TEKLA

A TRIMBLE COMPANY

Tekla Structures

Steel Components Reference Guide

Product version 21.0
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Contents

1 Shear tab connections

This section introduces shear tab connection components available in Tekla Structures.

Click the links below to find out more:

1.1 Shear plate (103)

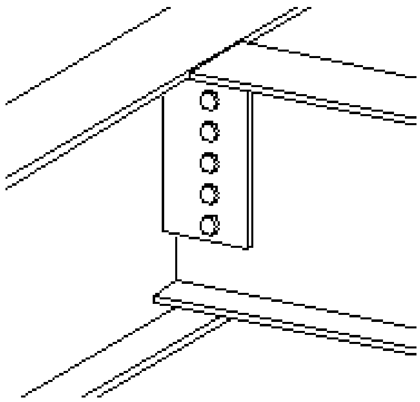
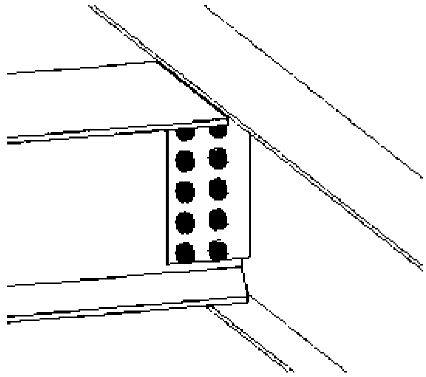
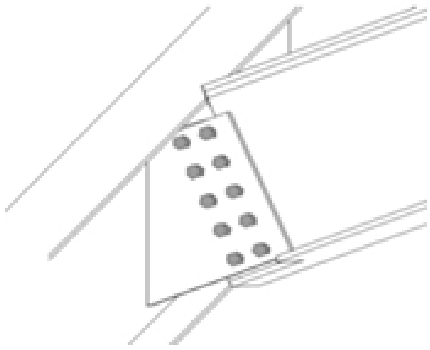
Shear plate (103) connects a beam to a beam or to a column with a shear tab. The shear tab is welded to the main part and bolted to the secondary beam.

Objects created

- Shear tab
- Bolts

- Welds
- Cuts

Use for

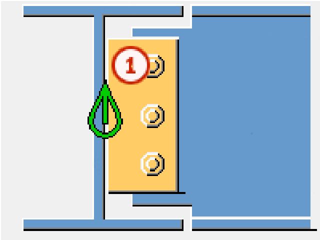
Situation	Description
	Shear tab connected to a beam.
	Shear tab connected to a beam. The secondary beam is skewed.
	Shear tab connected to a beam. The secondary beam is sloped and skewed.

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

See also

Shear plate (103): Picture tab on page 19

Shear plate (103): Parts tab on page 20

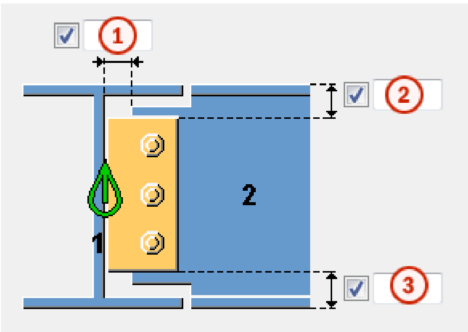
Shear plate (103): Notch tab on page 21

Shear plate (103): Bolts tab on page 26

Shear plate (103): Picture tab

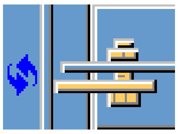
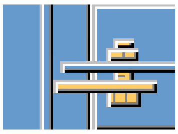
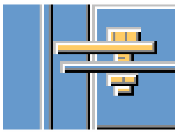
Use the **Picture** tab to control the position of the shear tab in the **Shear plate (103)** connection.

Shear tab dimensions

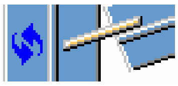
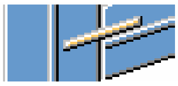
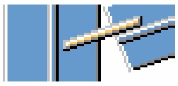


	Description
1	Define the cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part. The cut is defined from the main part web.
2	Define the distance from the top edge of the secondary beam to the top edge of the shear plate.
3	Define the distance 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.

Shear plate (103): Parts tab

Use the **Parts** tab to control the shear tab properties in the **Shear plate (103)** connection.

Shear plate

Part	Description
Shear plate	Define the shear tab thickness and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

Option	Description	Default
	can enter the assembly position number.	
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Shear plate (103): Notch tab

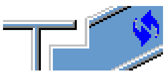
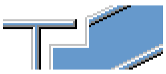
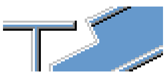
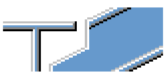
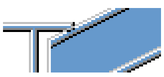
Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties in the **Shear plate (103)** connection. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

Automatic notching

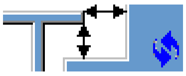
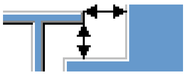
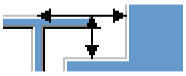
Automatic notching options affect both the top and the bottom flange.

Notch shape

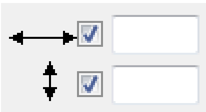
Automatic notching is switched on when you select a notch shape.

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.

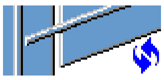
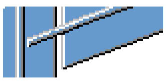
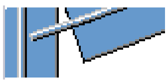
Notch size

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.

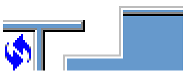
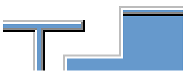
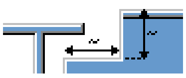


Flange cut shape

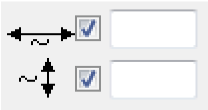
Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

Notch dimension rounding

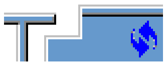
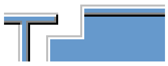
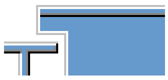
Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

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.

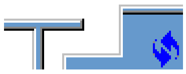
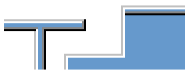
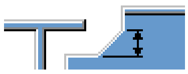
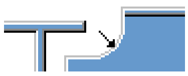
The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



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.

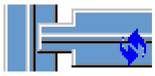
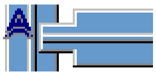
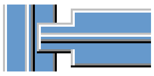
Enter a radius for the chamfer.

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.

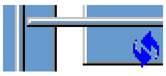
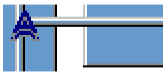
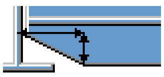
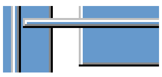
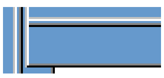
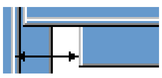
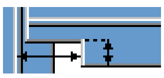
Side of flange notch

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

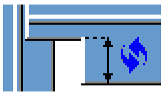
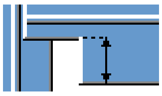
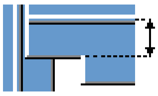
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the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

Flange notch shape

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

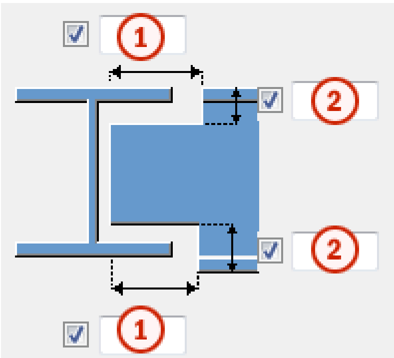
Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. 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 1 and 2.
	The flange is not cut.
	Creates cuts to the flange according to the value in the field 1 to make it flush with the web.
	Creates cuts to the flange according to the values in the fields 1 and 2.

Flange notch depth

Option	Description
	Default Defines the flange notch depth. AutoDefaults can change this option.
	Defines the flange notch depth.
	Defines the 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	Define the dimensions for the horizontal flange cuts.	`10 mm`
2	Define the 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.

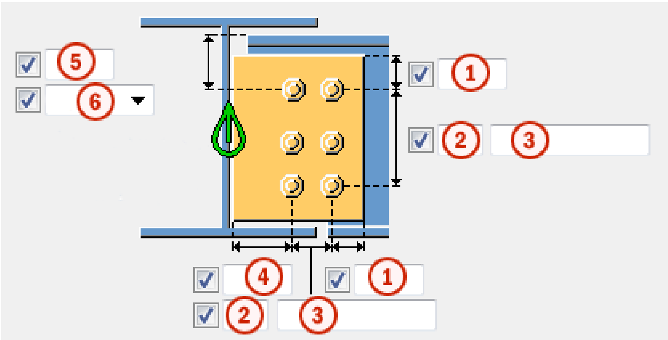
Option	Description
Default	Define the notch dimensions.
Yes	Creates a 50 mm notch for simple beam-to-beam connections.

Option	Description
No	Use the options on this **Notch** tab to define the notch dimensions.

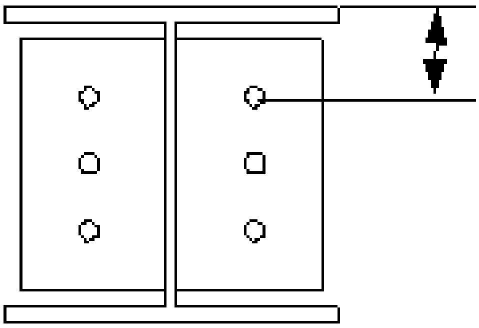
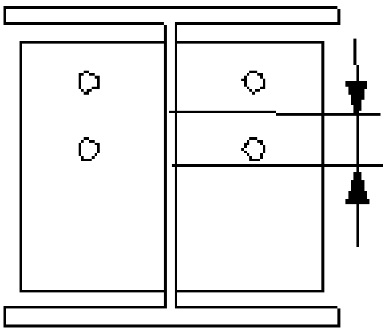
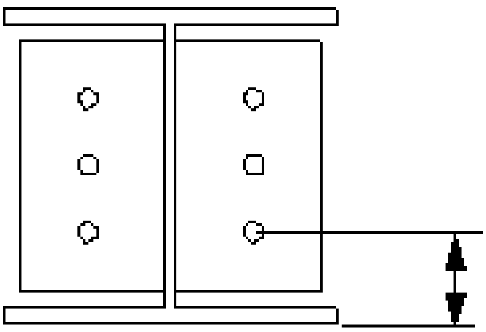
Shear plate (103): Bolts tab

Use the **Bolts** tab to control the bolt properties in the **Shear plate (103)** connection.

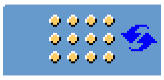
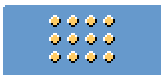
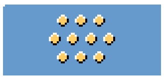
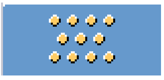
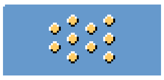
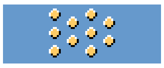
Bolt group dimensions



	Description
1	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Define the number of bolts.
3	Define the 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	Define the dimension for horizontal bolt group position.
5	Define the dimension for vertical bolt group position.

	Description
6	Define 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. 

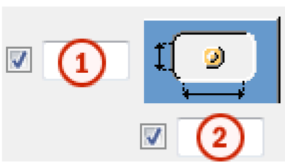
Staggering of bolts

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
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes You can define slotted, oversized, or tapped holes.

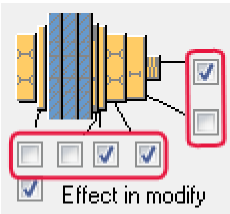


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.

Option	Description	Default
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

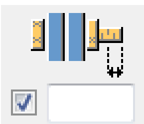
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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

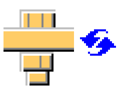
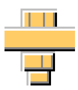


To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

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

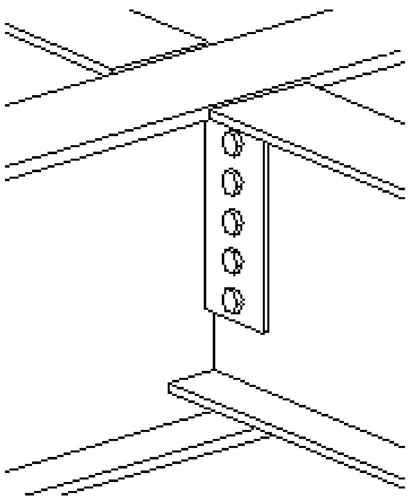
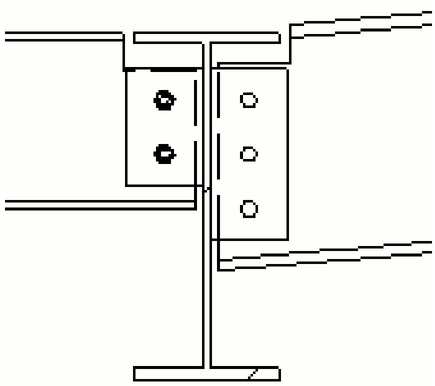
1.2 Two sided shear plate (118)

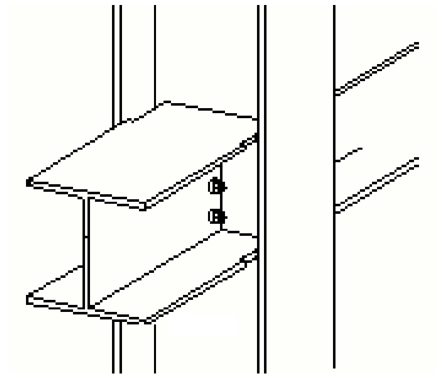
Two sided shear plate (118) connects two beams to a beam or a column with shear tabs. The shear tabs are welded to the main beam or column, and bolted to the secondary beams.

Objects created

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

Use for

Situation	Description
	Simple shear tabs connected to a beam.
	Simple shear tabs connected to a beam. The other secondary beam is sloped.

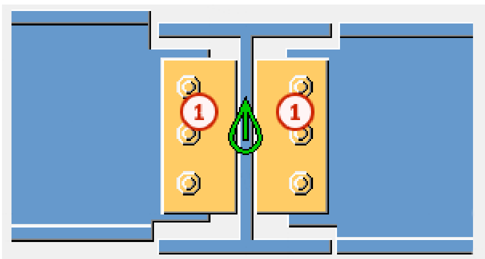
Situation	Description
	Simple shear tabs connected to a column web.

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

See also
Two sided shear plate (118): Picture tab on page 31

Two sided shear plate (118): Parts tab on page 33

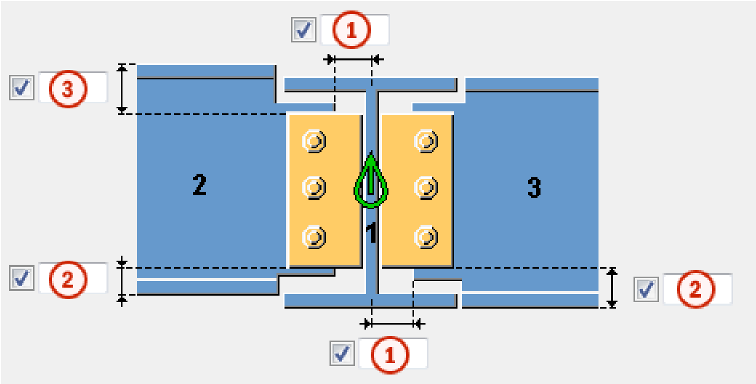
Two sided shear plate (118): Notch tab on page 33

Two sided shear plate (118): Bolts tab on page 36

Two sided shear plate (118): Picture tab

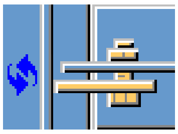
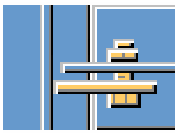
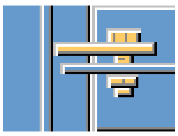
Use the **Picture** tab to control the position of the shear tabs in the **Two sided shear plate (118)** connection.

Shear tab dimensions

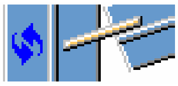
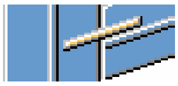
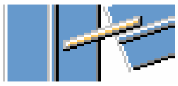


	Description	Default
1	Define the cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part. The cut is defined from the main part web.	
2	Define the distance from the bottom edge of the secondary beam to the bottom edge of the shear tab.	
3	Define the 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 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
	Bevel Cuts the end of the flange bevel.
	Square Cuts the end of the flange square.

Two sided shear plate (118): Parts tab

Use the **Parts** tab to control the shear tab properties in the **Two sided shear plate (118)** connection.

Shear plate

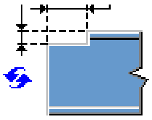
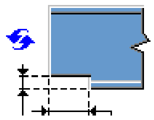
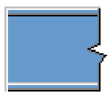
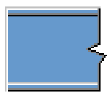
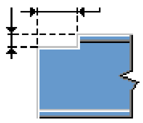
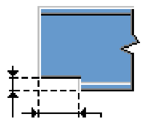
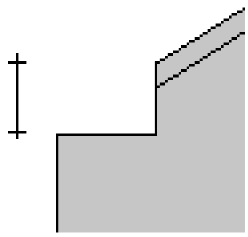
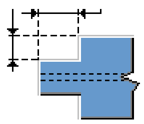
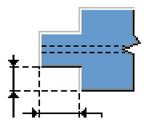
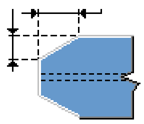
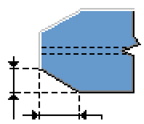
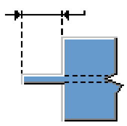
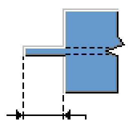
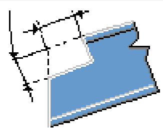
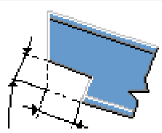
Part	Description
Shear plate	Define the shear tab thickness and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

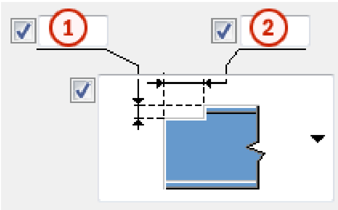
Two sided shear plate (118): Notch tab

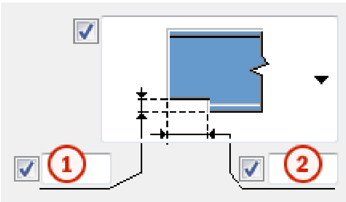
Use the **Notch** tab to create notches for the secondary beams and to control the notch properties in the **Two sided shear plate (118)** connection. Define the notches for both secondary beams.

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

Option	Option	Description
		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, the depth is measured as shown in the picture. 
		Creates a notch on both sides of the secondary part. Define the notch dimensions.
		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.

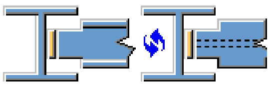
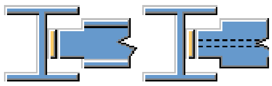
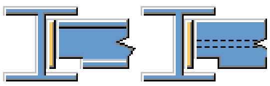
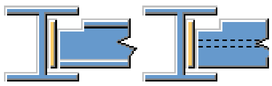
Notch dimensions Define the top and the bottom dimensions of the notch if you have set the **BCSA notch def** option to **No**.





	Description
1	Define the vertical notch dimension.
2	Define the 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.

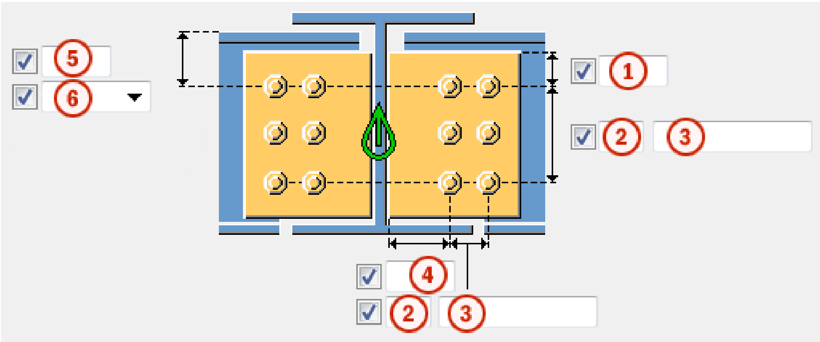
Option	Description
Default	Define the notch dimensions.
Yes	Creates a 50 mm notch for simple beam-to-beam connections.

Option	Description
No	Use the options on this **Notch** tab to define the notch dimensions.

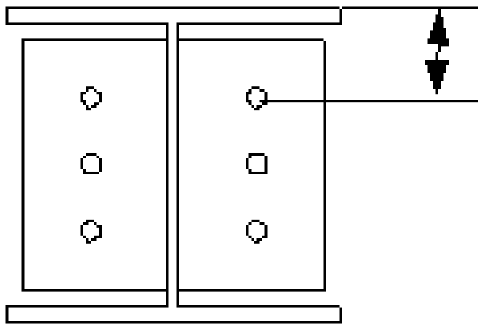
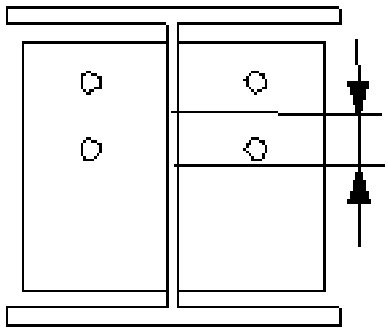
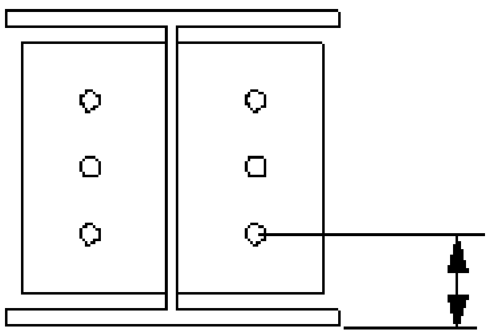
Two sided shear plate (118): Bolts tab

Use the **Bolts** tab to control the bolt properties in the **Two sided shear plate (118)** connection.

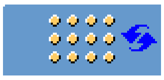
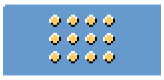
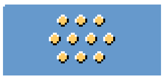
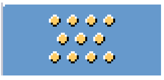
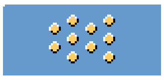
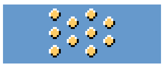
Bolt group dimensions



	Description
①	Define the 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	Define the 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	Define the horizontal bolt edge distance.
⑤	Define the dimension for vertical bolt group position.

	Description
6	Define 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. 

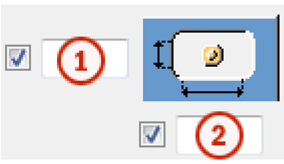
Staggering of bolts

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
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes You can define slotted, oversized, or tapped holes.

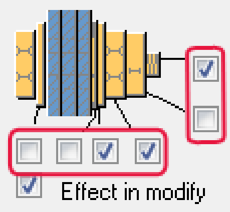


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.

Option	Description	Default
②	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

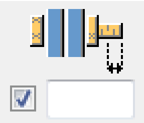
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



1.3 Beam with stiffener (129)

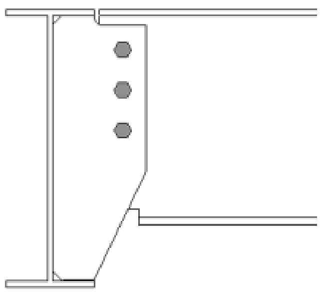
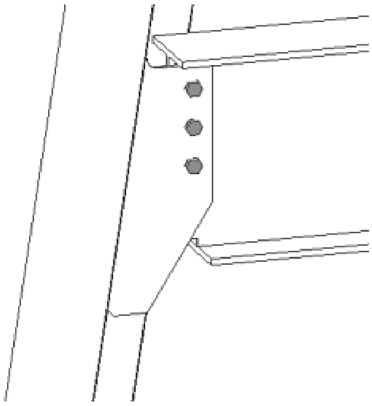
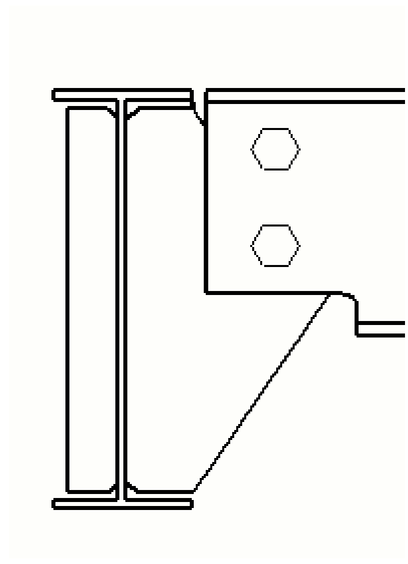
Beam with stiffener (129) connects a beam to another beam with a bolted and welded shear tab. The connection can be used at the back of a U-profile. The secondary beam can be leveled or sloped and/or skewed.

Objects created

- Shear tabs (1 or 2)
- Stiffener (optional)

- Haunch plates (optional)
- Welds
- Bolts
- Cuts

Use for

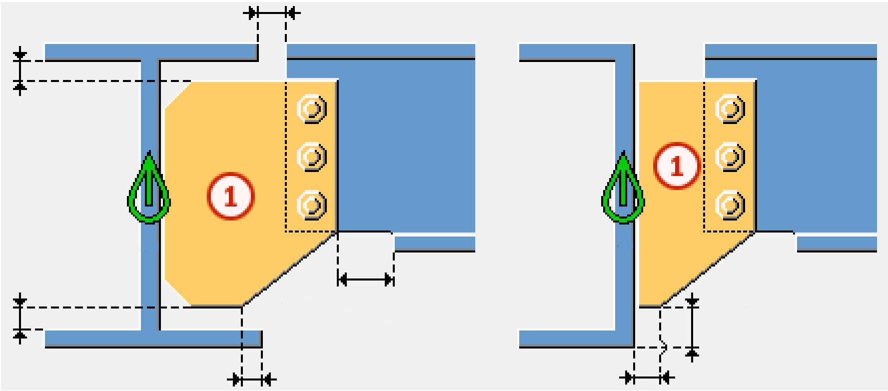
Situation	Description
	Full depth shear tab.
	Full depth shear tab. The secondary part is sloped and/or skewed.
	Shear tab with a beam stiffener.

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

You can use the `joints.def` file to change the default values of this component.

See also

Beam with stiffener (129): Picture tab on page 41

Beam with stiffener (129): Plates tab on page 44

Beam with stiffener (129): Stiffeners tab on page 48

Beam with stiffener (129): Bolts tab on page 51

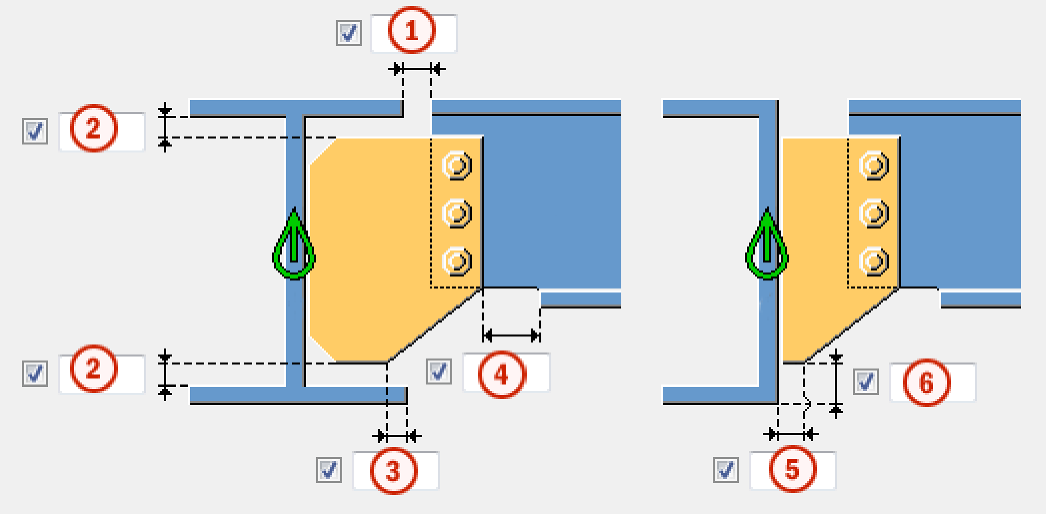
Beam with stiffener (129): Notch tab on page 55

Beam with stiffener (129): Haunch tab on page 60

Beam with stiffener (129): Picture tab

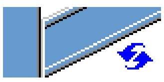
Use the **Picture** tab to control the position of the shear tab, and the beam flange and the web cuts in the **Beam with stiffener (129)** connection.

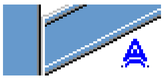
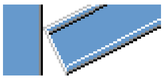
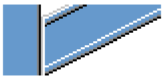
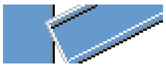
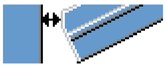
Dimensions



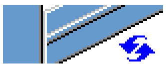
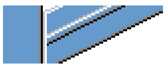
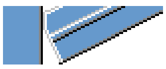
	Description	Default
1	Define the cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	10 mm
2	Define the shear tab edge distance from the main part flange edge.	0
3	Define the distance from the corner of the shear tab to the edge of the main part flange.	
4	Define the 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	Define the distance from the edge of the main part to the corner of the shear tab.	20 mm
6	Define the 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.

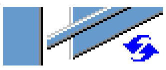
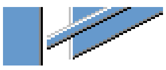
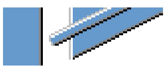
Option	Description
	Default Bevel AutoDefaults can change this option.

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.
	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.

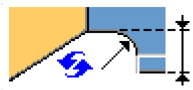
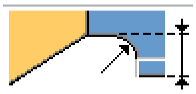
Beam flange cut Define how the secondary beam flange end is cut. The beam is viewed from the top.

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 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 bottom flange cut

Option	Description
	Default Notch AutoDefaults can change this option.
	Notch 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.

Beam with stiffener (129): Plates tab

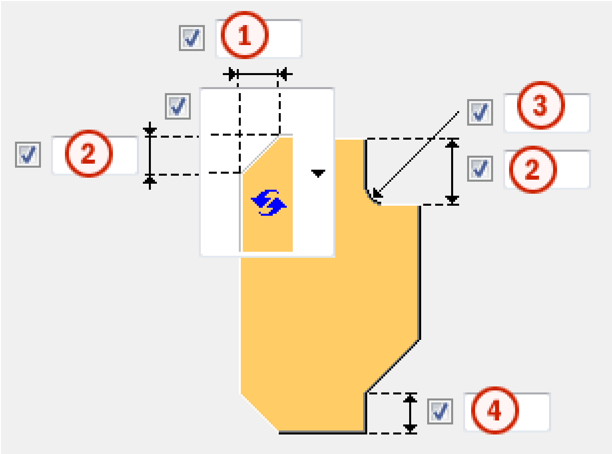
Use the **Plates** tab to control the size, position, number, and shape of the shear tab in the **Beam with stiffener (129)** connection.

Shear tab plate

Part	Description
Tab plate	Define the shear tab plate thickness, width and height.

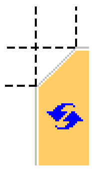
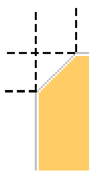
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

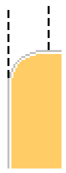
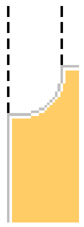
Shear tab chamfers



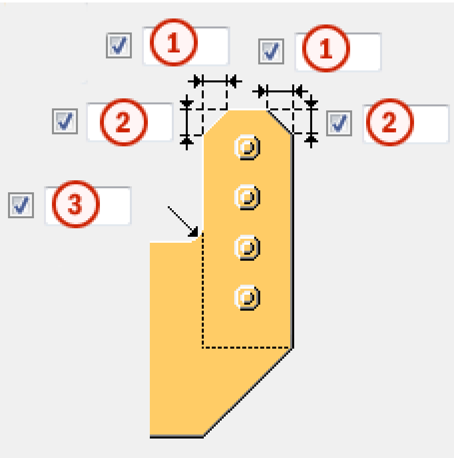
	Description
1	Define the horizontal dimension of the shear tab chamfer.
2	Define the vertical dimension of the shear tab chamfer.
3	Define the vertical and the horizontal dimension of the shear tab chamfer.
4	Define the vertical dimension from the bottom edge of the shear tab to the lower shear tab corner.

Chamfer type

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

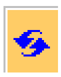
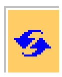
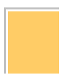
Option	Description
	Convex arc chamfer
	Concave arc chamfer

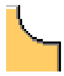
Inner shear tab chamfers



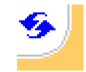
	Description
1	Define the horizontal dimension of the shear tab chamfer.
2	Define the vertical dimension of the shear tab chamfer.
3	Define the radius and the vertical dimensions of the shear tab inner chamfer.

Chamfer type

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

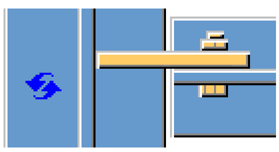
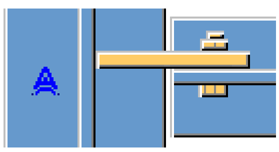
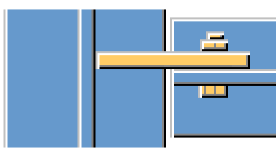
Option	Option	Description
		Line chamfer
		Convex arc chamfer
		Concave arc chamfer

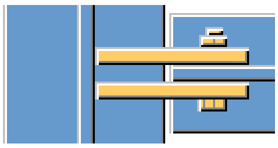
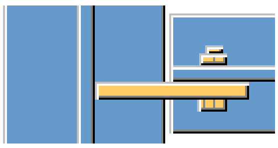
Inner chamfer type

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

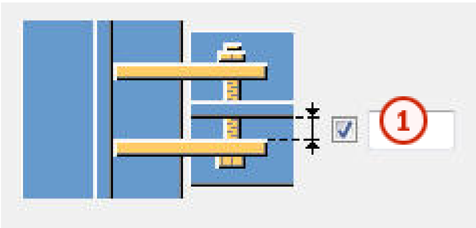
Shear tab position

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 near side or 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

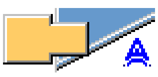
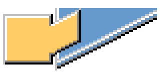
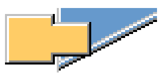
Option	Description
	Near side and far side shear tab
	Near side shear tab

Gap between shear tabs



	Description	Default
1	Define the 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

Beam with stiffener (129): Stiffeners tab

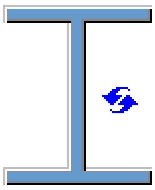
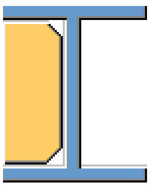
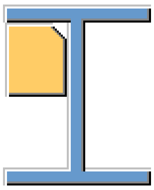
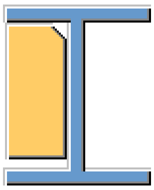
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position, and type in the **Beam with stiffener (129)** connection.

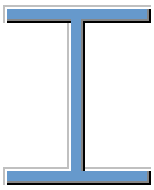
Opposite web stiffener plate dimensions

Part	Description
Opposite web stiffener	Define the opposite web stiffener plate thickness, width and height.

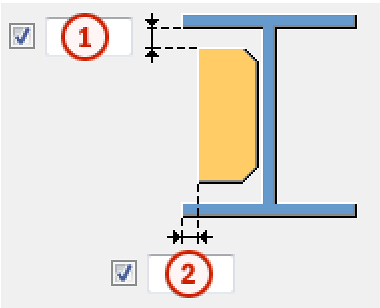
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a 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.
	Partial Leaves a gap between the stiffener plate and the bottom flange of the main part.

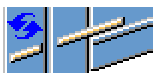
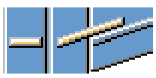
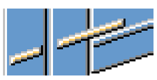
Option	Description
	No stiffeners are created.

Stiffener gap

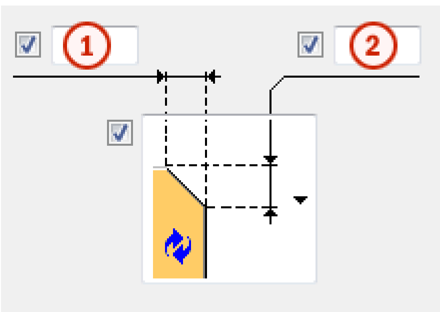


	Description
1	Define the size of the gap between the main part flange and the stiffener.
2	Define the distance from the edge of the main part flange to the edge of the stiffener.

Stiffener orientation

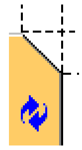
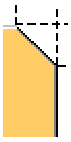
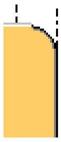
Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are perpendicular to the main part.
	Stiffeners are parallel to the secondary part.

Chamfer dimensions



	Description
1	Define the horizontal dimension of the chamfer.
2	Define the vertical dimension of the chamfer.

Chamfer type

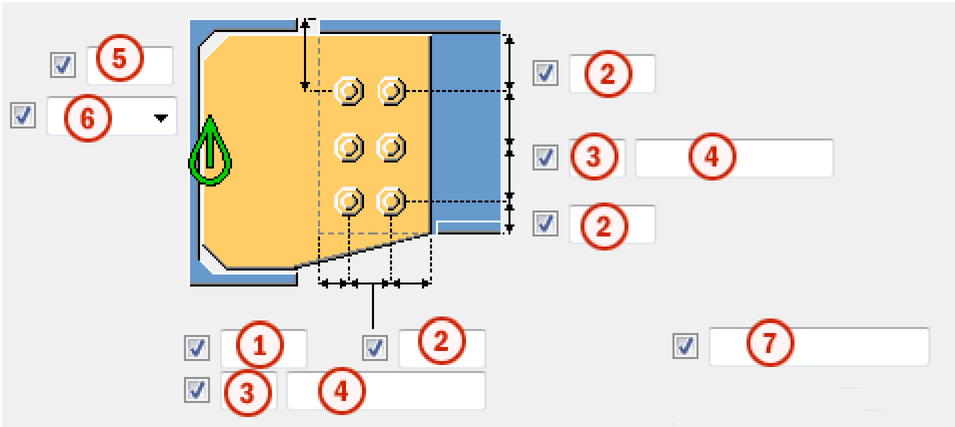
Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

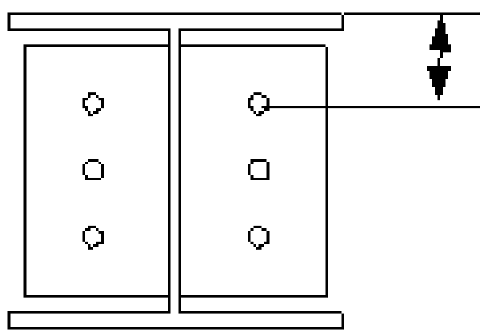
Beam with stiffener (129): Bolts tab

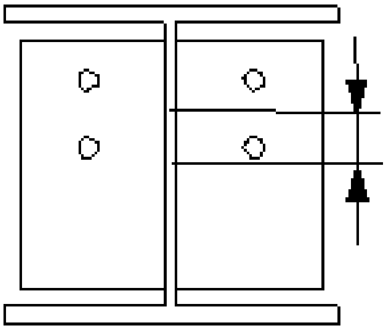
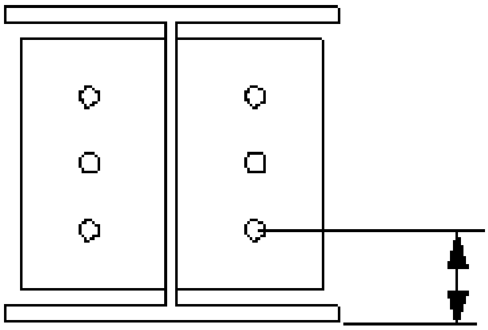
Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part in the **Beam with stiffener (129)** connection.

Bolt group dimensions

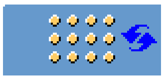
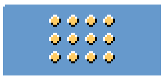
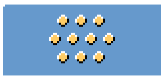
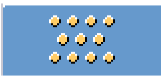
Bolt group dimensions affect the size and shape of the shear tab.

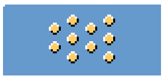
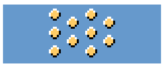


Option	Description
1	Define the dimension for horizontal bolt group position.
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.
4	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Define the dimension for vertical bolt group position.
6	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt. 

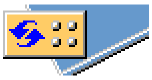
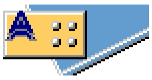
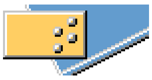
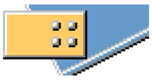
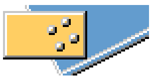
Option	Description
	• **Middle**: From the center line of the bolts to the center line of the secondary part.  • **Below**: From the lower edge of the secondary part to the lowest bolt. 
7	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate 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

Option	Description
	Staggered type 3
	Staggered type 4

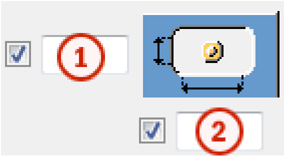
Bolt group orientation

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
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

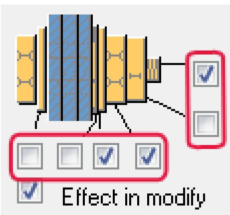
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

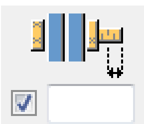
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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 with stiffener (129): Notch tab

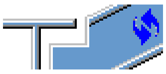
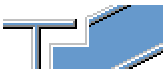
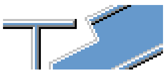
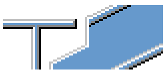
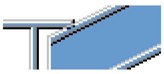
Use the **Notch** tab to automatically create notches for the secondary beams and to control the notch properties in the **Beam with stiffener (129)** connection. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

Automatic notching

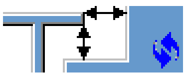
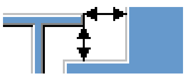
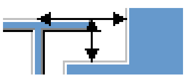
Automatic notching options affect both the top and the bottom flange.

Notch shape

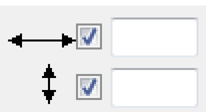
Automatic notching is switched on when you select a notch shape.

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.

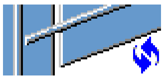
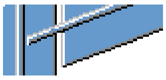
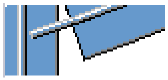
Notch size

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.

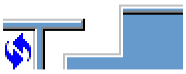
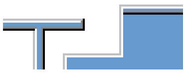
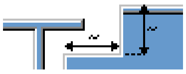


Flange cut shape

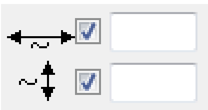
Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

Notch dimension rounding

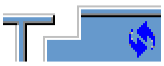
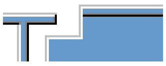
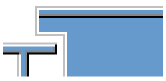
Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

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.

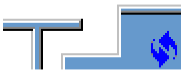
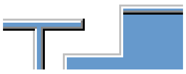
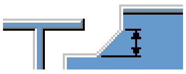
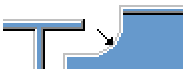
The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



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.

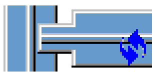
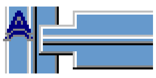
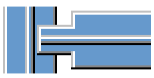
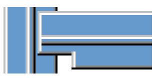
Enter a radius for the chamfer.

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.

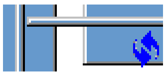
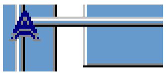
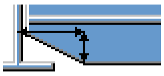
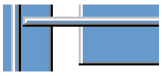
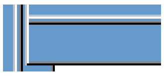
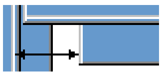
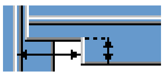
Side of flange notch

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

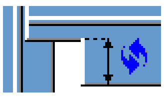
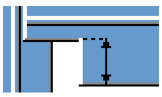
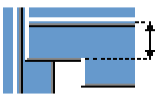
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the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

Flange notch shape

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

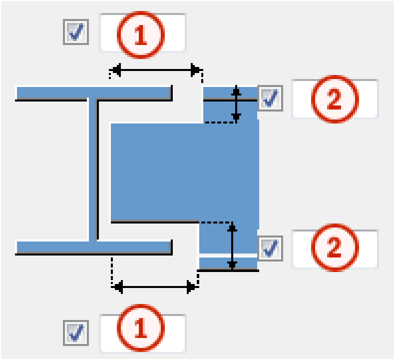
Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. 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 1 and 2.
	The flange is not cut.
	Creates cuts to the flange according to the value in the field 1 to make it flush with the web.
	Creates cuts to the flange according to the values in the fields 1 and 2.

Flange notch depth

Option	Description
	Default Defines the flange notch depth. AutoDefaults can change this option.
	Defines the flange notch depth.
	Defines the 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	Define the dimensions for the horizontal flange cuts.	`10 mm`
2	Define the 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 with stiffener (129): Haunch tab

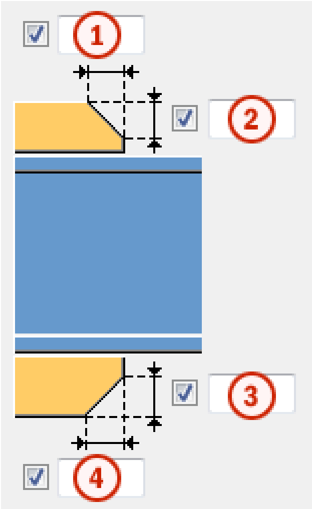
Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges in the **Beam with stiffener (129)** connection.

Haunch plates

Part	Description
Top plate	Define the top haunch plate thickness, width and height.
Bottom plate	Define the bottom haunch plate thickness, width and height.

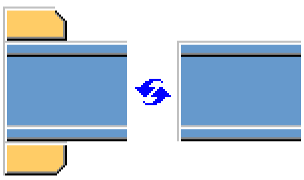
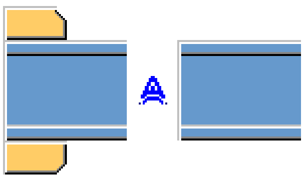
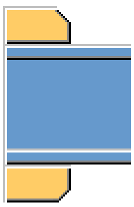
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

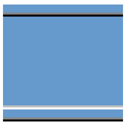
Haunch plate chamfers



	Description
1	Define the width of the top haunch plate chamfer.
2	Define the height of the top haunch plate chamfer.
3	Define the height of the bottom haunch plate chamfer.
4	Define the width of the bottom haunch plate chamfer.

Hauch 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.
	Top and bottom haunch plates are created. To create a single plate, enter 0 in the thickness (**t**) field for the plate you do not need (top or bottom plate).

Option	Description
	Haunch plates are not created.

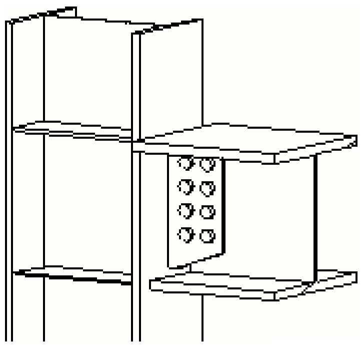
1.4 Column with shear plate (131)

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

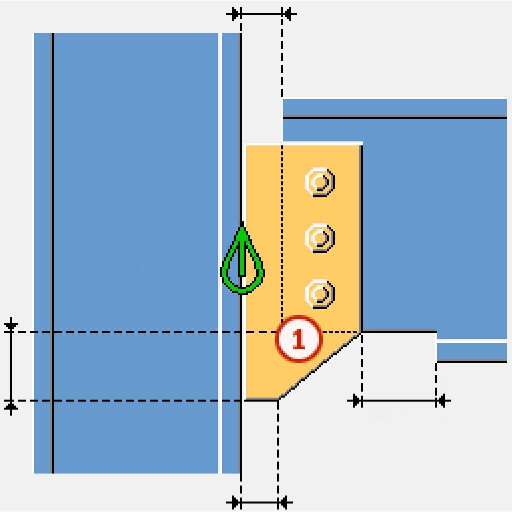
Option	Description
	Two shear tabs and four stiffeners.

