if you do not define the top cover thickness.	
6	Pile thickness. The pile thickness value on the <b>Parts</b> tab overrides this value.	300 mm
7	Distance from the bottom of the foundation plate to the bottom of the pile.	5000 mm
8	Pile depth in the foundation plate.	50 mm
9	Foundation plate thickness.	800 mm

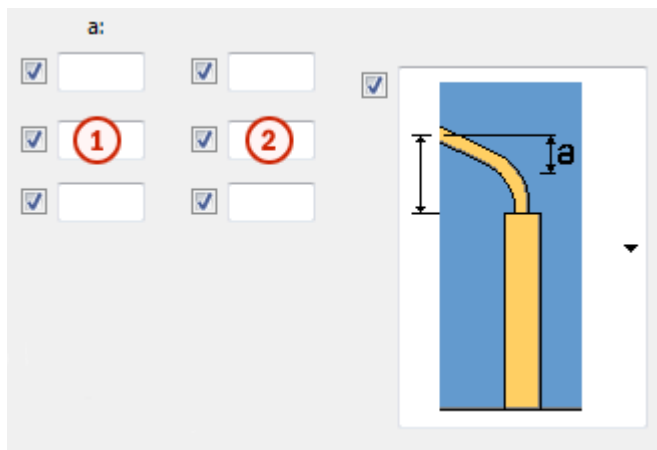
	Description	Default
10	Distance between the column and the foundation plate.	0 mm
11	Vertical offset from the picked point. 	0 mm
12	Reinforcing bar height.	800 mm 400 mm + 50% of height of concrete footing
13	Injection tube elevation 1.	500 mm
14, 15	Injection tube elevations 2 and 3. Vertical offset for the injection tubes if the tubes are pointing to the same direction. Define the level to use on the <b>Inj. Tube and rebar</b> tab. 	

### Injection tube

Select the shape and dimensions of the injection tubes. Sloping injection hoses are fitted to the column edge.

Option	Description
	<p>Injection tube in one piece, 90 degree angle.</p>
	<p>Injection tube in one piece. Use value <b>a</b> to define the slope of the tube.</p>
	<p>Injection tube and a 90 degree injection hose.</p>
	<p>Injection tube and a sloped injection hose. Use value <b>a</b> to define the slope of the hose.</p>

Option	Description
	Straight injection tube. No injection tube opening is created.



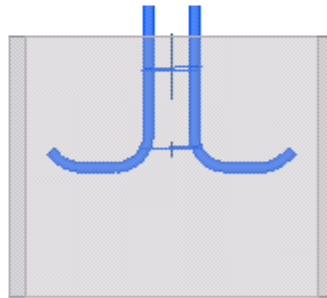
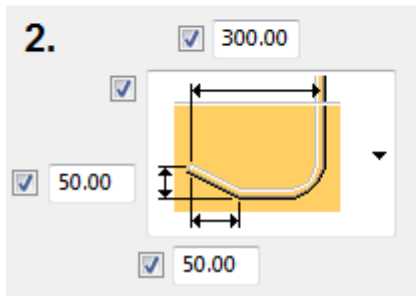
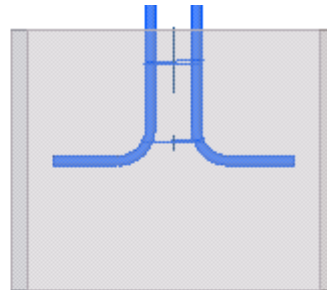
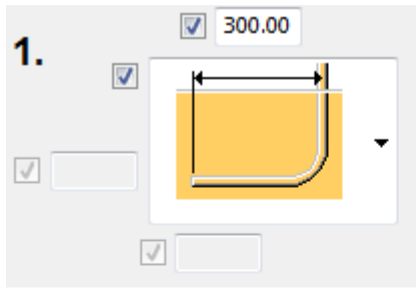
	Description	Default
1	Define the height of a sloped injection tube or hose angle.	30 mm
2	Define the height of a curved injection hose.	0 mm

### Reinforcing bar hook length

Define the reinforcing bar hook length. You can define also the end angle of the reinforcing bar.

The default value is  $10 * \text{reinforcing bar diameter}$ .





### Parts tab

Use the **Parts** tab to control the profile properties of the foundation plate, foundation piles, stirrups and injection tubes.

### Part properties

Define the part profile properties.

If you leave the pile thickness value empty on the **Parts** tab, the pile thickness value defined on the **Picture** tab is used instead together with the **Pile profile type prefix (e.g. D)**.

Option	Description
<b>t, b, h</b>	Define the thickness, width, and height of the foundation plate and piles, or select the profile from the profile catalog.
<b>Pos_No</b>	Prefix and a start number for the part position number.
<b>Material</b>	Material grade.
<b>Name</b>	Name that is shown in drawings and reports.
<b>Class</b>	Part class number.
<b>Comment</b>	Add a comment for the part.

## Reinforcing bars

Option	Description
<b>Type of reinforcing bars</b>	Select the profile type for the reinforcing bars. <ul style="list-style-type: none"> <li>• <b>Default:</b> the same as <b>Reinforcing bar</b></li> <li>• <b>Poly-profile:</b> profile catalog</li> <li>• <b>Reinforcing bar:</b> reinforcing bar catalog</li> <li>• <b>Polyprofile (as sub-assembly):</b> profile catalog. Create the polyprofile as a sub-assembly to the foundation part.</li> </ul>
<b>Reinforcement bars</b>	Size of the reinforcing bars.
<b>Radius</b>	Radius of the reinforcing bar hook.
<b>Reinf. bars belong to</b>	Define to which part the reinforcing bars belong. <ul style="list-style-type: none"> <li>• <b>Default:</b> the same as <b>Columns</b></li> <li>• <b>Concrete massive:</b> reinforcing bars belong to the concrete foundation plate.</li> <li>• <b>Column:</b> reinforcing bars belong to the column.</li> <li>• <b>Loose part:</b> reinforcing bars are not connected to any part.</li> <li>• <b>Neighbor:</b> reinforcing bars belong to the neighbor part. Use the name or class to find the part.</li> </ul>

## Injection tubes and curve

Option	Description
<b>Injection tubes</b>	Size of the injection tubes.
<b>Curve</b>	Size of the injection hoses.
<b>Article number</b>	Article number for the injection hose and the injection tube. The entered values are saved to the user-defined attribute of the part.
	Define how the injection hoses are connected to the injection tubes. <ul style="list-style-type: none"> <li>• <b>Default:</b> injection hoses are loose parts.</li> <li>• <b>Part-add gain:</b> injection hoses are added to the injection tubes.</li> </ul>

Option	Description
	<ul style="list-style-type: none"> <li>• <b>Weld gain:</b> injection hoses are welded to the injection tubes.</li> <li>• <b>Cast unit column:</b> injection hoses are added to the column.</li> <li>• <b>Weld to column:</b> injection hoses are welded to the column.</li> </ul>

Option	Description
<b>Pile profile type prefix (e.g. D)</b>	<p>Default parametric profile prefix for the piles.</p> <p>This value works only if you have set the pile thickness on the <b>Picture</b> tab.</p> <p>You can override this value by setting the pile thickness on the <b>Parts</b> tab.</p>
<b>Reinf. bar profile type prefix (e.g.D)</b>	Default parametric profile prefix for the reinforcing bar profiles.

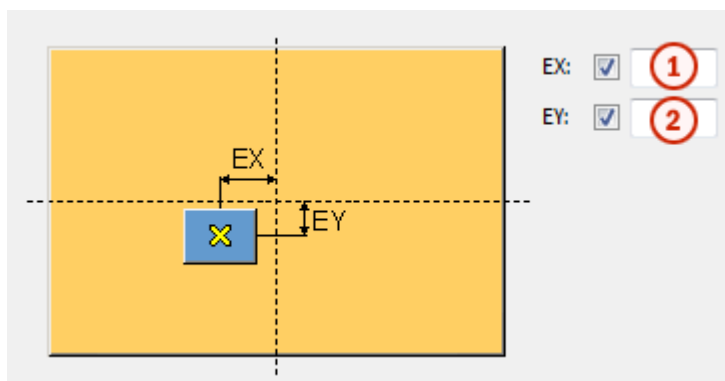
### Massive tab

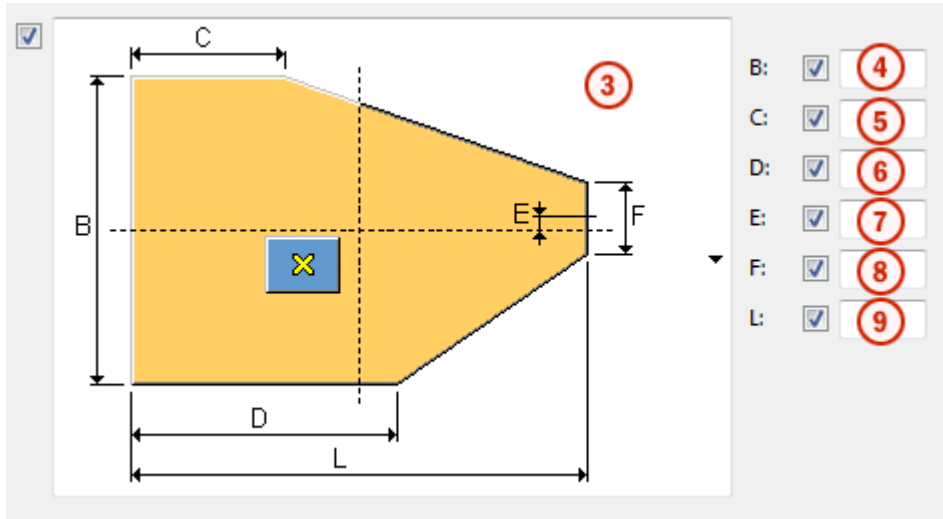
Use the **Massive** tab to control the shape and the dimensions of the concrete foundation plate and the recesses.

### Concrete foundation plate type

Option	Description
<b>Type of massive</b>	Select the plate type for the rectangular foundation plate.
<b>Massive direction</b>	Select the direction of the foundation plate.

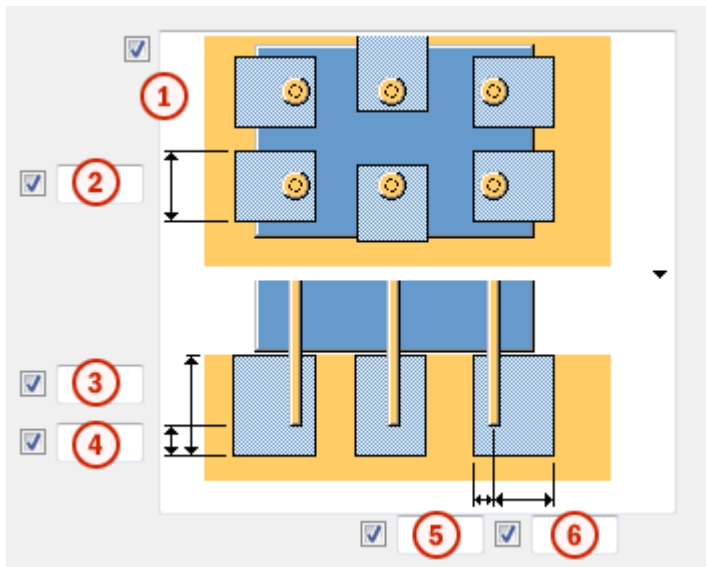
### Concrete foundation plate dimensions





	Description
1	Offset from the concrete column in the x direction.
2	Offset from the concrete column in the y direction.
3	Select the shape of the foundation plate.
4	Width of the foundation plate.
5	Length of the straight part of the foundation plate.
6	
7	Offset from the foundation plate center line.
8	Width of the straight part of the foundation plate.
9	Length of the foundation plate.

### Recess dimensions



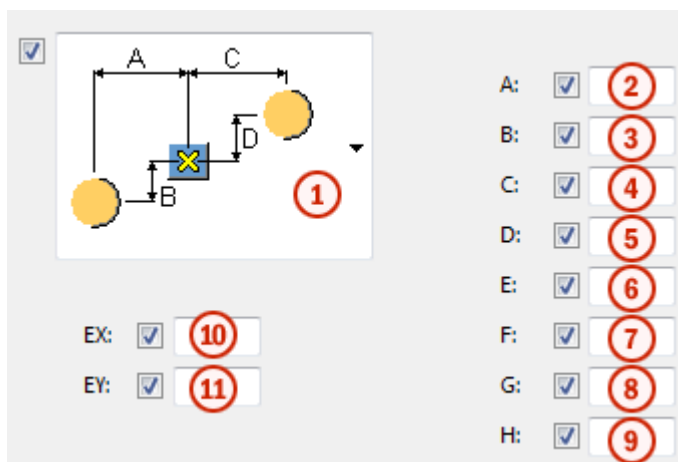
	Description
1	Select the type of the recess.
2	Width of the recesses.
3	Depth of the recesses.
4	Distance between the bottom of the reinforcing bar and the bottom of the recess.
5	Distance between the center line of the reinforcing bar and the left side of the recess.
6	Distance between the center line of the reinforcing bar and the right side of the recess.

Option	Description
<b>Chamfer type for rectangular massive</b>	Chamfer type for the rectangular foundation plate.
<b>Chamfer X</b>	Chamfer size in the x direction.
<b>Chamfer Y</b>	Chamfer size in the y direction.

### Piles tab

Use the **Piles** tab to control the position of the foundation piles.

### Pile positions



	Description
1	Select the position and the offset of the piles.
2	Distance between the first pile and the column in the x direction.
4	Distance between the second pile and the column in the x direction.
6	
8	Distance between the third pile and the column in the x direction.

	<b>Description</b>
	Distance between the fourth pile and the column in the x direction.
<b>3</b>	Distance between the first pile and the column in y direction.
<b>5</b>	Distance between the second pile and the column in y direction.
<b>7</b>	
<b>9</b>	Distance between the third pile and the column in y direction.
	Distance between the fourth pile and the column in y direction.
<b>10</b>	Pile offset from the concrete column in the x direction.
<b>11</b>	Pile offset from the concrete column in the y direction.

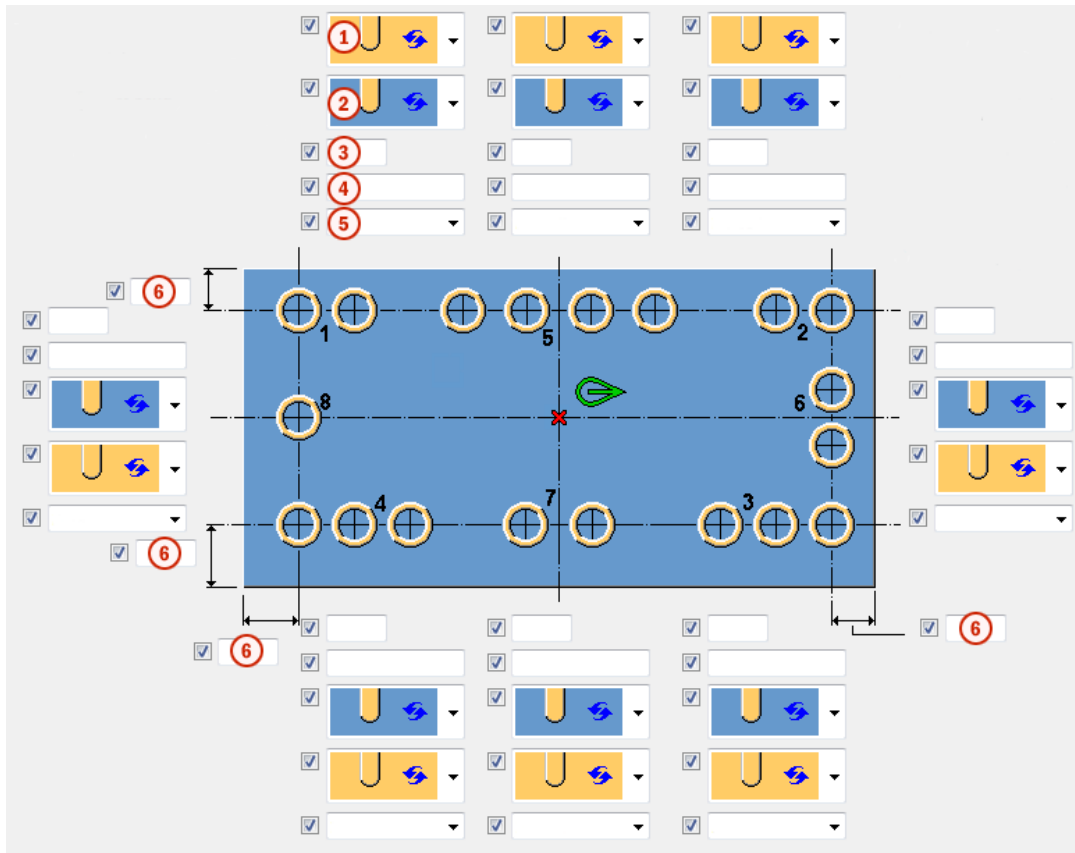
<b>Option</b>	<b>Description</b>
<b>Piles direction</b>	Define the direction of the piles.
<b>Join piles to massive</b>	Define how the piles are connected to the foundation plate.

#### **Inj. tube and rebar tab**

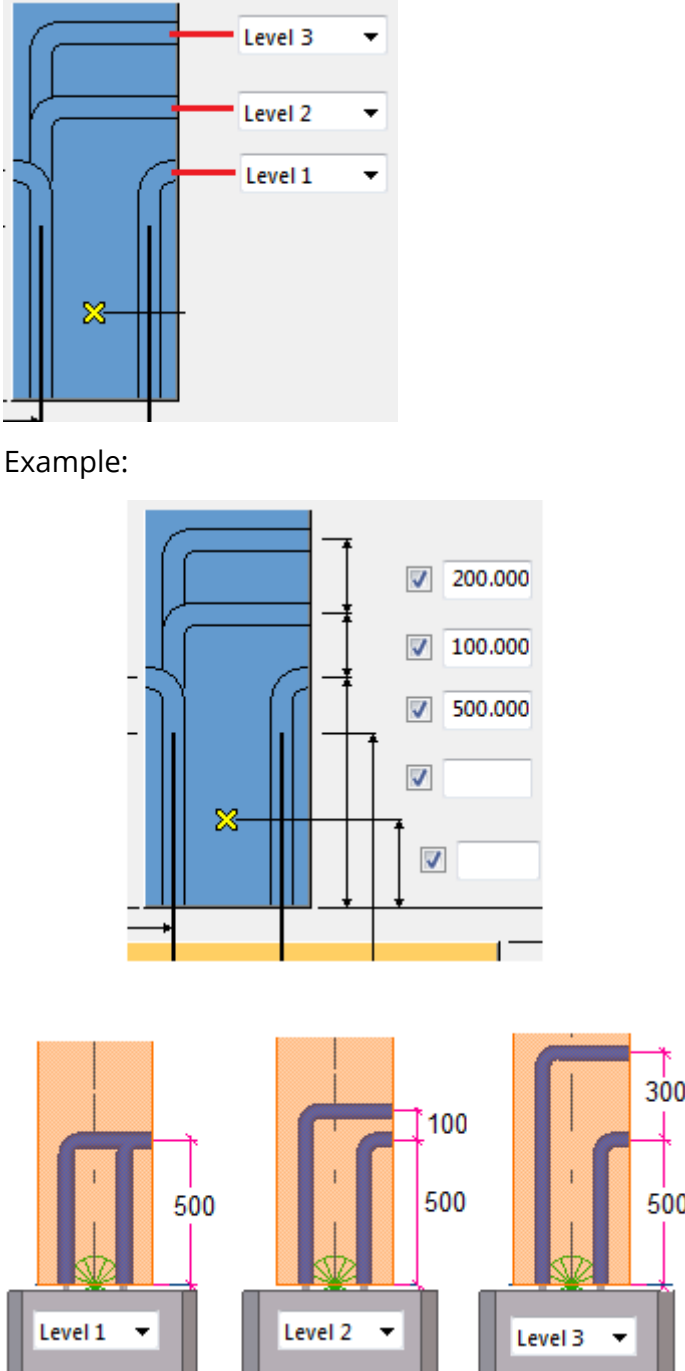
Use the **Inj. tube and rebar** tab to control the creation, number and position of the reinforcing bars and injection tubes.

<b>Option</b>	<b>Description</b>
<b>Create</b>	Select which parts are created.
<b>Injection tubes bend radius</b>	Radius of the injection tubes.

## Injection tube properties

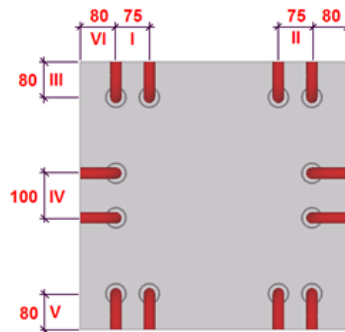
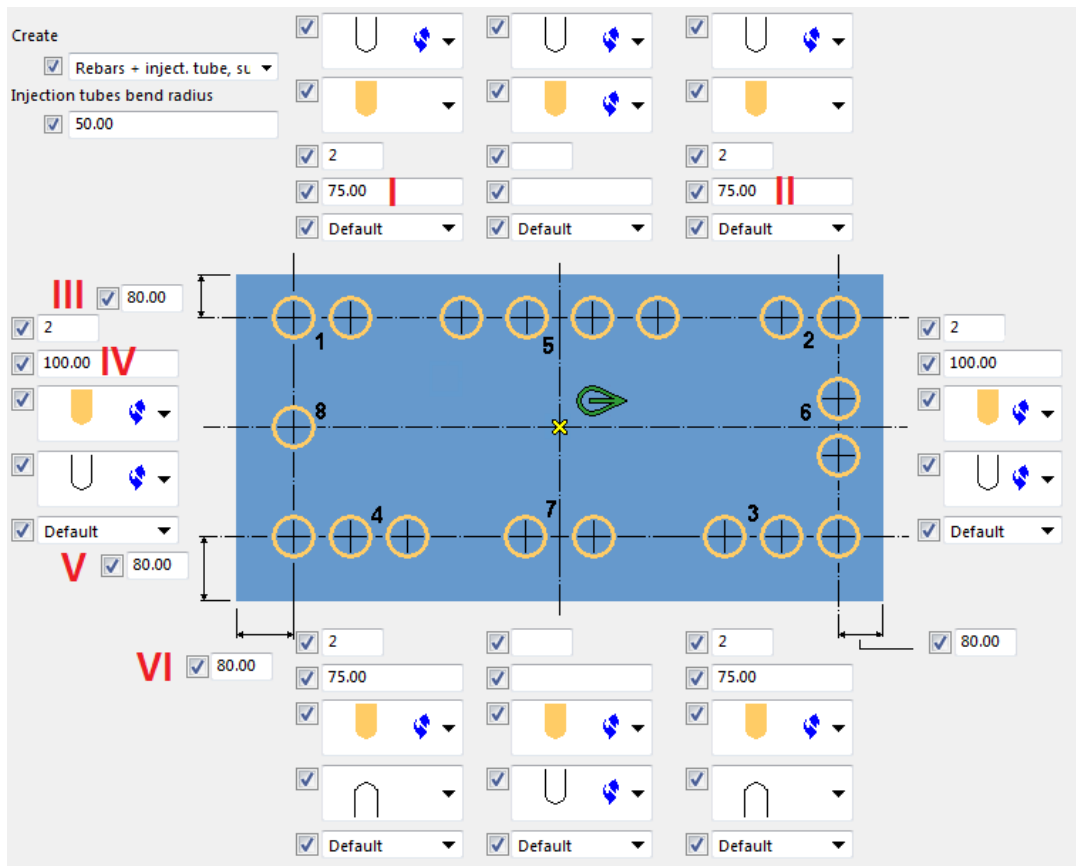


	Description
1	Select the direction of the bent bars.
2	Select the direction of the injection hoses.
3	Number of injection tubes.
4	Center-to-center distance between the injection tubes.
5	Define the level of the curved injection parts. This is useful if the curved parts are pointing to the same direction. You can define the levels on the <b>Picture</b> tab.

	Description
	 <p>Example:</p>
6	Define the distance from the center of the injection tube to the outer contour of the concrete foundation.



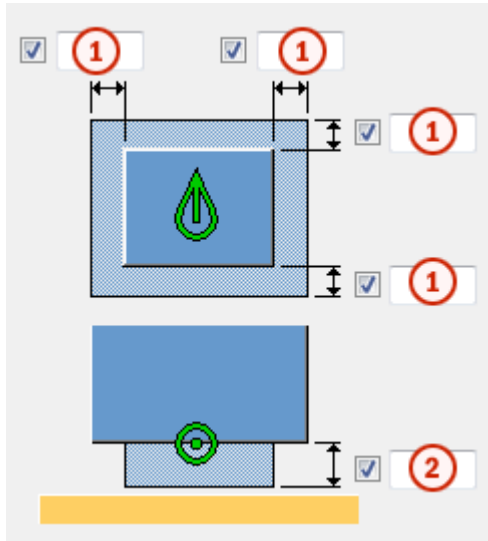
## Example



### Column tab

Use the **Column** tab to control the dimensions of the column cut-out.

## Column dimensions



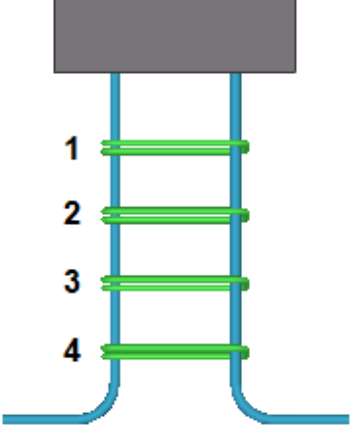
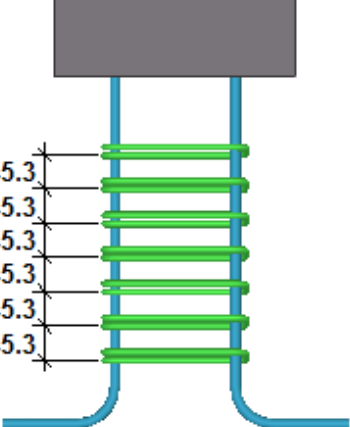
	Description
1	Size of the column cut-out.
2	Height of the column cut-out.

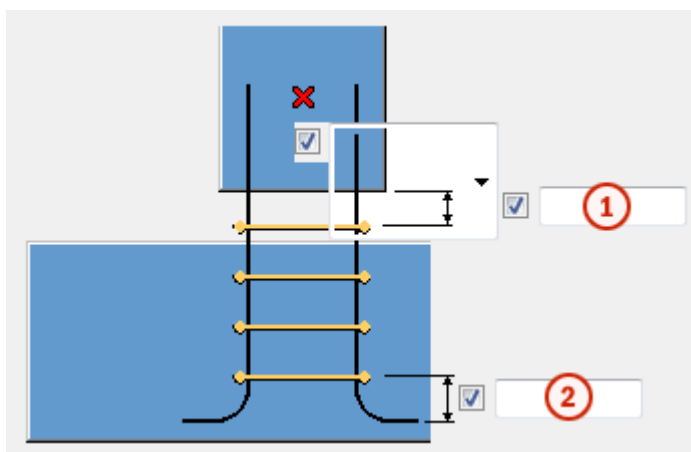
## Stirrups tab

Use the **Stirrups** tab to control the stirrup properties.

## Stirrup properties

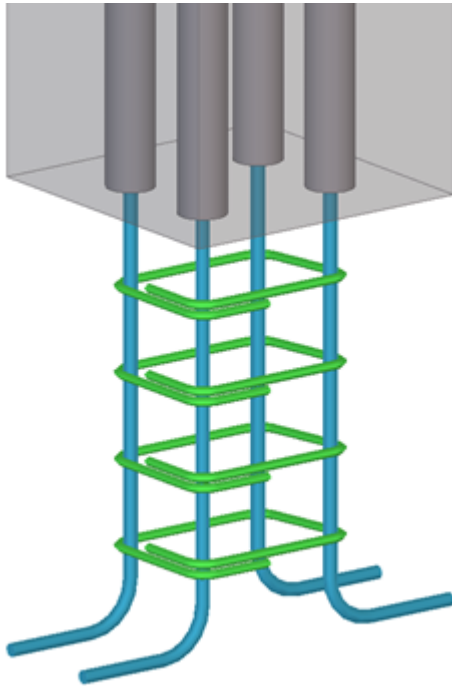
Option	Description
<input checked="" type="checkbox"/> a: <input checked="" type="checkbox"/> <input type="text"/> b: <input checked="" type="checkbox"/> <input type="text"/>	Select whether the stirrups are created. Define the length of the laps.
<b>Grade</b>	Grade of the stirrups.
<b>Size</b>	Size of the stirrups.
<b>End conditions left</b>	Hook for the start point of the stirrups.
<b>End conditions right</b>	Hook for the end point of the stirrups.
<b>Bend lengths left</b>	Hook length for the start point of the stirrup.
<b>Bend lengths right</b>	Hook length for the end point of the stirrup.
<b>Creation method</b>	Creation method of the stirrups. <b>Number of bars:</b> Enter the number of the stirrups.

Option	Description
	<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="width: 30%;"> <p><input checked="" type="checkbox"/> Number of bars ▾</p> <p><input checked="" type="checkbox"/> 4 <input type="checkbox"/></p> </div> <div style="width: 60%; text-align: center;">  </div> </div> <p><b>By spacing:</b> Enter a spacing value.</p> <div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="width: 30%;"> <p><input checked="" type="checkbox"/> By spacing ▾</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> 50.00</p> </div> <div style="width: 60%; text-align: center;">  </div> </div>
	<p>Define the comment, name, class, serie and start number for the stirrups.</p>



	Description
1	Select the start point of stirrups, either from the bottom of the column to the first stirrup or from the top of the reinforcing bar to first stirrup.
2	Define the distance from the bottom of the reinforcing bar to the last stirrup.

### Example



#### General tab

Click the link below to find out more:

[General tab](#)

#### Analysis tab

Click the link below to find out more:

[Analysis tab](#)

## 3.2 Reinforcement

This section introduces components that can be used in reinforcement.

## See also

[Reinforcement for foundations \(page 3293\)](#)

[Beam, column, and slab reinforcement \(page 3316\)](#)

[Lifting \(page 3570\)](#)

## Reinforcement for foundations

Tekla Structures includes the following components that you can use to automatically create reinforcement for foundations:

- [Strip footing reinforcement \(75\) \(page 3293\)](#)
- [Pile cap reinforcement \(76\) \(page 3297\)](#)
- [Pad footing reinforcement \(77\) \(page 3303\)](#)
- [Starter bars for pillar \(86\) \(page 3310\)](#)
- [Starter bars for footing \(87\) \(page 3312\)](#)

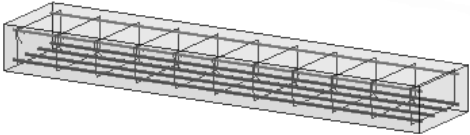
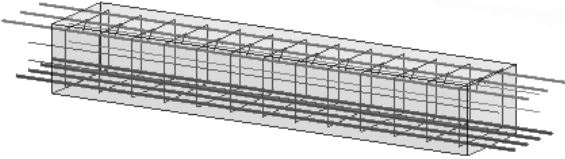
### ***Strip footing reinforcement (75)***

**Strip footing reinforcement (75)** creates reinforcement for a concrete strip footing.

#### **Bars created**

- Longitudinal bars for the top and bottom surfaces and sides of the footing
- Stirrups

#### **Use for**

<b>Situation</b>	<b>More information</b>
Straight strip footings that have rectangular cross sections	
	Main bars entirely inside the footing, no side bars, stirrup laps at stirrup corners.
	Main bars protruding from the footing, two bars on both sides, stirrup laps in the middle of the top surface.

### Do not use for

Footings that have:

- Irregular cross sections
- Skew or cut corners

### Before you start

- Create the concrete strip footing.
- Calculate the required area of reinforcement.

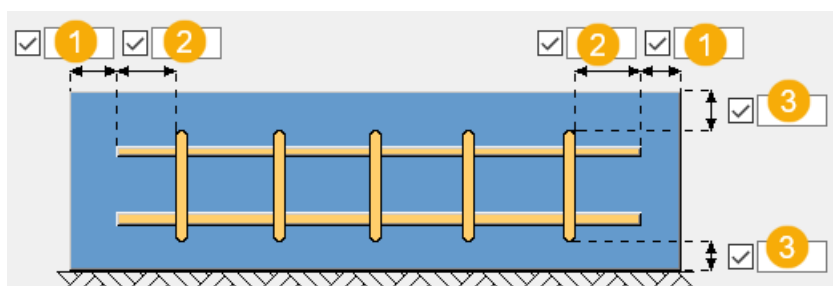
### Selection order

1. Select the concrete strip footing.

### Picture tab

Use the **Picture** tab to define the concrete cover thickness and stirrup offset.

### Cover thickness



	Description
1	Cover thickness (strip ends)
2	Stirrup offset
3	Cover thickness (top and bottom)

### Main bars tab

Use the **Main bars** tab to define the properties of top, bottom, left and right bars.

### Bond length of main bars

Bond lengths define how far main bars extend into adjacent structures at the ends of strip footings. Use the **Bond length 1** boxes for the first end of the footing (with the yellow handle), and the **Bond length 2** boxes for the second end of the footing (with the magenta handle).

You can define bond lengths separately for:

- Top bars
- Bottom bars

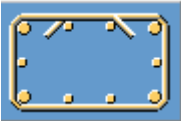
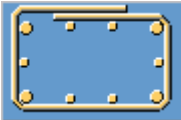
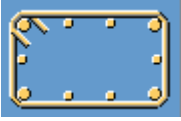
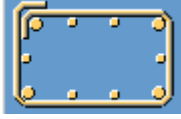





- Bars on the left side of the footing
- Bars on the right side of the footing




**Stirrups tab**

Use the **Stirrups** tab to define stirrup properties and spacing type.

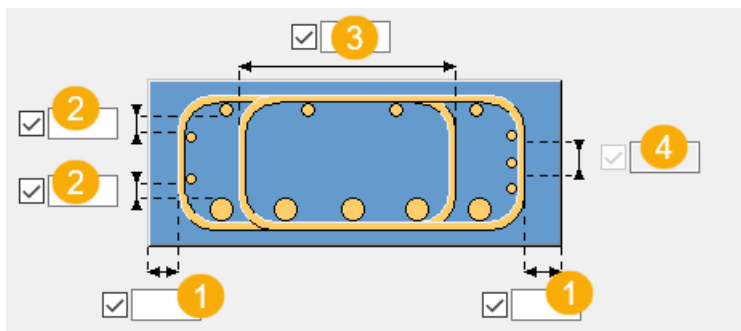
**Bend type**

Select the location of the stirrup laps in the strip footing.

	<b>Option</b>
<b>At mid</b>	 
<b>At corner</b>	 
<b>U-shaped</b>	  
<b>U-shaped</b> Enter the overlap length in the <b>Transverse</b> picture for the first two options.	 




	Option
	
<b>Double stirrup bars</b>	
<b>Straight transverse bar</b>	

### Stirrup dimensions




	Description
<b>1</b>	Cover thickness (sides)
<b>2</b>	Outer distance between the main bars and outer side bars
<b>3</b>	Overlap length of the double stirrup
<b>4</b>	Overlap length of the double U-bars

### Bending direction



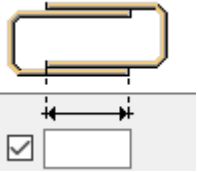
	Option
1	
2	
3	



	Option
4	

### End shape of double stirrup bars

If you selected double stirrup bars, you can select the end shapes for bars from the list.

Option	Examples
135-degree Default	
90-degree	
Overlapped If you select overlapped, you can enter the overlap length.	

### Attributes tab

Use the **Attributes** tab to define the numbering properties of bars and stirrups.

Option	Description
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.
<b>Name</b>	Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.

### ***Pile cap reinforcement (76)***

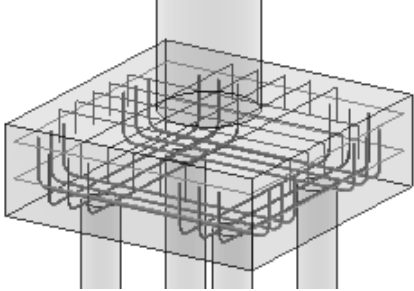
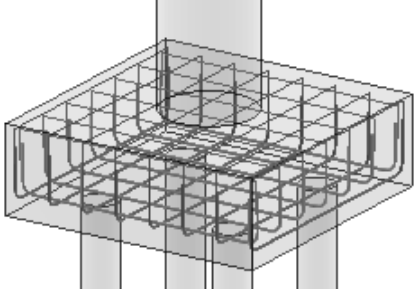
**Pile cap reinforcement (76)** creates reinforcement for a concrete pile cap.

#### Bars created

- Bars in two directions for the top and bottom surfaces of the pile cap

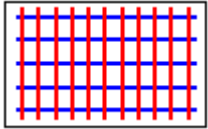
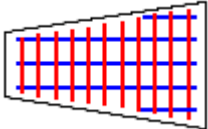
- Lacer bars

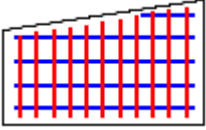
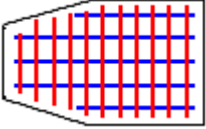
**Use for**

Situation	More information
	Bottom bars concentrated over the piles, top bars under the column. Two lacer bars.
	Bars evenly distributed on the bottom and top surfaces. No lacer bars.
Rectangular footings with or without cut corners, footings that are skewed on one or both sides	Pad footing and pile cap shapes
Bars on the top, bottom, or both surfaces of the footing	
Straight or bent bar ends	

**Pad footing and pile cap shapes**

Use the **Pile cap reinforcement (76)** to create reinforcement for the following shapes of foundations:

Shape	Description
	Rectangular
	Skewed on two sides

Shape	Description
	Skewed on one side
	Rectangular with cut corners

### Before you start

- Create the concrete pile cap.
- Calculate the required area of reinforcement.

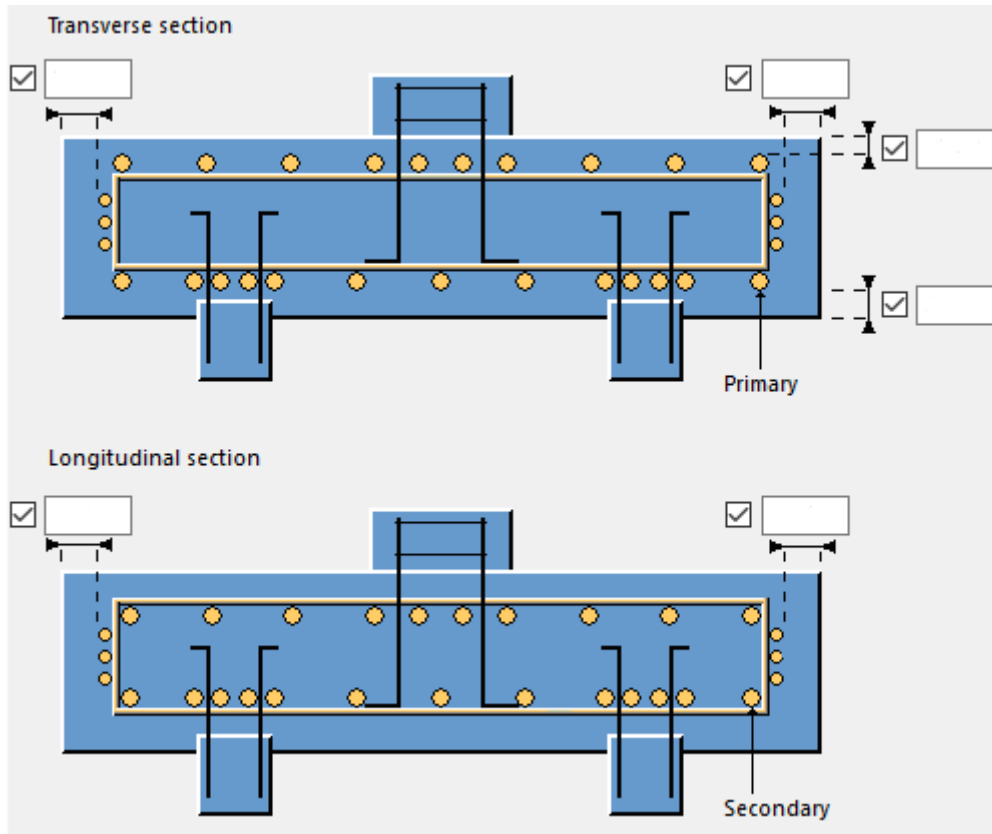
### Selection order

1. Select the concrete pile cap.
2. Select the piles and/or columns.
3. Click the middle mouse button to finish.

### Picture tab

Use the **Picture** tab to define the concrete cover thickness and primary bar direction.

Enter the concrete cover thicknesses:



Select the primary bar direction to either **Parallel with longer dimension** or **Parallel with shorter dimension**.

**Primary/Secondary top bars and Primary/Secondary bottom bars tabs**  
Use the **Primary/Secondary top bars** and **Primary/Secondary bottom bars** tabs to define the bar properties.

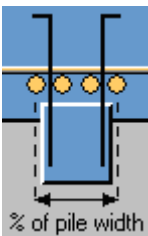
### Bar properties

Option	Description
<b>Grade</b>	Strength of the steel used in the reinforcing bar. This field cooperates with the <b>Size</b> field.
<b>Size</b>	Diameter of the reinforcing bar. Pressing the ... button right of the

Option	Description
	<p>field will open the <b>Select rebar</b> dialog box.</p> <p>In the dialog box you can select the grade and the accompanying diameter.</p> <hr/> <p><b>NOTE</b> Selecting a size will override the value in the <b>Grade</b> field.</p>
<b>End conditions left/right</b>	<p>Defines the shape of the rebar end.</p> <p>Default value is <b>Straight</b>.</p>
<b>Bend lengths left/right</b>	<p>Defines the length of the left/right end-extension.</p>
<b>Creation method</b>	<p><b>Number of bars</b></p> <p>A fixed number of bars is created. The spacing between the bars is automatically calculated.</p>
	<p><b>By spacing</b></p> <p>A accompanying field becomes active. The entered value is the fixed spacing for the rebars. The number of rebars is calculated automatically.</p>

### Pile caps

Define the pile cap reinforcement using the following properties:

Field	Description
<b>To suit pile/column</b>	Select <b>Yes</b> to concentrate main bars over piles and under columns.
<b>% of pile/column width</b> 	<p>The area where the bars are concentrated, as a percentage of the width of the pile or column.</p> <p>For example, if the pile diameter or width is 500 mm, enter 120 in the <b>% of pile width</b> field to concentrate bars in a 600 mm-wide area over the pile.</p>
<b>Bar portioning (%)</b>	The proportion of bars concentrated over a pile or under a column.

Field	Description
<b>Bar portioning (number of bars)</b>	The number of bars concentrated over a pile or under a column.

### Lacer bars tab

Use the **Lacer bars** tab to create and define lacer bars.

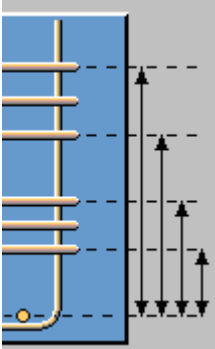
Lacer bars are reinforcing bars that loop around the sides of a concrete footing.

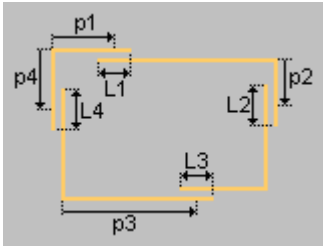
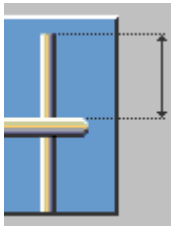
You can create up to six different groups of lacer bars in a footing. Each group can contain different values for:

- Grade
- Bar size
- Number of bars
- Spacing
- Shape
- Dimensions

To create lacer bars for a footing:

1. In the **Lacer bar option** list box, select **Yes** to create lacer bars.
2. Enter properties for each lacer bar group:

Property	Description
	<p>Quantity, spacing, and location of lacer bar groups.</p> <p>Tekla Structures only uses information from some of the fields, in this order of priority:</p> <ol style="list-style-type: none"> <li>1. <b>Number of bars</b> and <b>Spacing</b></li> <li>2. <b>Number of bars, Start,</b> and <b>End</b></li> <li>3. <b>Spacing, Start,</b> and <b>End</b></li> </ol>
<b>Type</b>	<p>The number and location of laps. The options are:</p> <div style="display: flex; flex-wrap: wrap; gap: 10px;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">def</div> <div style="border: 1px solid black; width: 40px; height: 15px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 15px; margin-right: 5px; margin-top: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 15px; margin-right: 5px; margin-top: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 15px; margin-right: 5px; margin-top: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 15px; margin-right: 5px; margin-top: 5px;"></div> </div>

Property	Description
<b>Orientation</b>	The options are <b>Default</b> , <b>Front</b> , and <b>Back</b> .
<b>p1...p4</b> <b>L1...L4</b>	The exact locations and lengths of lacer bar laps. Locations are measured from the corner of the bar to the midpoints of laps. 
	The location of the topmost lacer bar, measured from the end of main bars. Entering a value here overrides the location defined in the <b>End</b> field.

#### Attributes tab

Use the **Attributes** tab to define numbering properties of bars.

Option	Description
<b>Prefix</b>	Prefix for the bar position number.
<b>Start number</b>	Start number for the bar position number.
<b>Name</b>	Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.

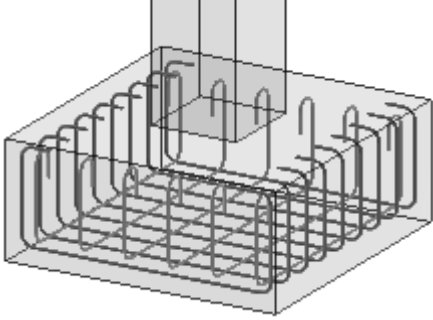
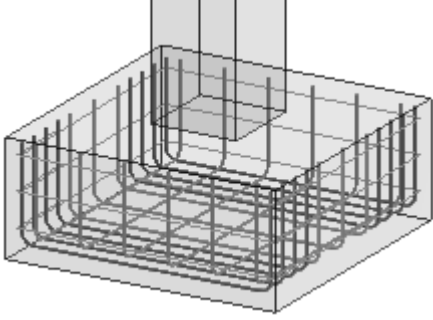
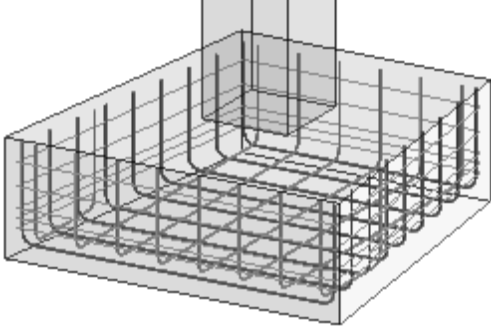
#### ***Pad footing reinforcement (77)***

**Pad footing reinforcement (77)** creates reinforcement for a concrete pad footing.

#### **Bars created**

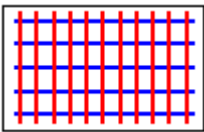
- Bars in two directions for the bottom surface of the pad footing
- Lacer bars

**Use for**

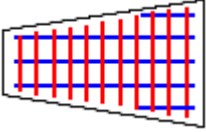
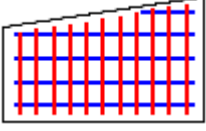
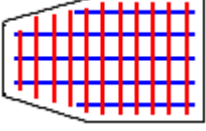
Situation	More information
	<p>Rectangular footing, 90-degree hooks at the primary bar ends, 180-degree hooks at the secondary bar ends, no lacer bars.</p>
	<p>Rectangular footing, three zones of primary bars with different spacing, straight bar ends, three lacer bars.</p>
	<p>Footing skewed on two sides, two groups of lacer bars with different spacing.</p>
<p>Rectangular footings with or without cut corners, footings that are skewed on one or both sides</p>	<p>Pad footing and pile cap shapes</p>

**Pad footing and pile cap shapes**

Use the **Pad footing (77)** to create reinforcement for the following shapes of foundations:

Shape	Description
	<p>Rectangular</p>



Shape	Description
	Skewed on two sides
	Skewed on one side
	Rectangular with cut corners


### Before you start

- Create the concrete pad footing.
- Calculate the required area of reinforcement.

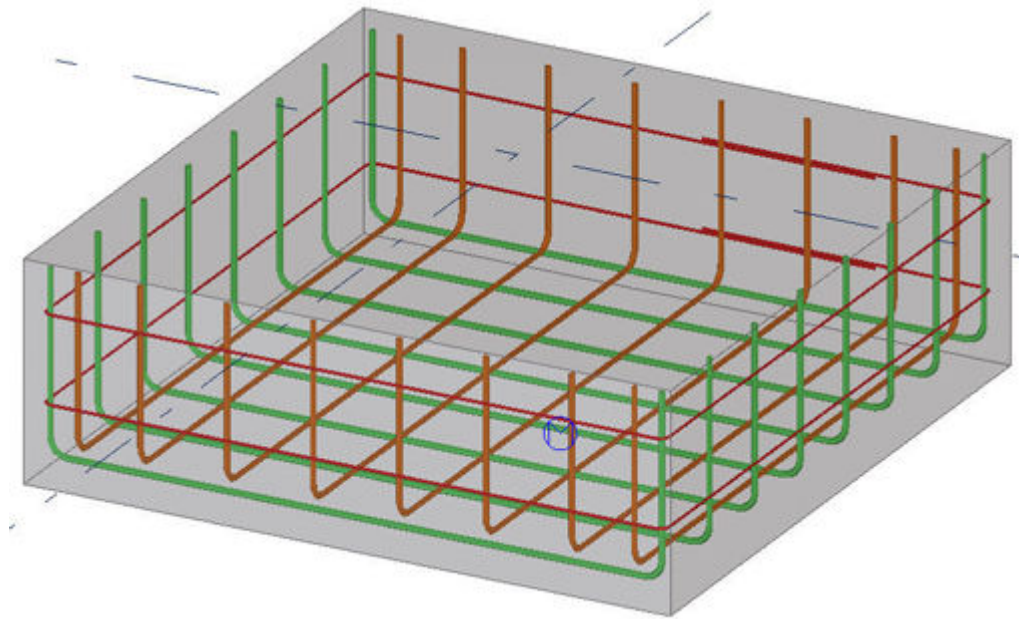
### Selection order

1. Select the concrete pad footing.

### Add a pad footing reinforcement using Pad footing reinforcement (77)

1. Create a pad footing.
2. Click the **Applications & components** button  in the side pane to open the **Applications & components** catalog.
3. Enter `pad footing` in the search box.
4. Select **Pad footing reinforcement (77)**.
5. Select the pad footing.

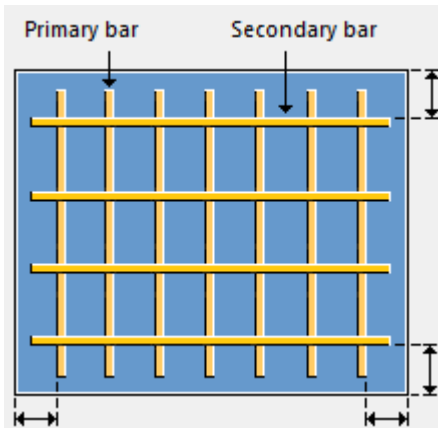
Tekla Structures inserts the lacer bar and bottom reinforcement in the pad footing.

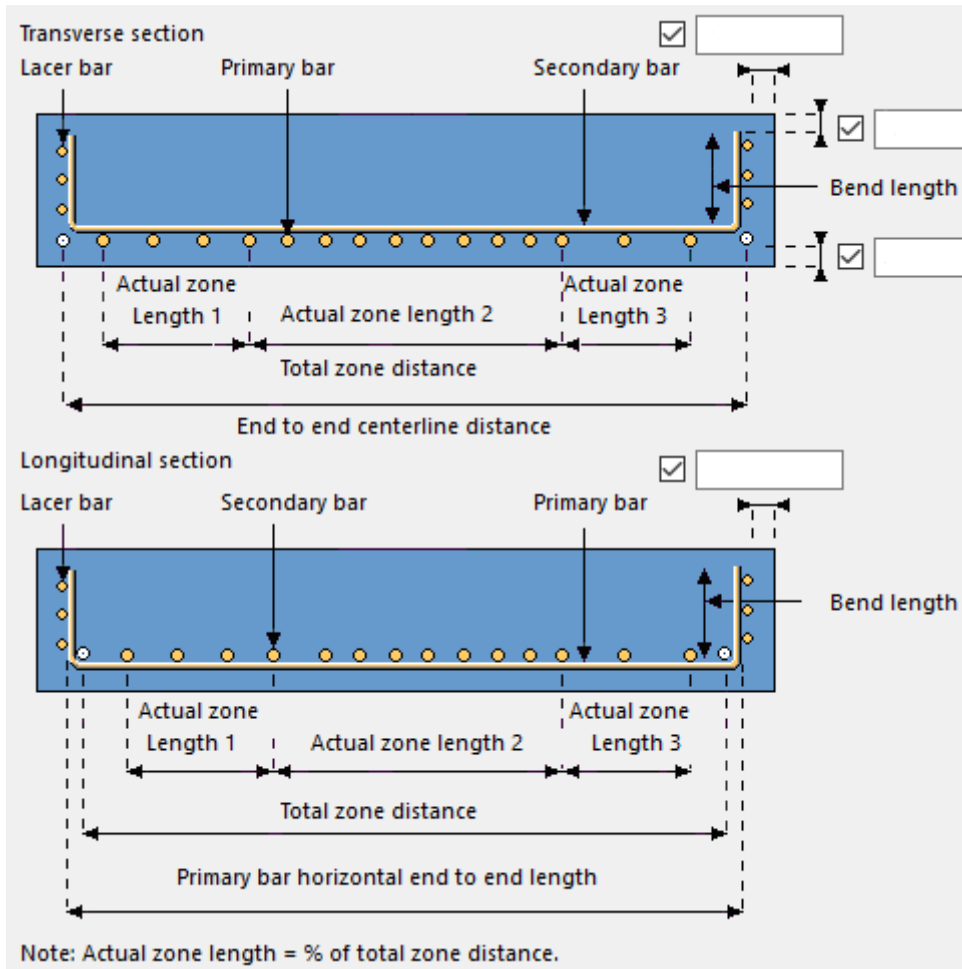


**Picture tab**

Use the **Picture** tab to define the concrete cover thickness.

Enter the concrete cover thicknesses on the plane and from the plane.





## Mesh alignment

Option	Description
<b>Square mesh</b>	Set the alignment of the secondary bars of the created mesh perpendicular to the primary bars.
<b>Mesh aligned to both sides</b>	Align the primary and secondary bars to the skewed edges.

## Primary/Secondary bar tab

Use **Primary/Secondary bar** tabs to define the bar properties.

## Pad footings

In pad footings, you can arrange the main reinforcing bars into:

- One zone of bars that have the same bar properties

- Three zones of bars that have different bar properties

You set the options separately for primary and secondary bars. Select an option from the **Arrangement** list box.

### Hooks

Select to create hooks from **Left end hook** and **Right end hook**.

You can create the hooks as custom hooks from dropdown list.

### Lacer bar tab

Use the **Lacer bar** tab to define the lacer bar properties.

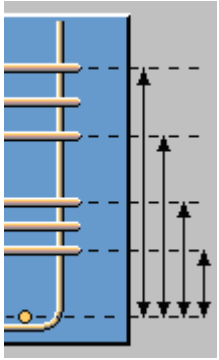
Lacer bars are reinforcing bars that loop around the sides of a concrete footing.

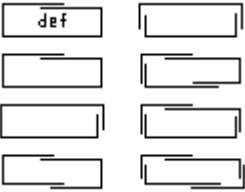
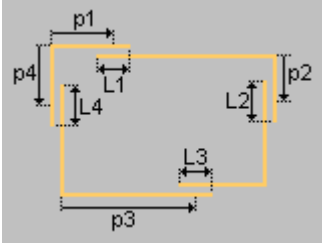
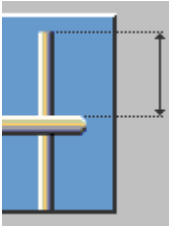
You can create up to six different groups of lacer bars in a footing. Each group can contain different values for:

- Grade
- Bar size
- Number of bars
- Spacing
- Shape
- Dimensions

To create lacer bars for a footing:

1. Open the footing reinforcement properties dialog box and click the **Lacer bars** tab.
2. In the **Lacer bar option** list box, select **Yes** to create lacer bars.
3. Enter properties for each lacer bar group:

Property	Description
	<p>Quantity, spacing, and location of lacer bar groups.</p> <p>Tekla Structures only uses information from some of the fields, in this order of priority:</p> <ol style="list-style-type: none"> <li>1. <b>Number of bars</b> and <b>Spacing</b></li> <li>2. <b>Number of bars, Start</b>, and <b>End</b></li> <li>3. <b>Spacing, Start</b>, and <b>End</b></li> </ol>

Property	Description
<b>Type</b>	<p>The number and location of laps. The options are:</p> 
<b>Orientation</b>	<p>The options are <b>Default</b>, <b>Front</b>, and <b>Back</b>.</p>
<b>p1...p4</b> <b>L1...L4</b>	<p>The exact locations and lengths of lacer bar laps. Locations are measured from the corner of the bar to the midpoints of laps.</p> 
	<p>The location of the topmost lacer bar, measured from the end of main bars. Entering a value here overrides the location defined in the <b>End</b> field.</p>

#### Attributes tab

Use the **Attributes** tab to define numbering properties.

Field	Description
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.
<b>Name</b>	Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use the <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.

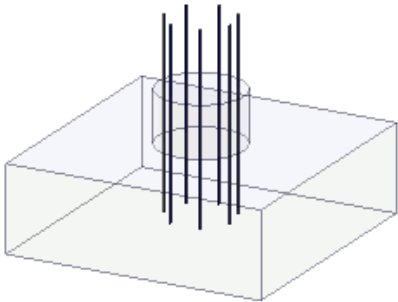
### ***Starter bars for pillar (86)***

**Starter bars for pillar (86)** creates starter bars in a footing and a pedestal for a column. Starter bars may go through a pedestal or straight to the column. Starter bars can be in a rectangular or circular form.

#### **Bars created**

- Starter bars (straight or L-shaped)
- Stirrups (optional)

#### **Use for**

<b>Situation</b>	<b>More information</b>
	<b>Starter bars for pillar (86)</b> creates straight or L-shaped starter bars that go through a rectangular or circular pedestal. Starter bars can have stirrups.

#### **Before you start**

- Create the footing.
- Calculate the required area of reinforcement.

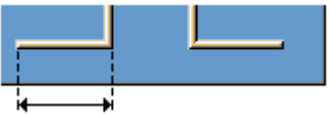
#### **Selection order**



1. Footing
2. Pedestal

#### **Picture tab**

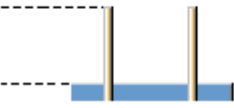
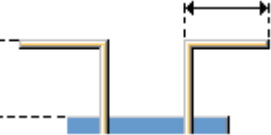
Use the **Picture** tab to define bar dimensions and locations, spacing of bars, stirrup type, and concrete cover thickness.

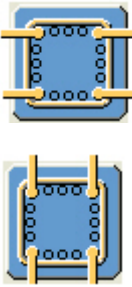
Select the shape of the starter bars:

<b>Option</b>	<b>Description</b>
	L-shaped starter bars. Define the length of the bar.

Option	Description
	Straight starter bars.
	L-shaped starter bars. Define concrete cover thickness.

Select the shape for the top of the starter bars:

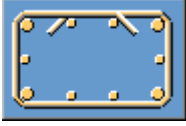
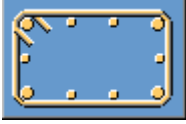
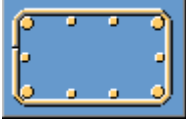
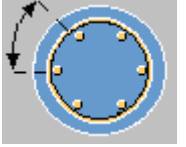
Option	Description
	The top of the starter bars is straight. Default
	The top of the starter bars is bent. Define the length of the bent part.

Option	Description
<b>Number of stirrups/Spacing</b>	Define the number of stirrups and their spacing.  Use a space to separate spacing values. Enter a value for each space between the reinforcing bars. For example, if there are 3 reinforcing bars, enter 2 values.
<b>Create corner bars</b>	Select to create corner bars. Default value is <b>Yes</b> .
	Select the placement of the corner bars.
<b>Grade</b>	Define the grade of the reinforcing bar.
<b>Size</b>	Define the size of the reinforcing bar.

Option	Description
<b>Bending radius</b>	Define the bending radius of the reinforcing bar.

## Stirrups

Use these options to define stirrup laps in footings:

Option	Description
	Laps on the side of the stirrups 45-degree hooks at bar ends
	Laps at stirrup corners 135-degree hooks at bar ends
	Laps at stirrup corners 90-degree hooks at bar ends
	If the starter bars are in a circular form, you must define the angle of stirrup overlap.

## Parameters tab

Use the **Parameters** tab to define numbering properties of bars.

Option	Description
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.
<b>Name</b>	Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.

## ***Starter bars for footing (87)***

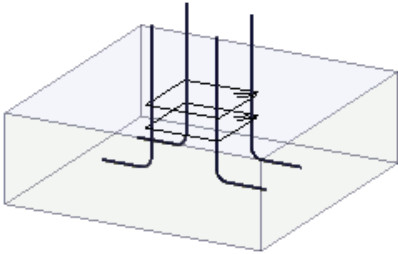
**Starter bars for footing (87)** creates starter bars in a footing for a column. Starter bars may go through a pedestal or straight to the column. Starter bars can be in a rectangular or circular form.



### Bars created

- Starter bars (straight or L-shaped)
- Stirrups (optional)

### Use for

Situation	More information
	<p><b>Starter bars for footing (87)</b> places starter bars in a footing in rectangular or circular form. Starter bars can be straight or L-shaped, and can have stirrups.</p>

### Before you start

- Create the footing.
- Calculate the required area of reinforcement.

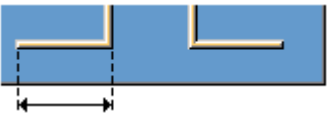


### Selection order

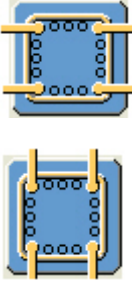
1. Footing

### Picture tab

Use the **Picture** tab to define bar dimensions and locations, number and spacing of bars, and concrete cover thickness.

Select the shape of the starter bars:

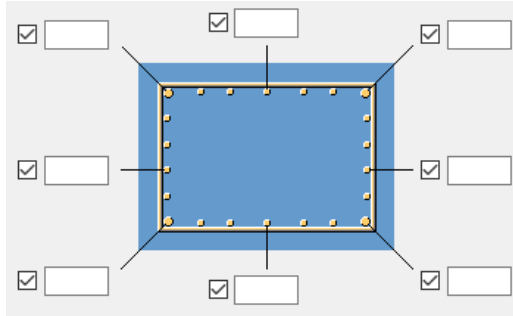
Option	Description
	<p>L-shaped starter bars. Define the length of the bar.</p>
	<p>Straight starter bars.</p>
	<p>L-shaped starter bars. Define concrete cover thickness.</p>

Option	Description
<b>Number of stirrups/Spacing</b>	Define the number of stirrups and their spacing.  Use a space to separate spacing values. Enter a value for each space between the reinforcing bars. For example, if there are 3 reinforcing bars, enter 2 values.
<b>Create corner bars</b>	Select to create corner bars.  Default value is <b>Yes</b> .
	Select the placement of the corner bars.
<b>Grade</b>	Define the grade of the reinforcing bar.
<b>Size</b>	Define the size of the reinforcing bar.
<b>Bending radius</b>	Define the bending radius of the reinforcing bar.

### Bottom cover tab

Use the **Bottom cover** tab to define bottom cover thickness for bar groups.

Select to set bottom cover thickness from the **Same for all** list:

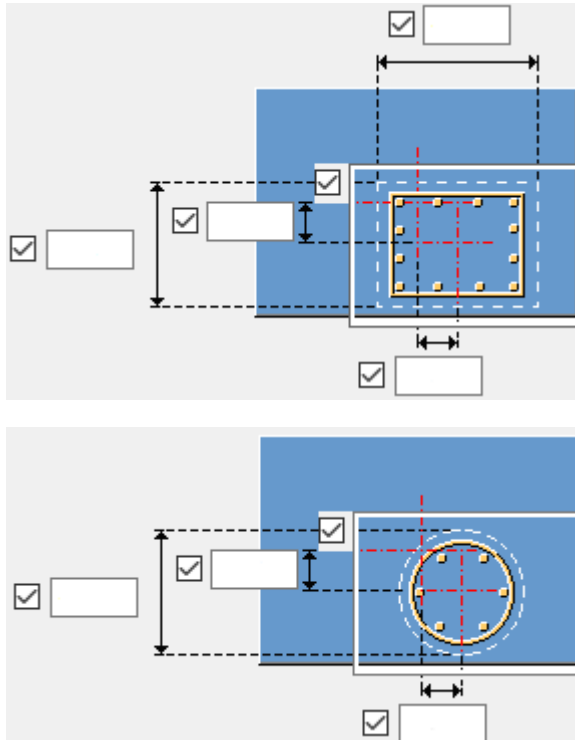
Option	Discription
<b>Yes</b>	Sets the same bottom cover thickness for all corner and side bars.
<b>No</b>	Enter the separate bottom cover thickness for each bar group.  

### Location tab

Use the **Location** tab to define starter bar location and stirrup type.

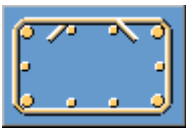
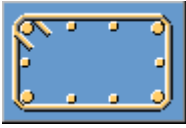
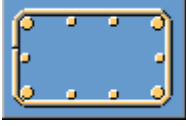
### Starter bar location

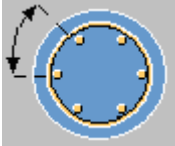
Enter the distance from the center of the bar group to the center of the footing, in two directions:



### Stirrups

Use these options to define stirrup laps in footings:

Option	Description
	Laps on the side of the stirrups 45-degree hooks at bar ends Default
	Laps at stirrup corners 135-degree hooks at bar ends
	Laps at stirrup corners 90-degree hooks at bar ends

Option	Description
	<p>If the starter bars are in a circular form, you must define the angle of stirrup overlap.</p>

### Parameters tab

Use the **Parameters** tab to define numbering properties of bars.