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

You can use the `joints.def` file to change the default values of this component.

See also

Column with shear plate (131): Picture tab on page 63

Column with shear plate (131): Plates tab on page 66

Column with shear plate (131): Stiffeners tab on page 69

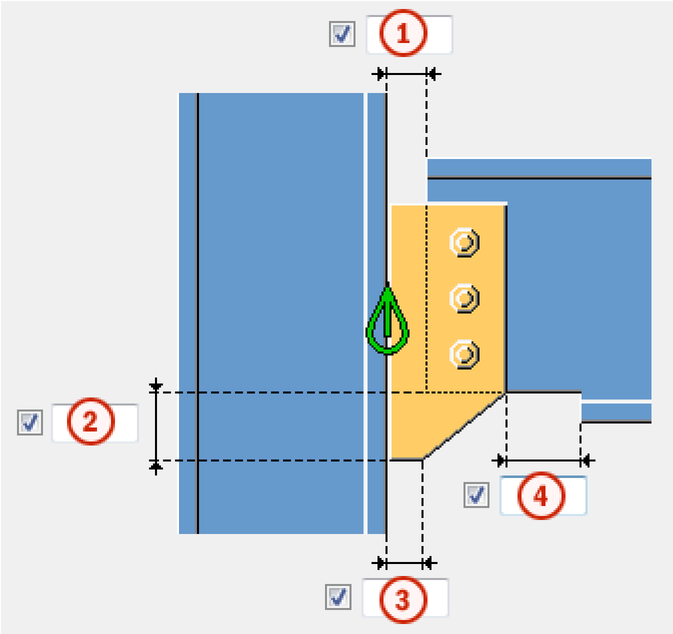
Column with shear plate (131): Bolts tab on page 73

Column with shear plate (131): Notch tab on page 78

Column with shear plate (131): Picture tab

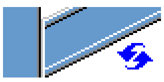
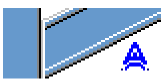
Use the **Picture** tab to control the position of the shear tab, and the beam flange and the web cuts in the **Column with shear plate (131)** connection.

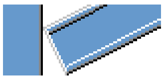
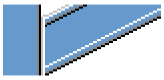
Dimensions



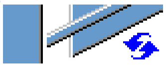
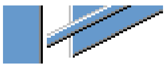
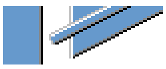
	Description	Default
1	Define the cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	10 mm
2	Define the height of the chamfered part of the shear tab.	50 mm
3	Define the distance from the edge of the main part to the corner of the shear tab.	20 mm
4	Define the 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.

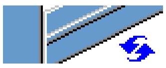
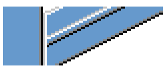
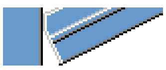
Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.

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.

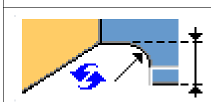
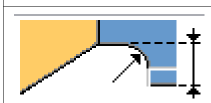
Beam web cut Define how the secondary beam web end is cut. The beam is viewed from the top.

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 AutoDefaults can change this option.
	Notch The bottom of the secondary beam is notched if the shear tab crosses the flange.

Option	Description
	Flange cut The secondary beam flange is cut on the same side as the shear tab if the shear tab crosses the flange.

Column with shear plate (131): Plates tab

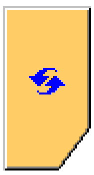
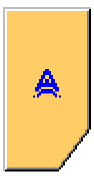
Use the **Plates** tab to control the size, position, number, orientation and shape of the shear tab in the **Column with shear plate (131)** connection.

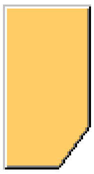
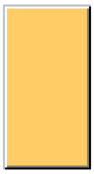
Shear tab plate

Part	Description
Tab plate	Define the shear tab plate thickness, width and height.

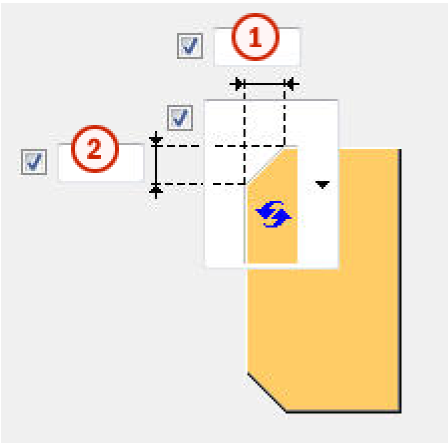
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a 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.

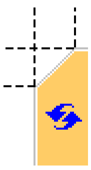
Option	Description
	Shear tab corner is chamfered.
	Shear tab corner is not chamfered.

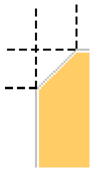
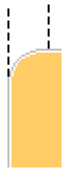
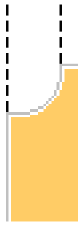
Shear tab chamfers



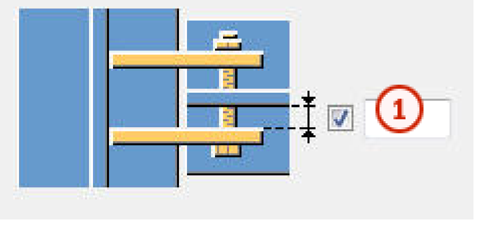
	Description
1	Define the horizontal dimension of the shear tab chamfer.
2	Define the vertical dimension of the shear tab chamfer.

Chamfer type

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

Option	Description
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

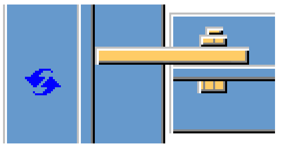
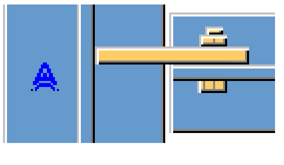
Gap between shear tabs

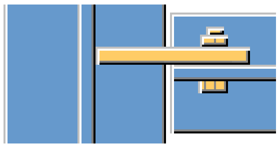
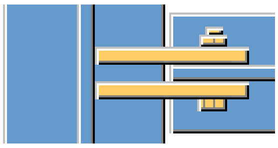
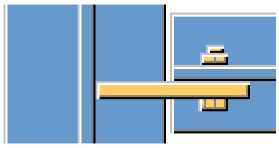


	Description	Default
1	Define the gap between the secondary part web and shear tab. This only affects connections with two shear tabs.	0

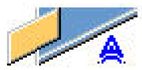
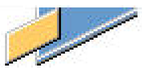
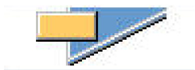
Shear tab position

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 near side or far side shear tab. The tab is created to the side of the secondary part

Option	Description
	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

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 **Sloped** option, but the vertical edge of the shear tab connected to the secondary beam is cut perpendicular to the secondary beam flange.

Column with shear plate (131): Stiffeners tab

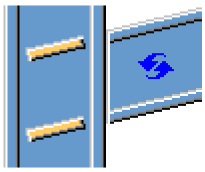
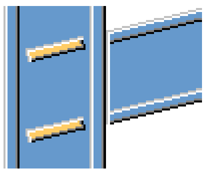
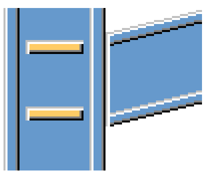
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type in the **Column with shear plate (131)** connection.

Stiffener plate dimensions

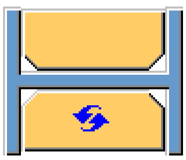
Part	Description
Top NS	Define the top near side stiffener thickness, width and height.
Top FS	Define the top far side stiffener thickness, width and height.
Bottom NS	Define the bottom near side stiffener thickness, width and height.
Bottom FS	Define the bottom far side stiffener thickness, width and height.

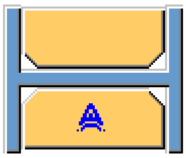
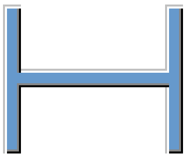
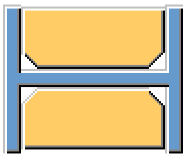
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Stiffener orientation

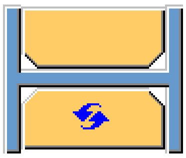
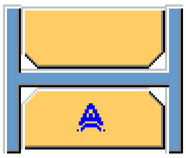
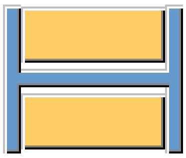
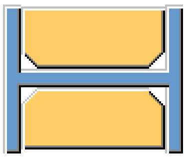
Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are parallel to the secondary part.
	Stiffeners are perpendicular to the main part.

Stiffener creation

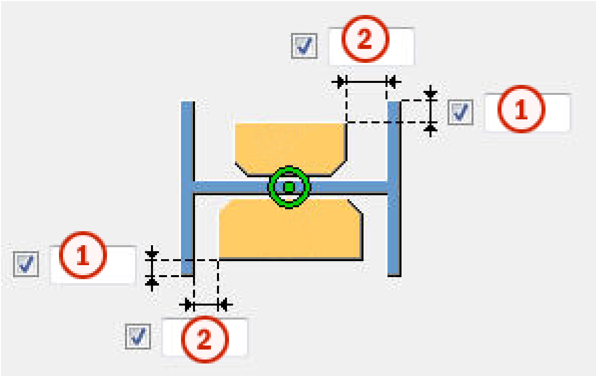
Option	Description
	Default Stiffeners are created. AutoDefaults can change this option.

Option	Description
	Automatic Stiffeners are created when necessary.
	No stiffeners are created.
	Stiffeners are created.

Stiffener shape

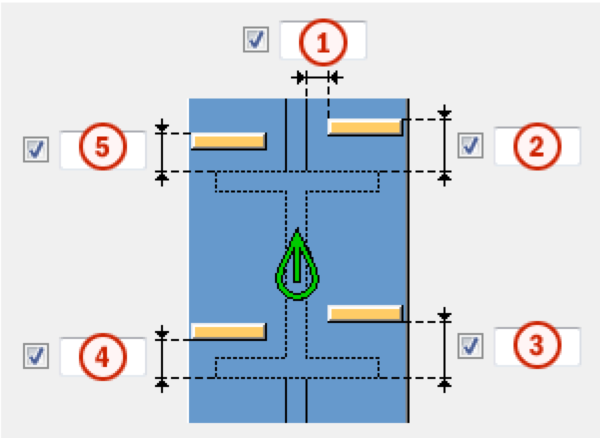
Option	Description
	Default Line chamfered stiffener plates AutoDefaults can change this option.
	Automatic Line chamfered stiffener plates
	Square stiffener plates Stiffener plates with a gap for the main part web rounding
	Line chamfered stiffener plates

Stiffener gap



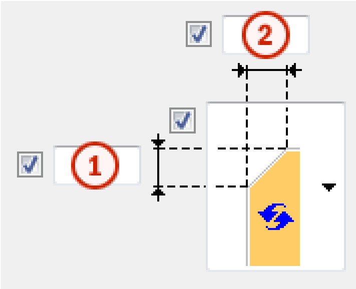
	Description
1	Define the distance from the edge of the flange to the edge of the stiffener.
2	Define the size of the gap between the flanges and the stiffener.

Stiffener positions



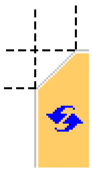
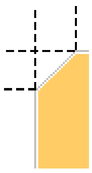
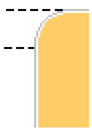
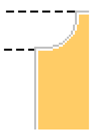
	Description
1	Define the size of the gap between the stiffener and the beam web edge.
2	Define the size of the gap between the top near side stiffener and the beam flange edge.
3	Define the size of the gap between the bottom near side stiffener and the beam flange edge.
4	Define the size of the gap between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

Chamfer dimensions



	Description	Default
1	Define the vertical dimension of the chamfer.	`10 mm`
2	Define the horizontal dimension of the chamfer.	`10 mm`

Chamfer type

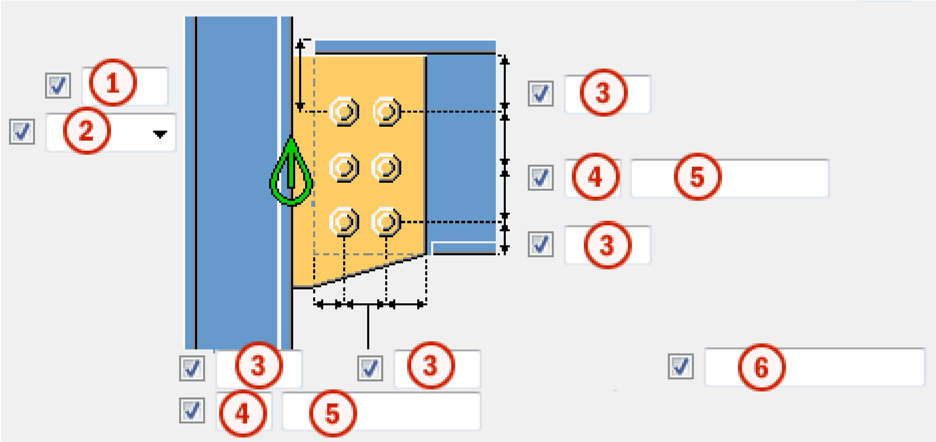
Option	Description
	Default. Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

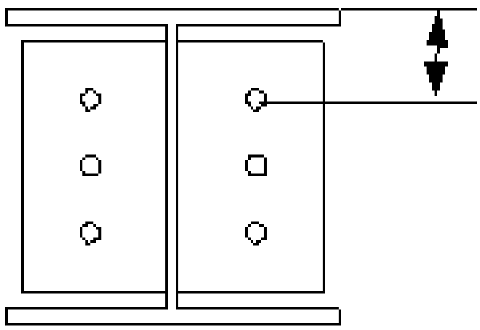
Column with shear plate (131): Bolts tab

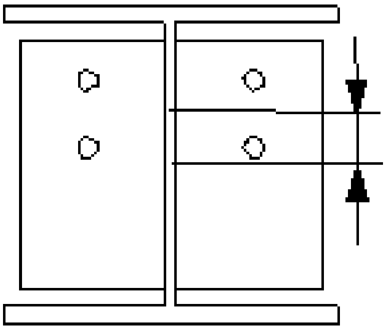
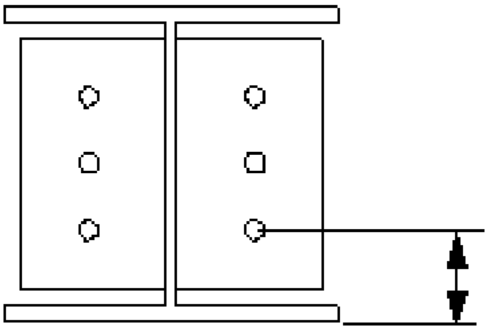
Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part in the **Column with shear plate (131)** connection.

Bolt group dimensions

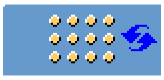
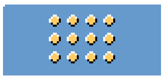
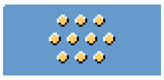
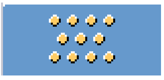
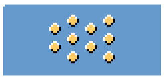
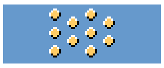
Bolt group dimensions affect the size and shape of the shear tab.



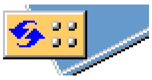
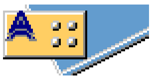
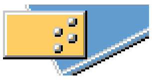
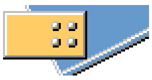
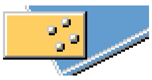
Option	Description
1	Define the dimension for vertical bolt group position.
2	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt. 

Option	Description
	• **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. 
③	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
④	Define the number of bolts.
⑤	Define the 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.

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

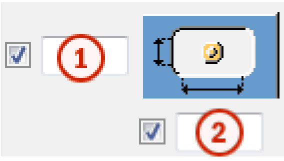
Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

Bolt basic properties

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

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

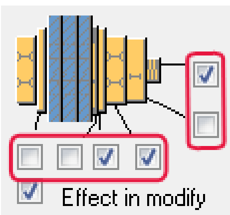
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

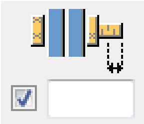
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.

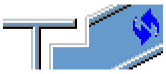
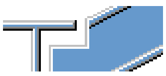
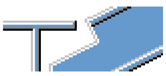
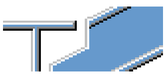
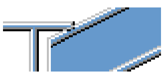


Column with shear plate (131): Notch tab

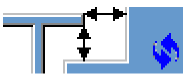
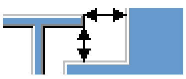
Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties in the **Column with shear plate (131)** connection. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

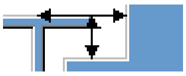
Automatic notching Automatic notching options affect both the top and the bottom flange.

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

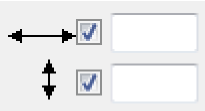
Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary 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

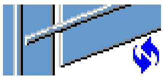
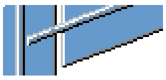
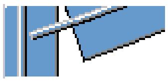
Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.

Option	Description
	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.

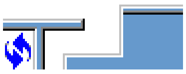
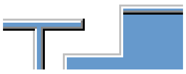
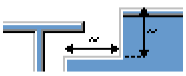


Flange cut shape

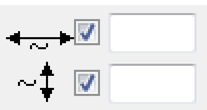
Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

Notch dimension rounding

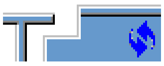
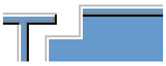
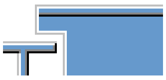
Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

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.

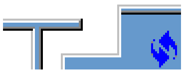
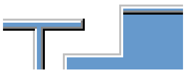
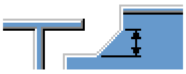
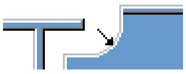
The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



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.

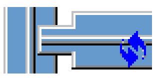
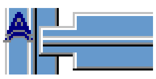
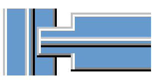
Enter a radius for the chamfer.

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.

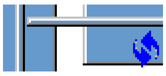
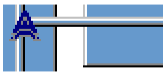
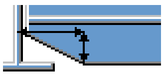
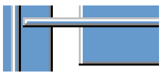
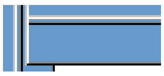
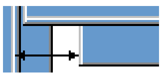
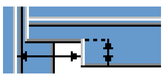
Side of flange notch

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

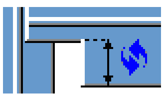
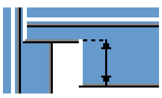
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.

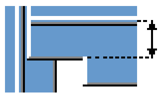
Option	Description
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

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 1 and 2.
	The flange is not cut.
	Creates cuts to the flange according to the value in the field 1 to make it flush with the web.
	Creates cuts to the flange according to the values in the fields 1 and 2.

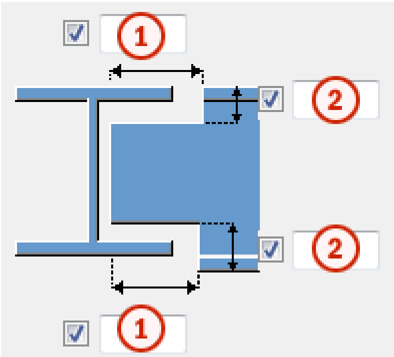
Flange notch depth

Option	Description
	Default Defines the flange notch depth. AutoDefaults can change this option.
	Defines the flange notch depth.

Option	Description
	Defines the 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	Define the dimensions for the horizontal flange cuts.	10 mm
2	Define the 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.

1.5 Bolted moment connection (134)

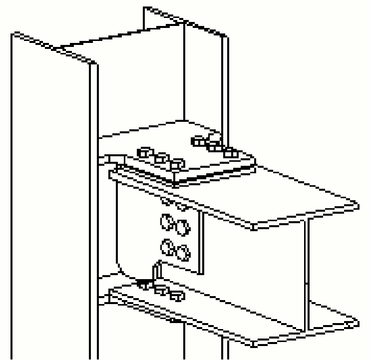
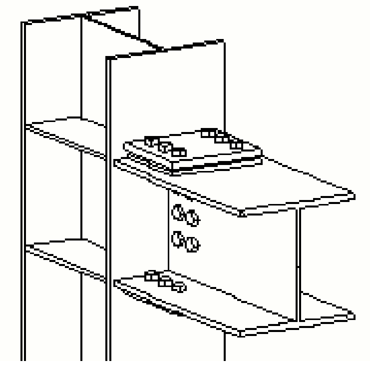
Bolted moment connection (134) connects a beam to a column web or flange. The shear tab is welded to the main part web or flange, and bolted to the secondary part web. The secondary part can be leveled or sloped and/or skewed.

Objects created

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

- Bolts
- Welds
- Cuts

Use for

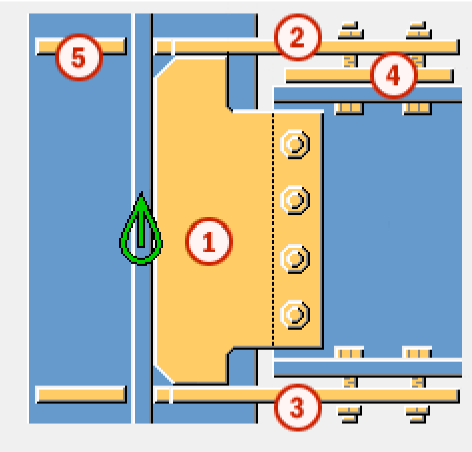
Situation	Description
	Beam connected to column web.
	Beam connected to column flange.

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

You can use the `joints.def` file to change the default values of this component.

See also

Bolted moment connection (134): Picture tab on page 84

Bolted moment connection (134): Shear plate tab on page 86

Bolted moment connection (134): Flange plate tab on page 89

Bolted moment connection (134): Stiffeners tab on page 92

Bolted moment connection (134): Shear bolts tab on page 96

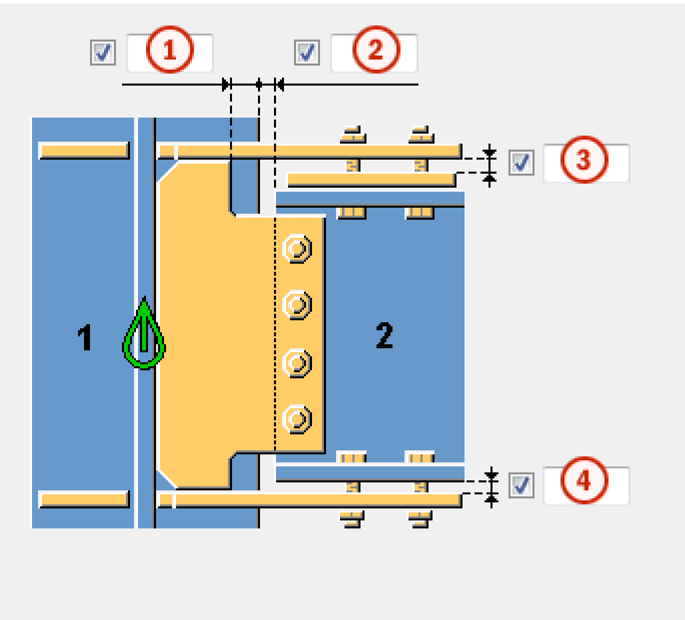
Bolted moment connection (134): Flange bolts tab on page 99

Bolted moment connection (134): Doubler plate tab on page 103

Bolted moment connection (134): Picture tab

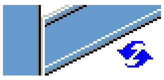
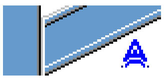
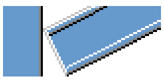
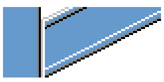
Use the **Picture** tab to control the position of the shear tab, and the beam flange and web cuts in the **Bolted moment connection (134)** connection.

Dimensions

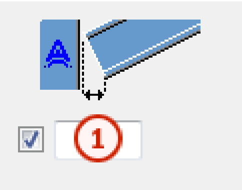


	Description
1	Define the shear tab edge distance from the main part flange edge.
2	Define the cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.
3	Define the distance from the shim plate edge to the flange plate edge.
4	Define the distance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

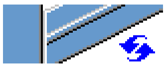
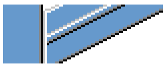
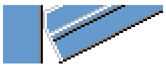
Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.
	Square Cuts the end of the secondary beam square.
	Bevel Cuts the end of the secondary beam parallel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

Beam bevel cut



	Description
1	Define the 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.

Bolted moment connection (134): Shear plate tab

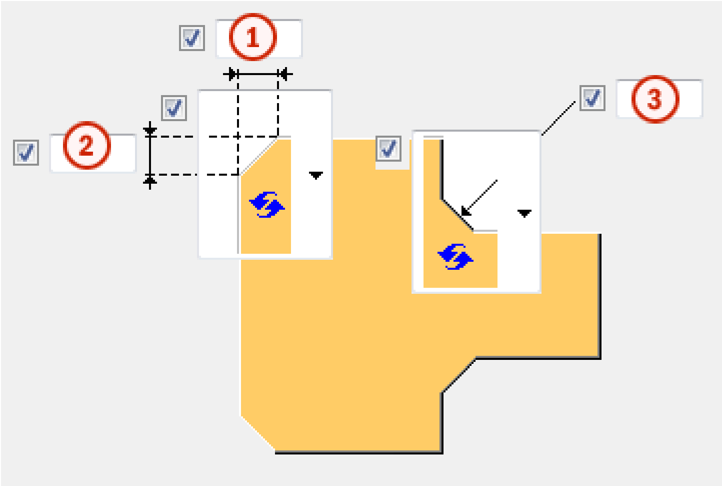
Use the **Shear plate** tab to control the size, position, number, orientation and shape of the shear tab in the **Bolted moment connection (134)** connection.

Shear tab plate

Part	Description
Tab plate	Define the shear tab plate thickness, width and height.

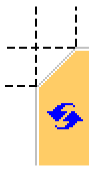
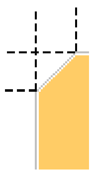
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

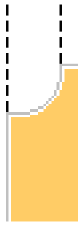
Shear tab chamfers



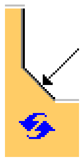
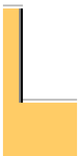
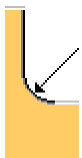
	Description
1	Define the horizontal dimension of the shear tab chamfer.
2	Define the vertical dimension of the shear tab chamfer.
3	Define the vertical and the horizontal dimension of the shear tab chamfer.

Chamfer type

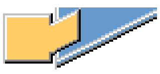
Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer

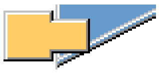
Option	Description
	Concave arc chamfer

Chamfer type dimensions

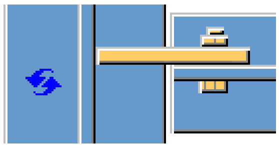
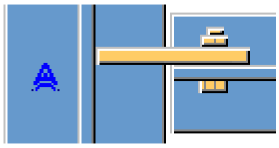
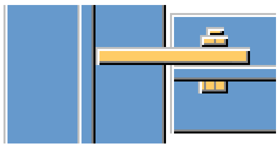
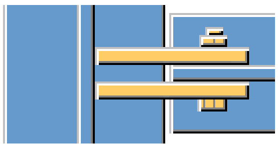
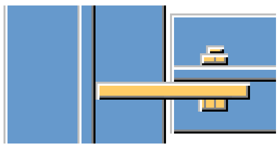
Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Concave arc chamfer

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. Both vertical edges of the shear tab are cut parallel to the end of the secondary beam.

Option	Description
	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 near side or 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

Bolted moment connection (134): Flange plate tab

Use the **Flange plate** tab to control the size, position, number, orientation and shapte of the flange plates and shim plates in the **Bolted moment connection (134)** connection.

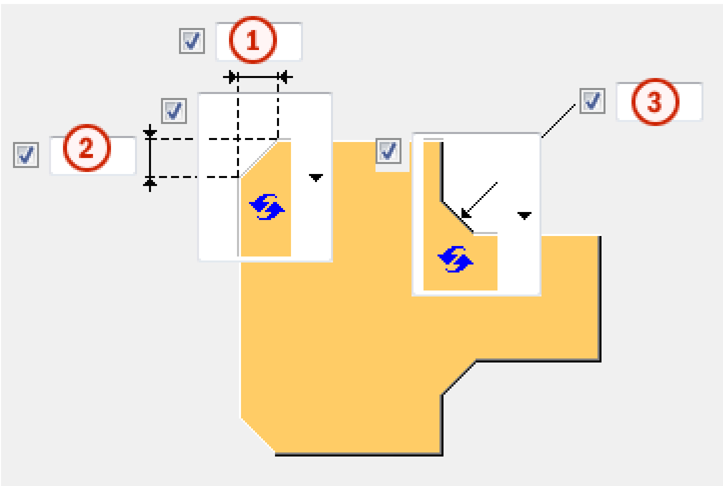
Tab plate

Part	Description	Default
Upper flange plate	Define the upper flange plate thickness.	20 mm
Lower flange plate	Define the lower flange plate thickness.	20 mm

Part	Description	Default
Upper deck fill	Define the upper deck shim plate thickness and width.	10 mm
Lower deck fill	Define the lower deck shim plate thickness and width.	0
Upper loose fill	Define the upper shim plate thickness.	
Lower loose fill	Define the lower shim plate thickness.	

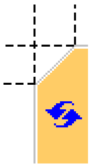
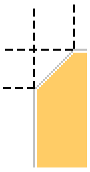
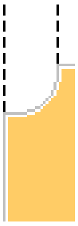
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Flange plate chamfers

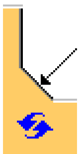


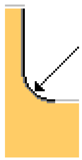
	Description
1	Define the horizontal dimension of the flange plate chamfer.
2	Define the vertical dimension of the flange plate chamfer.
3	Define the vertical and the horizontal dimension of the flange plate chamfer.

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
	Line chamfer

Option	Description
	Concave arc chamfer

Bolted moment connection (134): Stiffeners tab

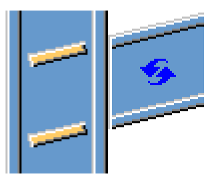
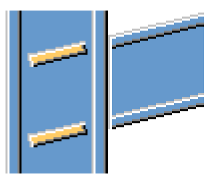
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position, and type in the **Bolted moment connection (134)** connection.

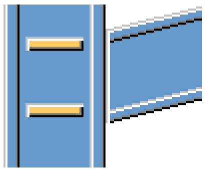
Stiffener plate dimensions

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.
Bottom NS	Define the bottom near side stiffener thickness, width and height.
Bottom FS	Define the bottom far side stiffener thickness, width and height.

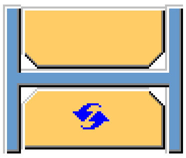
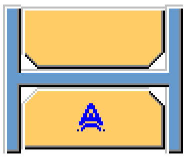
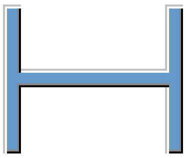
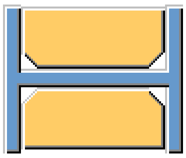
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Stiffener orientation

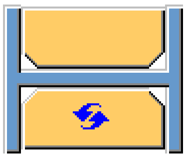
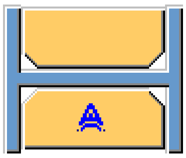
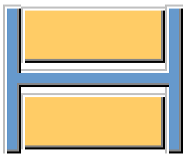
Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are parallel to the secondary part.

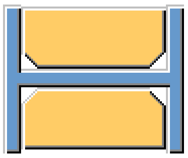
Option	Description
	Stiffeners are perpendicular to the main part.

Stiffener creation

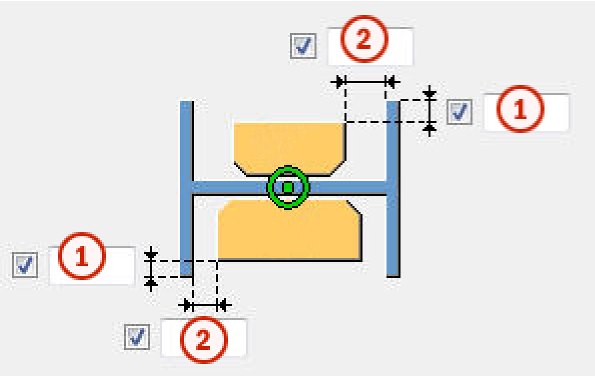
Option	Description
	Default Stiffeners are created. AutoDefaults can change this option.
	Automatic Stiffeners are created when necessary.
	No stiffeners are created.
	Stiffeners are created.

Stiffener shape

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

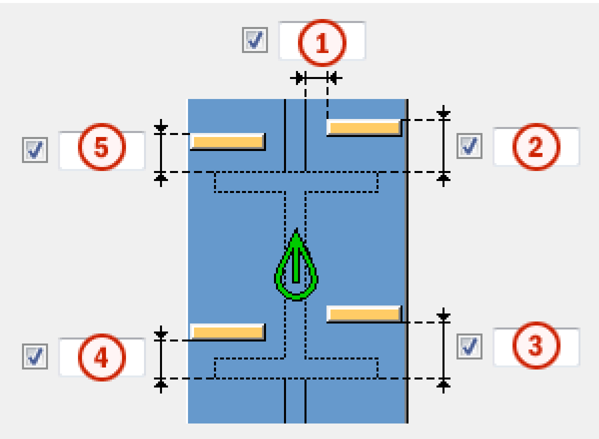
Option	Description
	Line chamfered stiffener plates

Stiffener gap



	Description
1	Define the distance from the edge of the flange to the edge of the stiffener.
2	Define the size of the gap between the flanges and the stiffener.

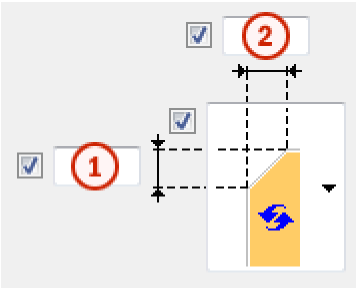
Stiffener positions



	Description
1	Define the size of the gap between the stiffener and the beam web edge.
2	Define the size of the gap between the top near side stiffener and the beam flange edge.
3	Define the size of the gap between the bottom near side stiffener and the beam flange edge.

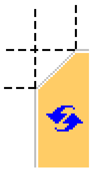
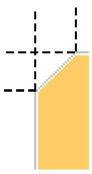
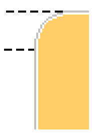
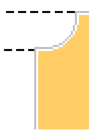
	Description
4	Define the size of the gap between the bottom far side stiffener and the beam flange edge.
5	Define the size of the gap between the top far side stiffener and the beam flange edge.

Chamfer dimensions



	Description	Default
1	Define the vertical dimension of the chamfer.	`10 mm`
2	Define the horizontal dimension of the chamfer.	`10 mm`

Chamfer type

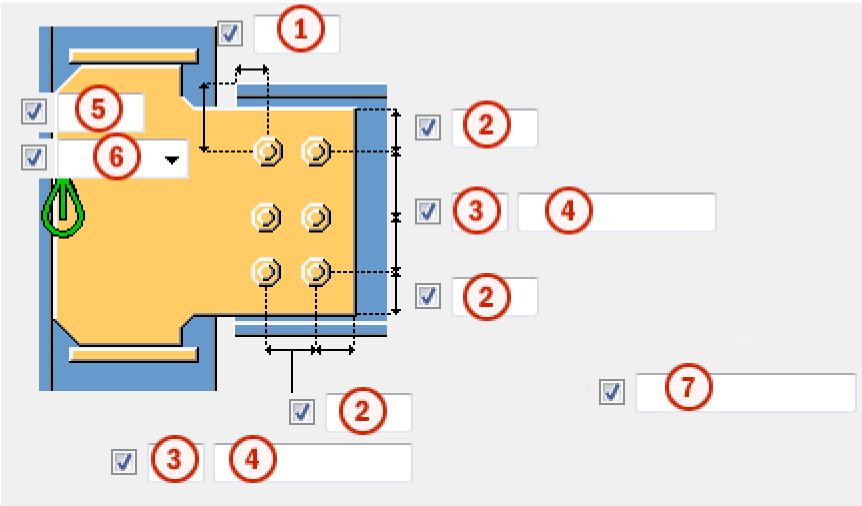
Option	Description
	Default. Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

Bolted moment connection (134): Shear bolts tab

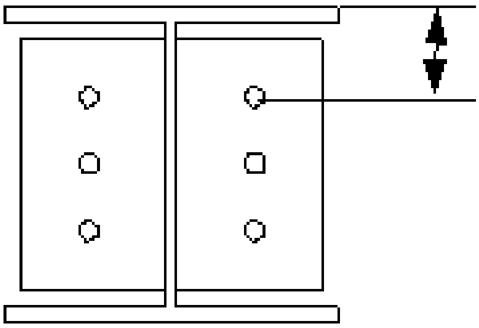
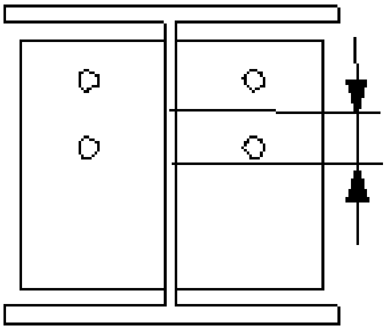
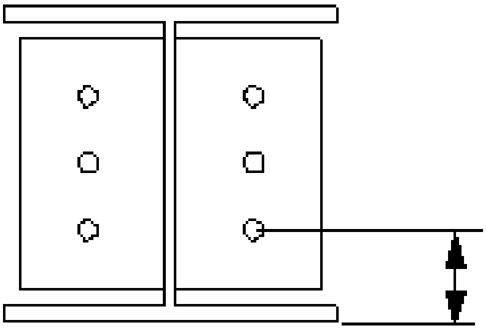
Use the **Shear bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part in the **Bolted moment connection (134)** connection.

Bolt group dimensions

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

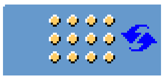
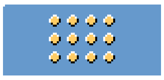
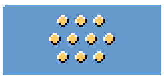
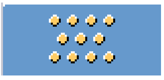
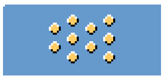
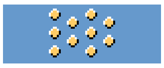


	Description
1	Define the dimension for horizontal bolt group position.
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.
4	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value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

	Description
6	Define 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. 

	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.

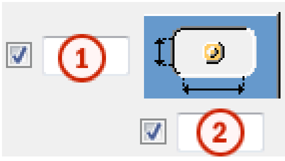
Staggering of bolts

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 basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

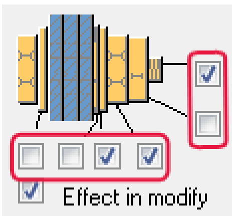
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

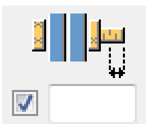
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.

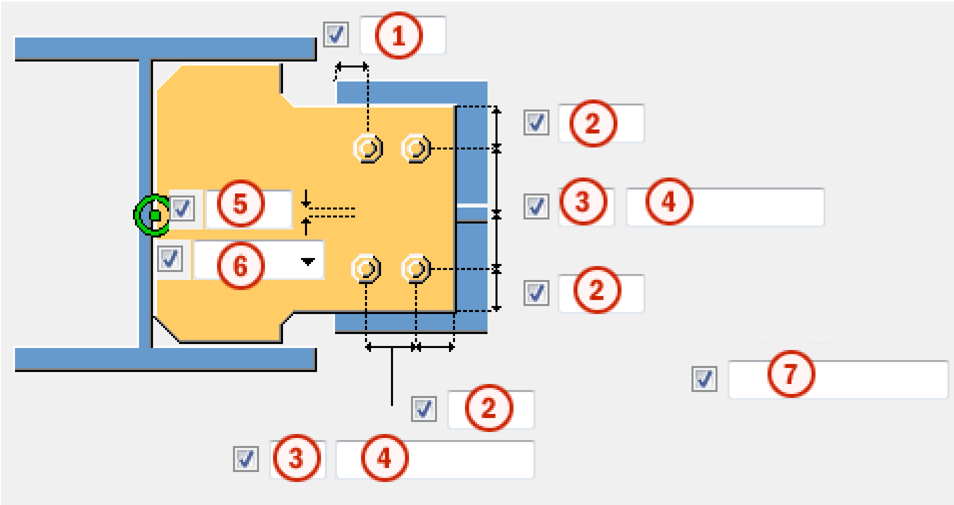


Bolted moment connection (134): Flange bolts tab

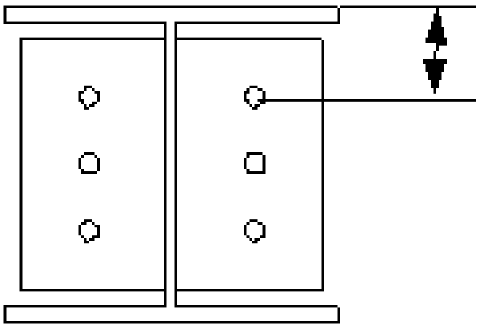
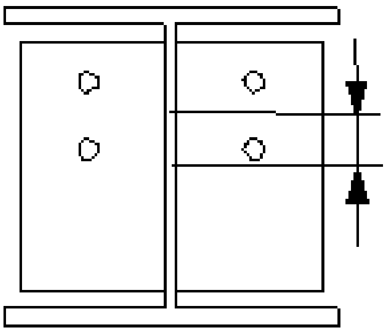
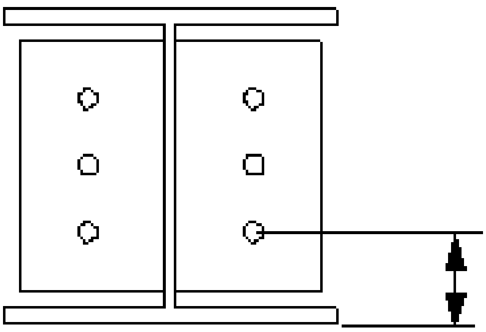
Use the **Flange bolts** tab to control the properties of the bolts that connect the flange plate to the secondary part in the **Bolted moment connection (134)**.

Bolt group dimensions

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

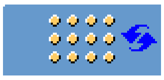
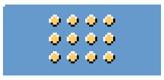
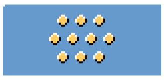
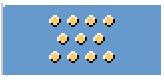
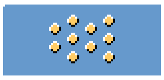
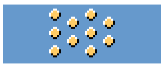


	Description
1	Define the dimension for horizontal bolt group position.
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.
4	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value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

	Description
6	Define 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. 

	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.

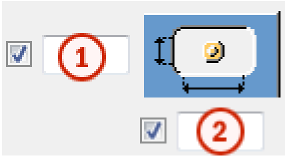
Staggering of bolts

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 basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

Bolted moment connection (134): Doubler plate tab

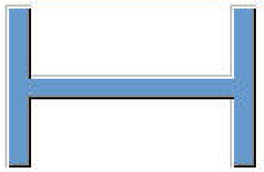
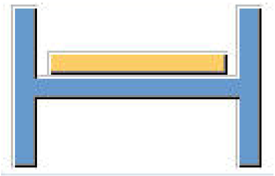
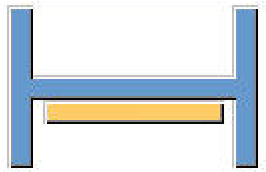
Use the **Doubler plate** tab to create doubler plates to strengthen the web of the main part in the **Bolted moment connection (134)** connection.

Web plate

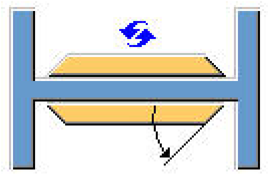
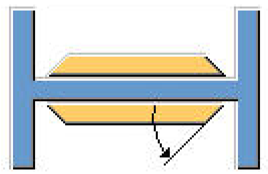
Part	Description
Web plate	Define the web plate thickness and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

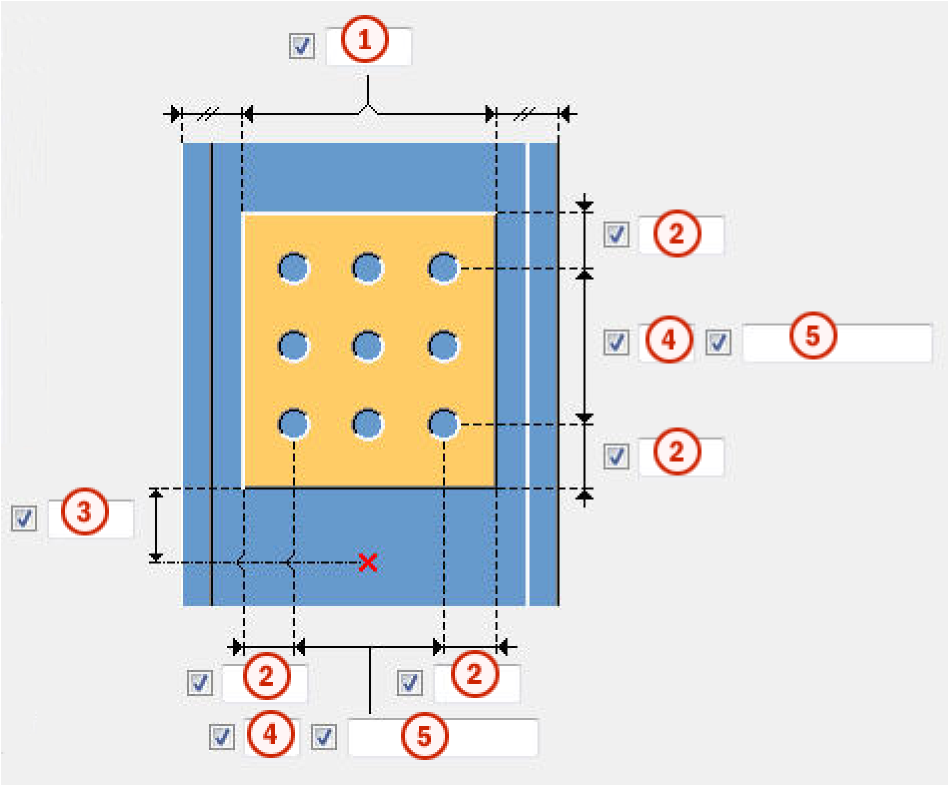
Doubler plates

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

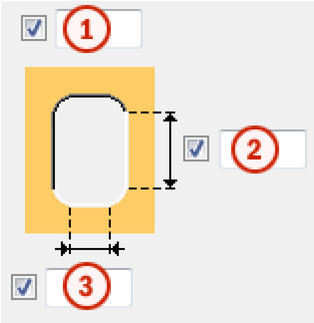
Option	Description
	Default Bevel doubler plates AutoDefauls can change this option.
	Bevel doubler plates Enter the angle in 
	Square doubler plates

General settings



	Description
1	Define the edge distance from the column flange.
2	Define the doubler plate edge distance. Edge distance is the distance from the center of a hole to the edge of the part.
3	Define the edge distance of the doubler plate in relation to the bottom of the secondary part.
4	Define the number of holes.
5	Define the 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	Define the hole diameter.
2	Define the slot length.
3	Define the slot width.

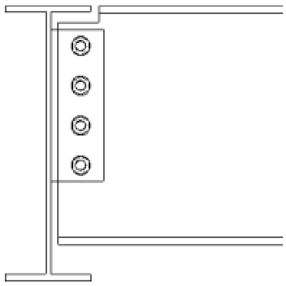
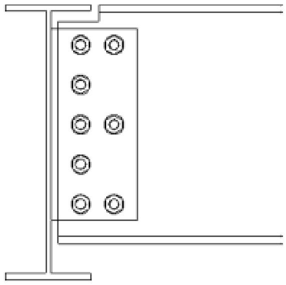
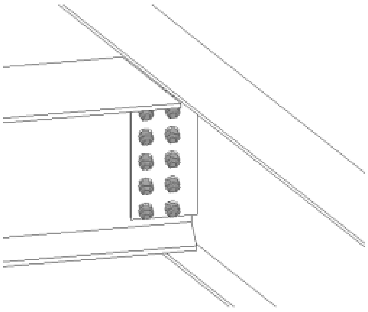
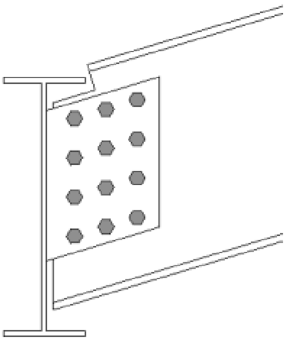
1.6 Shear plate simple (146)

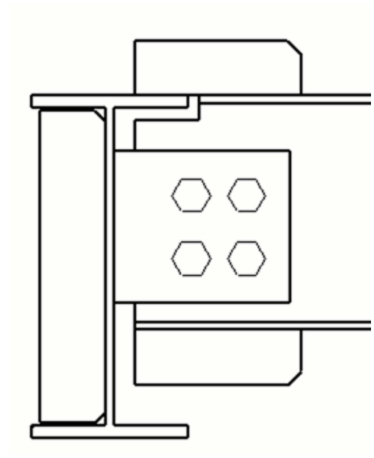
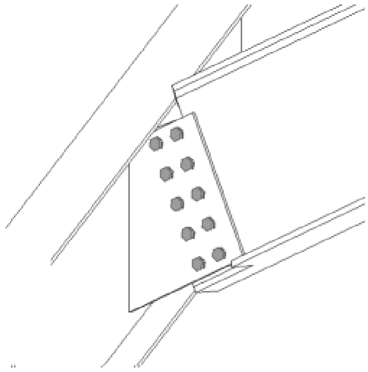
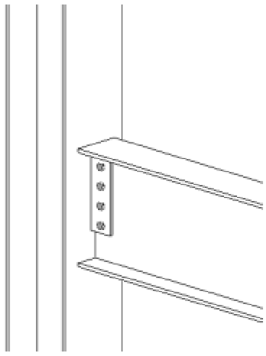
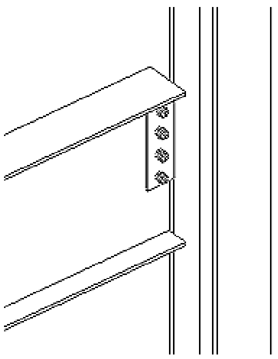
Shear plate simple (146) connects a beam to a beam or a beam to a column with a single square shear tab or double shear tabs. The shear tab is welded to the main part web and flanges, and bolted to the secondary beam web. The secondary beam can be leveled or sloped and/or skewed. A stiffener plate on the opposite side of the main beam web is optional.

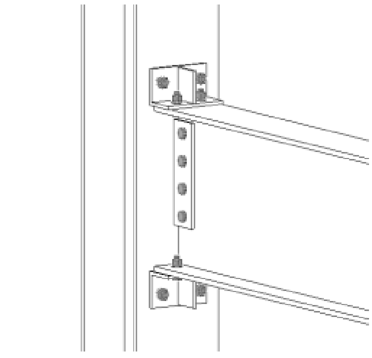
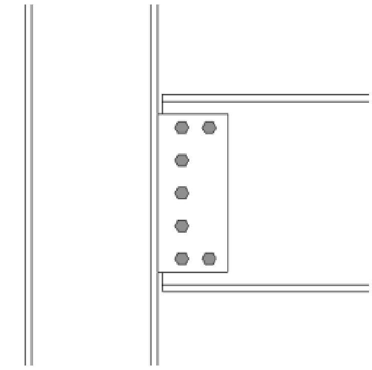
Objects created

- 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.
	Simple shear tab connected to a beam. The secondary part is skewed.
	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.

Situation	Description
	Simple shear tab connected to a beam with haunches and a stiffener plate.
	Simple shear tab connected to a beam. The secondary part is sloped and skewed.
	Simple shear tab connected to a column flange.
	Simple shear tab connected to a column flange/edge.

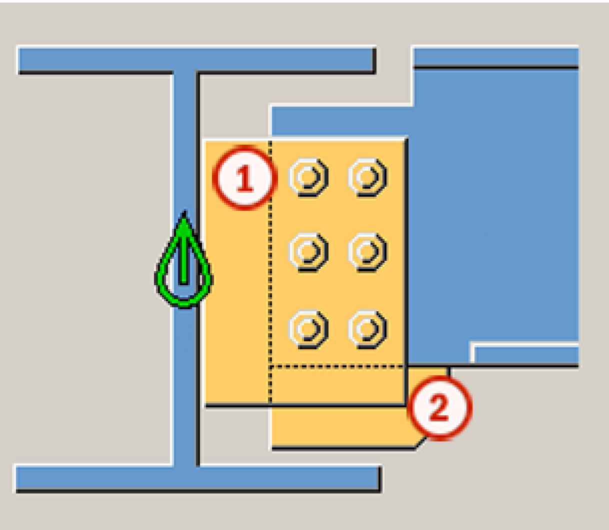
Situation	Description
	Simple shear tab connected to a column flange with seat angle options.
	Simple shear tab connected to a column flange. Some bolts have been deleted.

Selection order

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

You can use the `joints.def` file to change the default values of this component.

See also

Shear plate simple (146): Picture tab on page 110

Shear plate simple (146): Plates tab on page 112

Shear plate simple (146): Stiffeners tab on page 116

Shear plate simple (146): Haunch tab on page 119

Shear plate simple (146): Notch tab on page 121

Shear plate simple (146): Bolts tab on page 125

Shear plate simple (146): Beam cut tab on page 131

Shear plate simple (146): Angle box tab on page 135

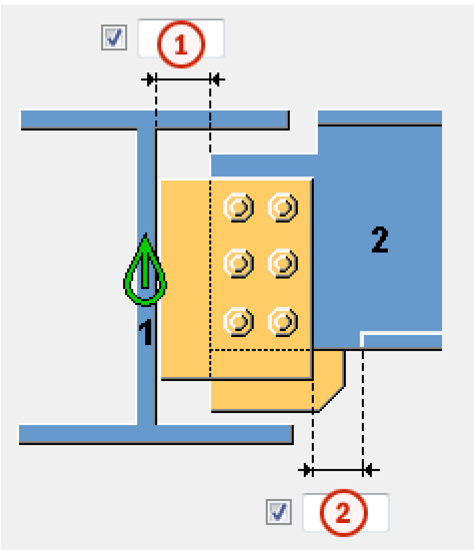
Shear plate simple (146): BoxPBolts tab on page 141

Shear plate simple (146): BoxSBolts tab on page 143

Shear plate simple (146): Picture tab

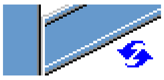
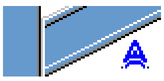
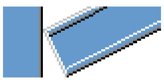
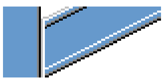
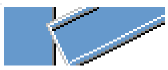
Use the **Picture** tab to control the position of the shear tab, and the beam flange and the web cuts in the **Shear plate simple (146)** connection.

Dimensions

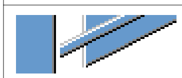


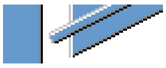
	Description	Default
1	Define the cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	20
2	Define the size of the strip made to the secondary part flange. The cut of the flange is defined from the shear tab edge.	The flange is automatically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

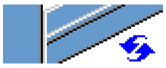
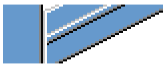
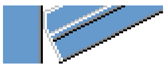
Beam web cut Define how the secondary beam web end is cut. The beam is viewed from the top.

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.

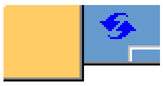
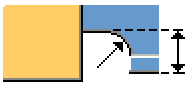
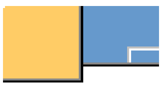
Option	Description
	Square Cuts the end of the web square even if the end of the secondary beam is cut bevel.

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.

Shear plate simple (146): Plates tab

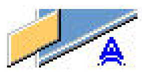
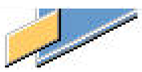
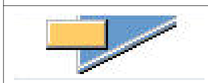
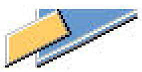
Use the **Plates** tab to control the size, position, number, orientation and shape of the shear tab in the **Shear plate simple (146)** connection.

Shear tab plate

Part	Description
Tab plate	Define the shear tab plate thickness, width and height.

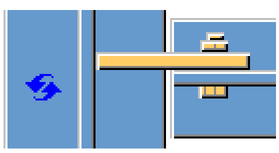
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

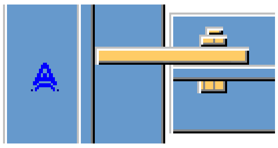
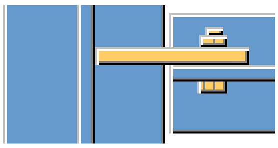
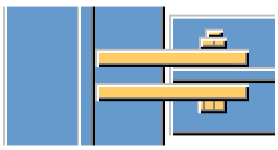
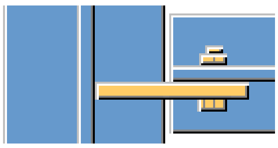
Shear tab orientation

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 **Sloped** option, but the vertical edge of the shear tab connected to the secondary beam is cut perpendicular to the secondary beam flange.

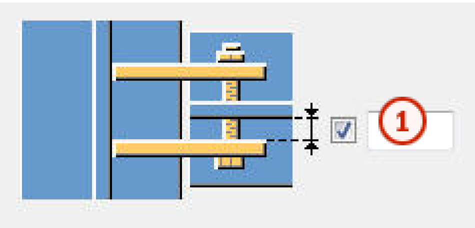
Shear tab position

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

Option	Description
	Default Far side shear tab AutoDefaults can change this option.

Option	Description
	Automatic The component automatically selects either near side or 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

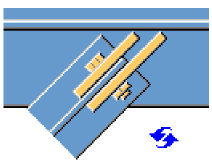
Gap between shear tabs

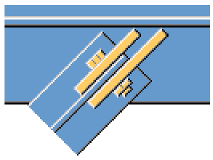
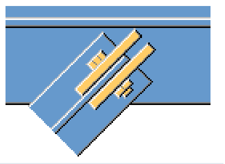


	Description	Default
1	Define the gap between the secondary part web and shear tab. This only affects connections with two shear tabs.	0

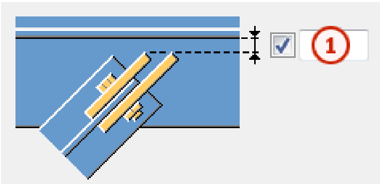
Shear tab position (sloped)

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.

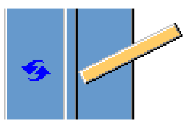
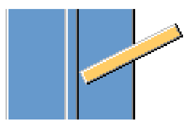
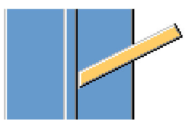
Option	Description
	Shear tab edges reach the same level in the main part.
	Shear tabs have the same length.

Shear tab edge distance

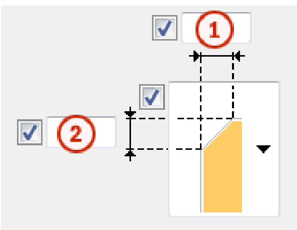


	Description
1	Define the distance between the main part web and the edge of the shear tabs.

Shear tab end cut

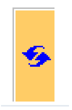
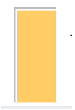
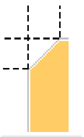
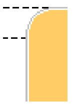
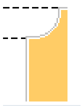
Option	Description
	Default The shear tab end is not cut. AutoDefaults can change this option.
	Square The shear tab end is not cut.
	Bevel The shear tab end is cut parallel to the main part web.

Shear tab chamfers



	Description
1	Define the horizontal dimension of the shear tab chamfer.
2	Define the 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 plate simple (146): Stiffeners tab

Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type in the **Shear plate simple (146)** connection.

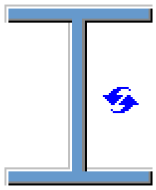
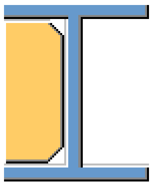
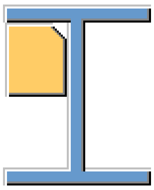
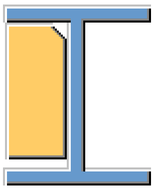
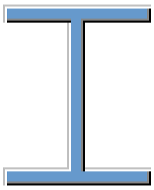
Opposite web stiffener plate dimensions

Part	Description
Opposite web stiffener	Define the opposite web stiffener plate thickness, width and height.

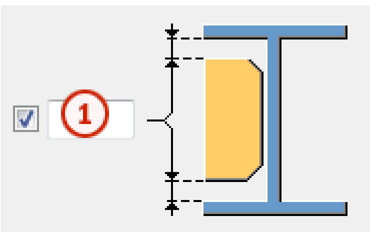
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

Option	Description	Default
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Stiffener creation

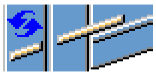
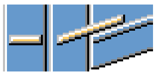
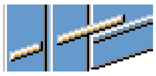
Option	Description
	Default No stiffeners are created. AutoDefaults can change this option.
	Full Creates a full stiffener of the same height as the web of the main part.
	Determined by shear tab Tekla Structures determines the size of the stiffener based on the shear tab size. Tekla Structures attempts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

Stiffener gap

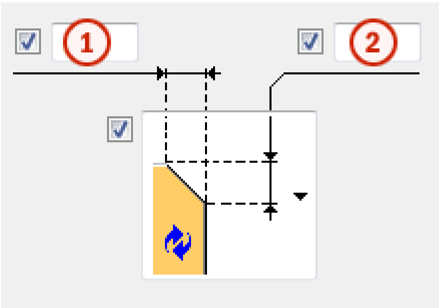


	Description
1	Define the size of the gap between the main part flanges and the stiffener.

Stiffener orientation

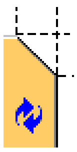
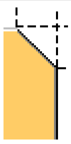
Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are perpendicular to the main part.
	Stiffeners are parallel to the secondary part.

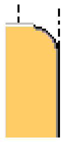
Chamfer dimensions



	Description
1	Define the horizontal dimension of the chamfer.
2	Define the vertical dimension of the chamfer.

Chamfer type

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

Option	Description
	Convex arc chamfer
	Concave arc chamfer

Shear plate simple (146): Haunch tab

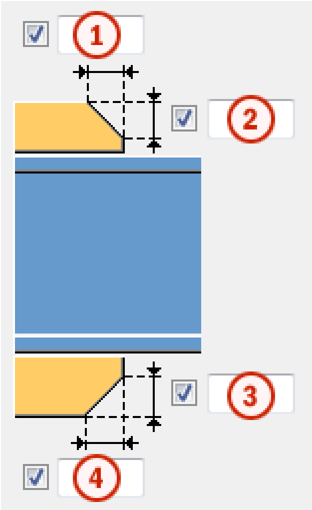
Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges in the **Shear plate simple (146)** connection.

Haunch plates

Part	Description
Top plate	Define the top haunch plate thickness, width and height.
Bottom plate	Define the bottom haunch plate thickness, width and height.

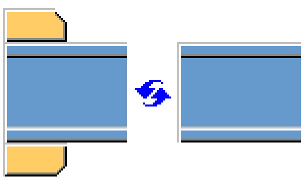
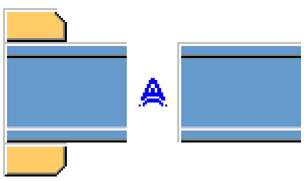
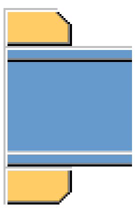
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

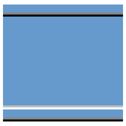
Haunch plate chamfers



	Description
1	Define the width of the top haunch plate chamfer.
2	Define the height of the top haunch plate chamfer.
3	Define the height of the bottom haunch plate chamfer.
4	Define the width of the bottom haunch plate chamfer.

Hauch 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.
	Top and bottom haunch plates are created. To create a single plate, enter 0 in the thickness (**t**) field for the plate you do not need (top or bottom plate).

Option	Description
	Haunch plates are not created.

Shear plate simple (146): Notch tab

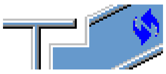
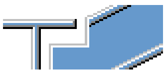
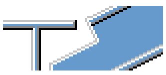
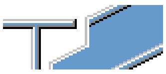
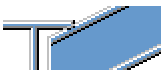
Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties in the **Shear plate simple (146)** connection. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

Automatic notching

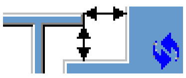
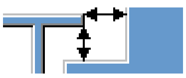
Automatic notching options affect both the top and the bottom flange.

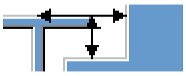
Notch shape

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

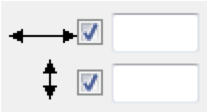
Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary 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

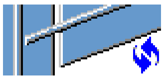
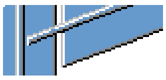
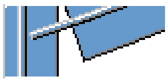
Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.

Option	Description
	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.

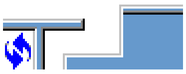
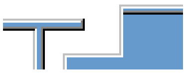
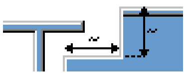


Flange cut shape

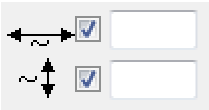
Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

Notch dimension rounding

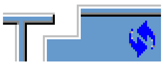
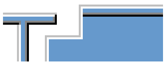
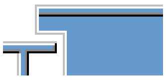
Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

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.

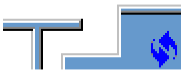
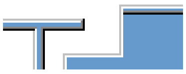
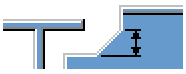
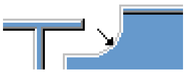
The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



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.

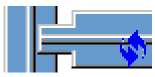
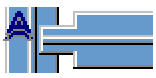
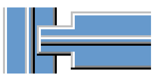
Enter a radius for the chamfer.

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

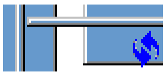
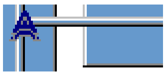
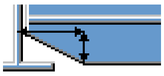
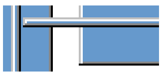
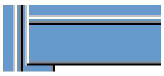
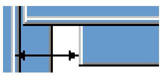
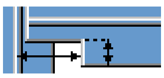
The side of flange notch defines on which side of the beam the notches are created.

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.

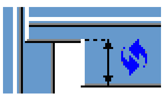
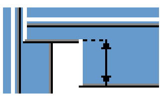
Option	Description
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

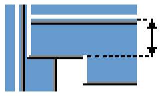
Flange notch shape

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 1 and 2.
	The flange is not cut.
	Creates cuts to the flange according to the value in the field 1 to make it flush with the web.
	Creates cuts to the flange according to the values in the fields 1 and 2.

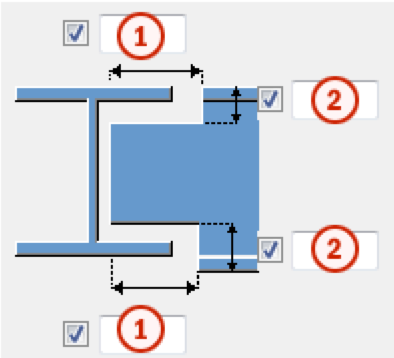
Flange notch depth

Option	Description
	Default Defines the flange notch depth. AutoDefaults can change this option.
	Defines the flange notch depth.

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

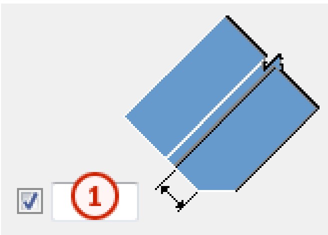
Enter the value for flange notch depth.

Cut dimensions



	Description	Default
1	Define the dimensions for the horizontal flange cuts.	10 mm
2	Define the 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



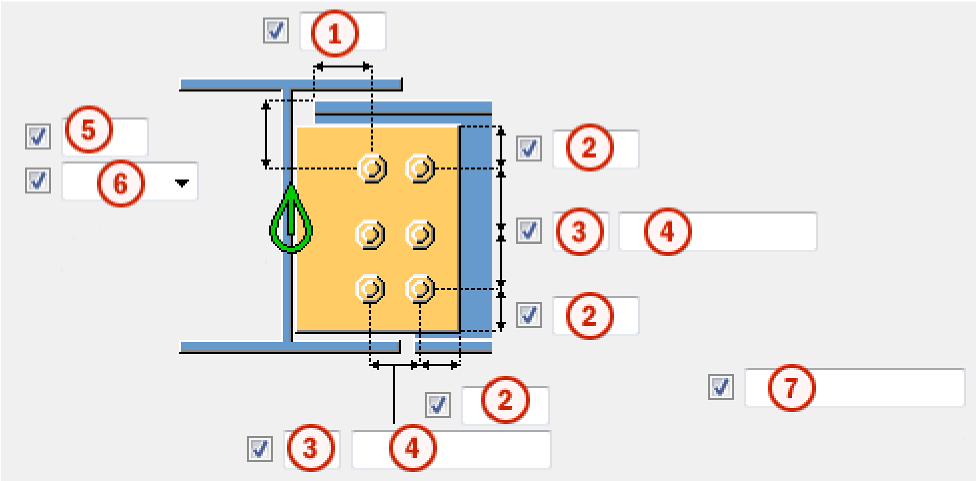
	Description
1	Define the distance between the web and the flange cut.

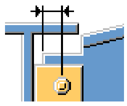
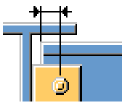
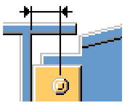
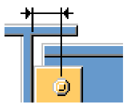
Shear plate simple (146): Bolts tab

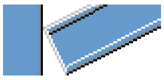
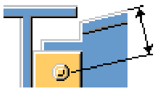
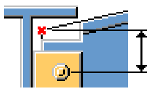
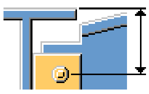
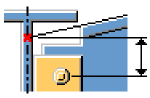
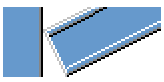
Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part in the **Shear plate simple (146)** connection.

Bolt group dimensions

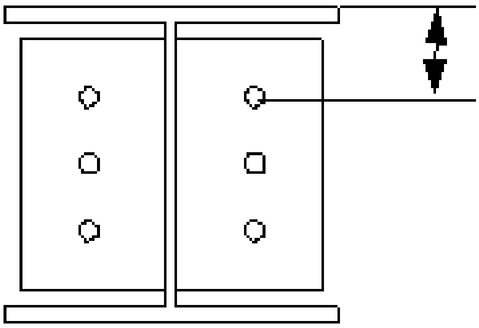
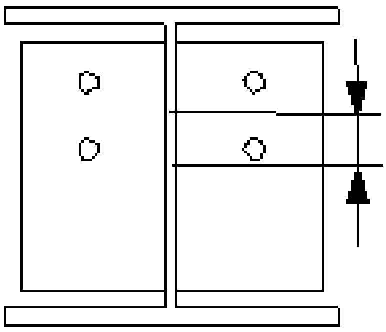
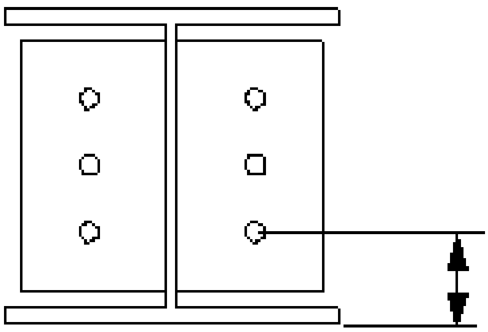
Bolt group dimensions affect the size and shape of the shear tab.



Option	Description
1	Define the dimension for horizontal bolt group position. 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. • Sloped, to the secondary part  • Skewed, to the secondary part  • Sloped, to the main part  • Skewed, to the main part 

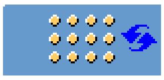
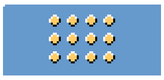
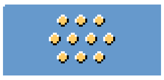
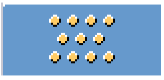
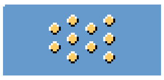
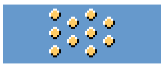
Option	Description
	The default is that the horizontal dimension is measured from the bolt group to the edge of the secondary part. Ensure that the **Beam end cut** on the **Picture** tab is set to square  .
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.
4	Define the 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 dimension for vertical bolt group position. 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. • Vertical sloped dimension, to the secondary part  • Vertical dimension, to the secondary part  • Vertical dimension, to the main part  • Vertical dimension, to the center line of the main part  The default is that the vertical dimension is measured from the bolt group the edge of the secondary part (sloped dimension). Ensure that the **Beam end cut** on the **Picture** tab is set to square  .

<table>
<tr><th>Option</th><th>Description</th></tr>
<tr><td>6</td><td>Define how to measure the dimensions for vertical bolt group position.

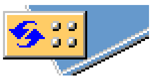
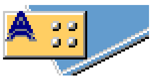
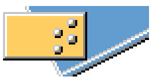
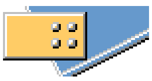
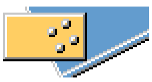
Top: From the upper edge of the secondary part to the uppermost bolt.

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.

</td></tr>
</table>

Option	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.

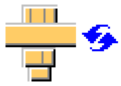
Staggering of bolts

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.

Bolting direction

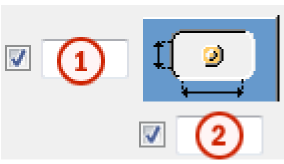
Option	Description
	Default Bolting direction 1 AutoDefaults can change this option.
	Bolting direction 1
	Bolting direction 2

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

You can define slotted, oversized, or tapped holes.



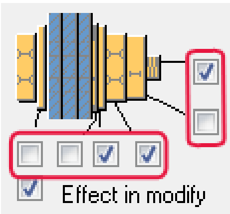
Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	

Option	Description	Default
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(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.

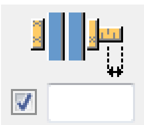
If you want to create a hole only, clear all the check boxes.



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.



Shear plate simple (146): Beam cut tab

Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts in the **Shear plate simple (146)** connection.

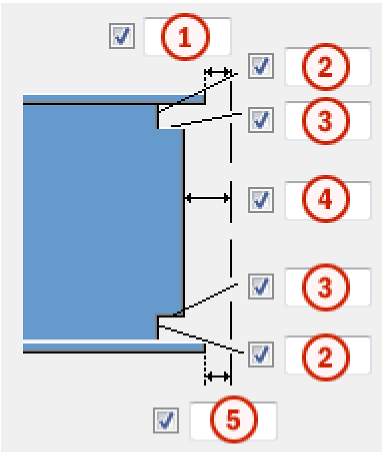
Weld backing bar

Part	Description
Weld backing bar	Define the weld backing bar thickness and width.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

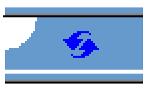
Option	Description	Default
	can enter the assembly position number.	
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

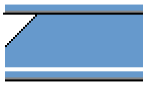
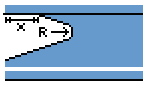
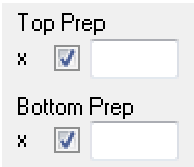
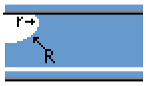
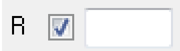
Weld access hole dimensions



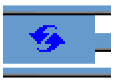
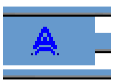
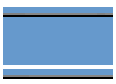
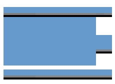
	Description
1	Define the gap between the secondary part top flange and the main part.
2	Define the vertical dimensions for the top and the bottom weld access holes.
3	Define the horizontal dimensions for the top and the bottom weld access holes.
4	Define the gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the **Picture** tab.
5	Define the 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 **Picture** tab.

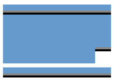
Weld access holes

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

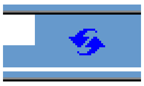
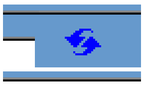
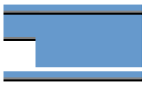
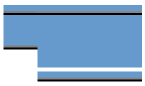
Option	Description	Default
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	
	Round weld access hole with a radius that you can define in 	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in  and 	
	Cone-shaped weld access hole with radiuses that you can define in  and  Capital **R** defines the large radius (height). Small **r** defines the small radius.	`R = 35` `r = 10`

Beam end preparation

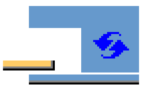
Option	Description
	Default Top and bottom flange are prepared. AutoDefaults can change this option.
	Automatic Top and bottom flange are prepared.
	Beam end is not prepared.
	Top and bottom flange are prepared.

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

Flange cut

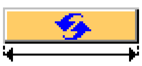
Option for top flange	Option for bottom flange	Description
		Default Flange is not cut. AutoDefaults can change this option.
		Flange is not cut.
		Flange is cut.

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.

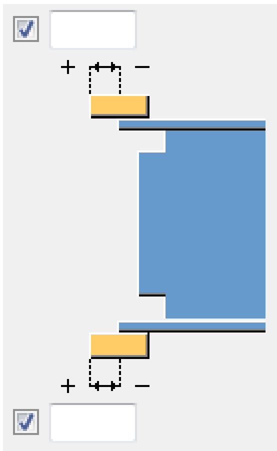
Weld backing bar length

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

Option	Description
	Default Absolute length of the backing bar AutoDefaults can change this option.

Option	Description
	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.

Shear plate simple (146): Angle box tab

Use the **Angle box** tab to add a seat angle to the **Shear plate simple (146)** connection.

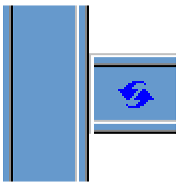
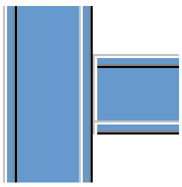
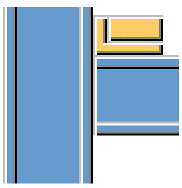
Seat angle The purpose of seat angles is to carry loads from the secondary part. Seat angles can be positioned to top, bottom or both flanges of the secondary part. The seat angle can be stiffened, and bolted or welded to the main and secondary parts.

Part	Description
Stiffeners	Define the stiffener thickness, width and height.
Profile	Define the seat angle profile by selecting it from the profile catalog.

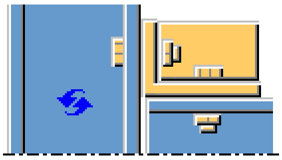
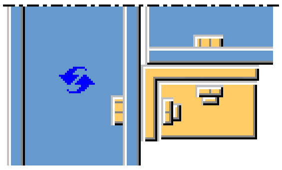
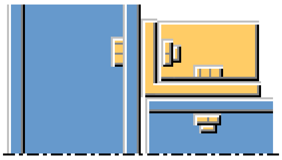
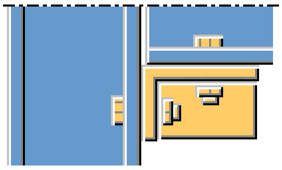
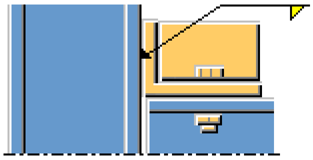
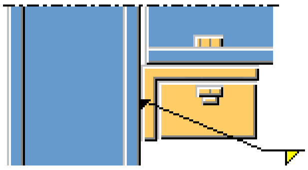
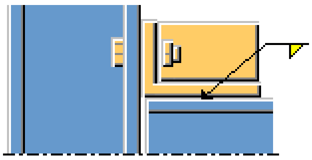
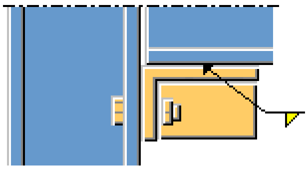
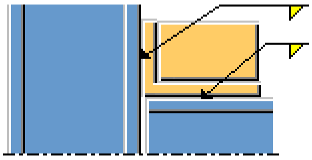
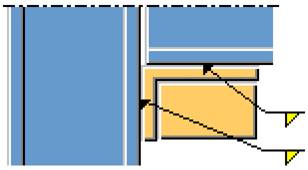
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

Option	Description	Default
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Seat angle position

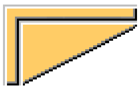
Option	Description
	Default No seat angle is created. AutoDefaults can change this option.
	No seat angle is created.
	Seat angle is created at the top of the flange.
	Seat angle is created at the bottom of the flange.
	Seat angles are created on both sides of the flange.

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

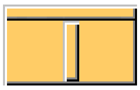
Option for top seat angle	Option for bottom seat angle	Description
		Default Bolted Seat angle is bolted to the main part and to the secondary part. AutoDefaults can change this option.
		Bolted Seat angle is bolted to the main part and to the secondary part.
		Welded-bolted Seat angle is welded to the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

Stiffener type

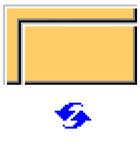
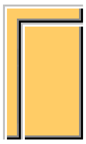
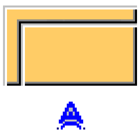
Option	Description
	Default Rectangular stiffener plate AutoDefaults can change this option.
	Rectangular stiffener plate
	Triangular stiffener plate

Option	Description
	The line connecting the ends of the seat angle legs defines the stiffener plate shape.

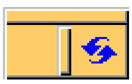
Seat angle rotation

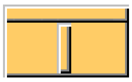
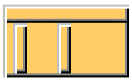
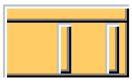
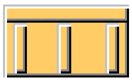
Option	Description
	Default Seat angle is not rotated. AutoDefaults can change this option.
	Seat angle is not rotated.
	Seat angle is rotated horizontally 90 degrees. To stiffen the rotated seat angle, select the **Middle stiffeners** option in the **Middle stiffener position** list.

Seat angle orientation

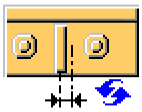
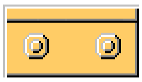
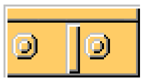
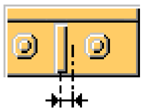
Option	Description
	Default The longer leg of the seat angle is connected to the secondary part. AutoDefaults can change this option.
	The longer leg of the seat angle is connected to the secondary part.
	The longer leg of the seat angle is connected to the main part.
	Automatic The longer leg of the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

Side stiffener position

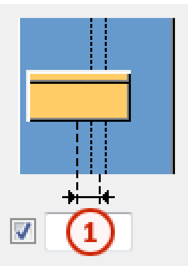
Option	Description
	Default No side stiffeners are created. AutoDefaults can change this option.

Option	Description
	No side stiffeners are created.
	Near side side stiffeners are created.
	Far side side stiffeners are created.
	Near side and far side stiffeners are created.

Middle stiffener position

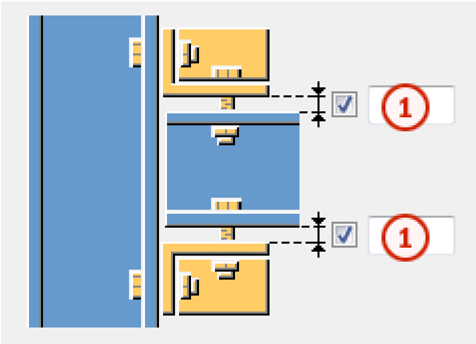
Option	Description
	Default According to bolts AutoDefaults can change this option.
	No middle stiffener plate is created.
	Middle stiffeners The stiffener plate is positioned in the middle of the seat angle. Enter the number of middle stiffeners in the **Number of middle stiffeners** field. Multiple 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 field below the **According to bolts** option.

Seat angle offset



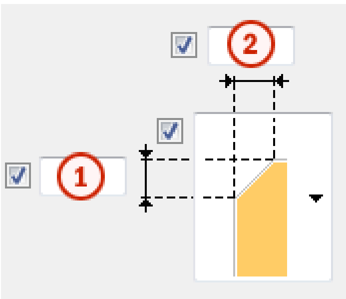
	Description
1	Define the seat angle horizontal offset from the center line of the main part.

Gap



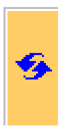
	Description
1	Define the top gap and the bottom gap between the seat angle and the secondary part.

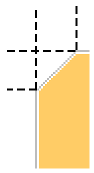
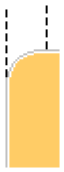
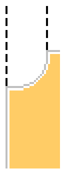
Chamfer dimensions



	Description
1	Define the vertical dimension of the chamfer.
2	Define the horizontal dimension of the chamfer.

Chamfer type

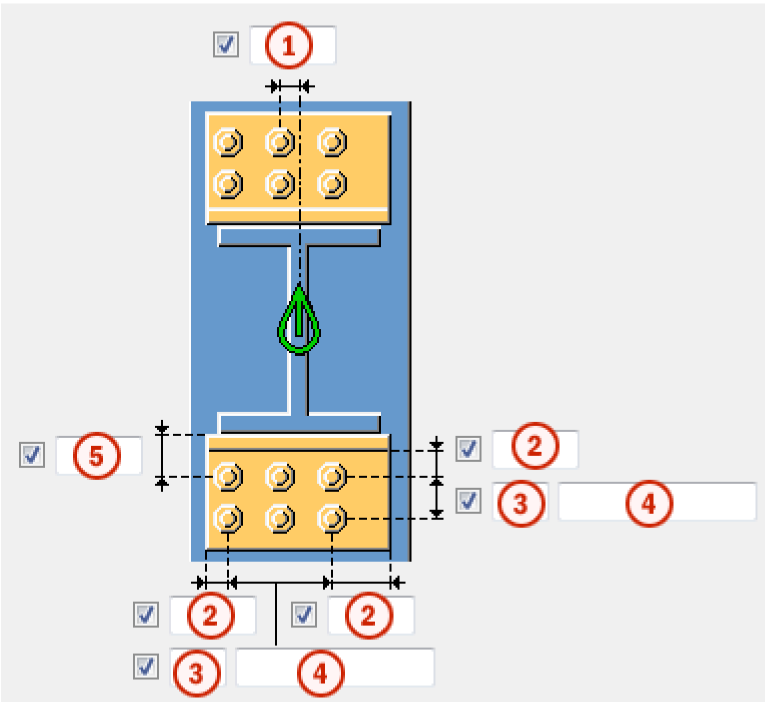
Option	Description
	Default No chamfer AutoDefaults can change this option.
	No chamfer

Option	Description
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

Shear plate simple (146): BoxPBolts tab

Use the **BoxPBolts** tab to control properties of the bolts that connect the seat angle to the main part in the **Shear plate simple (146)** connection.

Bolt group dimensions



Option	Description
1	Define the 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. Define the bolt edge distance.
3	Define the number of bolts.
4	Define the 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 dimension for vertical bolt group position. The dimension is defined from the bottom of the secondary beam.

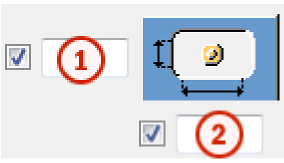
Top **Top** refers to the bolt group that connects the top seat angle to the main part.

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

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes You can define slotted, oversized, or tapped holes.

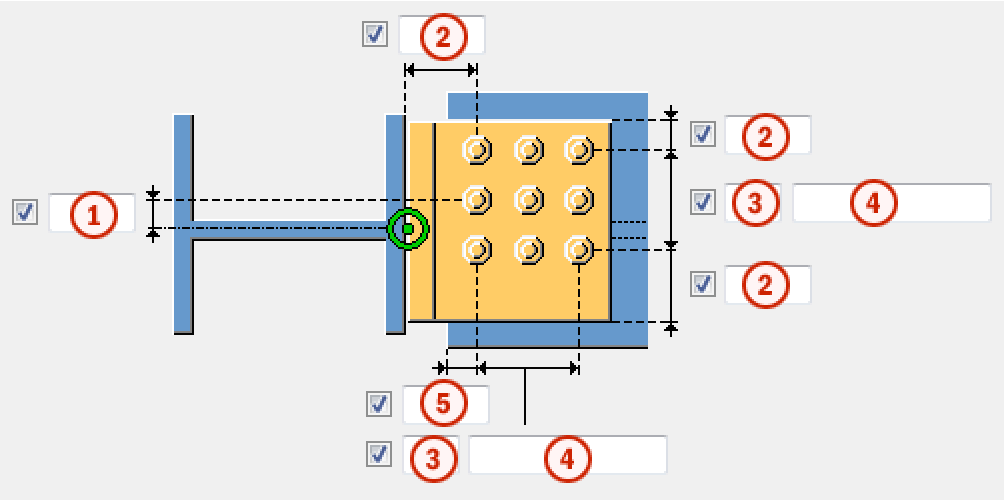


Option	Description	Default
①	Vertical dimension of slotted hole.	0, which results in a round hole.
②	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

Shear plate simple (146): BoxSBolts tab

Use the **BoxSBolts** tab to control the properties of the bolts that connect the seat angle to the secondary part in the **Shear plate simple (146)** connection.

Bolt group dimensions



Option	Description
①	Define the dimension for vertical bolt group position. The dimension is defined from the middle line of the secondary beam.

Option	Description
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.
4	Define the 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 dimension for horizontal bolt group position. The dimension is defined from the bottom of the secondary beam.

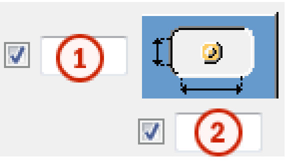
Top **Top** refers to the bolt group that connects the top seat angle to the secondary part.

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

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	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	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

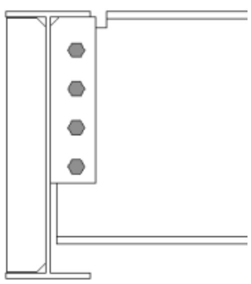
1.7 Welded to top flange (147)

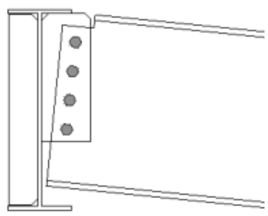
Welded to top flange (147) connects two beams with a single shear tab or double shear tabs. The shear tabs are welded to the main beam web and the top flange, and bolted to secondary beam web. The secondary beam can be leveled or sloped.

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
	Partial depth shear tab connected to the top flange of a beam. Stiffener is created.

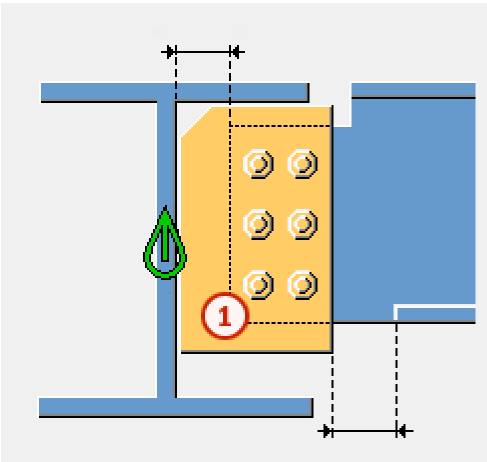
Situation	Description
	Partial depth shear tab connected to the top flange of a beam. The secondary part is sloped. Stiffener is created.

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



	Part
1	Shear tab

You can use the `joints.def` file to change the default values of this component.

See also

Welded to top flange (147): Picture tab on page 147

Welded to top flange (147): Plates tab on page 149

Welded to top flange (147): Stiffeners tab on page 151

Welded to top flange (147): Haunch tab on page 154

Welded to top flange (147): Notch tab on page 156

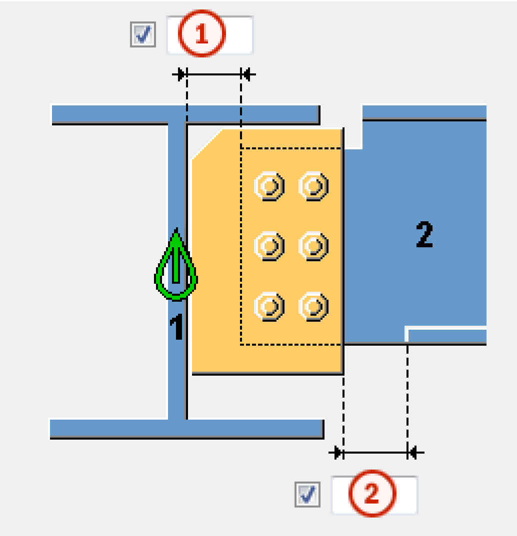
Welded to top flange (147): Bolts tab on page 160

Welded to top flange (147): Beam cut tab on page 164

Welded to top flange (147): Picture tab

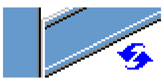
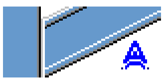
Use the **Picture** tab to control the position of the shear tab, and the beam flange and the web cuts in the **Welded to top flange (147)** connection.

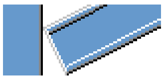
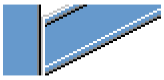
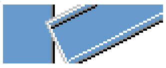
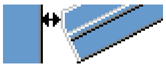
Dimensions



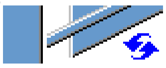
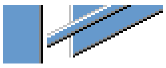
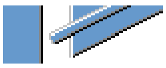
	Description	Default
①	Define the cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	20
②	Define the size of the strip made to the secondary part flange. The cut of the flange is defined from the shear tab edge.	The flange is automatically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

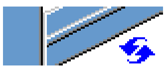
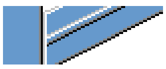
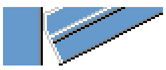
Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.

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.
	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.

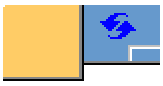
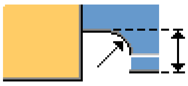
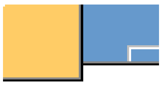
Beam web cut Define how the secondary beam web end is cut. The beam is viewed from the top.

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.

Welded to top flange (147): Plates tab

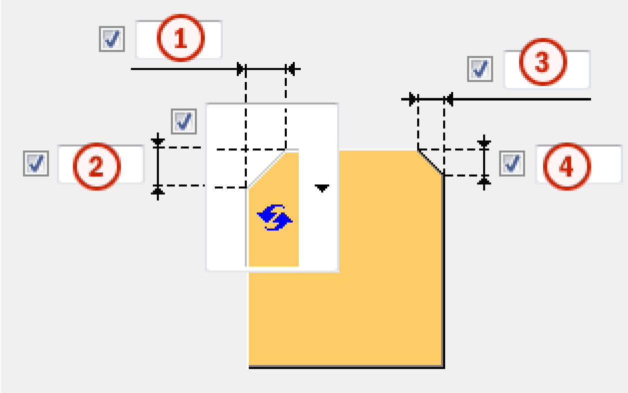
Use the **Plates** tab to control the size, position, number, orientation and shape of the shear tab in the **Welded to top flange (147)** connection.