Option	Description
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.
<b>Name</b>	Tekla Structures uses the name in drawings and reports.
<b>Class</b>	<p>Use <b>Class</b> to group reinforcement.</p> <p>For example, you can display reinforcement of different classes in different colors.</p>

## Beam, column, and slab reinforcement

Tekla Structures includes the following components that you can use to automatically create reinforcement for beams, columns, and slabs:

- [Detailing manager \(page 3317\)](#)
- [Mesh Bars / Mesh Bars by Area \(page 3319\)](#)
- [Rebar coupler and anchor tools \(page 3331\)](#)
- [Beam reinforcement \(63\) \(page 3347\)](#)
- [Stirrup reinforcement \(67\) \(page 3353\)](#)
- [Longitudinal reinforcement \(70\) \(page 3359\)](#)
- [Beam end reinforcement \(79\) \(page 3362\)](#)
- [Corbel reinforcement \(81\) \(page 3367\)](#)
- [Round column reinforcement \(82\) \(page 3374\)](#)
- [Rectangular column reinforcement \(83\) \(page 3384\)](#)
- [Hole reinforcement for slabs and walls \(84\) \(page 3398\)](#)
- [Hole creation and reinforcement \(85\) \(page 3404\)](#)
- [Braced girder \(88\) \(page 3408\)](#)

- [Braced girder \(89\) \(page 3429\)](#)
- [Reinforcement mesh array in area \(89\) / Reinforcement mesh array \(91\) \(page 3450\)](#)
- [Rebar in beam \(90\) \(page 3455\)](#)
- [Border rebar for single edge \(93\) \(page 3471\)](#)
- [Rectangular area reinforcement \(94\) \(page 3488\)](#)
- [Wall panel reinforcement / Double wall edge and opening reinforcement \(page 3503\)](#)
- [Multiple Wire Size Mesh \(page 3514\)](#)
- [Embedded anchors \(8\) \(page 3518\)](#)
- [Embed \(1008\) \(page 3558\)](#)
- [Continuous Beam Reinforcement \(page 3568\)](#)

### ***Detailing manager***

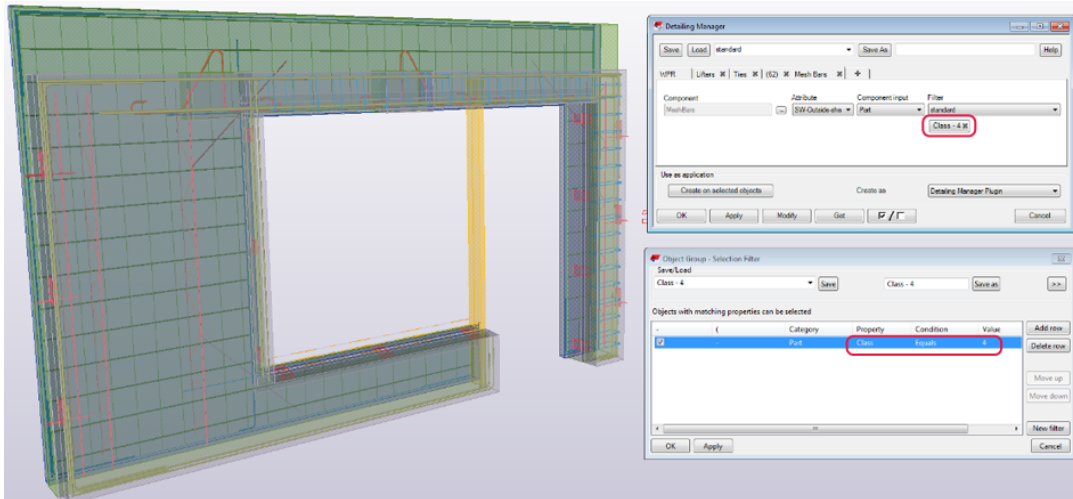
**Detailing manager** is used to apply detailing components into any structure. With **Detailing manager** you can define rules to apply multiple components at one go to detail the structure of a cast unit or the entire model.

You can use selection filters to define detailing rules for automating repetitive detailing tasks. You can add custom details, extensions or system components with **Detailing manager**.

You have three options:

- Use **Detailing manager** to have a part as input. All parts in the cast unit are examined and detailed by the set rules.
- Use **Detailing manager** to have a cast unit as input. All parts in the cast unit are examined and detailed by the set rules.
- Use **Detailing manager** to have a component as input, for example, tools such as **Floor layout** or **Wall layout** where the same tool creates multiple parts. All parts in the component are examined and detailed by the set rules.

The image below shows an example of **Detailing manager**. In the example, the **Mesh bars** component is created to the outside shell of the cast unit because it has the class 4 filter selected and there is a selection filter for objects with class 4.



## Properties

Option	Description
<b>Rule</b>	<p>Use the rules to define detailing settings.</p> <p>The maximum number of rules is 25. Click <input type="button" value="+"/> to add a new rule. You can rename a rule by double-clicking the rule tab.</p> <p>You can remove the content from a rule tab by double-clicking the rule tab and selecting <b>Clear</b>.</p> <p>You can remove rule tabs by double-clicking the rule tab and selecting:</p> <ul style="list-style-type: none"> <li>• <b>Close</b> to remove the selected tab.</li> <li>• <b>Close other tabs</b> to remove other tabs than the selected tab.</li> <li>• <b>Close all tabs</b> to remove all tabs. <b>Detailing manager</b> adds a new empty rule tab.</li> </ul> <p>You can also remove rules by clicking <input type="button" value="x"/> on a rule tab.</p>
<b>Component</b>	<p>Click <input type="checkbox"/> to select the component that you want to use to detail a structure.</p> <p>Double-click the component in the <b>Applications &amp; components</b> catalog to add it to the <b>Component</b> box.</p>
<b>Attribute</b>	<p>Select the attribute file for the component. If you do not select a file, the standard file is used.</p>
<b>Component input</b>	<p>Define the creation method of the selected component:</p> <ul style="list-style-type: none"> <li>• <b>Part</b>: Select the part to which you are creating the component.</li> </ul>

Option	Description
	<ul style="list-style-type: none"> <li>• <b>Part + one point:</b> Select the part and one additional point on the part. With this option, <b>Detailing manager</b> places the center of the object boundary box to that point.  Use this setting with custom component details.</li> <li>• <b>Part + two points:</b> Select the part and two additional points on the part. With this option, <b>Detailing manager</b> uses the start and the end point of the part as insertion points.</li> </ul>
<b>Filter</b>	<p>Select which parts inside the selected cast unit or component get the selected component. The available selection filters are listed in the filter list.</p> <p>You can also create new selection filters. You can use five selection filters if you want to create an intersection of the filters.</p>
<b>Create on selected objects</b>	<p><b>Detailing manager</b> is created to selected parts, cast units or components. The rule settings that are currently set in the <b>Detailing manager</b> dialog box are used.</p>
<b>Create as</b>	<ul style="list-style-type: none"> <li>• <b>Detailing manager plug-in:</b> Components are inserted as <b>Detailing manager</b> plug-ins and not as separate components.  Select this option if you use a component as input.</li> <li>• <b>Separate components:</b> With this setting, the inserted components do not have any connection to <b>Detailing manager</b>.</li> </ul>

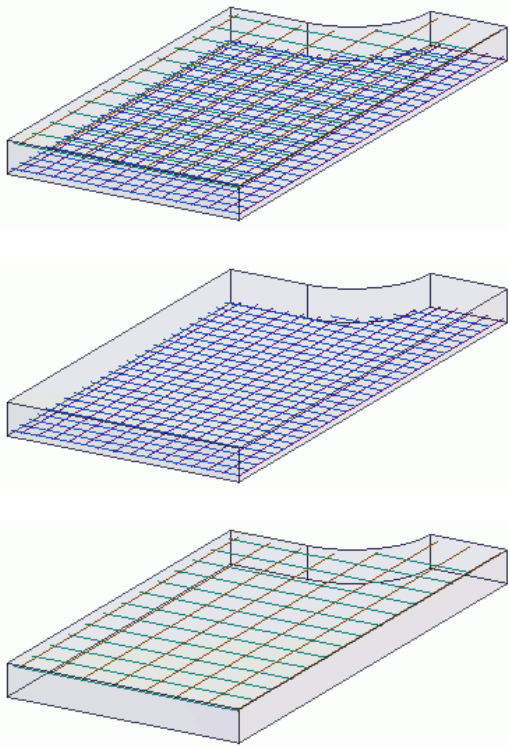
### ***Mesh Bars / Mesh Bars by Area***

**Mesh Bars** and **Mesh bars by area** create reinforcement for concrete slabs or walls.

#### **Objects created**

- Primary bars
- Crossing bars

**Use for**


Situation	Description
	<p>Reinforcement for the bottom or the top surface of the concrete element, or for both.</p>

**Selection order**

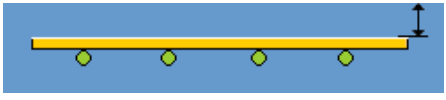

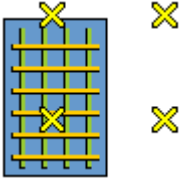
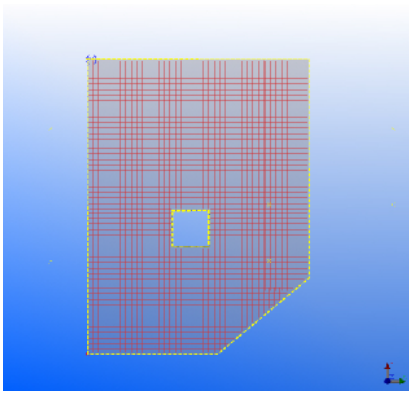
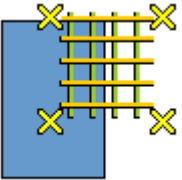
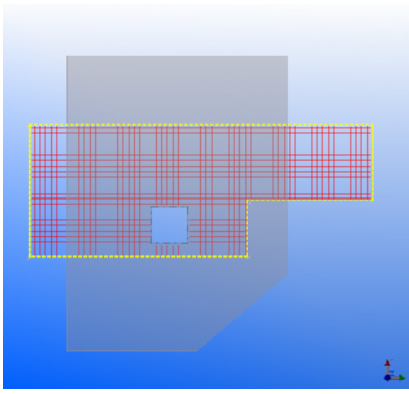
Component	To create mesh bars
<b>Mesh Bars</b>	<ol style="list-style-type: none"> <li>1. Select a concrete slab. The reinforcement is created automatically.</li> </ol>
<b>Mesh bars by area</b>	<ol style="list-style-type: none"> <li>1. Select a concrete slab.</li> <li>2. Select a group of points to define a working polygon. The reinforcement is created automatically.</li> </ol>

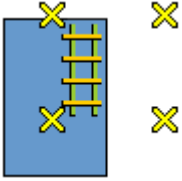
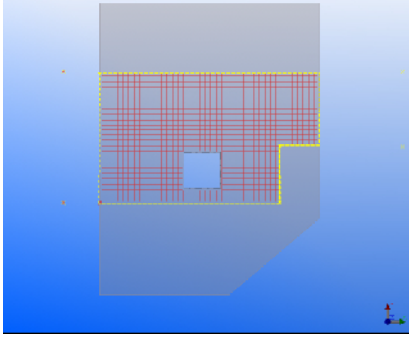
**Picture tab**

Use the **Picture** tab to define how the top and bottom bars are created.

Option	Description
<b>Create bars</b>	 <p>Top bars with primary bars above secondary bars</p>



Option	Description	
		Top bars with secondary bars above primary bars
		No bars
<p>The same options are available for the bottom bars as well.</p> <p>The value defined in the box is the cover thickness for the top/ bottom layer.</p> <p>If you only want to create bars in the middle of the slab, select the <b>No bars</b> option either for the top or bottom bars, and then select <b>Yes</b> in the <b>Place central</b> list that appears.</p>		
<b>Mesh area perimeter</b>	<p>This option is only available for <b>Mesh bars by area</b>.</p> <p>Select the outline that the mesh follows.</p> <p>The meshes in the examples are created by picking the same points but with different mesh area perimeters.</p>	
	 <p>Part</p>	<p>Part, for example:</p> 
	 <p>Polygon</p>	<p>Polygon, for example:</p> 

Option	Description	
	 <p>Polygon + part</p>	<p>Part + polygon, for example:</p> 
<p><b>Same as bottom</b></p>	<p>Select whether the top bars are created using the same properties as the bottom bars.</p> <p>If you select <b>No</b>, enter the top bar properties.</p>	
<p><b>Bar type</b></p>	<p>Select whether the bars are created as a bar group or as a mesh.</p> <p>Depending on the option you select, some other settings and options are available. For example:</p> <ul style="list-style-type: none"> <li>• If you select the <b>Bar group</b> option: <ul style="list-style-type: none"> <li>• You can move, copy, and delete bars using direct modification.</li> <li>To move a bar, drag it to a new location.</li> <li>To copy a bar, hold down <b>Ctrl</b> and drag the bar.</li> <li>To delete a bar, select it and press <b>Delete</b>.</li> </ul> </li> <li>• You can use the grid, minimum length, <b>Bar grouping</b>, and <b>Bar behavior at cuts</b> settings on the <b>Detailing</b> tab.</li> <li>• If you select the <b>Mesh</b> option, bars are always cut by the cuts in the concrete part.</li> </ul>	
<p><b>Size</b></p>	<p>Select the diameter of a bar.</p> <p>You can set the size separately for the top primary and secondary bars, and for the bottom primary and secondary bars.</p>	
<p><b>Grade</b></p>	<p>Define the strength of the steel used in the bars.</p> <p>You can set the grade separately for the top primary and secondary bars, and for the bottom primary and secondary bars.</p>	

Option	Description
<b>Spacing type</b>	<p>Select whether the spacing is based on the number of bars or on the spacing values.</p> <ul style="list-style-type: none"> <li>• <b>By spacings:</b> enter the distance between the bars in the <b>Spacing</b> box.</li> <li>• <b>Number of bars:</b> enter the number of bars in the <b>Number of bars</b> box.</li> <li>• <b>By exact spacings:</b> list the distances between the bars in the <b>Spacing</b> box. For example: 200, 200, 50, 50, 50, 100 or 2*200, 3*50, 100</li> </ul>
<b>Spacing</b>	<p>Distances between the bars.</p> <p>Tekla Structures calculates the number of bars.</p> <p>You can set the spacing separately for the top primary and secondary bars, and for the bottom primary and secondary bars.</p>
<b>Number of bars</b>	<p>Number of bars.</p> <p>Tekla Structures calculates the distance between bars.</p> <p>You can set the number of bars separately for the top primary and secondary bars, and for the bottom primary and secondary bars.</p>
<b>Primary bars direction</b>	<p>The direction of the primary bars. Use to change the bar direction.</p> <p>If the <b>Auto</b> option is selected, the primary bars are created along the two longest parallel sides of a slab. If there are no parallel sides, you can select to create the bars along the slab x direction instead.</p> <p>To rotate the bars, select one of the direct modification options. For non-perpendicular meshes, use the flexible angle option to individually rotate both arrow sides around their axis.</p>
<b>Up direction</b>	<p>Select which sides are regarded as the top and bottom sides of the slab.</p> <p>If the <b>Auto</b> option is selected, then the bars are created on the side with the greatest area.</p>

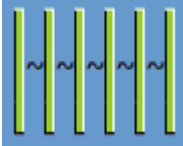
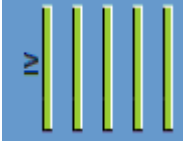
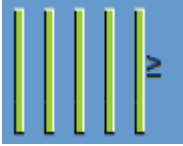
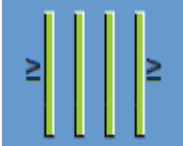
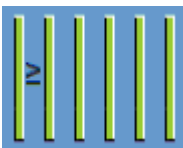
### Detailing tab

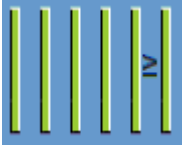
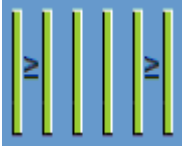
Use the **Detailing** tab to control how the bars are distributed.

Bars that are created as bar groups can be distributed **By grid** or **Without grid**.

Using a grid makes it easier to accurately place bars only at set intervals. When direct modification is switched on and you move or copy bar group bars, they snap to the grid.

### Detailing without grid

Option	Description	
<b>Bar distances</b>	Select how the distances between the bars are measured. <ul style="list-style-type: none"> <li>• <b>From center of bar</b></li> <li>• <b>From edge of bar</b></li> </ul> Select whether the distances are the same or different for the top and bottom bars. Using different distances helps in placing top and bottom bars so that their hooks do not collide, for example.	
<b>Adjustment</b>	Select how the bars are distributed. The same options are available for both the primary and the secondary bars.	
	Equal distribution by target spacing value.	
	By exact spacing value with flexible first space without first bar.	
	By exact spacing value with flexible last space without last bar.	
	By exact spacing value with flexible first and last space without first and last bars.	
	By exact spacing value with flexible first space.	

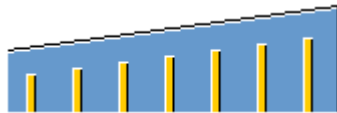
Option	Description	
		By exact spacing value with flexible last space.
		By exact spacing value with flexible first and last space.



### Detailing by grid

The same options are available for both the longitudinal and the crossing bars.

Option	Description
<b>Min overhang</b>	Minimum extension of the longitudinal or crossing bars over the outermost bars of the other direction.  You can set the minimum overhang separately for the start and end of the bars.
<b>Min spacing</b>	Minimum distance between the bars.
<b>Longitudinal grid size</b> <b>Crossing grid size</b>	Defines the location intervals to which the bar group bars snap when they are moved or copied using direct modification.

### Other detailing options

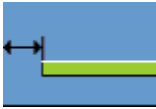
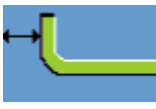



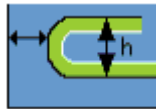
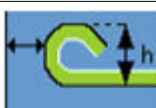
Option	Description	
<b>Minimum length of primary bar to be created</b> <b>Minimum length of secondary bar to be created</b>	In bar groups, bars that are shorter than this value are not created.	
<b>Bar grouping</b>	For bar groups, select whether tapered bars are grouped or not.  If you group the tapered bars, select how the bars along the tapered edge are handled.	
		Tapered bars are handled normally.

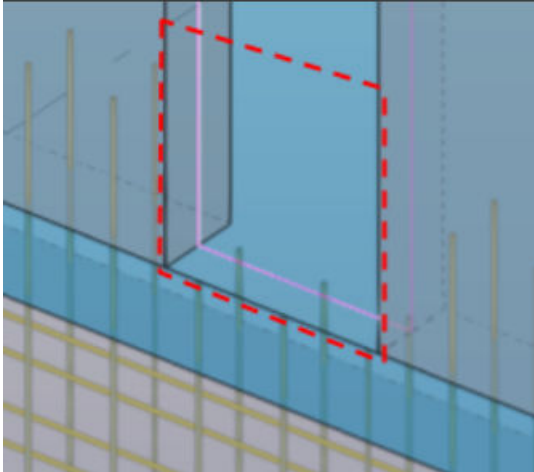
Option	Description
	<div> </div> <p>Creates as many bars as possible with same length at the tapered edge.</p> <p>The value you enter is the maximum allowed shortening of a bar.</p>
<p><b>Bar behavior at cuts</b></p>	<p>Select how bars next to openings are handled.</p> <ul style="list-style-type: none"> <li>• <b>Cut bars:</b> Select whether the bars are cut and which cuts are ignored.</li> </ul> <p>In bar groups, you can ignore cuts by part name, part class, or selection filter.</p> <p>With the <b>Yes, but ignore cuts by filter</b> option, the <b>Selection filter</b> list only shows the selection filters where one rule has the object type 11 (polygon cut) and the other rules have been defined by using the <b>Template</b> category.</p> <ul style="list-style-type: none"> <li>• <b>Ignore openings smaller than:</b> The minimum length of a cut (in the direction of the bars) that will cut the bars. Lower values are ignored.</li> </ul> <p>This setting only affects bars that are created as bar groups. Bars that are created as a mesh are always cut by the cuts in the concrete part.</p> <ul style="list-style-type: none"> <li>• <b>Cover thickness:</b> Distance between the bar end/start point to the edge of the opening.</li> </ul> <p>You can use this option to define the cover thickness for</p> <p>both windows  and doors .</p> <p>This option is useful if window and door openings need to have different cover thicknesses.</p> <ul style="list-style-type: none"> <li>• <b>Create cuts around selected parts:</b> Select whether the bars are cut by the parts that clash with the reinforced part. The cutting parts are defined by a selection filter.</li> <li>• <b>Create support bars for loose bars:</b> Select whether additional support bars are created for the loose bars in the mesh. <ul style="list-style-type: none"> <li>• <b>Yes, without extended support bar</b> creates support bars for loose bars only within the range of the loose bars.</li> </ul> </li> </ul>

Option	Description
	<ul style="list-style-type: none"> <li><b>Yes, with extended support bar</b> extends support bars to the whole mesh area.</li> </ul> <p>You can define the overlap length for the support bars. The length defines how much the additional bars overlap with the existing mesh.</p>

### Bar end conditions tab

Use the **Bar end conditions** tab to control the cover thickness and bar hooks.

Option	Description
<b>Cover thickness on sides</b>	<ul style="list-style-type: none"> <li><b>Different each side:</b> Each end of a bar group can have different distances from part edges.</li> <li><b>Same all sides:</b> All ends of the bar groups have the same distance from part edge.</li> </ul>
<b>Use bar end conditions around holes</b>	Select whether the same bar end conditions are used around the openings as at part edges.
<b>End conditions</b>	 <p>Creates a straight bar without a hook at the given end of a bar.</p>
	 <p>Creates a 90° hook at a given end of bar.</p>
	 <p>Creates a 135° hook at a given end of bar.</p>
	 <p>Creates a 180° hook at a given end of bar.</p>
	 <p>Creates a hook with a free angle at the given end of a bar.</p>
	 <p>Creates a double bent hook at the given end of a bar.</p>
	 <p>Creates an inward bent hook in a 135-degree angle. You can define the hook height.</p>

Option	Description
<b>Cut bars by negative neighbor parts</b>	<p>Select whether the bars that protrude from the selected concrete parts are cut at the openings of neighbor parts. To cut the bars at the openings, select <b>Yes</b>, and then enter the cover thickness.</p> 
<b>Bending radius</b>	Bending radius at bar ends
<b>Bending length</b>	Bending length at bar ends

### Splicing tab

Use the **Splicing** tab to control the splicing of the reinforcing bars.

Option	Description
<b>Splice bars</b>	Select whether the reinforcing bars are spliced or not.
<b>Manufacturer</b>	<p>Select the manufacturer of the reinforcement.</p> <p>The maximum bar lengths and lap lengths are then listed by the grade and size of the bar.</p> <p>If needed, you can modify these splicing definitions in the <code>MeshBarsSplicing_Manufacturers.dat</code> file. You can also copy the default file from <code>..\ProgramData\Trimble\Tekla Structures\&lt;version&gt;\environments\common\system</code>, edit it, and save it to your project or firm folder.</p>
<b>Maximum length of bars</b>	Maximum reinforcing bar length after which the bars are spliced.
<b>Lapping length</b>	Length of the lapping connection.



Option	Description
<b>Splicing in same cross section</b>	Select how many reinforcing bars can be spliced in the same location. <ul style="list-style-type: none"> <li>• <b>1/1</b> = all reinforcing bars are spliced in the same cross section.</li> <li>• <b>1/2</b> = every second reinforcing bar is spliced in the same cross section.</li> <li>• <b>1/3</b> = every third reinforcing bar is spliced in the same cross section.</li> <li>• <b>1/4</b> = every fourth reinforcing bar is spliced in the same cross section.</li> </ul>
<b>Splicing symmetry</b>	Select the symmetry that is applied when the reinforcing bars are spliced. <ul style="list-style-type: none"> <li>• <b>Not Symmetrical:</b> The splice pattern of the reinforcing bar is not symmetrical and the uneven length is only at one side.</li> <li>• <b>Symmetrical with different lengths at sides:</b> The splice pattern of the reinforcing bar is symmetrical with uneven lengths at the sides.</li> <li>• <b>Symmetrical with different length at center:</b> The splice pattern of the reinforcing bar is symmetrical with uneven length in the center.</li> </ul>
<b>Splicing offset</b>	Offset of the splice center point from the point where the reinforcing bars originally met.
<b>Minimum splitting distance</b>	Minimum longitudinal distance between two splices in consecutive bars.
<b>Splicing type</b>	Select the type of the splice.
<b>Bar position</b>	Select whether the lapping bars are on top of each other or parallel to each other.

#### Attributes tab

Use the **Attributes** tab to control the bar group or mesh properties, and user-defined attributes.

#### Properties

Option	Description
<b>Name</b>	Name of the bar group or mesh.
<b>Prefix</b>	Prefix for the position number of the bar group or mesh.
<b>Start number</b>	Start number for the position number of the bar group or mesh.

Option	Description
<b>Class</b>	Class of the bar group or mesh. If you create a mesh, only the class of primary bars is taken into account.

### User-defined attributes (UDAs) for reinforcing bars

The UDAs are predefined in the `MeshBars.Udas.dat` file.

Option	Description
<b>Same for all</b>	Select <b>Yes</b> to use the UDA for all reinforcing bars. Select <b>No</b> to define the UDA separately for all reinforcing bars.
<b>Top bars</b> <b>Bottom bars</b>	Enter a UDA value for the top and bottom reinforcing bars.

### Rebar assembly tab

Use the **Rebar assembly** tab to add the created reinforcement as a rebar assembly to the cast units.

### Create as rebar assembly

You can add the created reinforcement as a rebar assembly to the cast units with a predefined assembly type, name, prefix, and start number.

Option	Description
<b>Create as rebar assembly</b>	Select <b>Yes</b> to create all reinforcement as one rebar assembly, and to include it to the cast unit of the input part.
<b>Rebar assembly type</b>	Select the rebar assembly type. If you do not select the type, the default value of the rebar assembly is used.
<b>Name, Profile, Start number</b>	Define the name, profile, and start number. If you do not define these, the default values of the rebar assembly are used.

### Customize the Attributes tab

You can customize the content of the user-defined attributes section on the **Attributes** tab by using the `MeshBars.Udas.dat` file. The file can be located

in any of the folders set in the `XS_FIRM`, `XS_PROJECT` or `XS_SYSTEM` advanced options, and in the model folder.

You can use the file to control which user-defined properties of the created reinforcement can be used in **Mesh Bars** and **Mesh Bars by Area**. We recommend that you only use UDAs that are typically common for all reinforcement.

The sample file shown below contains a full description of all the settings and the format of the file. The lines starting with `//` are comment lines.

```
//
// Customized user defined attributes (UDA) for layer parts created by
// Mesh Bars component
//
// Each row shall contain 2 or 3 fields separated by tab(s) or semicolon.
// Please note that all uda names shall be unique
//
// Field 1: The data type of the attribute. Valid values are 'distance',
// 'float', 'option', 'integer' and 'string'
// compatible with the actual user defined attributes as
// specified in objects.inp
// Field 2: UDA name. This is the name of the user defined attribute.
// Field 3: Label. This text is shown in the attributes dialog. It can be
// a translatable label (albl_) or any text.
//
string      comment      j_comment
string      USER_FIELD_1  j_user_field_1
string      USER_FIELD_2  j_user_field_2
string      USER_FIELD_3  j_user_field_3
string      USER_FIELD_4  j_user_field_4
```

### ***Rebar coupler and anchor tools***

**Rebar coupler and anchor tools** is a set of four components that help to model and manage

- reinforcing bar couplers that connect two bars
- end anchors that are devices at the unreserved end of the bar.

The following components are part of **Rebar coupler and anchor tools**:

- Rebar coupler
- Rebar end anchor
- Split rebar and add coupler
- Rebar end trimming

In addition, you can manage the user-defined attributes (UDAs) of the **Rebar coupler and anchor tools** with the **Update rebar attributes** component.

All couplers and end anchors are automatically added to the parent part of the reinforcing bar. This allows them to be shown in reports and drawings because they are added to the sub-assembly of the cast unit.

In some cases the reinforcing bars can move outside of the concrete. This may happen with reinforcing bars that are modeled with two points (straight bars and straight bars with hooks). If the reinforcing bars move outside of the

concrete, change the cover thickness to either a negative or a positive value depending on what is required.

Two report templates `Rebar Extra Fabrication Length.rpt` and `Rebar Thread Length.rpt` can be used to inquire **Threaded Length** and **Extra Fab. Length** of the reinforcing bars in the BOMs or BOQs.

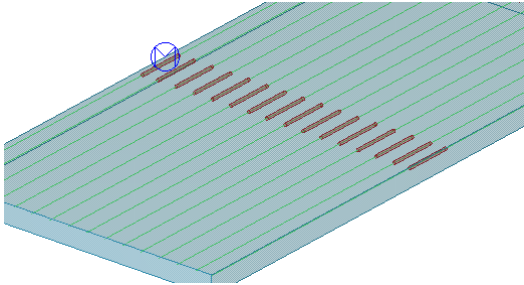
### Rebar coupler

**Rebar coupler** creates couplers to connect reinforcing bars, or reinforcement meshes, whose bar ends are in contact and parallel.

### Objects created

- Round parts  
The parts are created between two reinforcement objects.

### Use for

Situation	Description
	Couplers with split reinforcing bars.

### Before you start

Couplers can be created between reinforcing bars or reinforcement meshes. The selected reinforcement objects can be of different type and they can even have different number of bars. The only requirement is that one or more bar ends are in contact and parallel. With rebar sets, the couplers can only be created between spliced bars in that particular rebar set.

### Selection order

Reinforcing bars or reinforcement meshes	<ol style="list-style-type: none"> <li>1. Select the primary reinforcing bar(s).</li> <li>2. Select the secondary reinforcing bar(s).</li> </ol>
Rebar sets	<ol style="list-style-type: none"> <li>1. Select a rebar set.</li> <li>2. Define a location for a splitter by picking two points.  This splitter will become an input object for the couplers.</li> </ol>

	<p>3. Pick a point.</p> <p>This point defines the side of the primary reinforcing bar(s). This is needed if you have applied different properties for the primary and secondary bar(s).</p> <p>or</p> <p>1. Select an existing splitter in a rebar set.</p> <p>2. Pick a point.</p> <p>This point defines the side of the primary reinforcing bar(s). This is needed if you have applied different properties for the primary and secondary bar(s).</p>
--	---

Couplers are created at each location where

- the bar ends are parallel enough (angle < 5 degree) and
- the gap along the bar end is less than the length of the coupler and
- the offset perpendicular to the bar end legs is less than the diameter of the bars

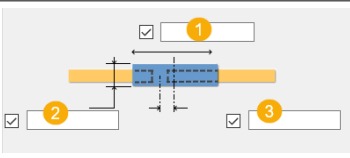
When there is no valid and no parallel end-to-end location between the selected bars, the component creates a dummy part that identifies the unsuccessful coupler insertion.

### Parameters tab

Use the **Parameters** tab to define the coupler properties.

Option	Description
<b>Use manually entered values</b>	Enter values for the coupler properties.
<b>Use auto attribute file</b>	<p>The values in the auto attribute file override the coupler component values.</p> <p>Typically the auto attributes file contains one or more attribute values to be used with certain bar sizes.</p> <p>Go to <a href="#">Tekla Warehouse</a> to get auto attribute files for your project.</p> <p>For more information on the structure of the auto attribute files, see <b>Customize attribute files, part mapping and user-defined attributes (UDAs)</b>.</p>

Option	Description
<b>Use custom component</b>	Select <b>Yes</b> to create the coupler as a custom part. Select <b>No</b> to create the coupler as a normal part.
<b>Name</b>	Type the name of the custom component, or select it from the <b>Applications &amp; components</b> catalog.  Ensure that the selected component is a custom part.
<b>Attribute</b>	Type the name of the attribute file of the custom component.  The coupler custom part is created using the saved attributes given here.
<b>Input points</b>	The order of the start and the end points of the custom component.
<b>Add to rebar assembly</b>	To add the coupler as a sub-assembly to the rebar assembly, select either <b>Yes, to primary bar</b> or <b>Yes, to secondary bar</b> .  Note that you must first create the rebar assembly, otherwise adding is not possible.  The default value is <b>No</b> .

Option	Description
<b>Numbering series</b>	Prefix and a start number for the coupler part position number.  In the <b>Inherit from</b> list, select which numbering settings are used for couplers. <ul style="list-style-type: none"> <li>• With <b>None</b>, enter the part and assembly prefix and start numbers.</li> <li>• With <b>Rebar</b>, the numbering settings of the primary bars are used.</li> <li>• With <b>Cast unit</b>, the cast unit numbering settings are used.</li> </ul>
<b>Attributes</b>	Name, diameter, material, finish and class of the coupler parts.
	<p><b>1</b> The overall end-to-end length of the coupler</p> <p>If you use a custom part, this is the length between the start point and the end point of the custom part.</p> <p><b>2</b> Coupler profile width</p>

Option	Description
	<p><b>3</b> Coupler offset in relation to the free gap center line. Positive values move the coupler to the right and negative to the left.</p> <p>You can also control this offset in the auto attribute file by using the attribute <code>CouplerOffset</code>.</p>

When you create the couplers as custom parts, the properties in the **Numbering series** and **Attributes** sections can be filled from the custom part settings if you have named the properties in a certain way.

### Rebar attributes tab

Use the **Rebar attributes** tab to define user-defined attributes (UDAs) for rebars.

Option	Description
<b>Threaded length</b>	<p>The value is written to the reinforcing bar UDA.</p> <p>The fields are used for checking which bars have threads and what are the thread values so that they can be shown in drawings and reports.</p>
<b>Extra fabrication length</b>	<p>This value is written to the reinforcing bar UDA.</p> <p>This value does not affect the length of the reinforcing bar. You need to add this value in your drawings and reports to get the correct length if required.</p>
<b>Method</b> <b>Type</b> <b>Product</b> <b>Code</b>	<p>UDAs written to the reinforcing bars.</p> <p>You can set the reinforcing bar end method and the coupler type, and add a product name and a code for reporting purposes.</p> <p>The used attribute name depends on which end of the reinforcing bar the coupler was created.</p>

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**NOTE** The above user-defined attributes affect numbering. Reinforcing bars with different attribute values get different part marks.

---

### Coupler attributes tab

Use the **Coupler attributes** tab to define user-defined attributes (UDAs) for couplers or end anchor parts. For each UDA, you can select to inherit the value from the rebar or the cast unit. To enter a value, select the inherit option **None**.

Note that if the cast unit does not have any value for that particular UDA, the value is taken from the main part of the cast unit. By default, you can enter a

**Comment** and values for **User field 1 ... 4 UDAs**. You can customize the set of UDAs by modifying the UDA fields in the `RebarCouplers.Udas.dat` file, located in the `..\Environments\common\system` folder.

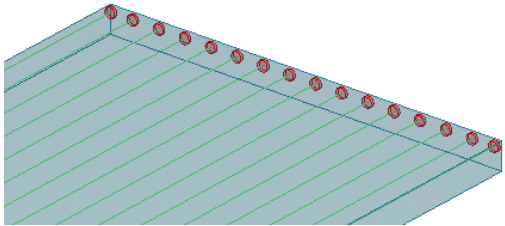
**Rebar end anchor**

**Rebar end anchor** creates end anchors at the ends of reinforcing bars or reinforcement meshes.

**Objects created**

- Round parts  
The parts are created at reinforcing bar ends.

**Use for**

Situation	Description
	Reinforcing bars with end anchors.

**Selection order**

Reinforcing bars or reinforcement meshes	<ol style="list-style-type: none"> <li>1. Select the reinforcing bar(s).</li> <li>2. Pick any point close to the bar end where you want to create the end anchors.</li> </ol>
Rebar set bars	<ol style="list-style-type: none"> <li>1. Select a rebar set.</li> <li>2. Define a location where to add an end detail modifier by picking two points. This end detail modifier will become an input object for the end anchors.</li> </ol> <p>or</p> <ol style="list-style-type: none"> <li>1. Select an existing end detail modifier in a rebar set.</li> </ol>

**Parameters tab**

Use the **Parameters** tab to define the end anchor properties.

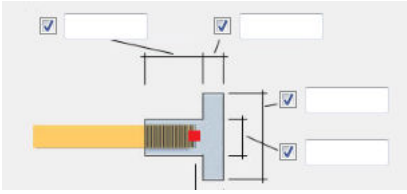
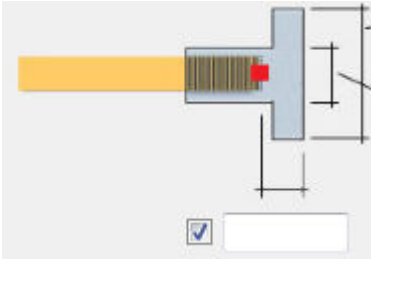
Option	Description
<b>Use manually entered values</b>	Enter values for the end anchor properties.



Option	Description
<b>Use auto attribute file</b>	<p>The values in the auto attribute file override the end anchor component values.</p> <p>Typically the auto attributes file contains one or more attribute values to be used with certain bar sizes.</p> <p>Go to <a href="#">Tekla Warehouse</a> to get auto attribute files for your project.</p> <p>For more information on the structure of the auto attribute files, see <b>Customize attribute files, part mapping and user-defined attributes (UDAs)</b>.</p>

Option	Description
<b>Use custom component</b>	<p>Select <b>Yes</b> to create the end anchor as a custom part.</p> <p>Select <b>No</b> to create the end anchor as a normal part.</p>
<b>Name</b>	<p>Type the name of the custom component, or select it from the <b>Applications &amp; components</b> catalog.</p> <p>Ensure that the selected component is a custom part.</p>
<b>Attribute</b>	<p>Type the name of the attribute file of the custom component.</p> <p>The end anchor custom part is created using the saved attributes given here.</p>
<b>Input points</b>	<p>The order of the start and the end points of the custom component.</p>
<b>Add to rebar assembly</b>	<p>To add the coupler as a sub-assembly to the rebar assembly, select either <b>Yes, to primary bar</b> or <b>Yes, to secondary bar</b>.</p> <p>Note that you must first create the rebar assembly, otherwise adding is not possible.</p> <p>The default value is <b>No</b>.</p>

Option	Description
<b>Numbering series</b>	<p>Prefix and a start number for the end anchor part position number.</p>

Option	Description
	<p>In the <b>Inherit from</b> list, select which numbering settings are used for couplers.</p> <ul style="list-style-type: none"> <li>• With <b>None</b>, enter the part and assembly prefix and start numbers.</li> <li>• With <b>Rebar</b>, the numbering settings of the primary bars are used.</li> <li>• With <b>Cast unit</b>, the cast unit numbering settings are used.</li> </ul>
<b>Attributes</b>	Name, diameter, material, finish and class of the end anchor parts.
	<p>The dimensions of the end anchor.</p> <p>If you use a custom part, define the length between the start point and the end point of the custom part using these values.</p>
	<p>The offset of the far most point of the coupler measured from the physical end of the reinforcing bar.</p> <p>Note that you cannot control the end of the reinforcing bar with this component. You need to make sure the end concrete cover of the reinforcing bar is greater or equal to this offset plus the minimum concrete cover.</p>

When you create the end anchors as custom parts, the properties in the **Numbering series** and **Attributes** sections can be filled from the custom part settings if you have named the properties in a certain way. For an example, see **Customize attribute files, part mapping and user-defined attributes (UDAs)**.

### Rebar attributes tab

Use the **Rebar attributes** tab to define the user-defined attributes (UDAs) for rebars.

Option	Description
<b>Threaded length</b>	<p>The value is written to the reinforcing bar UDA.</p> <p>The fields are used for checking which bars have threads and what are the thread values so that they can be shown in drawings and reports.</p>
<b>Extra fabrication length</b>	<p>This value is written to the reinforcing bar UDA.</p> <p>This value does not affect the length of the reinforcing bar. You need to add this value in your</p>

Option	Description
	drawings and reports to get the correct length if required.
<b>Method</b> <b>Type</b> <b>Product</b> <b>Code</b> <b>Thread type</b> <b>Free distance 1</b> <b>Free text 2</b>	UDAs written to the reinforcing bars.  You can set the reinforcing bar end method and the coupler type, and add a product name and a code for reporting purposes.  The used attribute name depends on which end of the reinforcing bar the coupler was created.

---

**NOTE** The above user-defined attributes affect numbering. Reinforcing bars with different attribute values get different part marks.

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### Coupler attributes tab

Use the **Coupler attributes** tab to define user-defined attributes (UDAs) for couplers or end anchor parts. For each UDA, you can select to inherit the value from the rebar or the cast unit. To enter a value, select the inherit option **None**.

Note that if the cast unit does not have any value for that particular UDA, the value is taken from the main part of the cast unit. By default, you can enter a **Comment** and values for **User field 1 ... 4** UDAs. You can customize the set of UDAs by modifying the UDA fields in the `RebarCouplers.Udas.dat` file, located in the `..\Environments\common\system` folder.

### Split rebar and add coupler

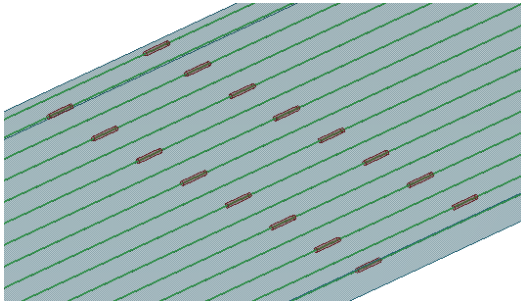
**Split rebar and add coupler** splits a reinforcing bar group or rebar set, and adds couplers in relation to the direction of the picked points.

### Objects created

- Circular hollow parts

The parts connect the two reinforcing bar groups or rebar sets.

## Use for

Situation	Description
	Staggered couplers with split reinforcing bars.

## Selection order

1. Double-click **Split rebar and add coupler** to open the component properties.
2. Click **Split rebar with coupler**.
3. Select the reinforcing bar, bar group, or rebar set to be split.
4. Pick the first split point.
5. Pick the second split point.  
This point defines the line at which the bars are split and couplers are inserted.
6. Pick the third point.  
This point defines the side of the primary bars. This is needed if the primary and secondary bars have different properties.
7. Repeat the steps 3 - 6, or press **Esc** to cancel picking.

## Parameters tab

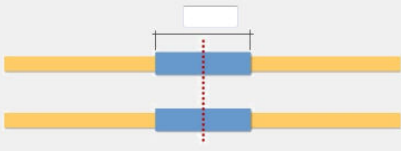
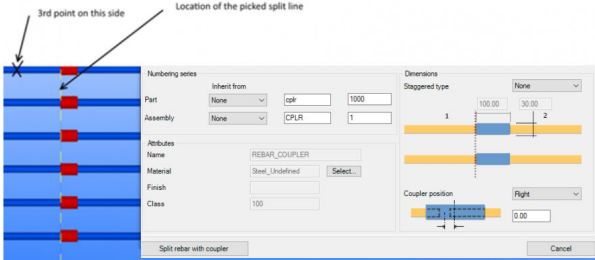
Use the **Parameters** tab to define the coupler properties.

Option	Description
<b>Use manually entered values</b>	Enter values for the coupler properties.
<b>Use auto attribute file</b>	The values in the auto attribute file override the coupler component values. Typically the auto attributes file contains one or more attribute values to be used with certain bar sizes. Go to <a href="#">Tekla Warehouse</a> to get auto attribute files for your project. For more information on the structure of the auto attribute files, see <b>Customize attribute files</b> ,

Option	Description
	<b>part mapping and user-defined attributes (UDAs).</b>

Option	Description
<b>Use custom component</b>	Select <b>Yes</b> to create the coupler as a custom part. Select <b>No</b> to create the coupler as a normal part.
<b>Name</b>	Type the name of the custom component, or select it from the <b>Applications &amp; components</b> catalog. Ensure that the selected component is a custom part.
<b>Attribute</b>	Type the name of the attribute file of the custom component. The coupler custom part is created using the saved attributes given here.
<b>Input points</b>	The order of the start and the end points of the custom component.
<b>Add to rebar assembly</b>	To add the coupler as a sub-assembly to the rebar assembly, select either <b>Yes, to primary bar</b> or <b>Yes, to secondary bar</b> . These options will create new rebar assemblies for the new bars created by the split command. The default value is <b>No</b> .

Option	Description
<b>Numbering series</b>	Prefix and a start number for the coupler part position number. In the <b>Inherit from</b> list, select which numbering settings are used for couplers. <ul style="list-style-type: none"> <li>• With <b>None</b>, enter the part and assembly prefix and start numbers.</li> <li>• With <b>Rebar</b>, the numbering settings of the primary bars are used.</li> <li>• With <b>Cast unit</b>, the cast unit numbering settings are used.</li> </ul>
<b>Attributes</b>	Name, diameter, material, finish and class of the coupler parts.

Option	Description
<p><b>Staggered type</b></p>	<ul style="list-style-type: none"> <li>• <b>None</b> Couplers are placed along the two picked points.</li> <li>• <b>Left</b> Couplers are placed to the left side of the two picked points.</li> <li>• <b>Right</b> Couplers are placed to the right side of the two picked points.</li> <li>• <b>Middle</b> Couplers are placed on both sides of the two picked points.</li> </ul>
	<p>The overall end-to-end length of the coupler.</p> <p>If you use a custom part, this is the length between the start point and end the point of the custom part.</p>
<p><b>Coupler position</b></p>	<p>Location of the couplers in relation to the selected split line.</p> <p>If you select the <b>Left</b> or the <b>Right</b> option, the actual left or right depends on the third input point which defines the side of the first bar.</p> <p>This option is available only when there is no staggering.</p> <p>Example:</p> 

When you create the couplers as custom parts, the properties in the **Numbering series** and **Attributes** sections can be filled from the custom part settings if you have named the properties in a certain way. For an example, see **Customize attribute files, part mapping and user-defined attributes (UDAs)**.

### Rebar attributes tab

Use the **Rebar attributes** tab to define the user-defined attributes (UDAs) for rebars.

Option	Description
<b>Threaded length</b>	The value is written to the reinforcing bar UDA. The fields are used for checking which bars have threads and what are the thread values so that they can be shown in drawings and reports.
<b>Extra fabrication length</b>	This value is written to the reinforcing bar UDA. This value does not affect the length of the reinforcing bar. You need to add this value in your drawings and reports to get the correct length if required.
<b>Method</b> <b>Type</b> <b>Product</b> <b>Code</b> <b>Thread type</b> <b>Free distance 1</b> <b>Free text 2</b>	UDAs written to the reinforcing bars. You can set the reinforcing bar end method and the coupler type, and add a product name and a code for reporting purposes. The used attribute name depends on which end of the reinforcing bar the coupler was created.

---

**NOTE** The above user-defined attributes affect numbering. Reinforcing bars with different attribute values get different part marks.

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### Coupler attributes tab

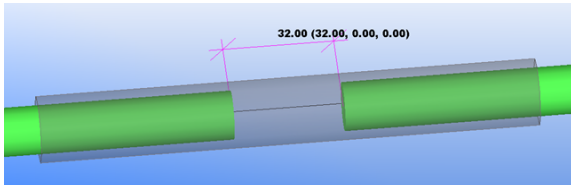
Use the **Coupler attributes** tab to define user-defined attributes (UDAs) for couplers or end anchor parts. For each UDA, you can select to inherit the value from the rebar or the cast unit. To enter a value, select the inherit option **None**.

Note that if the cast unit does not have any value for that particular UDA, the value is taken from the main part of the cast unit. By default, you can enter a **Comment** and values for **User field 1 ... 4** UDAs and **Layer**. You can customize the set of UDAs by modifying the UDA fields in the `RebarCouplers.Udas.dat` file, located in the `..\Environments\common\system` folder.

### Rebar end trimming

**Rebar end trimming** adjusts the space between two reinforcing bar ends.

## Use for

Situation	Description
	Space between reinforcing bar ends.

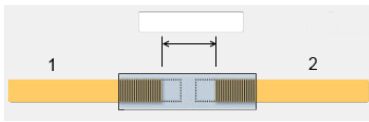
## Selection order

1. Select the couplers you want to modify.
2. Modify the properties.
3. Click **Apply to selected couplers**.

OR

1. Modify the properties.
2. Click **Select rebars**.
3. Select the reinforcing bars whose ends are adjusted according to the value set for the gap.

## Rebar coupler/Rebar end anchor tab

Option	Description
<b>Get free gap from auto attributes file</b>	Select <b>Yes</b> if you want to use the gap defined in the <b>Auto attribute file</b> for the couplers. When you select <b>Yes</b> , only the coupler components that have the <b>Use auto attribute file</b> in use are adjusted.  See <b>Customize attribute files, part mapping and user-defined attributes (UDAs)</b> .  Select <b>No</b> if you want to manually enter the free gap.
	The gap when <b>Get free gap from auto attributes file</b> is set to <b>No</b> .
<b>Trim both bars</b>	Select which of the reinforcing bars is modified.
<b>Apply to selected couplers</b>	Select the couplers you want to modify and click the <b>Apply to selected couplers</b> button to adjust the bars according to the value set for the gap.



Option	Description
<b>Select rebars</b>	<p>Click the <b>Select rebars</b> button and select the reinforcing bars whose ends you want to adjust according to the value set for the gap.</p> <p>The reinforcing bar ends need to be close to each other.</p>

#### Update rebar attributes

Use **Update rebar attributes** to manage the user-defined attributes (UDAs) of the couplers and the end anchor parts created by the **Rebar Coupler and Anchor Tools**. With **Update rebar attributes** you can check the current values of the selected reinforcing bars or all reinforcing bars.

If you have added coupler or end anchor components to reinforcing bars, the UDA values are controlled by the coupler or the end anchor components and their properties. If you delete the coupler or the end anchor component, the UDAs defined by those components are not cleared automatically. Use **Update rebar attributes** to clear the obsolete attribute values.

Option	Description
<b>Selected</b>	The values of all coupler and end anchor UDAs of the selected reinforcing bars in the model.
<b>All</b>	The values of all coupler and end anchor UDAs of all reinforcing bars in the model.
<b>Update</b>	<p>Deletes the values of all coupler and end anchor UDAs of all reinforcing bars on the selected rows.</p> <p>Only the obsolete coupler UDAs of the reinforcing bar are deleted.</p> <p>You can select multiple rows by holding down <b>Ctrl</b> or <b>Shift</b>.</p>
<b>Update (phase only)</b>	Updates the phase values of the coupler and end anchor parts so that the phase values are the same as the phase values of the related reinforcing bars.
<b>Show only rebar with attributes</b>	<p>Select this check box if you want to show only reinforcing bars that have values in their coupler or end anchor UDAs.</p> <p>After you have selected the check box, click <b>Selected</b> or <b>All</b> to refresh the table.</p>

## Customize attribute files, part mapping and user-defined attributes (UDAs)

### Auto attribute files

The attribute table files are text files that can locate in any of the system folders, or in a model folder. You can have as many attribute table files as you need. There are different attribute tables for end anchors (one input reinforcing bar) and coupler components (two input reinforcing bars). The extensions for attribute table files are

- `.couplers.csv` for **Rebar coupler** and **Split rebar and add coupler** components
- `.anchors.csv` for **Rebar end anchor** component.

The attribute table contains a header line, including the column names and one or more table rows containing the attribute values. Columns are either selector columns or attribute columns.

The selector column names are `Primary.Size`, `Primary.Grade`, `Secondary.Size`, and `Secondary.Grade`.

The attribute columns contain the attribute value that is the name given in the header row. The component attribute values given in the table row are used whenever the component input (primary + secondary for **Rebar coupler** and secondary for **Rebar end anchor**) matches with the selector values.

Go to [Tekla Warehouse](#) to get auto attribute files for your project.

### Custom part mapping

When you create the coupler or the end anchors as custom parts, the properties in the **Numbering series** and **Attributes** sections can be filled from the custom part settings if you have named the properties in a certain way. The following example shows the mapping between the **Numbering series** and **Attributes** properties and the custom part properties.

The screenshot displays two sections: 'Numbering series' and 'Attributes'. In the 'Numbering series' section, there are two rows. The first row has a checked 'Part' checkbox, a text field containing 'P7\_Part\_Pre', a checked checkbox, and a button labeled 'StartPart'. The second row has a checked 'Assembly' checkbox, a text field containing 'P6\_Ass\_Pre', a checked checkbox, and a button labeled 'StartAssembly'. The 'Attributes' section below it has five rows. Each row has a checked checkbox and a text field. The first row is 'Name' with 'P2\_Name'. The second is 'Diameter' with 'P1\_Profile'. The third is 'Material' with 'P3\_Material' and a 'Select...' button to its right. The fourth is 'Finish' with 'P5\_Finish'. The fifth is 'Class' with 'P4\_Class'.

### User-defined attributes (UDAs)

You can customize the content of the **Attributes** tab and the UDAs in the **Rebar Coupler and Anchor Tools** components.

The UDAs are defined in a text file named `RebarCoupler.Udas.dat`, located in the `... \ProgramData\Trimble\Tekla Structures\<version> \Environments\Common\system` folder. The file can also be placed in some other system folder or in a firm folder. Note that the file is not read from the model folder.

The `RebarCoupler.Udas.dat` file only defines which UDAs are shown on the **Attributes** tab. If you modify the file, include only existing UDAs to the file. If you want to create new UDAs, ensure that you define them properly.

---

**NOTE** The UDAs affect numbering if the UDAs' special numbering flag (`special_flag`) is set to `yes` in the `objects_couplers.inp` file. Reinforcing bars with different UDA values will then get different part marks.

---

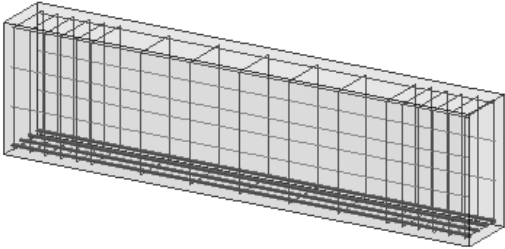
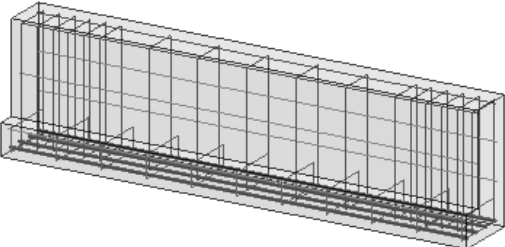
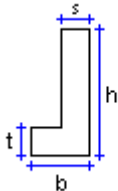
### **Beam reinforcement (63)**

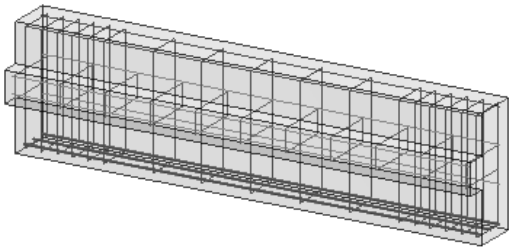
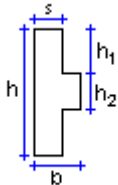
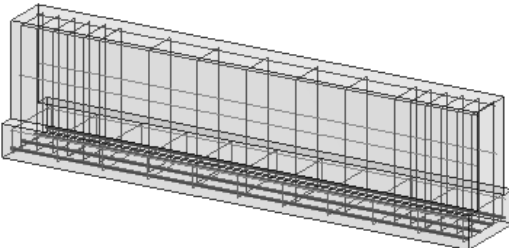
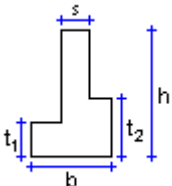
**Beam reinforcement (63)** creates reinforcement for a concrete beam.

#### **Bars created**

- Longitudinal main bars
- Corner and side bars
- Main stirrups
- Stirrups for one or two ledges

#### **Use for**

<b>Situation</b>	<b>More information</b>
	Rectangular beams
	L-shaped beams (RCL profiles) 

Situation	More information
	<p>RCX profiles</p> 
	<p>Inverted T-beams (RCDL profiles)</p> 

### Before you start

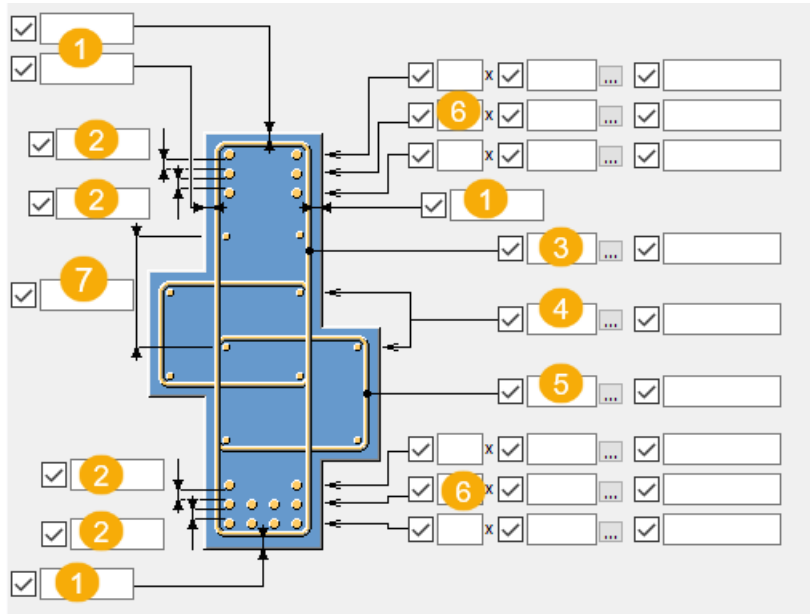
- Create the concrete beam.
- Calculate the required area of reinforcement.

### Selection order

1. Select the concrete beam.  
The reinforcement is created automatically when you select the beam.

### Parameters tab

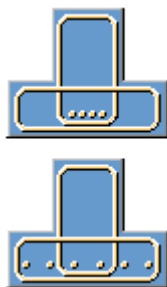
Use the **Parameters** tab to define the concrete cover thickness, number, size, and location of the bars, and stirrup size.



	Description
1	Cover thickness
2	Distance between bars
3	Main stirrup size
4	Corner and side bar size
5	Ledge stirrup size
6	Main bars number and sizes
7	Sidebar spacing, based on maximum target spacing



### Bottom main bars

Select how the bottom main bars are positioned: inside the main stirrups or distributed to the ledges. You can select the position when the bottom main bars have the same height as at least one of the ledges.







### Placing of top and bottom bars




Select the horizontal placing for the top and bottom bars. Select whether the bars are placed starting from the corner or at equal spaces.

Option	Description
	At equal spaces
	From the corner

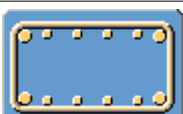
### Bending direction



Option	Description
	Type 1
	Type 2
	Type 3
	Type 4

### Stirrup shape

Option	Description
	90-degree
	135-degree
	Overlapped

### Additional links

Option	Description
	No additional links.

Option	Description
	Create additional internal links.
	Create additional links.

Select whether links are created always or depending on the profile size from the **Create links** list.

If you select **If profile size >**, enter the minimum profile length.






### Side bars

Select whether the side bars are created as one group or as separate rebar groups.

### Hooks tab

Use the **Hooks** tab to create hooks and define their properties.

Define the hook type and bar end cover separately for the start and end of the rows.

Option	Description
	No hook
	Standard 90-degree hook
	Standard 135-degree hook
	Standard 180-degree hook
	Custom hook

If you select a standard hook, the **Angle**, **Radius**, and **Length** use predefined dimensions.

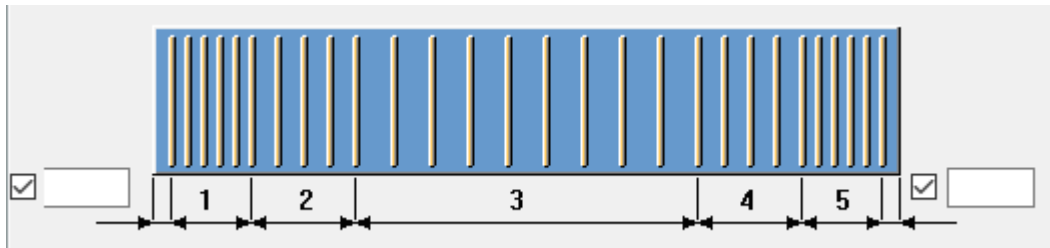
Option	Description
<b>Angle</b>	Enter a value between -180 and +180 degrees.
<b>Radius</b>	Enter the internal bending radius of the hook.
<b>Length</b>	Enter the length of the straight part.

### Stirrup spacing tab

Use the **Stirrup spacing** tab to define whether stirrups are created as one group or as separate groups, and to define stirrup spacing.

### Stirrup spacing

Define the distances from the part ends to the first stirrups.



Option	Description
<b>N</b>	Number of stirrups.
<b>Space</b>	Define the spacing of stirrups. Use a space to separate spacing values. Enter a value for each space between the stirrups. For example, if there are 3 stirrups, enter 2 values.

### Main stirrup spacing type and Ledge Stirrup Spacing Type

Define how the main stirrups and ledge stirrups are distributed along the length of the beam.

Option	Description
<b>Target</b>	Tekla Structures creates equal spaces between the bars, aiming the spacing value as closely as possible to the value you specify. This is the default option.
<b>Exact</b>	The first and last space of a zone adjust themselves to even out bar distribution. The spaces in the middle of each zone are exactly the size you specify.

### Advanced tab

Use the **Advanced** tab to define the naming and numbering properties of bars and stirrups.



Option	Description
<b>Name</b>	Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.
<b>Prefix</b>	Prefix for the bar position number.
<b>Start number</b>	Start number for the bar position number.

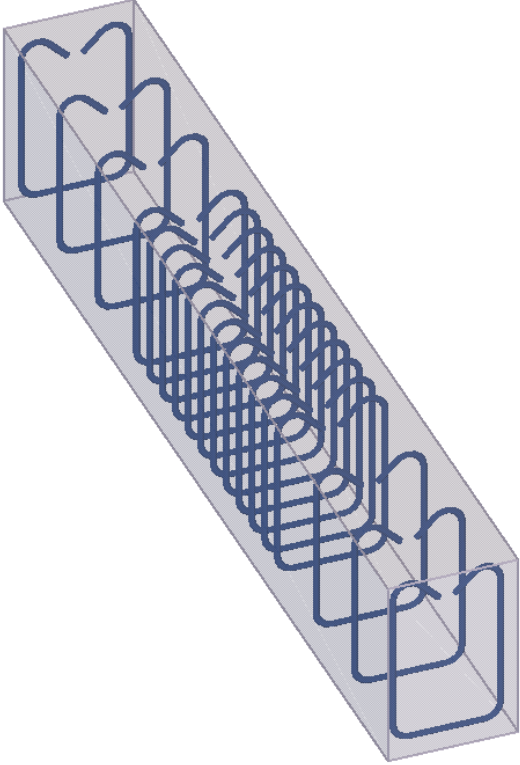
### ***Stirrup reinforcement (67)***

**Stirrup reinforcement (67)** creates stirrup reinforcement for a beam, a panel, or a rectangular slab.

#### **Reinforcement created**

- Main stirrups
- Hooks (Optional)

## Use for

Situation	More information
	A concrete beam with main stirrups.

### Before you start

- Create the concrete part.
- Calculate the required area of reinforcement.

### Parameters tab

Use the **Parameters** tab to define stirrup properties.






### Reinforcing bar

Option	Description
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.
<b>Name</b>	Tekla Structures uses the name in drawings and reports.
<b>Size</b>	Diameter of the reinforcing bar.

Option	Description
<b>Grade</b>	Strength of the steel used in the reinforcing bars.
<b>Bending radius</b>	Internal radius of the bends in the bar.  You can enter a separate value for each bar bend. Separate the values with spaces.  Bending radius complies with the design code you are using. Main bars, stirrups, ties, and hooks usually have their own minimum internal bending radii, which are proportional to the diameter of the reinforcing bar. The actual bending radius is normally chosen to suit the size of the mandrels on the bar-bending machine.
<b>Class</b>	Use <b>Class</b> to group reinforcement.  For example, you can display reinforcement of different classes in different colors.

### Hook type

Define the hook type separately for the start and end of the part. The options are:

Option	Description
	No hook
	Standard 90-degree hook
	Standard 135-degree hook
	Standard 180-degree hook
	Custom hook

If you select a standard hook, the **Angle**, **Radius**, and **Length** use predefined dimensions.

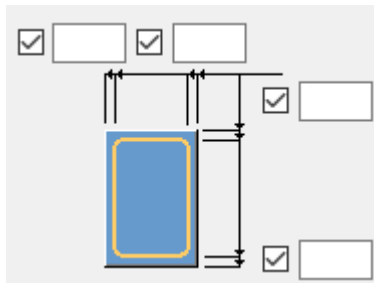
Option	Description
<b>Angle</b>	Enter a value between -180 and +180 degrees.
<b>Radius</b>	Enter the internal bending radius of the hook.

Option	Description
<b>Length</b>	Enter the length of the straight part.
<b>Stirrup shape</b>	Select the shape of the stirrups. The options are <b>Open</b> , <b>Closed</b> , and <b>Spiral</b> .
<b>Number of rounds, N*</b>	If you select the stirrup shape <b>Spiral</b> , enter the number of rounds the spiraled stirrup has.

### Cover thickness

Define whether the concrete cover thickness is same or different on each side from **Concrete cover** dropdown list.

If you select a different concrete cover for each side, enter the separate cover thicknesses.



### Rotation



Rotate the polygon of the rebar shape from the **First stirrup** and the **Second stirrup**. You can rotate the polygon either at each even or odd position.

### Stirrup spacing tab

Use the **Stirrup spacing** tab to define the spacing of stirrups.

You can define six zones for the distribution.

Option	Description
<b>Symmetric</b>	Define whether the same spacing and bundling properties are used at the start and end of the part.
<b>N</b>	Number of stirrups.
<b>Space</b>	Define the spacing of stirrups. Use a space to separate spacing values. Enter a value for each space between the stirrups. For example, if there are 3 stirrups, enter 2 values.

Option	Description
<b>Bundling</b>	Select whether to have single or double main stirrups.  Single stirrups:  Bundled stirrups: 
<b>Min hole size</b>	Define a size limit for the holes.
<b>Stirrup spacing type</b>	<p><b>Target</b></p> <p>Tekla Structures creates equal spaces between the bars, aiming the spacing value as closely as possible to the value you specify. This is the default option.</p> <hr/> <p><b>Exact</b></p> <p>The first and last space of a zone adjust themselves to even out bar distribution. The spaces in the middle of each zone are exactly the size you specify.</p>

### Holes and recesses tab

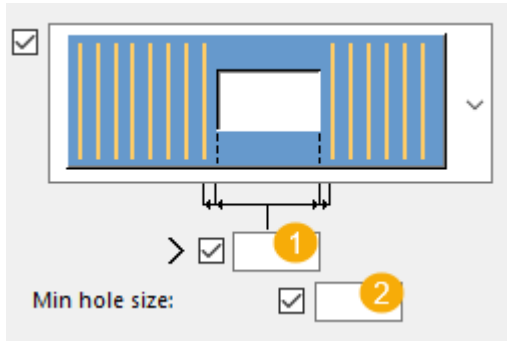
Use the **Holes and recesses** tab to define how reinforcement is created around openings.

### Bar behavior at holes and recesses

Select how the bars next to holes and recesses are handled.

Option	Description
<b>Cut bars</b>	Select whether the bars are cut and which cuts are ignored.  You can select to ignore cuts by part name or class. If you ignore cuts by name, define the name. If you ignore cuts by class, define the class.

## Cover thickness



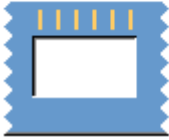
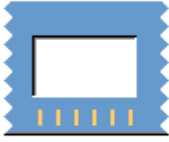
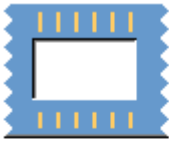
	Description
1	Define the cover thickness of the opening to control where the first full height stirrup is placed.
2	Define the minimum hole size.