Shear tab plate

Part	Description
Tab plate	Define the shear tab plate thickness, width and height.

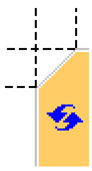
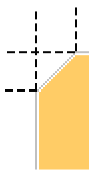
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

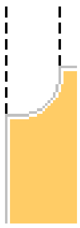
Shear tab chamfers



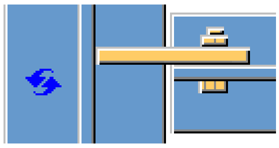
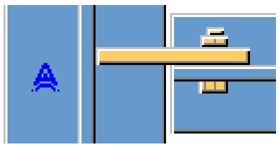
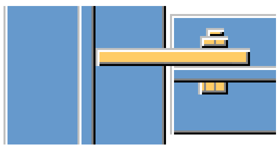
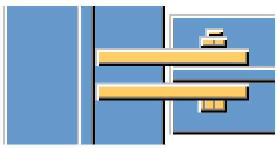
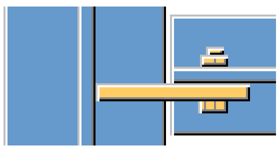
	Description
1	Define the horizontal dimension of the shear tab chamfer.
2	Define the vertical dimension of the shear tab chamfer.
3	Define the horizontal dimension of the shear tab exterior chamfer.
4	Define the vertical dimension of the shear tab exterior chamfer.

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 near side or 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

Welded to top flange (147): Stiffeners tab

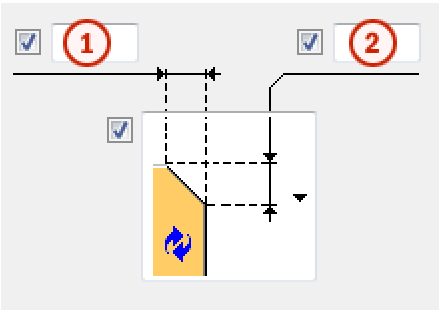
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type in the **Welded to top flange (147)** connection.

Opposite web stiffener plate dimensions

Part	Description
Opposite web stiffener	Define the opposite web stiffener plate thickness, width and height.

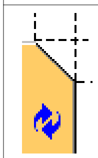
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

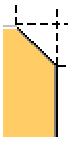
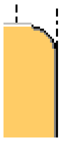
Chamfer dimensions



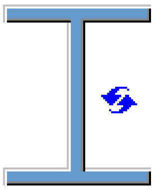
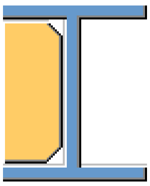
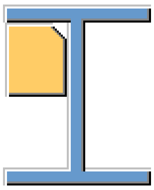
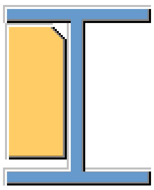
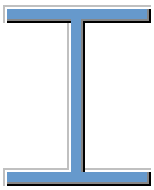
	Description
1	Define the horizontal dimension of the chamfer.
2	Define the vertical dimension of the chamfer.

Chamfer type

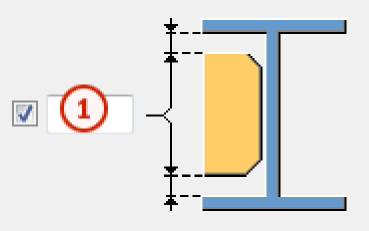
Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer

Option	Description
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

Stiffener creation

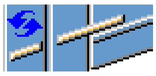
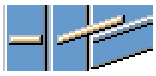
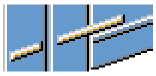
Option	Description
	Default No stiffeners are created. AutoDefaults can change this option.
	Full Creates a full stiffener of the same height as the web of the main part.
	Determined by shear tab Tekla Structures determines the size of the stiffener based on the shear tab size. Tekla Structures attempts 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	Define the 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.

Welded to top flange (147): Haunch tab

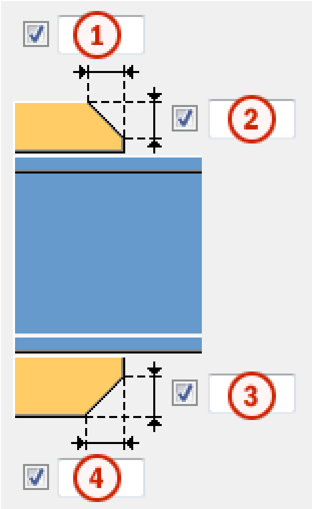
Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges in the **Welded to top flange (147)** connection.

Haunch plates

Part	Description
Top plate	Define the top haunch plate thickness, width and height.
Bottom plate	Define the bottom haunch plate thickness, width and height.

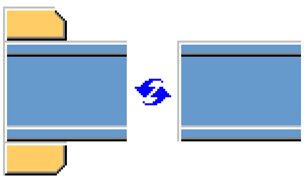
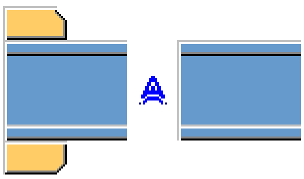
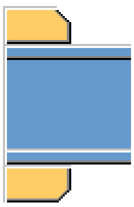
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

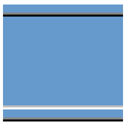
Haunch plate chamfers



	Description
1	Define the width of the top haunch plate chamfer.
2	Define the height of the top haunch plate chamfer.
3	Define the height of the bottom haunch plate chamfer.
4	Define the width of the bottom haunch plate chamfer.

Hauch 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.
	Top and bottom haunch plates are created. To create a single plate, enter 0 in the thickness (**t**) field for the plate you do not need (top or bottom plate).

Option	Description
	Haunch plates are not created.

Welded to top flange (147): Notch tab

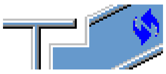
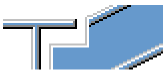
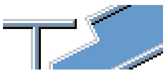
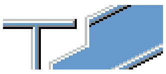
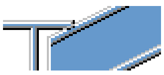
Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties in the **Welded to top flange (147)** connection. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

Automatic notching

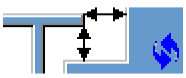
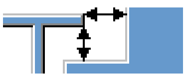
Automatic notching options affect both the top and the bottom flange.

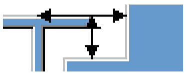
Notch shape

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

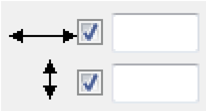
Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary 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

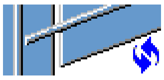
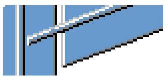
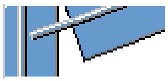
Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.

Option	Description
	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.

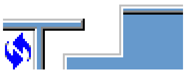
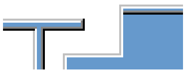
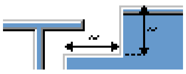


Flange cut shape

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.

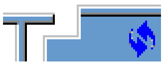
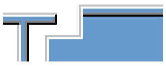
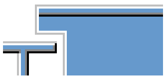
Notch dimension rounding

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.

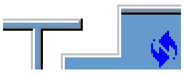
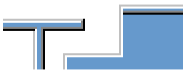
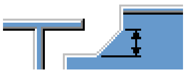
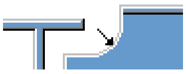
Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.

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.

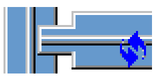
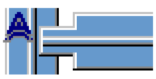
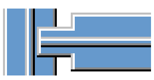
Enter a radius for the chamfer.

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.

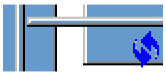
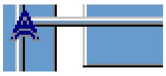
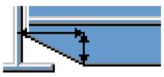
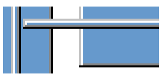
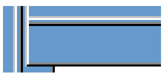
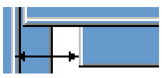
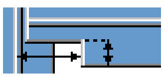
Side of flange notch

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

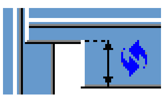
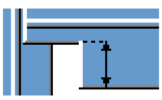
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.

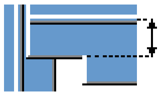
Option	Description
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

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 1 and 2.
	The flange is not cut.
	Creates cuts to the flange according to the value in the field 1 to make it flush with the web.
	Creates cuts to the flange according to the values in the fields 1 and 2.

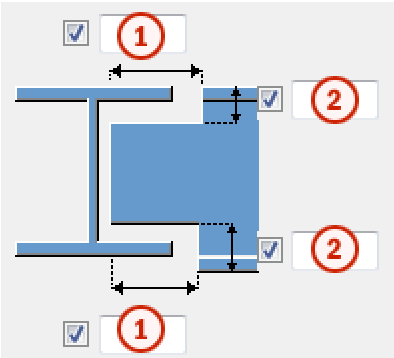
Flange notch depth

Option	Description
	Default Defines the flange notch depth. AutoDefaults can change this option.
	Defines the flange notch depth.

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

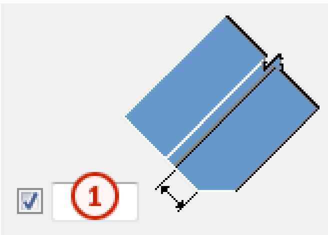
Enter the value for flange notch depth.

Cut dimensions



	Description	Default
1	Define the dimensions for the horizontal flange cuts.	10 mm
2	Define the 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

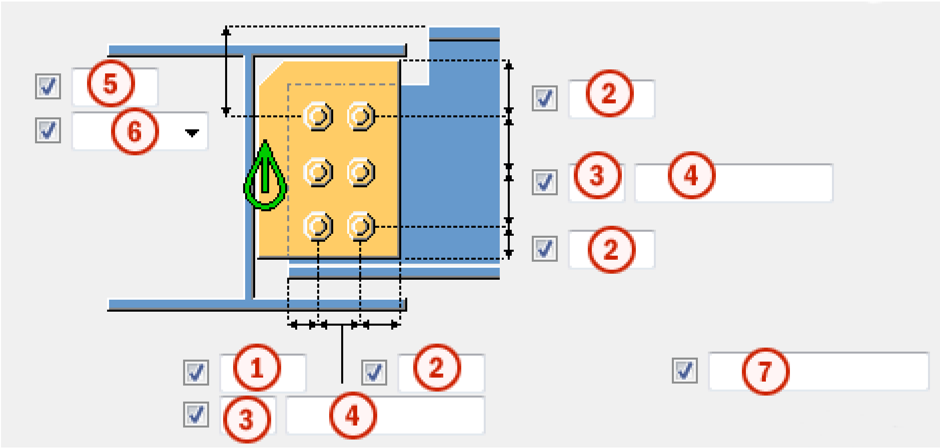


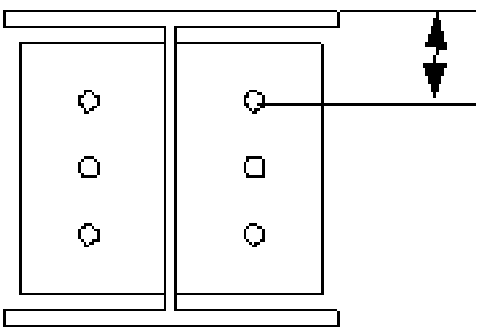
	Description
1	Define the distance between the web and the flange cut.

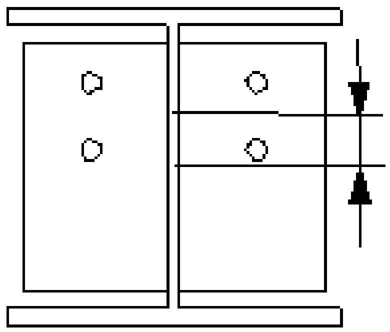
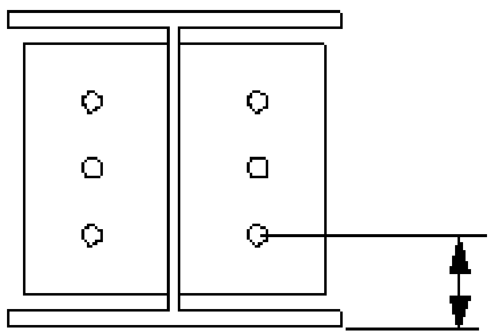
Welded to top flange (147): Bolts tab

Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the main part in the **Welded to top flange (147)** connection.

Bolt group dimensions



	Description
1	Define the dimension for horizontal bolt group position.
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.
4	Define the 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 dimension for vertical bolt group position.
6	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt. 

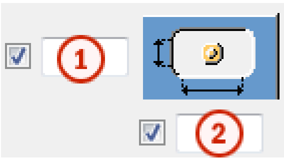
	Description
	• **Middle**: From the center line of the bolts to the center line of the secondary part.  • **Below**: From the lower edge of the secondary part to the lowest bolt. 
7	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

Bolt basic properties

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

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

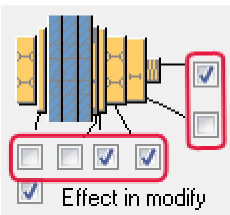
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

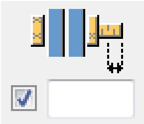
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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

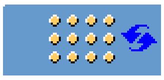
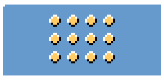
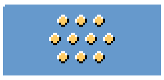
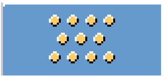
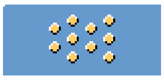
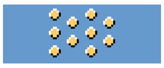


To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

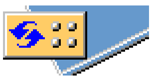
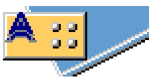
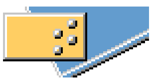
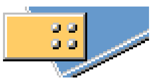
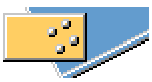
Bolt length increase Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



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
	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.

Welded to top flange (147): Beam cut tab

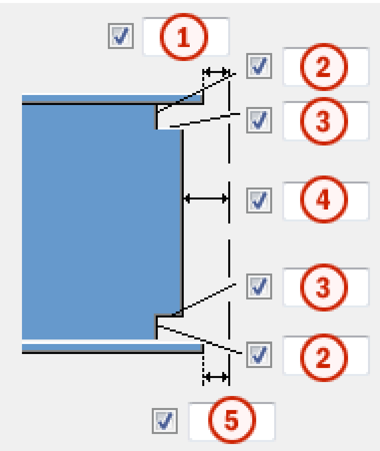
Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts in the **Welded to top flange (147)** connection.

Weld backing bar

Part	Description
Weld backing bar	Define the weld backing bar thickness and width.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

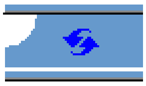
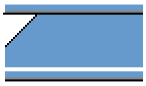
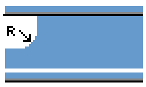
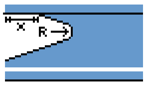
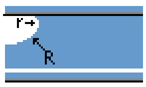
Weld access hole dimensions



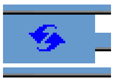
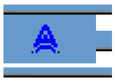
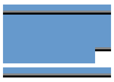
	Description
1	Define the gap between the secondary part top flange and the main part.
2	Define the vertical dimensions for the top and the bottom weld access holes.
3	Define the horizontal dimensions for the top and the bottom weld access holes.

	Description
4	Define the 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 **Picture** tab.
5	Define the 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 **Picture** tab.

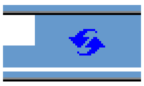
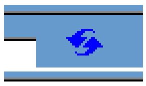
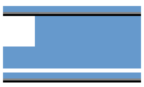
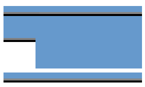
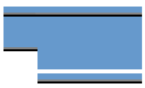
Weld access holes

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	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in R and Top Prep x Bottom Prep x	
	Cone-shaped weld access hole with radiuses that you can define in R and r Capital **R** defines the large radius (height). Small **r** 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.
	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

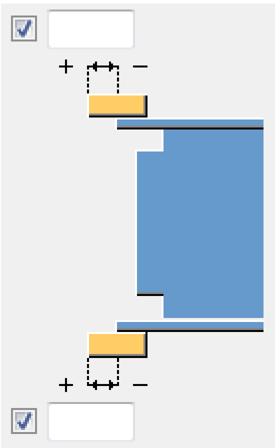
Option for bottom backing bar	Description
	Default Backing bars are created inside the flanges. AutoDefaults can change this option.
	No backing bars are created.

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 field 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.

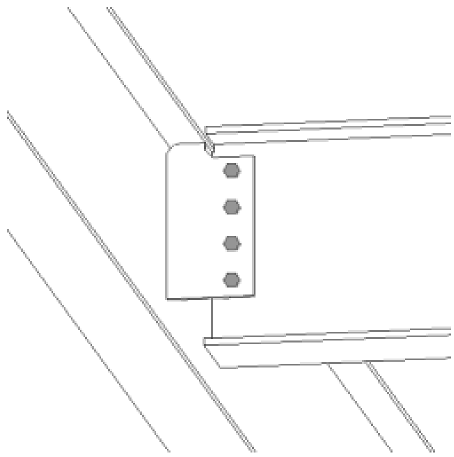
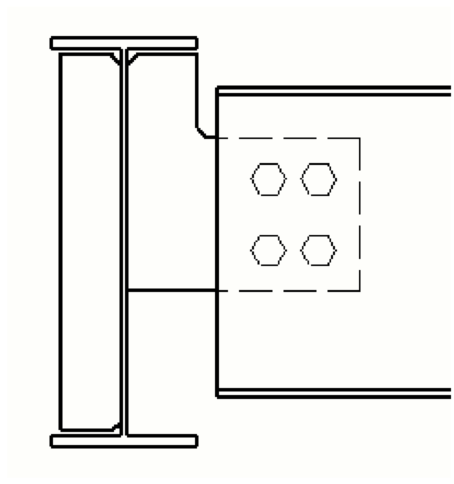
1.8 Welded to top flange S (149)

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

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

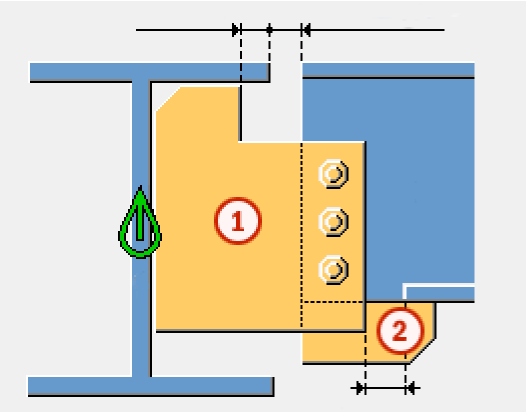
Selection order

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



	Part
1	Shear tab
2	Haunch plate

You can use the `joints.def` file to change the default values of this component.

See also

Welded to top flange S (149): Picture tab on page 170

Welded to top flange S (149): Plates tab on page 173

Welded to top flange S (149): Stiffeners tab on page 176

Welded to top flange S (149): Haunch tab on page 179

Welded to top flange S (149): Notch tab on page 181

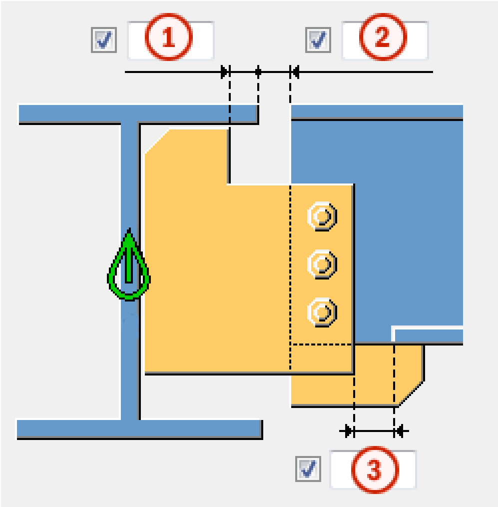
Welded to top flange S (149): Bolts tab on page 185

Welded to top flange S (149): Beam cut tab on page 189

Welded to top flange S (149): Picture tab

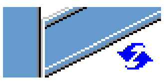
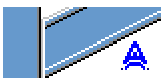
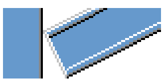
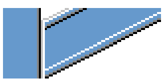
Use the **Picture** tab to control the position of the shear tab, and the beam flange and the web cuts in the **Welded to top flange S (149)** connection.

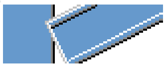
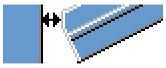
Dimensions



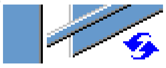
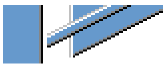
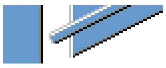
	Description	Default
1	Define the shear tab edge distance from the main part flange edge.	0
2	Define the cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	20
3	Define the size of the strip made to the secondary part flange. The cut of the 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.

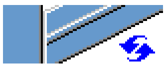
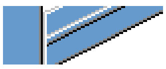
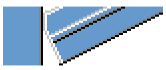
Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.
	Square Cuts the end of the secondary beam square.
	Bevel Cuts the end of the secondary beam parallel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

Option	Description
	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.

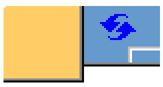
Beam web cut Define how the secondary beam web end is cut. The beam is viewed from the top.

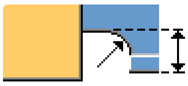
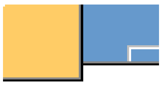
Option	Description
	Default Bevel AutoDefaults can change this option.
	Bevel Cuts the end of the web bevel when the end of the secondary beam is cut bevel.
	Square Cuts the end of the web square even if the end of the secondary beam is cut bevel.

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.

Option	Description
	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.

Welded to top flange S (149): Plates tab

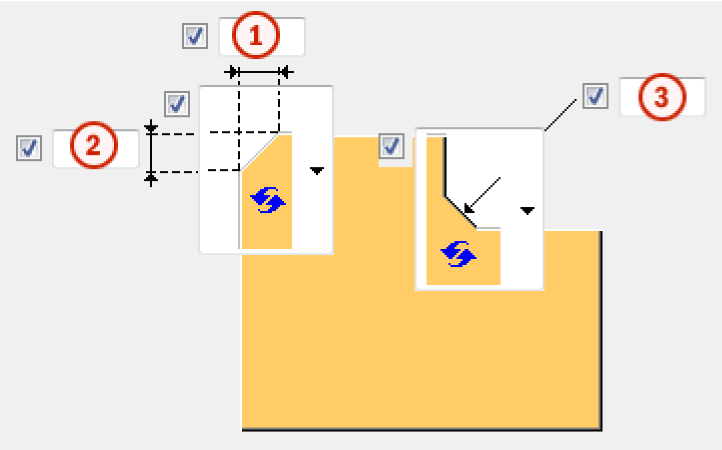
Use the **Plates** tab to control the size, position, number, orientation and shape of the shear tab in the **Welded to top flange S (149)** connection.

Shear tab plate

Part	Description
Tab plate	Define the shear tab plate thickness, width and height.

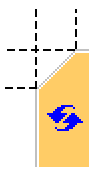
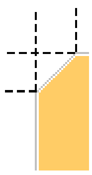
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

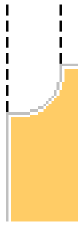
Shear tab chamfers



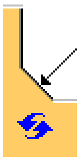
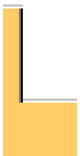
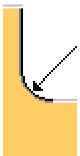
	Description
1	Define the horizontal dimension of the shear tab chamfer.
2	Define the vertical dimension of the shear tab chamfer.
3	Define the vertical and the horizontal dimension of the shear tab chamfer.

Chamfer type

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

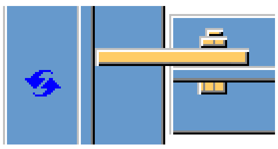
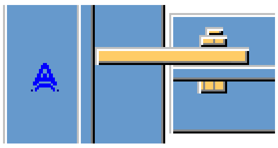
Option	Description
	Concave arc chamfer

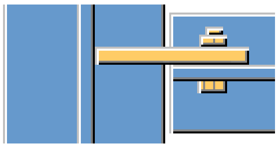
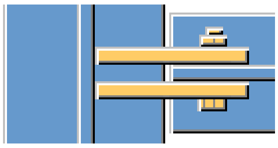
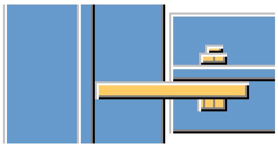
Chamfer type dimensions

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

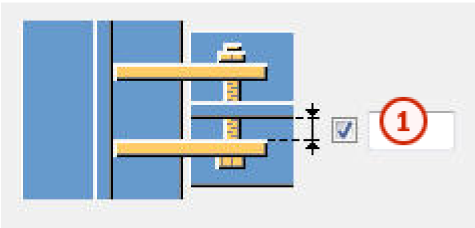
Shear tab position

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 near side or 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	Define the gap between the secondary part web and shear tab. This only affects connections with two shear tabs.	0

Welded to top flange S (149): Stiffeners tab

Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type in the **Welded to top flange S (149)** connection.

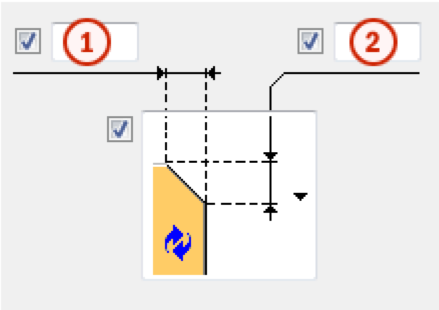
Opposite web stiffener plate dimensions

Part	Description
Opposite web stiffener	Define the opposite web stiffener plate thickness, width and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

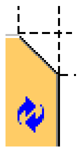
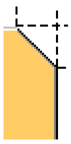
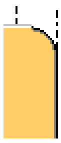
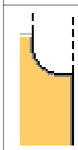
Option	Description	Default
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Chamfer dimensions

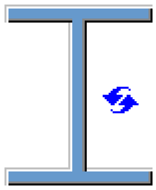
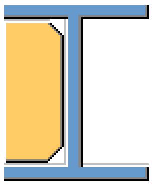
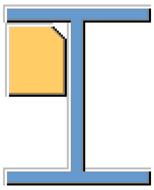
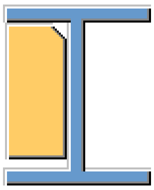
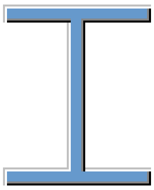


	Description
1	Define the horizontal dimension of the chamfer.
2	Define the vertical dimension of the chamfer.

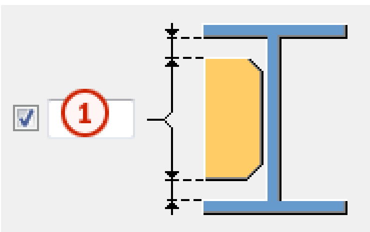
Chamfer type

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

Stiffener creation

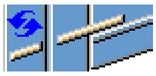
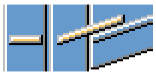
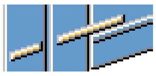
Option	Description
	Default No stiffeners are created. AutoDefaults can change this option.
	Full Creates a full stiffener of the same height as the web of the main part.
	Determined by shear tab Tekla Structures determines the size of the stiffener based on the shear tab size. Tekla Structures attempts 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	Define the 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.

Welded to top flange S (149): Haunch tab

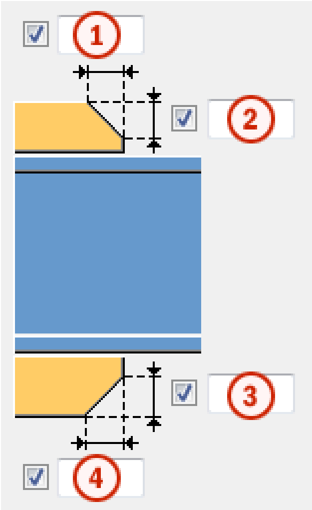
Use the Haunch tab to control the haunch plate creation and chamfers in the secondary beam flanges in the **Welded to top flange S (149)** connection.

Haunch plates

Part	Description
Top plate	Define the top haunch plate thickness, width and height.
Bottom plate	Define the bottom haunch plate thickness, width and height.

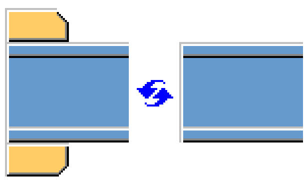
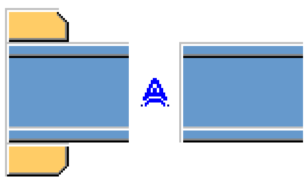
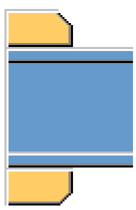
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

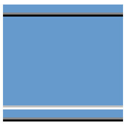
Haunch plate chamfers



	Description
1	Define the width of the top haunch plate chamfer.
2	Define the height of the top haunch plate chamfer.
3	Define the height of the bottom haunch plate chamfer.
4	Define the width of the bottom haunch plate chamfer.

Hauch 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.
	Top and bottom haunch plates are created. To create a single plate, enter 0 in the thickness (**t**) field for the plate you do not need (top or bottom plate).

Option	Description
	Haunch plates are not created.

Welded to top flange S (149): Notch tab

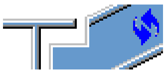
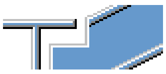
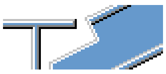
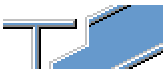
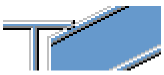
Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties in the **Welded to top flange S (149)** connection. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

Automatic notching

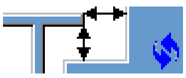
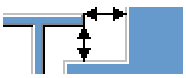
Automatic notching options affect both the top and the bottom flange.

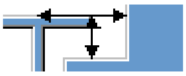
Notch shape

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

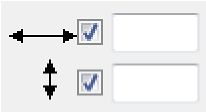
Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary 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

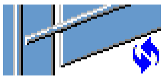
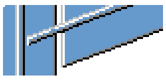
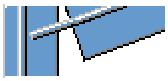
Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.

Option	Description
	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.

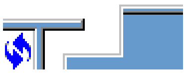
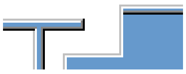
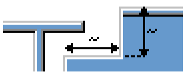


Flange cut shape

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.

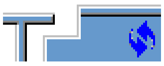
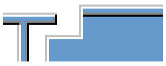
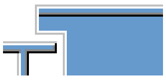
Notch dimension rounding

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.

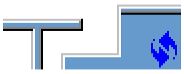
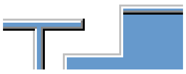
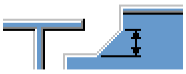
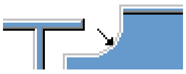
Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.

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.

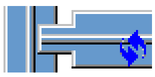
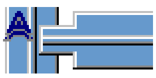
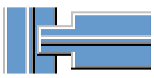
Enter a radius for the chamfer.

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

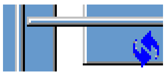
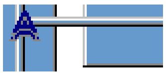
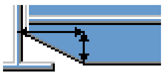
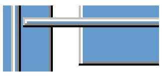
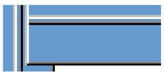
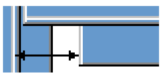
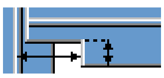
The side of flange notch defines on which side of the beam the notches are created.

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.

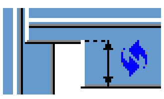
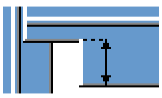
Option	Description
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

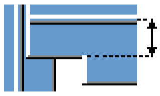
Flange notch shape

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 1 and 2.
	The flange is not cut.
	Creates cuts to the flange according to the value in the field 1 to make it flush with the web.
	Creates cuts to the flange according to the values in the fields 1 and 2.

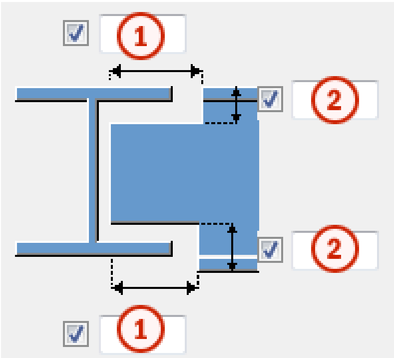
Flange notch depth

Option	Description
	Default Defines the flange notch depth. AutoDefaults can change this option.
	Defines the flange notch depth.

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

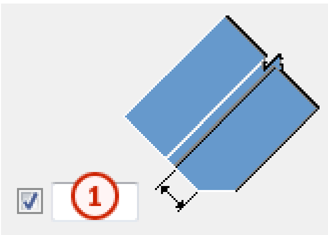
Enter the value for flange notch depth.

Cut dimensions



	Description	Default
1	Define the dimensions for the horizontal flange cuts.	10 mm
2	Define the 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

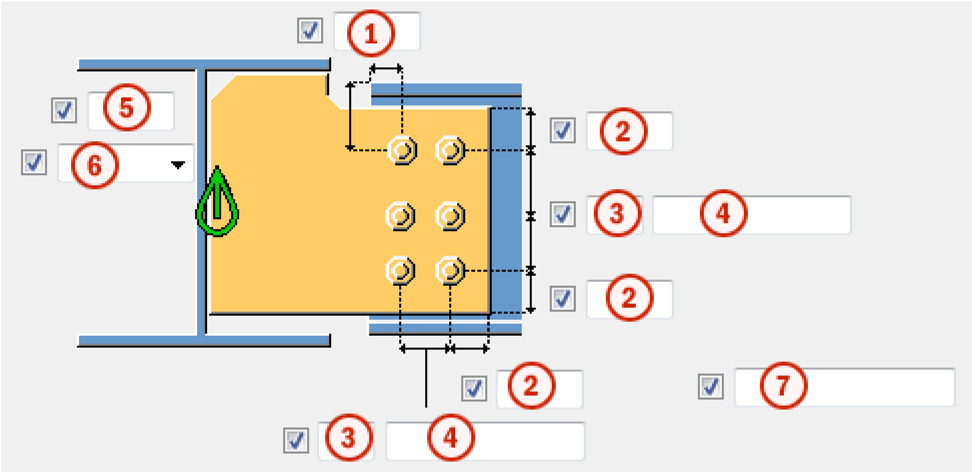


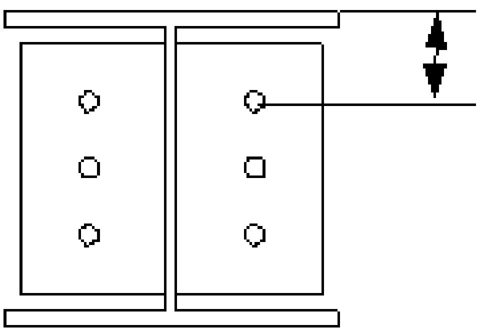
	Description
1	Define the distance between the web and the flange cut.

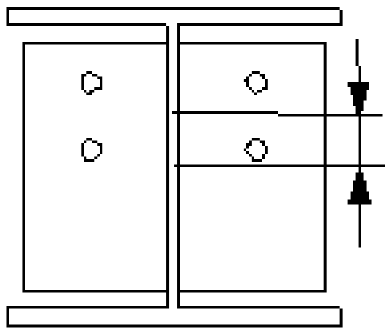
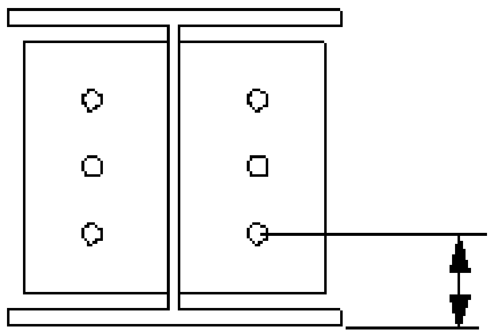
Welded to top flange S (149): Bolts tab

Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the main part in the **Welded to top flange S (149)** connection.

Bolt group dimensions



	Description
1	Define the dimension for horizontal bolt group position.
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.
4	Define the 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 dimension for vertical bolt group position.
6	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt. 

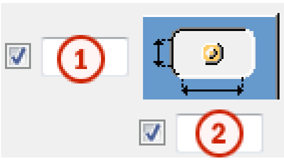
	Description
	• **Middle**: From the center line of the bolts to the center line of the secondary part.  • **Below**: From the lower edge of the secondary part to the lowest bolt. 
7	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

Bolt basic properties

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

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

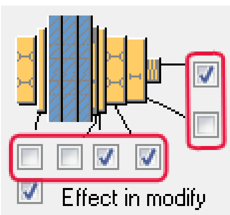
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(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.

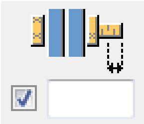
If you want to create a hole only, clear all the check boxes.



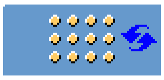
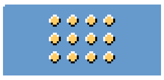
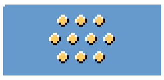
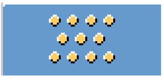
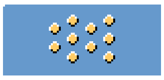
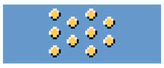
To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

Bolt length increase

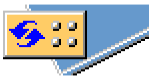
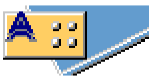
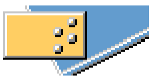
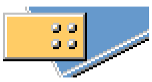
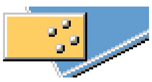
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



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
	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.

Welded to top flange S (149): Beam cut tab

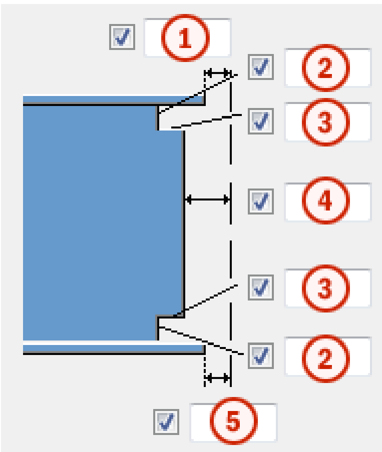
Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts in the **Welded to top flange S (149)** connection.

Weld backing bar

Part	Description
Weld backing bar	Define the weld backing bar thickness and width.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

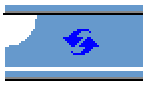
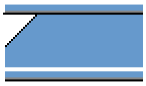
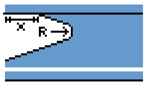
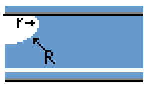
Weld access hole dimensions



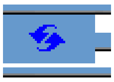
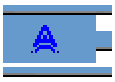
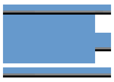
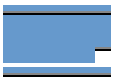
	Description
1	Define the gap between the secondary part top flange and the main part.
2	Define the vertical dimensions for the top and the bottom weld access holes.
3	Define the horizontal dimensions for the top and the bottom weld access holes.

	Description
4	Define the 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 **Picture** tab.
5	Define the 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 **Picture** tab.

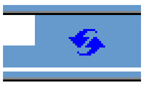
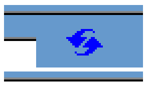
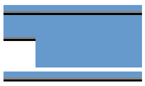
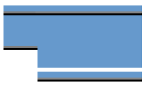
Weld access holes

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	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in R and Top Prep x Bottom Prep x	
	Cone-shaped weld access hole with radiuses that you can define in R and r Capital **R** defines the large radius (height). Small **r** 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.
	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.

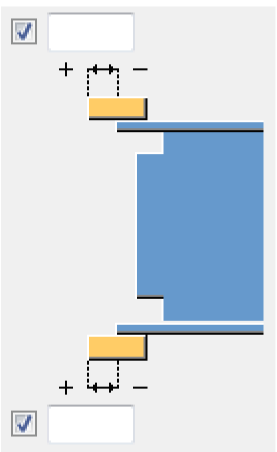
Option for bottom backing bar	Description
	Backing bars are created inside the flanges.
	Backing bars are created outside the flanges.

Weld backing bar length

Enter the length of the weld backing bar in the field 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.

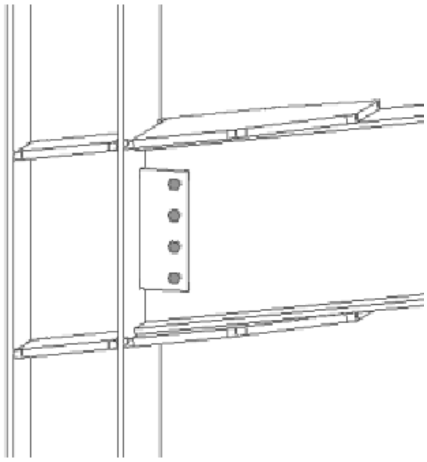
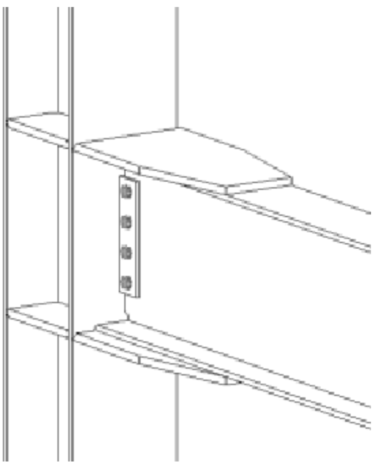
1.9 Moment connection (181)

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

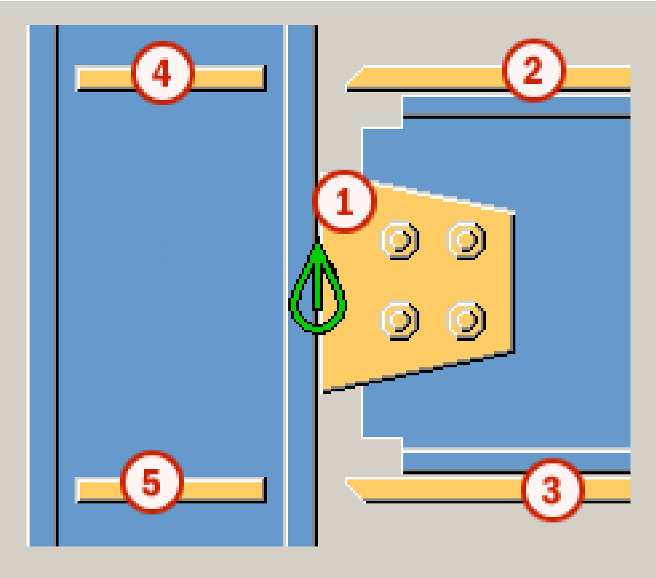
Situation	Description
	Moment connection welded to a column flange. The secondary part is sloped.
	Moment connection welded to a column flange. Beam weld preparation and weld access hole options.

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

You can use the `joints.def` file to change the default values of this component.

See also

Moment connection (181): Picture tab on page 195

Moment connection (181): Plates tab on page 197

Moment connection (181): Stiffeners tab on page 199

Moment connection (181): Notch tab on page 203

Moment connection (181): Bolts tab on page 207

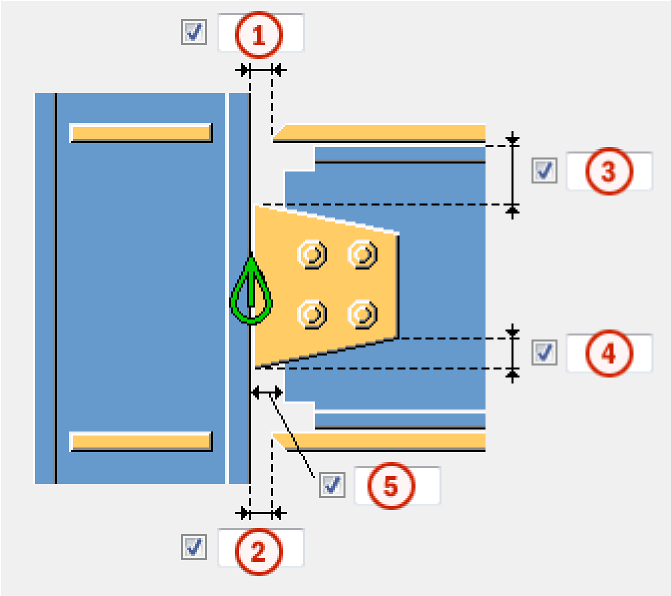
Moment connection (181): Beam cut tab on page 211

Moment connection (181): Doubler plates tab on page 214

Moment connection (181): Picture tab

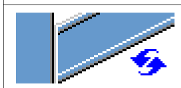
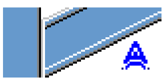
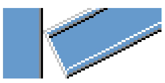
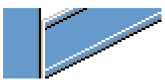
Use the **Picture** tab to control the position of the shear tab, and the beam flange and the web cuts in the **Moment connection (181)** connection.

Dimensions

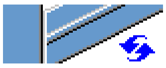
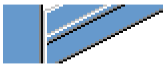
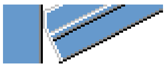


	Description
①	Define the site welding distance from the edge of the top flange plate to the main part flange.
②	Define the site welding distance from the edge of the bottom flange plate to the main part web.
③	Define the distance from the edge of the shear tab to the top edge of the secondary part.
④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

Moment connection (181): Plates tab

Use the **Plates** tab to control the size, position, number, and shape of the shear tab in the **Moment connection (181)** connection.

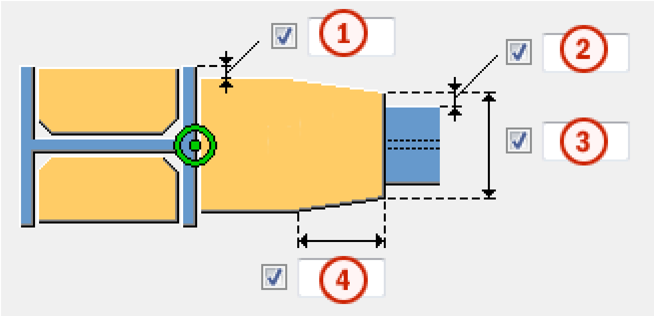
Plates

Part	Description
Tab plate	Define the shear tab plate thickness, width and height.

Part	Description
Top plate	Define the top plate thickness, width and height.
Bottom plate	Define the bottom plate thickness, width and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

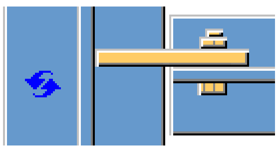
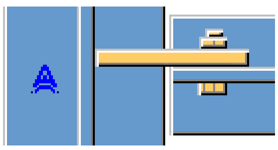
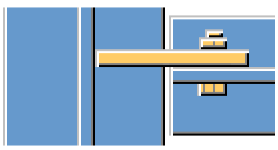
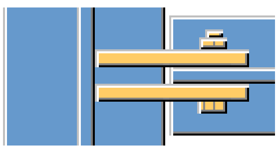
Shear tab dimensions

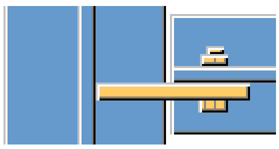


Option	Description
1	Define the distance from the edge of the main part flange to the edge of the top and bottom plate.
2	Define the distance from the flange of the secondary part to the edge of the top and bottom plate.
3	Define the width of the chamfered end of the top and bottom plate.
4	Define the 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
	Default Far side shear tab AutoDefaults can change this option.
	Automatic The component automatically selects either near side or 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

Option	Description
	Near side shear tab

Moment connection (181): Stiffeners tab

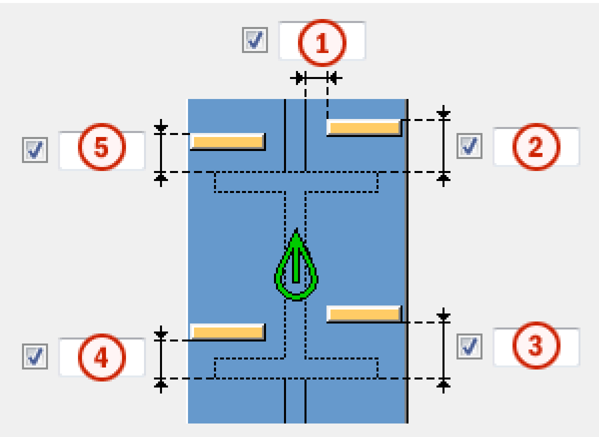
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type in the **Moment connection (181)** connection.

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.
Bottom NS	Define the bottom near side stiffener thickness, width and height.
Bottom FS	Define the bottom far side stiffener thickness, width and height.

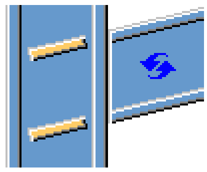
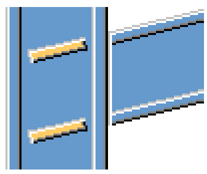
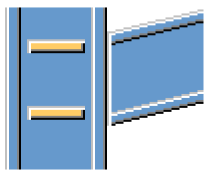
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Stiffener positions

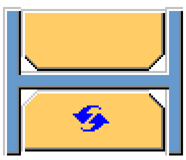
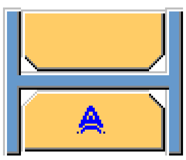


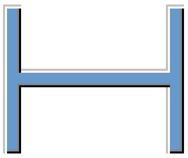
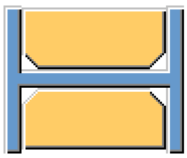
	Description
1	Define the size of the gap between the stiffener and the beam web edge.
2	Define the size of the gap between the top near side stiffener and the beam flange edge.
3	Define the size of the gap between the bottom near side stiffener and the beam flange edge.
4	Define the size of the gap between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

Stiffener orientation

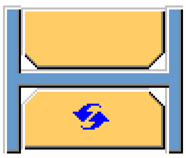
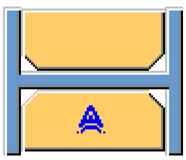
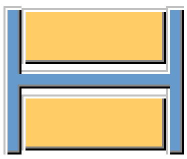
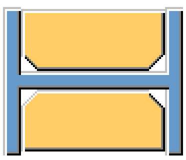
Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are parallel to the secondary part.
	Stiffeners are perpendicular to the main part.

Stiffener creation

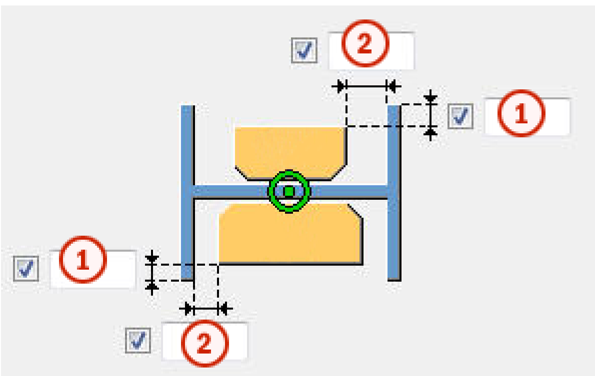
Option	Description
	Default Stiffeners are created. AutoDefaults can change this option.
	Automatic Stiffeners are created when necessary.

Option	Description
	No stiffeners are created.
	Stiffeners are created.

Stiffener shape

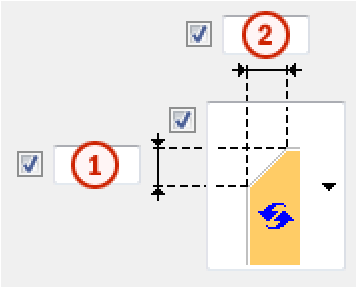
Option	Description
	Default Line chamfered stiffener plates AutoDefaults can change this option.
	Automatic Line chamfered stiffener plates
	Square stiffener plates Stiffener plates with a gap for the main part web rounding
	Line chamfered stiffener plates

Stiffener gap



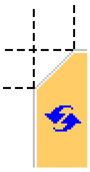
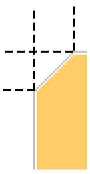
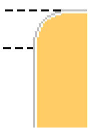
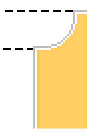
	Description
1	Define the distance from the edge of the flange to the edge of the stiffener.
2	Define the size of the gap between the flanges and the stiffener.

Chamfer dimensions



	Description	Default
1	Define the vertical dimension of the chamfer.	10 mm
2	Define the 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

Moment connection (181): Notch tab

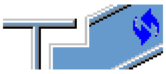
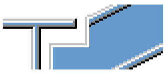
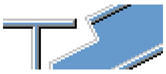
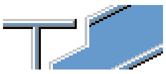
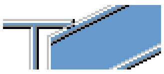
Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties in the **Moment connection (181)** connection. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

Automatic notching

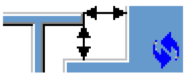
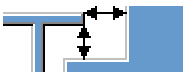
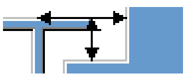
Automatic notching options affect both the top and the bottom flange.

Notch shape

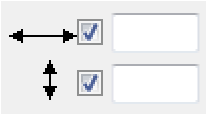
Automatic notching is switched on when you select a notch shape.

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.

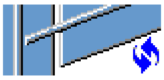
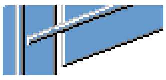
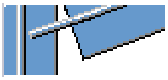
Notch size

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.

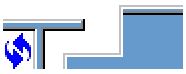
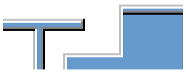
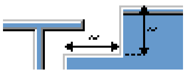


Flange cut shape

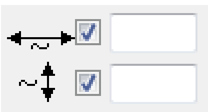
Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

Notch dimension rounding

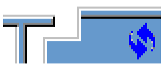
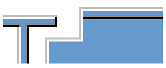
Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

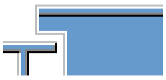
Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.

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.

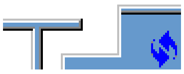
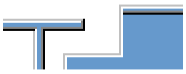
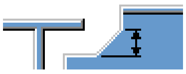
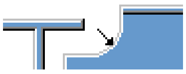


Notch position

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

Option	Description
	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.

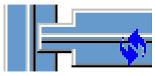
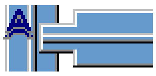
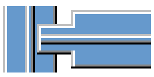
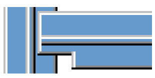
Enter a radius for the chamfer.

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.

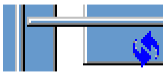
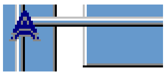
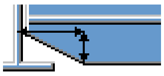
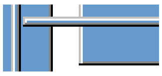
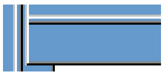
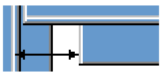
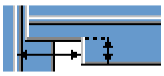
Side of flange notch

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

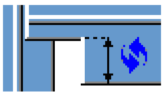
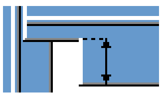
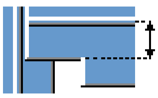
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the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

Flange notch shape

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

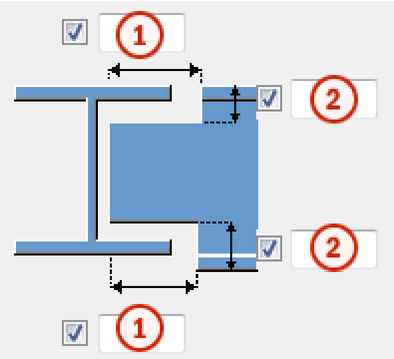
Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. 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 1 and 2.
	The flange is not cut.
	Creates cuts to the flange according to the value in the field 1 to make it flush with the web.
	Creates cuts to the flange according to the values in the fields 1 and 2.

Flange notch depth

Option	Description
	Default Defines the flange notch depth. AutoDefaults can change this option.
	Defines the flange notch depth.
	Defines the 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



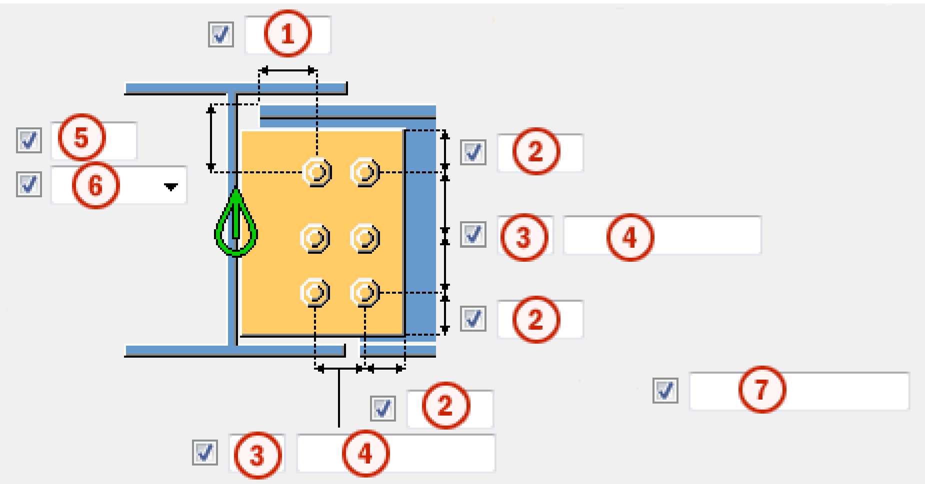
	Description	Default
1	Define the dimensions for the horizontal flange cuts.	10 mm
2	Define the dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

Moment connection (181): Bolts tab

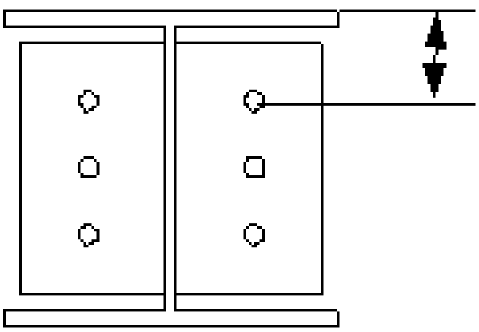
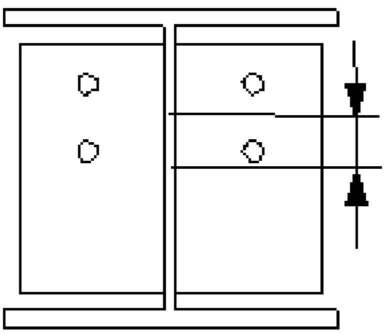
Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part in the **Moment connection (181)** connection.

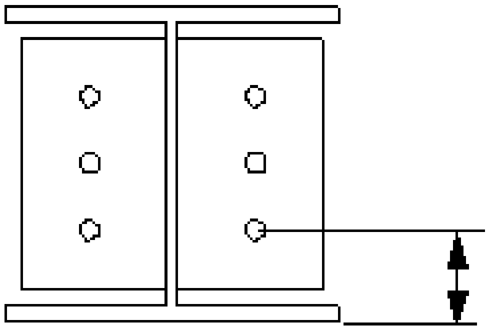
Bolt group dimensions

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

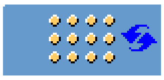
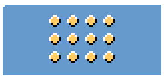
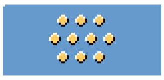
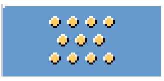
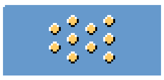
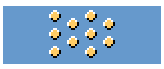


Option	Description
1	Define the dimension for horizontal bolt group position.

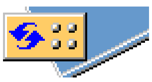
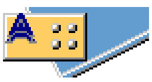
Option	Description
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.
4	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Define the dimension for vertical bolt group position.
6	Define 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. 

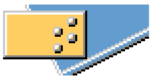
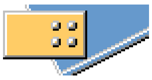
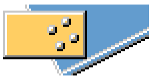
Option	Description
	• **Below**: From the lower edge of the secondary part to the lowest bolt. 
7	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

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

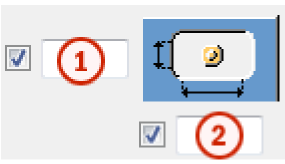
Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square

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
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes You can define slotted, oversized, or tapped holes.

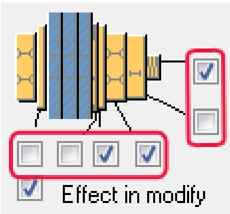


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	

Option	Description	Default
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

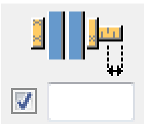
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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**.

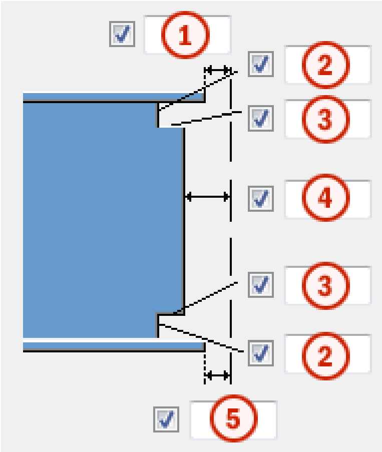
Bolt length increase Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



Moment connection (181): Beam cut tab

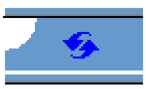
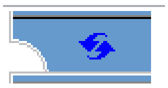
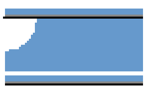
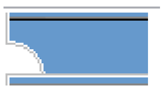
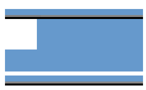
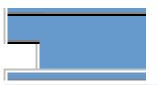
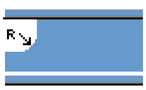
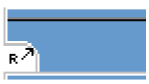
Use the **Beam cut** tab to control the weld access holes, beam end preparations, and flange cuts in the **Moment connection (181)** connection.

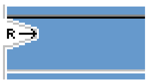
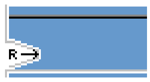
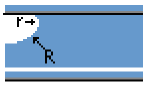
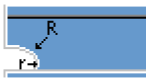
Weld access hole dimensions



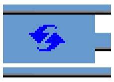
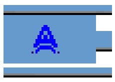
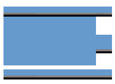
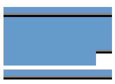
	Description
1	Define the gap between the secondary part top flange and the main part.
2	Define the vertical dimensions for the top and the bottom weld access holes.
3	Define the horizontal dimensions for the top and the bottom weld access holes.
4	Define the gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the **Picture** tab.
5	Define the 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 **Picture** tab.

Weld access holes

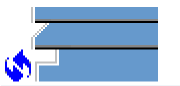
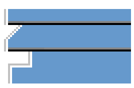
Option	Option	Description
		Default Round weld access hole AutoDefaults can change this option.
		Round weld access hole
		Square weld access hole
		Round weld access hole with a radius that you can define in 

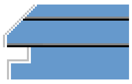
Option	Option	Description
		Extended cone-shaped weld access hole with a radius and dimensions that you can define in R
		Cone-shaped weld access hole with radiuses that you can define in R and r Capital **R** defines the large radius (height). Small **r** defines the small radius.

Beam end preparation

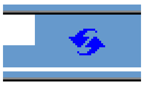
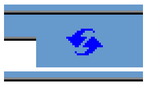
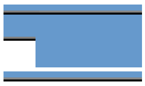
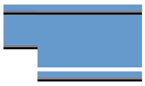
Option	Description
	Default Top and bottom flange are prepared. AutoDefaults can change this option.
	Automatic Top and bottom flange are prepared.
	Beam end is not prepared.
	Top and bottom flange are prepared.
	Top flange is prepared.
	Bottom flange is prepared.

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.

Option	Description
	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.
		Flange is cut.

Moment connection (181): Doubler plates tab

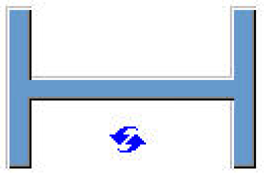
Use the **Doubler plate** tab to create doubler plates to strengthen the web of the main part in the **Moment connection (181)** connection.

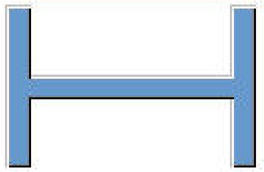
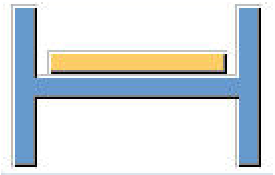
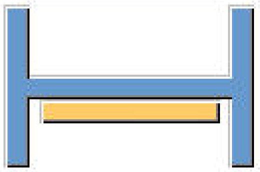
Web plate

Part	Description
Web plate	Define the web plate thickness and height.

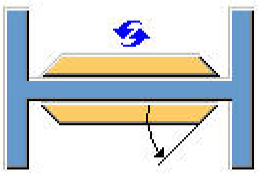
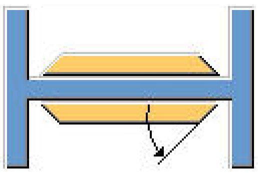
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Doubler plates

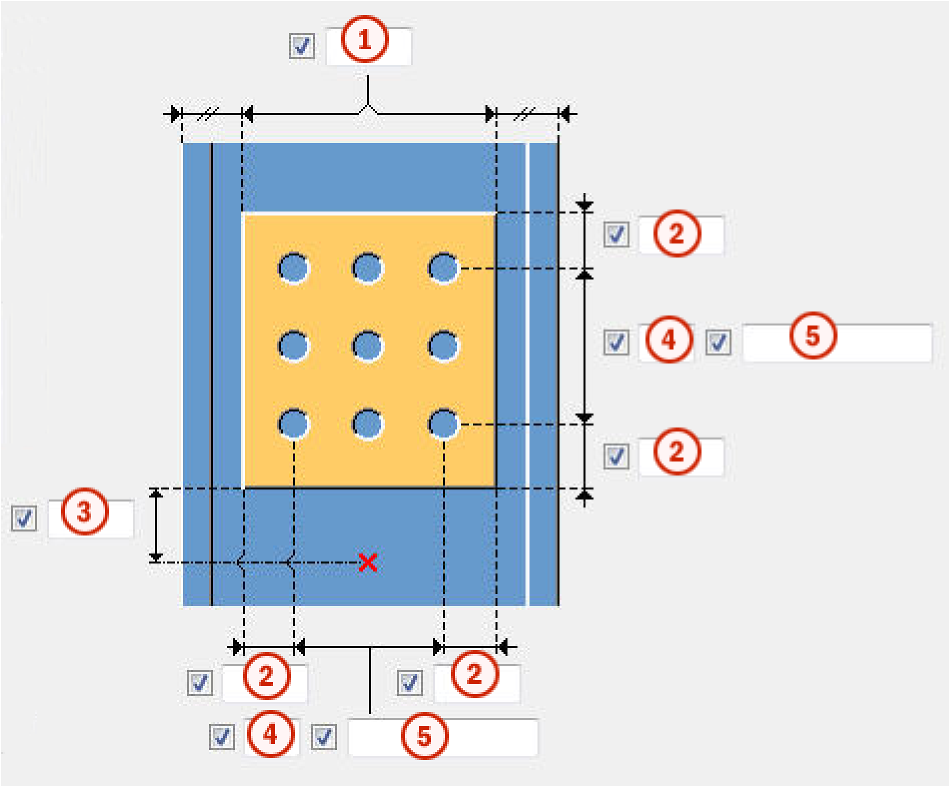
Option	Description
	Default Doubler plates are not created. AutoDefaults can change this option.

Option	Description
	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

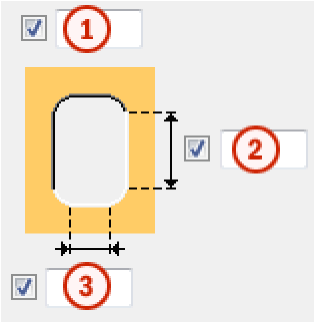
Option	Description
	Default Bevel doubler plates AutoDefauls can change this option.
	Bevel doubler plates Enter the angle in 
	Square doubler plates

General settings



	Description
1	Define the edge distance from the column flange.
2	Define the doubler plate edge distance. Edge distance is the distance from the center of a hole to the edge of the part.
3	Define the edge distance of the doubler plate in relation to the bottom of the secondary part.
4	Define the number of holes.
5	Define the 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	Define the hole diameter.
2	Define the slot length.
3	Define the slot width.

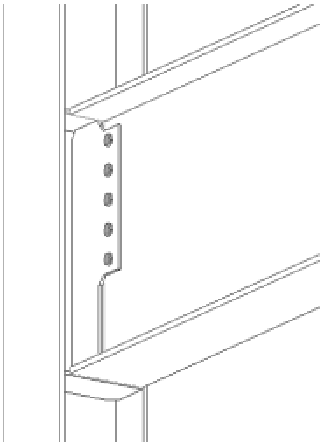
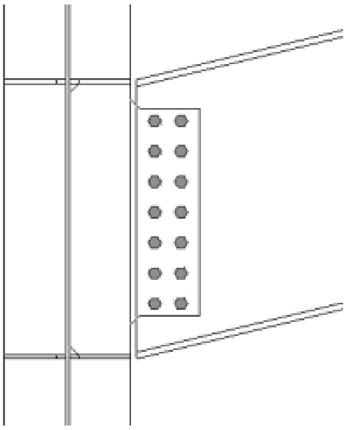
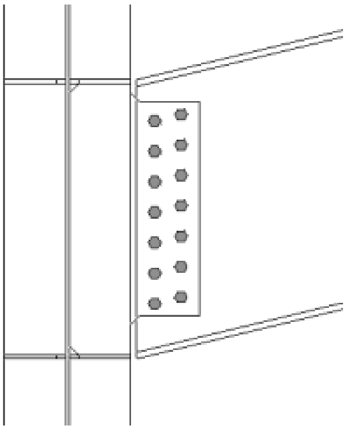
1.10 Column with stiffeners W (182)

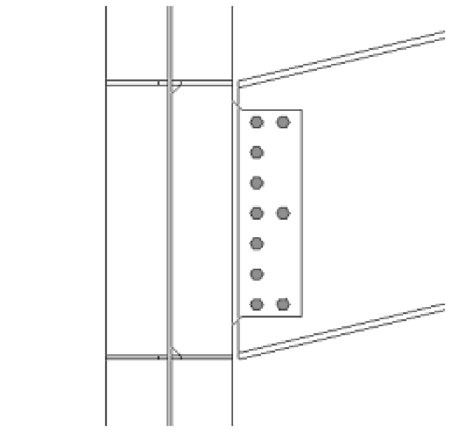
Column with stiffeners W (182) connects a column to a beam with a shear tab. The shear tab is welded to the main part and bolted to the secondary part web. The secondary beam can be leveled or sloped.

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

Situation	Description
	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.

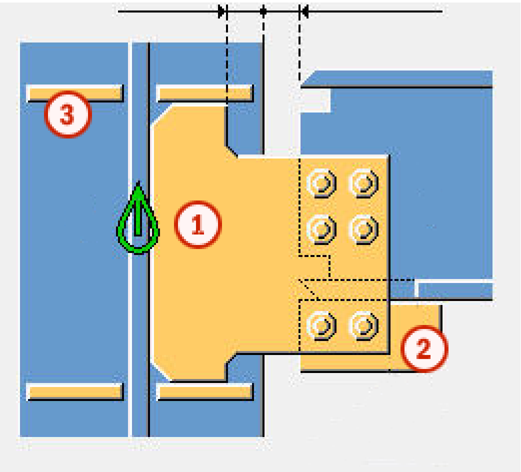
Situation	Description
	Shaped shear tab with column stiffeners. Bolts can be deleted.

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

You can use the `joints.def` file to change the default values of this component.

See also

Column with stiffeners W (182): Picture tab on page 220

Column with stiffeners W (182): Plates tab on page 221

Column with stiffeners W (182): Stiffeners tab on page 224

Column with stiffeners W (182): Haunch tab on page 229

Column with stiffeners W (182): Notch tab on page 231

Column with stiffeners W (182): Bolts tab on page 235

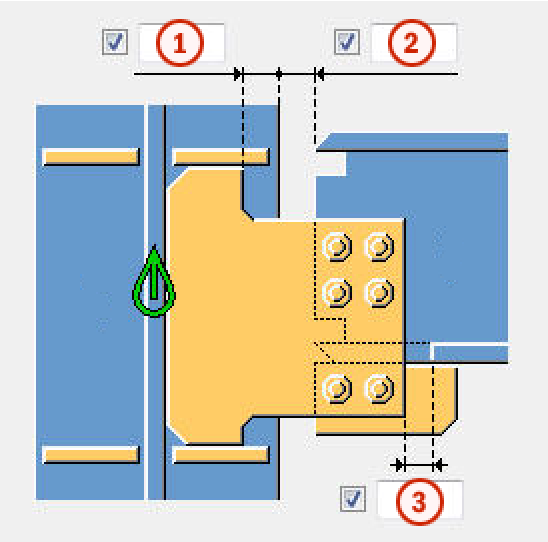
Column with stiffeners W (182): Beam cut tab on page 239

Column with stiffeners W (182): Doubler plate tab on page 243

Column with stiffeners W (182): Picture tab

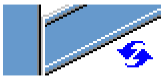
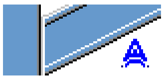
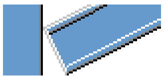
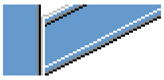
Use the **Picture** tab to control the position of the shear tab corner and to define how the beam end is cut in the **Column with stiffeners W (182)** connection.

Dimensions



	Description	Default
1	Define the shear tab edge distance from the main part flange edge.	
2	Define the cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	20 mm
3	Define the 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.

Column with stiffeners W (182): Plates tab

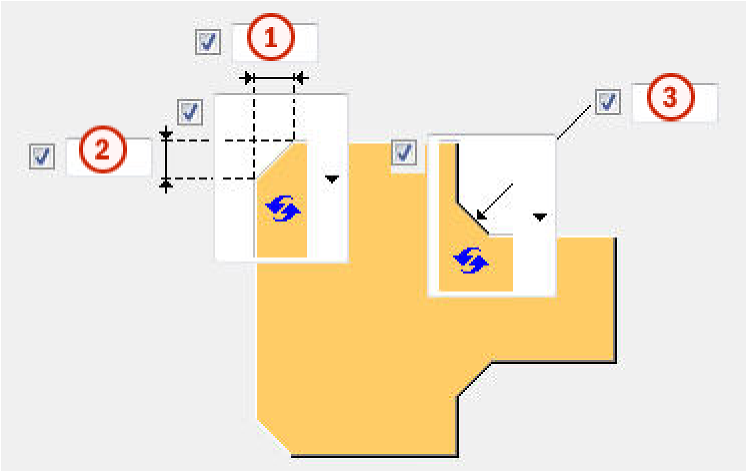
Use the **Plates** tab to control the size, position, number, orientation and shape of the shear tab in the **Column with stiffeners W (182)** connection.

Shear tab plate

Part	Description
Tab plate	Define the shear tab plate thickness, width and height.

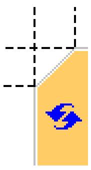
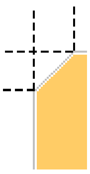
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

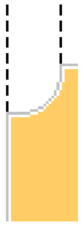
Shear tab chamfers



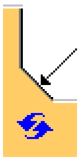
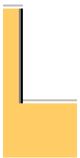
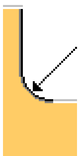
	Description
1	Define the horizontal dimension of the shear tab chamfer.
2	Define the vertical dimension of the shear tab chamfer.
3	Define the vertical and the horizontal dimension of the shear tab chamfer.

Chamfer type

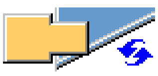
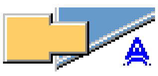
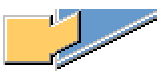
Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer

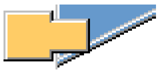
Option	Description
	Concave arc chamfer

Chamfer type dimensions

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

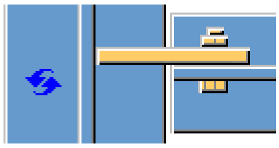
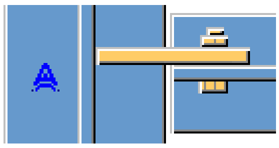
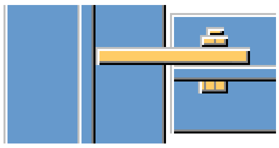
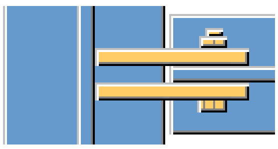
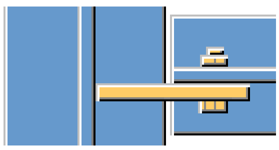
Shear tab orientation

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

Option	Description
	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 near side or 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

Column with stiffeners W (182): Stiffeners tab

Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type in the **Column with stiffeners W (182)** connection.

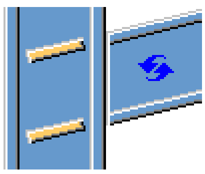
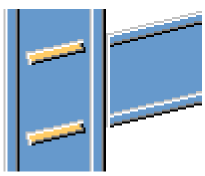
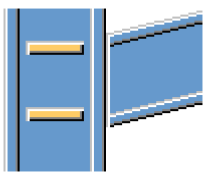
Stiffener plate dimensions

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.

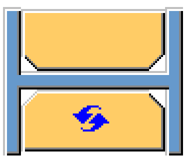
Part	Description
Bottom NS	Define the bottom near side stiffener thickness, width and height.
Bottom FS	Define the bottom far side stiffener thickness, width and height.

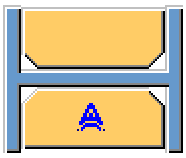
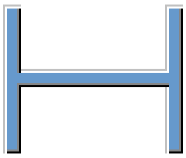
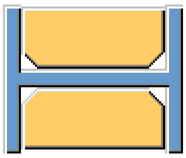
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Stiffener orientation

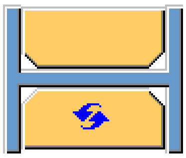
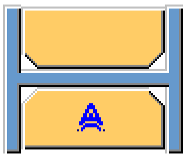
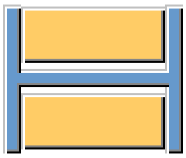
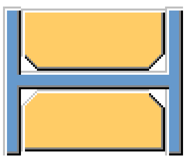
Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are parallel to the secondary part.
	Stiffeners are perpendicular to the main part.

Stiffener creation

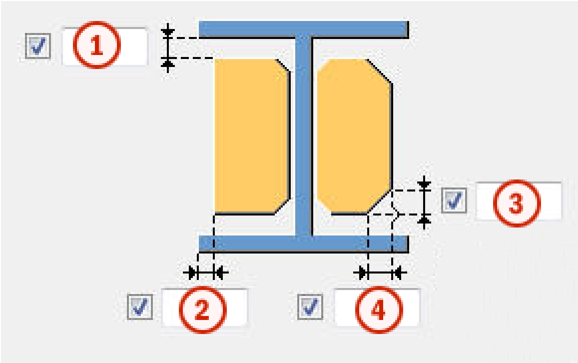
Option	Description
	Default Stiffeners are created. AutoDefaults can change this option.

Option	Description
	Automatic Stiffeners are created when necessary.
	No stiffeners are created.
	Stiffeners are created.

Stiffener shape

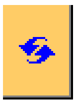
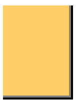
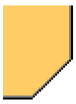
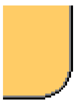
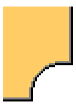
Option	Description
	Default Line chamfered stiffener plates AutoDefaults can change this option.
	Automatic Line chamfered stiffener plates
	Square stiffener plates Stiffener plates with a gap for the main part web rounding
	Line chamfered stiffener plates

Stiffener gap and chamfer size

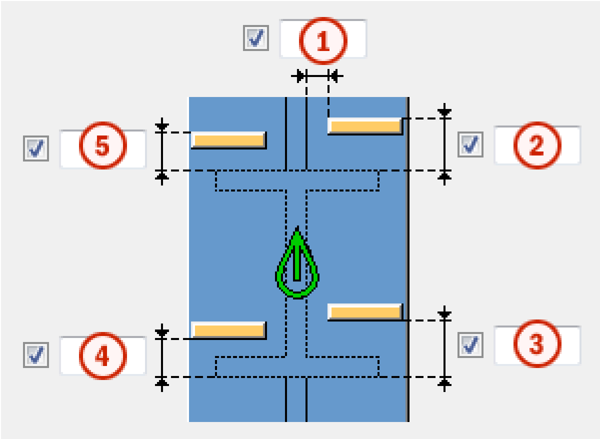


	Description
1	Define the size of the gap between the flanges and the stiffener.
2	Define the distance from the edge of the flange to the edge of the stiffener.
3	Define the vertical dimension of the stiffener line chamfer.
4	Define the horizontal dimension of the stiffener chamfer or radius of arc type chamfer.

Define the chamfer shape.

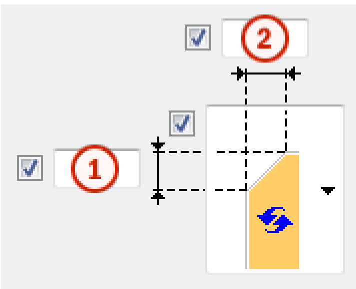
Option	Description
	Default No chamfers AutoDefaults can change this option.
	No chamfers
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

Stiffener positions



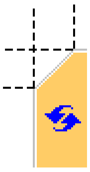
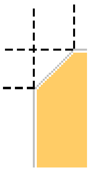
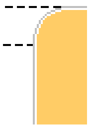
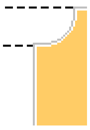
	Description
1	Define the size of the gap between the stiffener and the beam web edge.
2	Define the size of the gap between the top near side stiffener and the beam flange edge.
3	Define the size of the gap between the bottom near side stiffener and the beam flange edge.
4	Define the size of the gap between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

Chamfer dimensions



	Description	Default
1	Define the vertical dimension of the chamfer.	10 mm
2	Define the 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

Column with stiffeners W (182): Haunch tab

Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges in the **Column with stiffeners W (182)** connection.

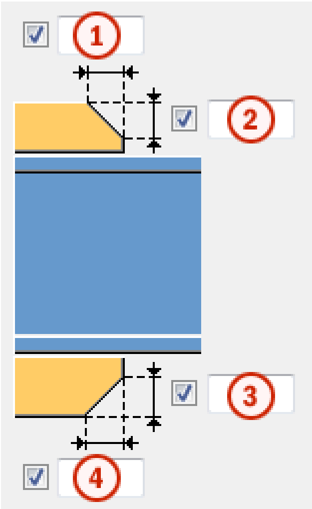
Haunch plates

Part	Description
Top plate	Define the top haunch plate thickness, width and height.
Bottom plate	Define the bottom haunch plate thickness, width and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** -->

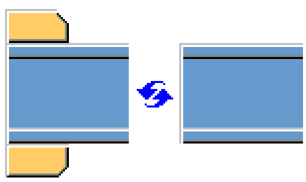
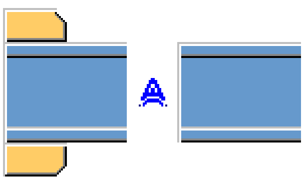
Option	Description	Default
		Options... --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

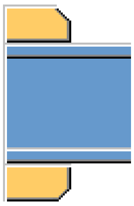
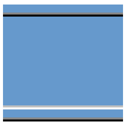
Haunch plate chamfers



	Description
1	Define the width of the top haunch plate chamfer.
2	Define the height of the top haunch plate chamfer.
3	Define the height of the bottom haunch plate chamfer.
4	Define the width of the bottom haunch plate chamfer.

Hauch 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
	Top and bottom haunch plates are created. To create a single plate, enter 0 in the thickness (**t**) field for the plate you do not need (top or bottom plate).
	Haunch plates are not created.

Column with stiffeners W (182): Notch tab

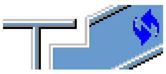
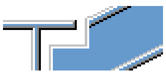
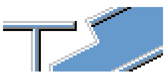
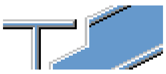
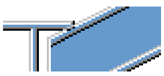
Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties in the **Column with stiffeners W (182)** connection. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

Automatic notching

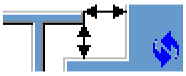
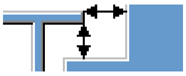
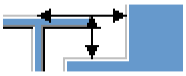
Automatic notching options affect both the top and the bottom flange.

Notch shape

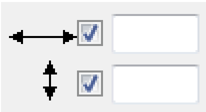
Automatic notching is switched on when you select a notch shape.

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.

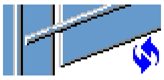
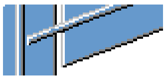
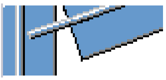
Notch size

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.

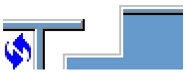
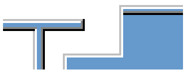
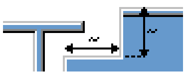


Flange cut shape

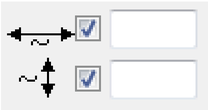
Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

Notch dimension rounding

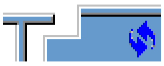
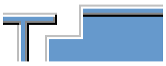
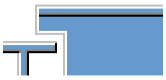
Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

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.

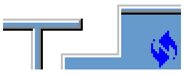
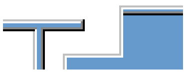
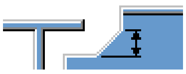
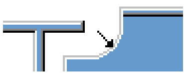
The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



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.

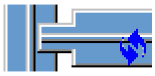
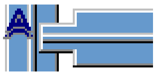
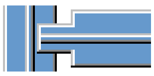
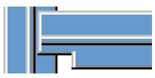
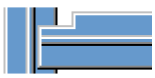
Enter a radius for the chamfer.

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.

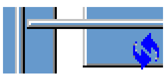
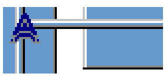
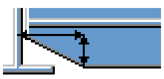
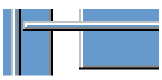
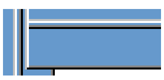
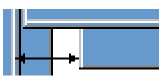
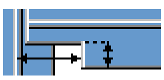
Side of flange notch

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

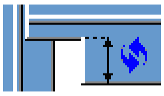
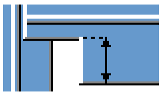
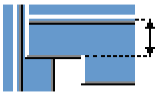
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the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

Flange notch shape

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

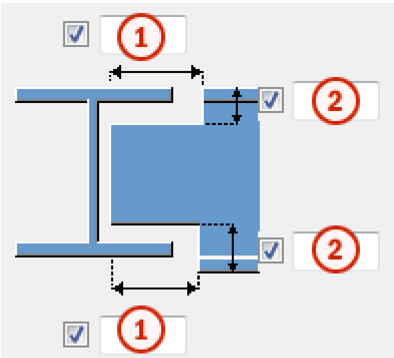
Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. 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 1 and 2.
	The flange is not cut.
	Creates cuts to the flange according to the value in the field 1 to make it flush with the web.
	Creates cuts to the flange according to the values in the fields 1 and 2.

Flange notch depth

Option	Description
	Default Defines the flange notch depth. AutoDefaults can change this option.
	Defines the flange notch depth.
	Defines the 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



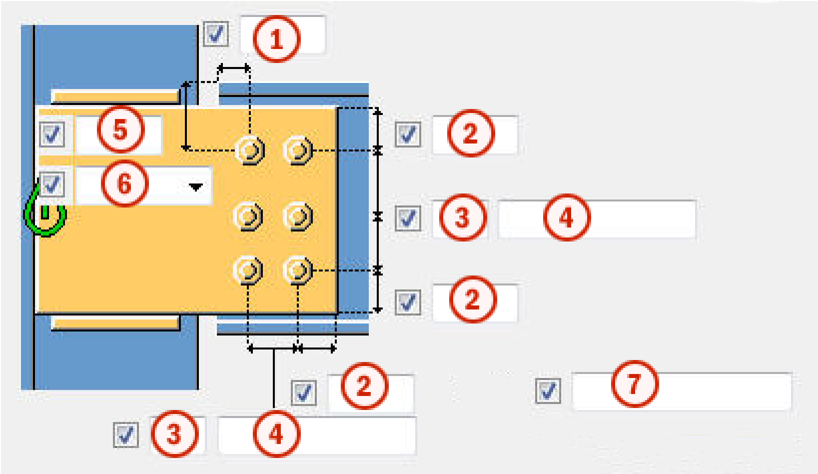
	Description	Default
1	Define the dimensions for the horizontal flange cuts.	10 mm
2	Define the dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

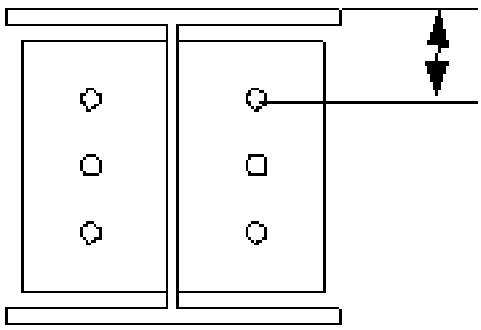
Column with stiffeners W (182): Bolts tab

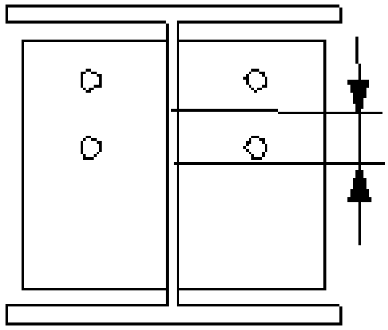
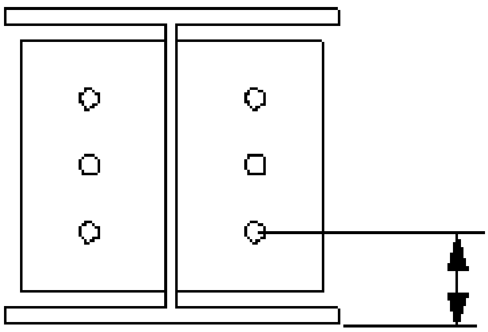
Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part in the **Column with stiffeners W (182)** connection.

Bolt group dimensions

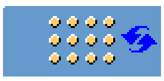
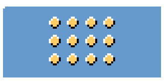
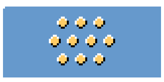
Bolt group dimensions affect the size and shape of the shear tab.

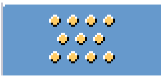
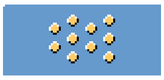
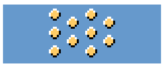


Option	Description
1	Define the dimension for horizontal bolt group position.
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.
4	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Define the dimension for vertical bolt group position.
6	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt. 

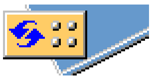
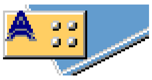
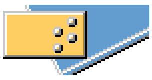
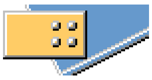
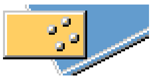
Option	Description
	• **Middle**: From the center line of the bolts to the center line of the secondary part.  • **Below**: From the lower edge of the secondary part to the lowest bolt. 
7	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate 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

Option	Description
	Staggered type 2
	Staggered type 3
	Staggered type 4

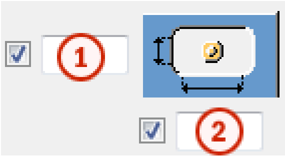
Bolt group orientation

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
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

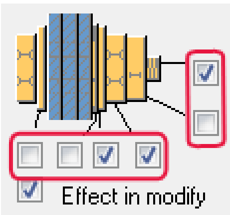
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

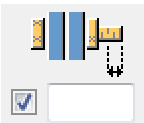
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



Column with stiffeners W (182): Beam cut tab

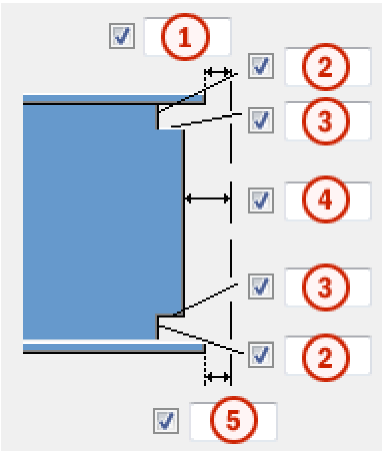
Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts in the **Column with stiffeners W (182)** connection.

Weld backing bar

Part	Description
Weld backing bar	Define the weld backing bar thickness and width.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

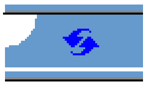
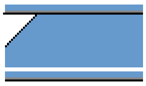
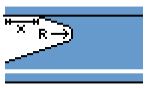
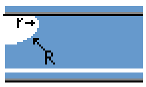
Weld access hole dimensions



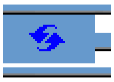
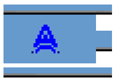
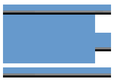
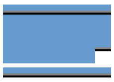
	Description
1	Define the gap between the secondary part top flange and the main part.
2	Define the vertical dimensions for the top and the bottom weld access holes.
3	Define the horizontal dimensions for the top and the bottom weld access holes.

	Description
4	Define the 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 **Picture** tab.
5	Define the 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 **Picture** tab.

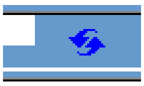
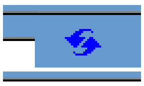
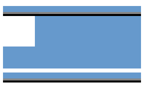
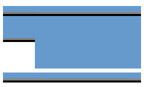
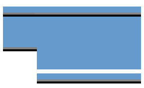
Weld access holes

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	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in R and Top Prep x Bottom Prep x	
	Cone-shaped weld access hole with radiuses that you can define in R and r Capital **R** defines the large radius (height). Small **r** defines the small radius.	R = 35 r = 10

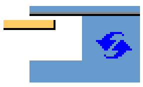
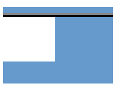
Beam end preparation

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.
	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.

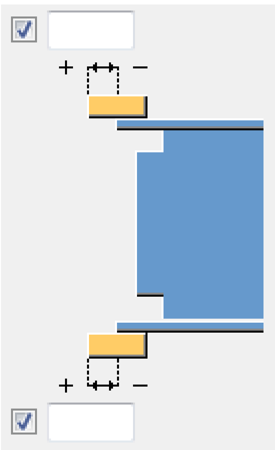
Option for top backing bar	Option for bottom backing bar	Description
		Backing bars are created inside the flanges.
		Backing bars are created outside the flanges.

Weld backing bar length

Enter the length of the weld backing bar in the field 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.