## Reinforcement around opening

Option	Description
	No reinforcement around the opening.
	Reinforcement is created around the opening.

## Reinforcement position

If you create reinforcement around the opening, select how the reinforcement is positioned.



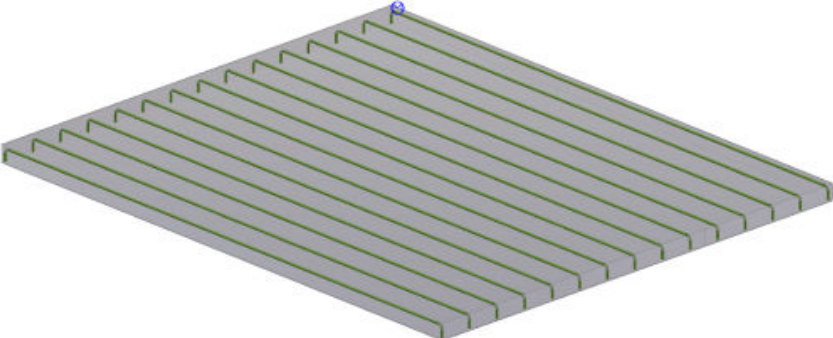
### ***Longitudinal reinforcement (70)***

**Longitudinal reinforcement (70)** creates longitudinal reinforcing bars to concrete parts.

#### **Objects created**

- Main bars
- Hooks (Optional)

#### **Use for**

<b>Situation</b>	<b>Description</b>
	Concrete slab with longitudinal main bars and standard hooks.

#### **Before you start**

- Create the concrete part.
- Calculate the required area of reinforcement.

#### **Selection order**

1. Select the concrete part.

### Parameters tab

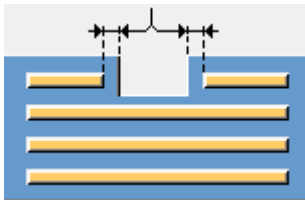
Use the **Parameters** tab to define the longitudinal bars properties and spacing.

### Properties

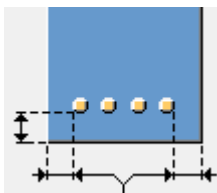
Option	Description
<b>Prefix</b>	Prefix for the part position number.
<b>Start No</b>	Start number for the part position number.
<b>Name</b>	Tekla Structures uses the name in drawings and reports.
<b>Size</b>	Diameter of the reinforcing bar.
<b>Grade</b>	Strength of the steel used in the reinforcing bars.
<b>Class</b>	Use <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.

### Concrete cover thickness

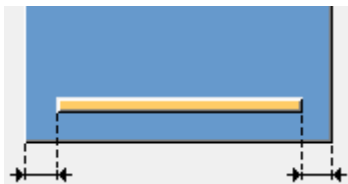
If the part has a cut, enter the concrete cover thicknesses at cut positions.



Enter the concrete cover thicknesses on the plane and from the plane.



Enter the concrete cover thickness at the start and end of the bars.

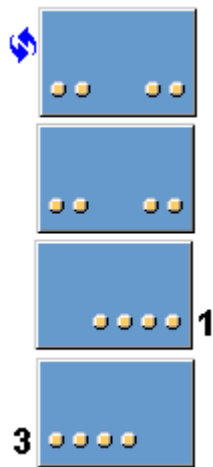




## Spacing

Option	Description
<b>Spacing</b>	Define the spacing of reinforcement bars.  Use a space to separate spacing values. Enter a value for each space between the bars. For example, if there are 3 bars, enter 2 values.
<b>Number of bars</b>	Enter the number of reinforcing bars.

Select the location of reinforcing bars from the list. The default is that the bars are on both sides.



## Hooks tab

Use the **Hooks** tab to create hooks and define their properties.

## Hook type

Define the hook type separately for the start and end of the part. The options are:

Option	Description
—	No hook
└	Standard 90-degree hook
∟	Standard 135-degree hook
═	Standard 180-degree hook
↙	Custom hook

If you select a standard hook, the **Angle**, **Radius**, and **Length** use predefined dimensions.

Option	Description
<b>Angle</b>	Enter a value between -180 and +180 degrees.
<b>Radius</b>	Enter the internal bending radius of the hook.
<b>Length</b>	Enter the length of the straight part.

Select the direction of hooks from the **Direction** list.

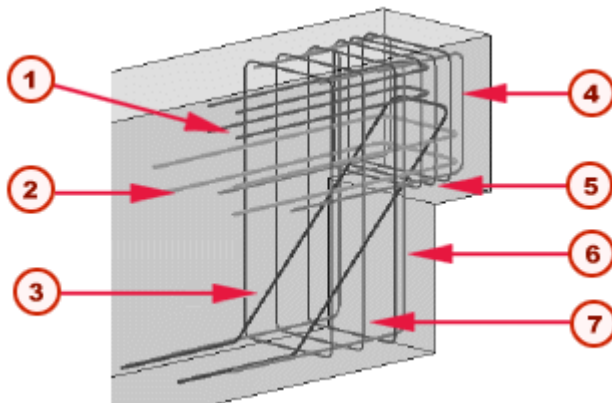
Select to create the hooks for split rebars from the **Hooks for split rebars** list.

### ***Beam end reinforcement (79)***

**Beam end reinforcement (79)** creates reinforcement for the end of a concrete beam or strip footing.

#### **Bars created**

- Horizontal U-shaped bars (types 1 and 2)
- Vertical U-shaped bars (types 3A and 3B)
- Oblique bar (type 4)
- Stirrups (types 5A and 5B)



	Description
<b>1</b>	Horizontal U bars (type <b>2</b> )
<b>2</b>	Horizontal U bars (type <b>1</b> )
<b>3</b>	Oblique bar (type <b>4</b> )
<b>4</b>	Vertical U bars (type <b>3A</b> )
<b>5</b>	Stirrups (type <b>5A</b> )
<b>6</b>	Vertical U bars (type <b>3B</b> )

	Description
7	Stirrups (type 5B)

### Use for

Situation	More information
Standard beams	Use bars 3A and 5A for the beam end.
Dapped beams	
Beams with anchor bolt hole in the notched area	
Beams and strip footings that have a rectangular cross section	

### Do not use for

Parts that have irregular cross sections.

### Before you start

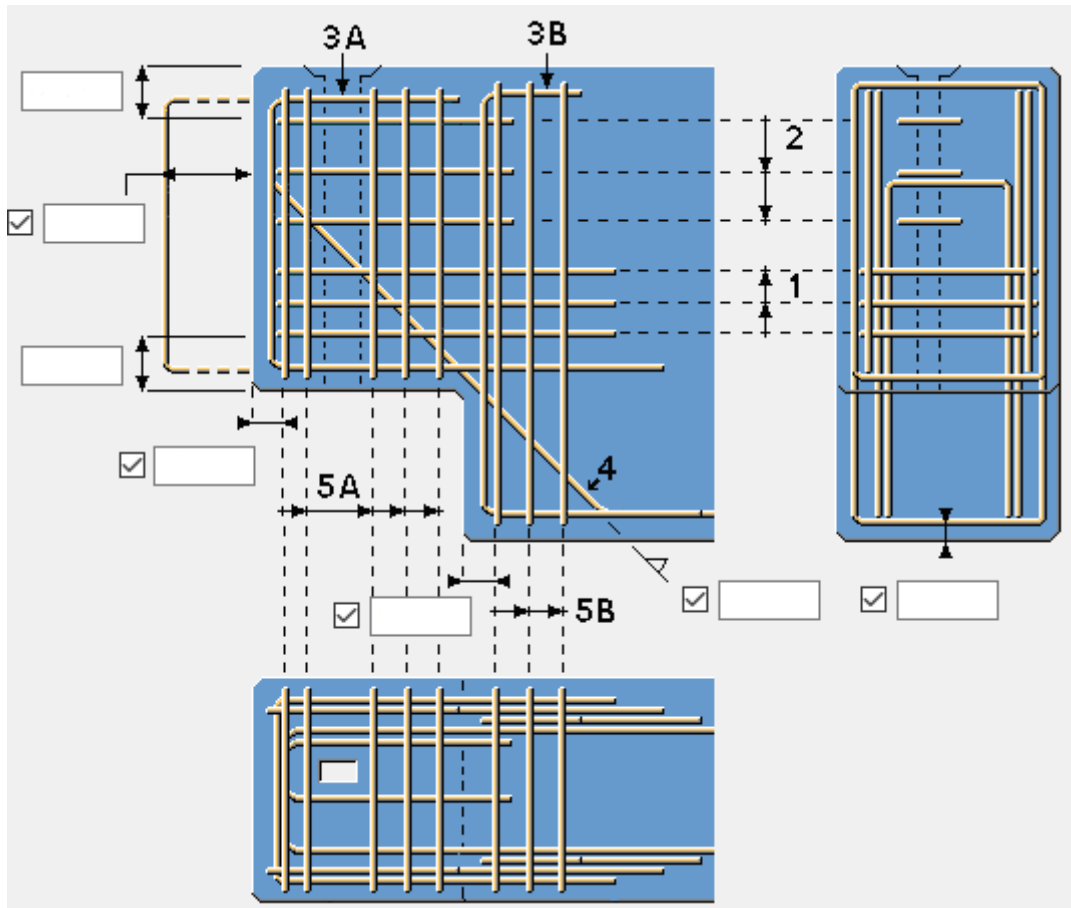
- Create the concrete beam or strip footing.
- Calculate the required area of reinforcement.

### Picking order

1. Select concrete beam or strip footing.
2. Pick position.

### Picture tab

Use the **Picture** tab to define concrete cover thickness, distances from the concrete surface to the bars, and angle of bar 4.





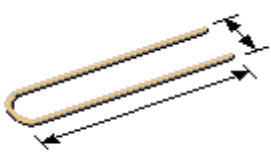

### Bars tab

Use the **Bars** tab to define which bars to create, bar dimensions, and to slice bars 3A and 3B.

### Horizontal U bars 1 and 2

Use the following options to create bars in the lower area of the beam end, in the horizontal planes (bar type 1):

Option	Description
	<p>Two bars on each plane. One in the middle of the beam end, the other extending to the sides of the beam.</p>

Option	Description
	<p>One bar on each plane, extending to the sides of the beam.</p>
	<p>One bar on each plane, in the middle of the beam end.</p>
	<p>Two identical, overlapping bars on each plane.</p>

To create bars in the upper area of the beam end, around a hole, enter dimensions for bar 2.

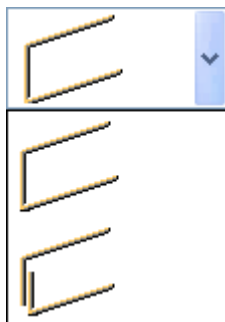
### Vertical U bars 3A and 3B

To create vertical U-shaped bars, enter dimensions for:

- Bar 3A: for the notched area of the beam.
- Bar 3B: for the higher part of the beam.

### Splicing bars 3

You can create vertical U bars (bar type 3) of two bars joined with a splice. To do this, use the following list box on the **Bars** tab:



If you choose to splice bars, you can select the splice type:

Option	Description
<b>Lap up</b>	Creates a lap splice above the horizontal center line of the beam end.
<b>Lap down</b>	Creates a lap splice below the horizontal center line of the beam end.
<b>Lap both</b>	Creates a lap splice centered to the horizontal center line of the beam end.
<b>Coupler</b>	Creates a coupler.
<b>Weld joint</b>	Creates a welded joint.

For lap splices, you can define the lap length **L** and whether the bars are on top of each other or parallel to each other.

For all splice types, you can define the offset of the splice center point from the horizontal center line of the beam end.

### Stirrups 5A and 5B

To create stirrups for beam ends, enter dimensions for:

- Bar 5A: for the notched area of the beam.
- Bar 5B: for the higher part of the beam.

### Groups tab

Use the **Groups** tab to define grouping properties of bars.

Enter the number and spacing of bars in each group of bar types. If the spacing varies, enter each value individually.

### Attributes tab

Use the **Attributes** tab to define bar properties.

Option	Description
<b>Grade</b>	Strength of the steel used in the reinforcing bars.
<b>Size</b>	Diameter of the reinforcing bar.
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.
<b>Name</b>	Define the name for the reinforcing bars.  Tekla Structures uses the name in drawings and reports.

Option	Description
<b>Class</b>	Use <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.

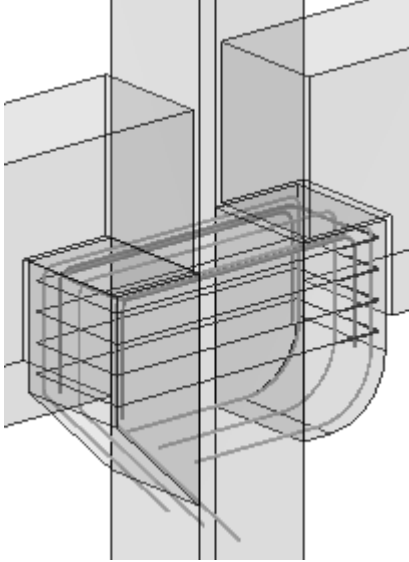

### ***Corbel reinforcement (81)***

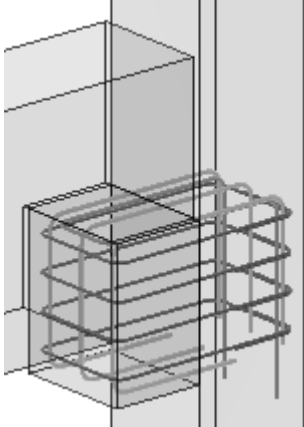

**Corbel reinforcement (81)** creates reinforcement for one or two corbels in a concrete column. The two corbels must have the same top level, thickness, and horizontal location.

#### **Objects created**

- Main bars
- Stirrups
- Additional bars

#### **Use for**

Situation	Description
	<p>Two corbels, beveled and rounded, with the same top level, thickness, and horizontal location.</p> <p>Two additional bars crossing each other.</p> 

Situation	Description
	<p>One straight corbel. One additional bar.</p> 

### Limitations

Do not use **Corbel reinforcement (81)** for two very different corbels.

### Before you start

- Create the concrete column and beams.
- Create the corbels. Use **Corbel connection (14)** or a seating connection to create the corbels.

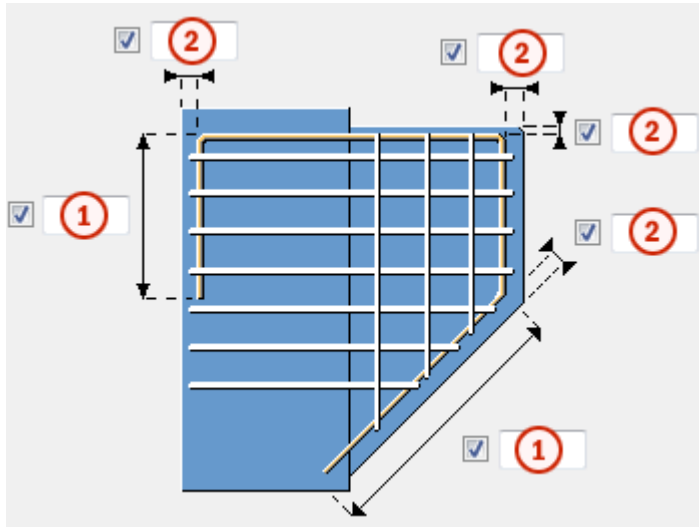
### Selection order

1. Select the main part (concrete column).
2. Select the secondary parts (one or more corbels).
3. Click the middle mouse button to create the reinforcement.

### Main bars tab

Use the **Main bars** tab to control the main bar length, concrete cover thickness, reinforcing bar spacing, and reinforcing bar properties.







	Description
1	Main bar length.
2	Distance from the concrete surface to the main bar.

Option	Description
<b>Grade</b>	Strength of the steel used in the reinforcing bars.
<b>Size</b>	Diameter of the reinforcing bar.
<b>Name</b>	Define a name for the main bars. Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.

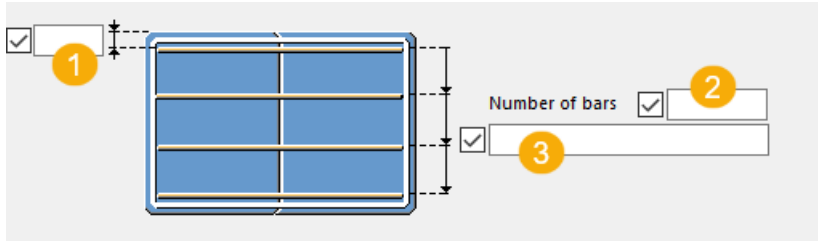
### Follow shape

This setting also affects the transverse stirrups.

Option	Description
	Inclined The last rebar segment follows the inclined corbel edge.

Option	Description
	Horizontal The last rebar segment is created horizontally.

### Cover thickness



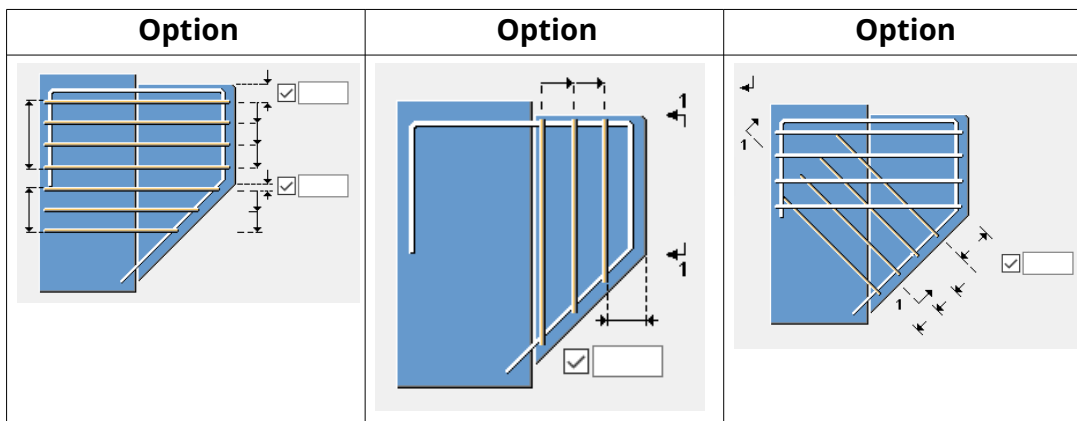
	Description
1	Concrete cover thickness.
2	Number of bars in the reinforcement.
3	Space between the reinforcing bars.

### Stirrups/Transverse stirrups/Diagonal stirrups tab

Use the **Stirrups**, **Transverse stirrups** and **Diagonal stirrups** tabs to control the stirrup creation, stirrup type, concrete cover thickness, reinforcing bar spacing and properties.

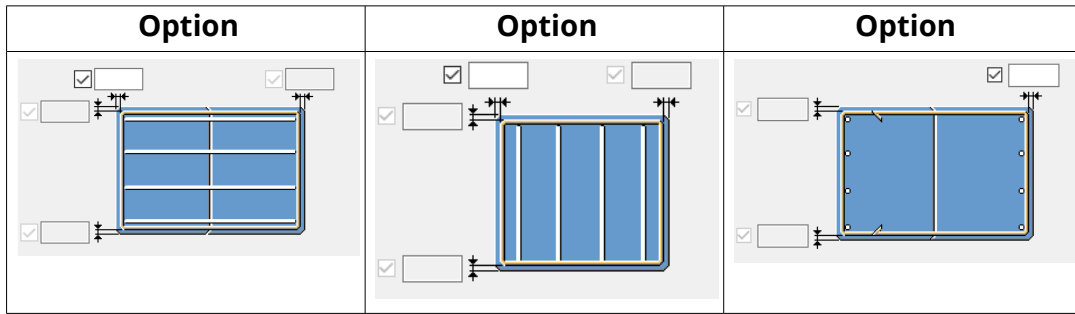
### Stirrups

Define the distance from the concrete surface to the stirrups.





### Concrete cover thickness



Define the concrete cover thickness. You can select that the concrete cover is the same at each side.



Option	Description
<b>Number of bars</b>	Define the number of bars in the reinforcement.
<b>Spacing values</b>	Define the space between the reinforcing bars.
<b>Transverse stirrups in column</b>	Select whether the column is reinforced with transverse stirrups.
<b>Name</b>	Define a name for the stirrups. Tekla Structures uses the name in drawings and reports.
<b>Size</b>	Diameter of the reinforcing bar.
<b>Grade</b>	Strength of the steel used in the reinforcing bars.
<b>Class</b>	Use <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.

### Stirrup type






Option	Description
	The stirrup consists of a bent single reinforcing bar. Define the hook length. The default values (for the standard 90 degree stirrup hook) are read from the <code>rebar_database.inp</code> file. Select a suitable overlap position for this stirrup type.
	The stirrup consist of two overlapping U bars that face each other. Define minimum and maximum overlapping length.

Option	Description
	The stirrup consists of two overlapping U bars. Define minimum and maximum overlapping length.
	The transverse stirrup is one open U-bar.

### Additional bars tab

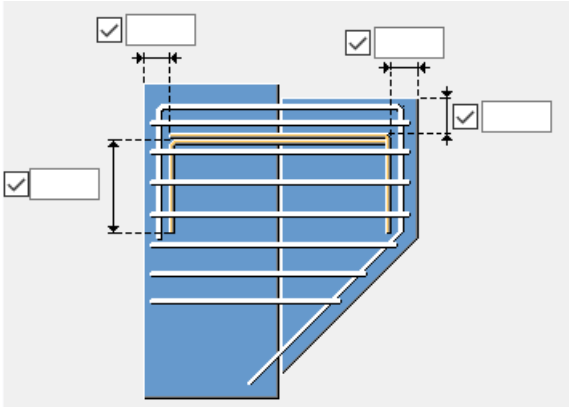
Use the **Additional bars** tab to control the creation of additional bars in corbels, concrete cover thickness, and additional bar properties.

### Additional bars

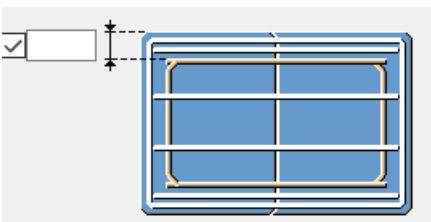
Option	Description
	No additional bars.
	One additional bar.
	Two additional bars parallel to each other.
	Two additional bars crossing each other.
	Two pairs of additional bars crossing each other.

### Stirrups and cover thickness

Define the distance from the concrete surface to the stirrups and the additional bar dimension.



Define the concrete cover thickness.



Option	Description
<b>Grade</b>	Strength of the steel used in the reinforcing bars.
<b>Size</b>	Diameter of the reinforcing bar.
<b>Name</b>	Define a name for the additional bars. Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.

### Rebar assembly tab

Use the **Rebar assembly** tab to add the created reinforcement as a rebar assembly to the cast units.

### Create as rebar assembly

You can add the created reinforcement as a rebar assembly to the cast units with a predefined assembly type, name, prefix, and start number.

Option	Description
<b>Create as rebar assembly</b>	Select <b>Yes</b> to create all reinforcement as one rebar assembly, and to include it to the cast unit of the input part.
<b>Add to existing rebar assembly</b>	<ul style="list-style-type: none"> <li>• <b>Do not add:</b> New rebar is added as a rebar assembly to the cast unit.</li> <li>• <b>As single bars:</b> Add all new rebars directly into an existing rebar assembly as rebars.</li> <li>• <b>As sub-assembly:</b> Add all new rebars to their own new rebar assembly, which is then included as a sub-assembly to the main rebar assembly.</li> </ul>
<b>Rebar assembly type</b>	Select the rebar assembly type. If you do not select the type, the default value of the rebar assembly is used.
<b>Name, Profile, Start number</b>	Define the name, profile, and start number. If you do not define these, the default values of the rebar assembly are used.

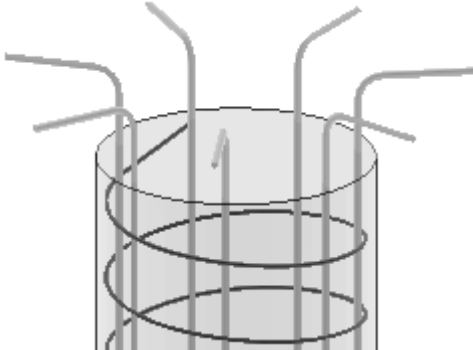
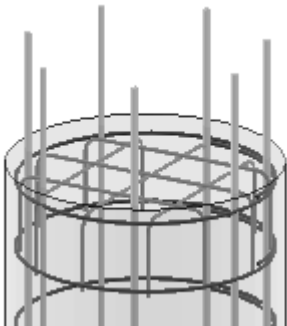
### ***Round column reinforcement (82)***

**Round column reinforcement (82)** creates reinforcement for a concrete column that has a round cross section.

#### **Objects created**

- Longitudinal main bars (6)
- Stirrups
- Column end reinforcement

## Use for

Situation	Description
	Round concrete column with main bars bent outside the column. Continuous spiral stirrup.
	Round concrete column with straight main bars protruding from the column, or entirely inside the column. Separate stirrups. Top of the column is reinforced.

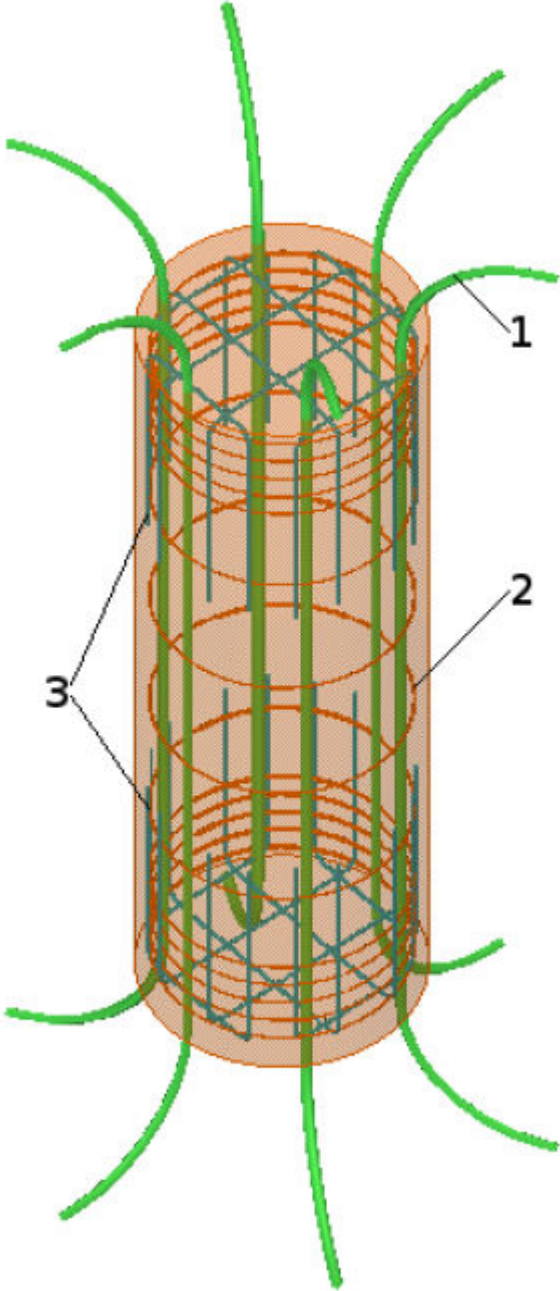
## Limitations

Do not use for rectangular columns.

## Selection order

1. Select the main part (column).  
The component is created automatically when the part is selected.

**Part identification key**



	<b>Part</b>
<b>1</b>	Main bars
<b>2</b>	Stirrups
<b>3</b>	Column end reinforcement



### Main bars tab

Use the **Main bars** tab to control the length of the vertical and horizontal extensions of the main bars at the top and bottom of the column, the thickness of the concrete cover over stirrups, and the cranking of the main bars.

### Main bar properties

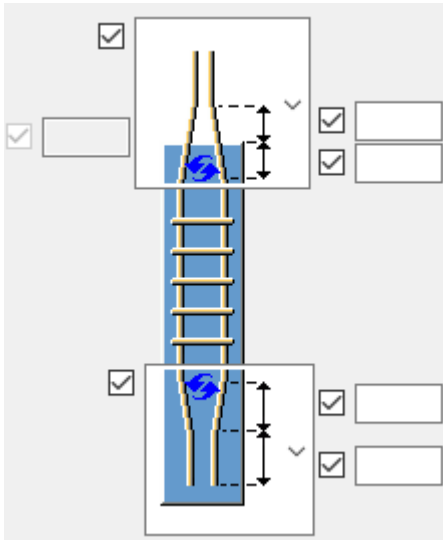
Option	Description
<b>Number of bars</b>	Number of main bars.
<b>Rotation</b>	Rotation of main bars.
<b>Grade</b>	Strength of the steel used in the reinforcing bars.
<b>Size</b>	Diameter of the main bars.
<b>Bending radius</b>	Bending radius of the main bars.
<b>Class</b>	Use <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.
<b>Name</b>	Name for the main bars. Tekla Structures uses the name in drawings and reports.
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.

### Hooks at top / bottom

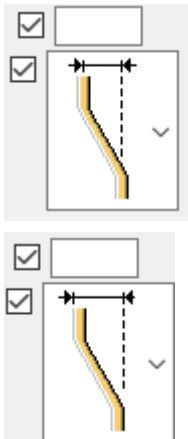
Option	Description
<b>Type</b>	Select the hook angle.
<b>Length</b>	Length of the hook.
<b>Bending radius</b>	Bending radius of the hook.

### Cranking

You can create cranked reinforcing bars at the top and at the bottom of the column. Enter the vertical and sloped distance dimensions.



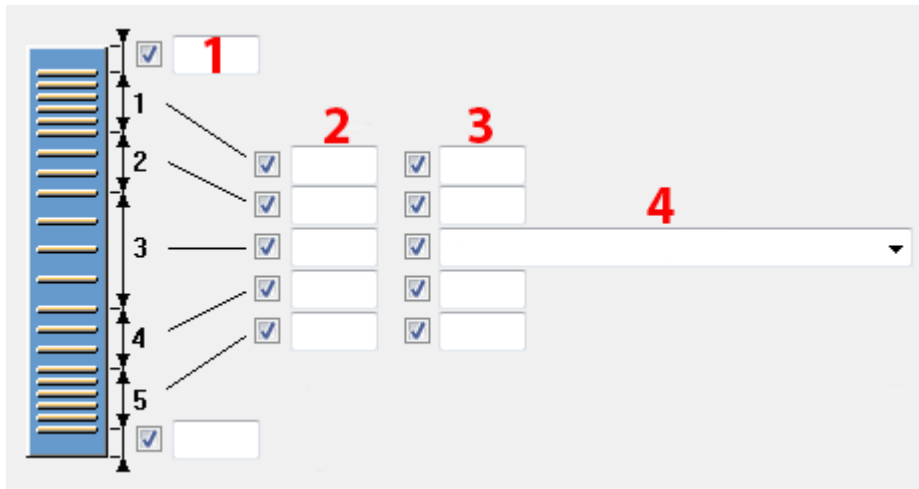
Enter the horizontal dimensions of top and bottom cranked bar as distance between center of bars or as outer distance of bars:



### Stirrups tab




Use the **Stirrups** tab to control the thickness of the concrete cover over the stirrups at the top and bottom of the column, spacing and number of stirrups or laps in each stirrup group, stirrup types and stirrup shapes.


## Stirrup dimensions



1. Thickness of the concrete cover over the stirrups at the top and the bottom of the column. The default cover thickness is 50 mm.  
Group 1 is the top stirrup group, 5 is the bottom stirrup group. Group 3 is always created.
2. Spacing of stirrups in each stirrup group.
3. Number of stirrups in each stirrup group.
4. Select how the stirrups are distributed.
  - **Exact space, flexible at ends:** Tekla Structures uses exactly the spacing value you specify, and evens out the stirrup distribution at the column ends.
  - **Target space:** Tekla Structures creates the stirrups at even spacings and tries to use the spacing value you specify.

## Stirrup types

Option	Description
	Separate stirrups
	Single, continuous spiral stirrup
	Separate spiral stirrups

Option	Description
	Single, continuous stirrup

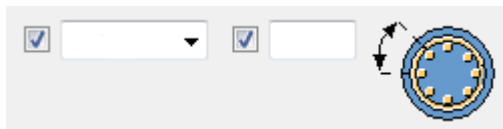
### Stirrup shape

Select the shape of the stirrup from the list.



### Stirrup overlap

Select the angle or the length of stirrup overlap. The option is not active if you have created spiral stirrups.



The overlapping angle can be of maximum 180 degrees.

The overlapping length can be in millimeters or inches.

### Stirrup attributes tab

Use the **Stirrup attributes** tab to control the grade, size, class, name, and numbering properties of the stirrups.

### Stirrup properties

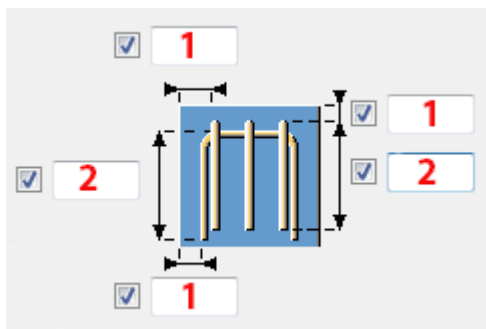
Option	Description
<b>Grade</b>	Strength of the steel used in the reinforcing bars.
<b>Size</b>	Diameter of the stirrups.

Option	Description
<b>Name</b>	Name for the stirrups. Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use the <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.

### Top tab

Use the **Top** tab to control the thickness of the concrete cover of the top reinforcement, the number of top bars, and their spacing and rotation.

### Column top reinforcement



1. Define the concrete cover thickness.
2. Define the length of the ultimate leg.

### Column top reinforcement rotation

Select how to rotate the reinforcement at the top of columns.



### Column top reinforcement properties

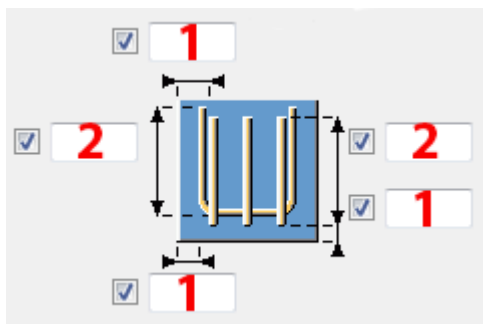
Option	Description
<b>Number of bars</b>	Number of top bars.
<b>Grade</b>	Strength of the steel used in the reinforcing bars.
<b>Size</b>	Diameter of the top bars.
<b>Class</b>	Use the <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.

Option	Description
<b>Name</b>	Name for the top bars. Tekla Structures uses the name in drawings and reports.
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.

### Bottom tab

Use the **Bottom** tab to control the thickness of the concrete cover of the bottom reinforcement, the number of bars, and their spacing and rotation.

### Column bottom reinforcement



1. Define the concrete cover thickness.
2. Define the length of the ultimate leg.

### Column bottom reinforcement rotation

Select how to rotate the reinforcement at the bottom of columns.



### Column bottom reinforcement properties

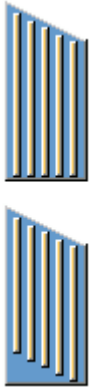
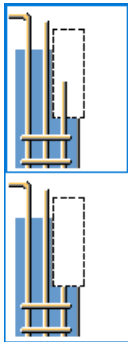
Option	Description
<b>Number of bars</b>	Number of bottom bars.
<b>Grade</b>	Strength of the steel used in the reinforcing bars.
<b>Size</b>	Diameter of the reinforcing bar.
<b>Class</b>	Use the <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.
<b>Name</b>	Name for the bottom bars. Tekla Structures uses the name in drawings and reports.
<b>Prefix</b>	Prefix for the part position number.

Option	Description
<b>Start number</b>	Start number for the part position number.

### Advanced (main bars) tab

Use the **Advanced (main bars)** tab to control the main bar extensions separately for each bar.

#### Extensions

Option	Description
	<p>In <b>Bar index</b>, enter the bar number for which to define the extension. Define the size, the distance from the column edge and the length of each extension.</p> <p>Select whether the main bars are tapered or moved according to the upper surface, if the top of the column is skewed.</p>
	<p>Select whether to cut bars by the cut in the column.</p>

### Rebar grouping

Select to create bars as a rebar group or as single bars from the **Creation method** list.

### Rebar assembly tab

Use the **Rebar assembly** tab to add the created reinforcement as a rebar assembly to the cast units.

### Create as rebar assembly

You can add the created reinforcement as a rebar assembly to the cast units with a predefined assembly type, name, prefix, and start number.

Option	Description
<b>Create as rebar assembly</b>	Select <b>Yes</b> to create all reinforcement as one rebar assembly, and to include it to the cast unit of the input part.
<b>Rebar assembly type</b>	Select the rebar assembly type. If you do not select the type, the default value of the rebar assembly is used.
<b>Name, Profile, Start number</b>	Define the name, profile, and start number. If you do not define these, the default values of the rebar assembly are used.

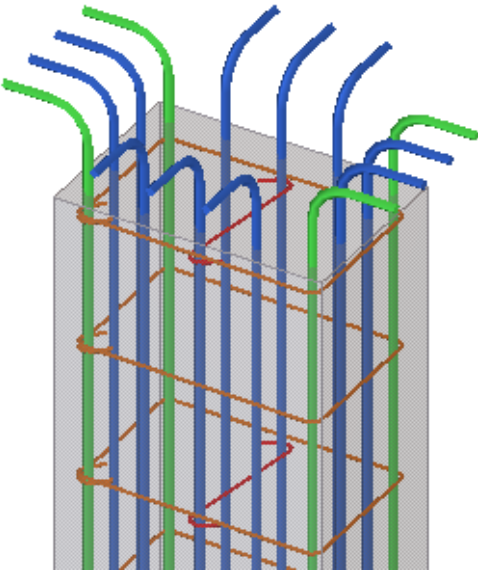
### ***Rectangular column reinforcement (83)***

**Rectangular column reinforcement (83)** creates reinforcement for a concrete column that has a rectangular cross section.

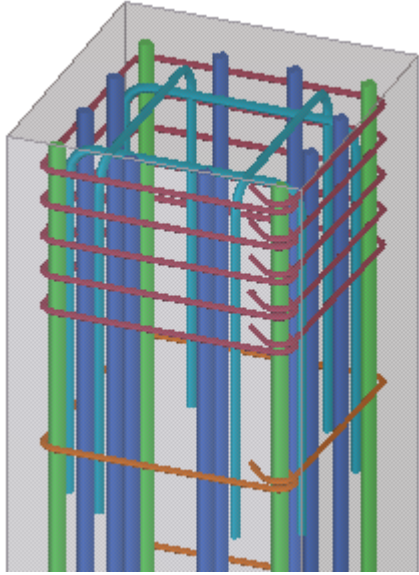
#### **Objects created**

- Longitudinal main bars: corner bars (4), side bars
- Stirrups
- Intermediate links
- Column end reinforcement

#### **Use for**

Situation	Description
	Rectangular concrete column with corner bars and side bars bent outside the column. Side bars on long sides. Intermediate links tie side bars at every second stirrup.



Situation	Description
	<p>Rectangular concrete column with straight corner and side bars entirely inside the column. End of column reinforced.</p>

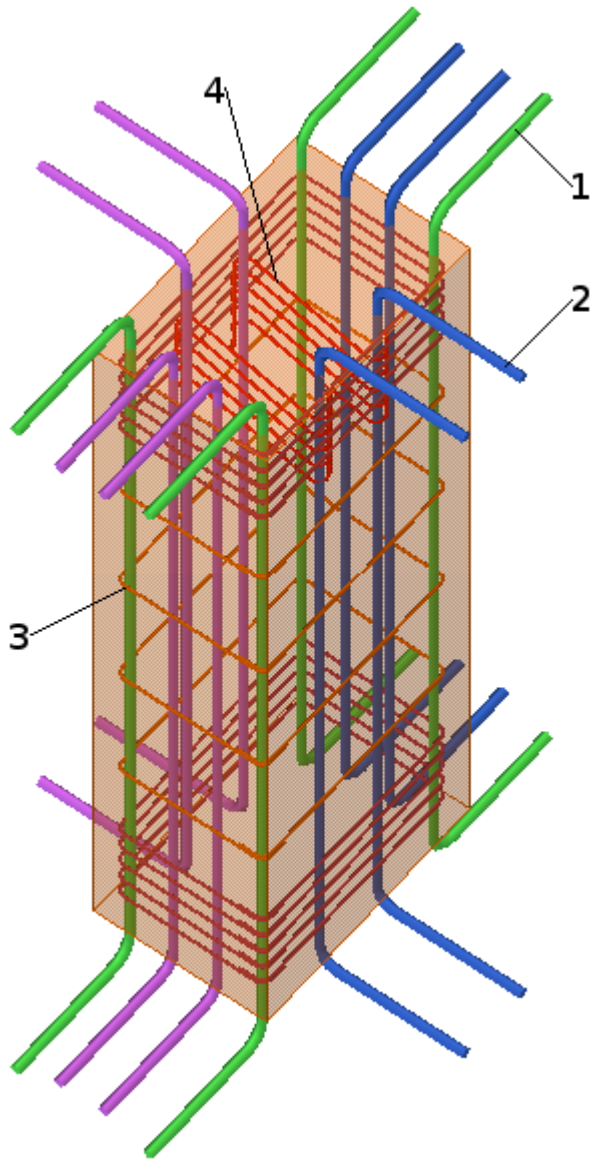
### Limitations

Do not use for round columns.

### Selection order

1. Select the main part (column).  
The component is created automatically when the part is selected.

### Part identification key



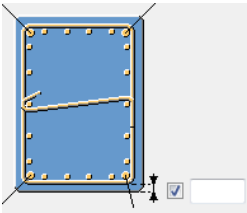
	Part
1	Corner bars
2	Side bars
3	Stirrups
4	Intermediate links

### Main bars tab

Use the **Main bars** tab to control the corner bar properties, the symmetry options, rotation, and concrete cover thickness.

## Basic corner bar properties

Define the grade, size and bending radius of the corner bars. The active settings depend on the selected symmetry option.

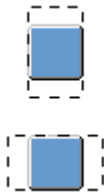
Option	Description
<b>Grade</b>	Strength of the steel used in the reinforcing bars.
<b>Size</b>	Diameter of the reinforcing bar.
<b>Bending radius</b>	Define the bending radius of the corner bars.
	Define the concrete cover thickness. Select whether the thickness is the same on all sides.

## Symmetry options



Select the symmetry option. Use the symmetrical conditions to define which of the corner bars have the same grade, size, and bending radius properties. The corner bars that have same properties are symmetrical.

## Rotation



In square columns, you can select the perpendicular sides of a column if the sides require different reinforcement. You can rotate all reinforcement in a square column by 90 degrees.

## Additional corner bar properties

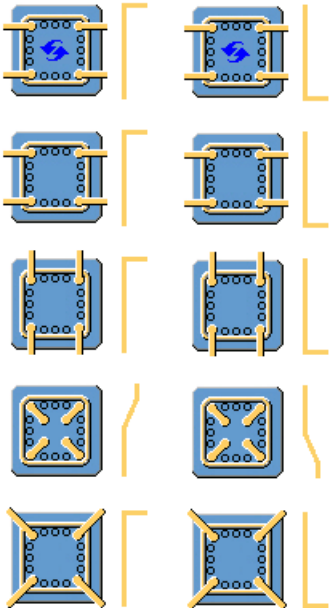


Option	Description
<b>Class</b>	Use <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.
<b>Name</b>	Define a name for the main bars. Tekla Structures uses the name in drawings and reports.

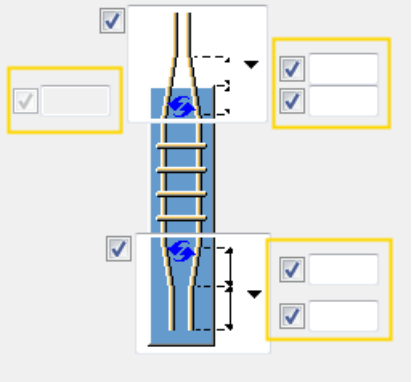
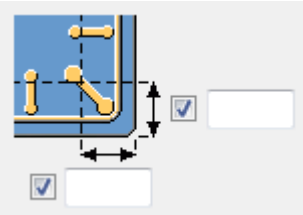
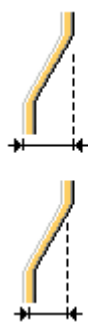
Option	Description
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.

### Bar ends tab

Use the **Bar ends** tab to control the length of vertical and horizontal extensions for the corner bars and side bars, and the cranking.

<b>Bar creation</b>	Select whether the extensions of corner bars and side bars are created symmetrically on both sides of the column.  If you select <b>Not symmetrical</b> , you can enter separate extension values for the opposite sides of the column.
<b>Vertical extension</b>	Define the length of the vertical extension outside the column for corner bars and side bars.  The active settings depend on <b>Bar creation: Symmetrical</b> or <b>Not symmetrical</b> .
<b>Horizontal extension</b>	Define the length of the horizontal extension for corner bars and side bars.  The active settings depend on <b>Bar creation: Symmetrical</b> or <b>Not symmetrical</b> .
<b>Corner bars</b> <b>Side bars 1</b> <b>Side bars 2</b>	Select the hook type, and define the hook length and bending radius.

<p><b>Top corner bar direction</b> <b>Bottom corner bar direction</b></p>	<p>Select the direction of the corner bars.</p>  <p>The options illustrate whether the direction is a horizontal extension or a cranking option.</p>
<p><b>Cranking</b></p>	<p>You can create cranked reinforcing bars at the top and at the bottom of the column.</p> <p>To activate the cranking options,</p>  <p>select  in the <b>Top corner bar direction</b> and <b>Bottom corner bar direction</b> lists. Define the dimensions for the cranked bars.</p>

	 <p>To successfully create the cranked reinforcing bars, ensure that the bending radius is not too large.</p>
<p><b>Align cranking</b></p>	<p>When set to <b>Yes</b>, the cranking of the corner bars is automatically aligned to the horizontal extension direction. This helps you to output two-dimensional bars easier.</p>
<p>Edge dimensions</p>	<p>Define the edge distance from the column corner to the point where the cranking starts</p>  <p>Select cranking from the edge or center line of the rebar:</p>  <p>Define the cranking separately for the corner bars and the side bars.</p>

### Side bars tab

Use the **Side bars** tab to control the number of side bars, side bar spacing and placing, symmetry options, and properties.

### Number of side bars



Define the number and spacing of side bars. You can define two sets of side bars on each side of the column.

You can define the side bars separately for each side of the column.

The active settings depend on the selected symmetry option.

### Placing of side bars

Select the horizontal and vertical placing for the side bars. Select whether the bars are placed starting from the corner or at equal spaces.

	Distance between corner bars and side bars.
	Distance between side bars.

### Symmetry options



Select the symmetry option. Using the symmetrical conditions you can define which side bars are symmetrical, and which side bars use the same properties.

### Side bar properties

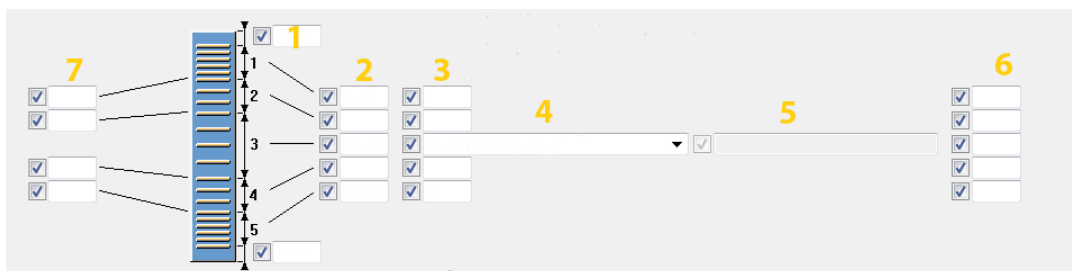
Option	Description
<b>Grade</b>	Define the strength of the steel used in the reinforcing bars.
<b>Size</b>	Define the diameter of the reinforcing bar.
<b>Bending radius</b>	Define the bending radius of the side bars.
<b>Class</b>	Use the <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.

Option	Description
<b>Name</b>	Define a name for the side bars. Tekla Structures uses the name in drawings and reports.
<b>Prefix</b>	Define a prefix for the part position number.
<b>Start number</b>	Define a start number for the part position number.

### Stirrups tab

Use the **Stirrups** tab to control the stirrup properties.

### Stirrup dimensions



<b>1</b>	Define the thickness of the concrete cover over the stirrups at the top and the bottom of the column. The default cover thickness is 50 mm. Group <b>1</b> is the top stirrup group, <b>5</b> is the bottom stirrup group. Group <b>3</b> is always created.
<b>2</b>	Define the spacing of stirrups in each stirrup group.
<b>3</b>	Define the number of stirrups in each stirrup group.
<b>4</b>	Select how the stirrups are distributed.
<b>5</b>	If you select the <b>Distance list</b> option, enter different spacing values for the groups.
<b>6</b>	Define the cover thickness for each stirrup group.
<b>7</b>	Define the gaps between the stirrup groups.

### Create stirrups

Select whether the stirrups are created as individual reinforcing bars, rebar group, or spiral rebar group.





## Rebar lapping at stirrup corners

Select the how the rebars lap at the stirrup corners. The options are 135-degree hooks or 90-degree hooks at the bar end, or overlapping U-shape stirrups.



You can define the overlap length for the U-shape stirrups.

## Ignore cuts

If you have a recess or a hole in the column, you can select to ignore the cuts at the top and the bottom of the column when the stirrups are created.

## Stirrup properties

Option	Description
<b>Grade</b>	Define the strength of the steel used in the reinforcing bars.
<b>Size</b>	Define the diameter of the reinforcing bar.
<b>Name</b>	Define a name for the stirrups. Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use the <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.
<b>Prefix</b>	Define a prefix for the part position number.
<b>Start number</b>	Define a start number for the part position number.
<b>Overlap length</b>	Define the overlap length for the U-shape stirrups.

## Intermediate links tab

Use the **Intermediate links** tab to control the intermediate links to tie all side bars.

If you have rectangular columns that have very large cross sections, the side bars may be far from the corners of the stirrups. You will need to create

intermediate links to tie all side bars, and to prevent them from buckling when they are in compression.

Intermediate links are created for each stirrup group.

**NOTE** Intermediate links are created between **Side bars 1** or **Side bars 2** that are symmetrical.

For **Side bars 2** intermediate links are created only if no **Side bars 1** are created.





### Create as one group

Select whether all the stirrups are created as a single group.

### Properties of intermediate links

Option	Description
<b>Grade</b>	Define the strength of the steel used in the reinforcing bars.
<b>Size</b>	Define the diameter of the reinforcing bar.
<b>Name</b>	Define a name for the stirrups. Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use the <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.
<b>Prefix</b>	Define a prefix for the part position number.
<b>Start number</b>	Define a start number for the part position number.

### Spacing of intermediate links

	Spacing is the same as stirrup spacing.
	Spacing is double the stirrup spacing (intermediate links at every second stirrup).
	Same as above, but for alternate stirrups.
	No intermediate links are created.

### Intermediate link type

Select the type of the link.



### Intermediate link pattern

Select whether intermediate links go in one direction or in a crossing pattern.



### Hook orientation

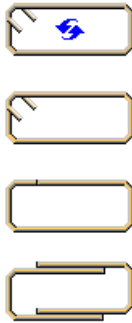
Select the hook orientation for both sides.

### Closed stirrups as intermediate links

Select whether to use closed stirrups as intermediate links.



If you select closed stirrups, select the type of the bar lapping at the stirrup corners.



### Zone without intermediate links

Define the zone length where intermediate links are not created. In this zone, the stirrups tie the side bars. The distance is measured from the stirrup corner.

If you have selected to use closed stirrups, you can define the distance from the corner of the closed stirrups.

### Top / Bottom tabs

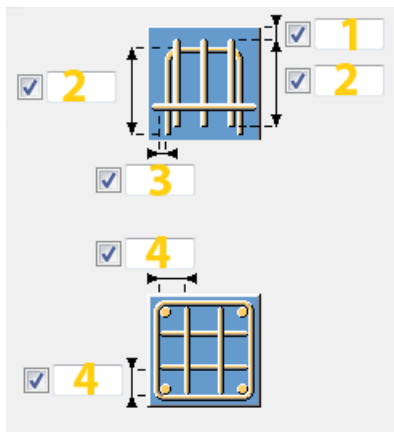
Use the **Top** and **Bottom** tabs to control the top and bottom reinforcement thickness of the concrete cover, number of bars, spacing and rotation.

### Number and spacing of bars

Define the number and spacing of the top or bottom bars.

You can define the number of transverse bars in both cross directions.

### Column top / bottom reinforcement





	Description
1	Define the concrete cover thickness from the top / bottom of the column.

	Description
2	Define the length of the rebar legs.
3	Define the concrete cover thickness from the sides of the column.
4	Define the distance from the edge of the column to the edge of the first rebar in the group.



### Placing of top or bottom bars

Select the horizontal and vertical placing for the top or bottom bars. Select whether the bars are placed starting from the corner or at equal spaces.

	Distance between corner bars and side bars.
	Distance between side bars.

### Rotation

Select how to rotate the reinforcement at the top or bottom of columns.

	<p>No rotation.</p> <p>Transverse bars are perpendicular to the longer side of the column.</p>
	<p>Rotation angle is 90 degrees.</p> <p>Transverse bars are parallel to the longer side of the column.</p>

### Top and bottom reinforcement properties

Option	Description
<b>Grade</b>	Define the strength of the steel used in the reinforcing bars.
<b>Size</b>	Define the diameter of the reinforcing bar.
<b>Bending radius</b>	Define the bending radius of the top or bottom bars.
<b>Class</b>	<p>Use the <b>Class</b> to group reinforcement.</p> <p>For example, you can display reinforcement of different classes in different colors.</p>
<b>Name</b>	<p>Define a name for the top or bottom bars.</p> <p>Tekla Structures uses the name in drawings and reports.</p>
<b>Prefix</b>	Define a prefix for the part position number.

Option	Description
<b>Start number</b>	Define a start number for the part position number.

### Rebar assembly tab

Use the **Rebar assembly** tab to add the created reinforcement as a rebar assembly to the cast units.

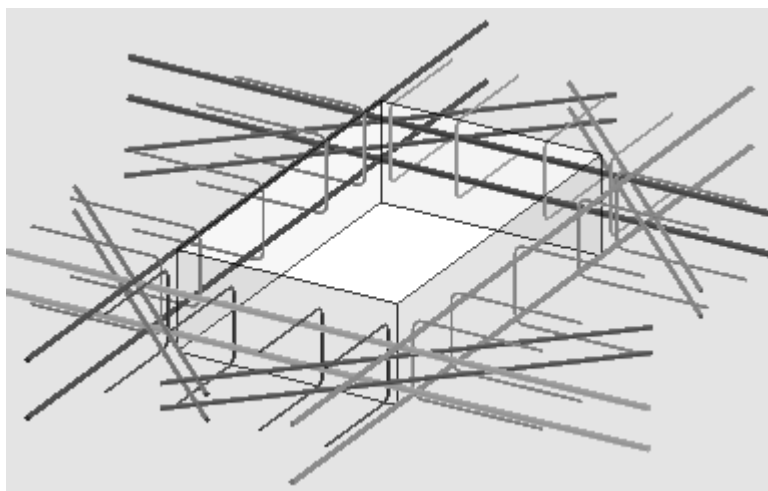
### Create as rebar assembly

You can add the created reinforcement as a rebar assembly to the cast units with a predefined assembly type, name, prefix, and start number.

Option	Description
<b>Create as rebar assembly</b>	Select <b>Yes</b> to create all reinforcement as one rebar assembly, and to include it to the cast unit of the input part.
<b>Rebar assembly type</b>	Select the rebar assembly type. If you do not select the type, the default value of the rebar assembly is used.
<b>Name, Profile, Start number</b>	Define the name, profile, and start number. If you do not define these, the default values of the rebar assembly are used.

### *Hole reinforcement for slabs and walls (84)*

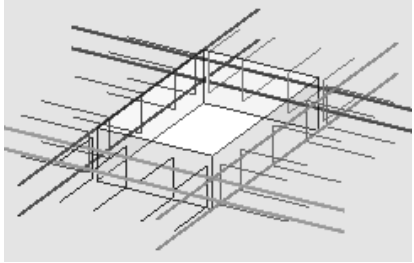
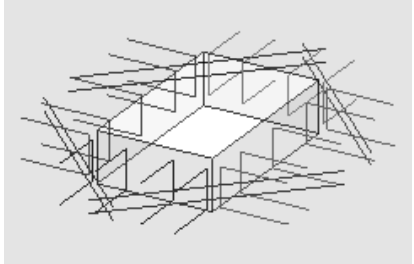
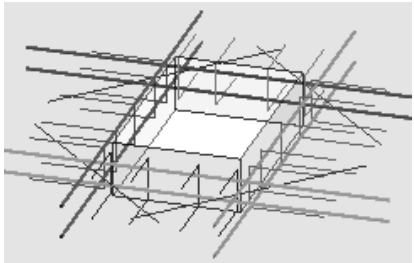
**Hole reinforcement for slabs and walls (84)** creates a hole in a concrete slab or wall and reinforcement around the hole.

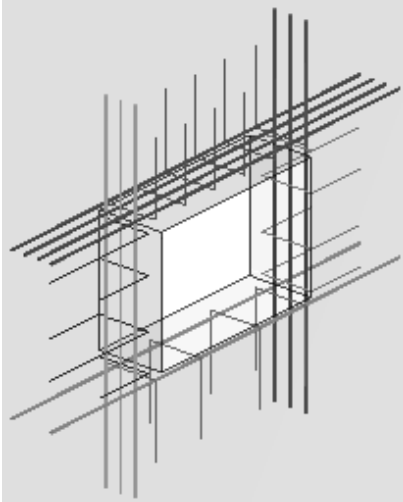


### Bars created

- Straight bars along hole edges
- Diagonal bars close to hole corners
- U-shaped edge bars

### Use for

Situation	More information
Rectangular or round holes in concrete slabs and walls	
	Straight and edge bars only, no diagonal bars.
	Diagonal and edge bars only, no straight bars.
	Hole rotated from the direction of the slab. One diagonal bar at each corner.

Situation	More information
	<p>Different number of bars on each side of the hole in the wall. No diagonal bars.</p>

### Before you start

- Create the concrete slab or wall.
- Calculate the required area of reinforcement.

### Selection order

1. Select the center of the hole.
2. Select the concrete slab or wall.



### Picture tab

Use the **Picture** tab to define creation of the hole, hole and bar dimensions, and concrete cover thickness.

### Hole

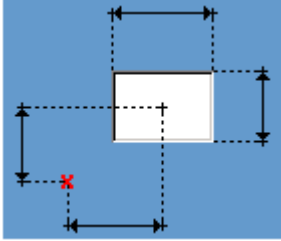
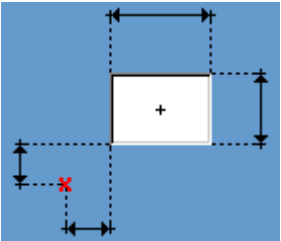
Select to create a hole and reinforce it or to create reinforcements to an existing hole from the **Create** list.

Select the shape of the hole:

Option	Description
	Rectangular
	Round

Select the pivot point for hole offsets:



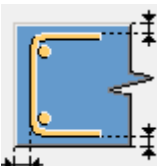
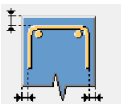
Option	Description
	Hole center
	Hole corner

Enter the rotation angle of the hole:



### Concrete cover

Enter the cover thicknesses for horizontal and vertical edge bars.

Horizontal	Vertical
	

### Generation start point

You can specify which point of the slab is taken as the origin where the creation plane starts. This means that the created reinforcement is aligned to the slab edge starting from that point.



### Horizontal and vertical bars tab

Use the **Horizontal and vertical bars** tab to define which bars are closest to the surface of the concrete, and the properties of bar groups along the sides of the hole.

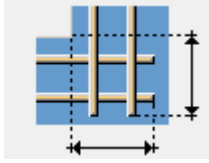
The slab or wall direction defines the direction of the hole and which bars are to the left and right of, and above and below the hole.

Option	Description
<b>Grade</b>	Strength of the steel used in the reinforcing bars.
<b>Size</b>	Diameter of the reinforcing bar.
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.
<b>Name</b>	Define the name for the reinforcing bars. Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.

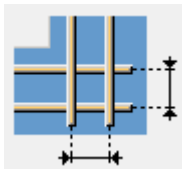
### Additional bars tab

Use the **Additional bars** tab to create additional bars and define their properties.

Enter the length of additional bars from the opening corner.



Enter the additional bars offsets from horizontal and vertical bars.



Option	Description
<b>Grade</b>	Strength of the steel used in the reinforcing bars.
<b>Size</b>	Diameter of the reinforcing bar.
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.
<b>Name</b>	Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.

### Edge bars tab

Use the **Edge bars** tab to define the properties of bar groups on each side.

The slab or wall direction defines the direction of the hole and which bars are to the left and right of, and above and below the hole.

Option	Description
<b>Grade</b>	Strength of the steel used in the reinforcing bar.
<b>Size</b>	Diameter of the reinforcing bar.
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.
<b>Name</b>	Tekla Structures uses the name in drawings and reports.

Option	Description
<b>Class</b>	Use <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.

#### **Diagonal bars tab**

Use the **Diagonal bars** tab to define the properties of bar groups at each corner of the hole.

The slab or wall direction defines the direction of the hole and which bars are to the left and right of, and above and below the hole.

Option	Description
<b>Grade</b>	Strength of the steel used in the reinforcing bars.
<b>Size</b>	Diameter of the reinforcing bar.
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.
<b>Name</b>	Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.

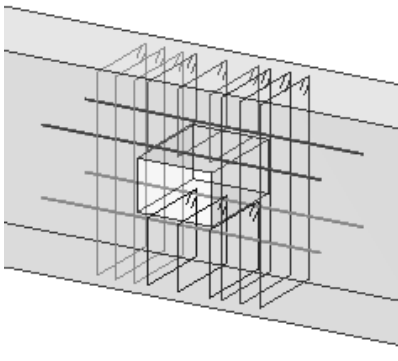
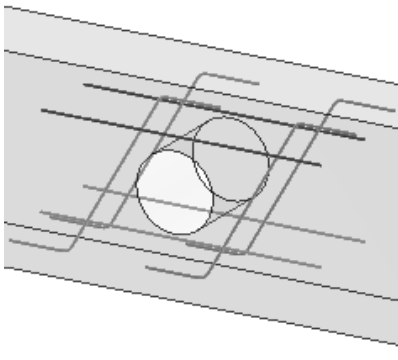
#### ***Hole creation and reinforcement (85)***

**Hole creation and reinforcement (85)** creates a hole in a concrete part and reinforcement around the hole.

#### **Bars created**

- Straight bars at hole edges
- Stirrups
- Z-shaped bars

## Use for

Situation	More information
	Rectangular hole, stirrups on each side of the hole, no Z-shaped bars.
	Round hole, Z-shaped bars, no stirrups around the hole.
Concrete beams or columns	
Round or rectangular holes	Hole only. No additional reinforcement around it.
With or without Z-shaped bars or stirrups	

## Do not use for

Parts that have round or irregular cross sections.

## Before you start

- Create the concrete part.
- Calculate the required area of reinforcement.

## Selection order

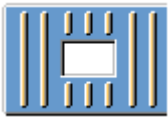

1. Select the center of the hole.
2. Select the concrete part.

## Picture tab


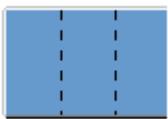
Use the **Picture** tab to define hole properties, bar dimensions and locations, concrete cover thickness, and angle of Z-shaped bars.

## Holes

Use these options to create holes and additional reinforcement:



Option	Description
	Creates a hole and additional reinforcement around it.
	Only creates a hole, no reinforcement.

Use these options to define the direction of holes:



Option	Description
	Hole along the local y direction of the part.
	Hole along the local z direction of the part.

## Z-shape bars

Use these options to define Z-shaped bars around round holes:

Option	Description
	Concrete cover measured in the direction of the radius of the hole.
	Concrete cover measured from the corner of the bounding box around the hole.

Use these options to define the direction of Z-shaped bars:

Option	Description
	
	

### Bars tab

Use the **Bars** tab to define bar properties.



Option	Description
<b>Grade</b>	Strength of the steel used in the reinforcing bars.
<b>Size</b>	Diameter of the reinforcing bar.
<b>Name</b>	Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.
<b>Prefix</b>	Prefix for the part position number.
<b>Start number</b>	Start number for the part position number.

### Stirrups tab



Use the **Stirrups** tab to define stirrups properties and additional settings.

### Stirrups

Use these options to define the stirrups around holes:

Option	Description
	Single stirrups
	Bundled stirrups

## Hooks

Option	Description
	135-degree hooks
	90-degree hooks

### ***Braced girder (88)***

**Braced girder (88)** creates braced girders in a precast concrete part, such as in a thin-shell slab or in a sandwich wall panel. The girders are cast into the concrete part and they also work as a part of the reinforcement and as a connector between the precast and cast-in-place concrete.

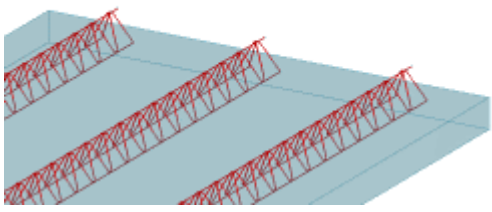
### **Objects created**

The girders consist of the following parts:

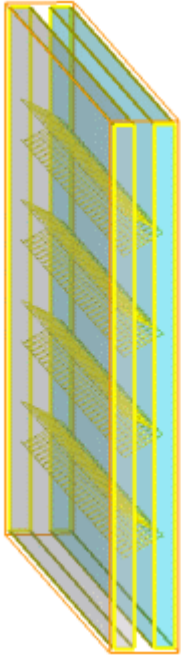

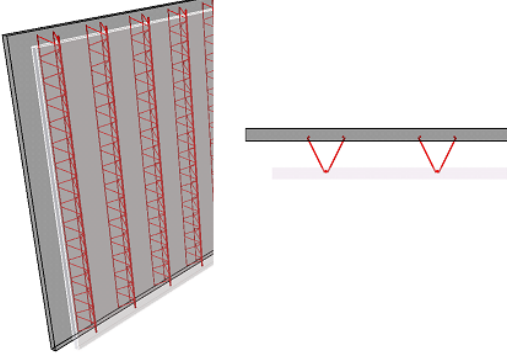
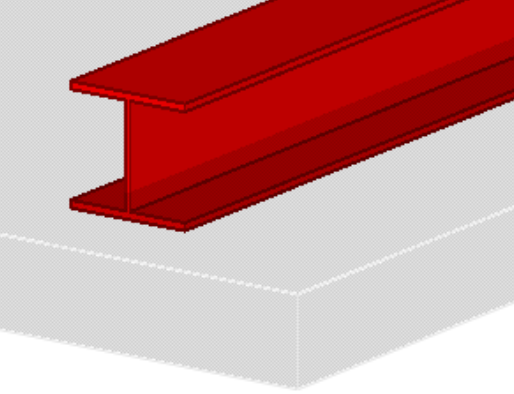
- Two bottom reinforcing bars
- One or two top reinforcing bars
- Two connecting reinforcing bars

Instead of using reinforcing bars, you can use profiles and plates to create the braced girders.