Column with stiffeners W (182): Doubler plate tab

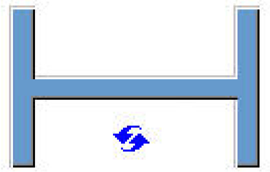
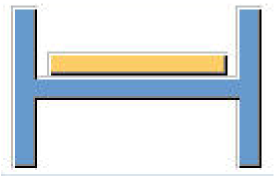
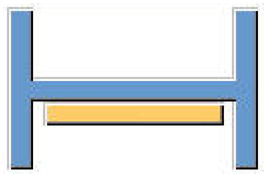
Use the **Doubler plate** tab to create doubler plates to strengthen the web of the main part in the **Column with stiffeners W (182)** connection.

Web plate

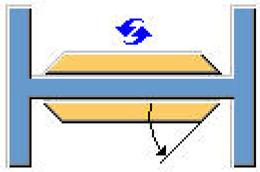
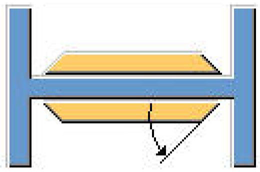
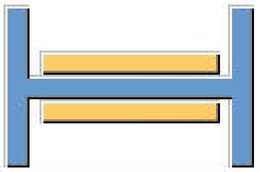
Part	Description
Web plate	Define the web plate thickness and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

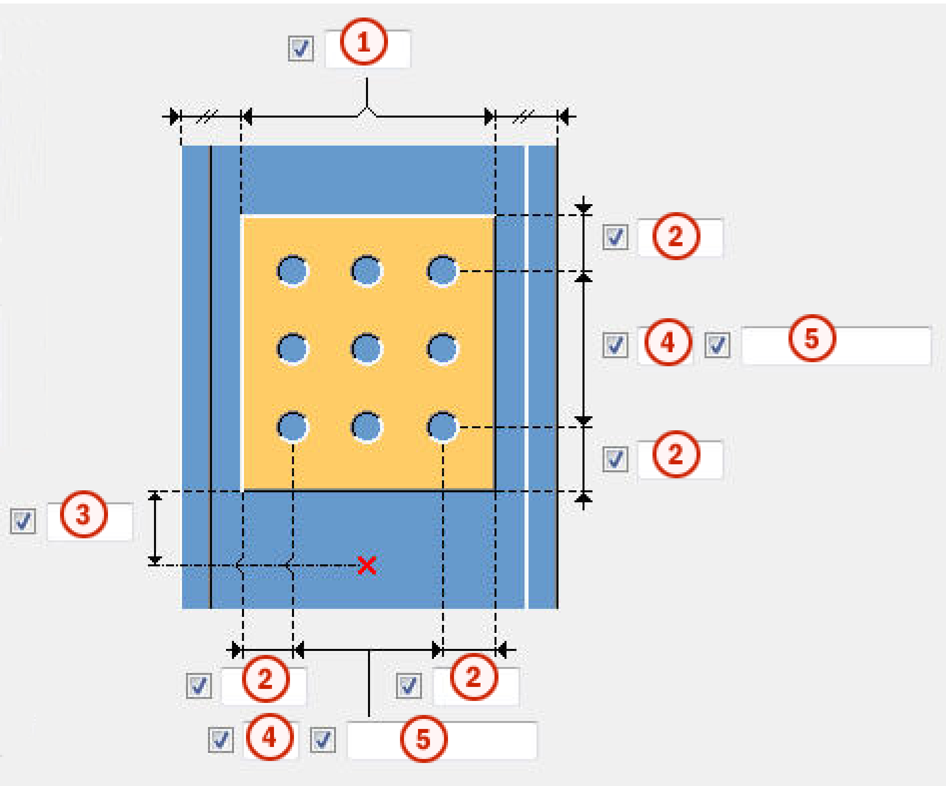
Doubler plates

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 AutoDefauls can change this option.
	Bevel doubler plates Enter the angle in 
	Square doubler plates

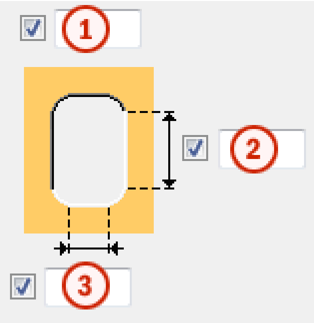
General settings



	Description
1	Define the edge distance from the column flange.

	Description
2	Define the doubler plate edge distance. Edge distance is the distance from the center of a hole to the edge of the part.
3	Define the edge distance of the doubler plate in relation to the bottom of the secondary part.
4	Define the number of holes.
5	Define the 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	Define the hole diameter.
2	Define the slot length.
3	Define the slot width.

1.11 Full depth (184)

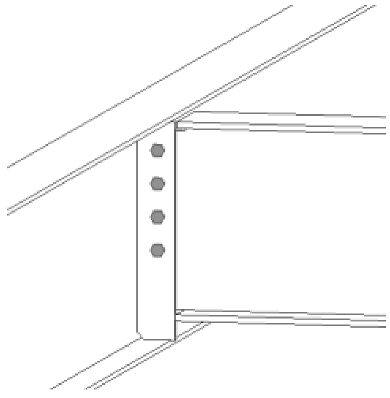
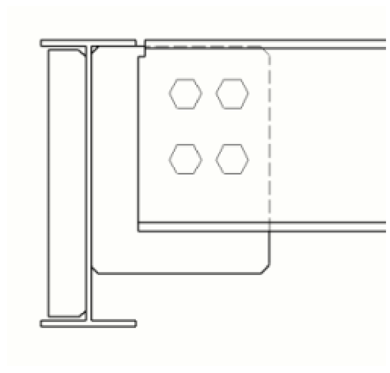
Full depth (184) connects two beams with a full depth shear tab. The shear tab is welded to the main beam web and flanges, and bolted to the secondary beam web. The secondary beam can be leveled or sloped. A stiffener plate on the opposite side of the main beam web and the haunch plates welded to the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

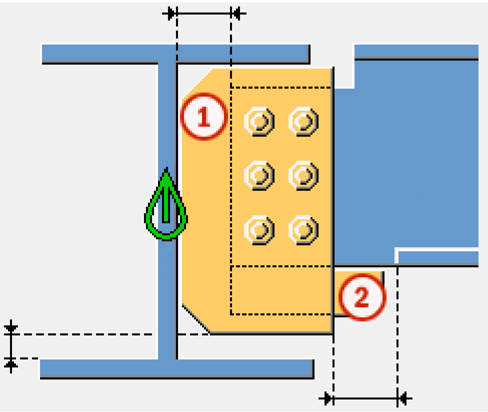
Situation	Description
	Full depth shear tab.
	Full depth connection with a stiffener plate.

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

You can use the `joints.def` file to change the default values of this component.

See also Full depth (184): Picture tab on page 248

Full depth (184): Plates tab on page 250

Full depth (184): Stiffeners tab on page 253

Full depth (184): Haunch tab on page 256

Full depth (184): Notch tab on page 258

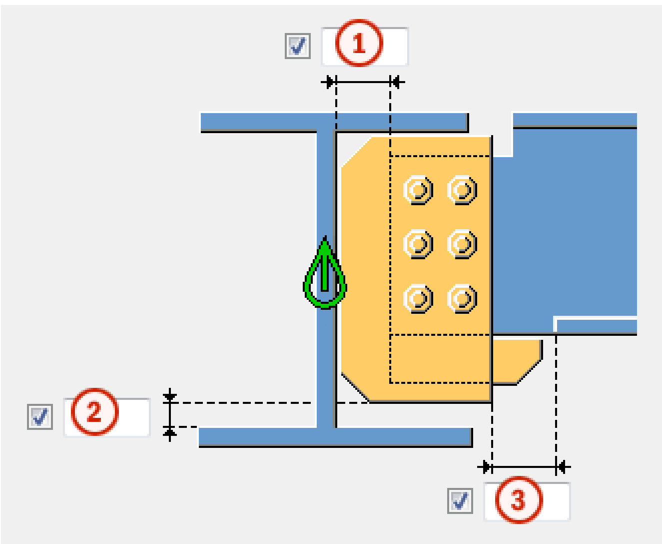
Full depth (184): Bolts tab on page 262

Full depth (184): Beam cut tab on page 267

Full depth (184): Picture tab

Use the **Picture** tab to control the position of the shear tab, and the beam flange and the web cuts in the **Full depth (184)** connection.

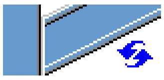
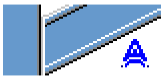
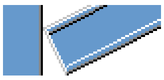
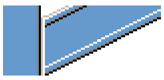
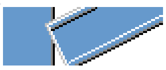
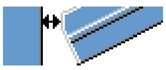
Dimensions



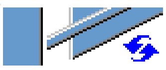
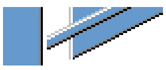
	Description	Default
1	Define the cut of the secondary part. The cut is defined from the main part web.	`20 mm`

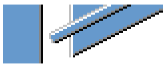
	Description	Default
2	Define the shear tab edge distance from the main part flange edge.	
3	Define the size of the strip made to the secondary part flange. The cut of the flange is defined from the shear tab edge.	The flange is automatically stripped when the shear tab crosses the flange. `10 mm`

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

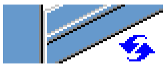
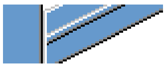
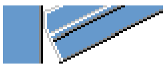
Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.
	Square Cuts the end of the secondary beam square.
	Bevel Cuts the end of the secondary beam parallel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

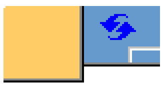
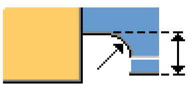
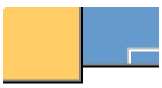
Option	Description
	Default Bevel AutoDefaults can change this option.
	Bevel Cuts the end of the web bevel when the end of the secondary beam is cut bevel.

Option	Description
	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.

Full depth (184): Plates tab

Use the **Plates** tab to control the size, position, number, and shape of the shear tab in the **Full depth (184)** connection.

Shear tab plate

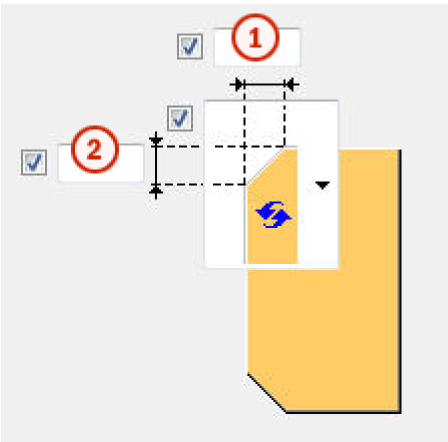
Part	Description
Tab plate	Define the shear tab plate thickness, width and height.

Part	Description
Top plate	Define the top plate thickness, width and height.
Bottom plate	Define the bottom plate thickness, width and height.

Part	Description
Doubler plate	Define the thickness of the doubler plate.

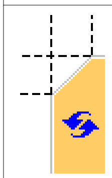
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

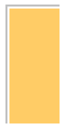
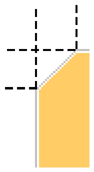
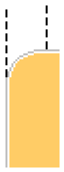
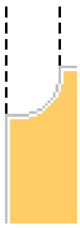
Shear tab chamfers



	Description
1	Define the horizontal dimension of the shear tab chamfer.
2	Define the vertical dimension of the shear tab chamfer.

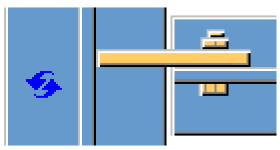
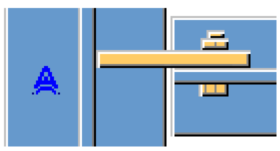
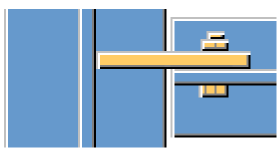
Chamfer type

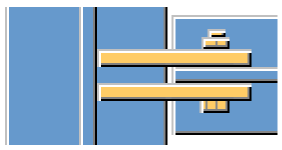
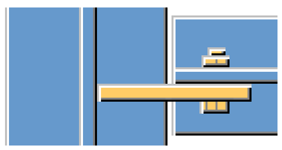
Option	Description
	Default Line chamfer AutoDefaults can change this option.

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

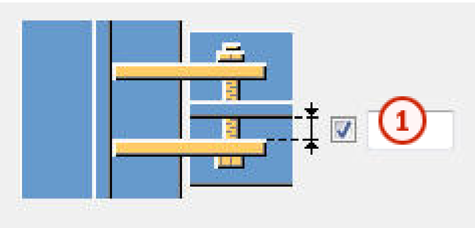
Shear tab position

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 near side or 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
1	Define the gap between the secondary part web and shear tab. This only affects connections with two shear tabs.	0

Full depth (184): Stiffeners tab

Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type in the **Full depth (184)** connection.

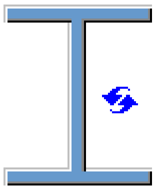
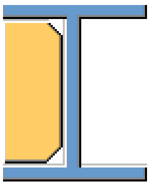
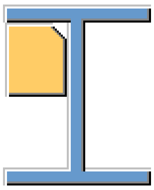
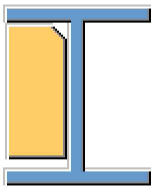
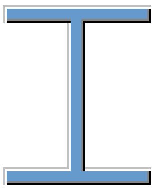
Opposite web stiffener plate dimensions

Part	Description
Opposite web stiffener	Define the opposite web stiffener plate thickness, width and height.

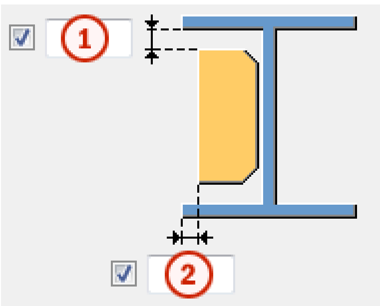
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.

Option	Description	Default
Name	Define a name that is shown in drawings and reports.	

Stiffener creation

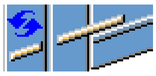
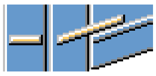
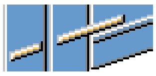
Option	Description
	Default No stiffeners are created. AutoDefaults can change this option.
	Full Creates a full stiffener of the same height as the web of the main part.
	Determined by shear tab Tekla Structures determines the size of the stiffener based on the shear tab size. Tekla Structures attempts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

Stiffener gap

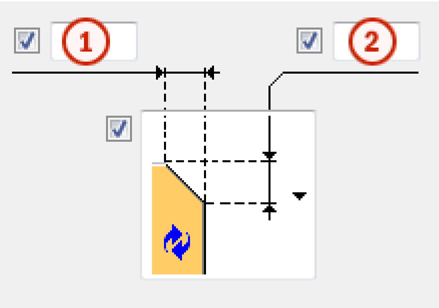


	Description
1	Define the size of the gap between the main part flange and the stiffener.
2	Define the distance from the edge of the main part flange to the edge of the stiffener.

Stiffener orientation

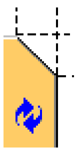
Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are perpendicular to the main part.
	Stiffeners are parallel to the secondary part.

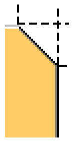
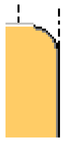
Chamfer dimensions



	Description
1	Define the horizontal dimension of the chamfer.
2	Define the 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

Full depth (184): Haunch tab

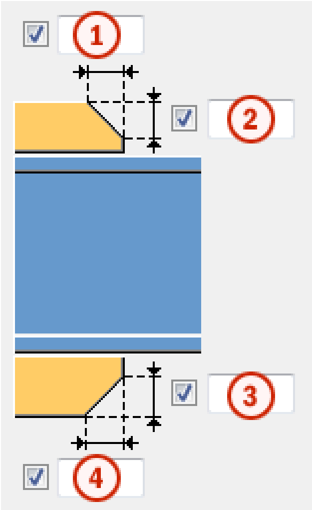
Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges in the **Full depth (184)** connection.

Haunch plates

Part	Description
Top plate	Define the top haunch plate thickness, width and height.
Bottom plate	Define the bottom haunch plate thickness, width and height.

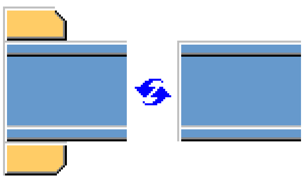
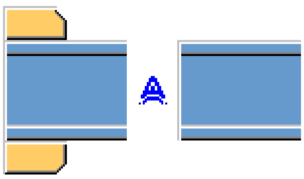
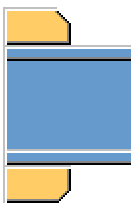
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

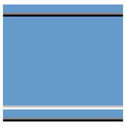
Haunch plate chamfers



	Description
1	Define the width of the top haunch plate chamfer.
2	Define the height of the top haunch plate chamfer.
3	Define the height of the bottom haunch plate chamfer.
4	Define the width of the bottom haunch plate chamfer.

Hauch 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.
	Top and bottom haunch plates are created. To create a single plate, enter 0 in the thickness (**t**) field for the plate you do not need (top or bottom plate).

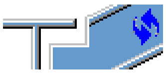
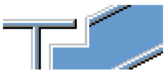
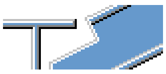
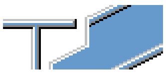
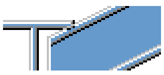
Option	Description
	Haunch plates are not created.

Full depth (184): Notch tab

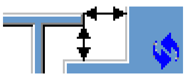
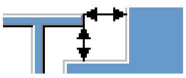
Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties in the **Full depth (184)** connection. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

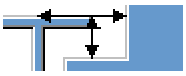
Automatic notching Automatic notching options affect both the top and the bottom flange.

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

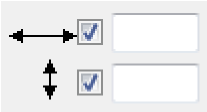
Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary 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

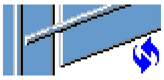
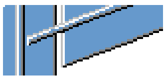
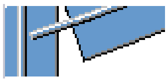
Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.

Option	Description
	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.

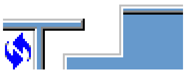
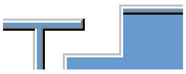
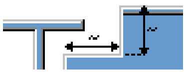


Flange cut shape

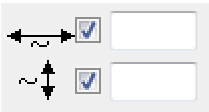
Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

Notch dimension rounding

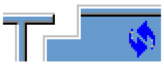
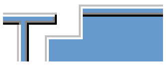
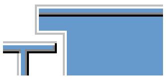
Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

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.

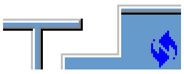
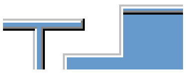
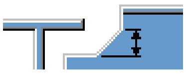
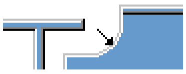
The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



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.

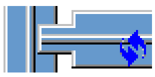
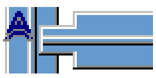
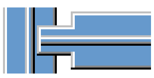
Notch chamfer

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.

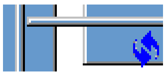
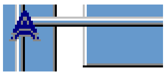
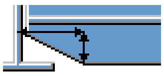
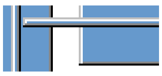
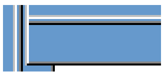
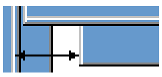
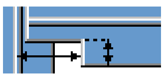
Side of flange notch The side of flange notch defines on which side of the beam the notches are created.

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.

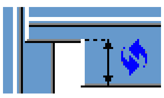
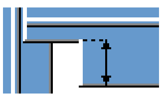
Option	Description
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

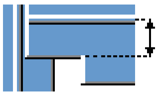
Flange notch shape

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 1 and 2.
	The flange is not cut.
	Creates cuts to the flange according to the value in the field 1 to make it flush with the web.
	Creates cuts to the flange according to the values in the fields 1 and 2.

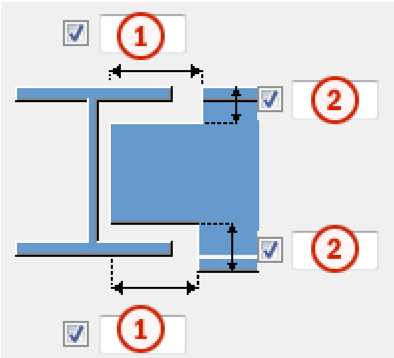
Flange notch depth

Option	Description
	Default Defines the flange notch depth. AutoDefaults can change this option.
	Defines the flange notch depth.

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

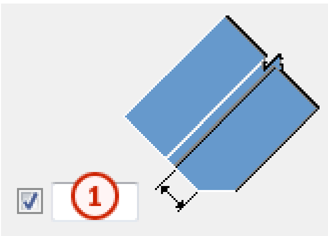
Enter the value for flange notch depth.

Cut dimensions



	Description	Default
1	Define the dimensions for the horizontal flange cuts.	10 mm
2	Define the 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



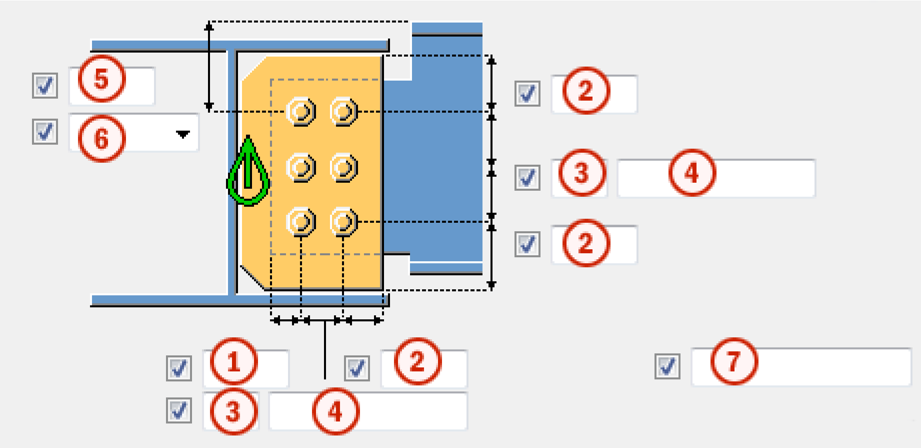
	Description
1	Define the distance between the web and the flange cut.

Full depth (184): Bolts tab

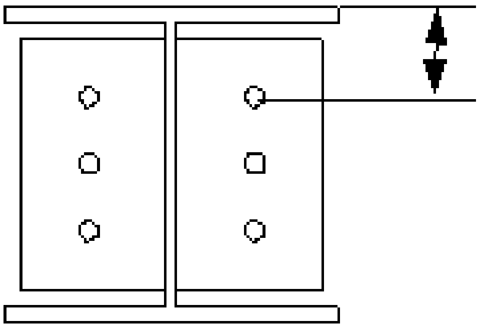
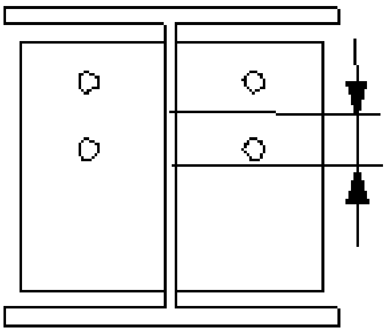
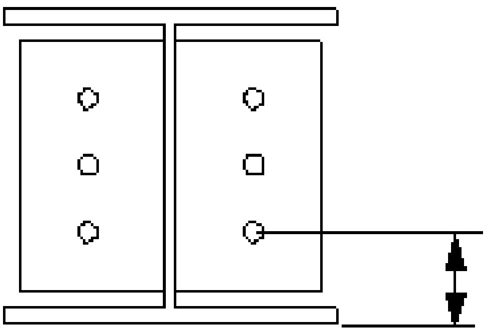
Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part in the **Full depth (184)** connection.

Bolt group dimensions

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

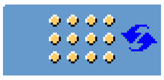
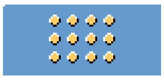
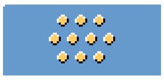
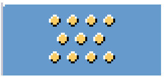
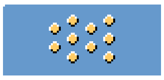
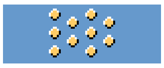


Option	Description
1	Define the dimension for horizontal bolt group position.
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.
4	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a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

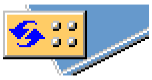
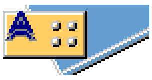
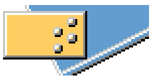
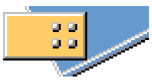
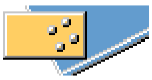
Option	Description
6	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt.  • **Middle**: From the center line of the bolts to the center line of the secondary part.  • **Below**: From the lower edge of the secondary part to the lowest bolt. 

Option	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

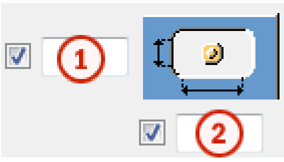
Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

Bolt basic properties

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

Option	Description	Default
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

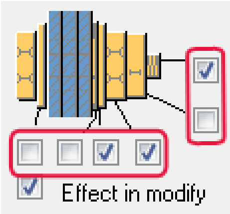
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

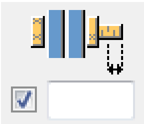
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



Full depth (184): Beam cut tab

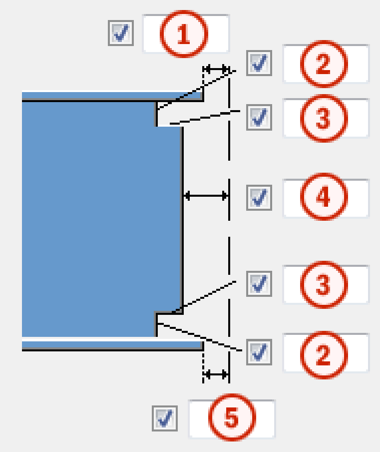
Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts in the **Full depth (184)** connection.

Weld backing bar

Part	Description
Weld backing bar	Define the weld backing bar thickness and width.

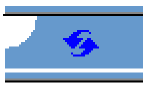
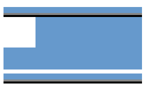
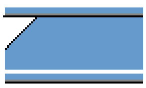
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

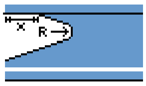
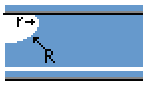
Weld access hole dimensions



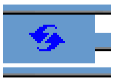
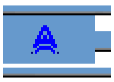
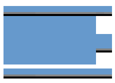
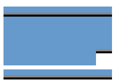
	Description
1	Define the gap between the secondary part top flange and the main part.
2	Define the vertical dimensions for the top and the bottom weld access holes.
3	Define the horizontal dimensions for the top and the bottom weld access holes.
4	Define the gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the **Picture** tab.
5	Define the 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 **Picture** tab.

Weld access holes

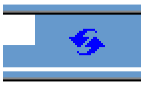
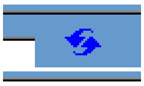
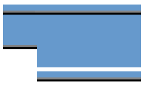
Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	

Option	Description	Default
	Round weld access hole with a radius that you can define in r ☑	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in R ☑ and Top Prep x ☑ Bottom Prep x ☑	
	Cone-shaped weld access hole with radiuses that you can define in R ☑ and r ☑ Capital **R** defines the large radius (height). Small **r** defines the small radius.	`R = 35` `r = 10`

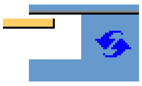
Beam end preparation

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.
	Top flange is prepared.
	Bottom flange is prepared.

Flange cut

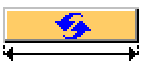
Option for top flange	Option for bottom flange	Description
		Default Flange is not cut. AutoDefaults can change this option.
		Flange is not cut.
		Flange is cut.

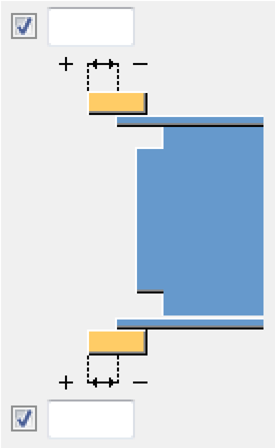
Weld backing bars

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 field 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.

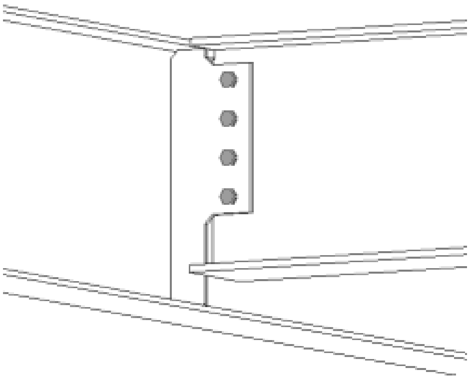
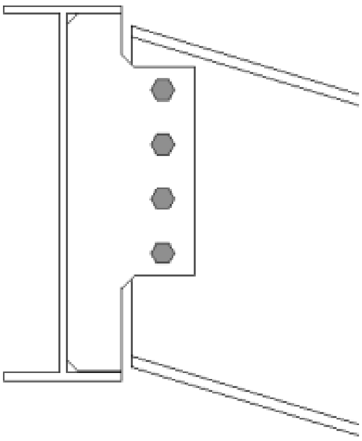
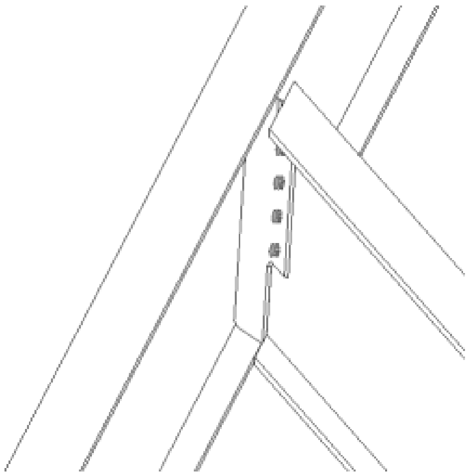
1.12 Full depth S (185)

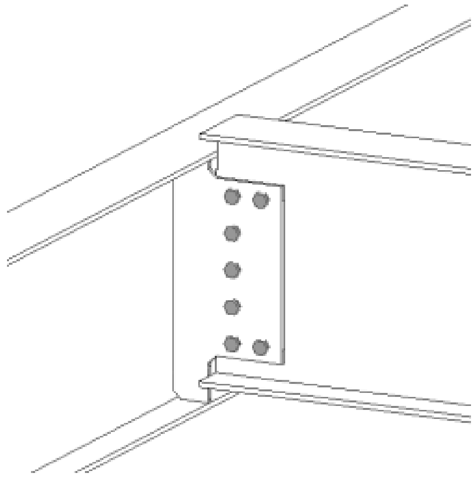
Full depth S (185) connects two beams with a full depth shear tab. The shear tab is welded to the main beam web and flanges, and bolted to the secondary beam web. The secondary beam can be leveled or sloped. A stiffener plate on the opposite side of the main beam web and the haunch plates welded to the 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

Situation	Description
	Full depth shear tab.
	Full depth shear tab. The secondary part is sloped.
	Full depth shear tab. The secondary part is sloped and skewed.

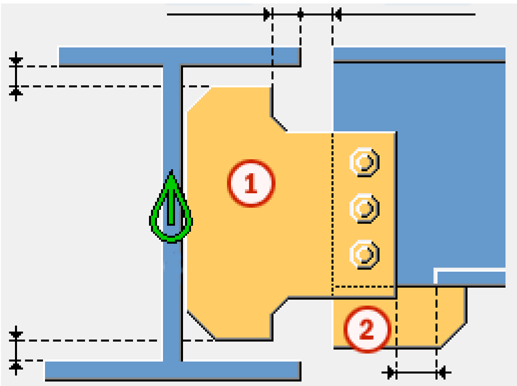
Situation	Description
	Full depth shear tab. The secondary part is offset. Some bolts have been deleted.

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

You can use the `joints.def` file to change the default values of this component.

See also

Full depth S (185): Picture tab on page 274

Full depth S (185): Plates tab on page 276

Full depth S (185): Stiffeners tab on page 281

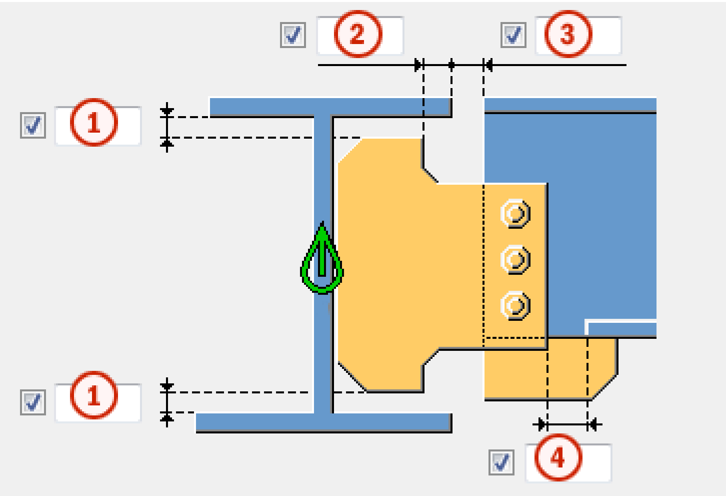
Full depth S (185): Haunch tab on page 284

[Full depth S (185): Notch tab on page 285]
[Full depth S (185): Bolts tab on page 290]
[Full depth S (185): Beam cut tab on page 294]

Full depth S (185): Picture tab

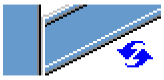
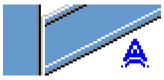
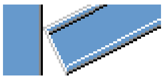
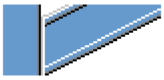
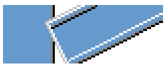
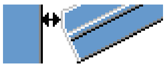
Use the **Picture** tab to control the position of the shear tab, and the beam flange and web cuts in the **Full depth S (185)** connection.

Dimensions

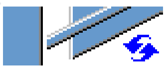
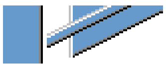
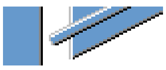


	Description	Default
1	Define the shear tab edge distance from the main part flange edge.	0
2	Define the shear tab edge distance from the main part flange edge.	0
3	Define the cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	20 mm
4	Define the 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

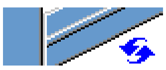
Beam end cut Define how the secondary beam end is cut. The beam is viewed from the side.

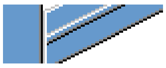
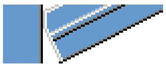
Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary beam is sloped less than 10 degrees, the beam end is cut square. Otherwise, the beam end is cut bevel.
	Square Cuts the end of the secondary beam square.
	Bevel Cuts the end of the secondary beam parallel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

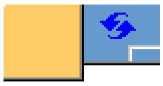
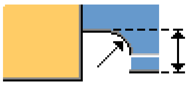
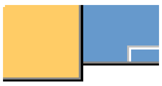
Option	Description
	Default Bevel AutoDefaults can change this option.
	Bevel Cuts the end of the web bevel when the end of the secondary beam is cut bevel.
	Square Cuts the end of the web square even if the end of the secondary beam is cut bevel.

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.

Option	Description
	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.

Full depth S (185): Plates tab

Use the **Plates** tab to control the size, position, number, and shape of the shear tab in the **Full depth S (185)** connection.

Shear tab plate

Part	Description
Tab plate	Define the shear tab plate thickness, width and height.

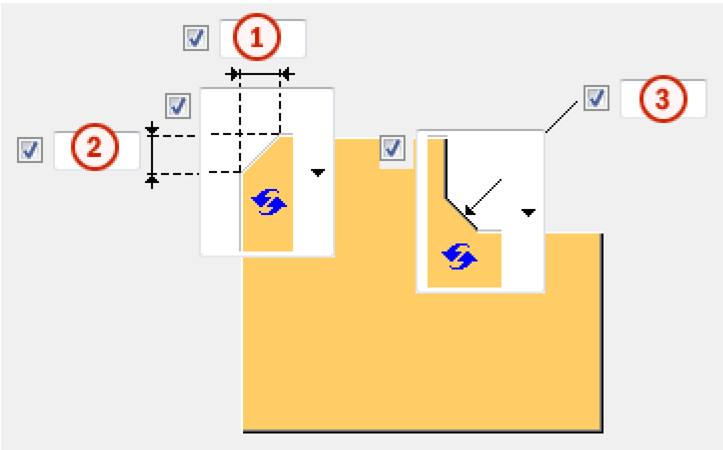
Part	Description
Top plate	Define the top plate thickness, width and height.
Bottom plate	Define the bottom plate thickness, width and height.

Part	Description
Doubler plate	Define the thickness of the doubler plate.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

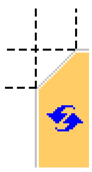
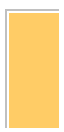
Option	Description	Default
	can enter the assembly position number.	
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

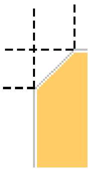
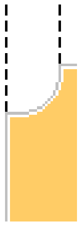
Shear tab chamfers



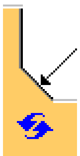
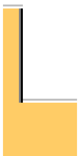
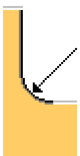
	Description
1	Define the horizontal dimension of the shear tab chamfer.
2	Define the vertical dimension of the shear tab chamfer.
3	Define the vertical and the horizontal dimension of the shear tab chamfer.

Chamfer type

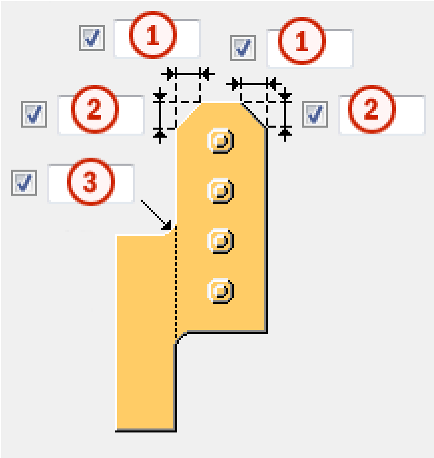
Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer

Option	Description
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

Chamfer type dimensions

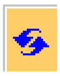
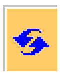
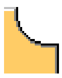
Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Concave arc chamfer

Inner shear tab chamfers

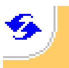


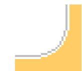
	Description
1	Define the horizontal dimension of the shear tab chamfer.
2	Define the vertical dimension of the shear tab chamfer.
3	Define the radius and the vertical dimensions of the shear tab inner chamfer.

Chamfer type

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

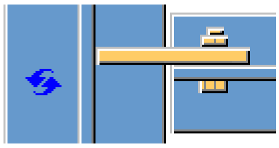
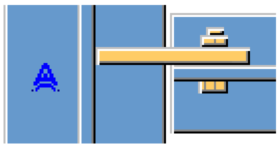
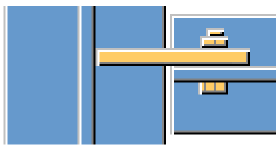
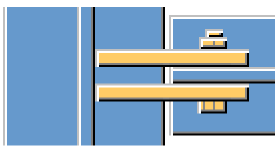
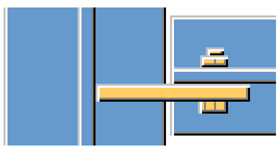
Inner chamfer type

Option	Description
	Default Concave arc chamfer AutoDefaults can change this option.

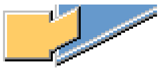
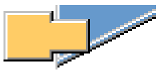
Option	Description
	No chamfer
	Line chamfer
	Concave arc chamfer
	Convex arc chamfer

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 near side or 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

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

Full depth S (185): Stiffeners tab

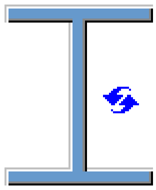
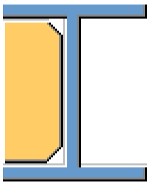
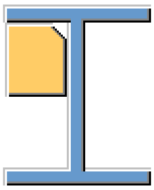
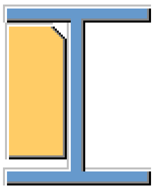
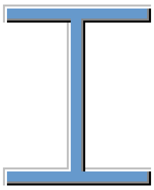
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type in the **Full depth S (185)** connection.

Opposite web stiffener plate dimensions

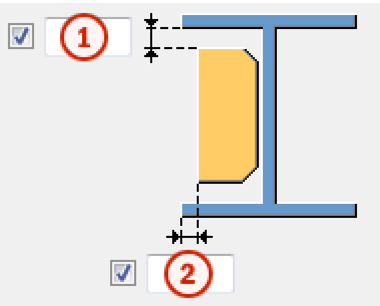
Part	Description
Opposite web stiffener	Define the opposite web stiffener plate thickness, width and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Stiffener creation

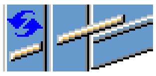
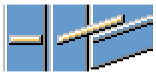
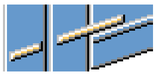
Option	Description
	Default No stiffeners are created. AutoDefaults can change this option.
	Full Creates a full stiffener of the same height as the web of the main part.
	Determined by shear tab Tekla Structures determines the size of the stiffener based on the shear tab size. Tekla Structures attempts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

Stiffener gap

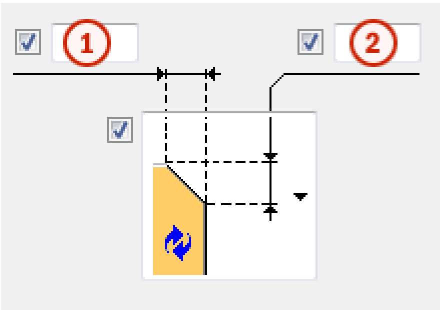


	Description
1	Define the size of the gap between the main part flange and the stiffener.
2	Define the distance from the edge of the main part flange to the edge of the stiffener.

Stiffener orientation

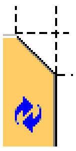
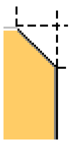
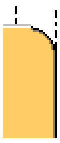
Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are perpendicular to the main part.
	Stiffeners are parallel to the secondary part.

Chamfer dimensions



	Description
1	Define the horizontal dimension of the chamfer.
2	Define the vertical dimension of the 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

Full depth S (185): Haunch tab

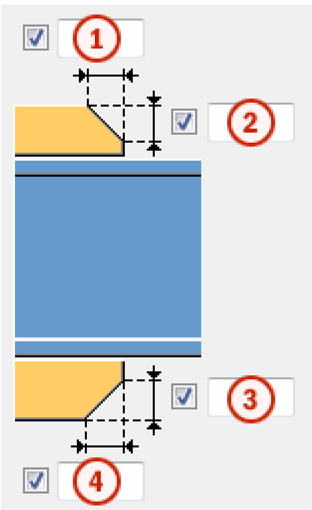
Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges in the **Full depth S (185)** connection.

Haunch plates

Part	Description
Top plate	Define the top haunch plate thickness, width and height.
Bottom plate	Define the bottom haunch plate thickness, width and height.

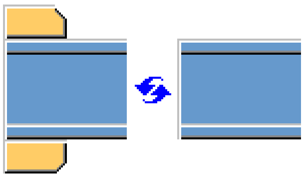
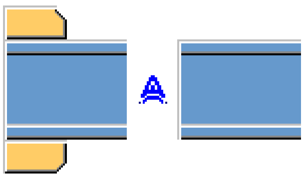
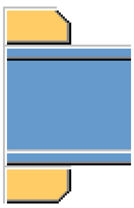
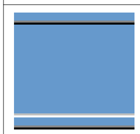
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Haunch plate chamfers



	Description
1	Define the width of the top haunch plate chamfer.
2	Define the height of the top haunch plate chamfer.
3	Define the height of the bottom haunch plate chamfer.
4	Define the width of the bottom haunch plate chamfer.

Hauch plate creation

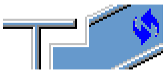
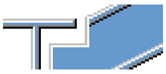
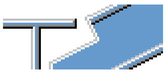
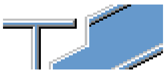
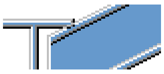
Option	Description
	Default Top and bottom haunch plates are created, if needed. AutoDefaults can change this option.
	Automatic Top or bottom haunch plate or both are created, if needed.
	Top and bottom haunch plates are created. To create a single plate, enter 0 in the thickness (**t**) field for the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

Full depth S (185): Notch tab

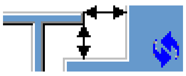
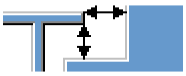
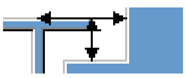
Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties in the **Full depth S (185)** connection. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

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

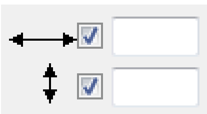
Notch shape Automatic notching is switched on when you select a notch shape.

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.

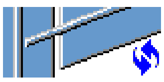
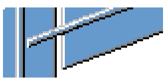
Notch size

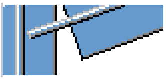
Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.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



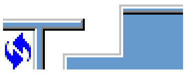
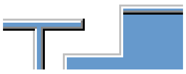
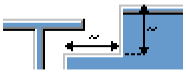
Flange cut shape

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.

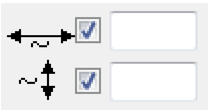
Option	Description
	Secondary beam flange is cut square.

Notch dimension rounding

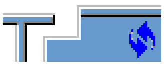
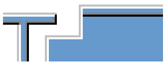
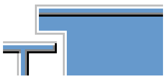
Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

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.

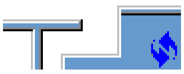
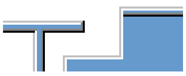
The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.

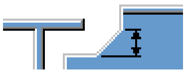
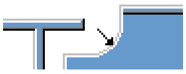


Notch position

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

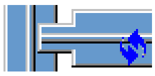
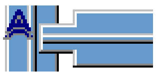
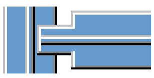
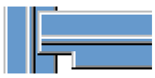
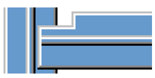
Option	Description
	Default The notch is not chamfered. AutoDefaults can change this option.
	The notch is not chamfered.

Option	Description
	Creates the notch with a line chamfer.
	The notch is chamfered according to the radius you enter.

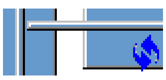
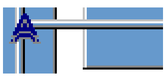
Enter a radius for the chamfer.

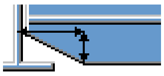
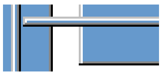
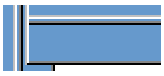
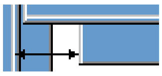
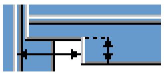
Manual notching Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.

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

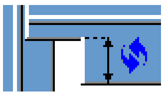
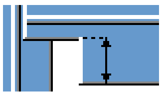
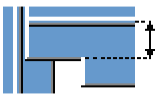
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the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

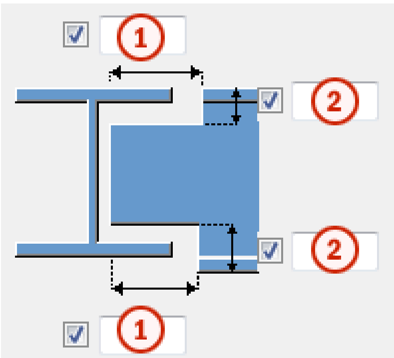
Option	Description
	thickness of the secondary flange. The cut always runs the entire width of the secondary flange.
	Creates chamfers in the flange. If you do not enter a horizontal dimension, a chamfer of 45 degrees is created.
	Creates cuts to the flange with default values unless you enter values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

Flange notch depth

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

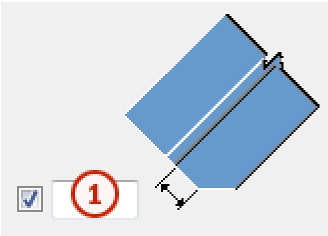
Enter the value for flange notch depth.