### **Use for**

Situation	Description
	Braced girders are created in the precast concrete slab.

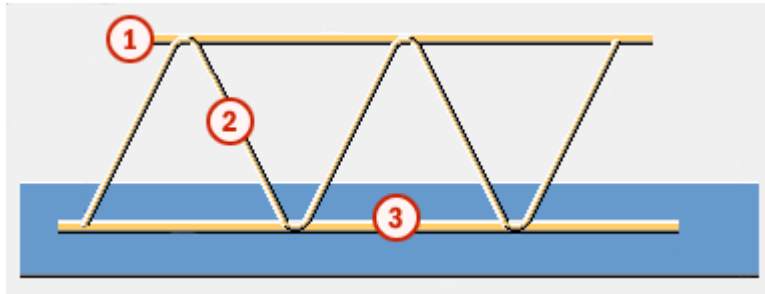


Situation	Description
	<p>Braced girders are created in the precast concrete sandwich panel.</p>
	<p>Braced girders are created in a wide plate floor with an opening.</p>
	<p>Braced girders are created in a hollow wall.</p>
	<p>Profile as a girder.</p>

### Selection order

1. Select the concrete part.  
The girders are created automatically.

### Part identification key

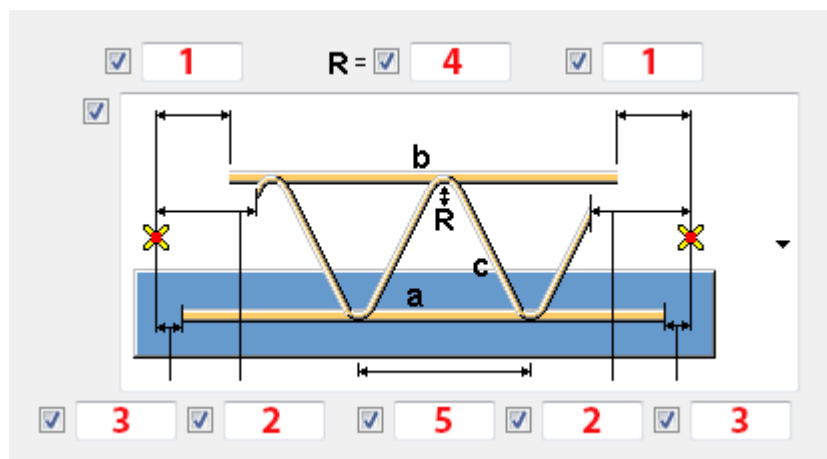


	Part
1	Top reinforcing bar
2	Connecting reinforcing bar
3	Bottom reinforcing bar

### Picture tab

Use the **Picture** tab to control the creation, shape and dimensions of reinforcing bars.

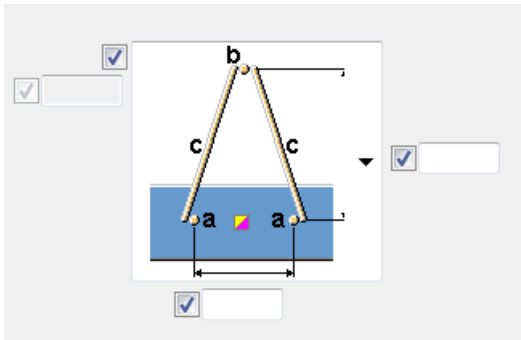
### Reinforcing bar dimensions and shape



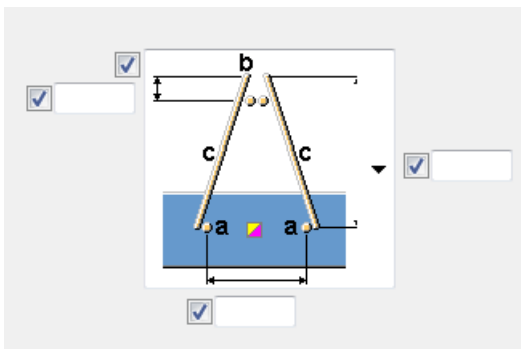
	Description
1	Distance between the end of the top reinforcing bar and the part end.
2	Distance between the end of the connecting reinforcing bar and the part end.

	Description
3	Distance between the end of the bottom reinforcing bar and the part end.
4	Radius of the connecting reinforcing bar.
5	Distance between bendings.

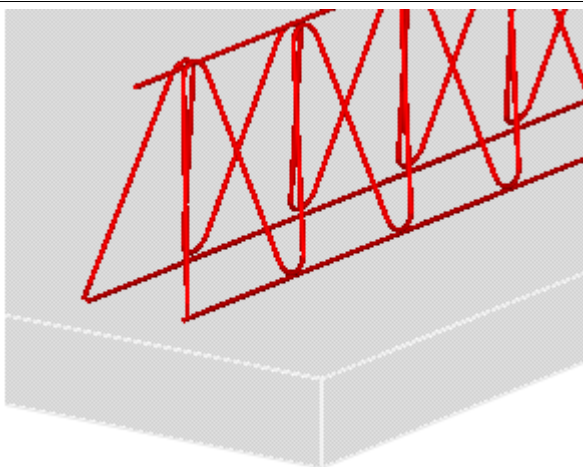
Define the distance between the bottom reinforcing bars, and the distance between the top and bottom reinforcing bars.



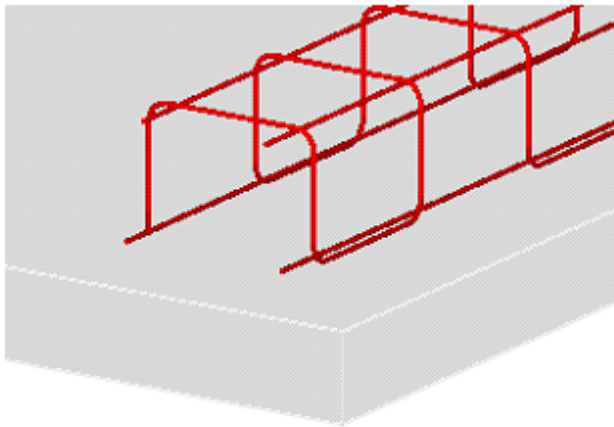
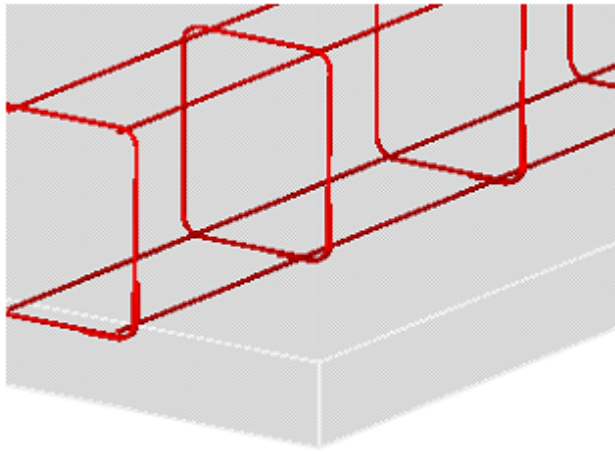
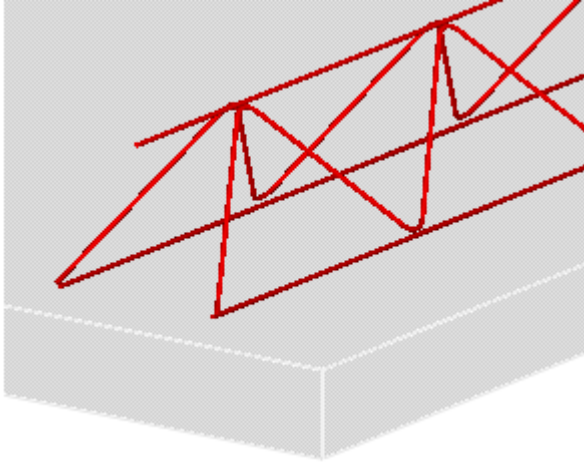
If you add two reinforcing bars at the top, you can define the distance of these reinforcing bars from the top of the connecting reinforcing bars.




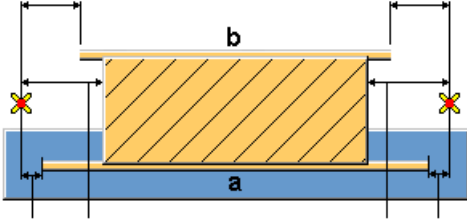
### Examples



## Examples



## Girder creation

Option	Description
<b>Create</b>	Select the type of the bottom, top and connecting reinforcing bars (Bar a, b, c): <ul style="list-style-type: none"> <li>• <b>Reinforcing bar</b></li> <li>• <b>Steel rod</b></li> <li>• <b>No</b> (The reinforcing bar is not created.)</li> </ul>
<b>Profile</b>	Profile selection is activated when you select the following girder option:  <p>Define a prefix and a start number for the part position number, and material, name, comment, and class.</p>
<b>Plate</b>	Plate creation is activated when you select the following girder option:  <p>Define a prefix and a start number for the part position number, and material, name, comment, and class.</p>
<b>Add as</b>	Select the method that is used to connect the girders to the cast unit: <p><b>Sub-assembly, Welded, No</b></p>

## Reinforcing bar properties

Define the reinforcing bar properties for the top, bottom and the connecting reinforcing bars.

Option	Description
<b>Size</b>	Size of the reinforcing bar.
<b>Grade/Material</b>	Grade of the reinforcing bar.

Option	Description
<b>Name</b> <b>Prefix</b> <b>Start number</b> <b>Comment</b> <b>Class</b>	A name, a prefix and a start number for the part position number, and comment and class for the reinforcing bar.

### Create as rebar assembly

You can add the created reinforcement as a rebar assembly to the cast units with a predefined assembly type, name, prefix, and start number.

Option	Description
<b>Create as rebar assembly</b>	Select <b>Yes</b> to create all reinforcement as one rebar assembly, and to include it to the cast unit of the input part.
<b>Add to existing rebar assembly</b>	<ul style="list-style-type: none"> <li>• <b>Do not add:</b> New rebar is added as a rebar assembly to the cast unit.</li> <li>• <b>As single bars:</b> Add all new rebars directly into an existing rebar assembly as rebars.</li> <li>• <b>As sub-assembly:</b> Add all new rebars to their own new rebar assembly, which is then included as a sub-assembly to the main rebar assembly.</li> </ul>
<b>Rebar assembly type</b>	Select the rebar assembly type. If you do not select the type, the default value of the rebar assembly is used.
<b>Name, Profile, Start number</b>	Define the name, profile, and start number. If you do not define these, the default values of the rebar assembly are used.

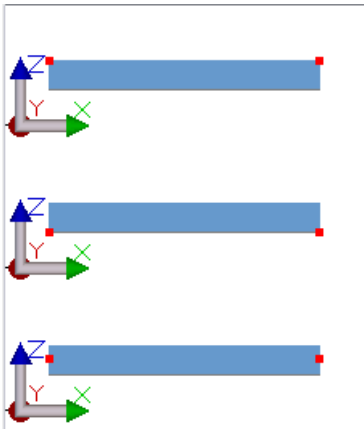
### Parts tab

Use the **Parts** tab to control the positioning and number of girders.

## Workplane orientation

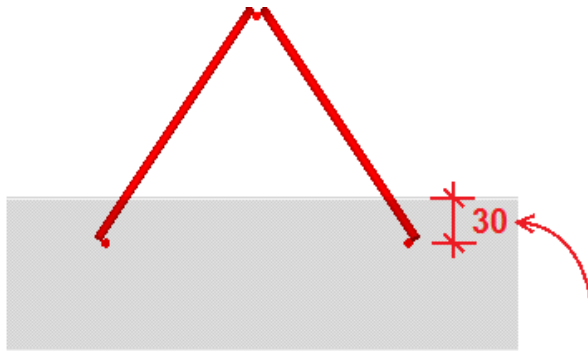
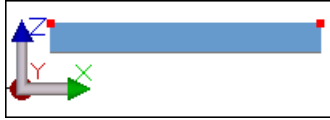
Option	Description
<b>Workplane position</b>	Use this setting to control to which side of the input part the girders are created. <ul style="list-style-type: none"> <li>• <b>Part XY plane</b></li> <li>• <b>Part YZ plane</b></li> <li>• <b>Part ZX plane</b></li> <li>• <b>Model</b> creates the girders according to the current work plane in the model.</li> <li>• <b>Top in form face</b> sets the work plane parallel to the top in form face plane.</li> </ul>
<b>Position in plane</b> <b>Rotation</b> <b>Position in depth</b>	Define the orientation of the girder on the work plane.

## Girder position in z direction

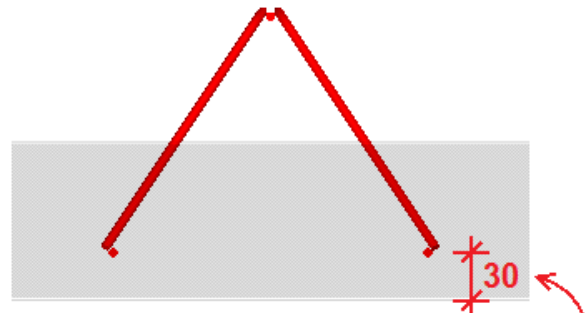
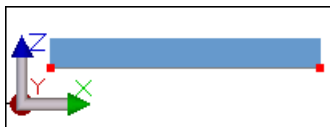
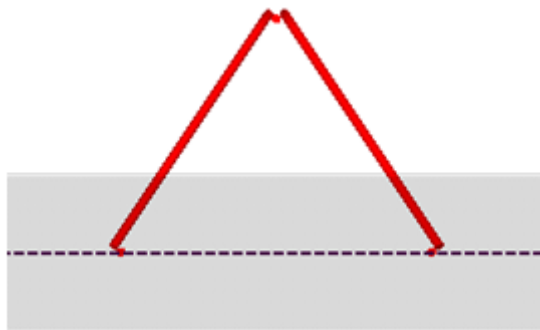
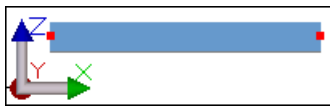


Select how the girders are positioned in the z direction.

## Examples



Position in plane	<input checked="" type="checkbox"/>	Right	<input checked="" type="checkbox"/>	
Rotation	<input checked="" type="checkbox"/>	Front	<input checked="" type="checkbox"/>	
Position in depth	<input checked="" type="checkbox"/>	Front	<input checked="" type="checkbox"/>	-30.000

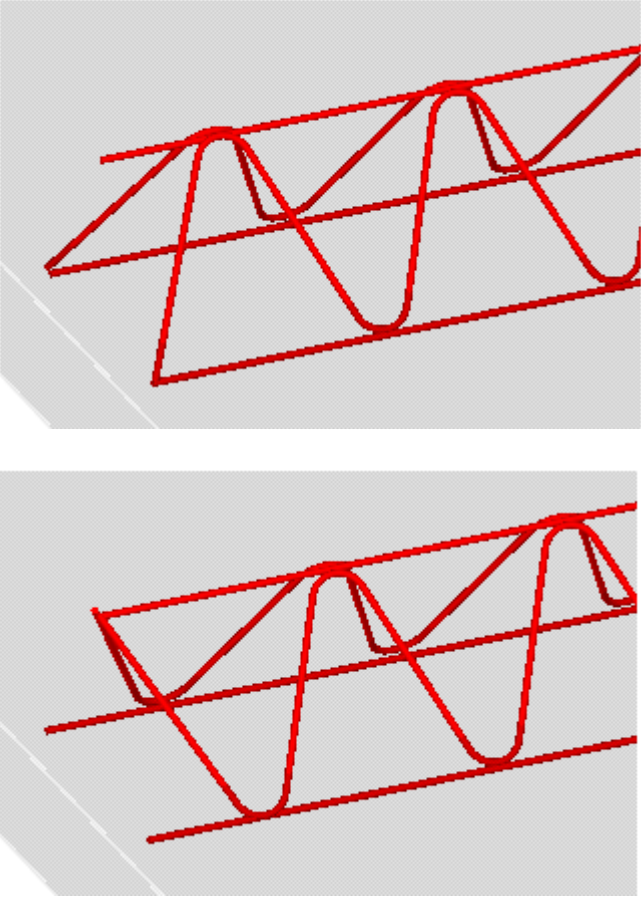


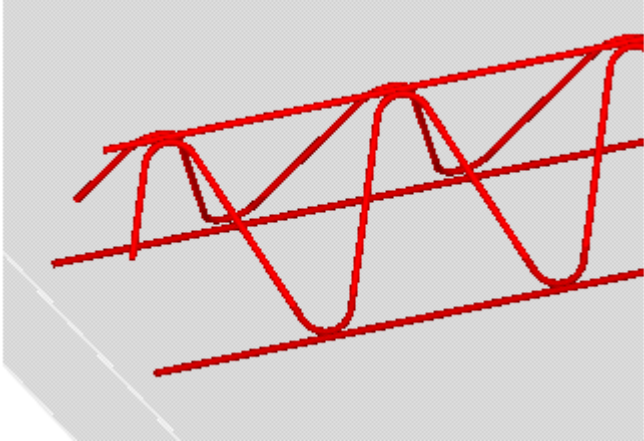
Position in plane	<input checked="" type="checkbox"/>	Right	<input checked="" type="checkbox"/>	
Rotation	<input checked="" type="checkbox"/>	Front	<input checked="" type="checkbox"/>	
Position in depth	<input checked="" type="checkbox"/>	Front	<input checked="" type="checkbox"/>	30.000

## Geometry

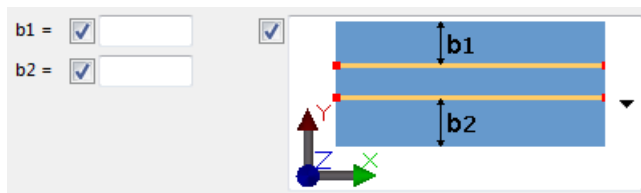
Multiple L factor	<input checked="" type="checkbox"/>	
Geometry type	<input checked="" type="checkbox"/>	



Option	Description
<b>Multiple L factor</b>	<p>Define the accuracy for the rounding of the girder length.</p> <p>The default value is 1.0. With the default value, there are no decimals in the girder length.</p>
<b>Geometry</b>	<p>Select the geometry for the connecting reinforcing bars.</p> <p>Examples:</p> 

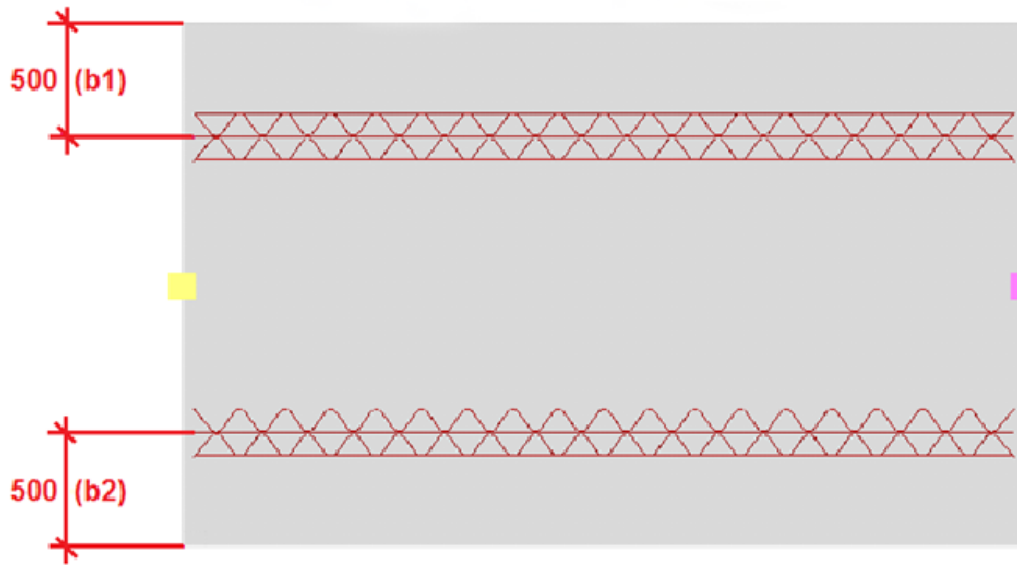
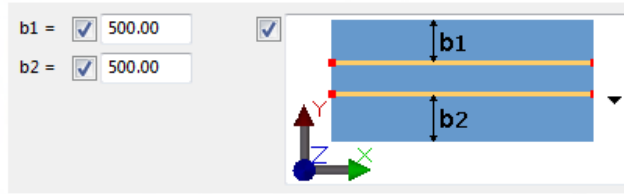
Option	Description
	

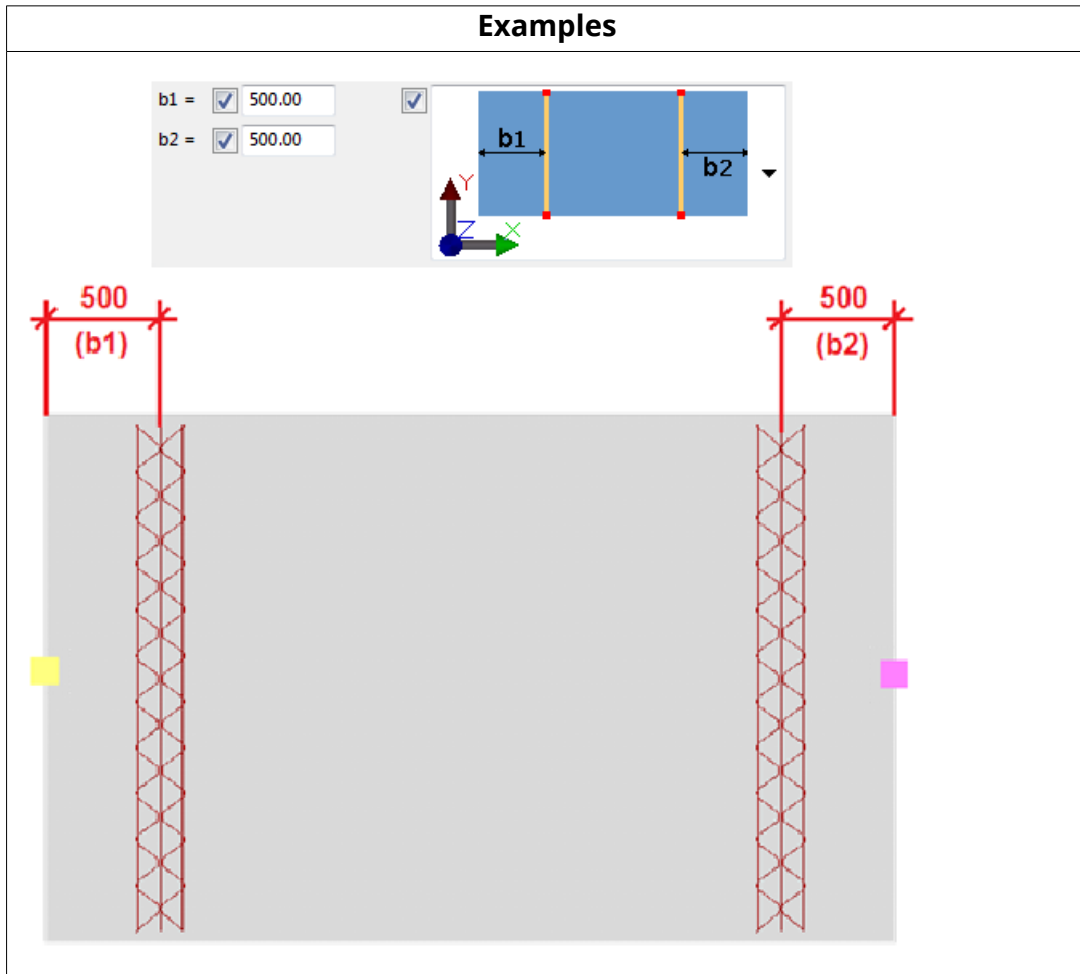
### Girder position in y direction



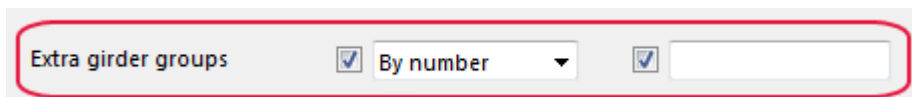
Select how the girders are positioned in the y direction.

## Examples

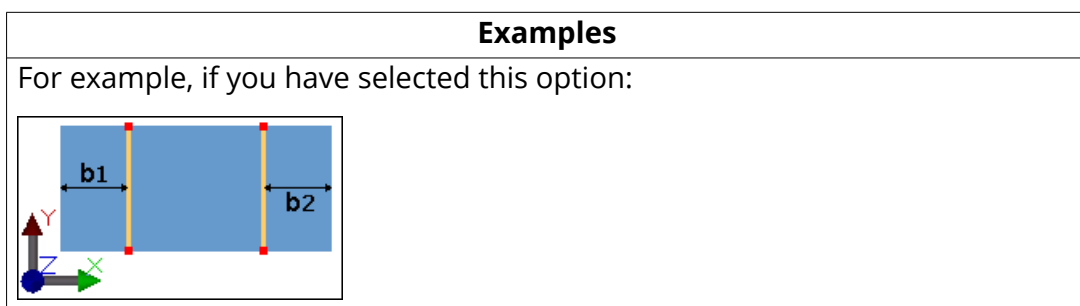




**Extra girders**

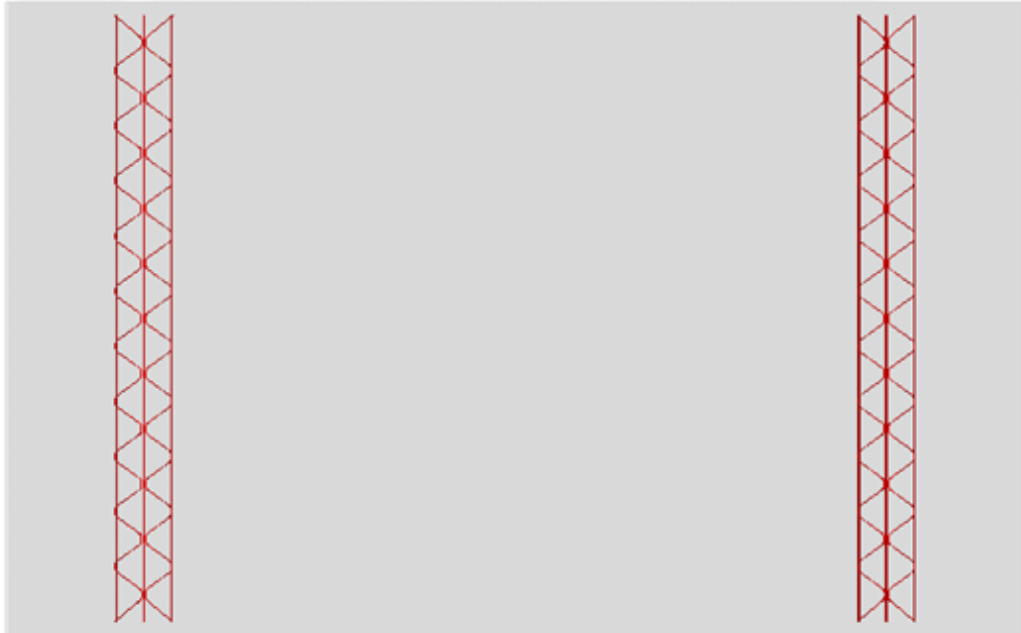


Select whether additional girder groups are created.



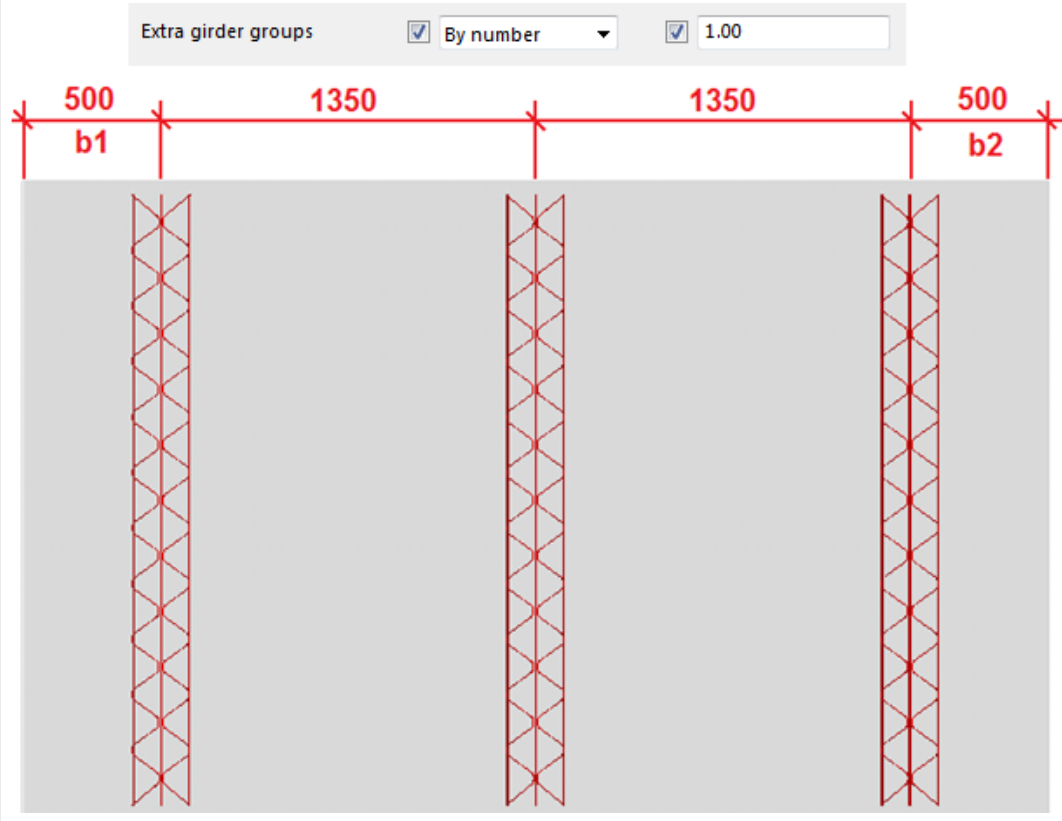
## Examples

**Extra girder groups** is set to **None**: No additional girder groups are created between 2 existing braced girders.



## Examples

**Extra girder groups** is set to **By number**: Additional girder groups are created based on the entered number. Distances between the groups are equally divided.



## Examples

**Extra girder groups** is set to **By distance**: The number of additional girder groups is based on the defined distance. The distances between the girder groups are equally divided.



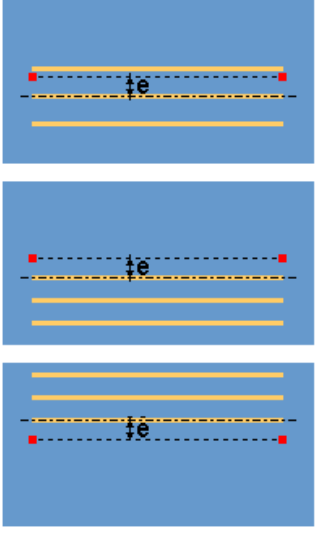
## Girder group

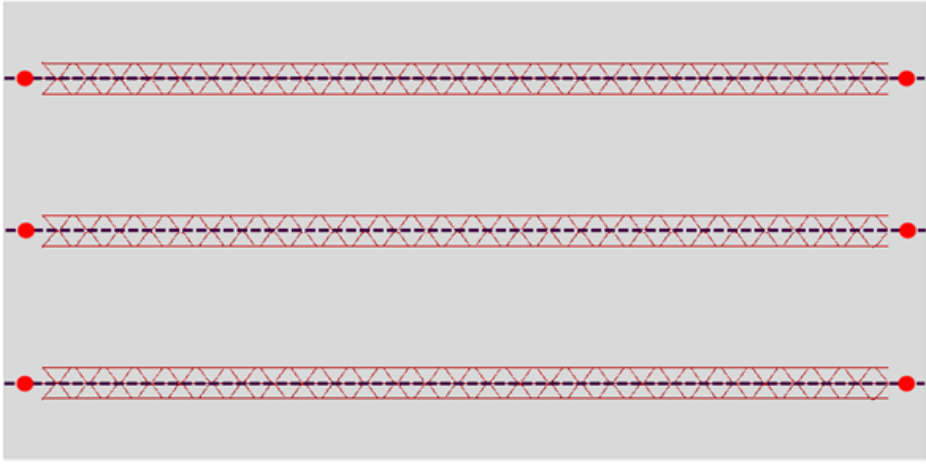
Define whether additional girders are created from the existing girders.

**Number** is the number of girders in the girder group.

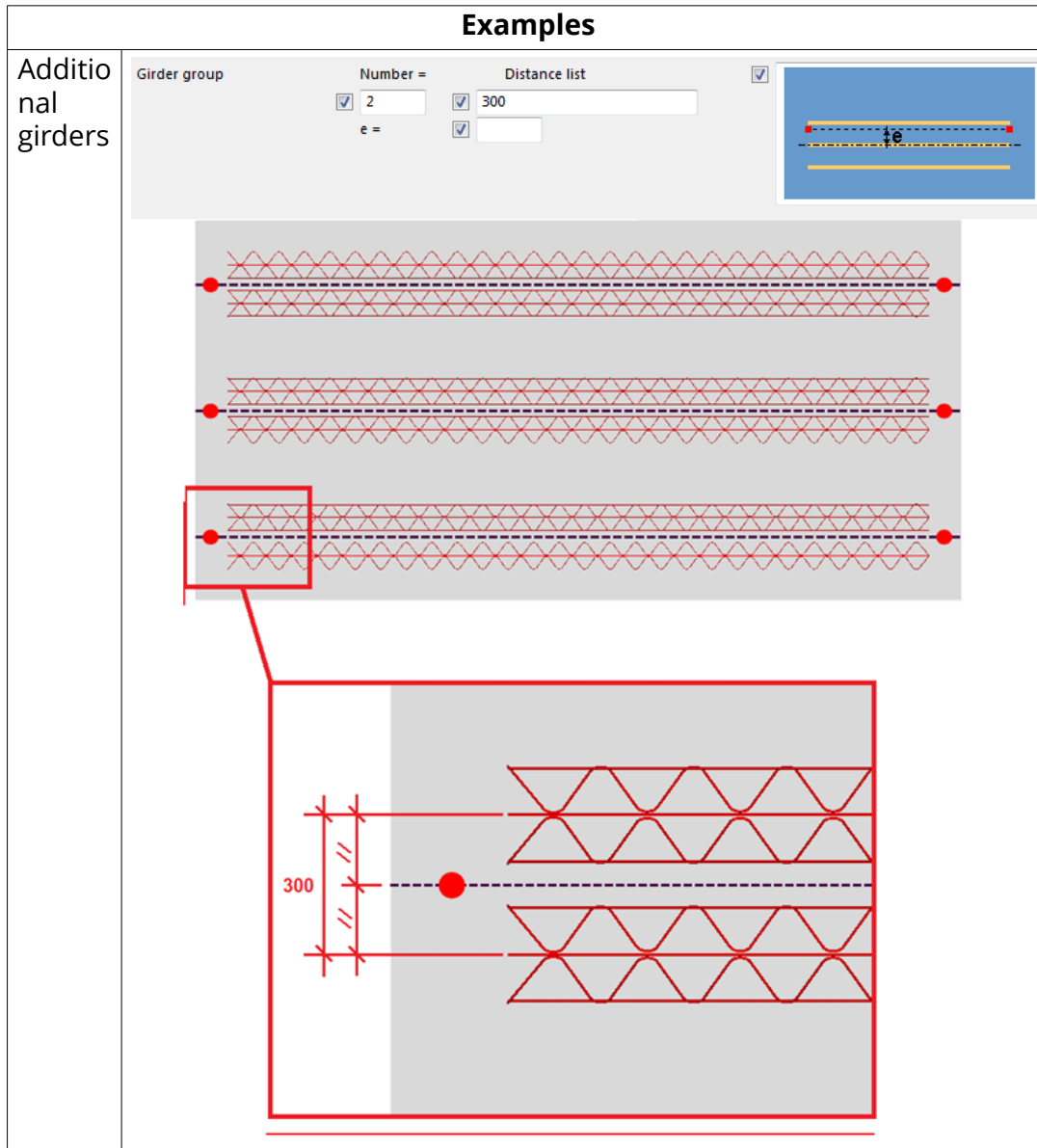
**Distance list** is the distance between the girders in the girder group.

**e =** is the position of the girders from the reference line.

Option	Description
	<ul style="list-style-type: none"> <li>Girder group is positioned in the middle of the reference line.</li> <li>Girder group is positioned on the right side of the reference line.</li> <li>Girder group is positioned on the left side of the reference line.</li> </ul>

Examples	
Existing girders	



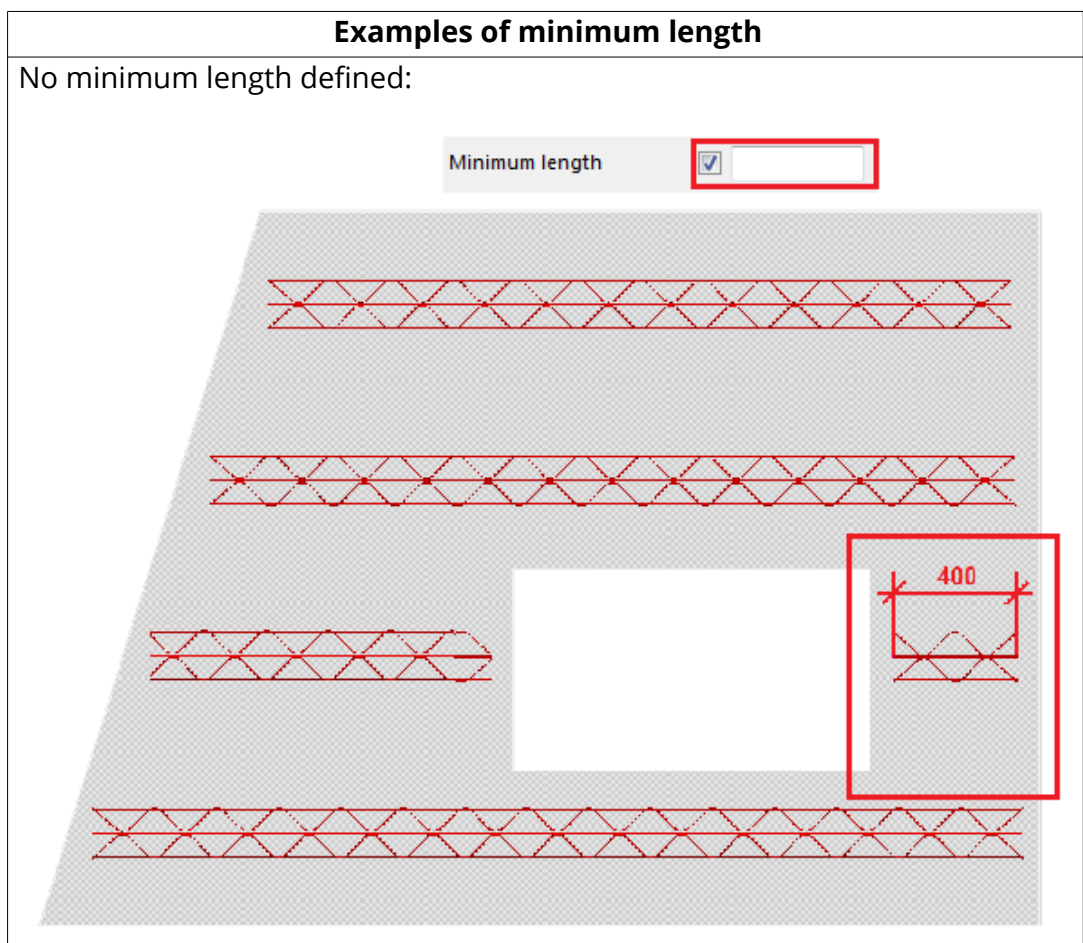


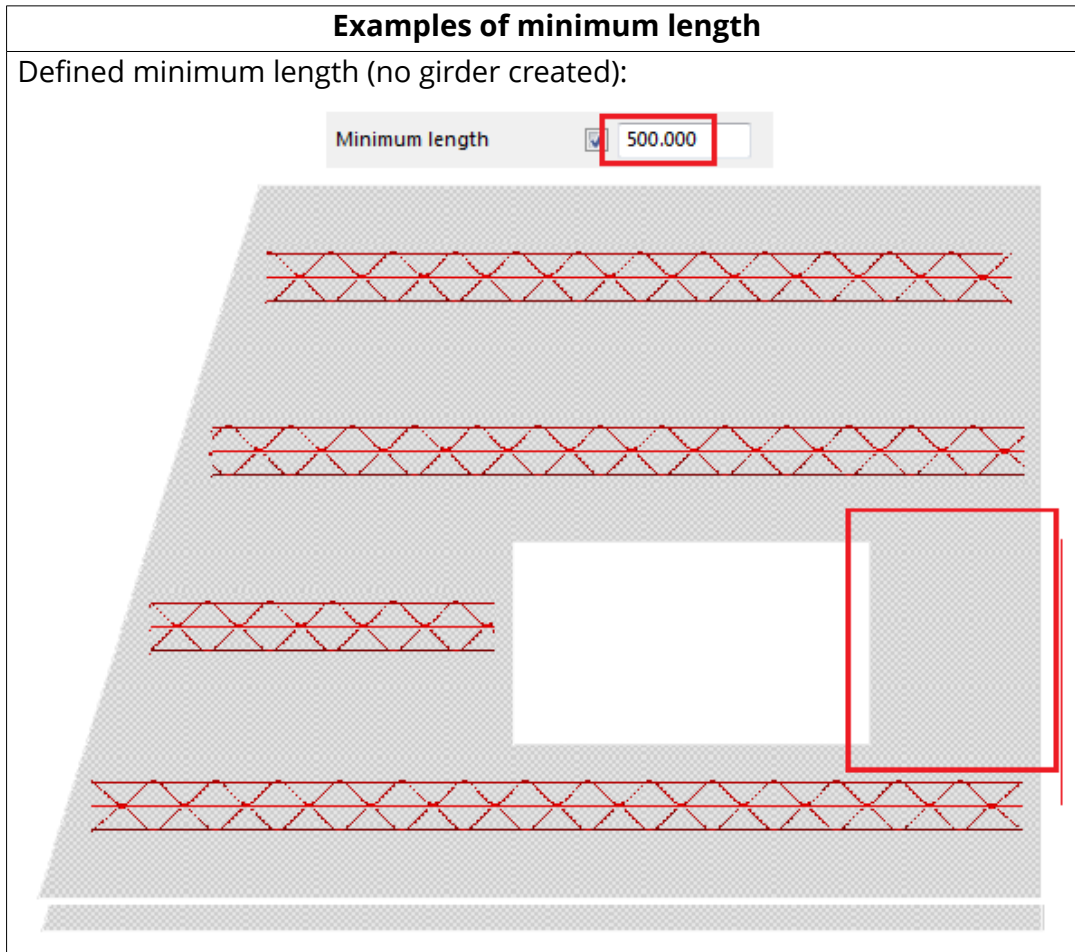
### Geometry tab

Use the **Geometry** tab to control how openings and part length affect the girder creation.

Option	Description
<b>Create always girders</b>	Select whether girders are always created.  If you select <b>Yes</b> , girders are created even when the girder is placed fully outside the concrete part.
<b>Openings</b>	Select whether girders are created in openings.

Option	Description
<b>Length</b>	Select how girders adapt to the part shape.
<b>Minimum length</b>	Define the minimum length of the girder.
<b>Maximum length</b>	Define the maximum length of the girder. The girder is split when the maximum length is reached.





### Double wall tab

Use the **Double wall** tab to select how a second concrete element affects the girders in **Braced girder (88)**.

### Look up sec concrete element

Select whether a second concrete element affects the creation of the girders. Define the class of the second wall in the **Class** box.

Select the first wall, and if the second wall matches the defined class, a girder is created. You can also enter a series of classes. You can use this creation method in combination with the options defined for openings on the **Geometry** tab.

The example below shows a hollow wall where inside and outside shells have different geometry.

<b>Examples</b>
<p>A hollow core wall where inside and outside shells have different geometry.</p> <p><b>Look up second concrete element = No</b></p>

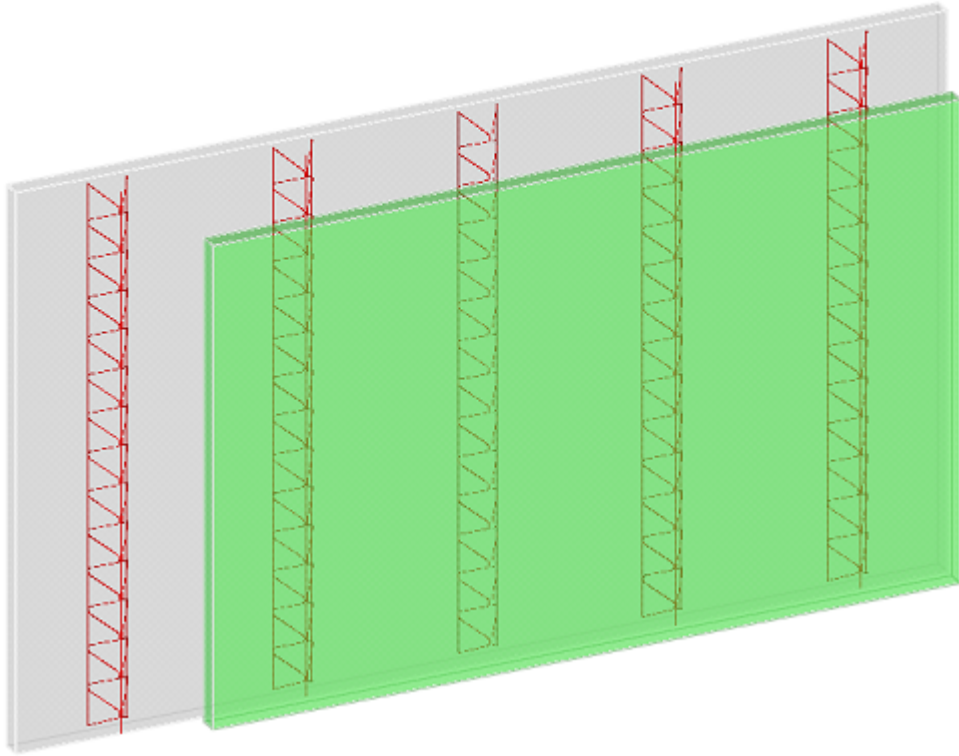
## Examples

Look up sec concrete element



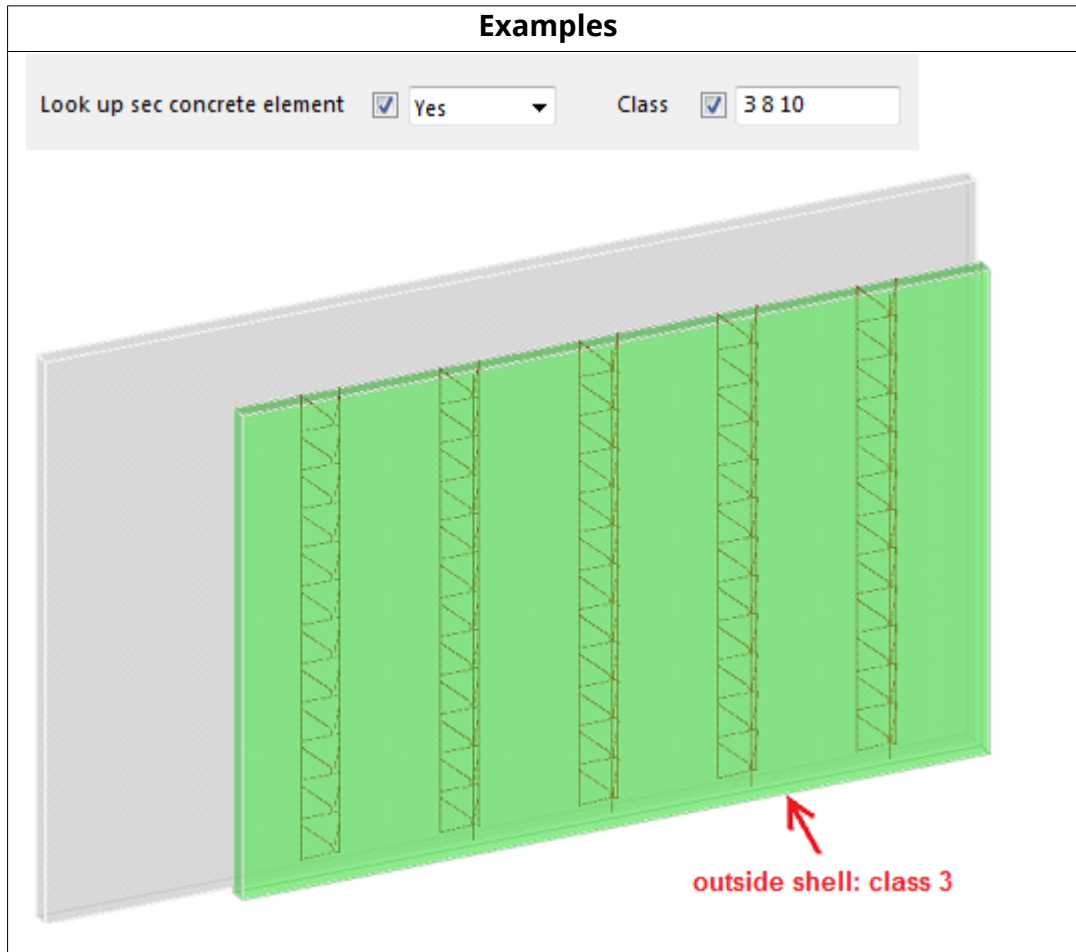
No

Class



A hollow core wall where inside and outside shells have different geometry.

**Look up second concrete element = Yes**



### UDA tab

You can define UDAs.

Type	<input checked="" type="checkbox"/>	<input type="text"/>
Article number	<input checked="" type="checkbox"/>	<input type="text"/>
Fabricator name	<input checked="" type="checkbox"/>	<input type="text"/>
Weight per unit length	<input checked="" type="checkbox"/>	<input type="text"/>

### ***Braced girder (89)***

**Braced girder (89)** creates braced girders between selected points in a precast concrete part, such as in a thin-shell slab or in a sandwich wall panel. The girders are cast into the concrete part and they also work as a part of the reinforcement and as a connector between the precast and cast-in-place concrete.

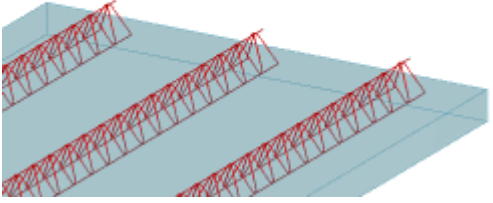
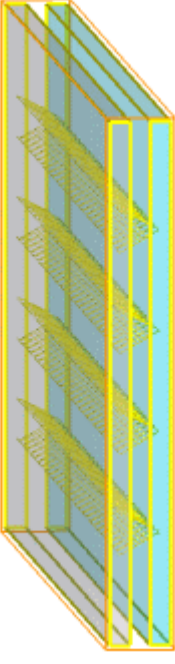

### **Objects created**

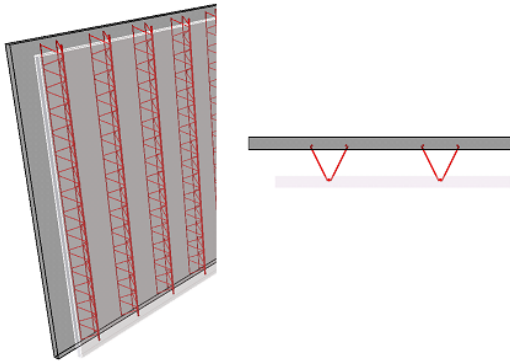
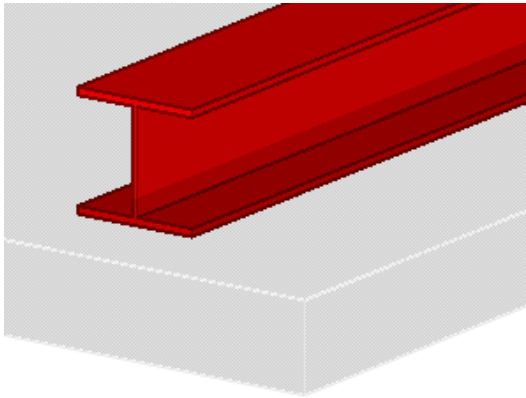
The girders consist of the following parts:

- Two bottom reinforcing bars
- One or two top reinforcing bars
- Two connecting reinforcing bars

Instead of using reinforcing bars, you can use profiles and plates to create the braced girders.

**Use for**

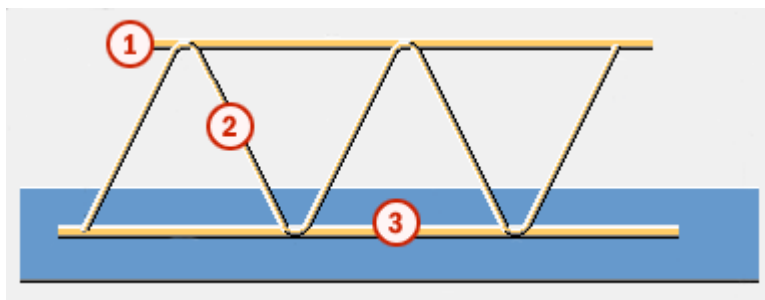
Situation	Description
	<p>Braced girders are created in the precast concrete slab.</p>
	<p>Braced girders are created in the precast concrete sandwich panel.</p>
	<p>Braced girders are created in a wide plate floor with an opening.</p>

Situation	Description
	<p>Braced girders are created in a hollow wall.</p>
	<p>Profile as a girder.</p>

### Selection order

1. Select the concrete part.
2. Pick the starting point of a girder.
3. Pick the end point of a girder.

### Part identification key

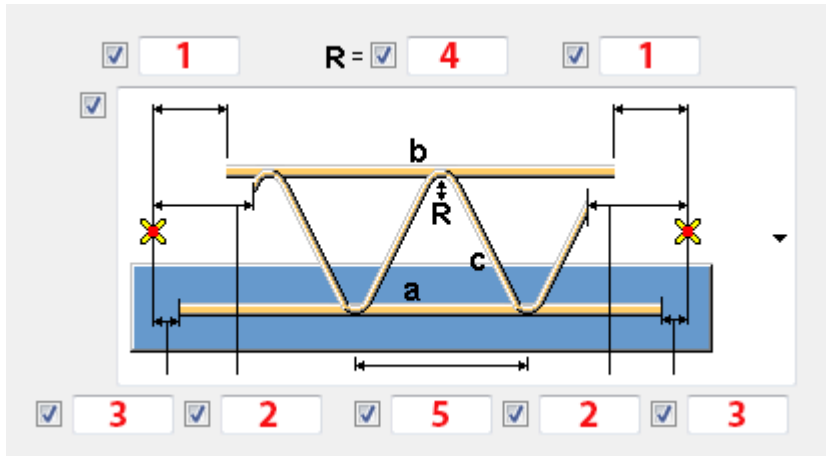


	Part
1	Top reinforcing bar
2	Connecting reinforcing bar
3	Bottom reinforcing bar

### Picture tab

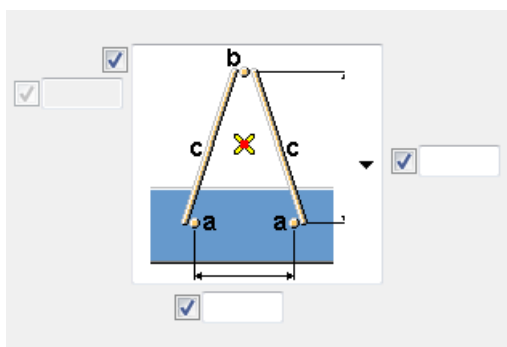
Use the **Picture** tab to control the creation, shape and dimensions of reinforcement bars.

### Reinforcing bar dimensions and shape



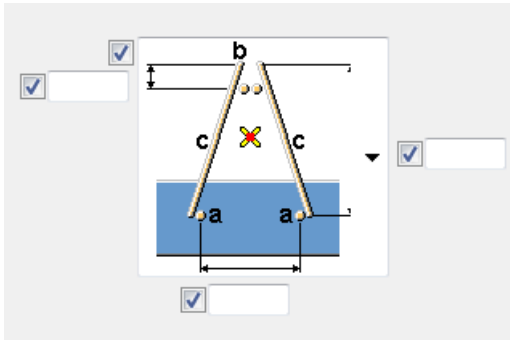
	Description
1	Distance between the end of the top reinforcing bar and the picked point.
2	Distance between the end of the connecting reinforcing bar and the picked point.
3	Distance between the end of the bottom reinforcing bar and the picked point.
4	Radius of the connecting reinforcing bar.
5	Distance between bendings.

Define the distance between the bottom reinforcing bars, and the distance between the top and bottom reinforcing bars.

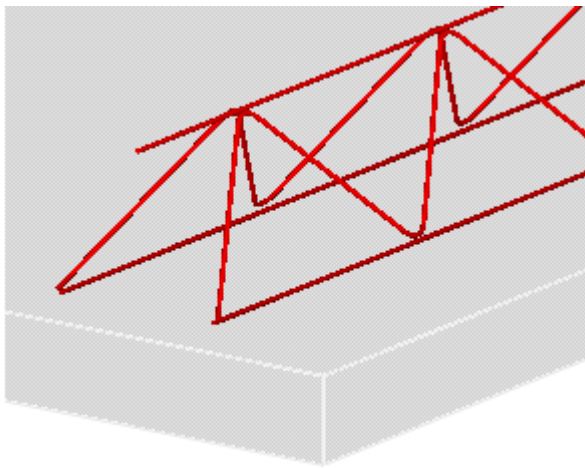
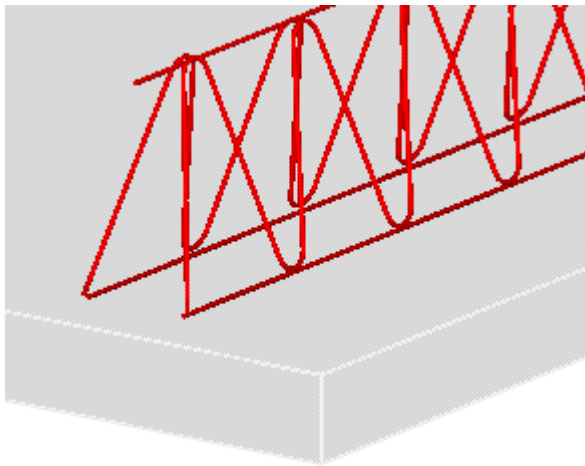


If you add two reinforcing bars at the top, you can define the distance of these reinforcing bars from the top of the connecting reinforcing bars.

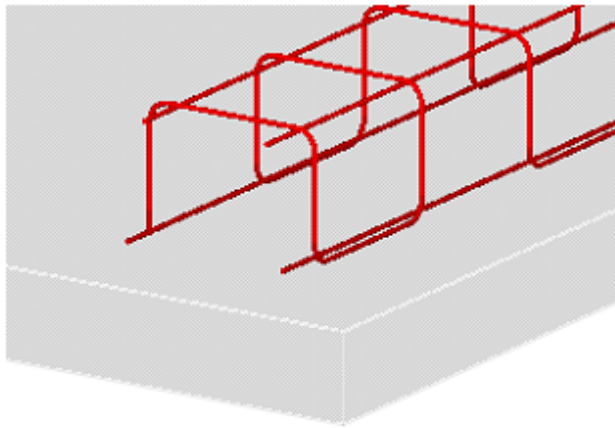
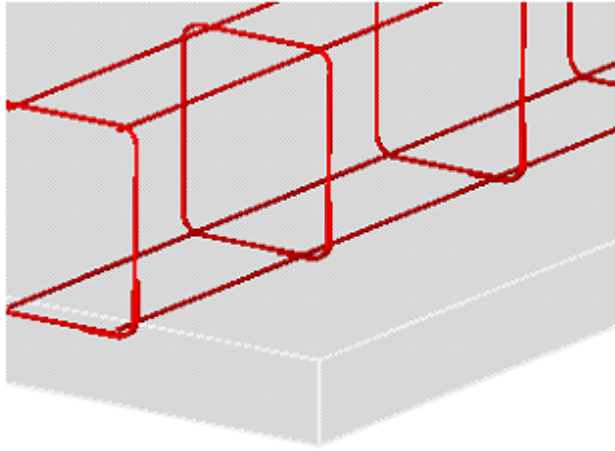




### Examples


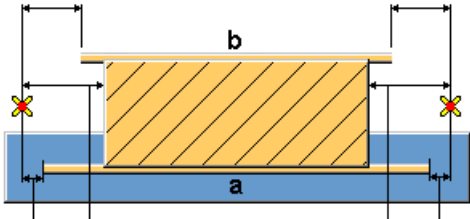


## Examples



### Girder creation

Option	Description
<b>Create</b>	Select the type of the bottom, top and connecting reinforcing bars (Bar a, b, c): <ul style="list-style-type: none"><li>• <b>Reinforcing bar</b></li><li>• <b>Steel rod</b></li><li>• <b>No</b> (The reinforcing bar is not created.)</li></ul>

Option	Description
<b>Profile</b>	<p>Profile selection is activated when you select the following girder option:</p>  <p>Define a prefix and a start number for the part position number, and material, name, comment, and class.</p>
<b>Plate</b>	<p>Plate creation is activated when you select the following girder option:</p>  <p>Define a prefix and a start number for the part position number, and material, name, comment, and class.</p>
<b>Add as</b>	<p>Select the method that is used to connect the girders to the cast unit:</p> <p><b>Sub-assembly, Welded, No</b></p>

### Reinforcing bar properties

Define the reinforcing bar properties for the top, bottom and the connecting reinforcing bars.

Option	Description
<b>Size</b>	Size of the reinforcing bar.
<b>Grade/Material</b>	Grade of the reinforcing bar.
<b>Name</b> <b>Prefix</b> <b>Start number</b> <b>Comment</b> <b>Class</b>	A name, a prefix and a start number for the part position number, and comment and class for the reinforcing bar.

## Create as rebar assembly

You can add the created reinforcement as a rebar assembly to the cast units with a predefined assembly type, name, prefix, and start number.

Option	Description
<b>Create as rebar assembly</b>	Select <b>Yes</b> to create all reinforcement as one rebar assembly, and to include it to the cast unit of the input part.
<b>Add to existing rebar assembly</b>	<ul style="list-style-type: none"><li>• <b>Do not add:</b> New rebar is added as a rebar assembly to the cast unit.</li><li>• <b>As single bars:</b> Add all new rebars directly into an existing rebar assembly as rebars.</li><li>• <b>As sub-assembly:</b> Add all new rebars to their own new rebar assembly, which is then included as a sub-assembly to the main rebar assembly.</li></ul>
<b>Rebar assembly type</b>	Select the rebar assembly type. If you do not select the type, the default value of the rebar assembly is used.
<b>Name, Profile, Start number</b>	Define the name, profile, and start number. If you do not define these, the default values of the rebar assembly are used.

## Parts tab

Use the **Parts** tab to control the positioning and number of girders.

## Workplane orientation

Workplane position  Part XY plane

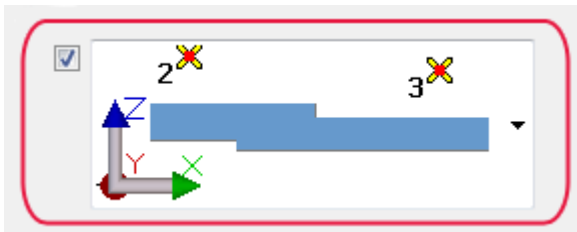
Position in plane  Middle

Rotation  Front

Position in depth  Middle

Option	Description
<b>Workplane position</b>	Use this setting to control to which side of the input part the girders are created. <ul style="list-style-type: none"> <li>• <b>Part XY plane</b></li> <li>• <b>Part YZ plane</b></li> <li>• <b>Part ZX plane</b></li> <li>• <b>Model</b> creates the girders according to the current work plane in the model.</li> <li>• <b>Top in form face</b> sets the work plane parallel to the top in form face plane.</li> </ul>
<b>Position in plane</b> <b>Rotation</b> <b>Position in depth</b>	Define the orientation of the girder on the work plane.

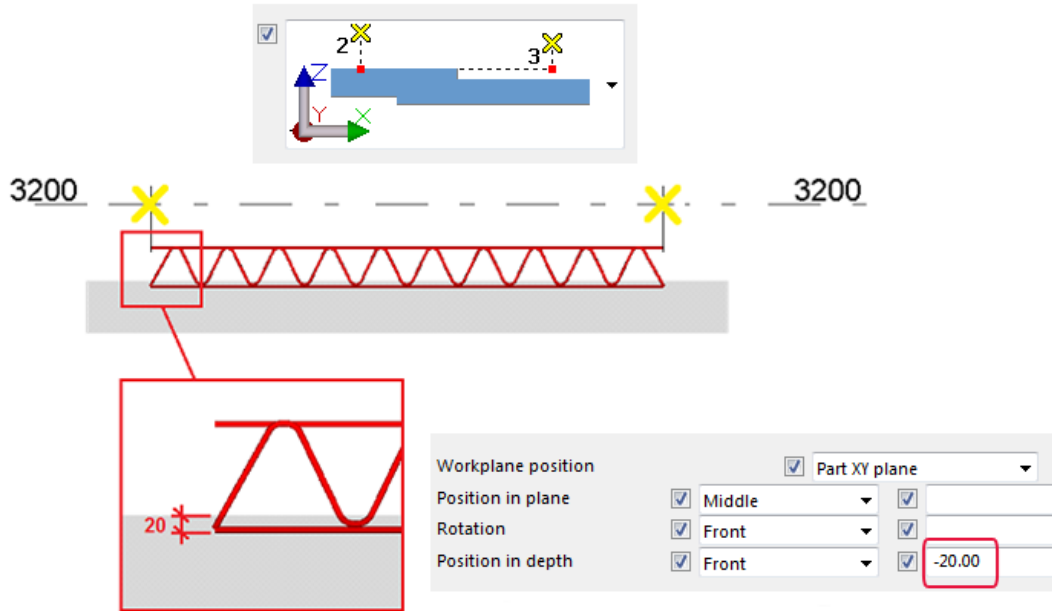
### Girder position in z direction



Select how the girders are positioned in the z direction.