Cut dimensions



	Description	Default
1	Define the dimensions for the horizontal flange cuts.	10 mm
2	Define the 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



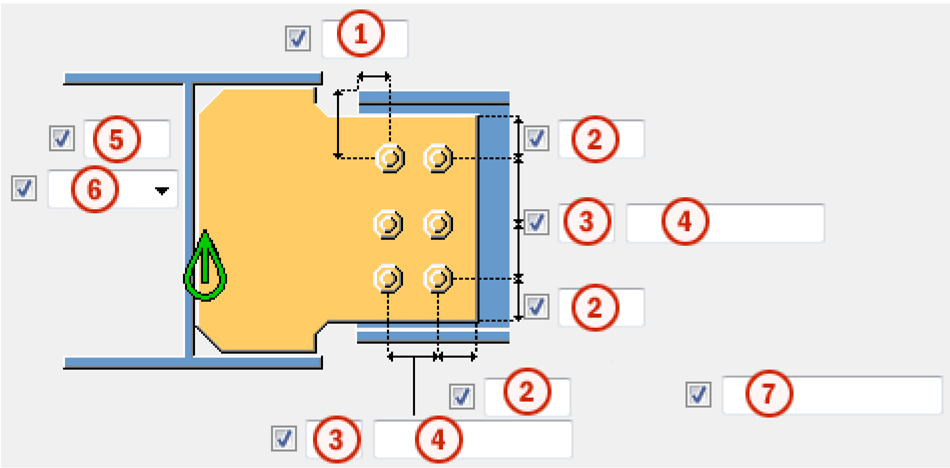
	Description
1	Define the distance between the web and the flange cut.

Full depth S (185): Bolts tab

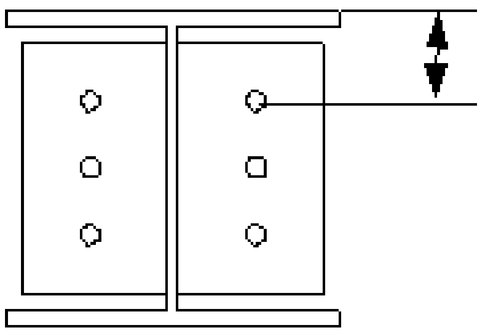
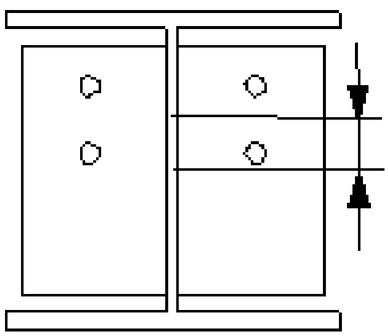
Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part in the **Full depth S (185)** connection.

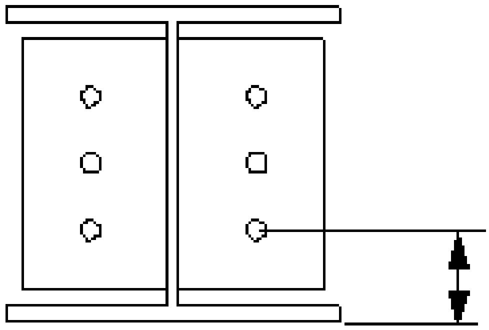
Bolt group dimensions

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

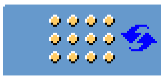
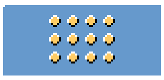
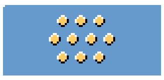
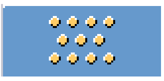
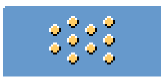
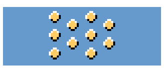


Option	Description
1	Define the dimension for horizontal bolt group position.

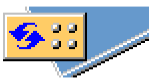
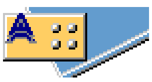
Option	Description
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.
4	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Define the dimension for vertical bolt group position.
6	Define 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. 

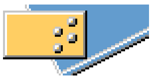
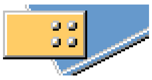
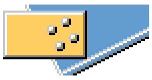
Option	Description
	• **Below**: From the lower edge of the secondary part to the lowest bolt. 
7	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

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

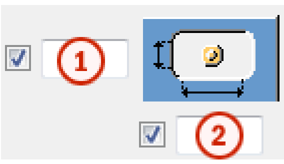
Option	Description
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

You can define slotted, oversized, or tapped holes.

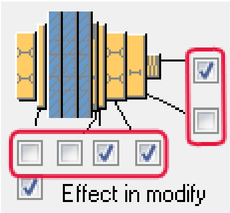


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	

Option	Description	Default
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

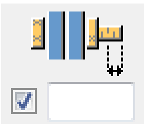
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



Full depth S (185): Beam cut tab

Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts in the **Full depth S (185)** connection.

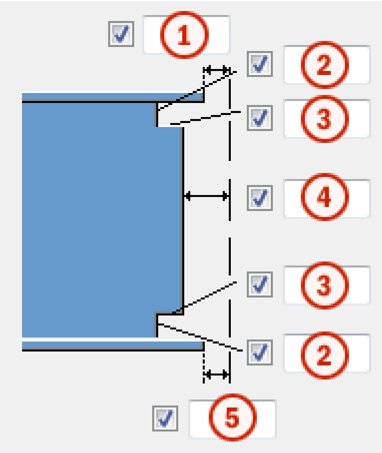
Weld backing bar

Part	Description
Weld backing bar	Define the weld backing bar thickness and width.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

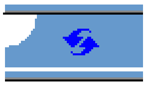
Option	Description	Default
	can enter the assembly position number.	
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

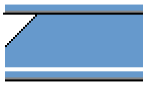
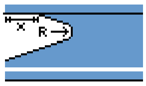
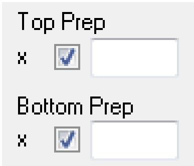
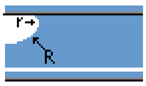
Weld access hole dimensions



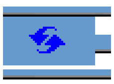
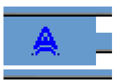
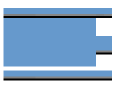
	Description
1	Define the gap between the secondary part top flange and the main part.
2	Define the vertical dimensions for the top and the bottom weld access holes.
3	Define the horizontal dimensions for the top and the bottom weld access holes.
4	Define the gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the **Picture** tab.
5	Define the 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 **Picture** tab.

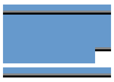
Weld access holes

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

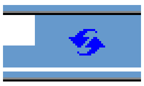
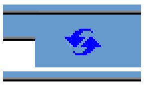
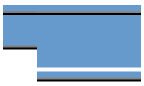
Option	Description	Default
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	
	Round weld access hole with a radius that you can define in 	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in  and 	
	Cone-shaped weld access hole with radiuses that you can define in  and  Capital **R** defines the large radius (height). Small **r** defines the small radius.	`R = 35` `r = 10`

Beam end preparation

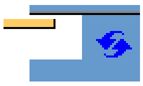
Option	Description
	Default Top and bottom flange are prepared. AutoDefaults can change this option.
	Automatic Top and bottom flange are prepared.
	Beam end is not prepared.
	Top and bottom flange are prepared.

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.

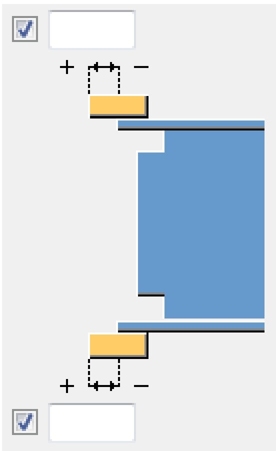
Weld backing bar length

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

Option	Description
	Default Absolute length of the backing bar AutoDefaults can change this option.

Option	Description
	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.

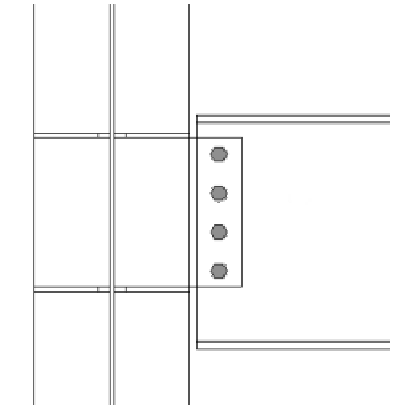
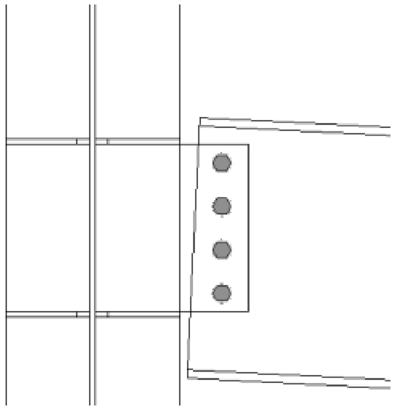
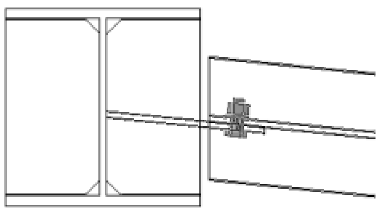
Assembly type Define the location where the weld backing bar welds are made. When you select the **Workshop** option, Tekla Structures includes the backing bars in the assembly.

1.13 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

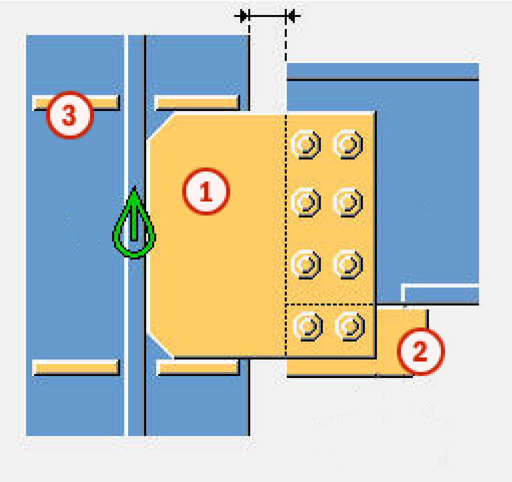
Use for	Situation	Description
		Shear tab with column stiffeners.
		Shear tab with column stiffeners. The secondary part is sloped.
		Shear tab with column stiffeners. The secondary part is skewed.

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

You can use the `joints.def` file to change the default values of this component.

See also

Column with stiffeners (186): Picture tab on page 300

Column with stiffeners (186): Plates tab on page 302

Column with stiffeners (186): Stiffeners tab on page 305

Column with stiffeners (186): Haunch tab on page 309

Column with stiffeners (186): Notch tab on page 311

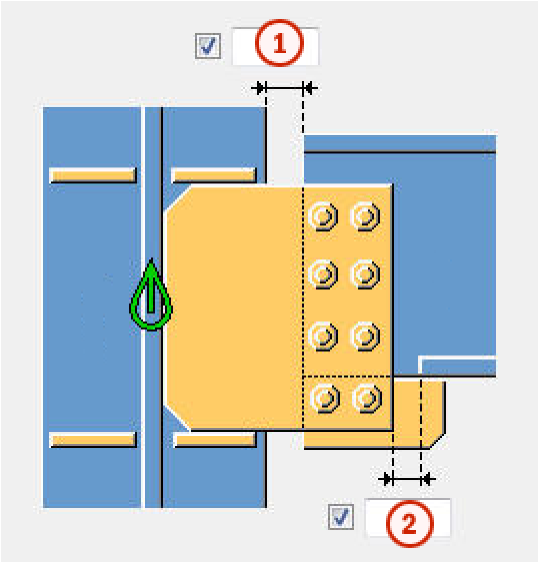
Column with stiffeners (186): Bolts tab on page 315

Column with stiffeners (186): Doubler plate tab on page 319

Column with stiffeners (186): Picture tab

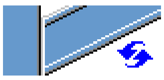
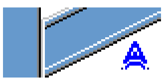
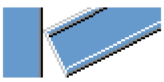
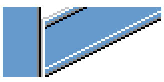
Use the **Picture** tab to control how the secondary beam end is cut in the **Column with stiffeners (186)** connection.

Dimensions

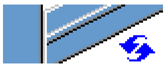
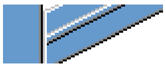
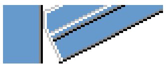


	Description	Default
1	Define the cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	20
2	Define the size of the strip made to the secondary part flange. The cut of the flange is defined from the shear tab edge.	The flange is automatically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

Column with stiffeners (186): Plates tab

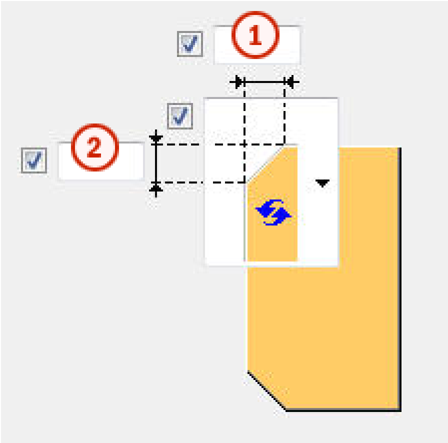
Use the **Plates** tab to control the size, position, number, orientation and shape of the shear tab in the **Column with stiffeners (186)** connection.

Shear tab plate

Part	Description
Tab plate	Define the shear tab plate thickness, width and height.

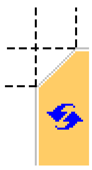
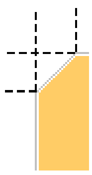
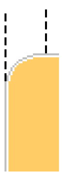
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

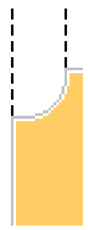
Shear tab chamfers



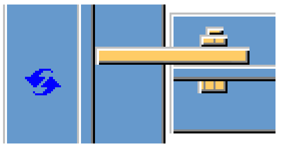
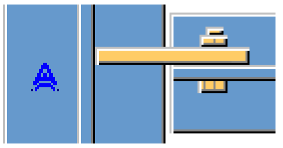
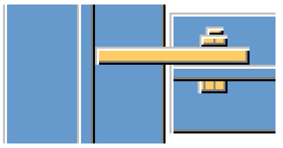
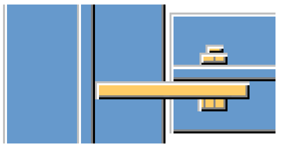
	Description
1	Define the horizontal dimension of the shear tab chamfer.
2	Define the vertical dimension of the shear tab chamfer.

Chamfer type

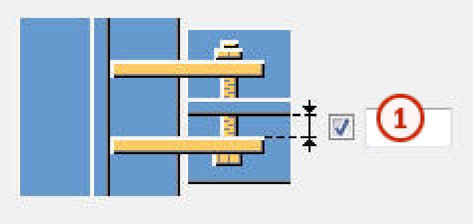
Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer

Option	Description
	Concave arc chamfer

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

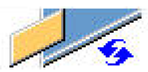
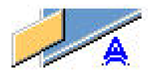
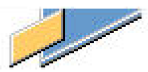
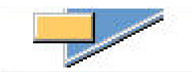
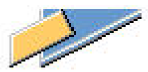
Option	Description
	Default Far side shear tab AutoDefaults can change this option.
	Automatic The component automatically selects either near side or far side shear tab. The tab is created to the side of the secondary part when the angle between the main part and the secondary part is less than 90 degrees.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

Gap between shear tabs



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

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 **Sloped** option, but the vertical edge of the shear tab connected to the secondary beam is cut perpendicular to the secondary beam flange.

Column with stiffeners (186): Stiffeners tab

Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type in the **Column with stiffeners (186)** connection.

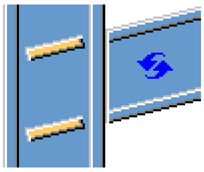
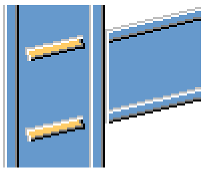
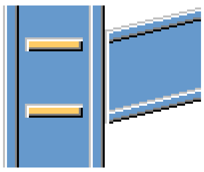
Stiffener plate dimensions

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.
Bottom NS	Define the bottom near side stiffener thickness, width and height.
Bottom FS	Define the bottom far side stiffener thickness, width and height.

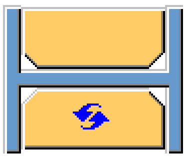
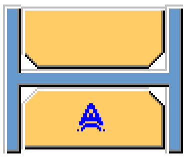
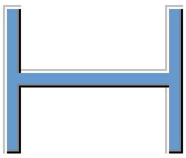
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** -->

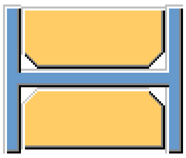
Option	Description	Default
		Options --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Stiffener orientation

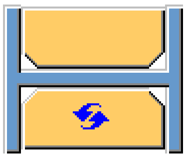
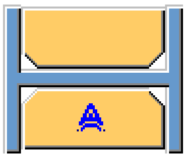
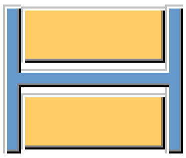
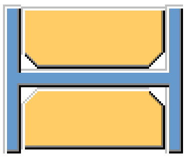
Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are parallel to the secondary part.
	Stiffeners are perpendicular to the main part.

Stiffener creation

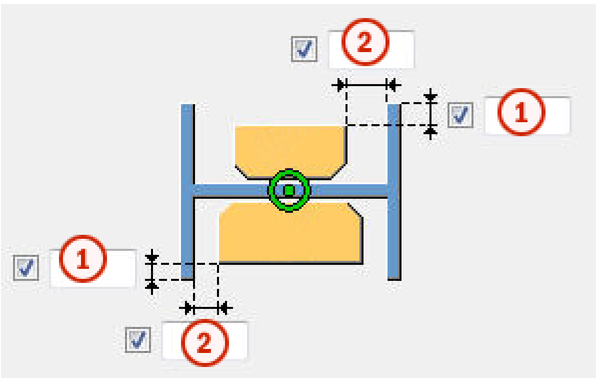
Option	Description
	Default Stiffeners are created. AutoDefaults can change this option.
	Automatic Stiffeners are created when necessary.
	No stiffeners are created.

Option	Description
	Stiffeners are created.

Stiffener shape

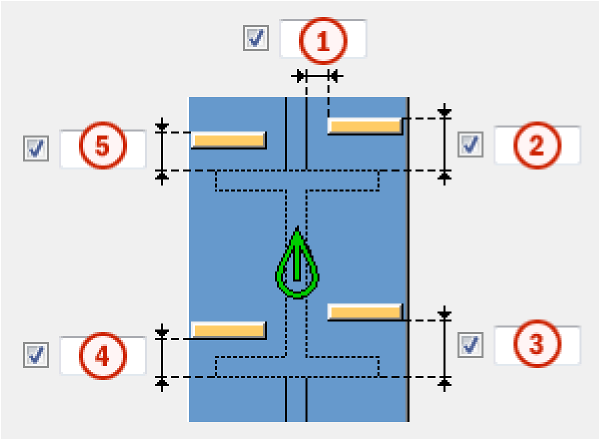
Option	Description
	Default Line chamfered stiffener plates AutoDefaults can change this option.
	Automatic Line chamfered stiffener plates
	Square stiffener plates Stiffener plates with a gap for the main part web rounding
	Line chamfered stiffener plates

Stiffener gap



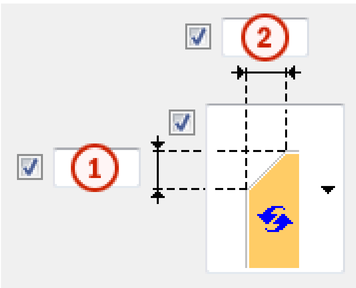
	Description
1	Define the distance from the edge of the flange to the edge of the stiffener.
2	Define the size of the gap between the flanges and the stiffener.

Stiffener positions



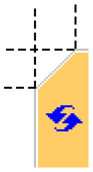
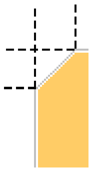
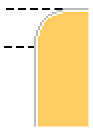
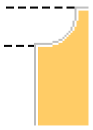
	Description
1	Define the size of the gap between the stiffener and the beam web edge.
2	Define the size of the gap between the top near side stiffener and the beam flange edge.
3	Define the size of the gap between the bottom near side stiffener and the beam flange edge.
4	Define the size of the gap between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

Chamfer dimensions



	Description	Default
1	Define the vertical dimension of the chamfer.	`10 mm`
2	Define the 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

Column with stiffeners (186): Haunch tab

Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges in the **Column with stiffeners (186)** connection.

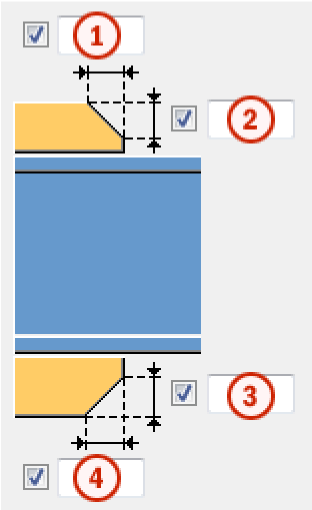
Haunch plates

Part	Description
Top plate	Define the top haunch plate thickness, width and height.
Bottom plate	Define the bottom haunch plate thickness, width and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** -->

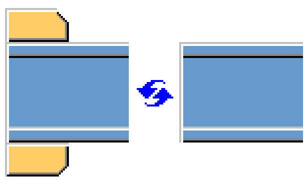
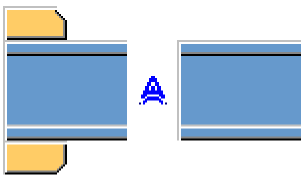
Option	Description	Default
		Options... --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

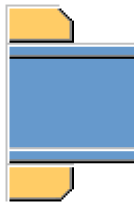
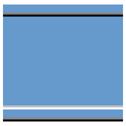
Haunch plate chamfers



	Description
1	Define the width of the top haunch plate chamfer.
2	Define the height of the top haunch plate chamfer.
3	Define the height of the bottom haunch plate chamfer.
4	Define the width of the bottom haunch plate chamfer.

Hauch 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
	Top and bottom haunch plates are created. To create a single plate, enter 0 in the thickness (**t**) field for the plate you do not need (top or bottom plate).
	Haunch plates are not created.

Column with stiffeners (186): Notch tab

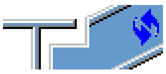
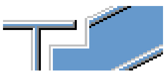
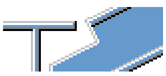
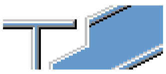
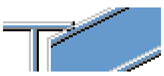
Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties in the **Column with stiffeners (186)** connection. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

Automatic notching

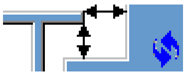
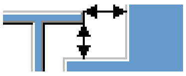
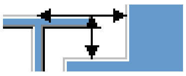
Automatic notching options affect both the top and the bottom flange.

Notch shape

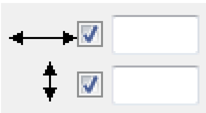
Automatic notching is switched on when you select a notch shape.

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.

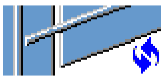
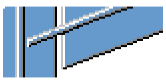
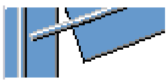
Notch size

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.

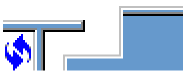
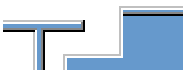
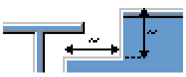


Flange cut shape

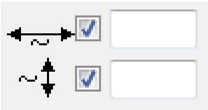
Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

Notch dimension rounding

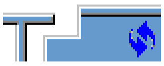
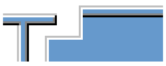
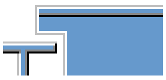
Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

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.

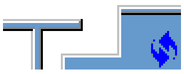
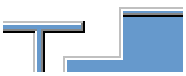
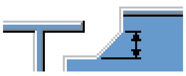
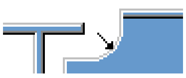
The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



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.

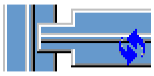
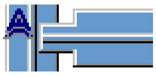
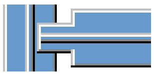
Notch chamfer

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.

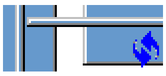
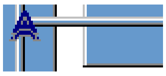
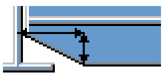
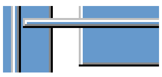
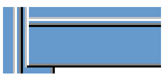
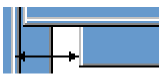
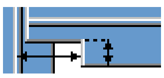
Manual notching Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.

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

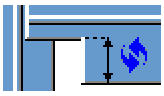
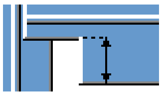
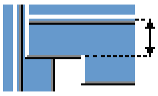
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the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

Flange notch shape

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

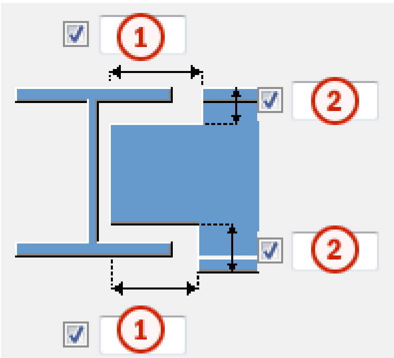
Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. 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 1 and 2.
	The flange is not cut.
	Creates cuts to the flange according to the value in the field 1 to make it flush with the web.
	Creates cuts to the flange according to the values in the fields 1 and 2.

Flange notch depth

Option	Description
	Default Defines the flange notch depth. AutoDefaults can change this option.
	Defines the flange notch depth.
	Defines the 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



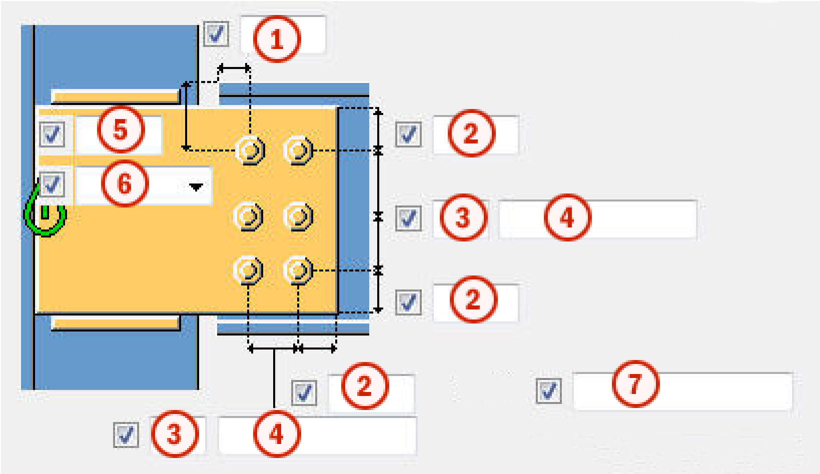
	Description	Default
1	Define the dimensions for the horizontal flange cuts.	`10 mm`
2	Define the dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest `5 mm`.

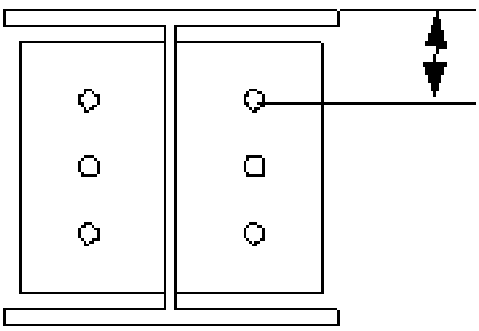
Column with stiffeners (186): Bolts tab

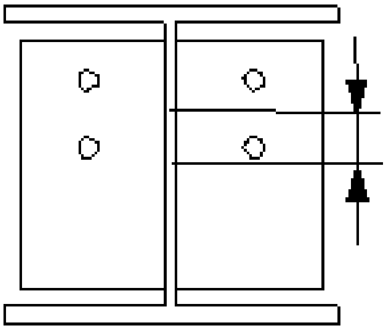
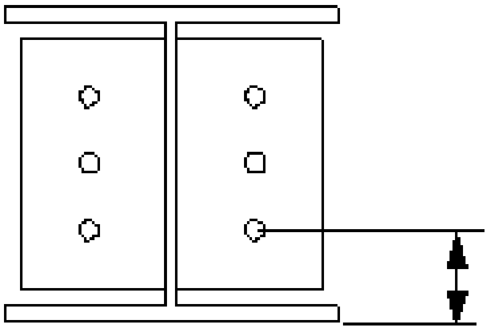
Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part in the **Column with stiffeners (186)** connection.

Bolt group dimensions

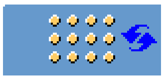
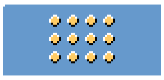
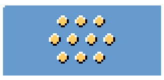
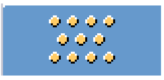
Bolt group dimensions affect the size and shape of the shear tab.

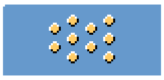
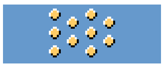


Option	Description
1	Define the dimension for horizontal bolt group position.
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.
4	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Define the dimension for vertical bolt group position.
6	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt. 

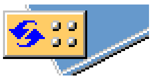
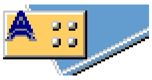
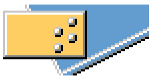
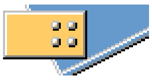
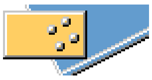
Option	Description
	• **Middle**: From the center line of the bolts to the center line of the secondary part.  • **Below**: From the lower edge of the secondary part to the lowest bolt. 
	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate 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

Option	Description
	Staggered type 3
	Staggered type 4

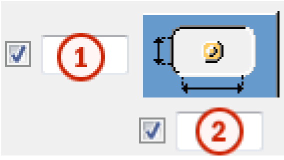
Bolt group orientation

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
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

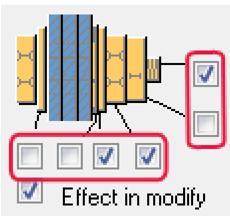
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

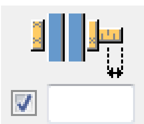
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



Column with stiffeners (186): Doubler plate tab

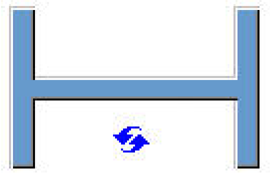
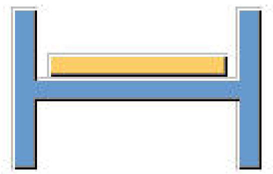
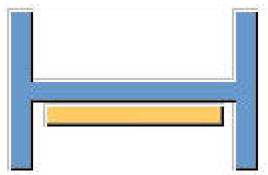
Use the **Doubler plate** tab to create doubler plates to strengthen the web of the main part in the **Column with stiffeners (186)** connection.

Web plate

Part	Description
Web plate	Define the web plate thickness and height.

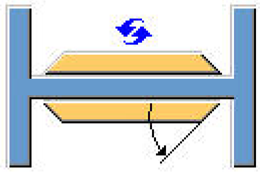
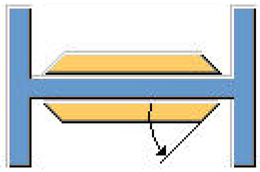
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Doubler plates

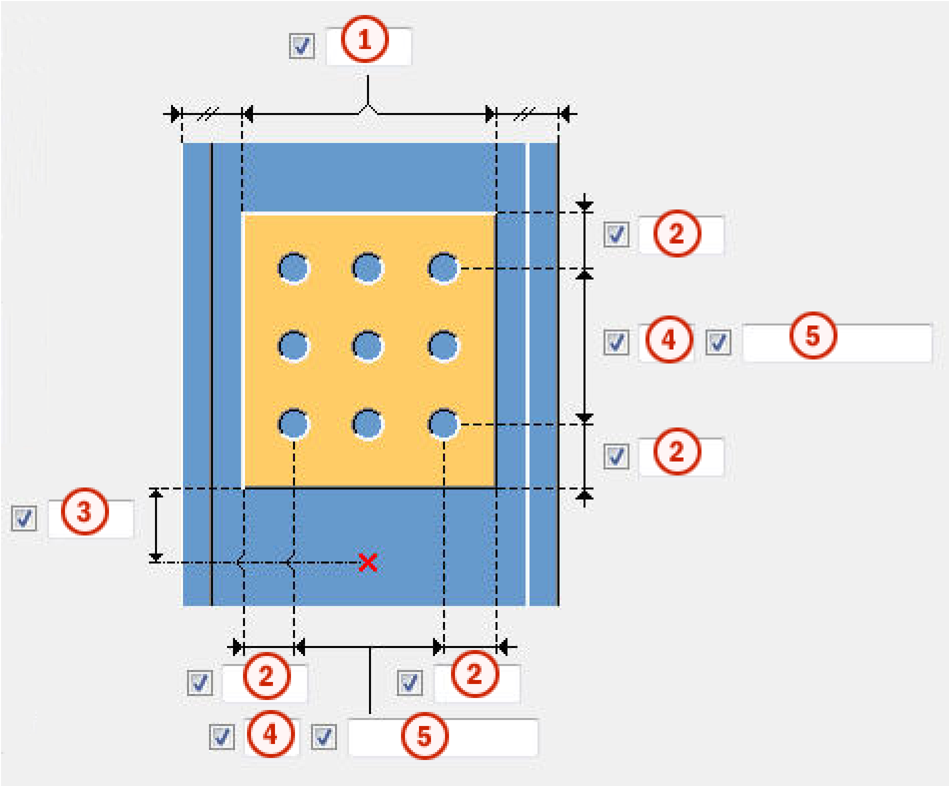
Option	Description
	Default Doubler plates are not created. AutoDefaults can change this option.
	Doubler plates are not created.
	Doubler plate is created on the far side.
	Doubler plate is created on the near side.

Option	Description
	Doubler plates are created on both sides.

Doubler plate edge shape

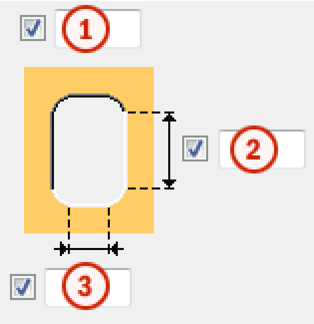
Option	Description
	Default Bevel doubler plates AutoDefauls can change this option.
	Bevel doubler plates Enter the angle in 
	Square doubler plates

General settings



	Description
1	Define the edge distance from the column flange.
2	Define the doubler plate edge distance. Edge distance is the distance from the center of a hole to the edge of the part.
3	Define the edge distance of the doubler plate in relation to the bottom of the secondary part.
4	Define the number of holes.
5	Define the 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	Define the hole diameter.
2	Define the slot length.
3	Define the slot width.

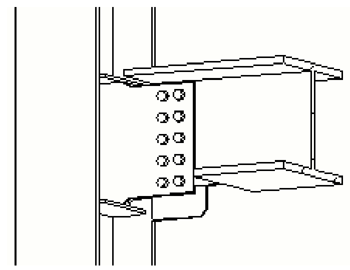
1.14 Column with stiffeners S (187)

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.

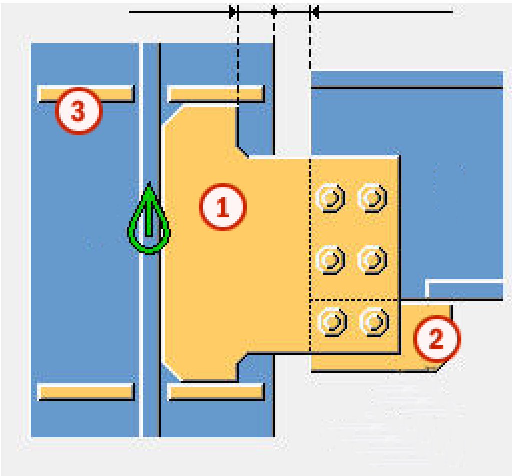
Selection order

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

You can use the `joints.def` file to change the default values of this component.

See also

Column with stiffeners S (187): Picture tab on page 324

Column with stiffeners S (187): Plates tab on page 326

Column with stiffeners S (187): Stiffeners tab on page 330

Column with stiffeners S (187): Haunch tab on page 334

Column with stiffeners S (187): Notch tab on page 336

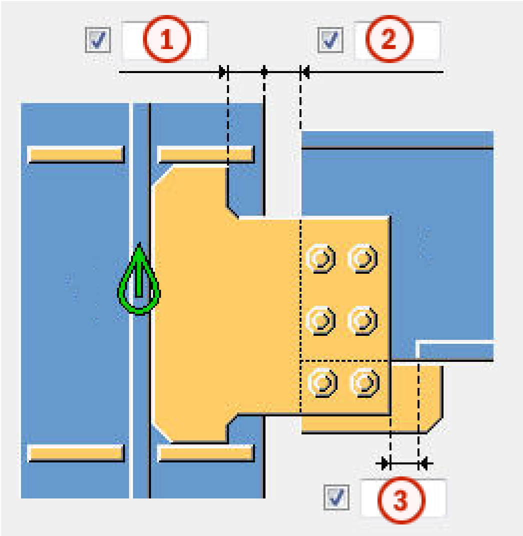
Column with stiffeners S (187): Bolts tab on page 340

Column with stiffeners S (187): Doubler plate tab on page 344

Column with stiffeners S (187): Picture tab

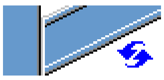
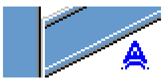
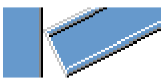
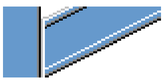
Use the **Picture** tab to control the position of the shear tab corner and to define how the beam end is cut in the **Column with stiffeners S (187)** connection.

Dimensions

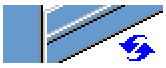
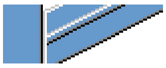
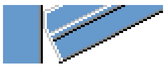


	Description	Default
1	Define the shear tab edge distance from the main part flange edge.	0
2	Define the cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	20 mm
3	Define the size of the strip made to the secondary part flange. The cut of 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.

Column with stiffeners S (187): Plates tab

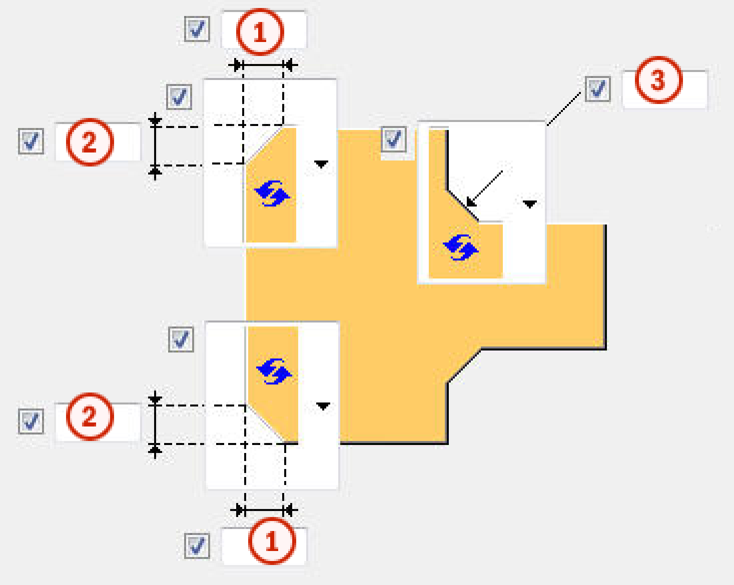
Use the **Plates** tab to control the size, position, number, orientation and shape of the shear tab in the **Column with stiffeners S (187)** connection.

Shear tab plate

Part	Description
Tab plate	Define the shear tab plate thickness, width and height.

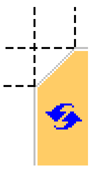
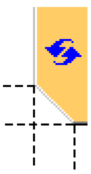
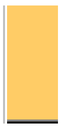
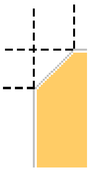
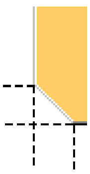
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

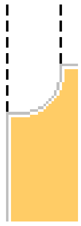
Shear tab chamfers



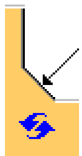
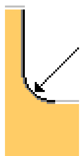
	Description
1	Define the horizontal dimension of the shear tab chamfer.
2	Define the vertical dimension of the shear tab chamfer.
3	Define the vertical and the horizontal dimension of the shear tab chamfer.

Chamfer type

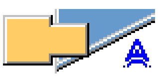
Option	Option	Description
		Default Line chamfer AutoDefaults can change this option.
		No chamfer
		Line chamfer

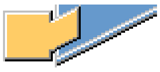
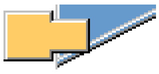
Option	Option	Description
		Convex arc chamfer
		Concave arc chamfer

Chamfer type dimensions

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

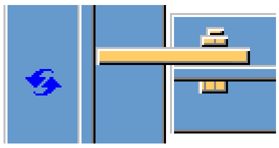
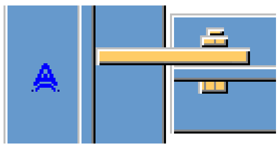
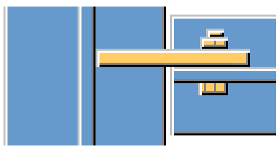
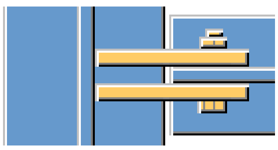
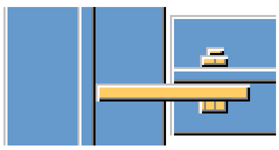
Shear tab orientation

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

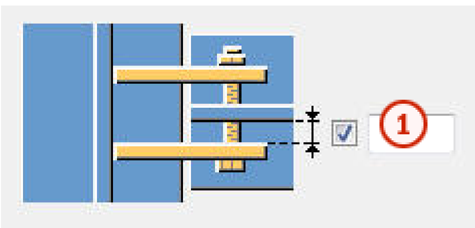
Option	Description
	Sloped The shear tab is sloped in the direction of the secondary beam. Both vertical edges of the shear tab are cut parallel to the end of the secondary beam.
	Square

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 near side or 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	Define the gap between the secondary part web and shear tab. This only affects connections with two shear tabs.	0

Column with stiffeners S (187): Stiffeners tab

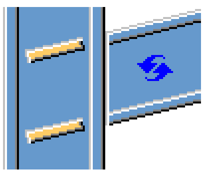
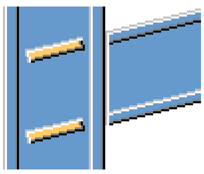
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type in the **Column with stiffeners S (187)** connection.

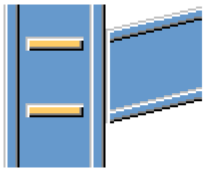
Stiffener plate dimensions

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.
Bottom NS	Define the bottom near side stiffener thickness, width and height.
Bottom FS	Define the bottom far side stiffener thickness, width and height.

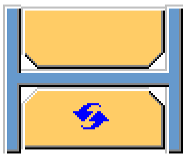
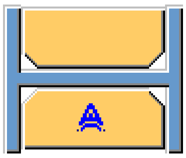
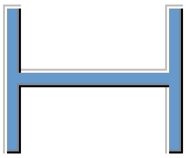
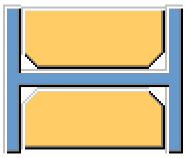
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Stiffener orientation

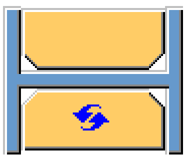
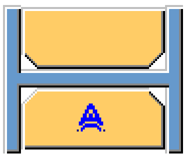
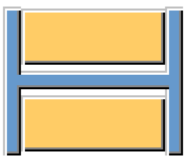
Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are parallel to the secondary part.

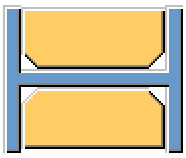
Option	Description
	Stiffeners are perpendicular to the main part.

Stiffener creation

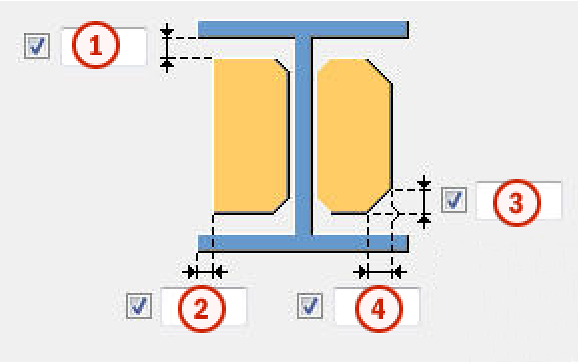
Option	Description
	Default Stiffeners are created. AutoDefaults can change this option.
	Automatic Stiffeners are created when necessary.
	No stiffeners are created.
	Stiffeners are created.

Stiffener shape

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

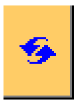
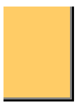
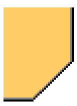
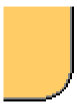
Option	Description
	Line chamfered stiffener plates

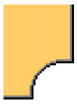
Stiffener gap and chamfer size



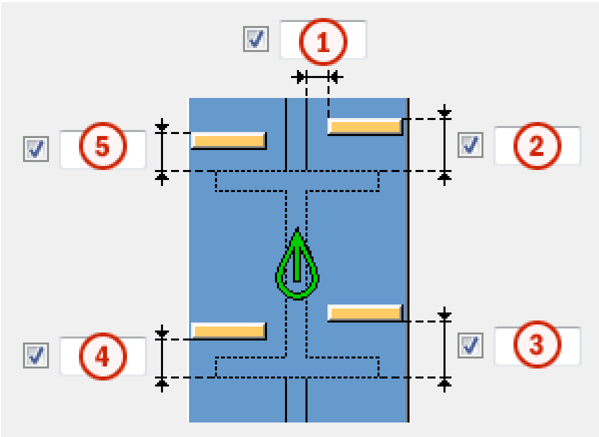
	Description
1	Define the size of the gap between the flanges and the stiffener.
2	Define the distance from the edge of the flange to the edge of the stiffener.
3	Define the vertical dimension of the stiffener line chamfer.
4	Define the horizontal dimension of the stiffener chamfer or radius of arc type chamfer.

Define the chamfer shape.

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

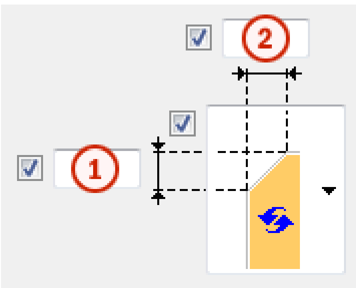
Option	Description
	Concave arc chamfer

Stiffener positions



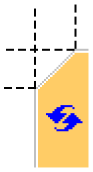
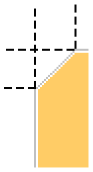
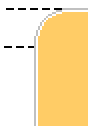
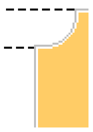
	Description
1	Define the size of the gap between the stiffener and the beam web edge.
2	Define the size of the gap between the top near side stiffener and the beam flange edge.
3	Define the size of the gap between the bottom near side stiffener and the beam flange edge.
4	Define the size of the gap between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

Chamfer dimensions



	Description	Default
1	Define the vertical dimension of the chamfer.	10 mm
2	Define the 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

Column with stiffeners S (187): Haunch tab

Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges in the **Column with stiffeners S (187)** connection.