### Example

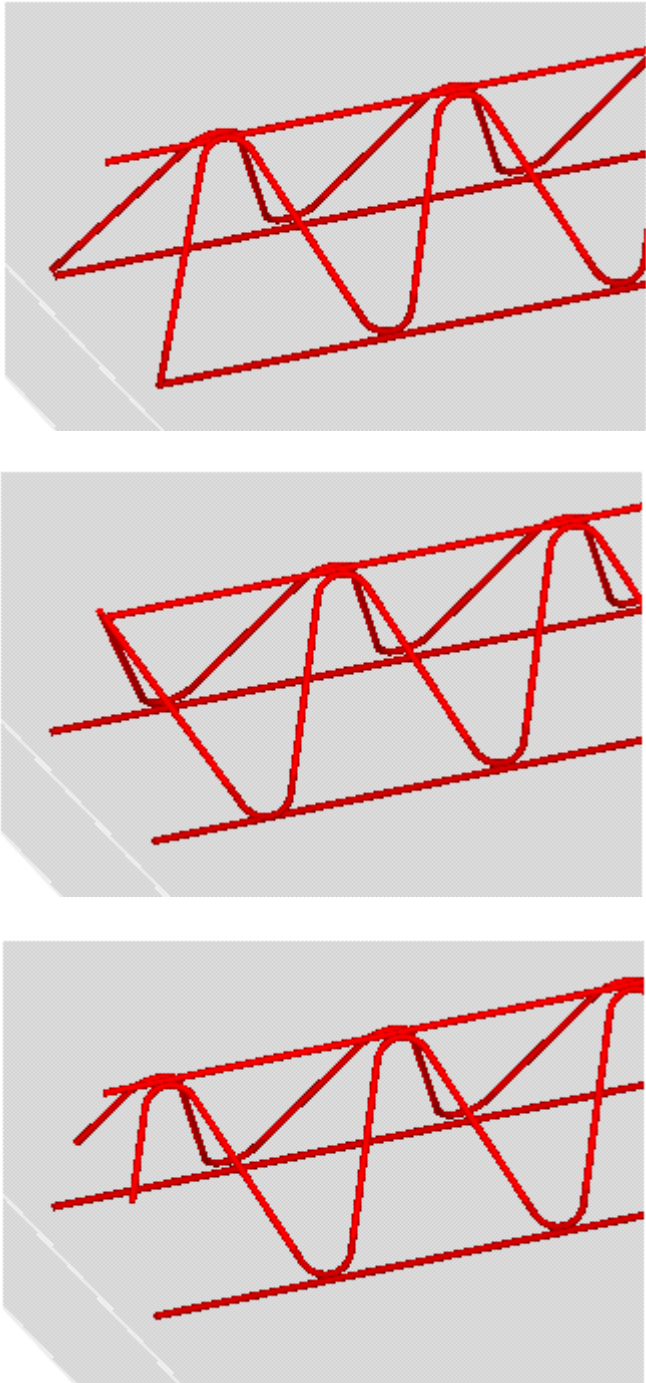
Braced girders are positioned to picked points. The braced girders are related to the top side of the part.



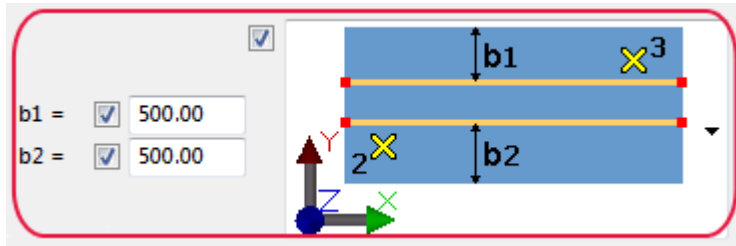
### Geometry



Option	Description
<b>Multiple L factor</b>	Define the accuracy for the rounding of the girder length. The default value is 1.0. With the default value, there are no decimals in the girder length.
<b>Geometry</b>	Select the geometry for the connecting reinforcing bars. Examples:

Option	Description
	

## Girder position in y direction



Select how the girders are positioned in the y direction.

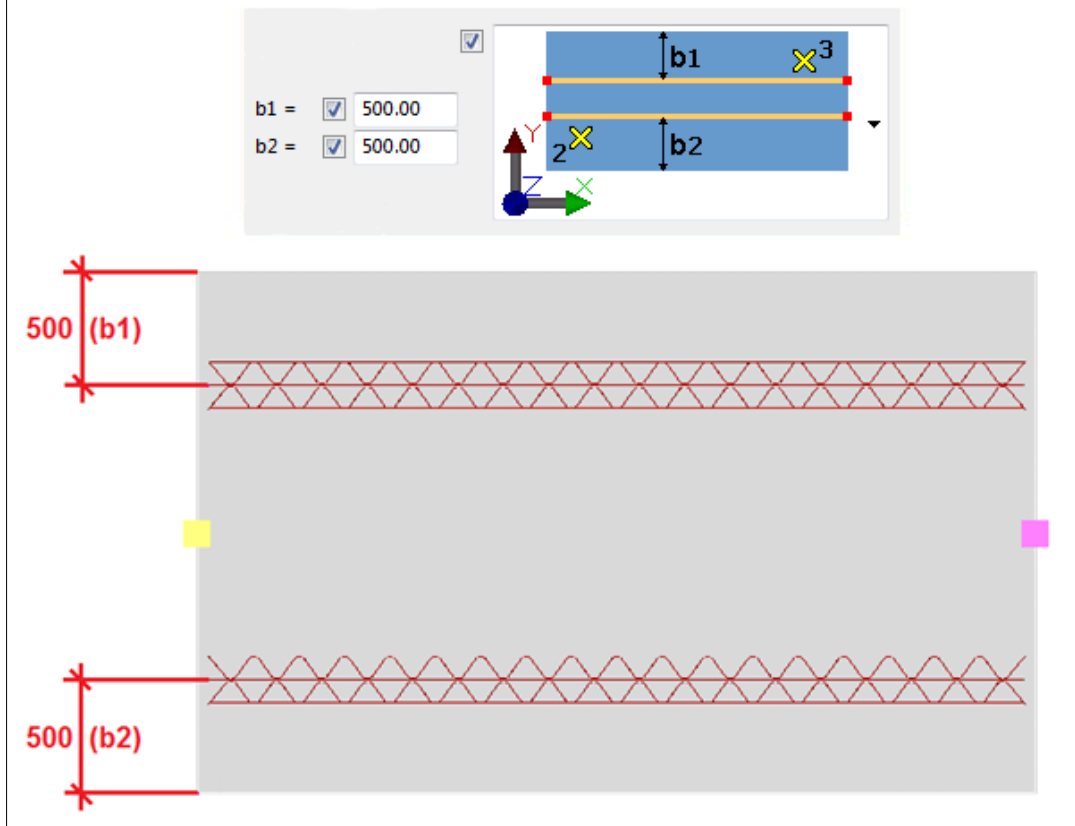
### Examples

Workplane position  Part XY plane

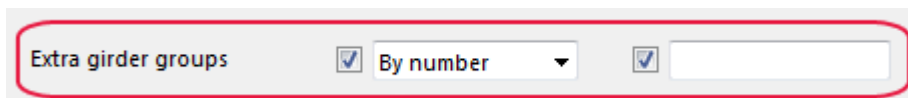
Position in plane	<input checked="" type="checkbox"/> Middle	<input checked="" type="checkbox"/> 300.000
Rotation	<input checked="" type="checkbox"/> Front	<input checked="" type="checkbox"/>
Position in depth	<input checked="" type="checkbox"/> Front	<input checked="" type="checkbox"/> -20.000



## Examples



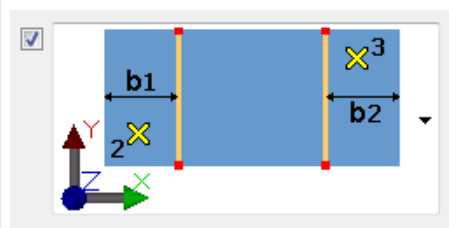
## Extra girders



Select whether additional girder groups are created.

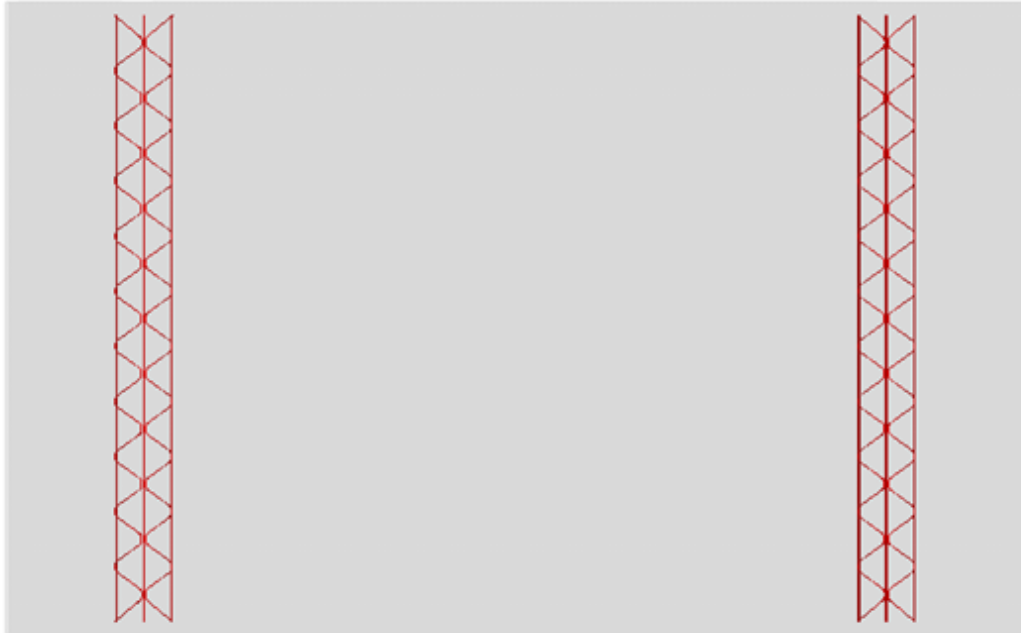
## Examples

For example, if you have selected this option:



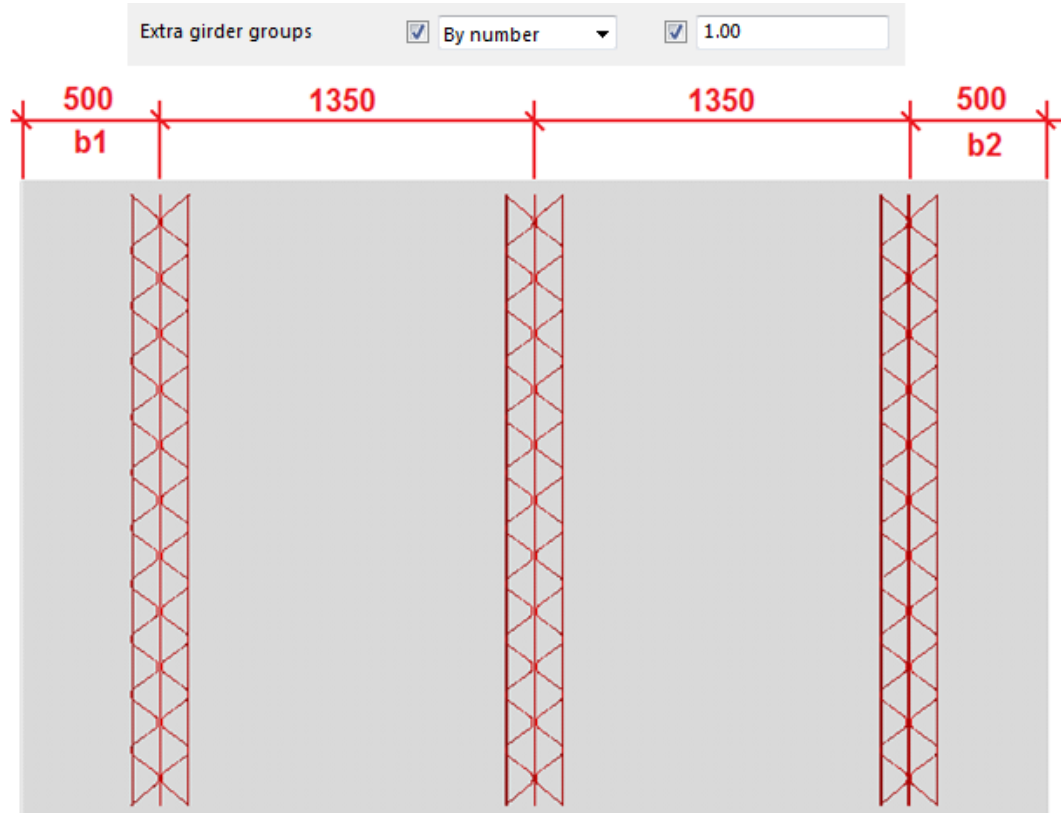
## Examples

**Extra girder groups** is set to **None**: No additional girder groups are created between 2 existing braced girders.



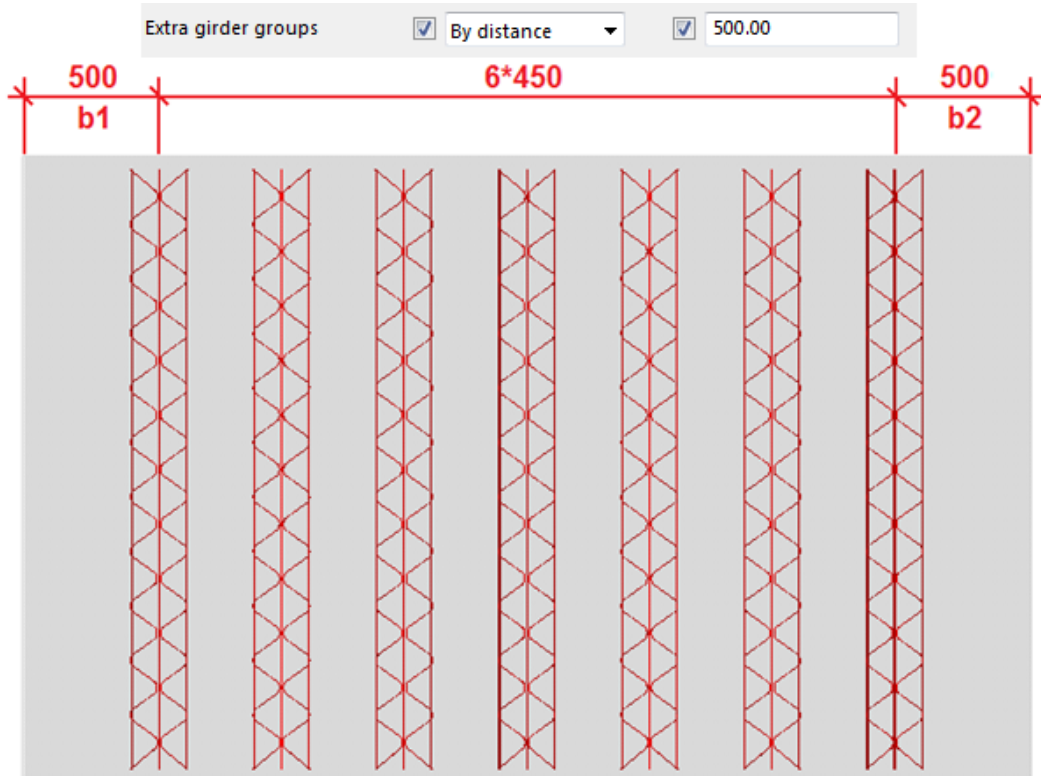
## Examples

**Extra girder groups** is set to **By number**: Additional girder groups are created based on the entered number. Distances between the groups are equally divided.



## Examples

**Extra girder groups** is set to **By distance**: The number of additional girder groups is based on the defined distance. The distances between the girder groups are equally divided.



## Girder group

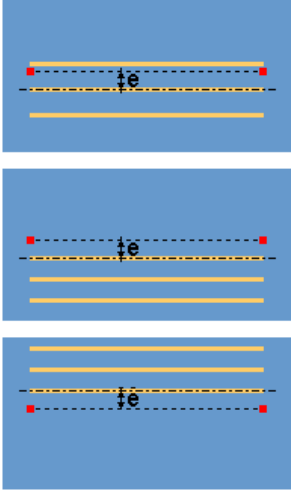
Girder group  Number =   Distance list     
 e =

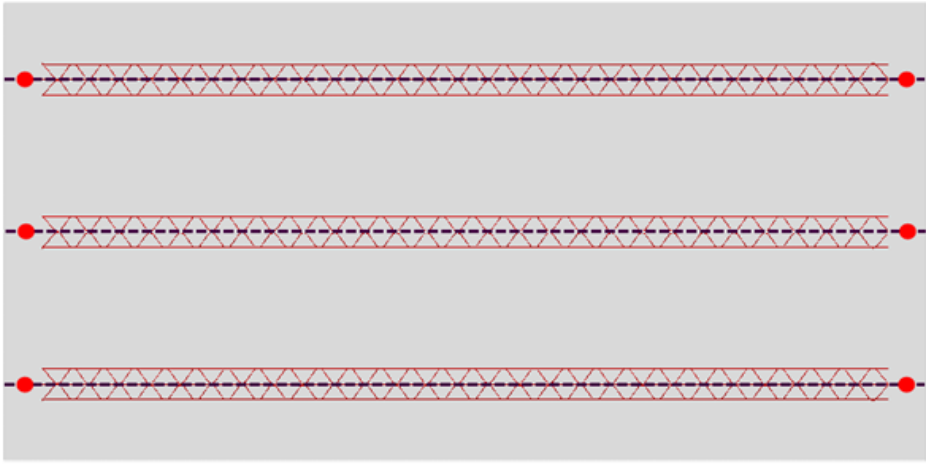
Define whether additional girders are created from the existing girders.

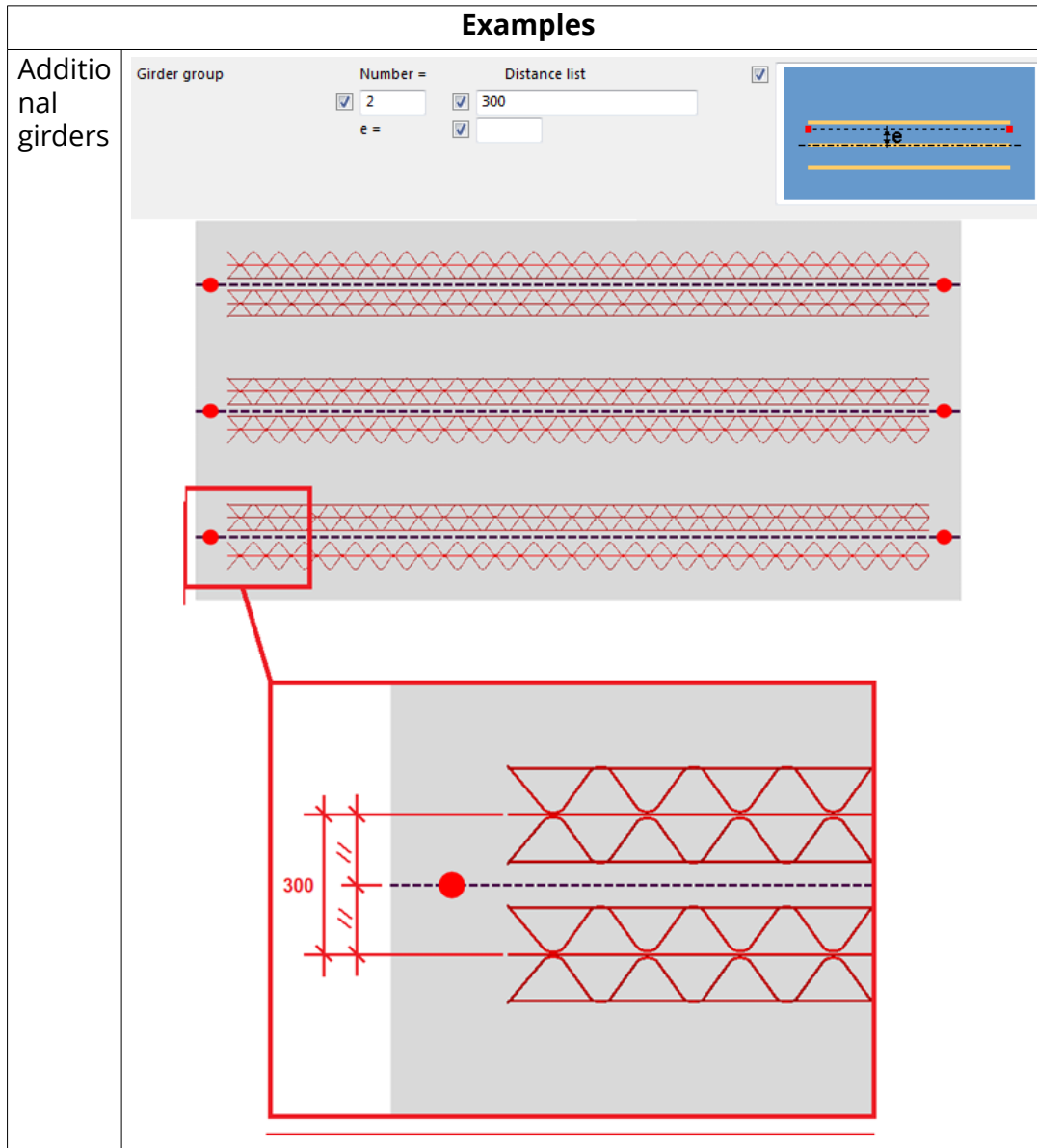
**Number** is the number of girders in the girder group.

**Distance list** is the distance between the girders in the girder group.

**e =** is the position of the girders from the reference line.

Option	Description
	<ul style="list-style-type: none"> <li>• Girder group is positioned in the middle of the reference line.</li> <li>• Girder group is positioned on the right side of the reference line.</li> <li>• Girder group is positioned on the left side of the reference line.</li> </ul>

Examples	
Existing girders	

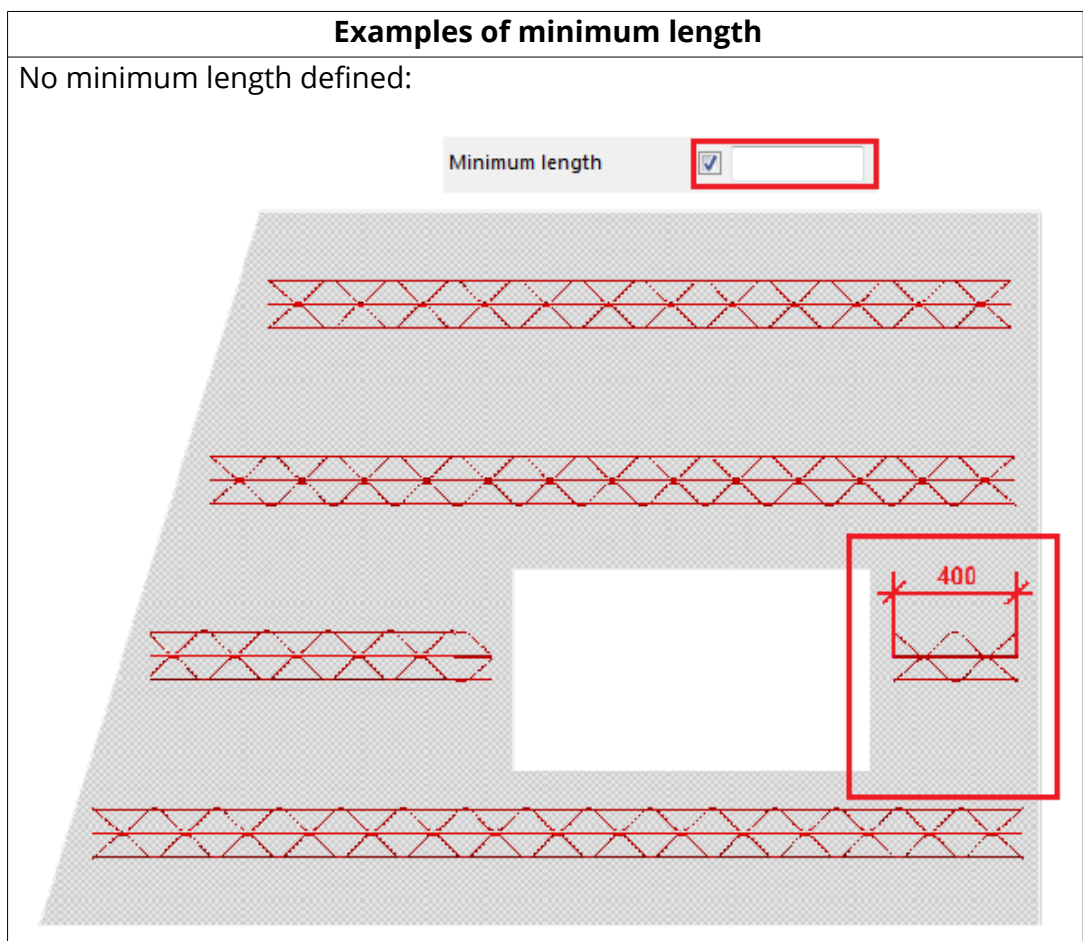


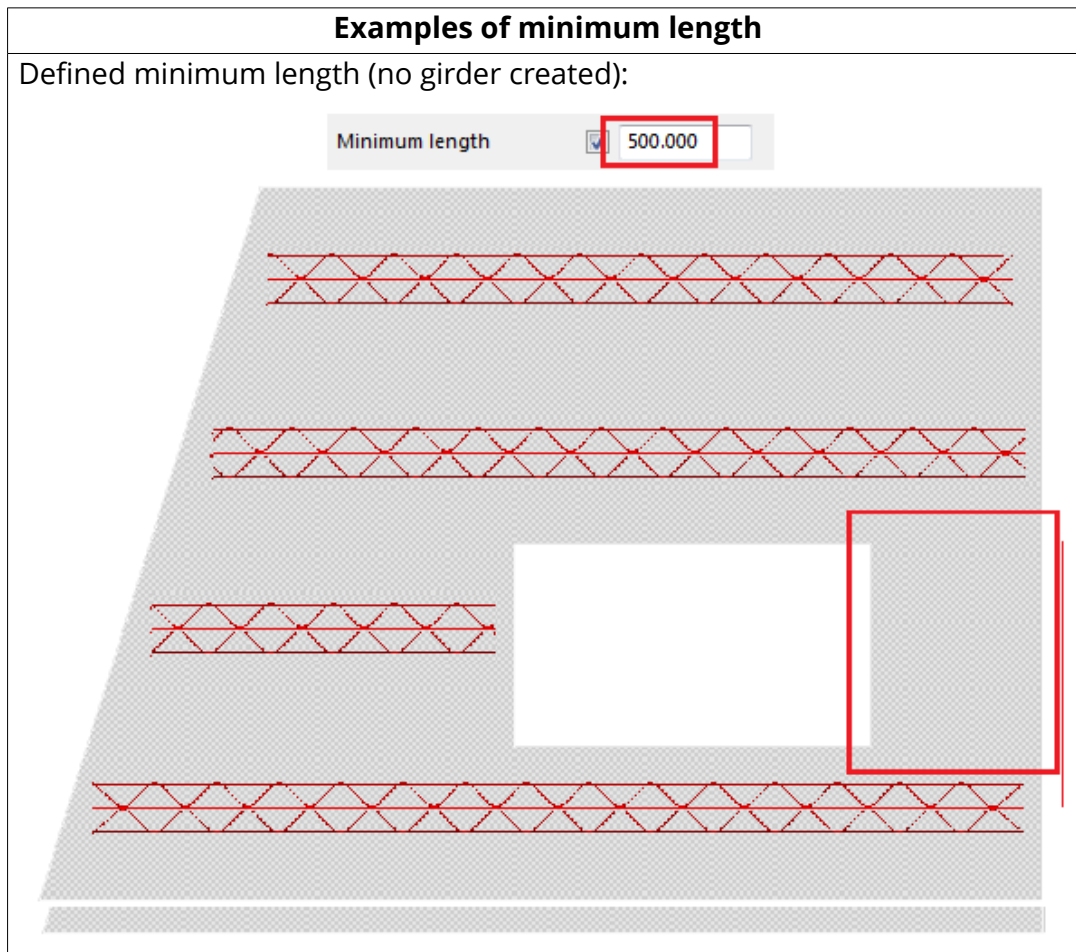
**Geometry tab**

Use the **Geometry** tab to control how openings and part length affect the girder creation.

Option	Description
<b>Create always girders</b>	Select whether girders are always created.  If you select <b>Yes</b> , girders are created even when the girder is placed fully outside the concrete part.
<b>Openings</b>	Select whether girders are created in openings.

Option	Description
<b>Length</b>	Select how girders adapt to the part shape.
<b>Minimum length</b>	Define the minimum length of the girder.
<b>Maximum length</b>	Define the maximum length of the girder. The girder is split when the maximum length is reached.





### Double wall

Use the **Double wall** tab to select how a second concrete element affects the girders.

### Look up sec concrete element

Select whether a second concrete element affects the creation of the girders. Define the class of the second wall in the **Class** box.

Select the first wall, and if the second wall matches the defined class, a girder is created. You can also enter a series of classes. You can use this creation method in combination with the options defined for openings on the **Geometry** tab.

The example below shows a hollow wall where inside and outside shells have different geometry.

Examples
<p>A hollow core wall where inside and outside shells have different geometry.</p> <p><b>Look up second concrete element = No</b></p>



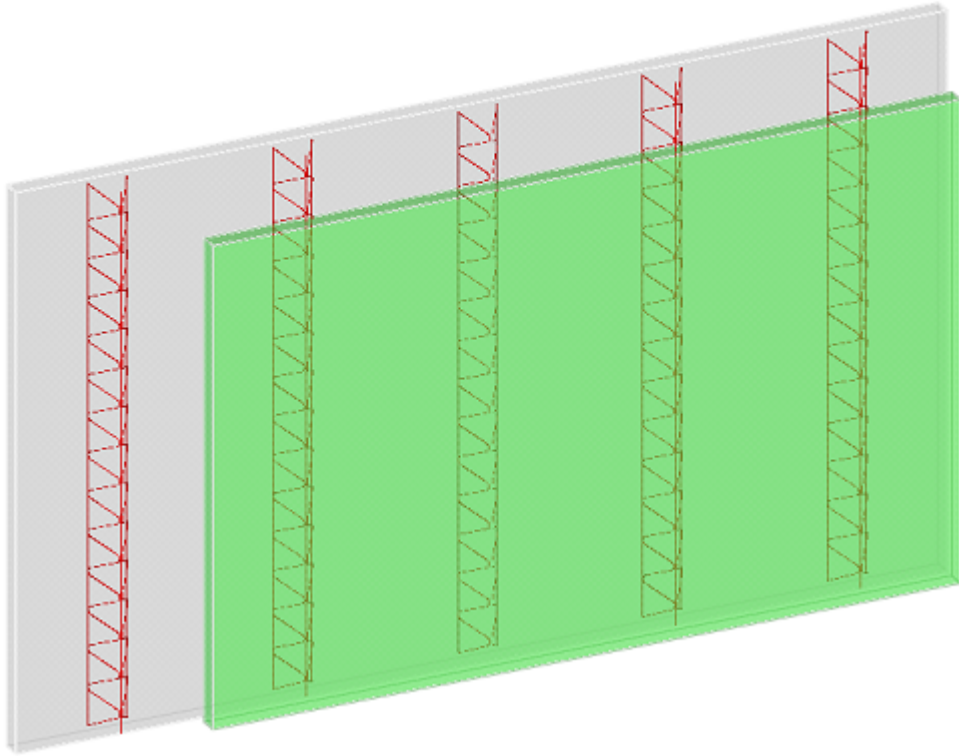
## Examples

Look up sec concrete element



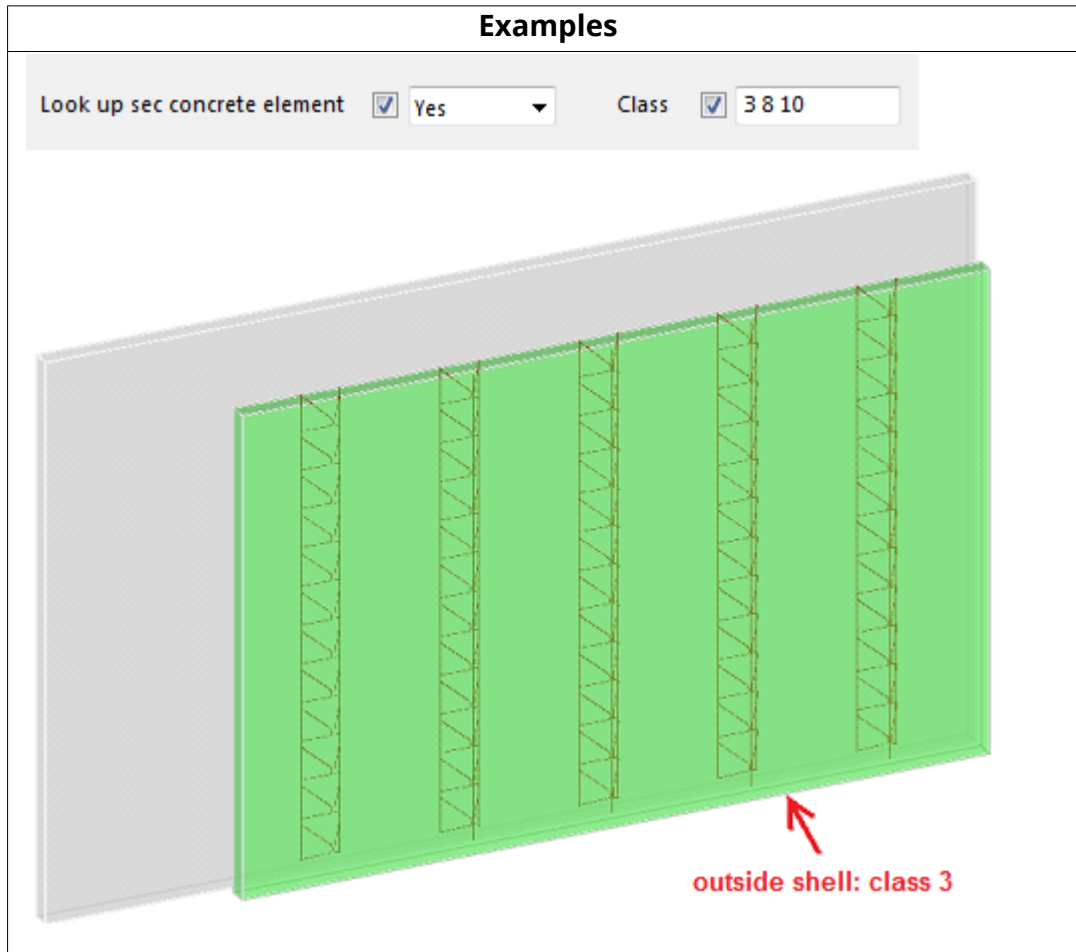
No

Class



A hollow core wall where inside and outside shells have different geometry.

**Look up second concrete element = Yes**



### UDA tab

You can define UDAs.

Type	<input checked="" type="checkbox"/>	<input type="text"/>
Article number	<input checked="" type="checkbox"/>	<input type="text"/>
Fabricator name	<input checked="" type="checkbox"/>	<input type="text"/>
Weight per unit length	<input checked="" type="checkbox"/>	<input type="text"/>

### ***Reinforcement mesh array in area (89) / Reinforcement mesh array (91)***

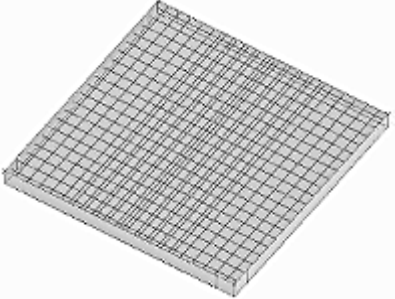
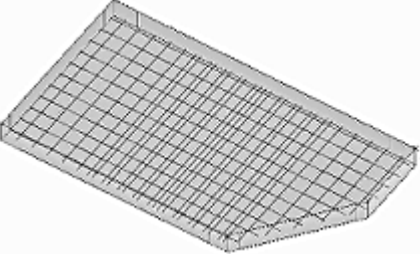
#### **Reinforcement mesh array in area (89) / Reinforcement mesh array (91)**

create reinforcement meshes for an entire concrete part, or for a defined polygonal area. **Reinforcement mesh array (91)** is suitable especially for precast panels and slabs.

### **Objects created**

- Reinforcement meshes

## Use for

Situation	Description
	Array of overlapping rectangular meshes.
	Array of meshes in a polygonal area that you define. Meshes clipped to fit the defined area.

## Before you start

- Create the concrete part.
- Set the work plane parallel to the plane where you want to create the mesh array.

## Selection order

Component	Create reinforcement mesh
<b>Reinforcement mesh array in area (89)</b>	1. To attach the reinforcement mesh array: <ul style="list-style-type: none"> <li>• to the entire part, pick the starting point of the mesh</li> <li>• to a selected area, pick points to define the polygonal shape of the mesh</li> </ul> 2. Click the middle mouse button to create the reinforcement mesh array.
<b>Reinforcement mesh array (91)</b>	1. Select the part. The reinforcement mesh array is created automatically when the part is selected.

## Picture tab

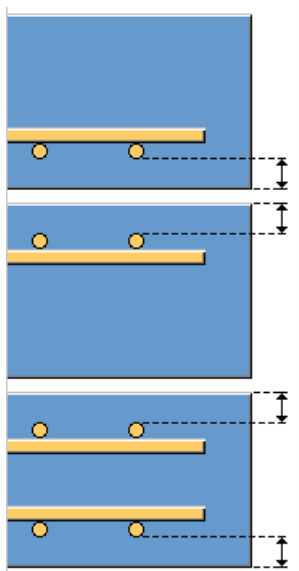
Use the **Picture** tab to define the mesh catalog type, cover thickness and location, mesh generation, cuts, and mesh area perimeter.

## Mesh type

Select the mesh catalog type from the mesh catalog.

## Cover thickness

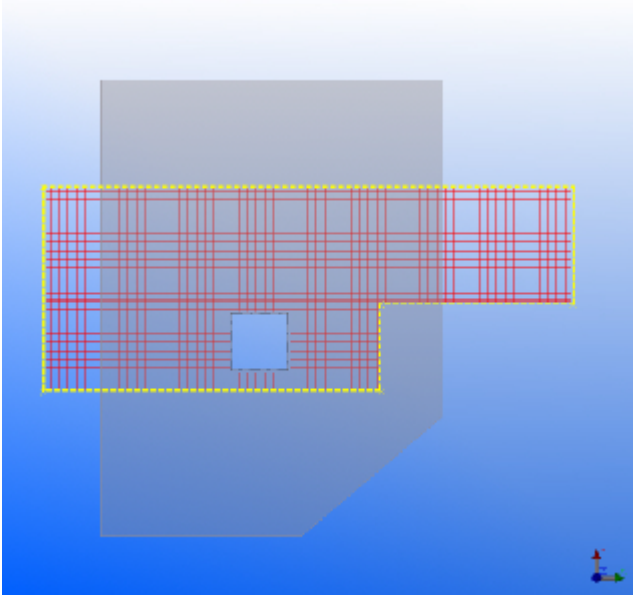
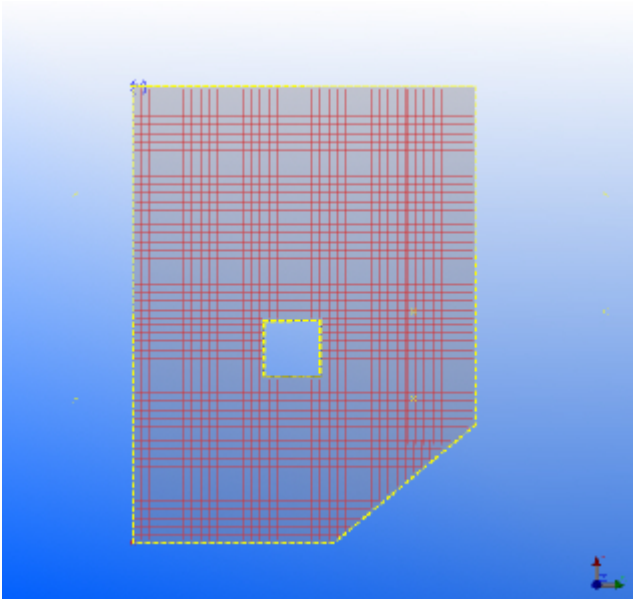
Define the mesh location and give values for **Cover thickness on plane** and **Cover thickness from plane**.

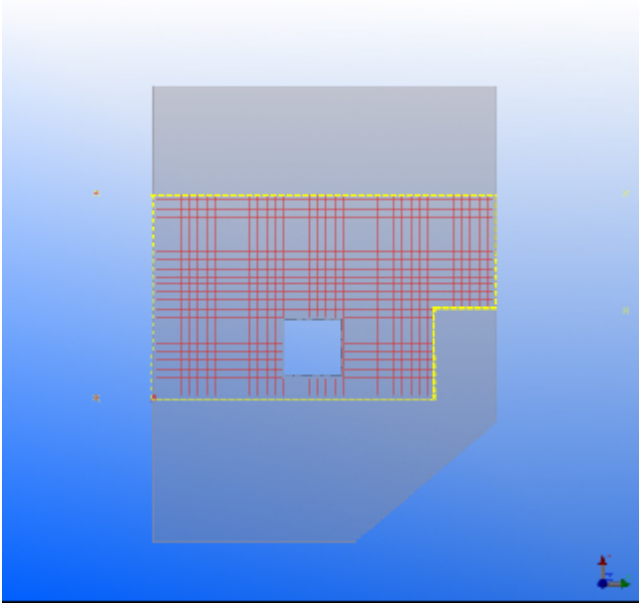


Define the cross bar location for top and bottom.

## Mesh generation

Option	Description
<b>Generation direction</b>	To rotate the mesh generation direction around the alignment point, enter an angle.
<b>Direction of bottom layer</b>	Select <b>Opposite of top layer</b> to mirror the bottom layer.
<b>Cut by father part cuts</b>	Select <b>Yes</b> to cut the mesh with the cuts made in the father part.
<b>Clipping outside</b>	Select <b>Yes</b> to clip the meshes to fit the part or the selected area.
<b>Mesh area perimeter</b>	Select the outline which the mesh follows. The meshes in the examples below are created by picking the same points but with different mesh area perimeters.

Option	Description
	<p><b>Example: Polygon</b></p> 
	<p><b>Example: Part</b></p> 

Option	Description
	<p><b>Example: Polygon + Part</b></p> 
<b>Hole cover thickness</b>	Define the hole cover thickness.

### Generation start point

Enter the polygon generation start point index.



### Overlapping tab

On the **Overlapping** tab, define the minimum and maximum overlapping along the longitudinal and crossing direction, and set the mesh offset.

Option	Description
<b>Overlapping</b>	Define the minimum and maximum overlap along the <b>Long side</b> and <b>Short side</b> of the mesh.
<b>Mesh offset</b>	Define how the meshes are placed. When you are creating both the top and the bottom mesh, you can shorten the starting mesh layer of both meshes separately. This allows you to move the whole mesh layer while the mesh layout defined in <b>Mesh offset</b> is retained.

Option	Description
<b>Mesh start offset</b>	<p>Define mesh start offset for the first mesh. The length of the first mesh is divided by the selected value.</p> <p>For example, if you select the <b>Mesh start offset</b> to be <b>1/4</b>, the length of the first mesh is divided by <b>1/4</b>.</p> <p>If you select <b>Specified</b>, the <b>Start length offset</b> option becomes visible and you can enter the offset for the first mesh.</p>

### Attributes tab

On the **Attributes** tab, define the numbering properties, name, and class of the reinforcement meshes.

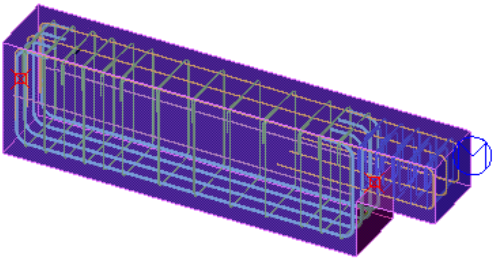
### **Rebar in beam (90)**

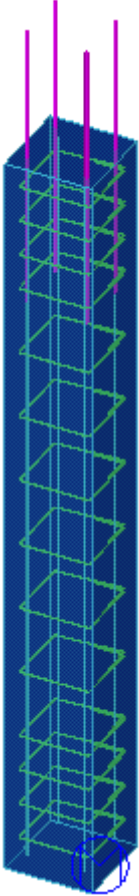
**Rebar in beam (90)** adds reinforcement bars to concrete beams.

### Parts created

Complete reinforcement structure: stirrups and perpendicular rebars are created in the concrete part.

### Use for

Situation	More information
	<p>Rebars in concrete beam.</p>

Situation	More information
	Rebars in a concrete column.

### Do not use for

Use this component to add reinforcement bars to a concrete part.

### Before you start

Before the component can be created, you need to create a concrete part first.

### Primary bottom bars tab

Use the **Primary bottom bars** tab to define the properties of the lower reinforcing bars.

### Properties






Option	Description
<b>Grade</b>	Defines the grade of the main bottom reinforcing bars. This field cooperates with the <b>Size</b> field.
<b>Size</b>	Defines the diameter of the main bottom reinforcing bars. Pressing







Option	Description
	<p>the ... button right of the field will open the <b>Select rebar</b> dialog box.</p> <p>In the dialog box you can select the grade and the accompanying diameter.</p> <hr/> <p><b>NOTE</b> Selecting a size will override the value in the <b>Grade</b> field.</p>
<b>Bend lengths left</b>	Defines the length of the left end-extension.
<b>Bend lengths right</b>	Defines the length of the right end-extension.

### End conditions left/right

















Picklist to define the rebars' end condition on the left and right side. The options are:


Picklist item	Example
Default	
90 Degree	
135 Degree	
180	
-180	

Picklist item	Example
-135	
-90	
-45	
45	

**Bar not to create**

Picklist to define which rebar should not be created. The options are:

Picklist Item	Example
	     
	     
	   

Picklist Item	Example
	○   ·   
	 ○   ○   ○   ·   

### Creation method

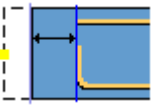

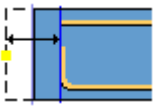

This field defines the way the rebars are created. There are three options:

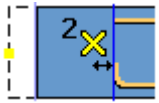

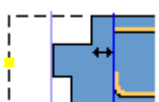

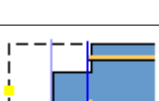

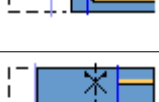

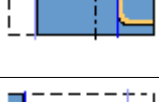
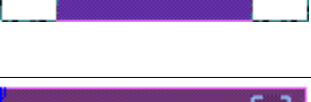

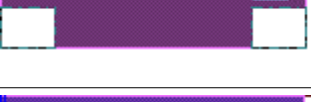
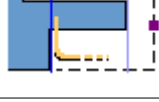


Option	Description
<b>No rebars</b>	No bottom rebars are created.
<b>Number of bars</b>	A fixed number of bars is created. The spacing between the bars is automatically calculated.
<b>By spacing</b>	A accompanying field becomes active. The entered value is the fixed spacing for the rebars. The number of rebars is calculated automatically.

### Positioning and distances

In the right upper side of this tab a picture and some picklists are displayed. These fields and lists are to define the position and de rebar distances.

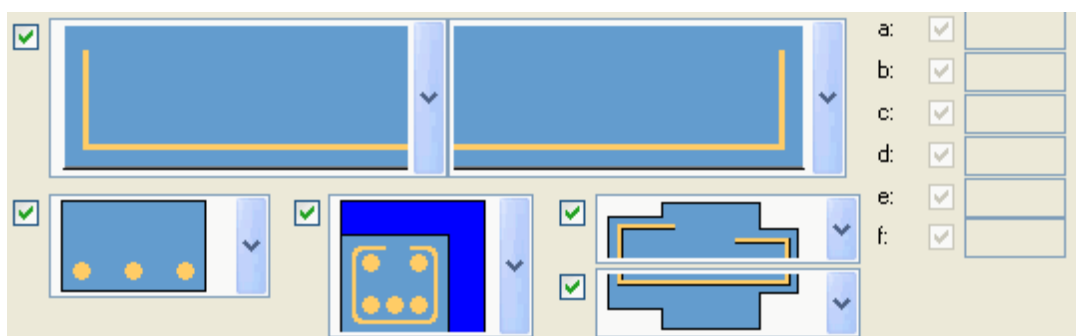
The distance fields are used for defining the size of the rebars. The picklists are for positioning. Below some examples for the positioning rebars on the left side:

Picklist item	Description	Example
	The part edge is normative for positioning the rebar.	
	The concrete parts' reference point is normative for positioning the rebar.	

Picklist item	Description	Example
	The picked position is normative.	
	The edge of the top part cut is normative for positioning the rebar.	
	The edge of the bottom part cut is normative for positioning the rebar.	
	The centerline of the concrete part is normative for positioning the rebar.	
		
		
		
		

### Shape and pattern

The picklists and input fields are used to define the rebar shape, rebar pattern and rebar distribution.



In the left bottom side of the tab, some picklists are available for defining the shape and distribution of the bottom rebars.

**A - Shape of rebar**

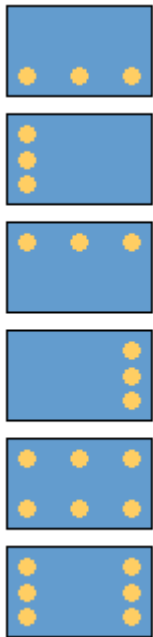
These picklists define the common shape of the rebars on both ends of the concrete part. For some shapes distances can be entered (B).

**B - Distance fields**

These distance fields only apply for two rebar shapes (A).

**C - Rebar pattern**

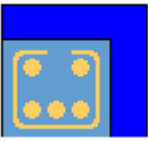
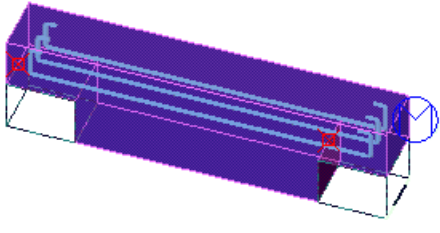
Picklist for defining the rebar pattern. The picklist contains six options:



**D - Consider part cuts in longitudinal direction**

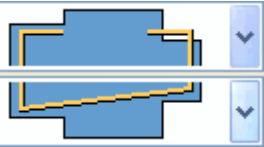


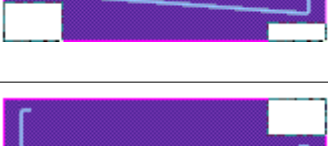
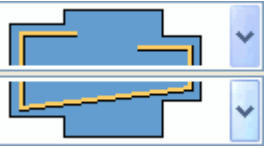

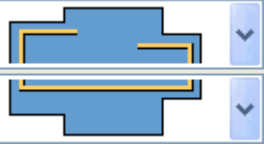

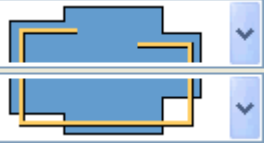

This picklist defines if part cuts in the concrete part should be taken into account when positioning the rebars.

Picklist item	Example

Picklist item	Example
	

### E - Consider part cuts in vertical direction

These picklists contain options for defining if rebar shape should consider the partcuts in vertical direction. For both top side and bottom side the placing can be defined. Examples:

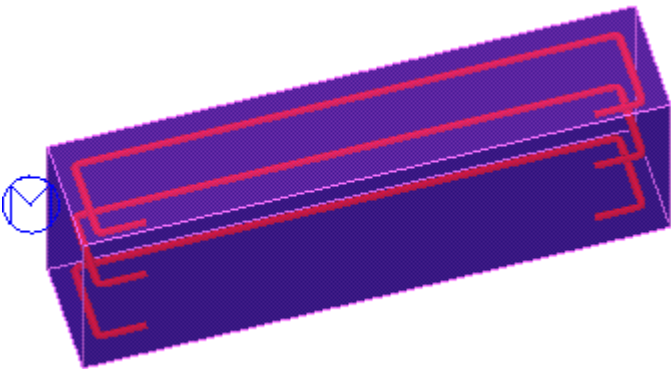
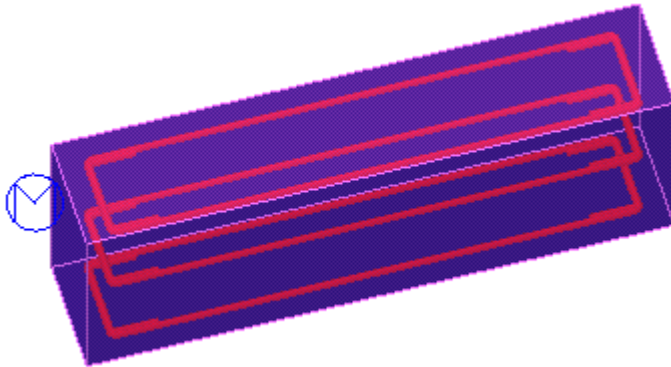
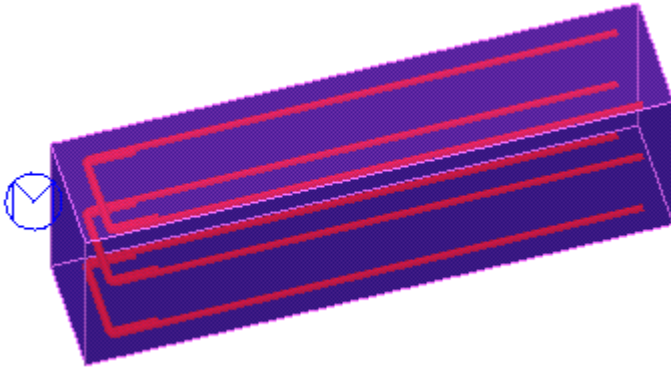
Picklist item	Example
	
	
	
	
	

### Side left tab

Use the **Side left** tab to create and define the properties of the horizontal rebars on the left side.

The rebars which can be created are placed in longitudinal direction (just as the Primary bars), but now the bends are created horizontally. The options on this tab (defining rebar shape, dimensions, number of bars, and rebar distribution) are similar to the options on the **Primary bottom bars** tab.

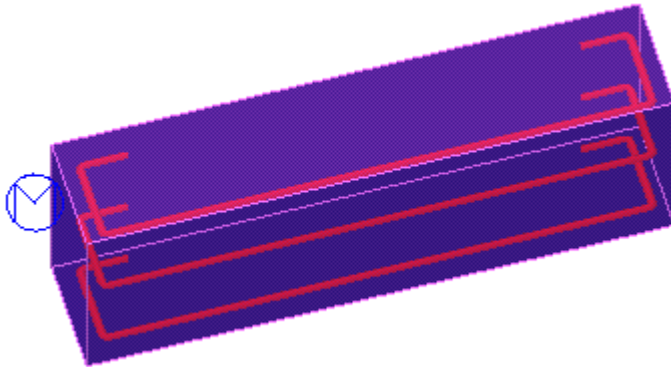
Examples of rebars which can be created with this tab:



**Side right tab**

Use the **Side right** tab to create and define the properties of the horizontal rebars on the right side.

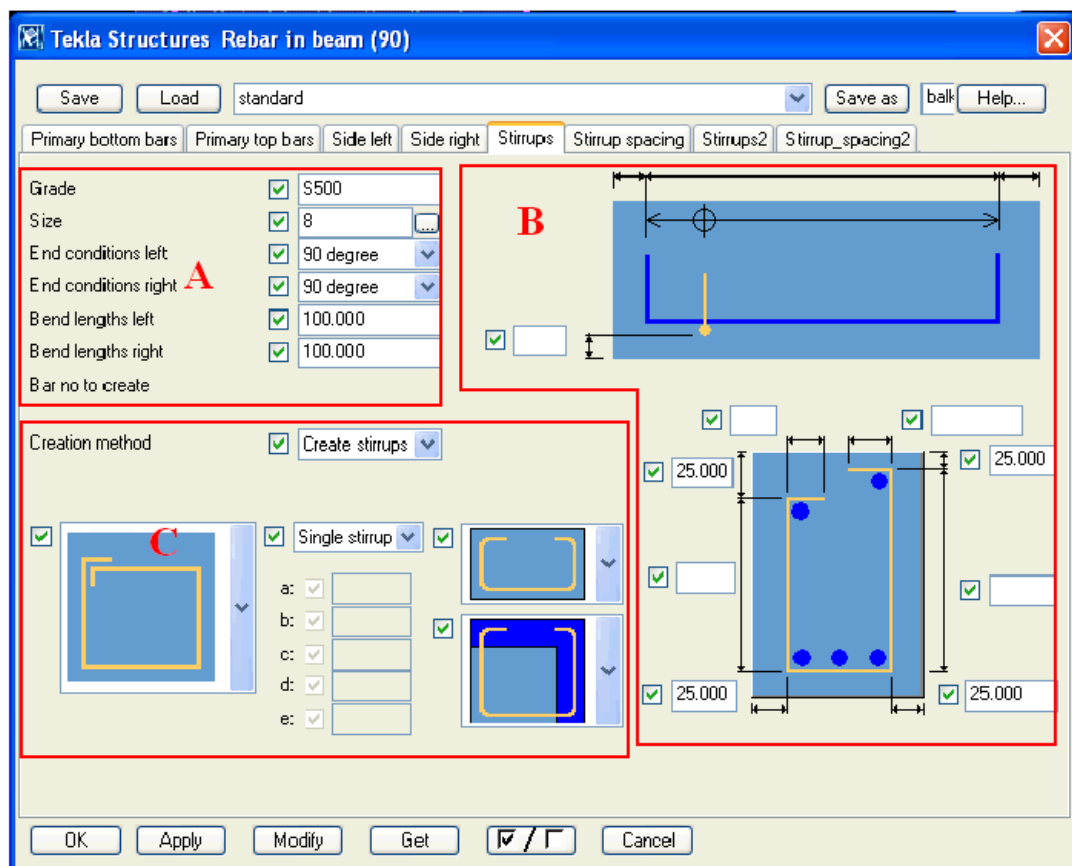
Similar to the **Side left** tab, but now the reference is the parts' right side.



### Stirrups tab

Use the **Stirrups** tab to define the dimensions of the stirrups in first section of the concrete part.

In the picture below, the options are grouped.



### Section A - Stirrup dimensions



Option	Description
<b>Grade</b>	Defines the grade of the main bottom reinforcing bars. This field cooperates with the <b>Size</b> field.
<b>Size</b>	<p>Defines the diameter of the main bottom reinforcing bars. Pressing the ... button right of the field will open the <b>Select rebar</b> dialog box.</p> <p>In the dialog box you can select the grade and the accompanying diameter.</p> <hr/> <p><b>NOTE</b> Selecting a size will override the value in the <b>Grade</b> field.</p> <hr/>
<b>Bend lengths left</b>	Defines the length of the left end-extension.
<b>Bend lengths right</b>	Defines the length of the right end-extension.

### Section B - Stirrup dimensions

One input field is available for defining a fixed distance from concrete parts' bottom side to bottom side of stirrup.

---

**NOTE** This offset is normative.

---

The input fields in the bottom side of this section are for defining the offset, width and height of the stirrups.


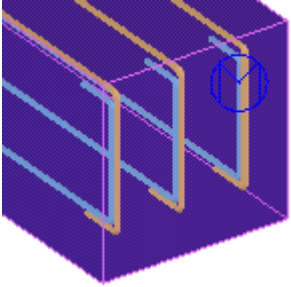

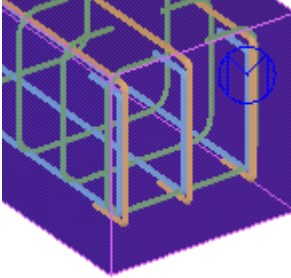
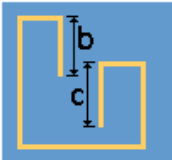
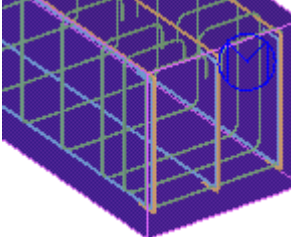

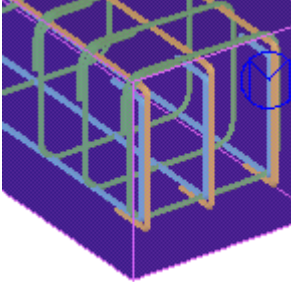
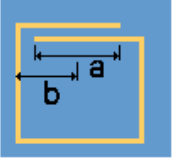
### Section C - Stirrup shape

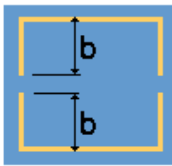
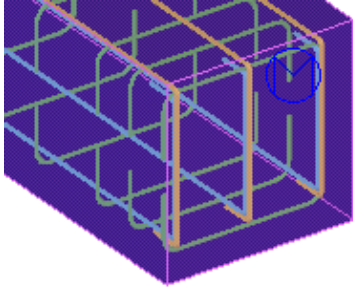
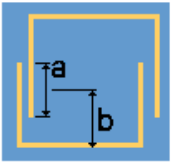
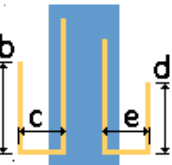
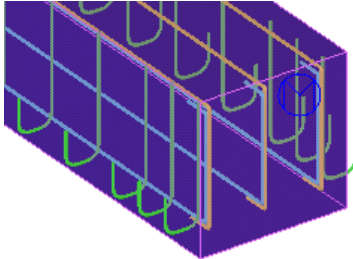
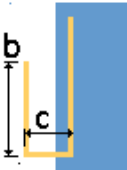
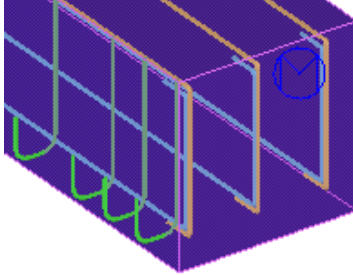
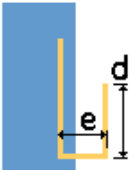
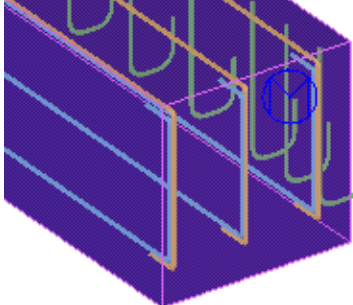
In this section the general shape of the stirrups is defined.

First there is the **Create stirrups** option. This picklist has three options:

- **No** - No stirrups are created
- **As one group** - Stirrups are created as one group
- **As separate group** - Stirrups are created as separate groups

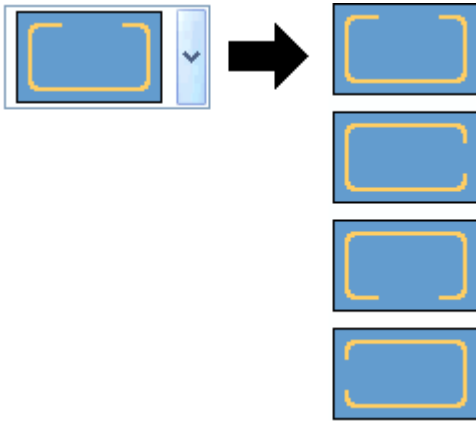
The general shape of the stirrup can be defined. You can choose a shape from the picklist:

Picklist item	Description	Example
	No stirrups are created	
	U-shape stirrups	
	C-shape inside	
	Closed box	
	Closed box overlap	

Picklist item	Description	Example
	Divided stirrup	
	Divided stirrups overlap	
	Double U-shape	
	Single U-shape left	
	Single U-shape right	

### Stirrup rotation

The rotation of the stirrups can be set with below picklist. The picklist contains four options: each option will rotate the stirrup 90 degrees counterclockwise.



### Stirrup spacing tab

Use the **Stirrup spacing** tab to define the distribution of the stirrups along the concrete part.

You can define six zones for the distribution. For each zone you can set a number of stirrups. The distance between the stirrups can be defined in two ways:

- Fixed spacing between each stirrup.
- Distance between outer stirrups. (Spacing is then calculated from this distance divided by the number of stirrups.)

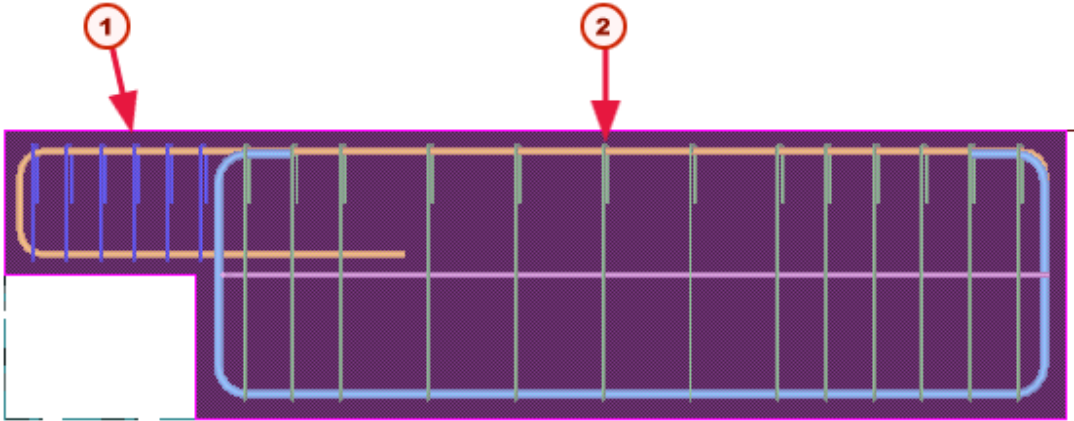
Examples:

Picklist item	Example																																								
<table border="1"> <thead> <tr> <th colspan="5">Main stirrups</th> </tr> <tr> <th></th> <th>Number of stirrups</th> <th>&lt;space&gt;</th> <th>Length</th> <th></th> </tr> </thead> <tbody> <tr> <td>Zone 1</td> <td><input checked="" type="checkbox"/> 3</td> <td><input checked="" type="checkbox"/> 100.000</td> <td><input checked="" type="checkbox"/></td> <td></td> </tr> <tr> <td>Zone 2</td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td></td> </tr> <tr> <td>Zone 3</td> <td><input checked="" type="checkbox"/> 4</td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td></td> </tr> <tr> <td>Zone 4</td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td></td> </tr> <tr> <td>Zone 5</td> <td><input checked="" type="checkbox"/> 3</td> <td><input checked="" type="checkbox"/> 100.000</td> <td><input checked="" type="checkbox"/></td> <td></td> </tr> <tr> <td>Zone 6</td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td></td> </tr> </tbody> </table>	Main stirrups						Number of stirrups	<space>	Length		Zone 1	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 100.000	<input checked="" type="checkbox"/>		Zone 2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Zone 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Zone 4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Zone 5	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 100.000	<input checked="" type="checkbox"/>		Zone 6	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
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Main stirrups																																									
	Number of stirrups	<space>	Length																																						
Zone 1	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	300.000																																					
Zone 2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>																																						
Zone 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	700.000																																					
Zone 4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>																																						
Zone 5	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	300.000																																					
Zone 6	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>																																						

### Stirrups 2 tab

Use the **Stirrups 2** tab to define a second group of stirrups.

This tab can be used if the shape of the concrete part is not uniform. For example, if a part cut is applied, you may need different stirrups on that area.



① Stirrups 2

② Stirrups

**Stirrups 2 spacing tab**

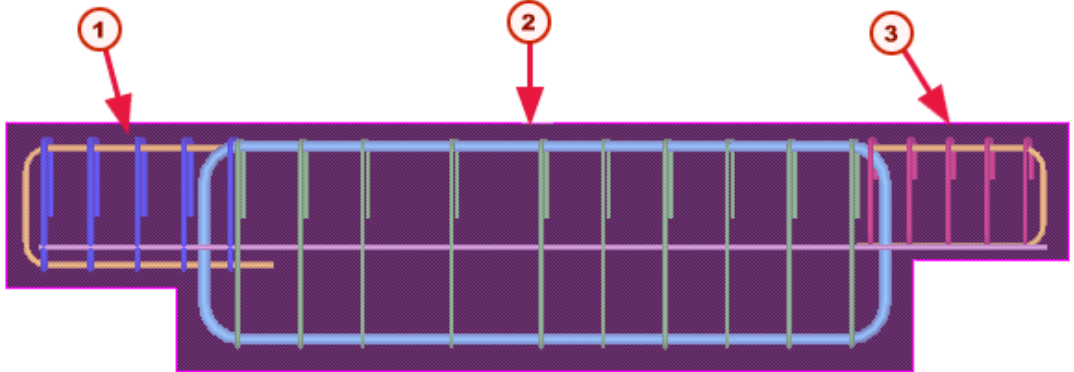
Use the **Stirrups 2 spacing** tab to define the spacing of the second group of stirrups.

**Stirrups 3 tab**

Use the **Stirrups 3** tab to define a third group of stirrups.

You may need this tab in case the concrete part contains multiple part cuts. For each area, the properties of the stirrups can be configured.

Example:



① Stirrups 2

**2** Stirrups

**3** Stirrups 3

### Stirrups 3 spacing tab

Use the **Stirrups 3 spacing** tab to define the spacing of the third group of stirrups.

### Advanced tab

Use the **Advanced** tab to define the naming and numbering properties of rebars and stirrups.

The following information can be added:

- **Comment**
- **Name**

Rebar profile	Default Name
Main bottom rebars	RB
Main top rebars	RB
Side left	RB
Side right	RB
Stirrups	STIRRUP
Stirrups2	STIRRUP
Stirrups3	STIRRUP

- **Class**

If the **Class** fields are left blank, then the following default classes will be used:

Rebar profile	Default Class
Main bottom rebars	201
Main top bars	202
Side left	203
Side right	204
Stirrups	301
Stirrups2	302
Stirrups3	303

- **Series**

If this field is left blank, the prefix will be empty for all rebar profiles.

- **Start number**

If this field is left blank, Tekla Structures will use '1' as default start number for all rebar profiles.

### **Configuration tab**

Use the **Configuration** tab to define the bending radius and rotation.

### **Bending radius**

The bending radius can be set separately for the main reinforcing bars and the stirrups. Furthermore the radius can be set separately for the main bends and the hook-bends.

The bending radius can be determined in three ways:

<b>Picklist item</b>	<b>Description</b>
<b>rebar_database.inp</b>	The bending radius is determined from a configuration file <code>rebar_database.inp</code> . This file is located in the <code>profil</code> folder.
<b>Relative to diameter</b>	For this option the radius is calculated by multiplying the reinforcing bar diameter with the entered coefficient.
<b>Bending radius</b>	Use this option to use a fixed value for the bending radius.

### **Rotation**

The picklist determines the orientation of the complete rebar structure in the concrete part. The picklist contains four options, each item represents a 90 degree rotation.

### ***Border rebar for single edge (93)***

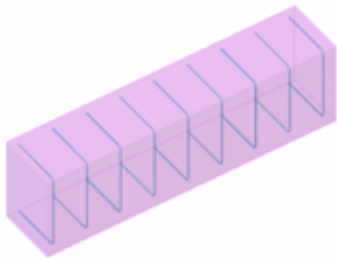
**Border rebar for single edge (93)** creates pin bars (U bars) and edge bars on the edge of a concrete part.

### **Objects created**

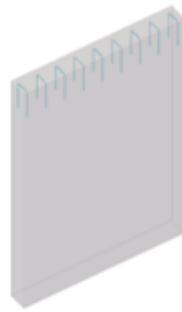
- Pin bars (U bars)
- Edge bars

### **Use for**

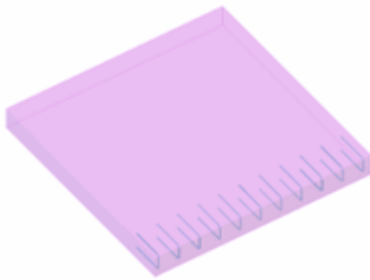
Use this component to create pin bars in a concrete part.



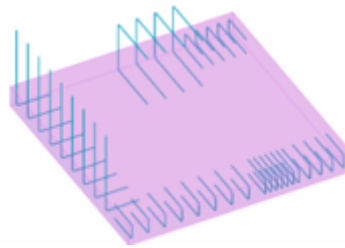
**Example beam**



**Example concrete panel**



**Example floor**



**Example shapes of rebars**

**Before you start**

Create the concrete part where you want to place the border rebars, usually a wall panel or a slab.

**Selection order**

1. Select the part where you want to create the border rebars.
2. Pick two input points on the desired edge of the part.







**Pins tab**




Use the **Pins** tab to define the properties of the pin bars.

**Properties**

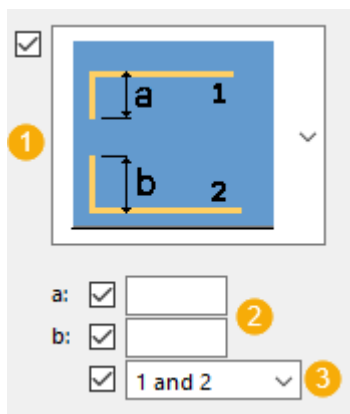
Option	Description
<b>Grade</b>	Define the grade. This setting is connected to the <b>Size</b> setting.
<b>Size</b>	Define the size. Click the ... button to open the <b>Select rebar</b> dialog box. Selecting the size also affects the <b>Grade</b> value.

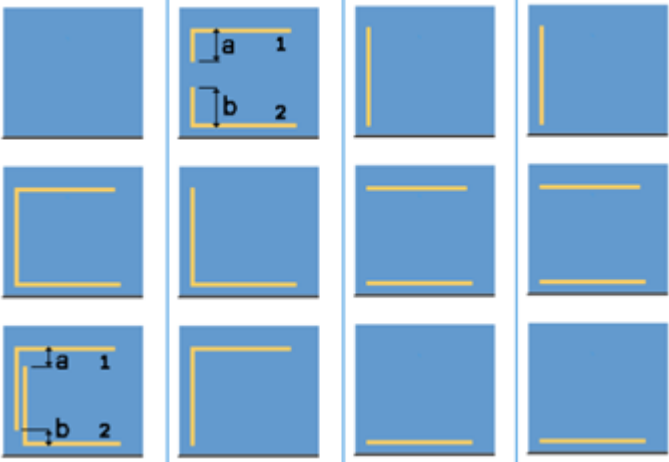


Option	Description
<p><b>End conditions left</b></p> <p><b>End conditions right</b></p>	<p>Select the end hook type for the left and right side of the pin bar.</p> <ul style="list-style-type: none"> <li>• Default (no hook)           <div style="text-align: center;">  </div> </li> <li>• 90 Degree           <div style="text-align: center;">  </div> </li> <li>• 135 Degree           <div style="text-align: center;">  </div> </li> <li>• 180           <div style="text-align: center;">  </div> </li> <li>• -180           <div style="text-align: center;">  </div> </li> <li>• -135           <div style="text-align: center;">  </div> </li> </ul>

Option	Description
	<ul style="list-style-type: none"> <li>-90</li> </ul>  <ul style="list-style-type: none"> <li>-45</li> </ul>  <ul style="list-style-type: none"> <li>45</li> </ul> 
<b>Bend lengths left</b>	<p>Define the length of the left end extension.</p> <p>To define the length, select some other value than <b>Default</b> in <b>End conditions left</b>.</p>
<b>Bend lengths right</b>	<p>Define the length of the right end extension.</p> <p>To define the length, select some other value than <b>Default</b> in <b>End conditions right</b>.</p>

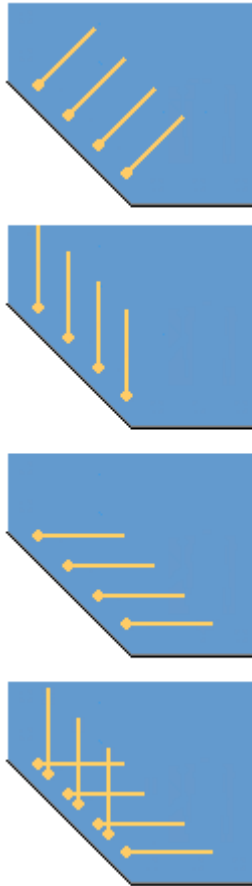
### Shape of pin bars



	<b>Description</b>
<b>1</b>	Select the shape of the pin bars. 
<b>2</b>	Define the vertical dimensions.
<b>3</b>	Select if both bars 1 and 2 are created, or only one of them.

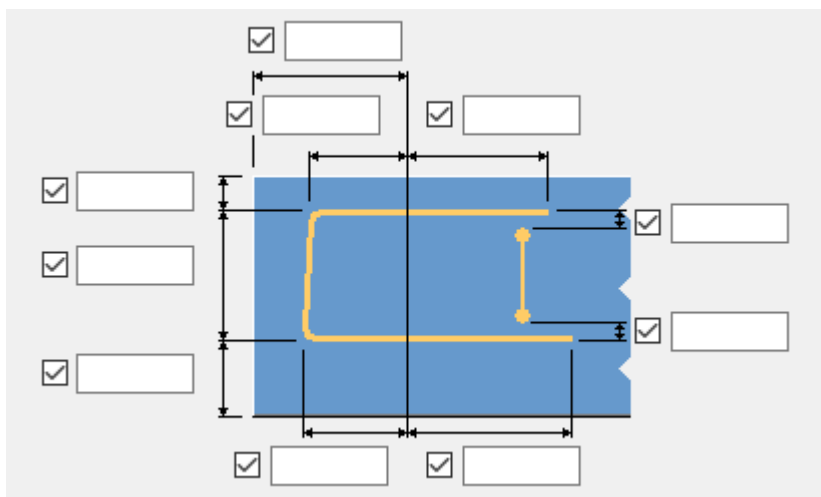
**Pin bar direction for bevel edges**

Select the direction of pin bars for bevel edges.



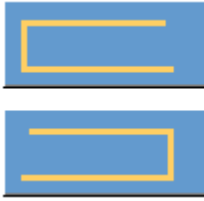
### Dimensions

Define the pin bar dimensions.



### Pin bar direction

Select the pin direction. This setting depends on the selected pin bar shape.



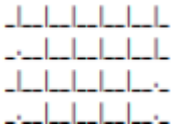
### Pin spacing tab

Use the **Pin spacing** tab to define the pin bar creation and distribution along the concrete part.

### Pin zones

You can define six zones for the pin bar distribution. For each zone, you can define the number of pin bars.



	Description
1	Set the pin bar offset from the sides.
2	Define which pin bars are created.  The bars illustrated as dots are not created.

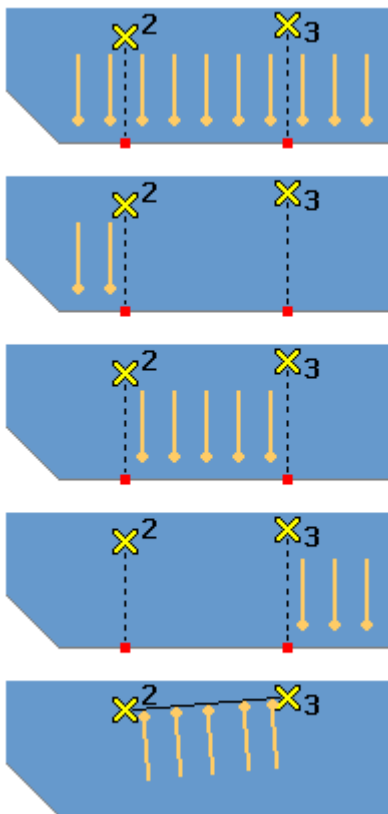
### Pin bar zone settings

Option	Description
<b>Number of spaces</b>	Define how many spacings are created for the zone.
<b>Space</b>	Define the spacing value for the zone.
<b>Length</b>	Define the length of the zone. Length is used if <b>Number of spaces</b> is left empty.

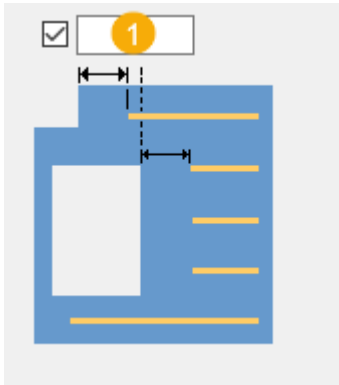
Option	Description
<b>Horizontal space</b>	Define the horizontal spacing of pin bars.  This setting is available if you have set <b>Different spacing horizontal and vertical</b> to <b>Yes</b> .
<b>Vertical space</b>	Define the vertical spacing of pin bars.  This setting is available if you have set <b>Different spacing horizontal and vertical</b> to <b>Yes</b> .

### Pin bar distribution range

Select the pin bar distribution range in relation to the input points.

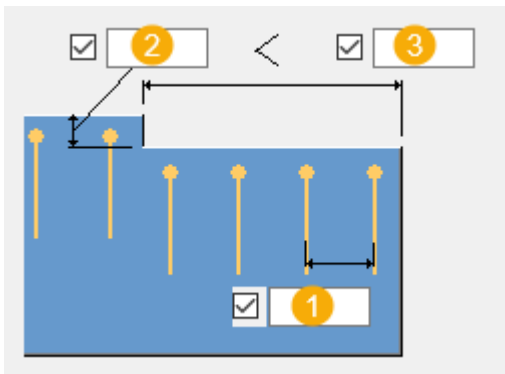


### Cover thickness



	Description
1	Define the minimum cover thickness for holes and notches.

### Spacing for partial cuts



	Description
1	Define the pin bar spacing.
2	Define the vertical cut dimension.
3	Define the horizontal cut dimension.

### Creation settings

Option	Description
<b>Creation method</b>	<p>Select how the spacing of pin bars is defined.</p> <ul style="list-style-type: none"> <li>• <b>By exact spacings</b> creates fixed spacing between each pin bar.</li> <li>• <b>By exact spacing value with flexible first and last space</b> creates fixed, regular spaces between the bars. Both the first</li> </ul>

Option	Description
	and last spaces adjust to even out bar distribution.
<b>Different spacing for horizontal and vertical</b>	Select whether to reinforce multiple edges of a wall without changing the settings.
<b>Consider openings</b>	Select whether openings are taken into account and how the bar groups are created.

### Edge bars tab

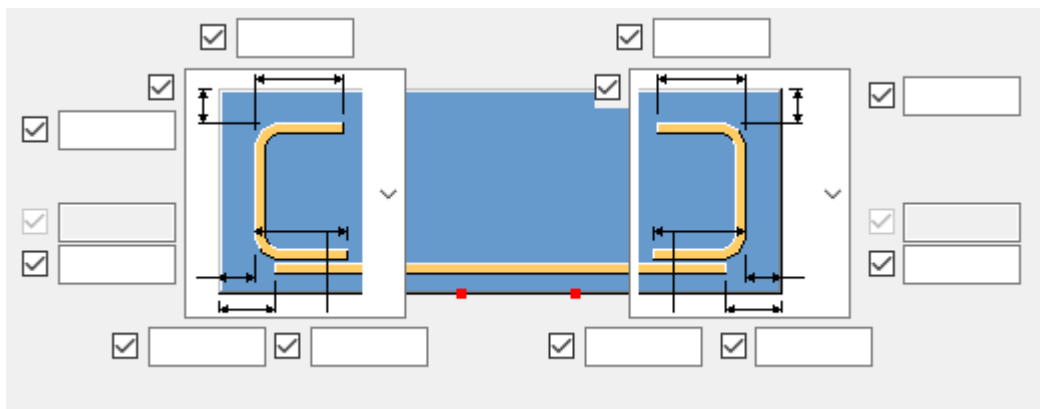
Use the **Edge bars** tab to define the edge bar dimensions and properties.

### Edge bars

Option	Description
<b>Create rebars</b>	Select whether edge bars are created.
<b>Standard rebar</b>	Define the grade and size of the first bar group.
<b>Create second group</b>	Select whether to create a second bar group. Define the grade and size of the second bar group.

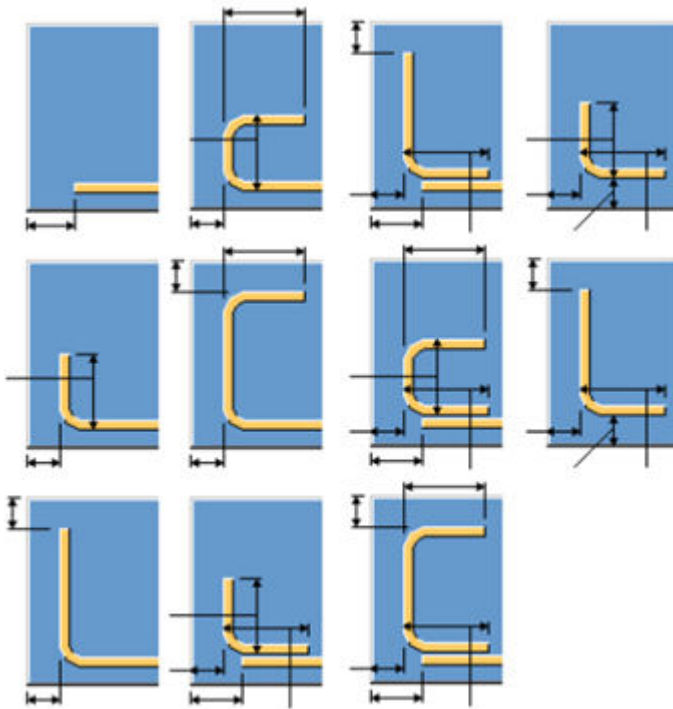
### End conditions on edge

Define the shape and dimensions of the bar ends of edge bars. You can define both sides separately.



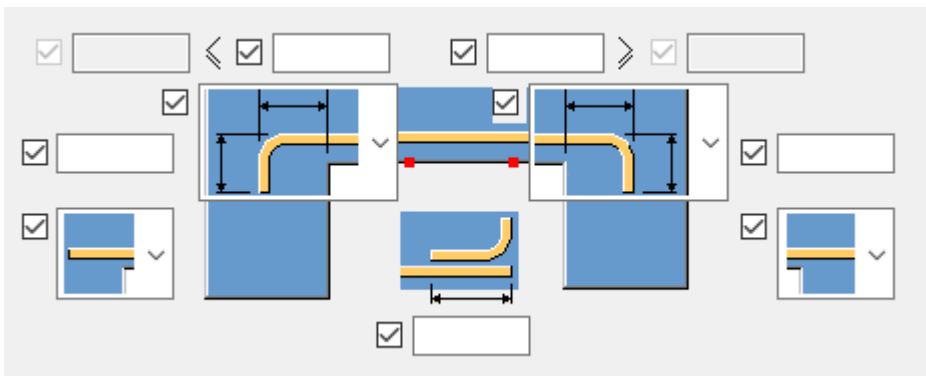
Select a shape:



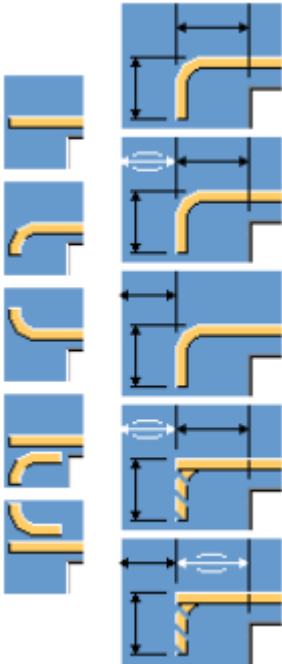


### End conditions on opening

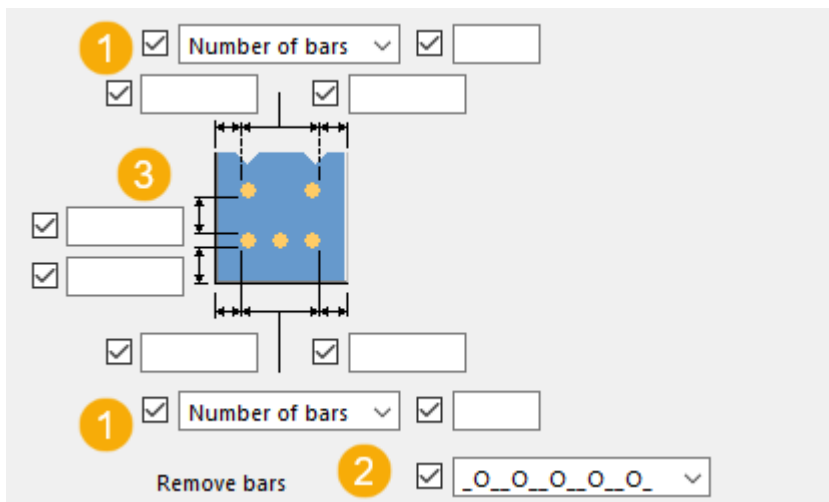
Define the shape and dimensions of the bar ends of opening bars. You can define both sides separately.



Select a shape:



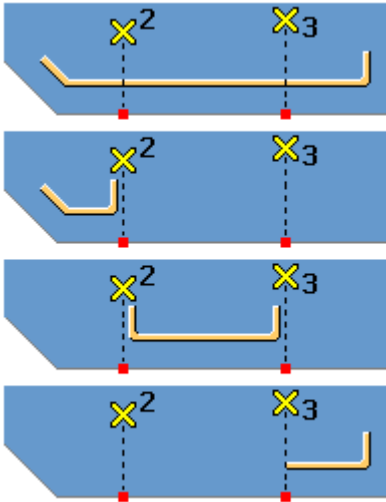
### Number of bars and spacing



	Description
1	Define either the spacing value or the number of edge bars. You can define the first and second bar group separately.
2	Define which bars are created. The bars illustrated as dots are not created.
3	Define the edge distances for the groups.

### Edge bar shape

Select the edge bar shape in relation to the input points.



### Consider openings

Select whether openings are taken into account.

### Hook length

Define the length of the hook. You can define the hook length if you have selected to create hooks in **Consider openings**.

### Advanced tab

Use the **Advanced** tab to define the properties for edge bars, pin bars, and rebar assemblies.

### Edge bars and pin bars

Option	Description
<b>Comment</b>	Add content to the comment UDA.
<b>Name</b>	Name that is shown in drawings and reports.
<b>Class</b>	Class number for the rebars.
<b>Serie</b>	Prefix for the rebar position number.
<b>Start number</b>	Start number for the rebar position number.

### Rebar groups

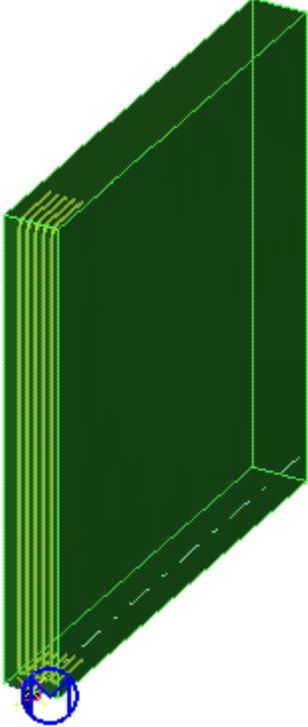
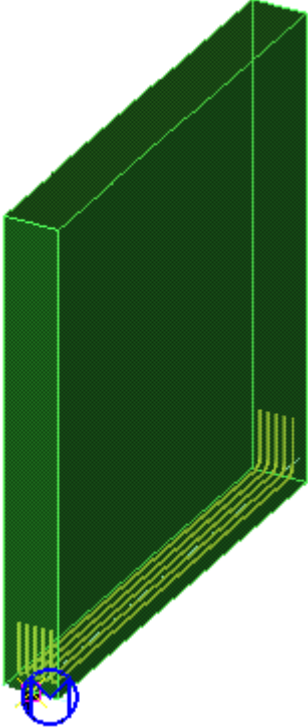
Select the number of edge bar groups. Define the grade and size properties on the **Edge bars** tab.



**Extra rotation**

Select how the pin bars are rotated.

Option	Example
<p><b>No</b> Pin bars are not rotated.</p>	

Option	Example
<p><b>Around X</b></p> <p>Pin bars are rotated around the x axis.</p>	
<p><b>Around Y</b></p> <p>Pin bars are rotated around the y axis.</p>	

### Create as rebar assembly

You can add the created reinforcement as a rebar assembly to the cast units with a predefined assembly type, name, prefix, and start number.

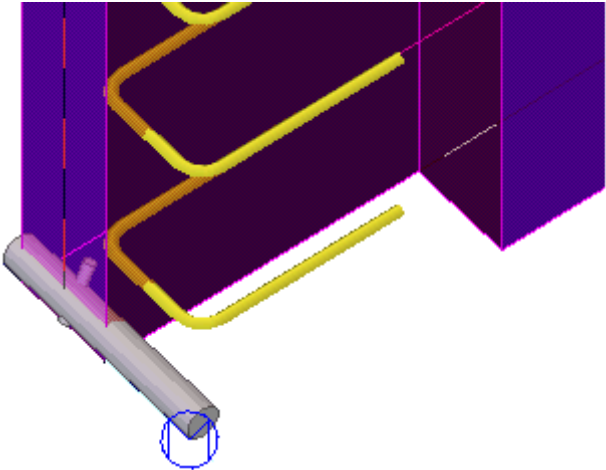
Option	Description
<b>Create as rebar assembly</b>	Select <b>Yes</b> to create all reinforcement as one rebar assembly, and to include it to the cast unit of the input part.
<b>Rebar assembly type</b>	Select the rebar assembly type. If you do not select the type, the default value of the rebar assembly is used.
<b>Name, Prefix, Start number</b>	Define the name, prefix, and start number. If you do not define these, the default values of the rebar assembly are used.
<b>Attach to</b>	Select which part the rebar assembly will be attached to, the main part or the neighbor part. Define the neighbor part selection criteria on the <b>Configuration</b> tab.

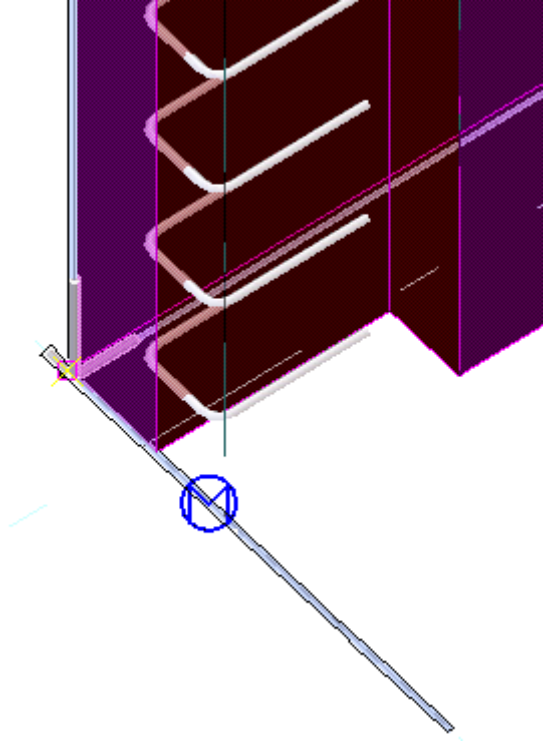
#### Configuration tab

Use the **Configuration** tab to define further settings for controlling border rebar creation.

#### Configuration settings

Option	Description
<b>Bending radius</b>	Define the bending radius for pin bars and edge bars. <ul style="list-style-type: none"> <li>• <code>rebar_database.inp</code> The radius values defined in the rebar catalog for main bars and tie/stirrup are used. The <code>rebar_database.inp</code> file is by default located in the <code>\profil</code> folder.</li> <li>• <b>Relative to diameter</b> The radius is calculated by multiplying the rebar diameter with the entered value.</li> <li>• <b>Bending radius</b> Define a fixed value for the bending radius.</li> </ul>

Option	Description
<b>Detect outside geometry</b>	<p>Define how part cuts are detected inside the concrete part. Typically, this setting is needed when the concrete part has recess cuts.</p> <p>Use the <b>Distance in material</b> setting and the options in the <b>position in plane</b> list to move the plane that is used in searching for part cuts.</p> <p>The plane location is visualized in the model if you set the <b>Draw geometry with profiles</b> to <b>Yes</b>.</p>
<b>Draw geometry with profiles</b>	<p>Select whether to create construction lines to visualize the location of the part cut detection plane.</p> <p>You can change the location in <b>Distance in material</b>.</p> 
<b>Detect neg. volume</b>	<p>If a recess cut is applied to the concrete part, you can use <b>Difference in thickness</b> to control whether the recess cut is taken into account.</p>
<b>Draw axis</b>	<p>Select whether to visualize the internal coordinate system of the component.</p> <p>If you select <b>Yes</b>, three small parts with a round diameter are created at the component axis, starting from the origin. This can help to set up the component, and to give more clearness in component orientation.</p> <p>Select <b>No</b> to remove the visualization.</p>

Option	Description
	
<b>Attach pins to</b> <b>Attach edge bars to</b>	Select whether the pins and edge bars are attached to the main part or the neighbor part.
<b>Find neighbor</b>	Define how the neighbor part is identified, by name or by class.

### ***Rectangular area reinforcement (94)***

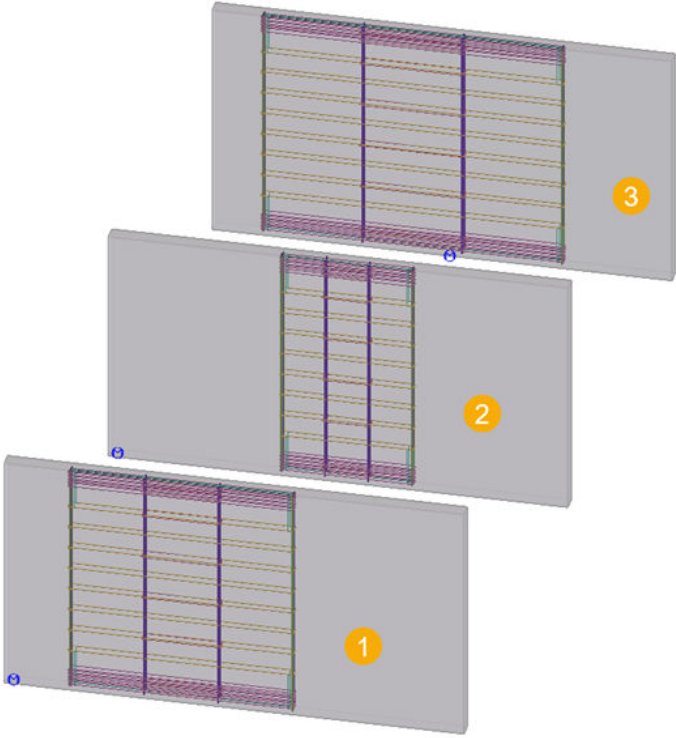
**Rectangular area reinforcement (94)** creates reinforcement for a rectangular area. Select the part where the reinforcement is placed and pick two points to create the reinforcement. The part defines the thickness of the reinforced area, and the two points define the geometry and the location of the reinforced area.

#### **Objects created**

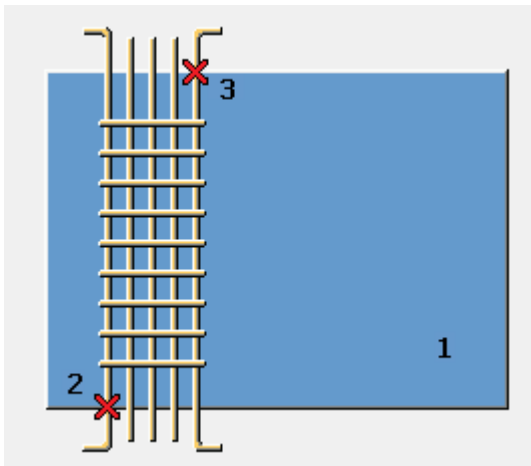
- Longitudinal main bars: corner bars (4), side bars
- Stirrups
- Intermediate links
- Top and bottom bars



## Use for

Situation	Description
	<p>Concrete wall panel with corner and side bars inside the wall. Top and bottom ends reinforced. Intermediate links tie side bars at every second stirrup.</p> <p><b>1</b> No rotation <b>2</b> Rotation in plane <b>3</b> Rotation out of plane</p>

## Selection order

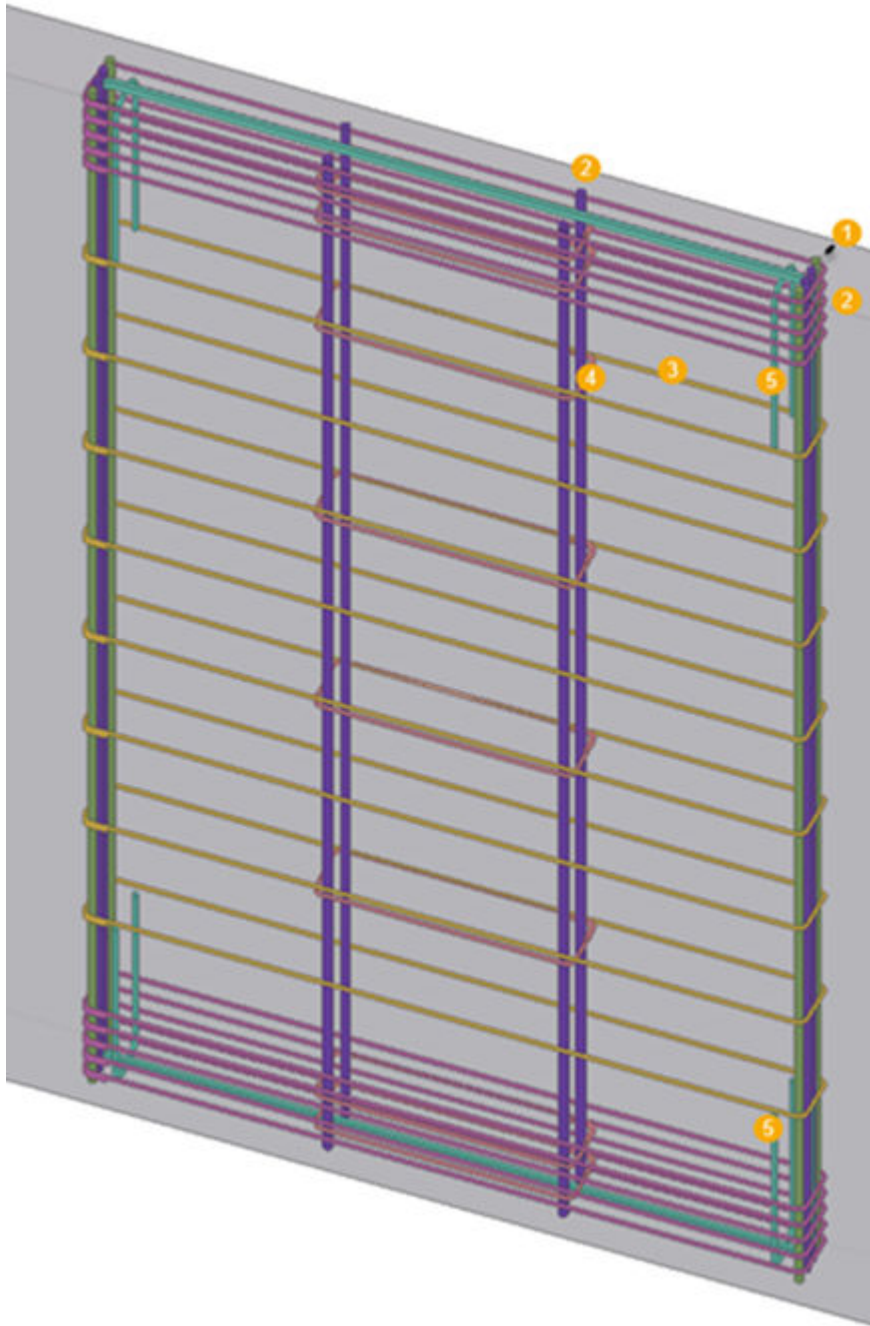


1. Select the part.
2. Pick the first point.
3. Pick the second point.

Picking the points (2 and 3) determines the area where the reinforcement is placed.

The reinforcement is created automatically when the second point is picked.

## Part identification key



	Part
1	Corner bars
2	Side bars
3	Stirrups
4	Intermediate links

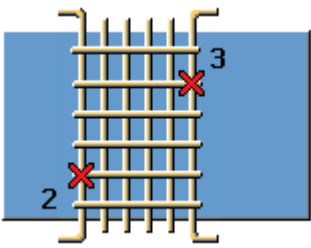
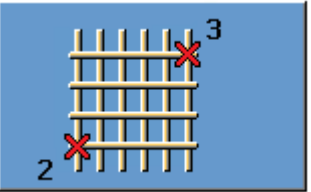
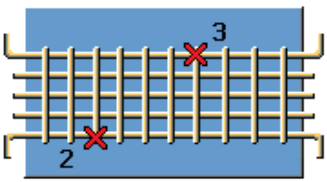
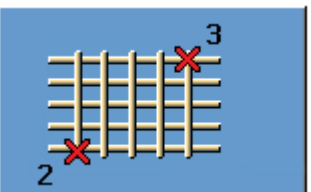
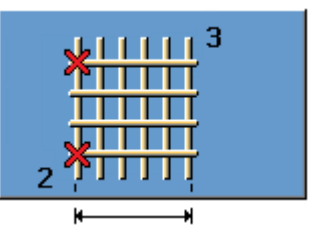
	Part
5	Top / Bottom bars

**Picture tab**

Use the **Picture** tab to select the reinforcement location and to set the reinforcement direction.

**Rectangular area**

Select how the reinforcement is extended over the wall.

Option	Description
	Column reinforcement area
	Area reinforcement with vertical rebars
	Beam reinforcement area
	Area reinforcement with horizontal rebars
	Area reinforcement using input points that define the direction for the creation plane Define the width of the area.

## Rotation

**Rectangular area reinforcement (94)** is based on the geometry of a standard panel. Using the component on slabs or beams in certain planes can affect the geometry of the reinforcement. By using the **In plane** or **Out of plane** options, you can adjust the reinforcement to the correct behavior.

Select the reinforcement direction in different part geometry and rotation situations:

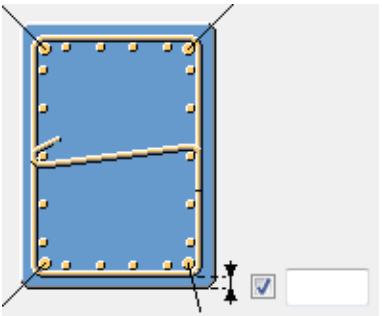
- **No**
- **In plane**
- **Out of plane**

## Main bars tab

Use the **Main bars** tab to control the corner bar properties, the symmetry options, rotation, and concrete cover thickness.

## Basic corner bar properties

Define the grade, size and bending radius of the corner bars. The active settings depend on the selected symmetry option.

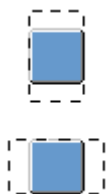
Option	Description
<b>Grade</b>	Define the strength of the steel used in the reinforcing bars.
<b>Size</b>	Define the diameter of the reinforcing bar.
<b>Bending radius</b>	Define the bending radius of the corner bars.
	Define the concrete cover thickness. Select whether the thickness is the same on all sides.

## Symmetry options



Select the symmetry option. Use the symmetrical conditions to define which of the corner bars have the same grade, size, and bending radius properties. The corner bars that have same properties are symmetrical.

## Rotation



In square reinforced parts, you can select the perpendicular sides if the sides require different reinforcement. You can rotate all reinforcement by 90 degrees.

## Additional corner bar properties

Option	Description
<b>Class</b>	Use the <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.
<b>Name</b>	Define a name for the main bars. Tekla Structures uses the name in drawings and reports.
<b>Prefix</b>	Define a prefix for the part position number.
<b>Start number</b>	Define a start number for the part position number.


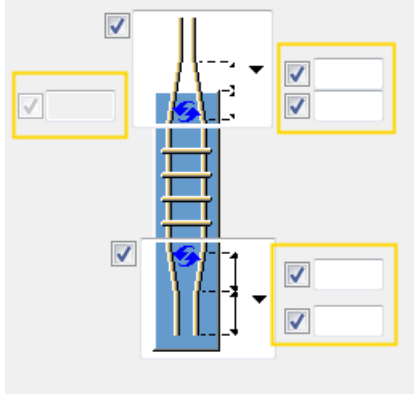
## Hooks at top / bottom

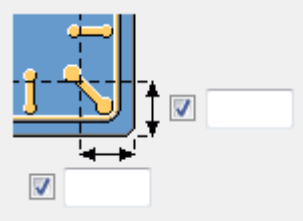
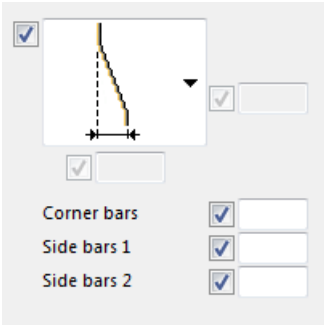
Option	Description
<b>Type</b>	Select the hook angle.
<b>Length</b>	Length of the hook.
<b>Bending radius</b>	Bending radius of the hook.

## Bar ends tab

Use the **Bar ends** tab to control the length of the vertical and horizontal extensions for the corner bars and side bars, and the cranking.

Option	Description
<b>Bar creation</b>	Select whether the extensions of corner bars and side bars are created symmetrically on both sides of the rectangular reinforcement. If you select <b>Not symmetrical</b> , you can enter separate extension values for the opposite sides of the reinforcement.

Option	Description
<b>Vertical extension</b>	<p>Define the length of the vertical extension for corner bars and side bars outside the reinforced part.</p> <p>The active settings depend on <b>Bar creation: Symmetrical</b> or <b>Not symmetrical</b>.</p>
<b>Horizontal extension</b>	<p>Define the length of the horizontal extension for corner bars and side bars.</p> <p>The active settings depend on <b>Bar creation: Symmetrical</b> or <b>Not symmetrical</b>.</p>
<b>Top corner bar direction</b> <b>Bottom corner bar direction</b>	<p>Select the direction of the corner bars.</p>
<b>Cranking</b>	<p>You can create cranked reinforcing bars at the top and at the bottom of the reinforcement.</p> <p>To activate the cranking options, select  in the <b>Top corner bar direction</b> and <b>Bottom corner bar direction</b> lists. Define the dimensions for the cranked bars.</p>  <p>To successfully create the cranked reinforcing bars, ensure that the bending radius is not too large.</p>

Option	Description
Edge dimensions	<p>Define the edge distance from the reinforced part corner to the point where the cranking starts</p>  <p>Define the cranking separately for the corner bars and the side bars.</p> 

### Side bars tab

Use the **Side bars** tab to control the number of side bars, side bar spacing and placing, symmetry options, and properties.

### Number of side bars



Define the number and spacing of side bars. You can define two sets of side bars on each side of the rectangular reinforcement.

You can define the side bars separately for each side.

The active settings depend on the selected symmetry option.

### Placing of side bars

Select the horizontal and vertical placing for the side bars. Select whether the bars are placed starting from the corner or at equal spaces.

	Distance between corner bars and side bars.
	Distance between side bars.



## Symmetry options



Select the symmetry option. Using the symmetrical conditions you can define which side bars are symmetrical, and which side bars use the same properties.

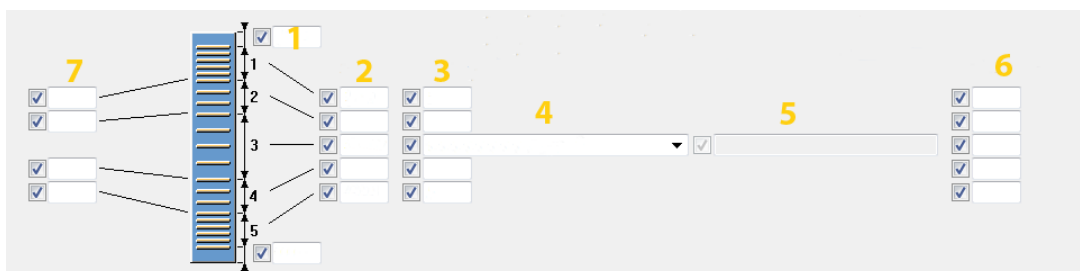
## Side bar properties

Option	Description
<b>Grade</b>	Define the strength of the steel used in the reinforcing bars.
<b>Size</b>	Define the diameter of the reinforcing bar.
<b>Bending radius</b>	Define the bending radius of the side bars.
<b>Class</b>	Use the <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.
<b>Name</b>	Define a name for the side bars. Tekla Structures uses the name in drawings and reports.
<b>Prefix</b>	Define a prefix for the part position number.
<b>Start number</b>	Define a start number for the part position number.

## Stirrups tab

Use the **Stirrups** tab to control the stirrup properties.

## Stirrup dimensions





	Description
<b>1</b>	Define the thickness of the concrete cover over the stirrups at the top and the bottom of the rectangular reinforcement. The default cover thickness is 50 mm.  Group <b>1</b> is the top stirrup group, <b>5</b> is the bottom stirrup group. Group <b>3</b> is always created.
<b>2</b>	Define the spacing of stirrups in each stirrup group.
<b>3</b>	Define the number of stirrups in each stirrup group.
<b>4</b>	Select how the stirrups are distributed.
<b>5</b>	If you select the <b>Distance list</b> option, enter different spacing values for the groups.
<b>6</b>	Define the cover thickness for each stirrup group.
<b>7</b>	Define the gaps between the stirrup groups.

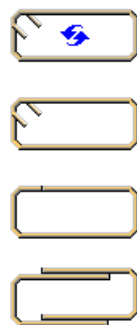
### Create stirrups

Select whether the stirrups are created as individual reinforcing bars, rebar group, or spiral rebar group.



### Rebar lapping at stirrup corners

Select how the rebars lap at the stirrup corners. The options are 135-degree hooks or 90-degree hooks at the bar end, or overlapping U-shape stirrups.



You can define the overlap length for the U-shape stirrups.

### Ignore cuts

If you have a recess or a hole in the reinforced part, you can select to ignore the cuts at the top and the bottom of the part when the stirrups are created.

## Stirrup properties

Option	Description
<b>Grade</b>	Define the strength of the steel used in the reinforcing bars.
<b>Size</b>	Define the diameter of the reinforcing bar.
<b>Name</b>	Define a name for the stirrups. Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use the <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.
<b>Prefix</b>	Define a prefix for the part position number.
<b>Start number</b>	Define a start number for the part position number.
<b>Overlap length</b>	Define the overlap length for the U-shape stirrups.

### Intermediate links tab

Use the **Intermediate links** tab to control the intermediate links to tie all side bars.

Intermediate links are created for each stirrup group.

---

**NOTE** Intermediate links are created between **Side bars 1** or **Side bars 2** that are symmetrical.

For **Side bars 2** intermediate links are created only if no **Side bars 1** are created.

---

### Create as one group





Select whether all the stirrups are created as a single group.

### Properties of intermediate links

Option	Description
<b>Grade</b>	Define the strength of the steel used in the reinforcing bars.
<b>Size</b>	Define the diameter of the reinforcing bar.
<b>Name</b>	Define a name for the stirrups. Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use the <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.
<b>Prefix</b>	Define a prefix for the part position number.

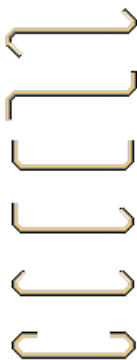
Option	Description
Start number	Define a start number for the part position number.

### Spacing of intermediate links

Option	Description
	Spacing is the same as stirrup spacing.
	Spacing is double the stirrup spacing (intermediate links at every second stirrup).
	Same as above, but for alternate stirrups.
	No intermediate links are created.

### Intermediate link type

Select the type of the link.



### Intermediate link pattern

Select whether intermediate links go in one direction or in a crossing pattern.



### Hook orientation

Select the hook orientation for both sides.

### Closed stirrups as intermediate links

Select whether to use closed stirrups as intermediate links.



If you select closed stirrups, select the type of the bar lapping at the stirrup corners.



### Zone without intermediate links

Define the zone length where intermediate links are not created. In this zone, the stirrups tie the side bars. The distance is measured from the stirrup corner.

If you have selected to use closed stirrups, you can define the distance from the corner of the closed stirrups.

### Top / Bottom tabs

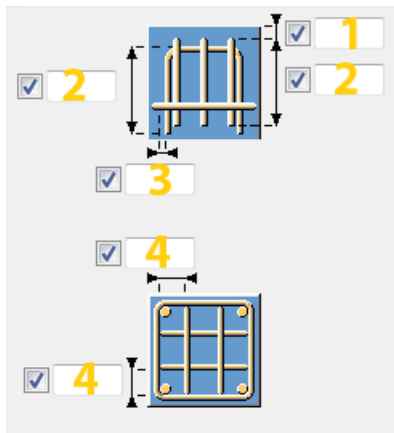
Use the **Top** and **Bottom** tabs to control the top and bottom reinforcement thickness of the concrete cover, number of bars, spacing and rotation.

### Number and spacing of bars

Define the number and spacing of the top or bottom bars.

You can define the number of transverse bars in both cross directions.



### Top / bottom reinforcement



	Description
1	Define the concrete cover thickness from the top / bottom of the rectangular reinforcement.
2	Define the length of the rebar legs.
3	Define the concrete cover thickness from the sides of the rectangular reinforcement.
4	Define the distance from the edge of the rectangular reinforcement to the edge of the first rebar in the group.



### Placing of top or bottom bars

Select the horizontal and vertical placing for the top or bottom bars. Select whether the bars are placed starting from the corner or at equal spaces.

Option	Description
	Distance between corner bars and side bars.
	Distance between side bars.

### Rotation

Select how to rotate the reinforcement at the top or bottom.

Option	Description
	No rotation. Transverse bars are perpendicular to the longer side of the rectangular reinforcement.
	Rotation angle is 90 degrees. Transverse bars are parallel to the longer side of the rectangular reinforcement.

### Top and bottom reinforcement properties

Option	Description
<b>Grade</b>	Define the strength of the steel used in the reinforcing bars.
<b>Size</b>	Define the diameter of the reinforcing bar.
<b>Class</b>	Use the <b>Class</b> to group reinforcement. For example, you can display reinforcement of different classes in different colors.
<b>Name</b>	Define a name for the top or bottom bars. Tekla Structures uses the name in drawings and reports.
<b>Prefix</b>	Define a prefix for the part position number.
<b>Start number</b>	Define a start number for the part position number.

### Rebar assembly tab

Use the **Rebar assembly** tab to add the created reinforcement as a rebar assembly to the cast units.

### Create as rebar assembly

You can add the created reinforcement as a rebar assembly to the cast units with a predefined assembly type, name, prefix, and start number.

Option	Description
<b>Create as rebar assembly</b>	Select <b>Yes</b> to create all reinforcement as one rebar assembly, and to include it to the cast unit of the input part.
<b>Rebar assembly type</b>	Select the rebar assembly type. If you do not select the type, the default value of the rebar assembly is used.
<b>Name, Profile, Start number</b>	Define the name, profile, and start number. If you do not define these, the default values of the rebar assembly are used.

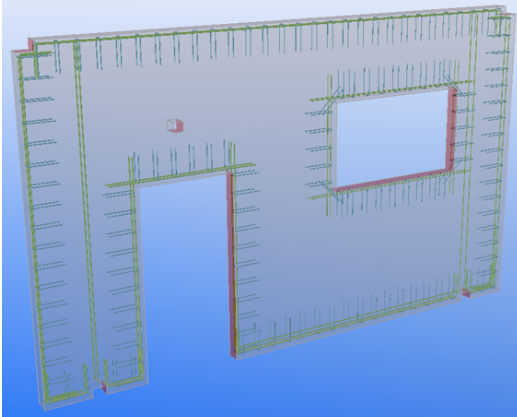
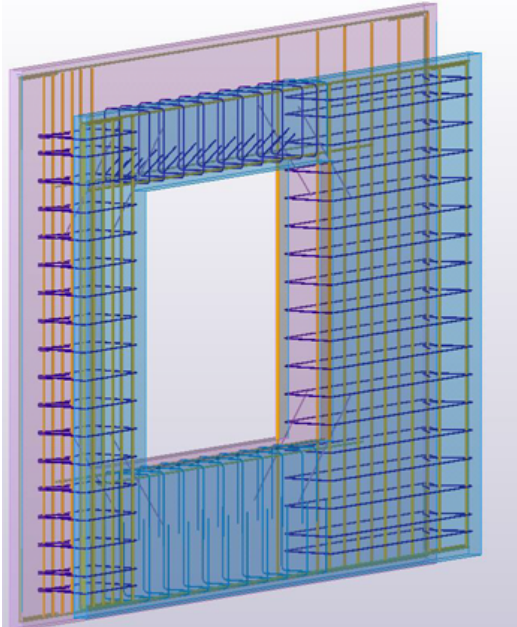
### ***Wall panel reinforcement / Double wall edge and opening reinforcement***

**Wall panel reinforcement** is used for detailing single precast wall panels. It includes the reinforcement for the panel edges, around the openings, a mesh for the whole panel and additional bars, for example, with a wall shoe connection. **Double wall edge and opening reinforcement** is used for detailing double walls by connecting two panels to each other. It includes the reinforcement for the panel edges and around the openings.

#### **Objects created**

- Reinforcement
- Stirrups
- Mesh (for single panels)

**Use for**


Situation	Description
	<p>Wall panel reinforcement with openings and reinforcement in the panel edges and around openings.</p>
	<p>Double wall with opening and reinforcement around the opening.            Ring reinforcement goes around both shells.            All reinforcing bars that connect the shells (U-bars and stirrups) are attached to the shell that is selected at creation.            Ring, beam and column reinforcing bars are attached to the selected shell that has been the input.</p>

**Selection order**




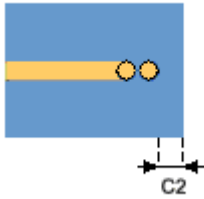
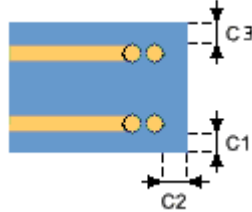
1. Select the concrete part to reinforce.  
 The reinforcement is created automatically.

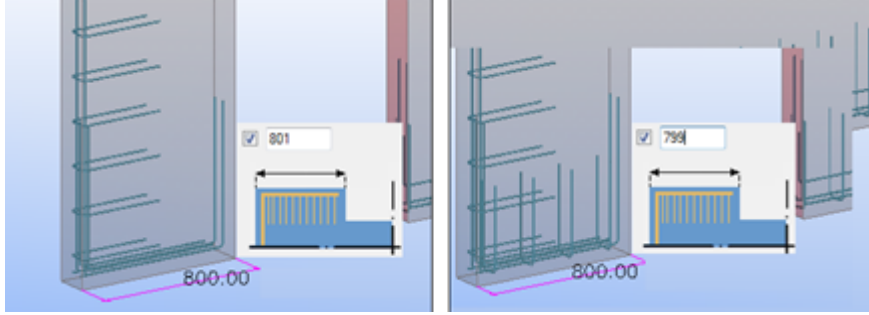
**Picture tab**

Use the **Picture** tab to select how the corners of a wall panel are reinforced.

Option	Description	
<p><b>Corner reinforcement</b></p>	<p>Select how the corners are reinforced and the bar is offset on both sides of the corner.</p>	







Option	Description	
		
		
		
<b>Minimum breaking distance</b>	Cuts smaller than this value are ignored and the reinforcing bars are not cut.	
<b>Rebar count</b>		Creates a single layer of reinforcement.
		Creates two layers of reinforcement.
<b>Cover thickness</b>	Distance from the edge of the wall panel to the side of the outermost bar.	
<b>Door minimum height</b>	Cuts greater than this value are considered as door openings and the additional reinforcing bars that are needed, for example, in shoe connections are not created.	
<b>Minimum bar length</b>	Edge bars shorter than this value are not created.	
<b>Create stirrups priority</b>	Select whether horizontal or vertical reinforcing bars are on top.	

Option	Description
<b>Minimum edge length</b>	<p>The edge stirrups are not created if the dimension is less than the defined minimum value.</p> 
<b>Create reinforcement in</b>	<p>Select whether the reinforcement is created in the selected part or in the entire cast unit. This setting is available in <b>Wall panel reinforcement</b>.</p>
<b>Longitudinal overhangs</b>	<p>Select <b>Target</b> to create variable overhang lengths. This creates meshes as full length meshes minus the cover thickness. Select <b>Exact</b> to create centered meshes with a fixed overhang length.</p>
<b>Minimum gap</b>	<p>Define the gap between the meshes in the corners.</p>

#### Reinforcement tab

Use the **Reinforcement** tab to create the reinforcing bars around the wall panel edges.


Option	Description	
<b>Wall panel edge reinforcement type</b>		<p>Creates normal reinforcement.</p>




Option	Description	
		Creates U reinforcement.
		No reinforcement is created.
		Creates stirrups.
<b>Mesh</b>	<p>Select whether a mesh is created for the whole panel.</p> <p>If a mesh is created, you can define the mesh properties, or use custom settings.</p> <p>You can use the <b>Mesh Bars</b> component to create the mesh.</p> <p>This option is available in <b>Wall panel reinforcement</b>.</p>	
<b>Create edge reinforcement</b>	<p>Select whether reinforcement is created at the edges.</p> <p>If you select <b>Yes</b>, define the horizontal and vertical reinforcing bar properties.</p> <p>This option is available in <b>Double wall edge and opening reinforcement</b>.</p>	

Option	Description																				
<b>Horizontal reinforcing bars</b>	<p>Define the horizontal reinforcing bar properties for the wall panel edges.</p> <p>Note that horizontal bars have three sets of properties, depending on the length of the bar.</p> <p>For example, if the length of the main bar is less than 3000, it uses the options on the left, if in between 3000 and 6000, the middle options and if greater than 6000, the options on the right.</p> <div style="border: 1px solid #ccc; padding: 5px; margin: 10px 0;"> <p style="margin: 0;">Horizontal reinforcing bars</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;"></td> <td style="width: 33%; text-align: center;">L &lt;= <input checked="" type="checkbox"/> 3000.00</td> <td style="width: 33%; text-align: center;">&lt; L &lt;= <input checked="" type="checkbox"/> 6000.00</td> <td style="width: 33%; text-align: center;">&lt; L</td> </tr> <tr> <td>Size</td> <td><input checked="" type="checkbox"/> 8 <input type="text" value="..."/></td> <td><input checked="" type="checkbox"/> 10 <input type="text" value="..."/></td> <td><input checked="" type="checkbox"/> 10 <input type="text" value="..."/></td> </tr> <tr> <td>Grade</td> <td><input checked="" type="checkbox"/> A</td> <td><input checked="" type="checkbox"/> A</td> <td><input checked="" type="checkbox"/> A</td> </tr> <tr> <td>Bending radius</td> <td><input checked="" type="checkbox"/> 16.00</td> <td><input checked="" type="checkbox"/> 20.00</td> <td><input checked="" type="checkbox"/> 20.00</td> </tr> <tr> <td>Splice length</td> <td><input checked="" type="checkbox"/> <input type="text" value=""/></td> <td><input checked="" type="checkbox"/> <input type="text" value=""/></td> <td><input checked="" type="checkbox"/> <input type="text" value=""/></td> </tr> </table> </div>		L <= <input checked="" type="checkbox"/> 3000.00	< L <= <input checked="" type="checkbox"/> 6000.00	< L	Size	<input checked="" type="checkbox"/> 8 <input type="text" value="..."/>	<input checked="" type="checkbox"/> 10 <input type="text" value="..."/>	<input checked="" type="checkbox"/> 10 <input type="text" value="..."/>	Grade	<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	Bending radius	<input checked="" type="checkbox"/> 16.00	<input checked="" type="checkbox"/> 20.00	<input checked="" type="checkbox"/> 20.00	Splice length	<input checked="" type="checkbox"/> <input type="text" value=""/>	<input checked="" type="checkbox"/> <input type="text" value=""/>	<input checked="" type="checkbox"/> <input type="text" value=""/>
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<b>Vertical reinforcing bars</b>	<p>Define the vertical reinforcing bar properties for the wall panel edges.</p> <p>Note that vertical bars have two sets of properties, depending on the length of the bar.</p>																				
<b>U Reinforcement</b>	<p>Select whether to create U rebars and stirrups as a rebar group, or as bent meshes. The bent meshes are always created in the outer layer of the reinforcement.</p> <p>Define the U reinforcing bar properties.</p> <p>Each side of the wall panel has a separate set of U reinforcing bar properties.</p>																				

### Opening tab


Use the **Opening** tab to create the reinforcing bars around the wall panel window and door openings.




Option	Description	
<b>Opening reinforcement type</b>		<p>Can be set for all four opening edges.</p> <p>Creates normal reinforcement.</p>

Option	Description	
		Creates U reinforcement.
		No reinforcement is created.
		Creates stirrups.
<b>Horizontal reinforcing bars</b>	Define the horizontal reinforcing bar properties. Note that horizontal bars have separate sets of properties for the top and the bottom bars.	
<b>Vertical reinforcing bars</b>	Define the vertical reinforcing bar properties.	
<b>U Reinforcement</b>	Select whether to create U rebars and stirrups as a rebar group, or as bent meshes. The bent meshes are always created in the outer layer of the reinforcement.  Define the U reinforcing bar properties.  Each side of the opening has a separate set of U reinforcing bar properties.	

### Door tab


Use the **Door** tab to define the door reinforcement.




Option	Description	
<b>Door reinforcement type</b>		Can be set for all three edges.  Creates normal reinforcement.

Option	Description	
		Creates U reinforcement.
		No reinforcement is created.
		Creates stirrups.
<b>Horizontal reinforcing bars</b>	Define the horizontal reinforcing bar properties.	
<b>Vertical reinforcing bars</b>	Define the vertical reinforcing bar properties.	
<b>U Reinforcement</b>	<p>Select whether to create U rebars and stirrups as a rebar group, or as bent meshes. The bent meshes are always created in the outer layer of the reinforcement.</p> <p>Define the U reinforcing bar properties.</p> <p>Each side of the door has a separate set of U reinforcing bar properties.</p>	

### Notch tab

Use the **Notch** tab to define the notch reinforcement.

Option	Description	
<b>Notch reinforcement type</b>	Can be set for two edges.	
		Creates normal reinforcement.

Option	Description	
		Creates U reinforcement.
		No reinforcement is created.
		Creates stirrups.
<b>Horizontal reinforcing bars</b>	Define the horizontal reinforcing bar properties.	
<b>Vertical reinforcing bars</b>	Define the vertical reinforcing bar properties.	
<b>U Reinforcement</b>	<p>Select whether to create U rebars and stirrups as a rebar group, or as bent meshes. The bent meshes are always created in the outer layer of the reinforcement.</p> <p>Define the U reinforcing bar properties.</p> <p>Each side of the notch has a separate set of U reinforcing bar properties.</p>	

### Diagonals tab

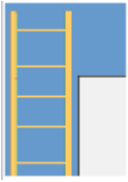
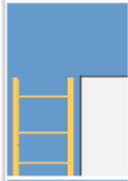
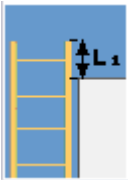
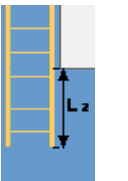
Use the **Diagonals** tab to create diagonal reinforcing bars at the corners of the openings.

Option	Description
<b>Create diagonals</b>	Select whether diagonal reinforcing bars are created or not.
<b>Diagonals count</b>	Number of diagonal reinforcing bars.
<b>Size</b>	Select the diameter of a bar.
<b>Grade</b>	Define the strength of the steel used in the bars.

Option	Description
<b>Bending radius</b>	Define the bar bending radius.
<b>L1 and L2</b>	L1 + L2: Length of the diagonal reinforcing bars.
<b>C</b>	Distance between the diagonal reinforcing bar and the corner of the opening.

### Column tab

Use the **Column** tab to create column reinforcement.

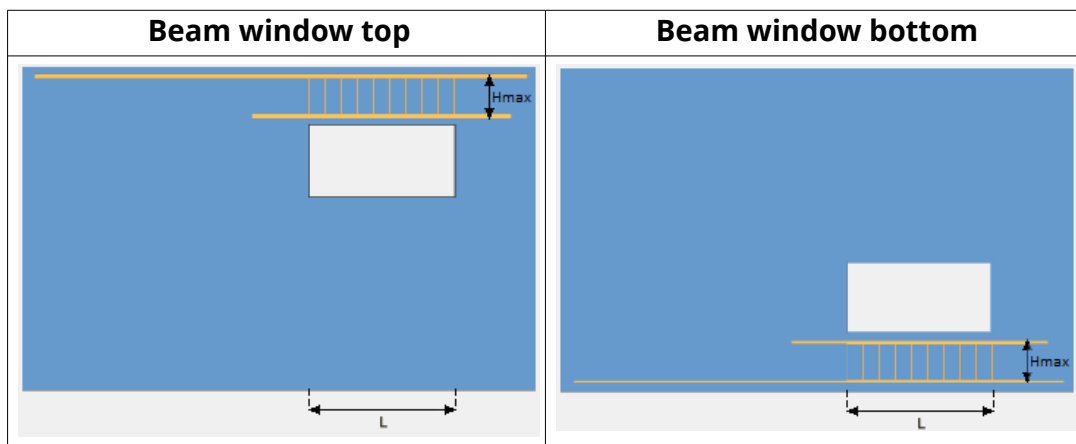
Option	Description
<b>Column reinforcement</b>	 <p>Column reinforcement is as high as the part.</p>
	 <p>Column reinforcement does not reach higher than the top edge of opening.</p>
	 <p>Column reinforcement is approximately the <b>L</b> value higher than opening edge.</p>
	 <p>Column reinforcement is approximately the <b>L</b> value lower than the opening edge.</p>
<b>Column reinforcement properties</b>	<p>Select whether column reinforcing bars are created or not.</p> <ul style="list-style-type: none"> <li>• <b>Minimum column height H:</b> cuts and openings smaller than the minimum value are not taken into account in the column creation.</li> <li>• <b>Maximum column width B:</b> if the width between two openings or cuts or edges is greater than the maximum value, then the column reinforcement is not created.</li> <li>• <b>Column height offset L1:</b> distance between the column reinforcement end and the opening edge.</li> <li>• <b>Column height offset L2:</b> same as L1 but for the bottom part of column reinforcement.</li> </ul>



Option	Description
<b>Main reinforcing bars</b>	Define the main reinforcing bar properties. Note that main bars have three sets of properties, depending on the width of the column.
<b>Stirrup type</b>	Select the stirrup type.
<b>Reinforcing stirrups</b>	Select whether to create rebar stirrups as a rebar group, or as bent meshes. The bent meshes are always created in the outer layer of the reinforcement.  Define the stirrup properties.  Note that stirrups have three sets of properties, depending on the width of the column.

#### Beam window top / Beam window bottom tab

Use the **Beam window top** and **Beam window bottom** tabs to create a beam reinforcement on top of the opening and below the opening.



Option	Description
<b>Beam reinforcement properties</b>	Select whether beam reinforcing bars are created or not. <ul style="list-style-type: none"> <li>• <b>Maximum beam height Hmax:</b> distance from the edge of the wall to the edge of the opening. If the height is greater than the maximum, then the beam reinforcement is not created.</li> <li>• <b>Minimum beam length Lmin:</b> distance between the sides of the opening. If the width of the opening is less than the minimum, then the beam reinforcement is not created.</li> </ul>

Option	Description
<b>Top</b>	Define the beam top reinforcement properties. Note that the reinforcing bars have two sets of properties, depending on the length of the beam.
<b>Bottom</b>	Define the beam bottom reinforcement properties. Note that the reinforcing bars have two sets of properties, depending on the length of the beam.
<b>Stirrup type</b>	Select whether to create stirrups as a rebar group, or as bent meshes. The bent meshes are always created in the outer layer of the reinforcement.  Select the stirrup type.
<b>Reinforcing stirrups</b>	Define the stirrup properties. Note that stirrups have two sets of properties, depending on the length of the beam.

#### **Additional tab**

Use the **Additional** tab to create additional horizontal and vertical reinforcing bars.

Option	Description
<b>Additional reinforcing bars</b>	Select whether additional reinforcing bars are created or not.  Define the additional reinforcing bar properties.

#### **Attributes tab**

Use the **Attributes** tab to control the reinforcing bar properties of the created parts.

Option	Description
<b>Prefix</b>	Define a prefix for the part position number.
<b>Start number</b>	Define a start number for the part position number.
<b>Name</b>	Define a name for the part.  Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Define the part class number.

#### **Multiple Wire Size Mesh**

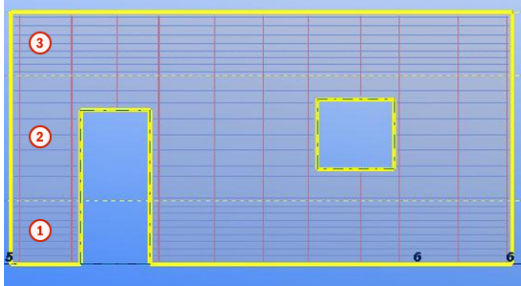
**Multiple Wire Size Mesh** creates reinforcement meshes with multiple reinforcing bar sizes. The created reinforcement mesh is optimized for a mesh welding machine. **Multiple Wire Size Mesh** can be used for slabs and wall

panels. The slabs and wall panels can be of any polygonal shape with any number of openings. The reinforcing bars in the mesh can be of different size, and the spacings between the bars can vary.

### Objects created

- Reinforcement meshes

### Use for

Situation	Description
	<p>Three zones of longitudinal reinforcing bars</p>

### Before you start

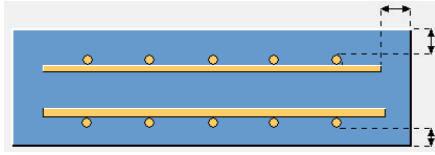
Create a polygon slab or a wall panel with any number of openings. Enter zone values to define the width of the area to be reinforced in both the longitudinal and crossing directions. Each direction can be divided up to five zones.

### Selection order

1. Select the main part (slab or wall panel).  
The reinforcement mesh is created automatically.

### Mesh Parameters tab

Use the **Mesh Parameters** tab to control the mesh creation and cover thickness.

Option	Description
	<p>Define the concrete cover thickness.</p>
<p><b>Create Rebars</b></p>	<p>Define to which side of the slab or the wall panel the reinforcing bars are created.</p>
<p><b>Longitudinal Direction</b></p>	<p>Define whether the x or the y direction is used as the longitudinal direction when the reinforcing bars are created.</p> <p>By default, the x direction is the longitudinal direction.</p>

### Longitudinal Wires/Crossing Wires tab

Use the **Longitudinal Wires** or the **Crossing Wires** tab to control the mesh creation in the longitudinal or the crossing direction, and the reinforcement zones.

Option	Description
<b>Wire sizes</b>	Define the sizes of the reinforcing bars used in the pattern. Separate the sizes with a space.
<b>Min overhang</b>	Define the minimum length of the reinforcing bar extension.
<b>Max overhang</b>	Define the maximum length of the reinforcing bar extension.
<b>Min spacing</b>	Define the minimum space between the reinforcing bars. The value must be divisible by the grid size. For example, if the <b>Min spacing</b> is 150, <b>Max spacing</b> is 300 and the <b>Grid size</b> is 50, the spacings are 150, 200, 250 and 300.
<b>Max spacing</b>	Define the maximum space between the reinforcing bars. The value must be divisible by the grid size. For example, if the <b>Min spacing</b> is 150, <b>Max spacing</b> is 300 and the <b>Grid size</b> is 50, the spacings are 150, 200, 250 and 300
<b>Grid size</b>	Define the mesh grid size. For example, if the <b>Min spacing</b> is 150, <b>Max spacing</b> is 300 and the <b>Grid size</b> is 50, the spacings are 150, 200, 250 and 300. This value depends on the welding machine.
<b>Min wire length</b>	Define the minimum reinforcing bar length.
<b>Min number of welding points</b>	Define the minimum number of crossing reinforcing bar intersections.
<b>Pattern width to fulfill</b>	Define the width of the pattern that is filled with the mesh. This value is used when the zone width is greater than the given value.
<b>Zone width value type</b>	Define the width of the area to be reinforced as a percentage of the whole slab or wall panel width, or as the actual length.

Option	Description
<b>Width, Real width, Mesh area per length</b>	Define the mesh width, real width and area per length in each zone.
<b>Load pattern from file</b>	Select the external text file where you have defined the patterns for longitudinal and crossing reinforcing bars.  If you use the external patterns file, <b>Multiple Wire Size Mesh</b> tries to determine a pattern with a suitable area per length value for every zone and apply these values to the zones.

#### Attributes tab

Use the **Attributes** tab to control the reinforcement properties in the longitudinal and in the crossing directions.

Option	Description
<b>Prefix</b>	Define a prefix for the part position number.
<b>Start Number</b>	Define a starting number for the part position number.
<b>Grade</b>	Define the strength of the steel used in the reinforcing bars.
<b>Name</b>	Define a name for the longitudinal and the crossing reinforcing bars.  Tekla Structures uses the name in drawings and reports.
<b>Class</b>	Use <b>Class</b> to group the longitudinal and the crossing reinforcing bars.  For example, you can display the longitudinal and the crossing reinforcing bars of different classes in different colors.

#### Configuration file for reinforcing bar patterns

Use an external text file to define the patterns for longitudinal and crossing reinforcing bars.

Every pattern starts from the **Pattern** line, followed by, for example, the pattern name. Each **Bar Size** and **Spacing** pair is on a separate row. The **Bar Size** and **Spacing** values are separated by a space.

The file has the following format:

```
< Pattern > < Name >
<Bar Size> <Spacing>
<Bar Size> <Spacing>
```

.....  
<Bar Size> <Spacing>

### **Examples**

#### **Pattern 1**

10 200

10 200

8 100

8 300

10 400

#### **Pattern 2**

10 200

10 200

8 100

8 100

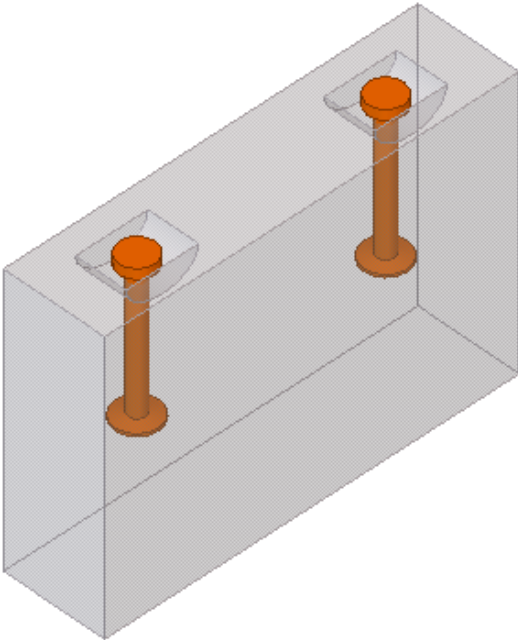
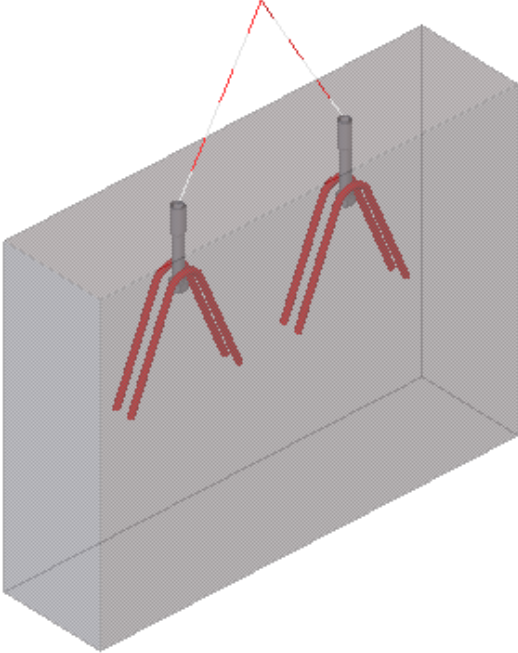
### ***Embedded anchors (8)***

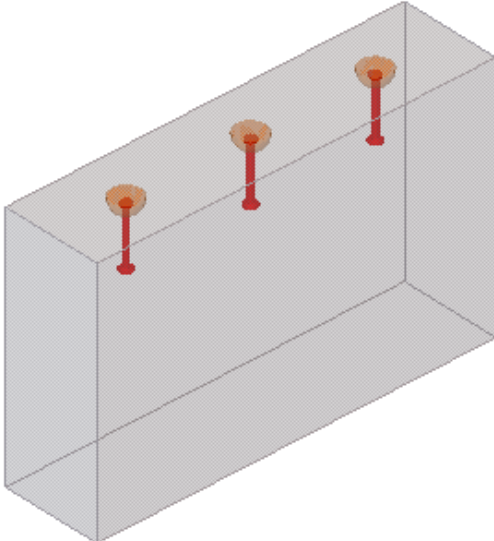
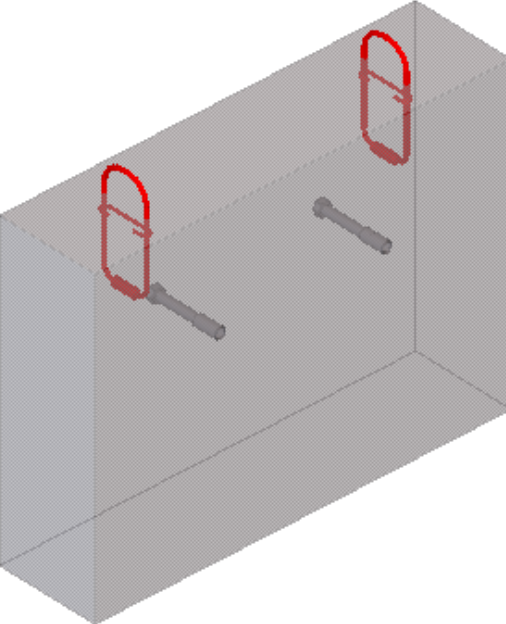
**Embedded anchors (8)** creates one or more embeds in a concrete part.

#### **Objects created**

- Embeds
- Thickening parts
- Reinforcing bars
- Hangup bars
- Crane cables

**Use for**

<b>Situation</b>	<b>Description</b>
 A 3D perspective view of a grey rectangular concrete block. Two custom anchors are embedded in the top surface. Each anchor consists of a vertical orange cylindrical stem with a circular orange base at the bottom. The top of each stem is capped with a square, flat orange plate. The anchors are positioned at different depths within the concrete block.	<p>Two custom anchors.</p>
 A 3D perspective view of a grey rectangular concrete block. Two bolt anchors are embedded in the top surface. Each anchor has a vertical grey stem with a circular grey base at the bottom. From the top of each stem, three red hanger bars extend downwards and outwards. Two red crane cables are attached to the top of the stems, forming a triangular shape above the concrete block.	<p>Bolt anchors that are custom parts, hanger bars and crane cables.</p>

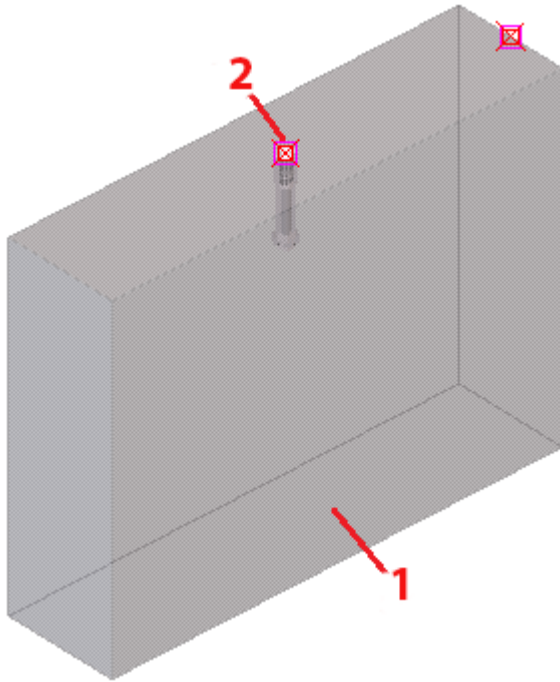
Situation	Description
	<p>Cast-in lifting anchors that are custom parts.</p>
	<p>Cast-in wire rope lifting hoops that are custom parts. Adjusting anchors are in the front side. The component is applied two times.</p>

**Selection order**

1. Select a concrete part.
2. Pick one point to position the embed.  
You can also select multiple points, depending on how the embeds are divided.
3. Click the middle mouse button to create the embeds.



## Part identification key



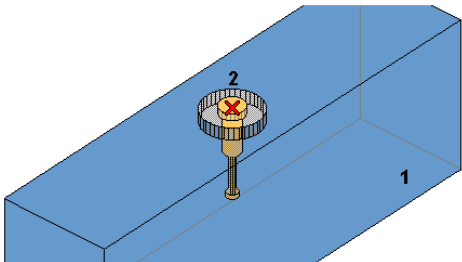
	<b>Part</b>
<b>1</b>	Concrete part (wall, column, beam, slab)
<b>2</b>	Point You can select multiple points.

### Input tab

Use the **Input** tab to control the custom parts used for the embeds, the input points for placing the embeds and the component direction properties.

### Input point sequence

Select the distribution method for the embeds. You can also adjust the placement of embeds on the **Input** tab.

<b>Option</b>	<b>Description</b>
 A 3D perspective view of a blue rectangular concrete part. A yellow and black embed is shown protruding from the top surface. A red-outlined icon with a white 'X' inside, labeled '2', is positioned on the top surface of the embed. A red arrow labeled '1' points to the bottom surface of the concrete part.	Select a concrete part and pick one position point for the anchor.

Option	Description
	Select a concrete part and pick multiple position points for the anchors.
	Select a concrete part and pick three points to define the plane. Pick a point to place the embed.
	Select a concrete part and pick three points to define the plane. Pick multiple points to place the embeds.

### Up direction

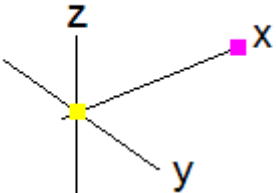
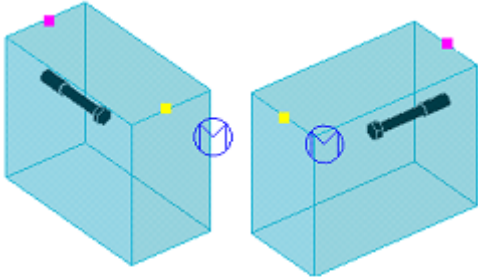
Define how the embeds are rotated.

This option is not available if the three-point-plane option is selected from the **Input points sequence** list.

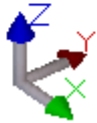
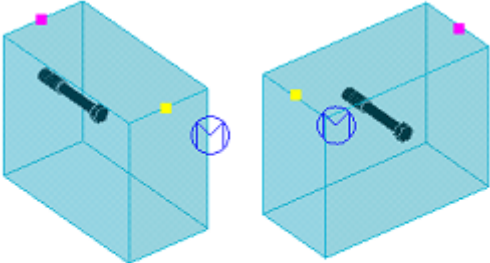
You can use the global directions +X,-X,+Y,-Y,+Z,-Z or the local directions +X,-X,+Y,-Y,+Z,-Z to define a specific face of a typical cube-shaped (slab, wall, beam or column) part.

Alternatively, you can use the **Top in form face** option. This option aligns the embedded anchors with the top form face of the cast unit.

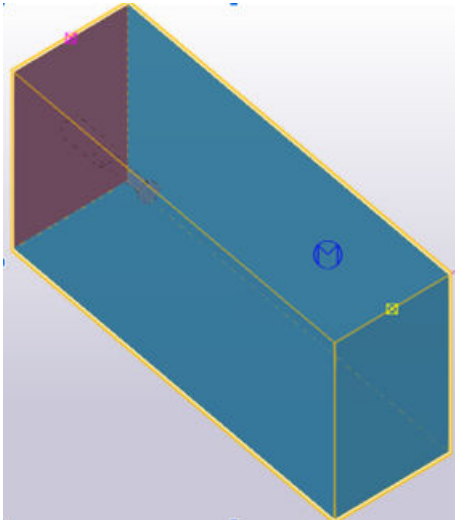
-X local:



+X global:



Top in form face:



## Embed handling

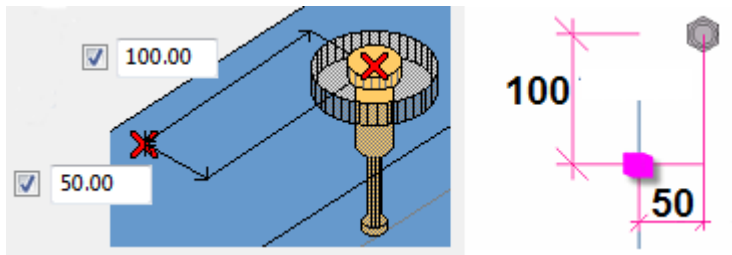


Select whether the embed is handled as a detail or as a modeling tool.

In general, a detail uses the shape of the main part for positioning the embeds, and a modeling tool uses the picked points for positioning the embeds.

## Embed offset

Define embed offsets in X- and/or Y-direction, from the picked position points.



## Anchor type

Select the type of the anchors from the **Anchor type** dropdown list. The options are:

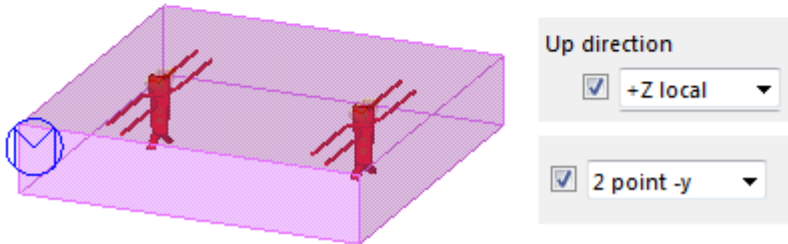
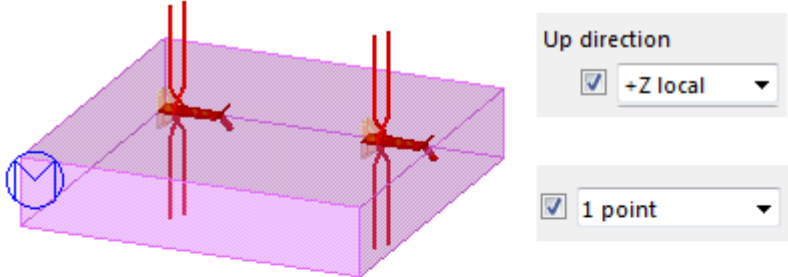
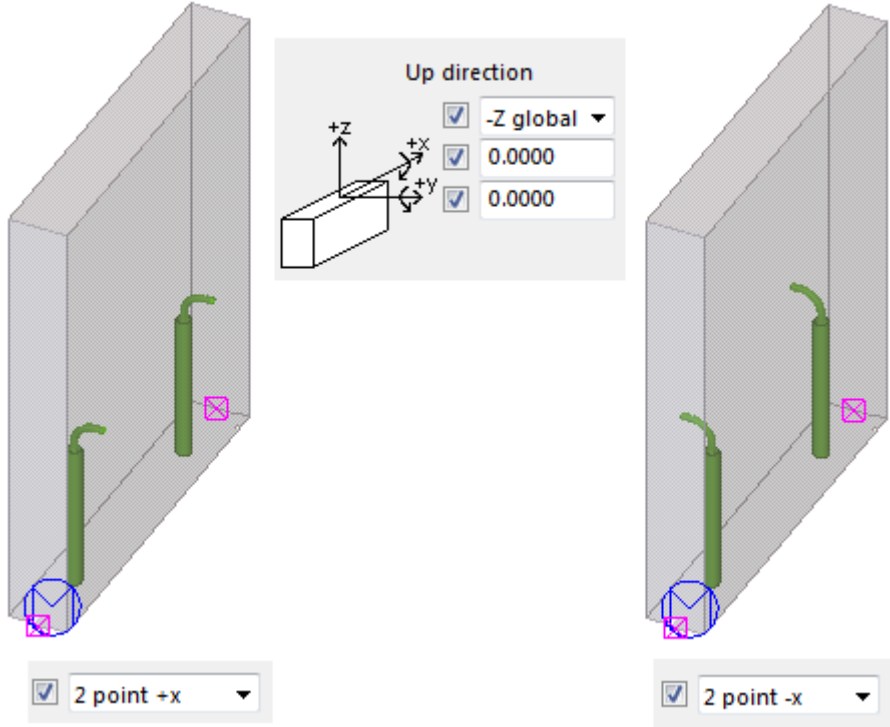
- **Anchor created by top part and bottom part**
- **Component part**
- **Component detail**
- **Surface treatment**
- **Component part and component detail**
- **Component part and top and bottom part**
- **Component detail and top and bottom part**

## Custom part

Option	Description
<b>Partname component</b>	<ol style="list-style-type: none"><li>1. Select a custom part from the <b>Applications &amp; components</b> catalog to be used as embed.</li><li>2. Select the configuration file.</li></ol>

Option	Description
	<p>3. Select whether the custom parts must be used for the embeds.</p> <ul style="list-style-type: none"> <li>• If set to <b>Do not connect</b>, define the embeds' shape on the <b>Input</b> tab.</li> <li>• Use the other options to connect the custom part to the main part as welded, added material, add to cast unit, or add as sub-assembly.</li> </ul> <p>4. Select how the embeds are rotated. The default direction is <b>2 point +x</b>.</p> <p>5. Select how the embeds are rotated around a position point.</p> <div style="text-align: center;"> </div> <p>6. Check the top in form face in direction to adapt the direction of the custom part.</p>
<b>Detailname component</b>	<ol style="list-style-type: none"> <li>1. Select a custom detail from the <b>Applications &amp; components</b> catalog to be used as embed.</li> <li>2. Select the configuration file.</li> </ol>
<b>Surface treatment</b>	<ol style="list-style-type: none"> <li>1. Define the thickness, width, and height of the surface treatment.</li> <li>2. Enter the name, color, and subtype.</li> </ol>

**Custom part positioning examples**



### Placement tab


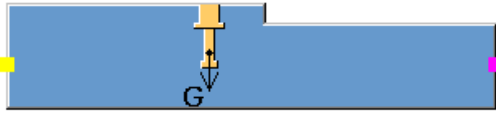
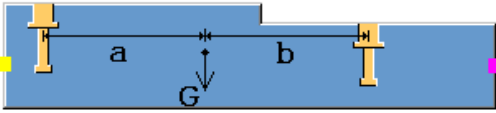
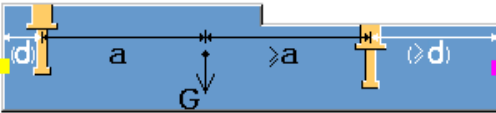
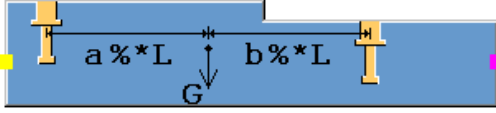
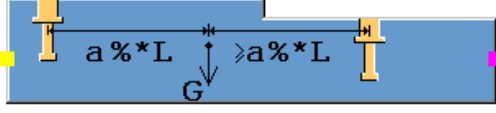
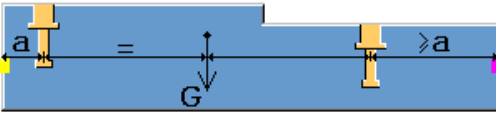
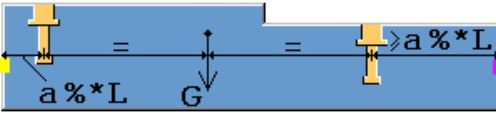
Use the **Placement** tab to control the placing of the embeds, crane cable angles and safety factor properties and to select the lifting anchors.

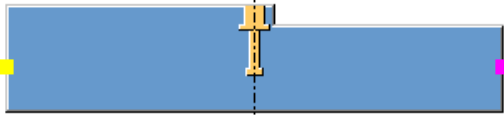
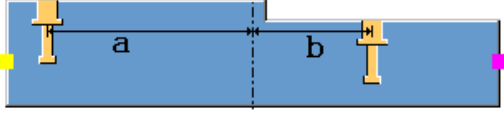
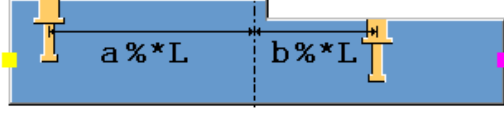


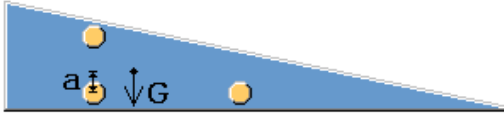
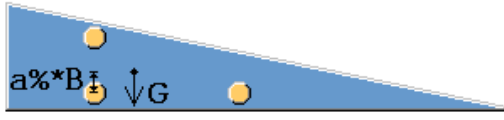
You can define the input point sequence, lift system and embed dimensions both in reference line and cross section direction.

### Input points sequence

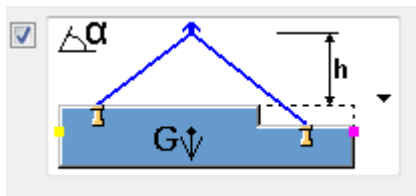
Select the distribution method of the embeds.

Use the **a** and **b** boxes on the right to enter the values.

Option	Description
	Embed is placed on a selected position point.
	Embed is placed on a center of gravity (COG) point in the part length direction.
	Multiple embeds. Define dimensions <b>a</b> and <b>b</b> . Reference = COG
	Define dimensions <b>a</b> and <b>b</b> . Reference = COG If embeds are likely to be placed outside the part, then value <b>d</b> is used.
	Define dimensions <b>a</b> and <b>b</b> as percentages of the part length. Reference = COG
	Define dimension <b>a</b> as a percentage of the part length. Reference = COG
	Define dimension <b>a</b> . The right embed is calculated from COG.
	Define dimension <b>a</b> as a percentage of the total part length. Reference = COG

Option	Description
	Embed is placed in the middle of the part.
	Define dimensions <b>a</b> and <b>b</b> . Reference = middle of the part
	Define dimensions <b>a</b> and <b>b</b> as percentages of the part length. Reference = middle of the part
	Define dimensions <b>a</b> and <b>b</b> . The distances are from the embeds to the part ends.
	Define dimensions <b>a</b> and <b>b</b> as percentages of the part length. The distances are from the embeds to the part ends.
	Three embeds in a triangular plate. Define the vertical distance <b>a</b> from COG.
	Three embeds in a triangular plate. Define the vertical distance <b>a</b> from COG as a percentage of the width <b>b</b> .

### Lift system



Select the crane cable lifting system.

### Dimensions

Option	Description
<b>a</b>	Define embed dimension <b>a</b> .
<b>b</b>	Define embed dimension <b>b</b> .

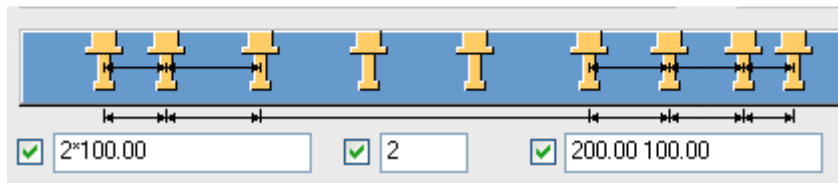
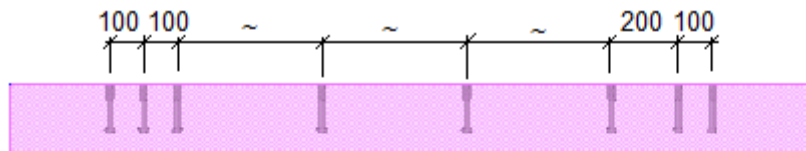


Option	Description
<b>c</b>	Define distance <b>c</b> .
<b>d</b>	Define anchor distance from the part edge.
<b>h</b>	Define crane cable height.
<b><math>\alpha</math></b>	Define crane cable angle <b><math>\alpha</math></b> .
<b><math>\beta</math></b>	Define cable angle <b><math>\beta</math></b> .
<b>Rounding</b>	Define the rounding value for anchor distances.

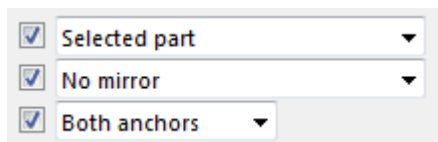
### Additional embeds

Define additional embeds. Use the boxes on the left and right to define distances. You can enter multiple distances. Use a space to separate the values.

Use the middle box to define the number of additional embeds.



### Mirroring



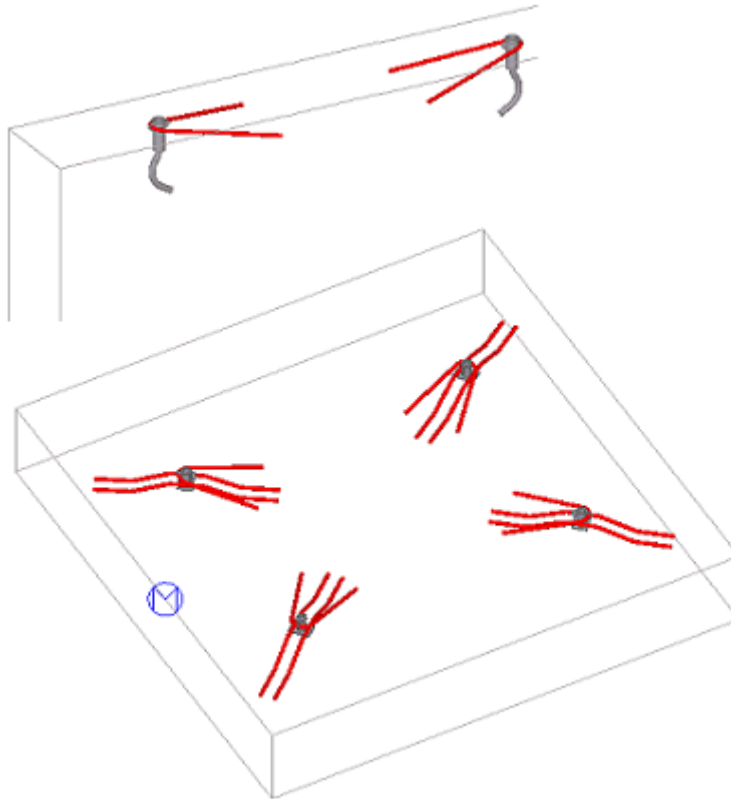
- Define the COG (center of gravity) for the selected parts, all connected parts, all connected parts without steel, an assembly, or assembly without steel parts.

**All connected parts** and **All connected parts without steel** include parts connected by bolts and welds.

**Assembly** and **Assembly without steel parts** include the parts in the current assembly only.

- Select whether embeds are mirrored.

Mirroring is useful for asymmetric custom part embeds. You can mirror and flip both in the reference line direction and cross section direction, and rotate anchors and horizontal bars based on the lifting direction.



- Select whether both anchors are created, or only left or right anchor.

### **Lift.dat configuration file**

You can use a configuration file to calculate the lifting capacities of lifting anchors.

Set **Browse configuration file** to **Yes**, and define the full path to the configuration file. The default file is `lift.dat`, located in the `profil` folder.

The `lift.dat` configuration file contains a list of all custom lifting anchors belonging to the default Tekla Structures installation. The anchors are sorted based on fabricator and type, component name and lifting capacity. You can add more custom components to the list in the configuration file. The file can be opened in any text editor, for example Notepad.

```

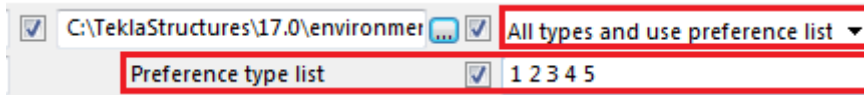
lift.dat - Kladblok
File Edit Format View Help
//Type  Type-client      Name CuCoPa      Lift-force ^ (kg)
//-----
// PFEIFER-Plaatstaalanker
1  PFEIFER-Plaatanker  pfeifer_HP-Rd12_0-5T      500
1  PFEIFER-Plaatanker  pfeifer_HP-Rd16_1-2T      1200
1  PFEIFER-Plaatanker  pfeifer_HP-Rd20_2-0T      2000
1  PFEIFER-Plaatanker  pfeifer_HP-Rd24_2-5T      2500
1  PFEIFER-Plaatanker  pfeifer_HP-Rd30_4-0T      4000
1  PFEIFER-Plaatanker  pfeifer_HP-Rd36_6-3T      6300
// PFEIFER-Golfanker
2  PFEIFER-Golfanker  pfeifer_HA-Rd12_0-5T      500
2  PFEIFER-Golfanker  pfeifer_HA-Rd16_1-2T      1200
2  PFEIFER-Golfanker  pfeifer_HA-Rd20_2-0T      2000
2  PFEIFER-Golfanker  pfeifer_HA-Rd24_2-5T      2500
2  PFEIFER-Golfanker  pfeifer_HA-Rd30_4-0T      4000
2  PFEIFER-Golfanker  pfeifer_HA-Rd36_6-3T      6300
2  PFEIFER-Golfanker  pfeifer_HA-Rd42_8-0T      8000
2  PFEIFER-Golfanker  pfeifer_HA-Rd52_12-5T     12500
2  PFEIFER-Golfanker  pfeifer_HA-Rd56_15-0T     15000
2  PFEIFER-Golfanker  pfeifer_HA-Rd60_20-0T     12500
// PFEIFER - Hijsslussen
3  PFEIFER-Hijslus    pfeifer_BS_0-8T          800
3  PFEIFER-Hijslus    pfeifer_BS_1-2T          1200
3  PFEIFER-Hijslus    pfeifer_BS_1-6T          1600
3  PFEIFER-Hijslus    pfeifer_BS_2-0T          2000
3  PFEIFER-Hijslus    pfeifer_BS_2-5T          2500
3  PFEIFER-Hijslus    pfeifer_BS_4-0T          4000
3  PFEIFER-Hijslus    pfeifer_BS_5-2T          5200
3  PFEIFER-Hijslus    pfeifer_BS_6-3T          6300
3  PFEIFER-Hijslus    pfeifer_BS_8-0T          8000

```

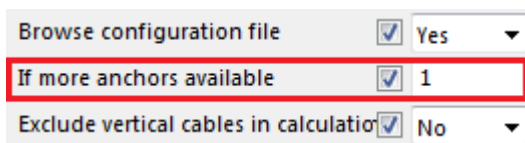
- **Type**  
Groups where lifting anchors can be selected.
- **Type client**  
Description of types.
- **Name CuCoPa**  
Name of custom component part as listed in the **Applications & components** catalog.
- **Lift force (kg)**  
Lifting capacity in kilograms.
- **Dir**  
Direction. Component direction during creation of custom component part.
- **Attribute file**  
Link to the configuration file.

The anchor type can be selected from the list. The first list option corresponds to the first type (1) in the `lift.dat` configuration file.

The last list option is **All types and use preference list**. This option searches from all groups. A preference can be defined in the **Preference type list**. Start with the highest preference group and separate the groups with a space.



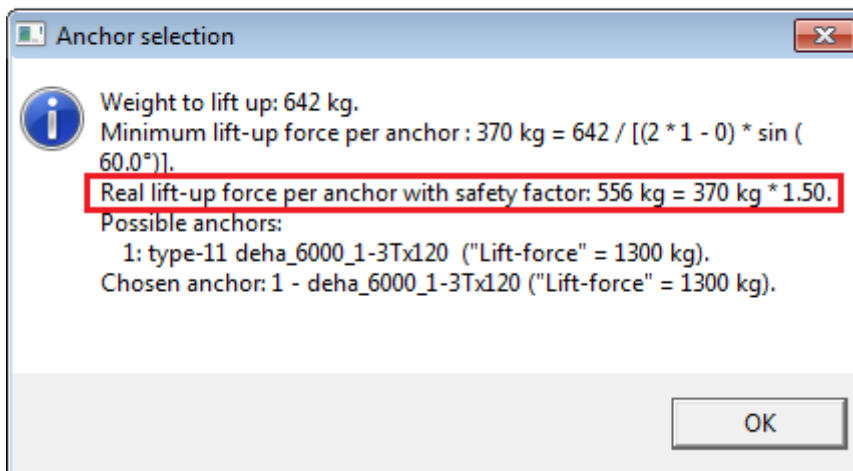
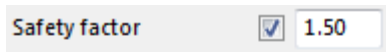
Several fabricators have lifting anchors with the same lifting capacity, but with different anchor lengths. Use the order in the configuration file to define which anchor is selected. First found anchor with correct capacity = 1, second found anchor = 2, and so on.



**NOTE** If you have selected to use a custom part, ensure that the corresponding custom parts are available in the model. Names of the custom parts should not contain spaces, because they are not read from the `lift.dat` configuration file.

## Safety factor

Define the safety factor. The weight to be lifted up is multiplied with this factor in the anchor calculation.



## Braced girder

Select to move the anchors to the closest braced girder in **Move to closest braced girder**.

Enter the **Maximum displacement** and **Placement offset** of the anchors.

Define the **Class** and **Name** for the top bar in the braced girder. Select whether to detect braced girders in the whole assembly.

## Avoid reinforcement

Select whether all reinforcement types are detected in the main part and define the placement offset to avoid collision with anchors.

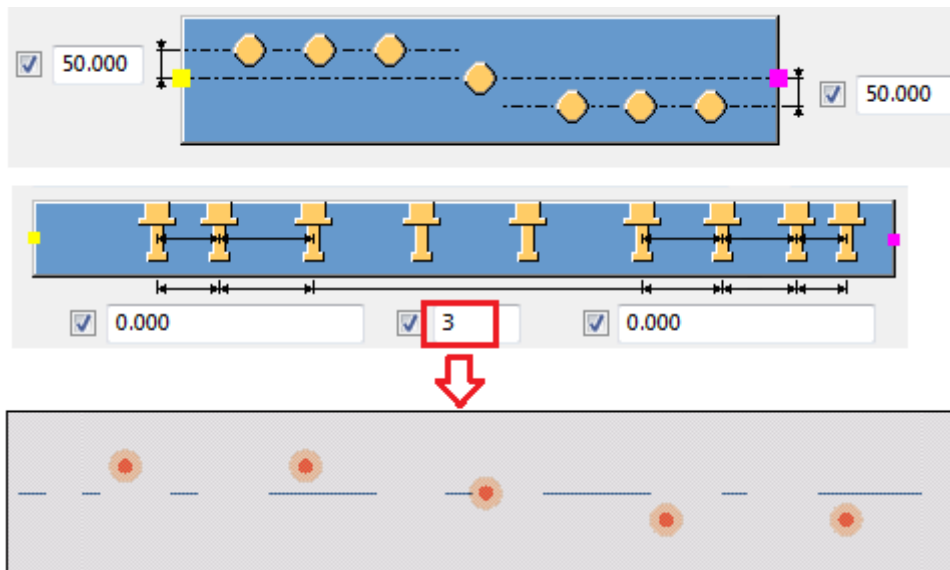
Define the **Class** and **Name** for the reinforcement. Select whether to detect reinforcement in the whole assembly.

## Top placement tab

Use the **Top placement** tab to define the embed offsets and how the information message box and crane cables are shown.

## Offset

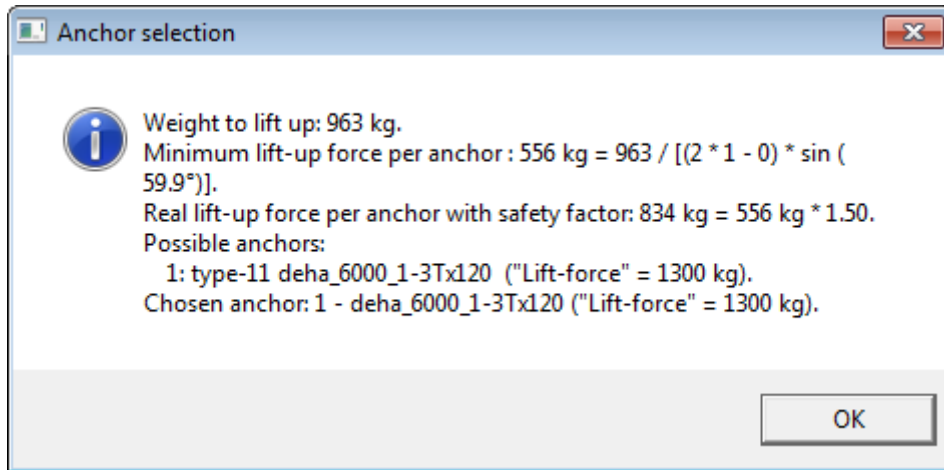
Define the embed offsets at both ends of the concrete part. An embed which is positioned exactly in the middle of the concrete part stays in that position and does not get an offset.



## Show information message boxes

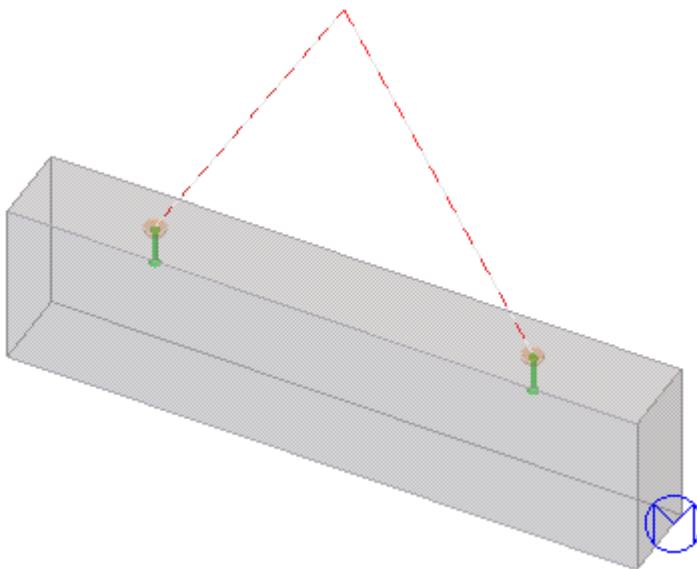
Define whether a message box containing the embed calculation results is shown. The message box shows the weight to be lifted up, the real lift-up weight including a safety factor, and the selected anchor.

The message box appears only if you have set **Browse configuration file** to **Yes** on the **Placement** tab.



### Show crane cables

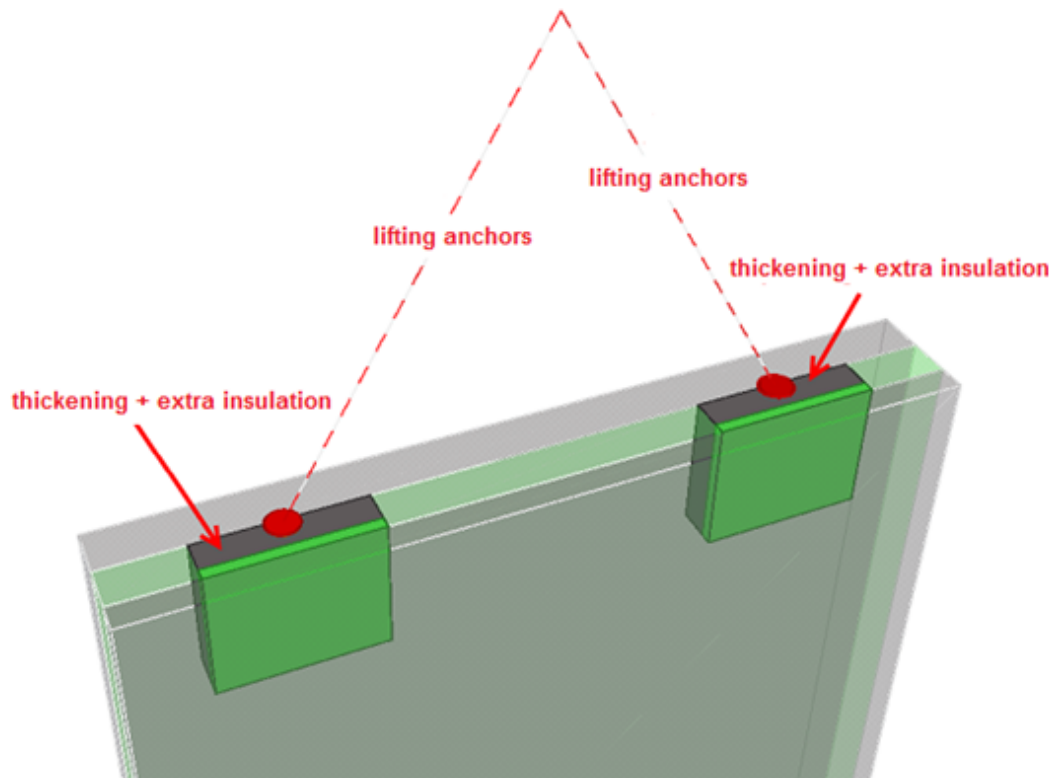
Define whether crane cables are shown. If set to **Yes**, crane cables are shown as construction lines or profiles with the  $\alpha$  angle, defined on the **Placement** tab.



### Thickening tab

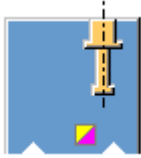
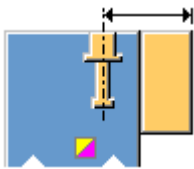
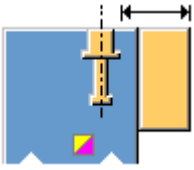
Use the **Thickening** tab to define the thickening of the concrete layer. The thickening is especially useful for sandwich walls where shells are thickened near lifting anchors.

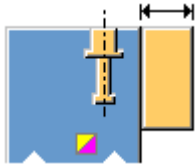
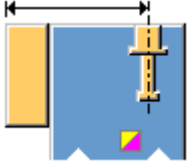
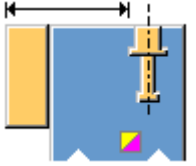
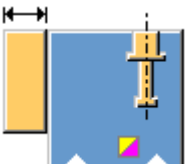
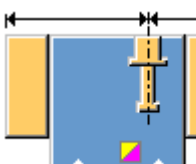
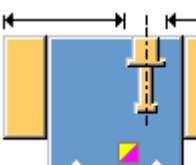
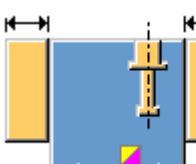
In the example below, a thickening is added with an extra insulation layer.



### Thickening options

Select the side where thickening is applied. You can also define the thickness.

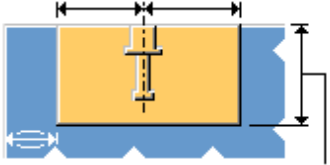
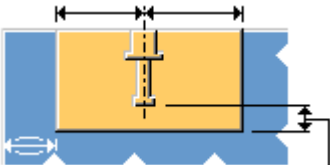
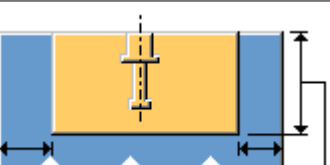
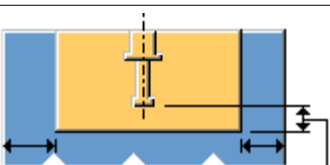
Option	Description
	No thickening.
	Right side thickening. Thickness is defined from center of the embed.
	Right side thickening. Thickness is defined from side of the embed.

Option	Description
	<p>Right side thickening. Thickness is defined from side of the shell.</p>
	<p>Left side thickening. Thickness is defined from center of the embed.</p>
	<p>Left side thickening. Thickness is defined from side of the embed.</p>
	<p>Left side thickening. Thickness is defined from side of the shell.</p>
	<p>Thickening on both sides. Thickness is defined from center of the embed.</p>
	<p>Thickening on both sides. Thickness is defined from side of the embed.</p>
	<p>Thickening on both sides. Thickness is defined from side of the shell.</p>

### Thickening width and height

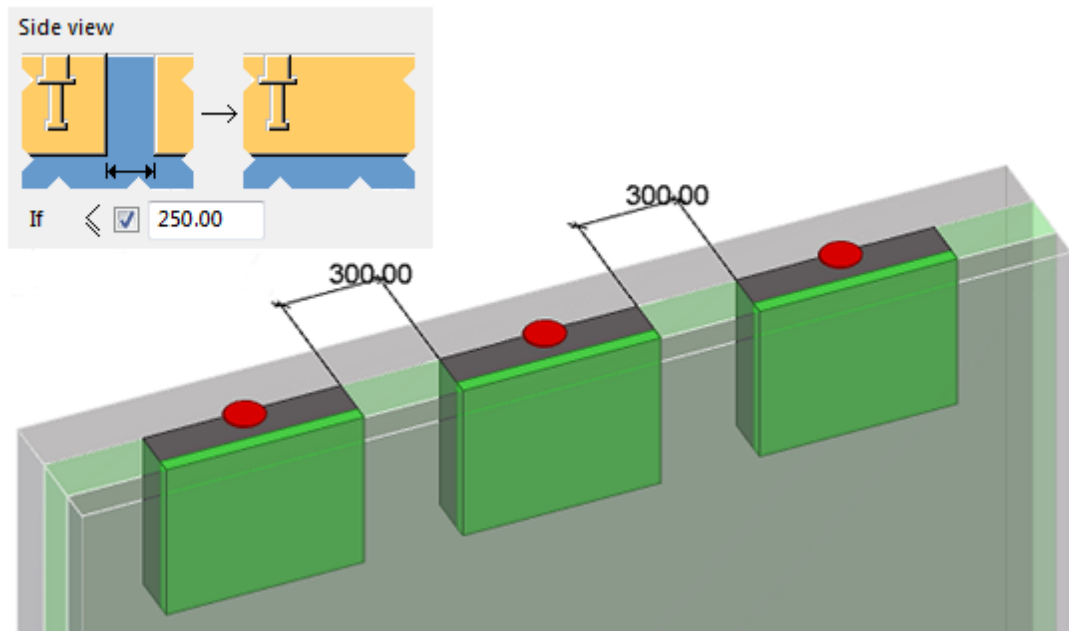
Select the thickening part reference, and define the thickening width and thickening height.

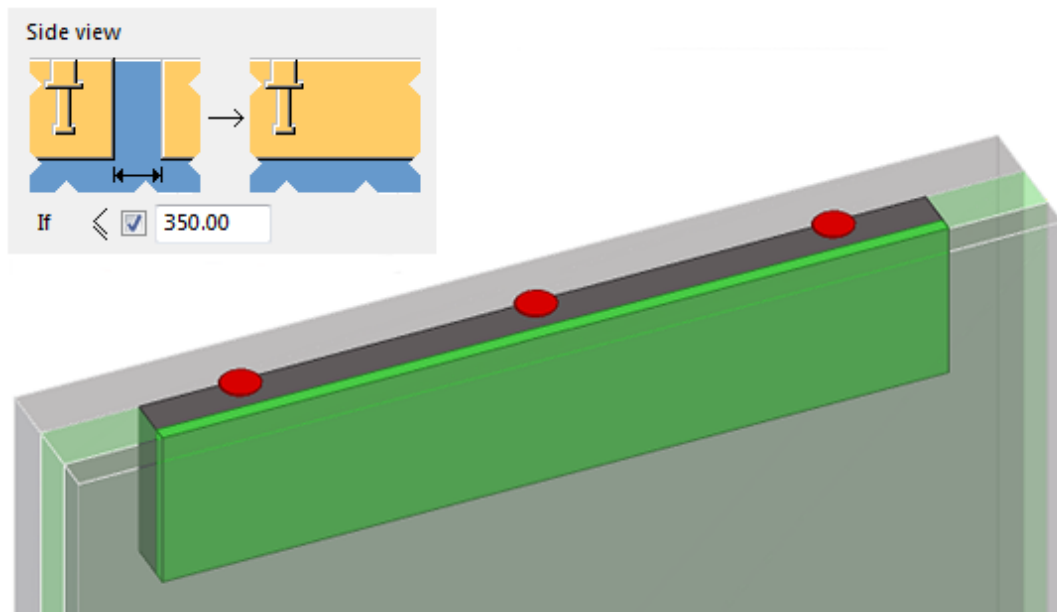


Option	Description
	<p>Width is defined from center of the embed. Height is defined from the top side of concrete.</p>
	<p>Width is defined from center of the embed. Height is defined from the bottom side of concrete shell.</p>
	<p>Width is defined from the side of concrete shell. Height is defined from the top side of concrete shell.</p>
	<p>Width is defined from the side of concrete shell. Height is defined from the bottom side of embed.</p>

### Side view

Option to combine multiple thickening parts into one if the distance between the thickenings is smaller than or equal to the defined value.



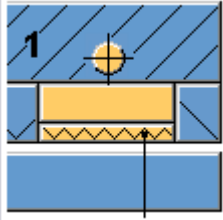


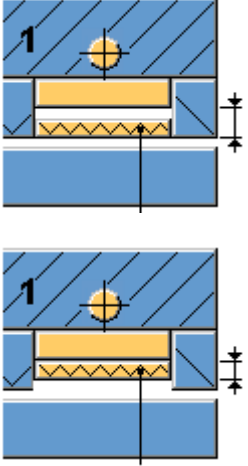
### Thickening part

Select how the thickening is connected to the shell. Define the thickening properties.

### Additional insulation

Select how to add insulation to thickening part.

Option	Description
<b>Insulation classes</b>	<p>Define the class of the insulation which is used in the concrete shell.</p> <p>If the defined class number matches the class of the insulation in the model, then the insulation will be cut at the location of the thickening.</p>
<b>Foil classes</b>	<p>Define the class of the insulation which is used in the sandwich wall.</p> <p>If the defined class number matches the class of the insulation, then the insulation will be cut at the location of the thickening</p>
<b>Create extra insulation</b>	<p>Select whether an additional insulation layer is created.</p>
	<p>Define the thickness of the insulation.</p>

Option	Description
	

### Additional options for the insulation part

Option	Description
<b>Extra insulation part</b>	Select whether the insulation part is added, and how it is added.
<b>To</b>	Select the part to which the insulation part is added.

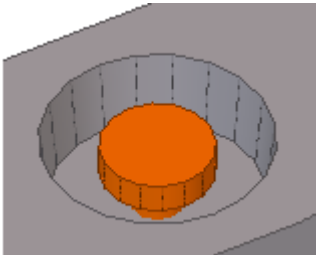
### Picture tab

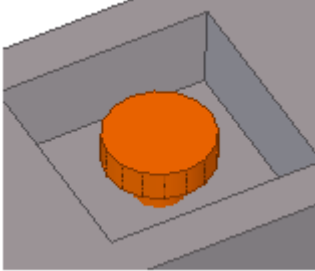
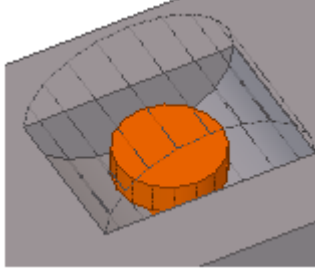
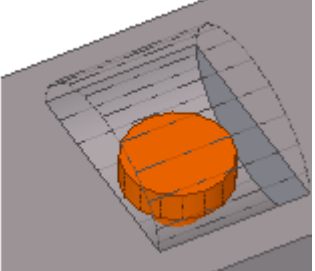
Use the **Picture** tab to control the embed dimensions, connection method and rotation.

### Embed dimensions

Define if the embed needs to be recessed. You can define the dimensions of the recess, distance from the recess plane to the top of the embed and select the shape of the cutout.

Select the shape of the cutout.

Option	Example
<b>Circle</b>	

Option	Example
<b>Square</b>	
<b>Half moon X</b>	
<b>Half moon Y</b>	

**As negative volume**


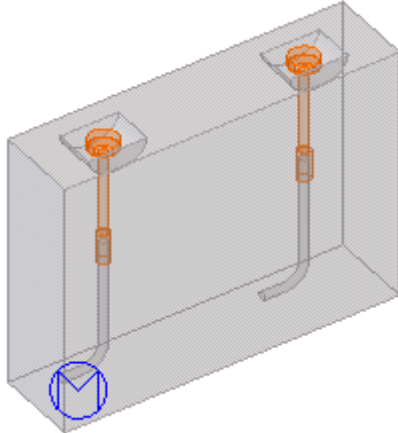
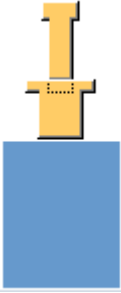
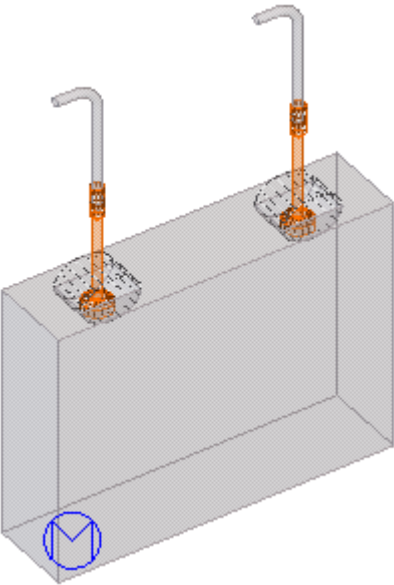

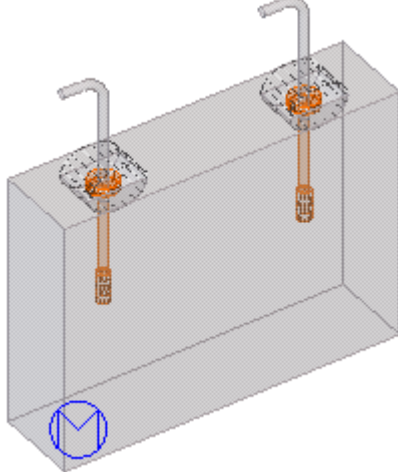
Select whether cutout profiles are handled as empty cutouts or cutouts with a formwork part.


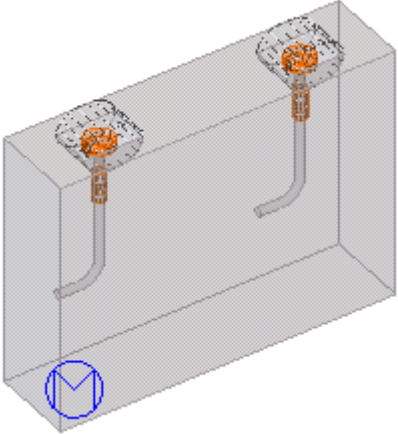
**Top part/Bottom part**

Set the part class and rotation. Each option rotates the embed 90 degrees counterclockwise. You can define also a fixed rotation angle.

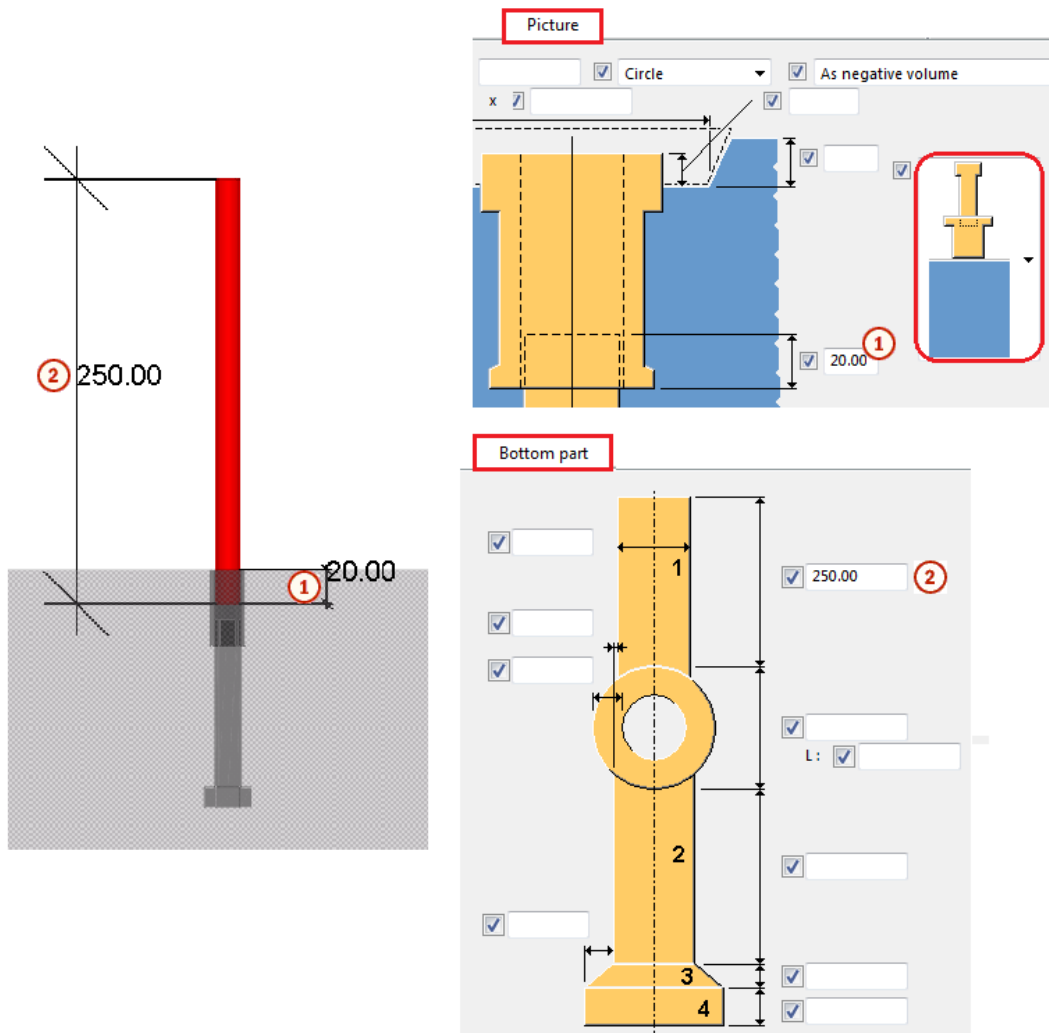
**Positioning**

Select how to position the top and the bottom parts of the embed.

Option	Example
	
	
	

Option	Example
	

An example of an anchor that is positioned on top of the concrete part.



### Create top part

Select whether the top part of embed is created, and if set to **Yes**, select how the part is connected to concrete part.

### Create bottom part

Select whether the bottom part of embed is created, and if set to **Yes**, select how the part is connected to the concrete part.

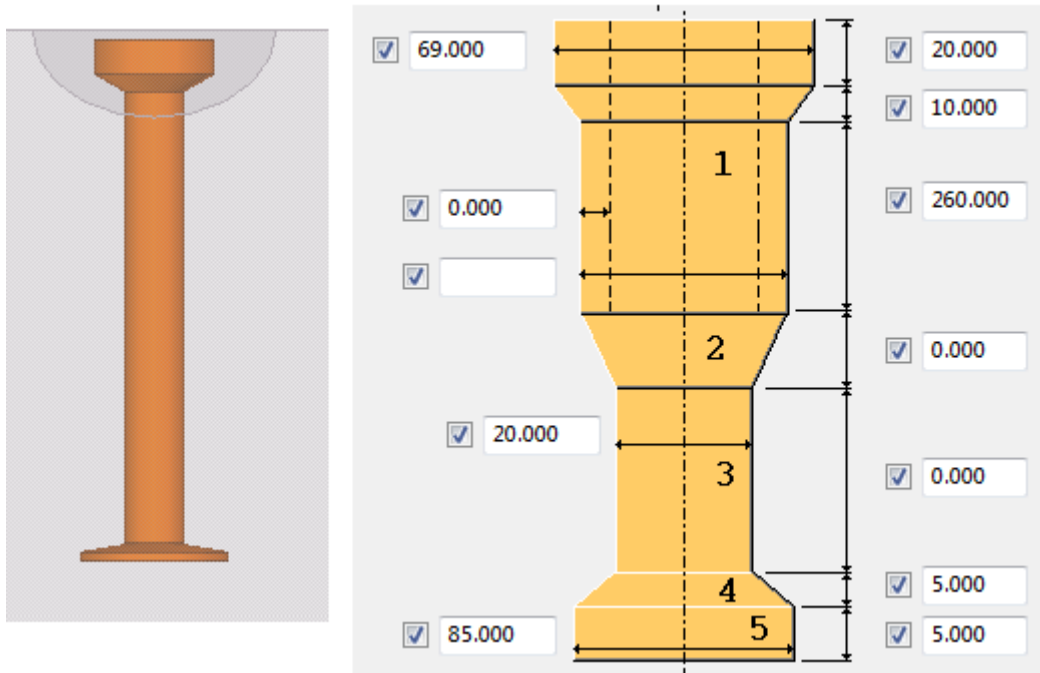
### Top part tab

Use the **Top part** tab to define the top part of the embed.

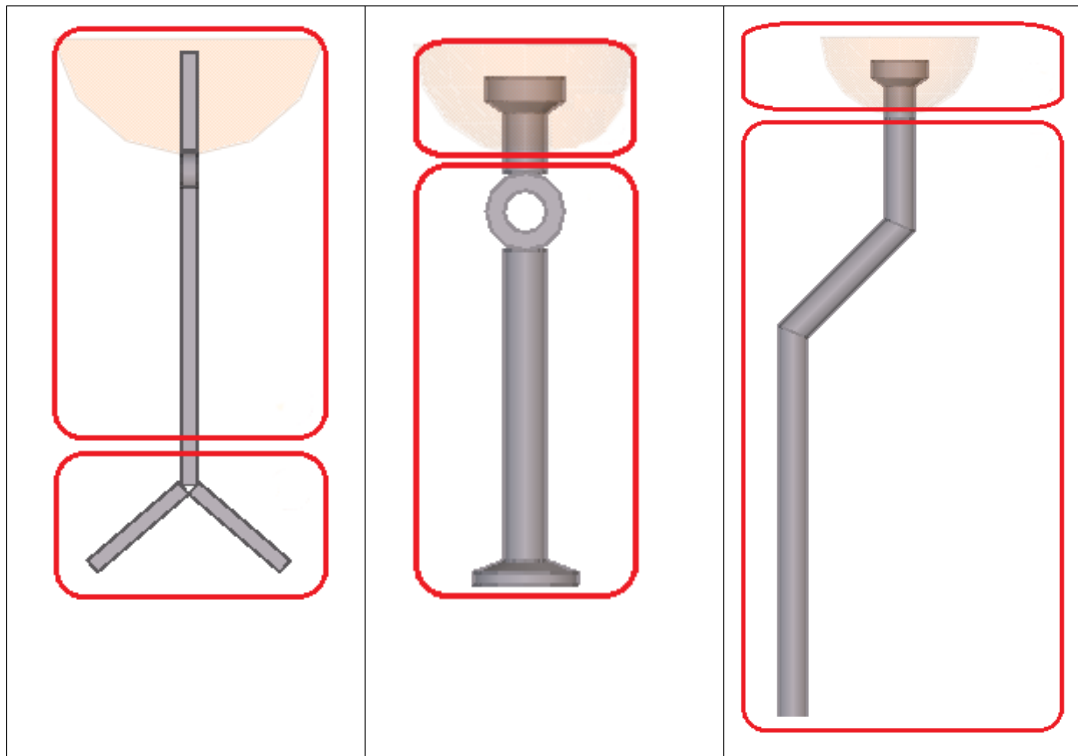
### Top part dimensions

Use the diameter and height boxes to define the shape of the top part of the embed. You can define the main diameters of parts 1, 2, 3, 4 and 5 also on the **Parts** tab.

### Examples



Embed top part defined on the **Top part** tab, embed bottom part defined on the **Bottom part** tab.



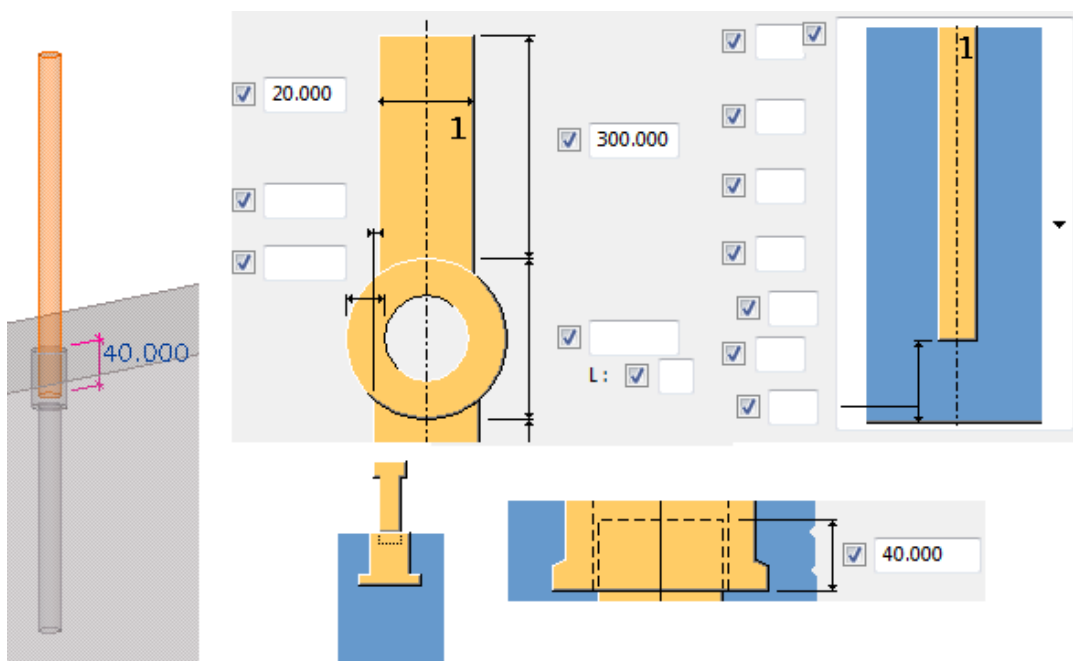
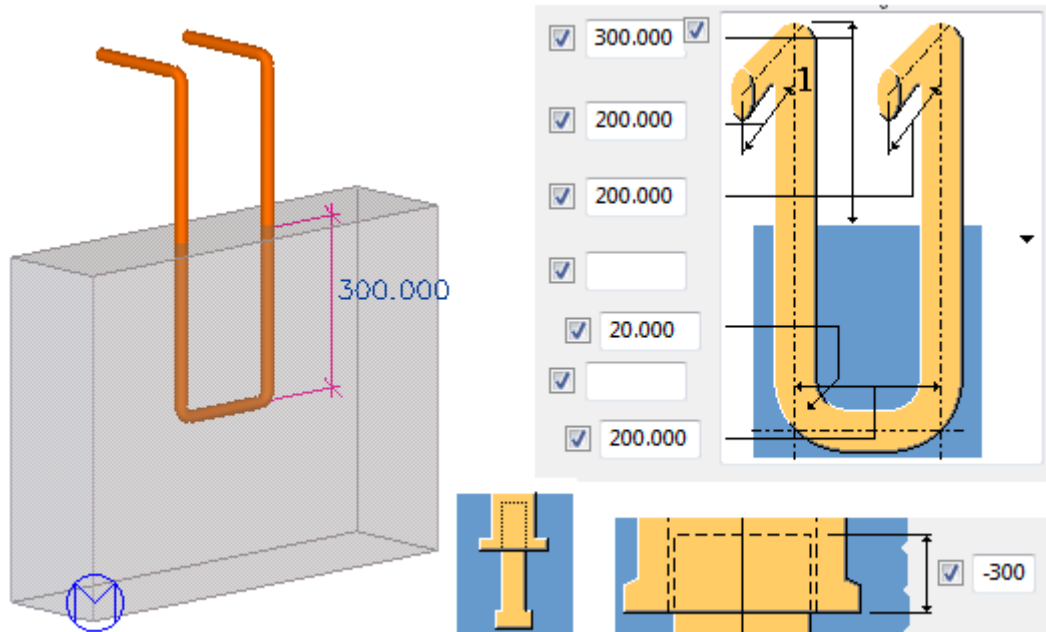
### **Bottom part tab**

Use the **Bottom part** tab to define the bottom part of the embed.

### **Bottom part dimensions**

Use the diameter and height boxes to define the shape of the bottom part of the embed. You can define the main diameters of parts 1, 2, 3, 4 and 5 also on the **Parts** tab.





### Parts tab

Use the **Parts** tab to define the embed top and bottom part properties and the formwork part properties.

### Part properties

Both the top and the bottom part are build from multiple profiles. You can define profiles for each section.

Define the part properties for the top, bottom and formwork part. If the profile properties are left empty, the lengths and diameters defined on the **Top part** and **Bottom part** tabs are used.

Option	Description
<b>t, b, h</b>	Part thickness, width and height.
<b>Pos_No</b>	Prefix and a start number for the part position number.
<b>Material</b>	Material grade.
<b>Name</b>	Name for the part.
<b>Comment</b>	Add a comment for the part.

You can define UDAs for the top and bottom parts.

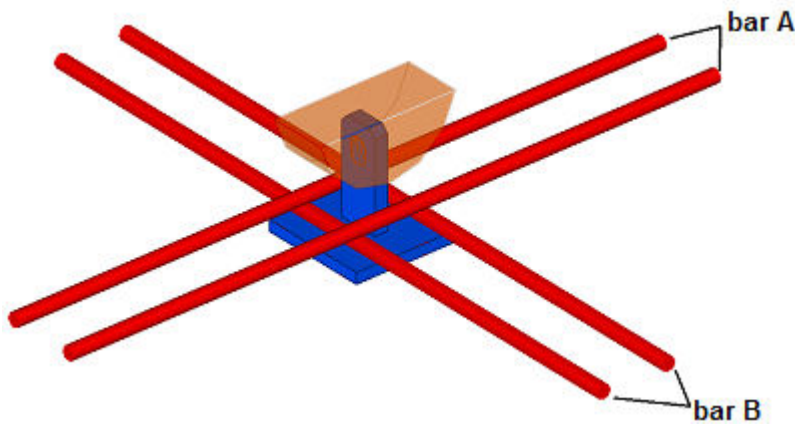
The image shows the Tekla Structures interface for defining beam properties. The 'Beam Properties' dialog is open, and the 'Parameters' tab is selected. The 'User-defined attributes...' button is highlighted, and a red box highlights the 'Fabricator name', 'Type', 'Nomination', and 'Article number' fields, which are populated with 'DEHA 6000', 'socket anchor', an empty field, and '12345-568' respectively. A red arrow points from the top-left configuration area to the 'User-defined attributes...' button.

### Reinforcing bar tab

Use the **Reinforcing bar** tab to define additional reinforcing bars for the embeds.

You can define the reinforcing bar shape and hook properties, and the reinforcing bar profile properties in two directions.

### Example

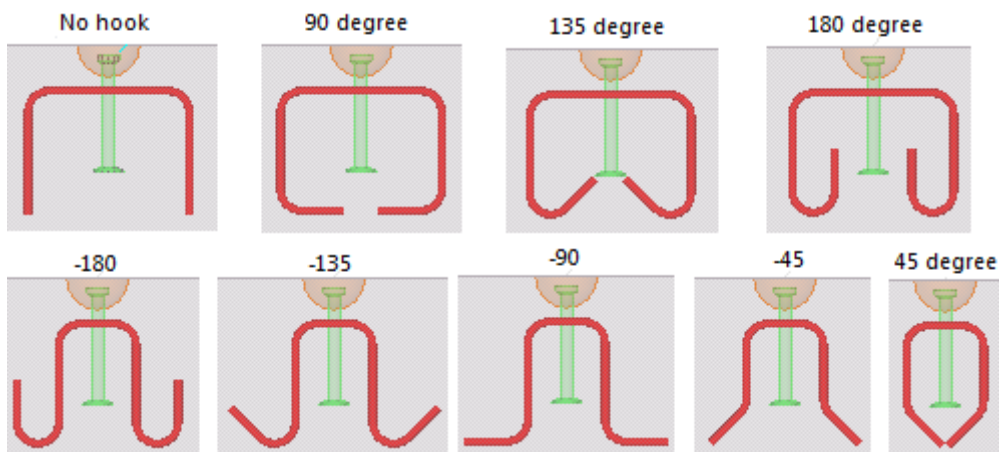


### Grade, Size

The **Grade** and **Size** options work together. Click the ... button next to the **Size** box to open the reinforcing bar catalog and to select a grade and a size for **bar A** and **bar B**.

### End conditions left/End conditions right

Select the shape of the reinforcing bar.

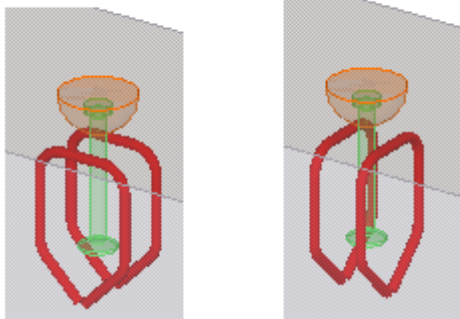


### Bend lengths left/Bend lengths right, Bend radius

Define the bend length for the hooks and the bend radius.

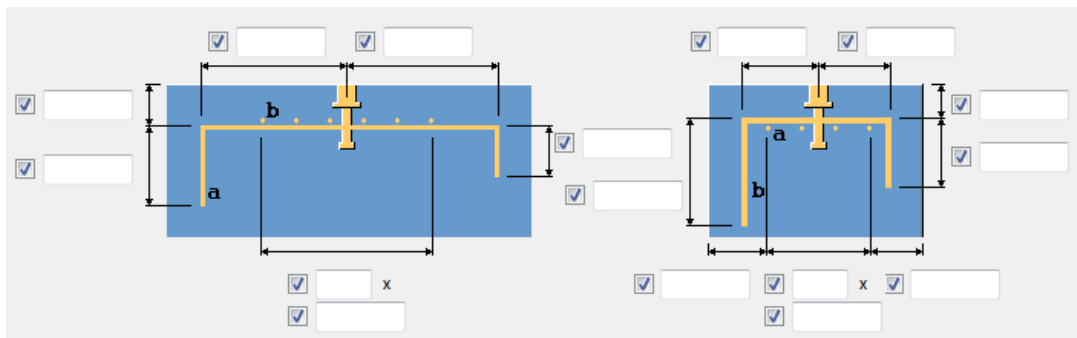
## Rotation

Select how to rotate the reinforcing bars and define the rotation angle.



## Dimensions

Define the reinforcing bar dimensions and the number of bars.

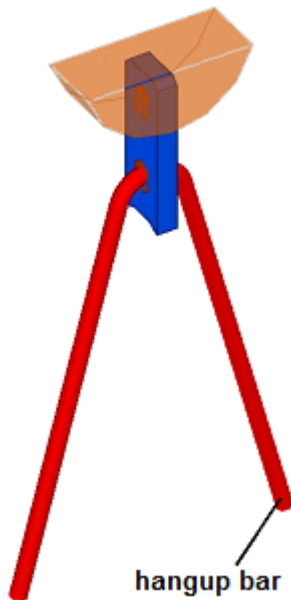


### Hangup bars tab

Use the **Hangup bars** tab to define additional reinforcing bars for the embeds.

You can define the reinforcing bar shape and hook properties, and the reinforcing bar profile properties.

### Example

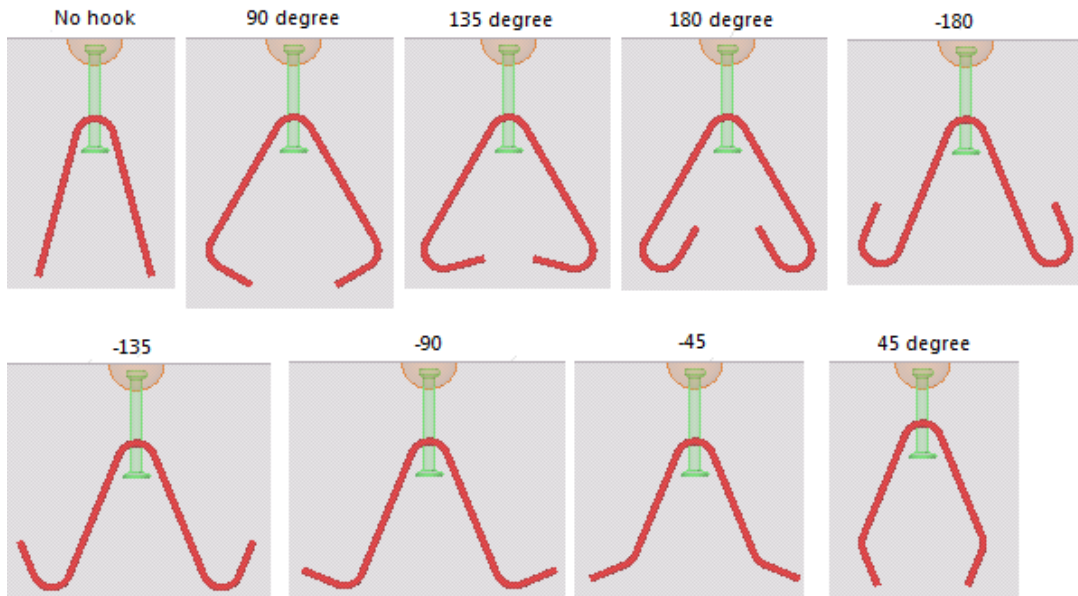


### Grade, Size

The **Grade** and **Size** options work together. Click the ... button next to the **Size** box to open the reinforcing bar catalog and to select a grade and a size.

### End conditions left/End conditions right

Select the shape of the reinforcing bar.

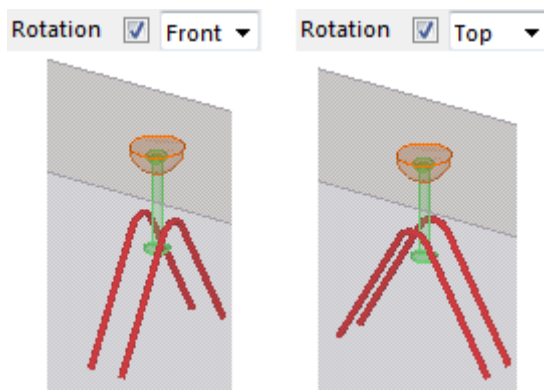


**Bend lengths left/Bend lengths right, Bend radius**

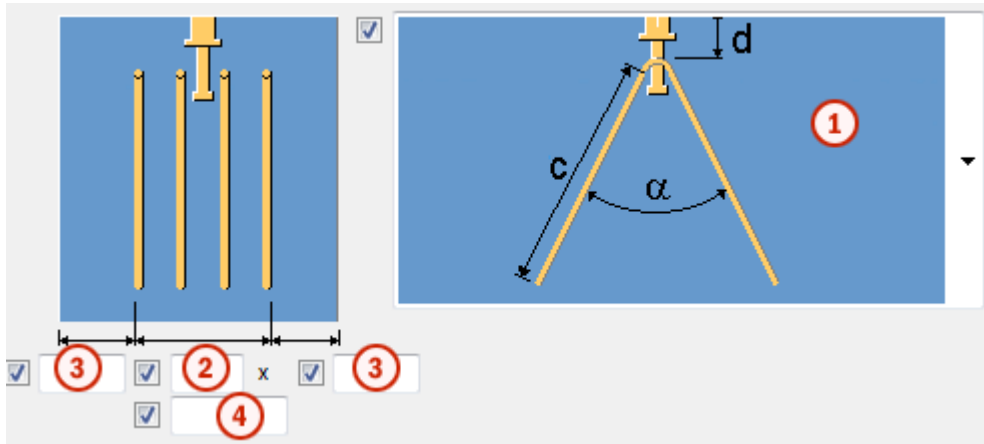
Define the bend length for the hooks and the bend radius.

**Rotation**

Select how to rotate the hangup reinforcing bars and define the rotation angle.



## Dimensions



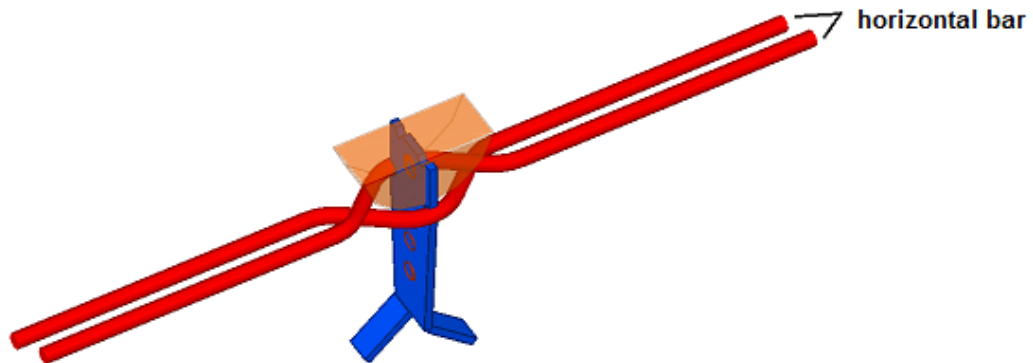
Option	Description	Default
1	Select how to place the hangup reinforcing bars. Use the values <b>a</b> , <b>b</b> , <b>c</b> , <b>d</b> , <b>e</b> , <b>f</b> and the angles <b>alpha</b> and <b>beta</b> to define the dimensions of the hangup reinforcing bars.	
2	Define the number of hangup reinforcing bars.	0
3	Define the cover thickness.	
4	Define the distance between hangup reinforcing bars.	100 mm

### Horizontal bar tab

Use the **Horizontal bar** tab to define additional horizontal reinforcing bars for the embeds.

You can define the reinforcing bar shape and hook properties, and the reinforcing bar profile properties.

### Example



### Grade, Size

The **Grade** and **Size** options work together. Click the ... button next to the **Size** box to open the reinforcing bar catalog and to select a grade and a size.

### End conditions left/End conditions right

Select the shape of the reinforcing bar.

### Bend lengths left/Bend lengths right, Bend radius

Define the bend length for the hooks and the bend radius.

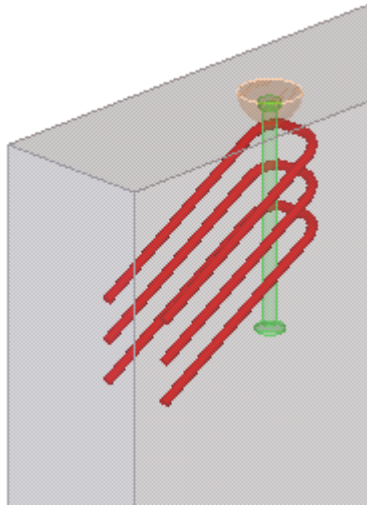
### Rotation

Select how to rotate the horizontal reinforcing bars and define the rotation angle.

### Side view

You can create sloped horizontal reinforcing bars. Define the number of bars and the distance between them. Use value **d** to define cover thickness for the top side and value **f** to define the reinforcing bar length.

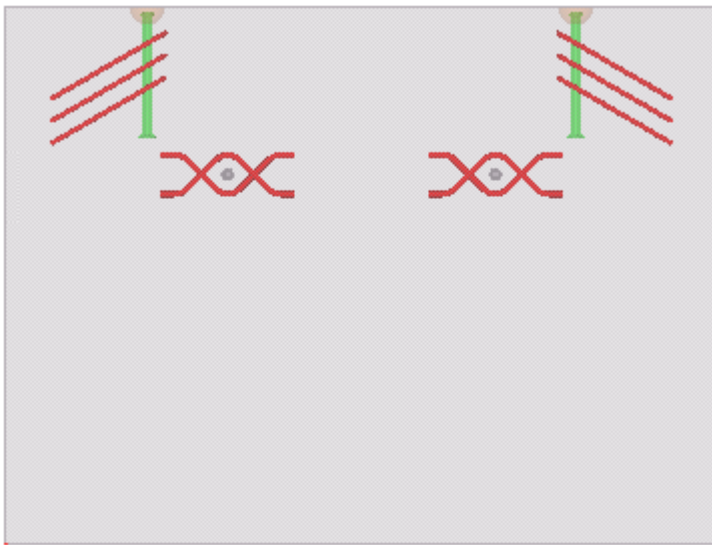
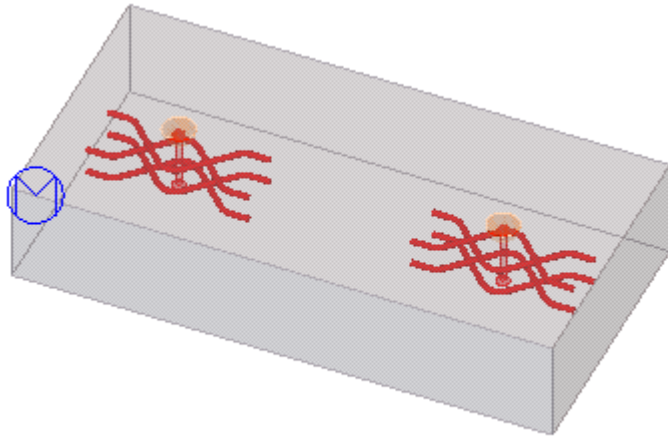




### Top view

Select a reinforcing bar shape.

Use values **a**, **b**, **c**, **d**, **e**, **f** and the angle  **$\alpha$**  to define the dimensions of the horizontal reinforcing bars.

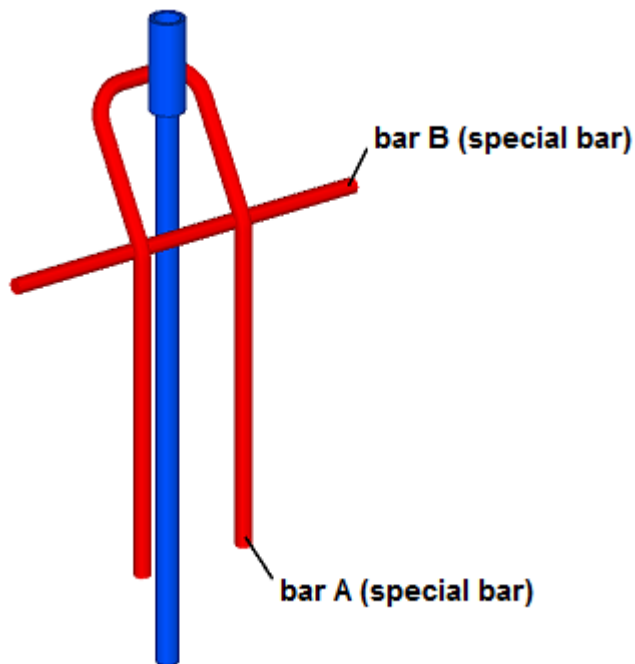


### Special bar tab

Use the **Special bar** tab to define additional U-shaped reinforcing bars for the embeds.

You can define the reinforcing bar shape and hook properties, and the reinforcing bar profile properties in two directions.

### Example



### Grade, Size

The **Grade** and **Size** options work together. Click the ... button next to the **Size** box to open the reinforcing bar catalog and to select a grade and a size for **bar A** and **bar B**.

### End conditions left/End conditions right

Select the shape of the reinforcing bar.

### Bend lengths left/Bend lengths right, Bend radius

Define the bend length for the hooks and the bend radius.

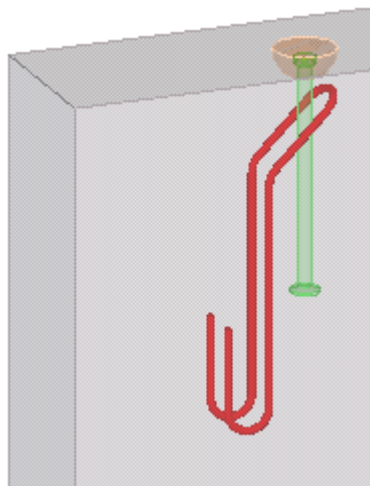
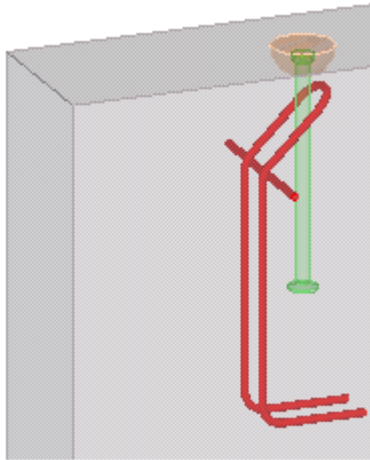
### Rotation

Select how to rotate the U-shaped reinforcing bars and define the rotation angle.

### Shape

Select a reinforcing bar shape.

Use the values **a, b, c, d, e, f** and the angles  **$\alpha$**  to define the dimensions of the U-shaped reinforcing bars.



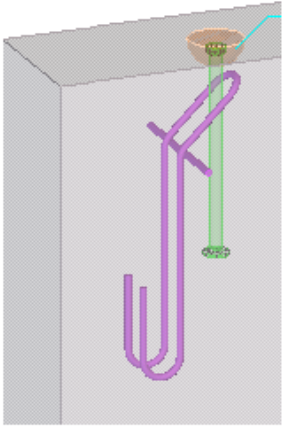
#### Advanced tab

Use the **Advanced** tab to define UDAs and reinforcing bar properties for the reinforcing bars, hangup bars, special bars and horizontal bars.

#### Reinforcing bar properties

Option	Description
<b>Comment</b>	Add a comment for the reinforcing bars.
<b>Name</b>	Define a name that is shown in drawings and reports.
<b>Class</b>	Define the class number for the reinforcing bars.
<b>Serie</b>	Define a prefix for the bar position number.
<b>Start number</b>	Define a start number for the bar position number.

	Comment	Name	Class	Serie	Start number
Reinforcing bar	<input checked="" type="checkbox"/>	<input type="text"/>	<input checked="" type="checkbox"/>	<input type="text"/>	<input checked="" type="checkbox"/>
Hangup bars	<input checked="" type="checkbox"/>	<input type="text"/>	<input checked="" type="checkbox"/>	<input type="text"/>	<input checked="" type="checkbox"/>
Horizontal bar	<input checked="" type="checkbox"/>	<input type="text"/>	<input checked="" type="checkbox"/>	<input type="text"/>	<input checked="" type="checkbox"/>
Special bar	<input checked="" type="checkbox"/> manually	<input checked="" type="checkbox"/> SPECIAL BAR	<input checked="" type="checkbox"/> 12	<input checked="" type="checkbox"/> X	<input checked="" type="checkbox"/> 3000



**Reinforcing Bar Properties**

Save Load standard Save as standard

General Group

Reinforcing bar

Prefix: X  Start No.: 3000

Name: SPECIAL BAR

Size: 8

Grade: B500 Select...

Bending radius: 20.000

Class: 12

User-defined attributes...

OK Apply

**Tekla Structures Reinforcing bar (1)**

Parameters

Comment  manually

### Create as rebar assembly

You can add the created reinforcement as a rebar assembly to the cast units with a predefined assembly type, name, prefix, and start number.

Option	Description
<b>Create as rebar assembly</b>	Select <b>Yes</b> to create all reinforcement as one rebar assembly, and to include it to the cast unit of the input part.
<b>Add to existing rebar assembly</b>	<ul style="list-style-type: none"> <li>• <b>Do not add:</b> New rebar is added as a rebar assembly to the cast unit.</li> <li>• <b>As single bars:</b> Add all new rebars directly into an existing rebar assembly as rebars.</li> <li>• <b>As sub-assembly:</b> Add all new rebars to their own new rebar assembly, which is then included</li> </ul>

Option	Description
	as a sub-assembly to the main rebar assembly.
<b>Rebar assembly type</b>	Select the rebar assembly type. If you do not select the type, the default value of the rebar assembly is used.
<b>Name, Profile, Start number</b>	Define the name, profile, and start number. If you do not define these, the default values of the rebar assembly are used.

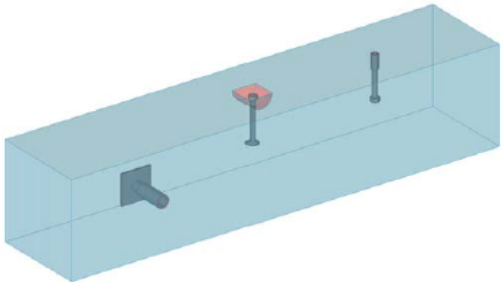
### **Embed (1008)**

**Embed (1008)** creates one or more embeds in concrete parts. You can create multiple embeds to be used as lifting anchors with one insertion point.

#### **Objects created**

- Embeds
- Reinforcing bars

#### **Use for**

Situation	Description
	Embeds

#### **Selection order**

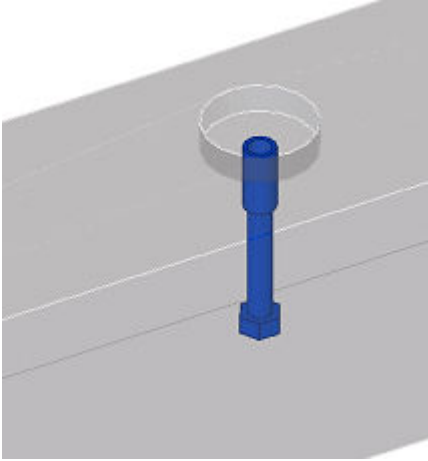
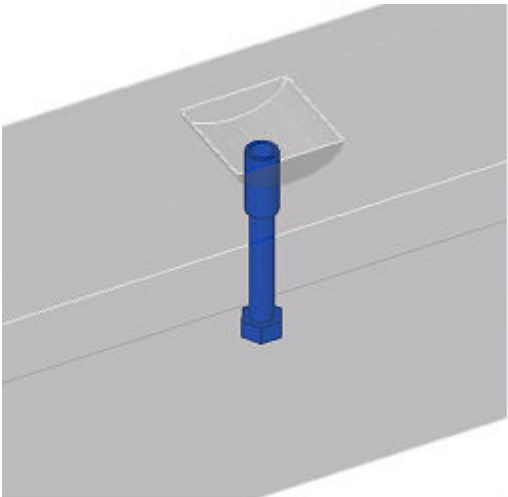
1. Select a concrete part.
2. Pick one point on the part face where you want to insert the embed.  
The detail is created automatically when you pick the point.

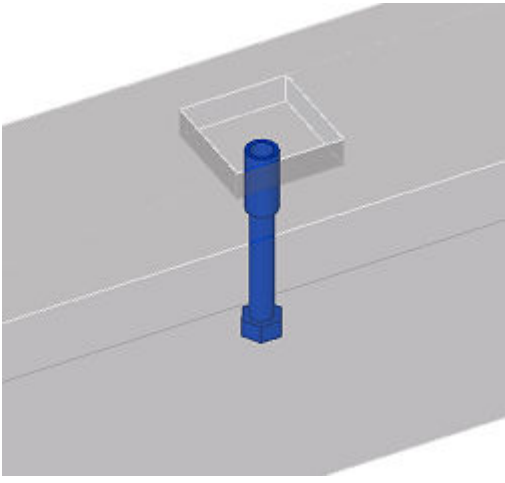
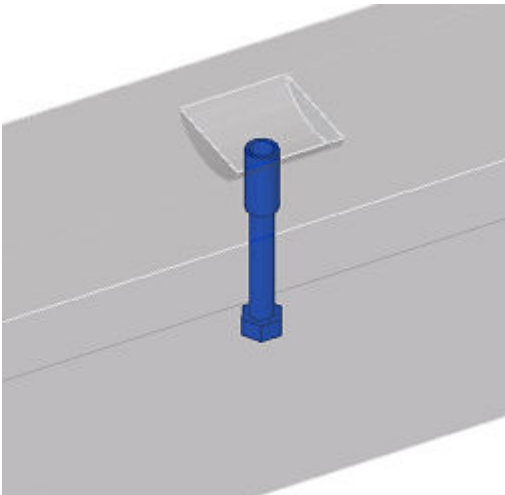
#### **Picture tab**

Use the **Picture** tab to control the embed dimensions, connection method and rotation.

### Embed dimensions

Define if the embed needs to be recessed. You can define the dimensions of the recess, distance from the recess plane to the top of the embed, select the shape of the cutout and whether the cutouts are handled as empty cutouts or cutouts with a formwork part.

Option	Example
<b>Circle</b>	
<b>Half moon X</b>	

Option	Example
<b>Square</b>	
<b>Half moon Y</b>	

### **Top part/Bottom part**

Set the part class and rotation. Each option rotates the embed 90 degrees counterclockwise. You can define also a fixed rotation angle.

### **How to connect top part to concrete element**

Select whether the top part of the embed is created, and if set to **Yes**, select how the part is connected to the concrete part.

### **How to connect bottom part**

Select whether the bottom part of the embed is created, and if set to **Yes**, select how the part is connected to the concrete part.



### Select a custom part from the Applications & components catalog

Select a custom part from the **Applications & components** catalog to be used as embed. To use saved custom component properties, select the saved properties file.

Use the **Yes and subassembly** option to add the embed as a subassembly to the main part. The default direction is **2 point +x**.

### Top part tab

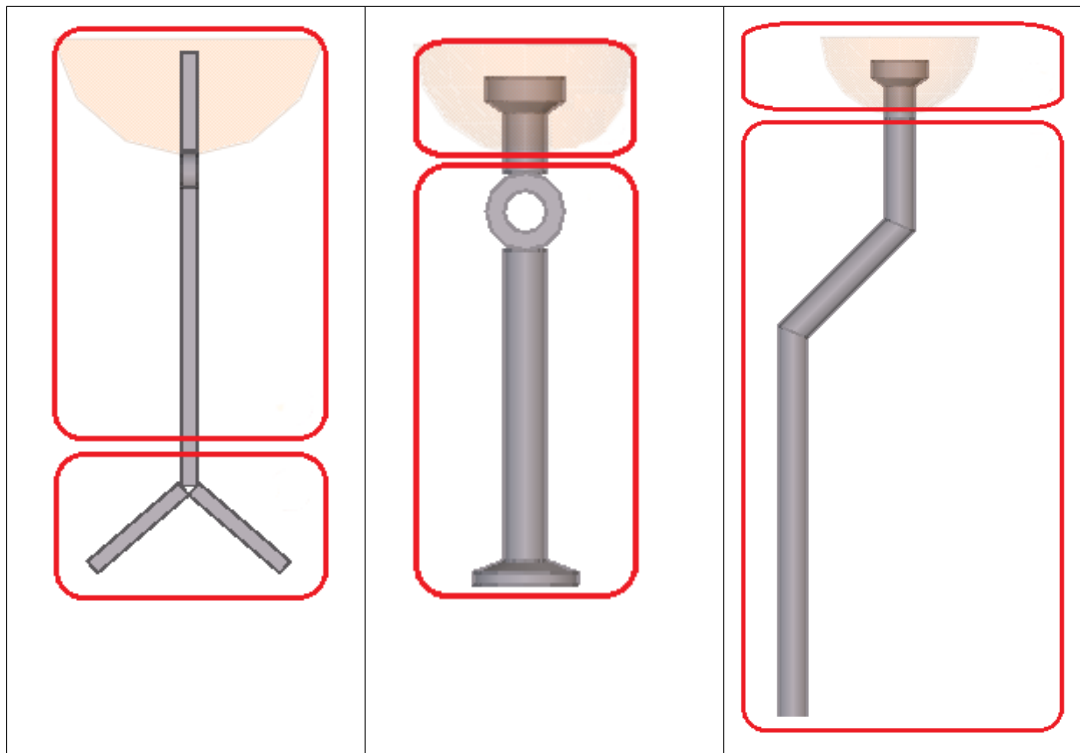
Use the **Top part** tab to define the top part of the embed.

### Top part dimensions

Use the diameter and height boxes to define the shape of the top part of the embed. You can define the main diameters of parts **1, 2, 3, 4** and **5** also on the **Parts** tab.

### Examples

Embed top part defined on the **Top part** tab, embed bottom part defined on the **Bottom part** tab.



### Bottom part tab

Use the **Bottom part** tab to define the bottom part of the embed.

### Bottom part dimensions

Use the diameter and height boxes to define the shape of the bottom part of the embed. You can define the main diameters of parts **1, 2, 3, 4** and **5** also on the **Parts** tab.

For examples, see **Top part** tab.

### Parts tab

Use the **Parts** tab to define the embed top and bottom part profiles and the formwork part properties.

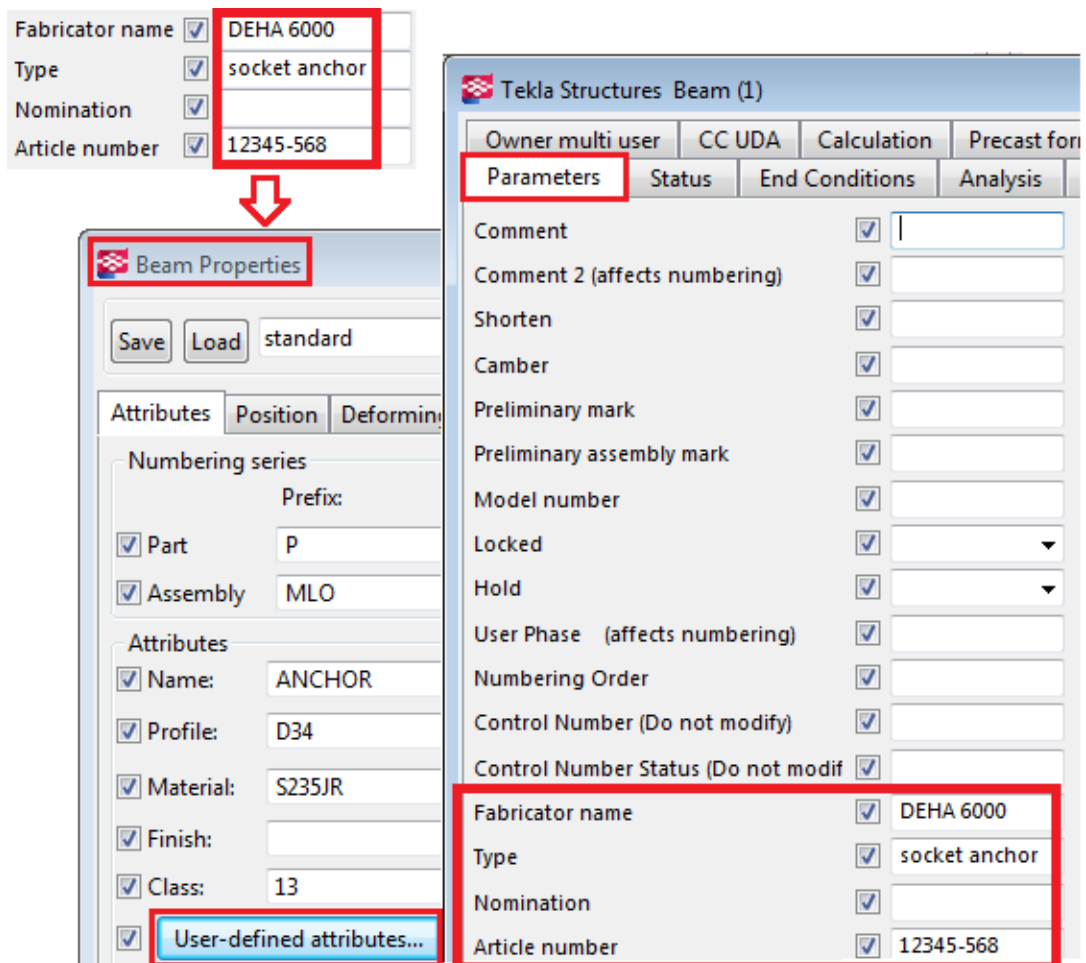
### Part properties

Both the top and the bottom part are build from multiple profiles. You can define profiles for each section.

Define the part properties for the top, bottom and formwork part. If the profile properties are left empty, the lengths and diameters defined on the **Top Part** and **Bottom Part** tabs are used.

Option	Description
<b>t, b, h</b>	Define the part thickness, width and height.
<b>Pos_No</b>	Define a prefix and a start number for the part position number.
<b>Material</b>	Define the material grade.
<b>Name</b>	Define a name for the part.
<b>Comment</b>	Add a comment for the part.

You can define UDAs for the top and bottom parts.



### Placement tab


Use the **Placement** tab to define the embed placing, positioning and embed distribution.

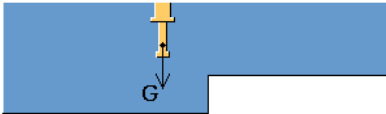
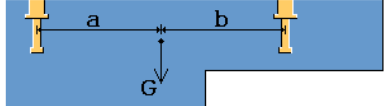
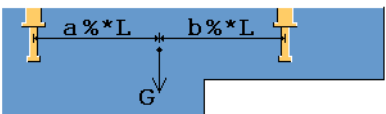
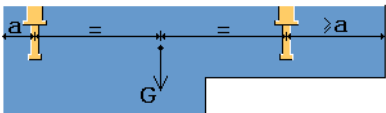
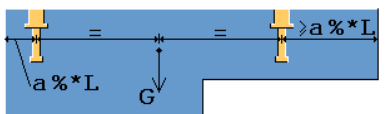
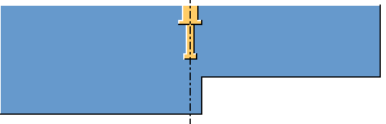
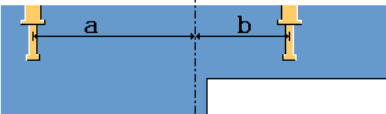
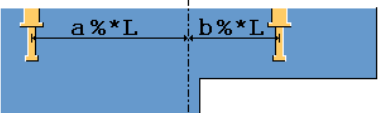


### Positioning

Select how to position the top and the bottom part of the embed.

### Placing

Define the placing type of the embed. Depending on the component insertion points, multiple embeds can be created.

Option	Description
	Embed is placed on a selected position point.

Option	Description
	Embed is placed on a center of gravity (COG) point in the part length direction.
	Multiple embeds. Define dimensions <b>a</b> and <b>b</b> . Reference = COG
	Define dimensions <b>a</b> and <b>b</b> as percentages of the part length. Reference = COG
	Embed is placed in the middle of the part, along the length of the concrete part.
	Multiple embeds. Define dimension <b>a</b> as a percentage of the total part length. Reference = COG
	Embed is placed in the middle of the part.
	Define dimensions <b>a</b> and <b>b</b> . Reference = middle of the part
	Define dimensions <b>a</b> and <b>b</b> as percentages of the part length. Reference = middle of the part
	Define dimensions <b>a</b> and <b>b</b> . The distances are from the embeds to the part ends.
	Define dimensions <b>a</b> and <b>b</b> as percentages of the part length. The distances are from the embeds to the part ends.

## Dimensions

Define embed dimensions **a** and **b**.

## Center of gravity

Define concrete part COG (center of gravity) for the embeds.

## Number of extra anchors

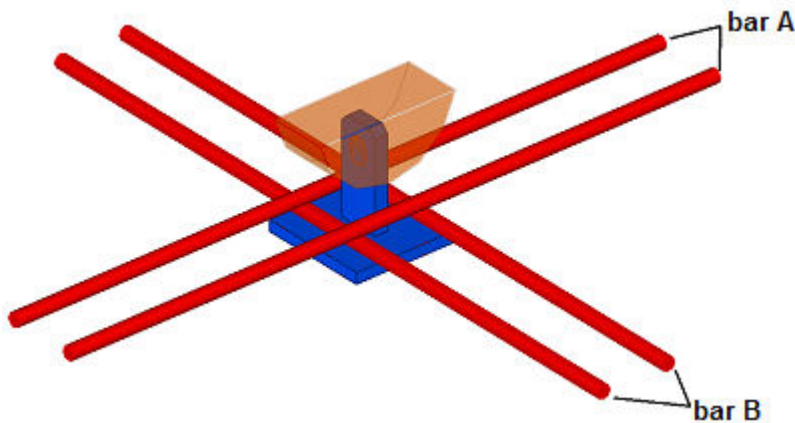
The spacing distance between multiple embeds.

## Reinforcing bar tab

Use the **Reinforcing bar** tab to define extra reinforcing bars for the embeds.

You can define the reinforcing bar shape properties, and the reinforcing bar profile properties in two directions.

You can define the number, shape, dimension and covering thickness of the reinforcing bars.



## Advanced tab

Use the **Advanced** tab to define bar properties for reinforcing bars A and B.

## Reinforcing bar properties

Option	Description
<b>Comment</b>	Add a comment for the reinforcing bars.
<b>Name</b>	Define a name that is shown in drawings and reports.
<b>Class</b>	Define the part class number for the reinforcing bars.
<b>Serie</b>	Define a prefix for the part position number.
<b>Start number</b>	Define a start number for the part position number.

## Create as rebar assembly

You can add the created reinforcement as a rebar assembly to the cast units with a predefined assembly type, name, prefix, and start number.

Option	Description
<b>Create as rebar assembly</b>	Select <b>Yes</b> to create all reinforcement as one rebar assembly, and to include it to the cast unit of the input part.
<b>Add to existing rebar assembly</b>	<ul style="list-style-type: none"> <li>• <b>Do not add:</b> New rebar is added as a rebar assembly to the cast unit.</li> <li>• <b>As single bars:</b> Add all new rebars directly into an existing rebar assembly as rebars.</li> <li>• <b>As sub-assembly:</b> Add all new rebars to their own new rebar assembly, which is then included as a sub-assembly to the main rebar assembly.</li> </ul>
<b>Rebar assembly type</b>	Select the rebar assembly type. If you do not select the type, the default value of the rebar assembly is used.
<b>Name, Profile, Start number</b>	Define the name, profile, and start number. If you do not define these, the default values of the rebar assembly are used.

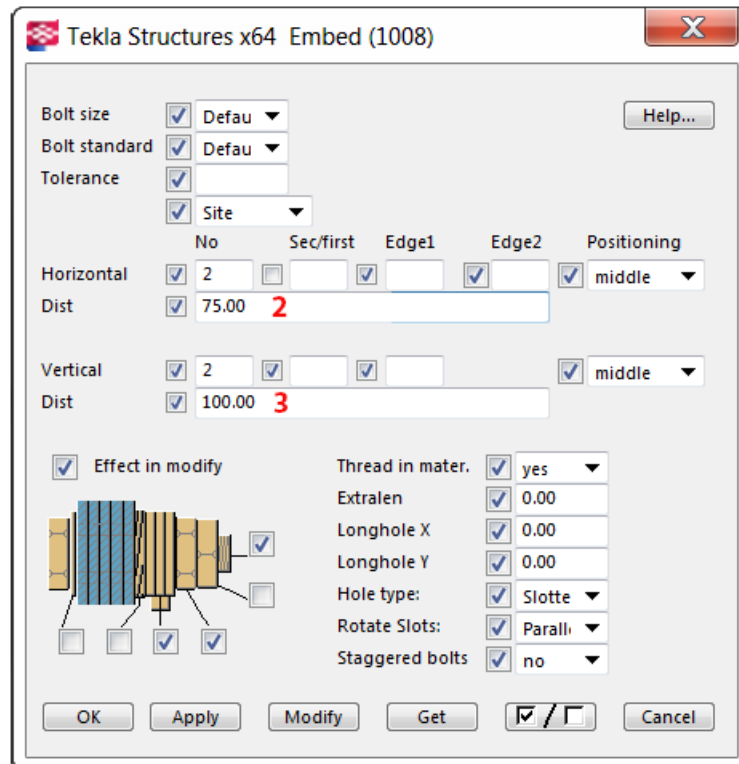
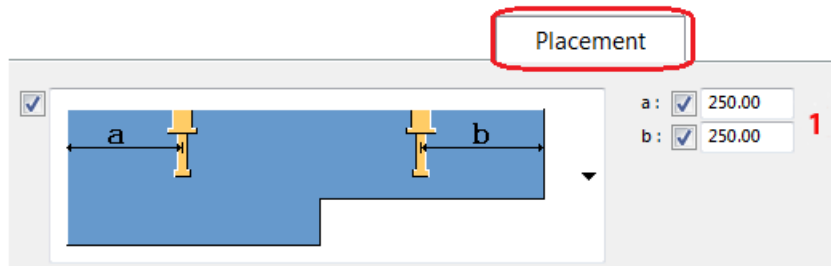
### **Bolts**

Click the **Bolts** button to open the **Bolts** dialog box where you can define extra embeds and embed offsets.

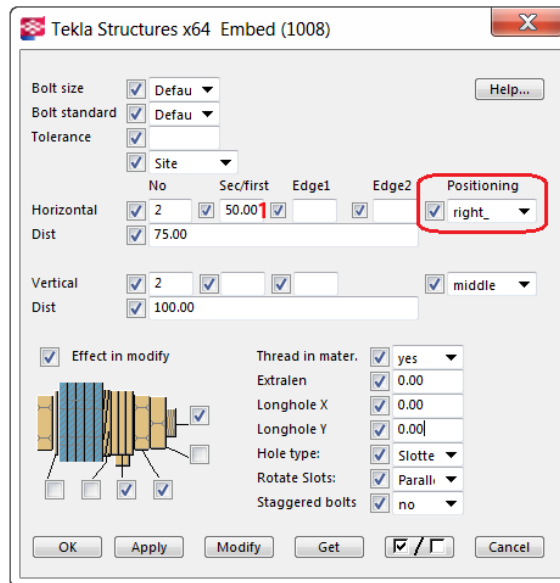
Embed (1008) uses only the **Horizontal Dist.** and **Vertical Dist.** options, the other options are not taken into account.

### **Example**

In the example below, the bolt placement uses fixed dimensions from part edges, defined on the **Placement** tab. Extra embeds are defined in the **Bolts** dialog box.



Optionally, you can also use the **Sec/first** and **Positioning** options to define a distance from the edge of the beam.



### General tab

Click the link below to find out more:

General tab

### Analysis tab

Click the link below to find out more:

Analysis tab


### ***Continuous Beam Reinforcement***

You can reinforce a continuous beam using a macro called **ContinuousBeamReinforcement**. The macro creates main top and bottom bars, stirrups, fittings, and additional top and bottom bars using system components. **Longitudinal reinforcement (70)** creates the main and



additional top and bottom bars, **Stirrup reinforcement (67)** creates stirrups, and **Battering connection (13)** creates fittings.

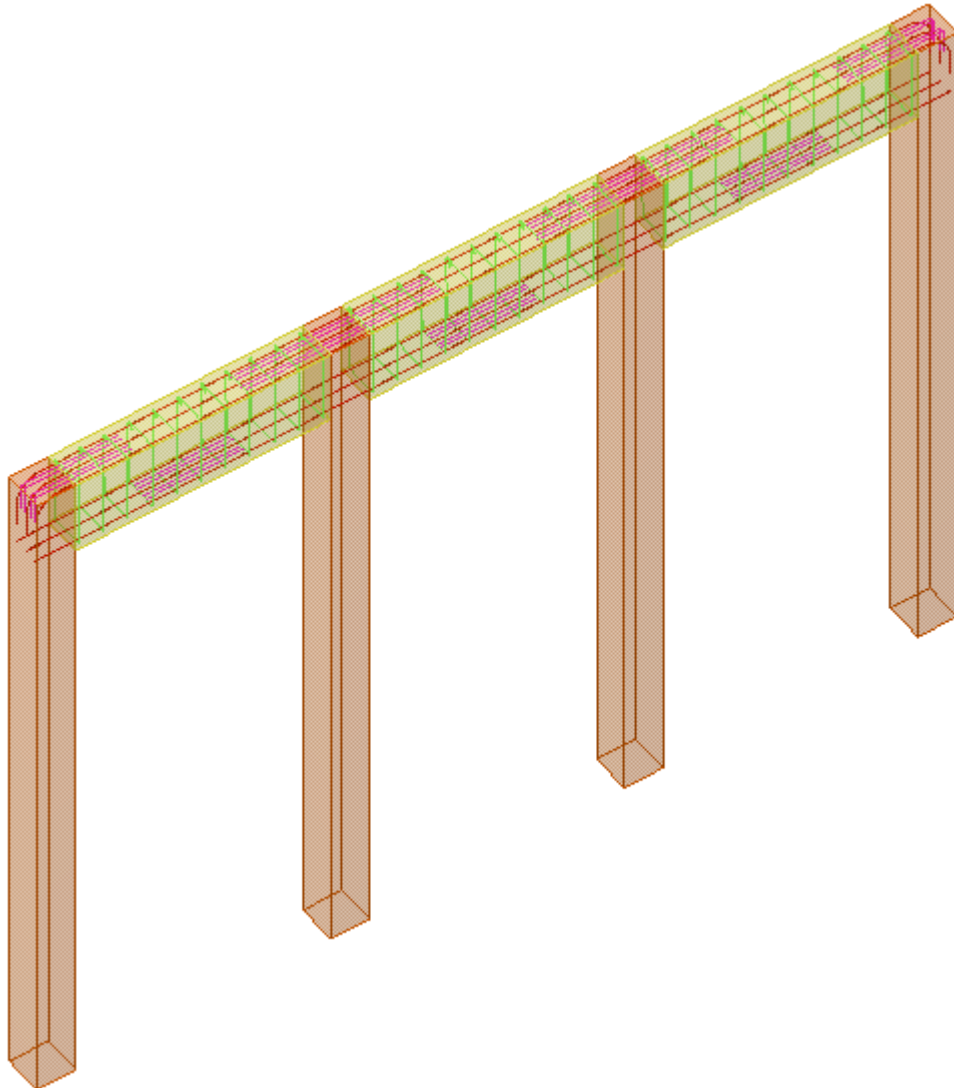
To reinforce a continuous beam:

1. Click the **Applications & components** button  in the side pane to open the **Applications & components** catalog.
  2. Click the arrow next to **Applications** to open the applications list.
  3. Double-click **ContinuousBeamReinforcement**.
  4. Select the beams and click **Next**.
  5. Select the columns and click **Next**.
  6. If needed, modify the reinforcement properties, and click **Finish**.
- The reinforcements are created.

### **Limitations**

The beams must be aligned for the reinforcing to be successful.

## Example



## Lifting

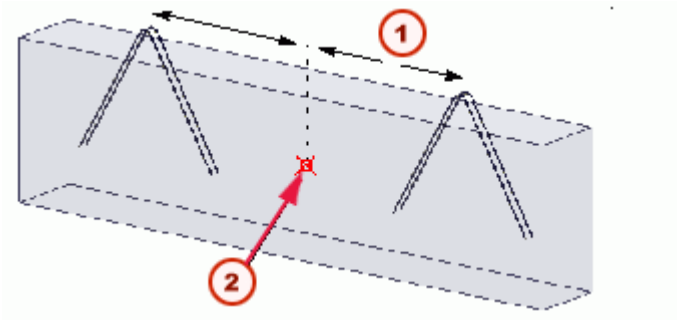
This section introduces components that can be used for lifting.

Click the links below to find out more:

- [Lifting anchor \(80\) \(page 3570\)](#)

### ***Lifting anchor (80)***

**Lifting anchor (80)** creates two lifting anchors (or anchor groups) for a concrete part and places them symmetrically on either side of the part's center of gravity.



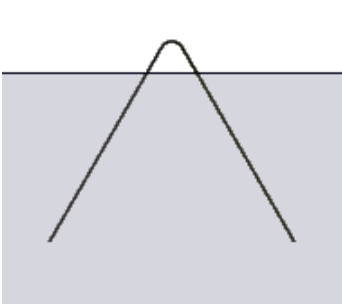
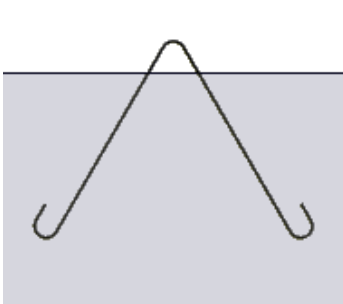
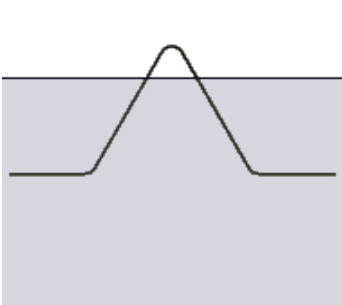
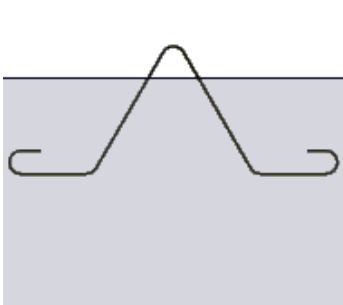
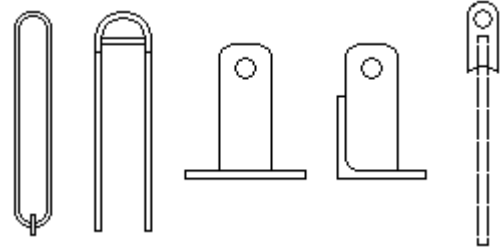
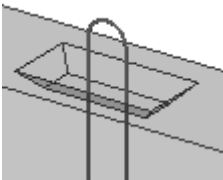
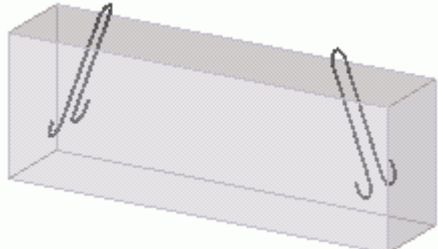
	Description
1	30% of part length (default)
2	Center of gravity

### Objects created

- Lifting anchors (2 or more)
- Recesses for anchors (optional)

### Use for

Situation		More information
		Straight anchor with straight legs (Type A in the anchor properties file, see <b>Anchor properties from a file</b> )

Situation		More information
		Angle anchor with straight legs (Type B)
		Angle anchor with L-shaped legs (Type C)
		Custom components as anchors
		Anchors recessed into the part.
		Skew and/or rotated anchors

**Before you start**

Create the concrete part.

## Selection order


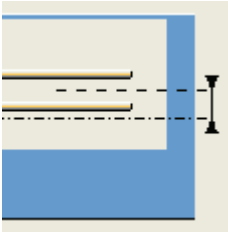
1. Concrete part.


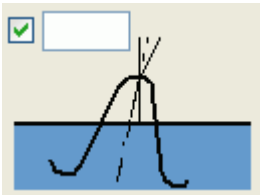
### Picture tab

Use the **Picture** tab to define anchor properties, to use custom components as anchors, to create recess and define recess dimensions.

### Lifting anchor properties

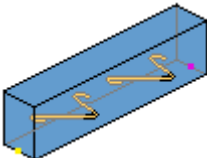
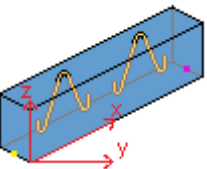
The properties of lifting anchors are:

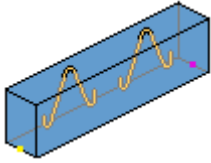
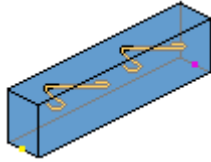
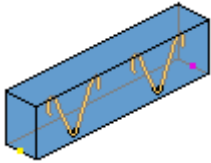
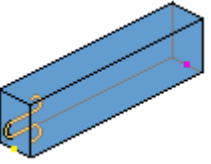
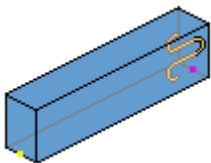
Option	Description
<b>Create anchors</b>	Select how the anchors are created.
<b>Anchor dimensions</b>	<p>The options are:</p> <ul style="list-style-type: none"> <li>• <b>Use dialog values</b></li> <li>• <b>Select from file</b>, see <b>Anchor properties from file</b>.</li> </ul> <p>You need to enter different dimensions for different anchor types.</p>
<b>Distance from</b>	<p>Set the anchor distribution from the center of gravity or part end.</p> <p>You can set the distance either by length or by percentage of the length.</p>
	The distance between an anchor (or anchor group) and the center of gravity of the part. Default is 30% of the part length.
	The distance between an anchor (or group) and the center line of the part.
<b>Number of bars/spacings</b>	The number and spacing of anchors in a group. If the spacing varies, enter each value individually.
<b>Custom</b>	See <b>Custom component as lifting anchor</b> .

Option	Description
<b>Component</b>	
<b>Custom settings</b>	
<b>Up direction</b>	
	The option to define if the anchors are recessed into the part.
	The skew angle of anchors. Anchor heads are skewed towards the part's center of gravity.
<b>Rotate anchor</b>	The option to rotate anchors. The options are: <ul style="list-style-type: none"> <li>• <b>No:</b> Anchors parallel to the part.</li> <li>• <b>Yes:</b> Anchors perpendicular to the part.</li> </ul>
<b>Grade</b>	Strength of the steel used in the anchor.
<b>Size</b>	Diameter of the anchor bar.
<b>Name</b>	Name that is shown in drawings and reports.
<b>Prefix, Start number</b>	Prefix and start number for the part position number.
<b>Class</b>	Part class number.

## Side



Select the side of the part where Tekla Structures creates the anchors:

Option	Description
	Front
	Top Default

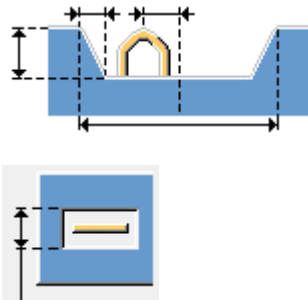
Option	Description
	
	Back
	Below
	Start end
	Finish end

### Recesses

Select one of the following options to define if the lifting anchors are recessed into the concrete part:

Option	Description
	Anchors on the surface of the part. Default
	Anchors recessed into the part.

If you choose to recess the anchors into the part, use the following fields to define the shape and dimensions of the recesses:



### Custom component as lifting anchor

To use custom components as lifting anchors:

1. In the **Custom** list box, select **Yes**.
2. Click the ... button next to the **Component** field to open the **Select component** dialog box.
3. Browse for the custom component you want to use as lifting anchor.  
The component you select must be a custom part and have two or three input points.

The component should be created so that the first and the second input points are on the concrete surface and along the longitudinal axis of the concrete part.

---

**TIP** For more information on how to create custom parts that can be used as lifting anchors, see [Creating standard embeds for global use](#).

---

4. Select the component and click **OK**.
5. To use saved custom component properties, select the saved properties file in **Custom settings**.
6. If the anchor position is not correct, select another option in the **Up direction** list box.

### Rebar assembly tab

Use the **Rebar assembly** tab to add the created reinforcement as a rebar assembly to the cast units.

### Create as rebar assembly

You can add the created reinforcement as a rebar assembly to the cast units with a predefined assembly type, name, prefix, and start number.

Option	Description
<b>Create as rebar assembly</b>	Select <b>Yes</b> to create all reinforcement as one rebar assembly, and to include it to the cast unit of the input part.



Option	Description
<b>Add to existing rebar assembly</b>	<ul style="list-style-type: none"> <li>• <b>Do not add:</b> New rebar is added as a rebar assembly to the cast unit.</li> <li>• <b>As single bars:</b> Add all new rebars directly into an existing rebar assembly as rebars.</li> <li>• <b>As sub-assembly:</b> Add all new rebars to their own new rebar assembly, which is then included as a sub-assembly to the main rebar assembly.</li> </ul>
<b>Rebar assembly type</b>	<p>Select the rebar assembly type.</p> <p>If you do not select the type, the default value of the rebar assembly is used.</p>
<b>Name, Profile, Start number</b>	<p>Define the name, profile, and start number.</p> <p>If you do not define these, the default values of the rebar assembly are used.</p>

### Anchor properties from file

You can define lifting anchor properties by entering values in the dialog box, or you can create a file containing the anchor properties you want to use. Use any standard text editor to create the file and save it as `LiftingAnchors.dat` in the model folder.

To use the anchor properties you define in a file:

1. In the **Lifting anchor (80)** dialog box, select **Select from file** from the **Anchor dimensions** list box.
2. Click the ... button to browse for the file.

### Example

Create a row in the file for each lifting anchor. Enter the following properties, separated by spaces:

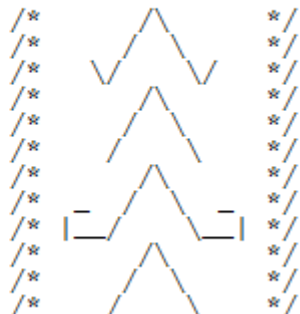
- Anchor capacity [kN], including safety and material factors
- Type [A, B, C, or D], see the **Use for** table.
- Grade [characters]
- Size [characters]
- Anchoring length 1 [mm]

- Anchoring length 2 [mm]
- Protruding dimension of the anchor outside the part [mm]
- Penetrating dimension of the anchor inside the part [mm]
- Bending radius [mm]
- Hook length [mm] (0 = no hook)
- Angle of leg 1 [degrees]
- Angle of leg 2 [degrees]

Here is an example of a lifting anchor file (Tekla Structures ignores the comments enclosed in /\* \*/):

#### LiftingAnchors.dat

10	B	A500HW	10	400	400	100	0	30	75	30	30	/*		*/
20	B	A500HW	12	600	600	150	0	36	100	30	30	/*		*/
30	B	A500HW	16	900	900	200	0	80	150	30	30	/*		*/
10	B	A500HW	10	400	400	100	0	30	0	30	30	/*		*/
20	B	A500HW	12	600	600	150	0	36	0	30	30	/*		*/
30	B	A500HW	16	900	900	200	0	80	0	30	30	/*		*/
10	C	A500HW	10	400	400	100	200	30	75	30	30	/*		*/
20	C	A500HW	12	600	600	150	300	36	100	30	30	/*		*/
30	C	A500HW	16	900	900	200	500	80	150	30	30	/*		*/
10	C	A500HW	10	400	400	100	200	30	0	30	30	/*		*/
20	C	A500HW	12	600	600	150	300	36	0	30	30	/*		*/
30	C	A500HW	16	900	900	200	500	80	0	30	30	/*		*/



Tekla Structures will use the first anchor in the file that:

1. Has the shape and type you define using the graphic list boxes in the **Lifting anchor (80)** dialog box.
2. Can carry the part's weight with other identical anchors. The total number of anchors is two times the number you specify in the **Number of bars** field.

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