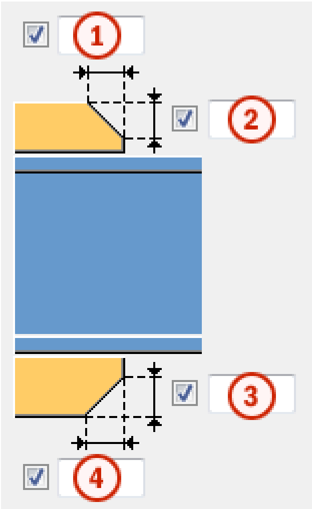
Haunch plates

Part	Description
Top plate	Define the top haunch plate thickness, width and height.
Bottom plate	Define the bottom haunch plate thickness, width and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** -->

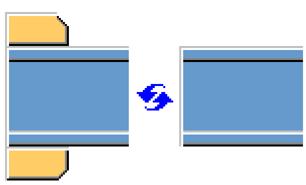
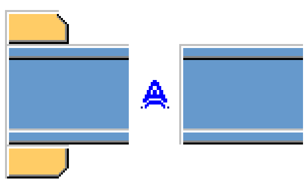
Option	Description	Default
		Options... --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

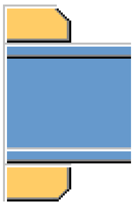
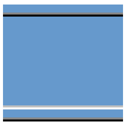
Haunch plate chamfers



	Description
1	Define the width of the top haunch plate chamfer.
2	Define the height of the top haunch plate chamfer.
3	Define the height of the bottom haunch plate chamfer.
4	Define the width of the bottom haunch plate chamfer.

Hauch 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
	Top and bottom haunch plates are created. To create a single plate, enter 0 in the thickness (**t**) field for the plate you do not need (top or bottom plate).
	Haunch plates are not created.

Column with stiffeners S (187): Notch tab

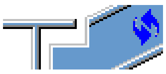
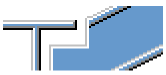
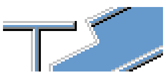
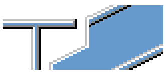
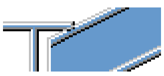
Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties in the **Column with stiffeners S (187)** connection. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

Automatic notching

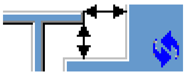
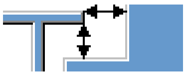
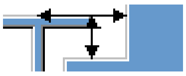
Automatic notching options affect both the top and the bottom flange.

Notch shape

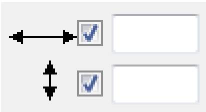
Automatic notching is switched on when you select a notch shape.

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.

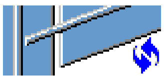
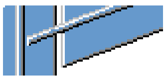
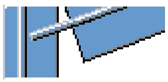
Notch size

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.

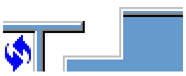
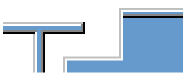
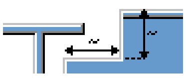


Flange cut shape

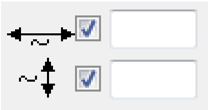
Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

Notch dimension rounding

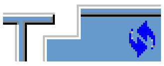
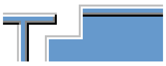
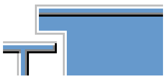
Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

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.

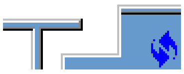
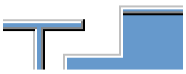
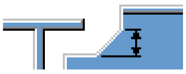
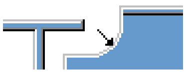
The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



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.

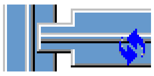
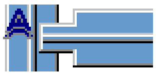
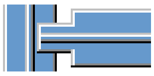
Enter a radius for the chamfer.

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.

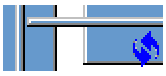
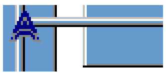
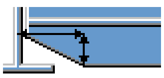
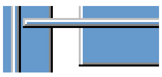
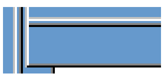
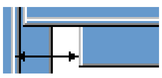
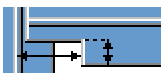
Side of flange notch

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

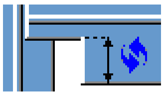
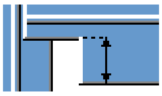
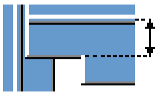
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the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

Flange notch shape

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

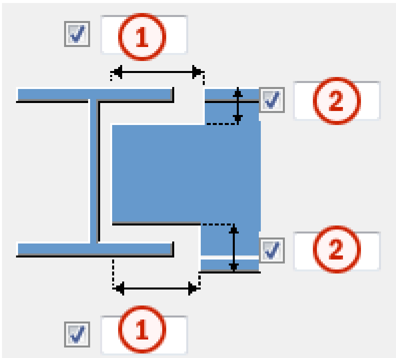
Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. 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 1 and 2.
	The flange is not cut.
	Creates cuts to the flange according to the value in the field 1 to make it flush with the web.
	Creates cuts to the flange according to the values in the fields 1 and 2.

Flange notch depth

Option	Description
	Default Defines the flange notch depth. AutoDefaults can change this option.
	Defines the flange notch depth.
	Defines the 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



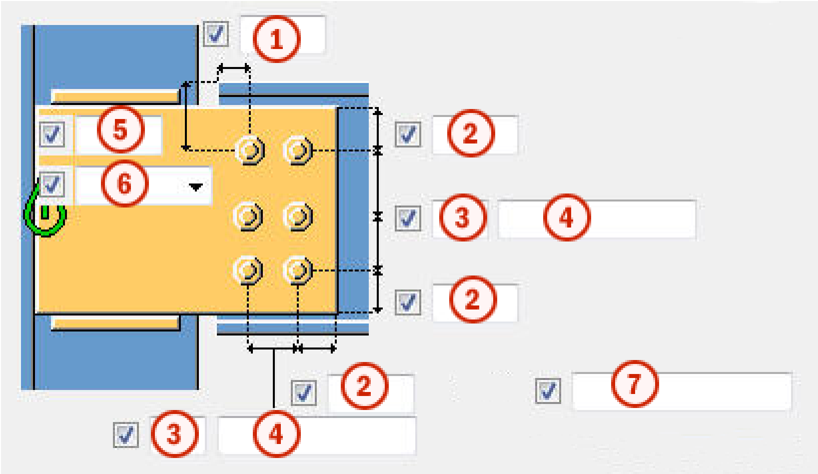
	Description	Default
1	Define the dimensions for the horizontal flange cuts.	10 mm
2	Define the dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

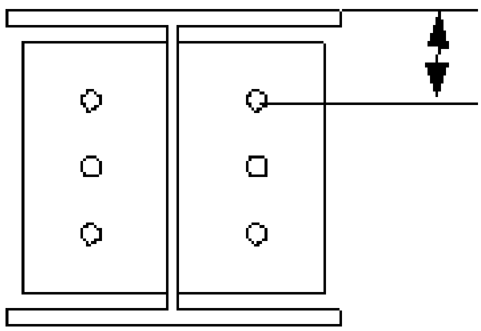
Column with stiffeners S (187): Bolts tab

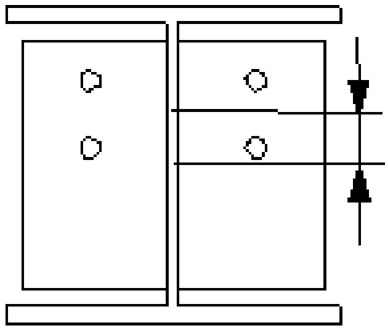
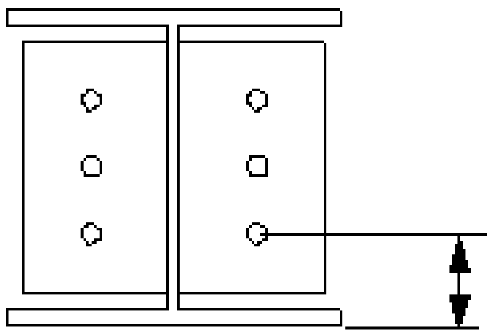
Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part in the **Column with stiffeners S (187)** connection.

Bolt group dimensions

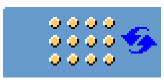
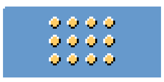
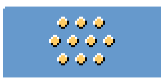
Bolt group dimensions affect the size and shape of the shear tab.

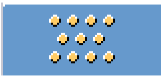
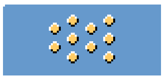
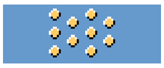


Option	Description
1	Define the dimension for horizontal bolt group position.
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.
4	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
5	Define the dimension for vertical bolt group position.
6	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt. 

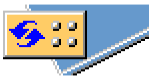
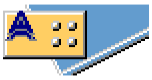
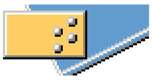
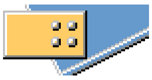
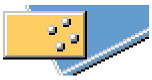
Option	Description
	• **Middle**: From the center line of the bolts to the center line of the secondary part.  • **Below**: From the lower edge of the secondary part to the lowest bolt. 
7	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate 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

Option	Description
	Staggered type 2
	Staggered type 3
	Staggered type 4

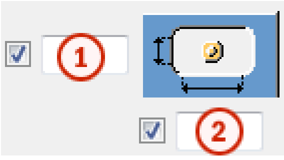
Bolt group orientation

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
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

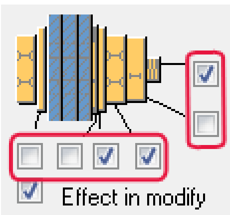
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

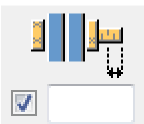
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



Column with stiffeners S (187): Doubler plate tab

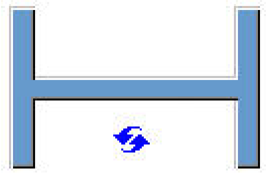
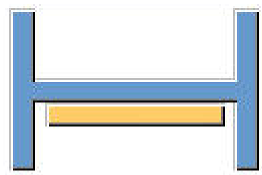
Use the **Doubler plate** tab to create doubler plates to strengthen the web of the main part in the **Column with stiffeners S (187)** connection.

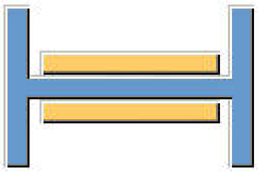
Web plate

Part	Description
Web plate	Define the web plate thickness and height.

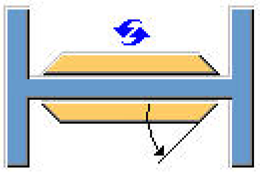
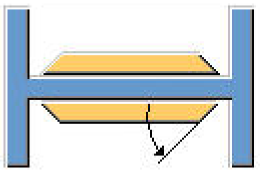
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Doubler plates

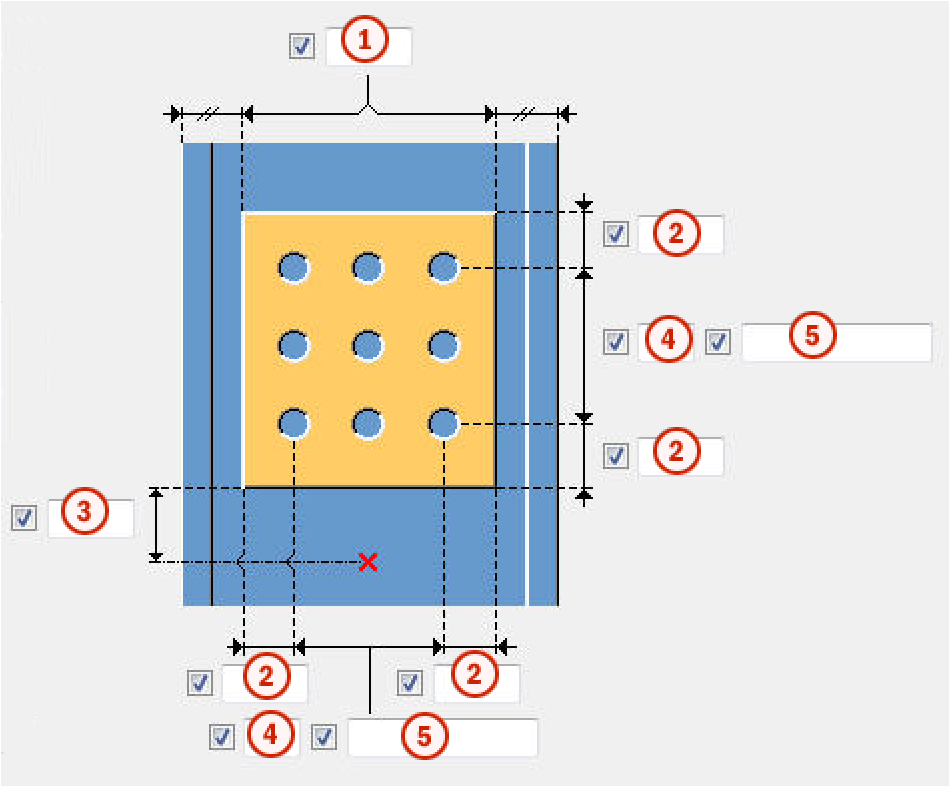
Option	Description
	Default Doubler plates are not created. AutoDefaults can change this option.
	Doubler plates are not created.
	Doubler plate is created on the far side.
	Doubler plate is created on the near side.

Option	Description
	Doubler plates are created on both sides.

Doubler plate edge shape

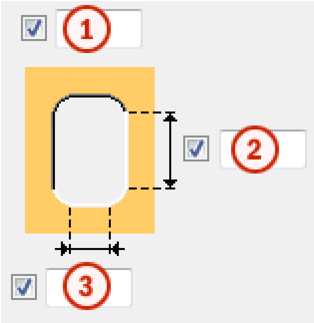
Option	Description
	Default Bevel doubler plates AutoDefauls can change this option.
	Bevel doubler plates Enter the angle in 
	Square doubler plates

General settings



	Description
1	Define the edge distance from the column flange.
2	Define the doubler plate edge distance. Edge distance is the distance from the center of a hole to the edge of the part.
3	Define the edge distance of the doubler plate in relation to the bottom of the secondary part.
4	Define the number of holes.
5	Define the 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	Define the hole diameter.
2	Define the slot length.
3	Define the slot width.

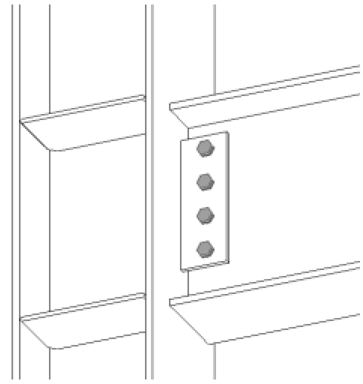
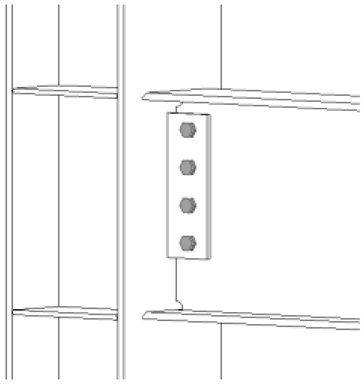
1.15 Column with stiffeners (188)

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

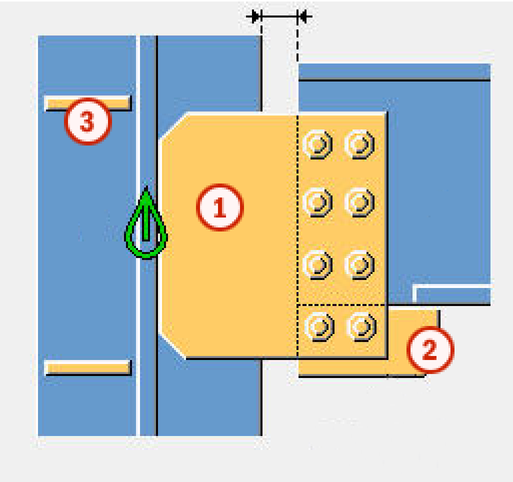
Situation	Description
	Shear tab to column flange with column stiffeners.
	Shear tab to column flange with column stiffeners. Weld preparation and weld access holes for moment connection.

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

	Part
3	Stiffener

You can use the joints.def file to change the default values of this component.

See also

Column with stiffeners (188): Picture tab on page 350

Column with stiffeners (188): Plates tab on page 352

Column with stiffeners (188): Stiffeners tab on page 354

Column with stiffeners (188): Haunch tab on page 358

Column with stiffeners (188): Notch tab on page 360

Column with stiffeners (188): Bolts tab on page 365

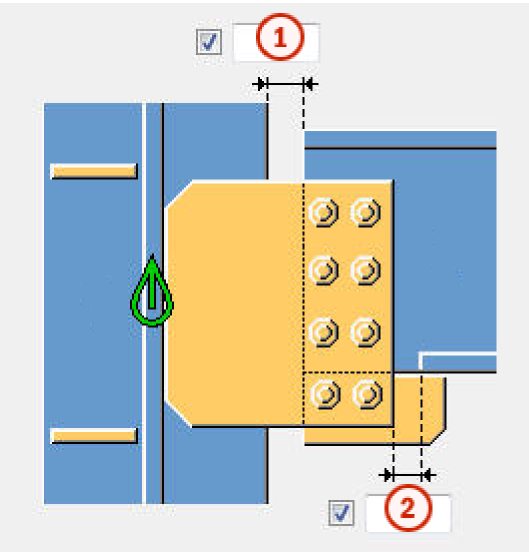
Column with stiffeners (188): Beam cut tab on page 369

Column with stiffeners (188): Doubler plate tab on page 373

Column with stiffeners (188): Picture tab

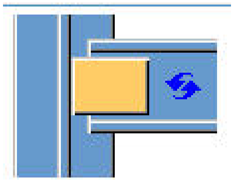
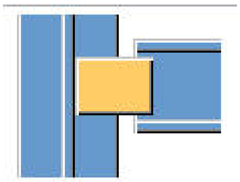
Use the **Picture** tab to control how the beam end is cut in the **Column with stiffeners (188)** connection.

Dimensions

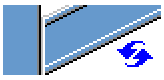
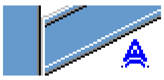
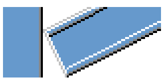
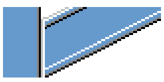


	Description	Default
1	Define the cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part. The cut is defined from the main part web or the main part flange.	`20 mm`
2	Define the size of the strip made to the secondary part flange. The cut of the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

Secondary part cut Define whether the secondary part cut is calculated from the main part web or main part flange.

Option	Description
	Default From the main part web AutoDefaults can change this option.
	From the main part 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.
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.

Column with stiffeners (188): Plates tab

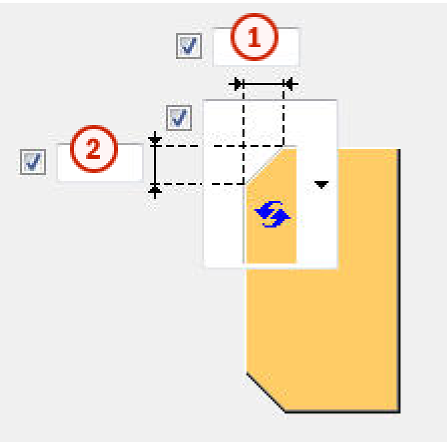
Use the **Plates** tab to control the size, position, number, orientation and shape of the shear tab in the **Column with stiffeners (188)** connection.

Shear tab plate

Part	Description
Tab plate	Define the shear tab plate thickness, width and height.

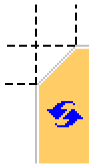
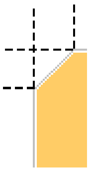
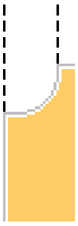
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Shear tab chamfers

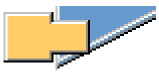


	Description
1	Define the horizontal dimension of the shear tab chamfer.
2	Define the vertical dimension of the shear tab chamfer.

Chamfer type

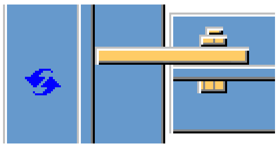
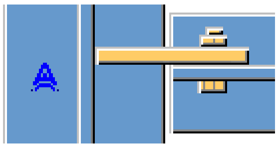
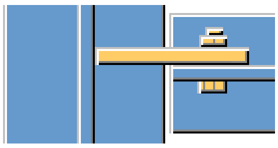
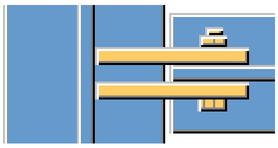
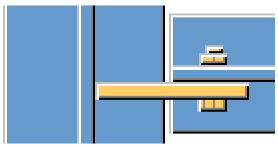
Option	Description
	Default Line chamfer AutoDefaults can change this option.
	No chamfer
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

Shear tab orientation

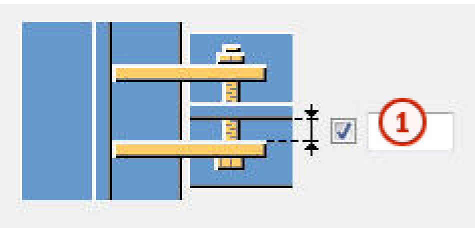
Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Sloped The shear tab is sloped in the direction of the secondary beam. Both vertical edges of the shear tab are cut parallel to the end of the secondary beam.
	Square

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 near side or 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	Define the gap between the secondary part web and shear tab. This only affects connections with two shear tabs.	0

Column with stiffeners (188): Stiffeners tab

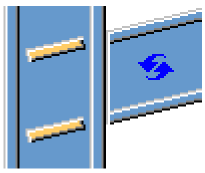
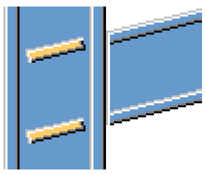
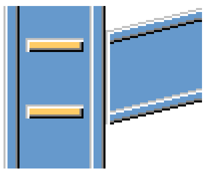
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position and type in the **Column with stiffeners (188)** connection.

Stiffener plate dimensions

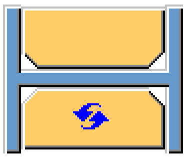
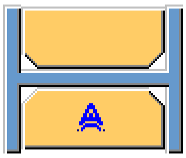
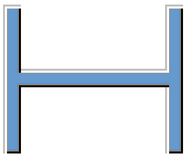
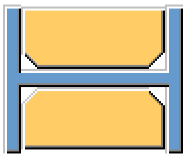
Part	Description
Top NS	Define the top near side stiffener thickness, width and height.
Top FS	Define the top far side stiffener thickness, width and height.
Bottom NS	Define the bottom near side stiffener thickness, width and height.
Bottom FS	Define the bottom far side stiffener thickness, width and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

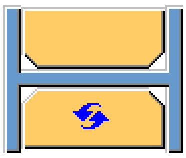
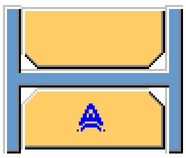
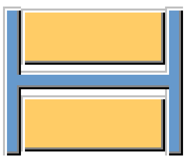
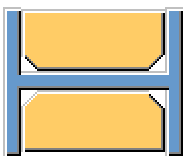
Stiffener orientation

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.

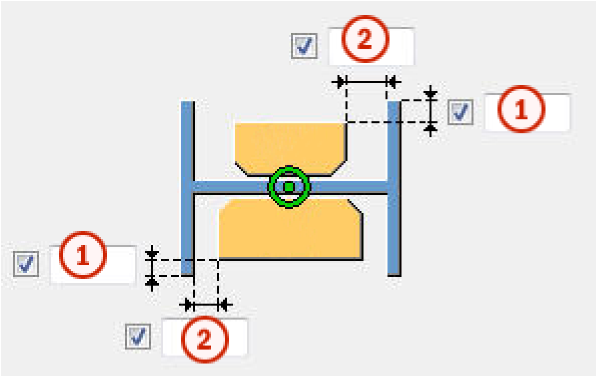
Stiffener creation

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

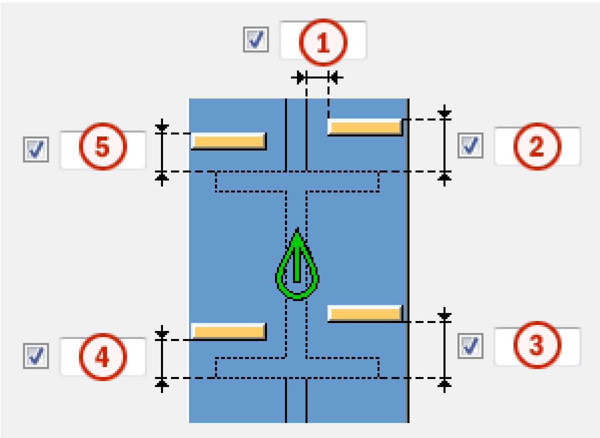
Option	Description
	Default Line chamfered stiffener plates AutoDefaults can change this option.
	Automatic Line chamfered stiffener plates
	Square stiffener plates Stiffener plates with a gap for the main part web rounding
	Line chamfered stiffener plates

Stiffener gap



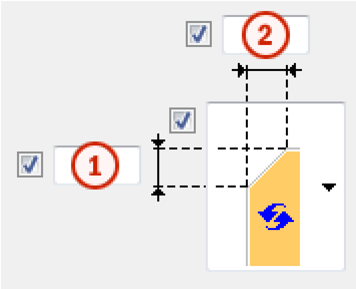
	Description
1	Define the distance from the edge of the flange to the edge of the stiffener.
2	Define the size of the gap between the flanges and the stiffener.

Stiffener positions



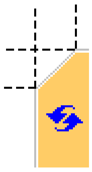
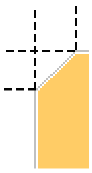
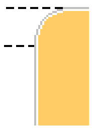
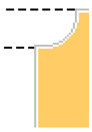
	Description
1	Define the size of the gap between the stiffener and the beam web edge.
2	Define the size of the gap between the top near side stiffener and the beam flange edge.
3	Define the size of the gap between the bottom near side stiffener and the beam flange edge.
4	Define the size of the gap between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

Chamfer dimensions



	Description	Default
1	Define the vertical dimension of the chamfer.	`10 mm`
2	Define the 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

Column with stiffeners (188): Haunch tab

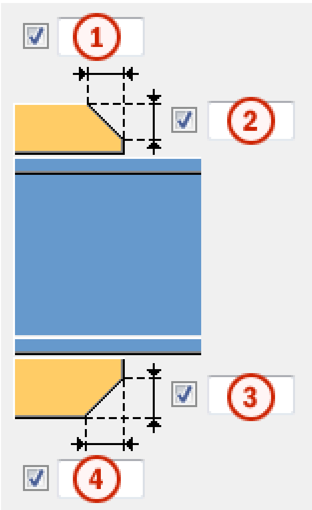
Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges in the **Column with stiffeners (188)** connection.

Haunch plates

Part	Description
Top plate	Define the top haunch plate thickness, width and height.
Bottom plate	Define the bottom haunch plate thickness, width and height.

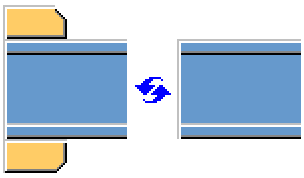
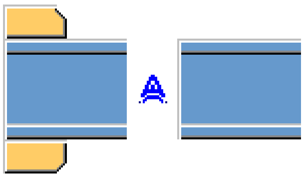
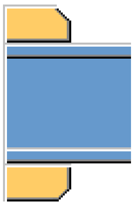
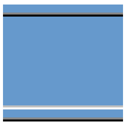
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Haunch plate chamfers



	Description
1	Define the width of the top haunch plate chamfer.
2	Define the height of the top haunch plate chamfer.
3	Define the height of the bottom haunch plate chamfer.
4	Define the width of the bottom haunch plate chamfer.

Hauch 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.
	Top and bottom haunch plates are created. To create a single plate, enter 0 in the thickness (**t**) field for the plate you do not need (top or bottom plate).
	Haunch plates are not created.

Column with stiffeners (188): Notch tab

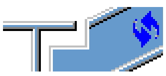
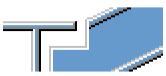
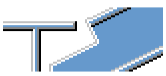
Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties in the **Column with stiffeners (188)** connection. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

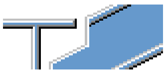
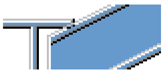
Automatic notching

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

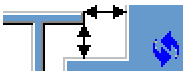
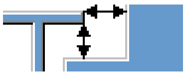
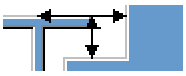
Notch shape

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

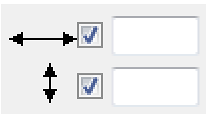
Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.

Option	Description
	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.

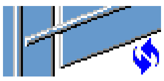
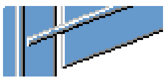
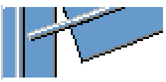
Notch size

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.

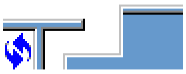
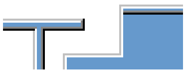
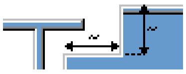


Flange cut shape

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.

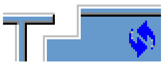
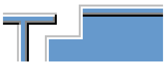
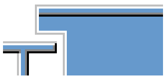
Notch dimension rounding

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.

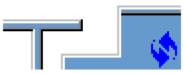
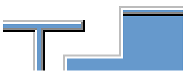
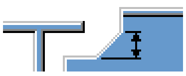
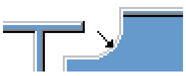
Option	Description
	Default Notch dimensions are not rounded. AutoDefaults can change this option.
	Notch dimensions are not rounded.
	Notch dimensions are rounded. Enter the horizontal and vertical rounding values.

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.

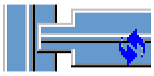
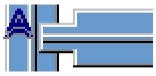
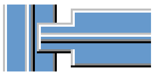
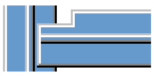
Notch chamfer

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.

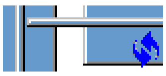
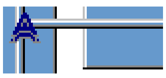
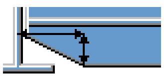
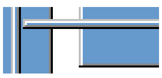
Enter a radius for the chamfer.

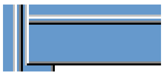
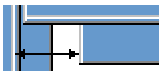
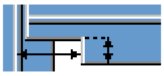
Manual notching Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.

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

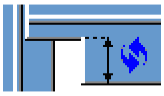
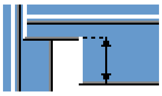
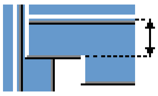
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the 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 1 and 2.

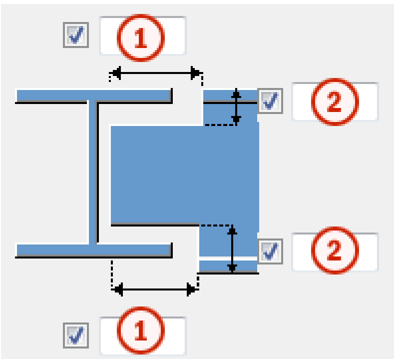
Option	Description
	The flange is not cut.
	Creates cuts to the flange according to the value in the field 1 to make it flush with the web.
	Creates cuts to the flange according to the values in the fields 1 and 2.

Flange notch depth

Option	Description
	Default Defines the flange notch depth. AutoDefaults can change this option.
	Defines the flange notch depth.
	Defines the 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	Define the dimensions for the horizontal flange cuts.	10 mm
2	Define the 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

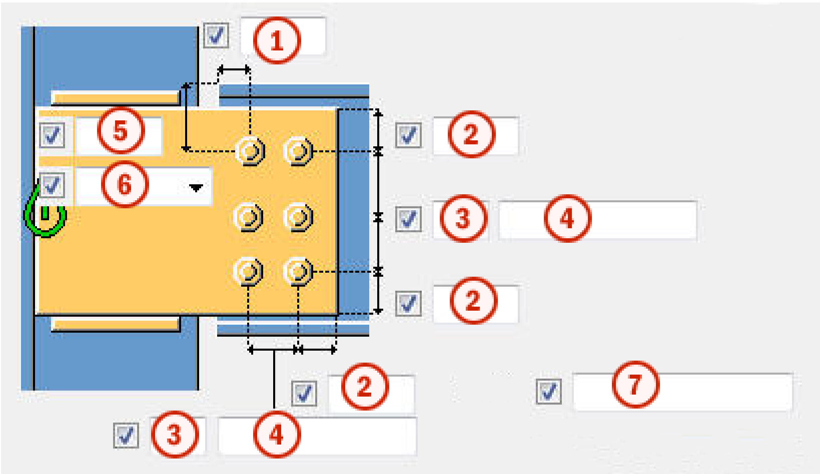
	Description	Default
		rounded up to the nearest 5 mm.

Column with stiffeners (188): Bolts tab

Use the **Bolts** tab to control the properties of the bolts that connect the shear tab to the secondary part in the **Column with stiffeners (188)** connection.

Bolt group dimensions

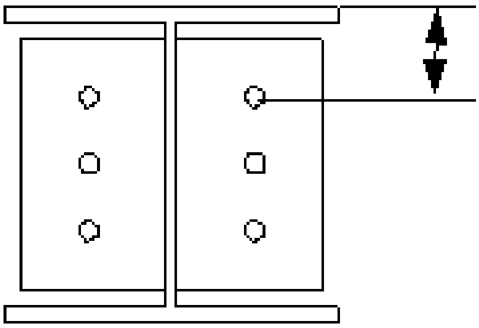
Bolt group dimensions affect the size and shape of the shear tab.



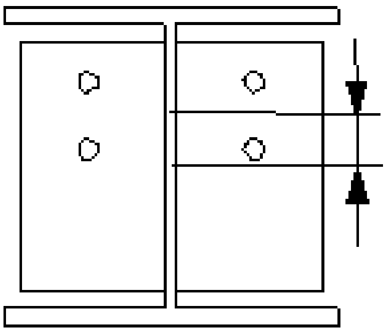
Option	Description
1	Define the dimension for horizontal bolt group position.
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.
4	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a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

<table>
<tr><th>Option</th><th>Description</th></tr>
<tr><td>6</td><td>Define how to measure the dimensions for vertical bolt group position.

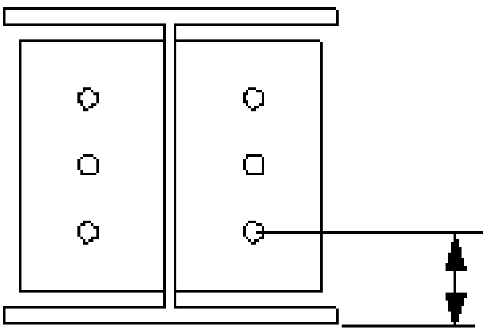
Top: From the upper edge of the secondary part to the uppermost bolt.



Middle: From the center line of the bolts to the center line of the secondary part.



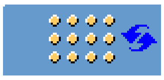
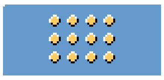
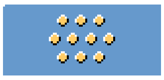
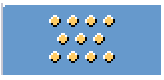
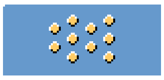
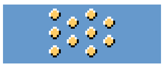
Below: From the lower edge of the secondary part to the lowest bolt.



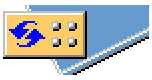
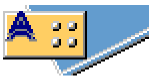
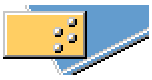
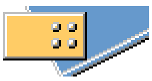
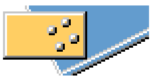
</td></tr>
</table>

Option	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

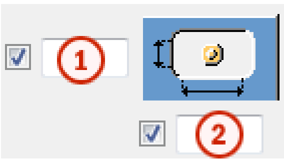
Option	Description
	Default Square AutoDefaults can change this option.
	Automatic Square
	Staggered Bolts are staggered in the direction of the secondary part.
	Square Square bolt group is positioned horizontally.
	Sloped Square bolt group is sloped in the direction of the secondary part.

Bolt basic properties

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

Option	Description	Default
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

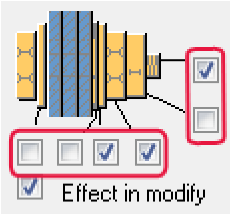
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

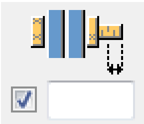
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



Column with stiffeners (188): Beam cut tab

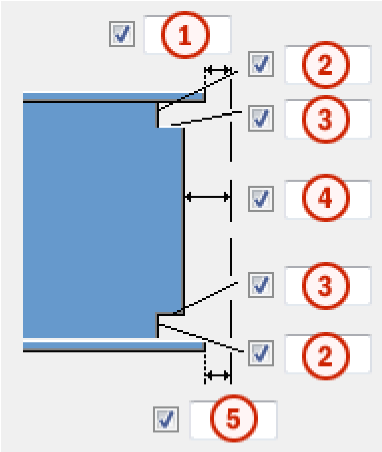
Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts in the **Column with stiffeners (188)** connection.

Weld backing bar

Part	Description
Weld backing bar	Define the weld backing bar thickness and width.

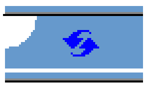
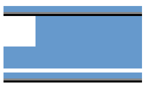
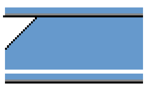
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

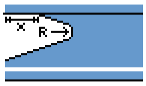
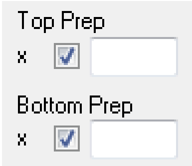
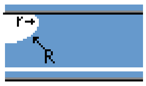
Weld access hole dimensions



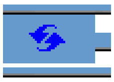
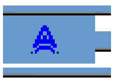
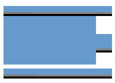
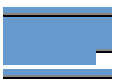
	Description
1	Define the gap between the secondary part top flange and the main part.
2	Define the vertical dimensions for the top and the bottom weld access holes.
3	Define the horizontal dimensions for the top and the bottom weld access holes.
4	Define the gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the **Picture** tab.
5	Define the 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 **Picture** tab.

Weld access holes

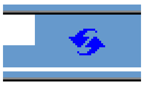
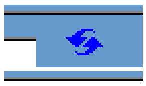
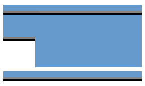
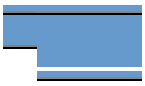
Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	

Option	Description	Default
	Round weld access hole with a radius that you can define in 	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in  and 	
	Cone-shaped weld access hole with radiuses that you can define in  and  Capital **R** defines the large radius (height). Small **r** defines the small radius.	`R = 35` `r = 10`

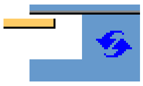
Beam end preparation

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.
	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.

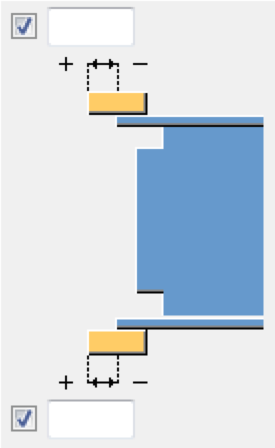
Weld backing bars

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 field 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

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.

Column with stiffeners (188): Doubler plate tab

Use the **Doubler plate** tab to create doubler plates to strengthen the web of the main part in the **Column with stiffeners (188)** connection.

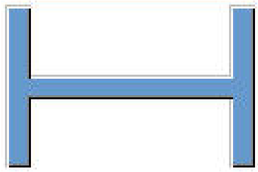
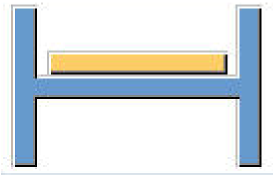
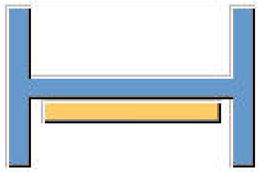
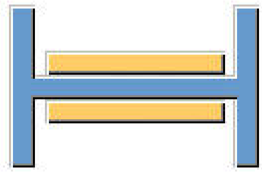
Web plate

Part	Description
Web plate	Define the web plate thickness and height.

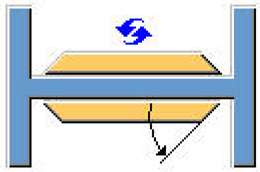
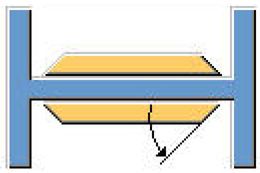
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Doubler plates

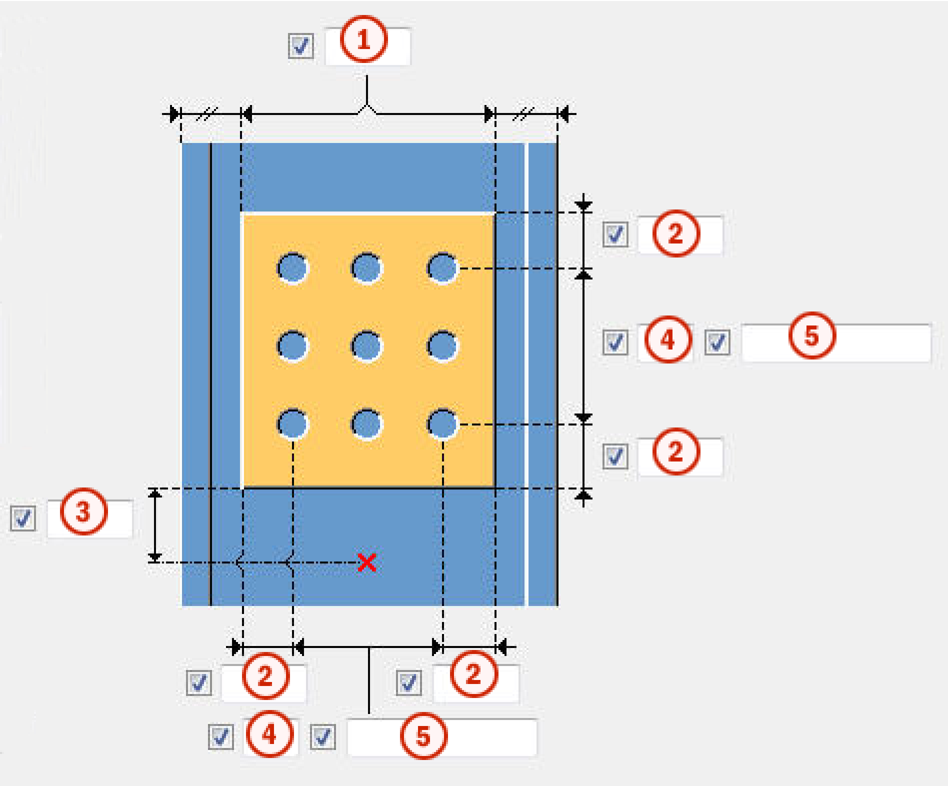
Option	Description
	Default Doubler plates are not created. AutoDefaults can change this option.

Option	Description
	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

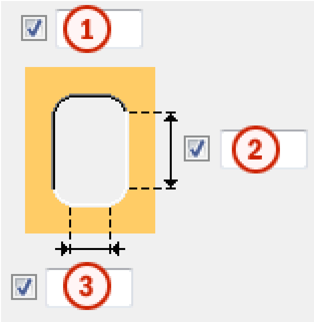
Option	Description
	Default Bevel doubler plates AutoDefauls can change this option.
	Bevel doubler plates Enter the angle in 
	Square doubler plates

General settings



	Description
1	Define the edge distance from the column flange.
2	Define the doubler plate edge distance. Edge distance is the distance from the center of a hole to the edge of the part.
3	Define the edge distance of the doubler plate in relation to the bottom of the secondary part.
4	Define the number of holes.
5	Define the 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	Define the hole diameter.
2	Define the slot length.
3	Define the slot width.

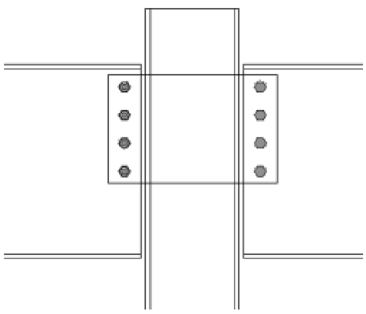
1.16 Shear plate tube column (189)

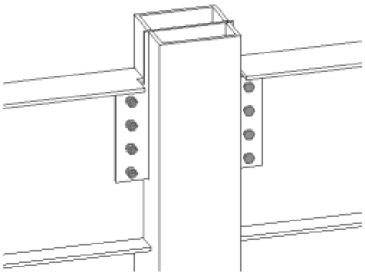
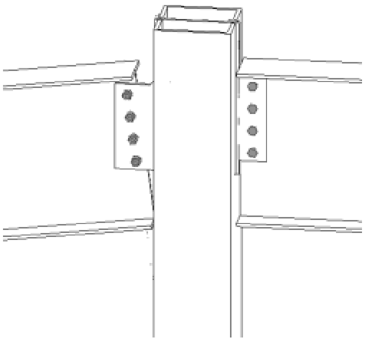
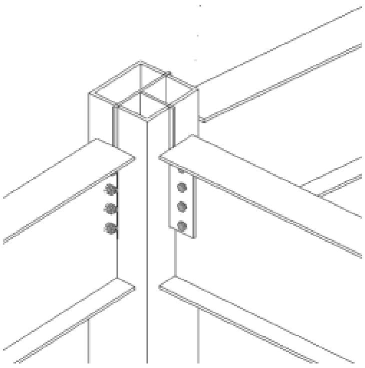
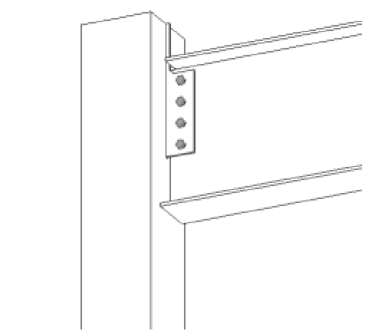
Shear plate tube column (189) connects a beam to a tube column with a shear tab. The shear tab goes through the tube column.

Objects created

- Shear tab (1 or 2)
- Bolts
- Welds
- Cuts

Use for

Situation	Description
	Shear tab through a tube column with two secondary parts

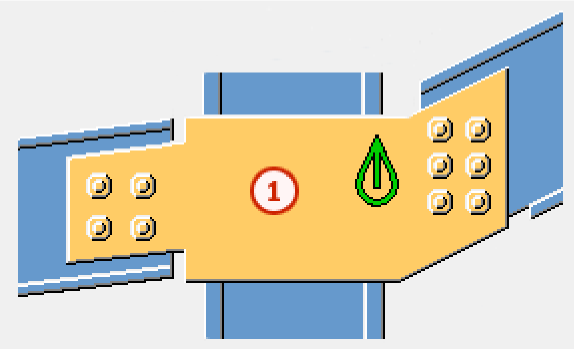
Situation	Description
	Shear tab through a tube column with two secondary parts. Shear tab extends to the top of the column.
	Shear tab through a tube column with two secondary parts and bolt alignment options. The secondary parts can be leveled and/or sloped.
	Shear tab through a tube column with two secondary parts. A third secondary part has been added after the connection was created.
	Shear tab through a tube column with one secondary part.

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

You can use the `joints.def` file to change the default values of this component.

See also

Shear plate tube column (189): Picture tab on page 378

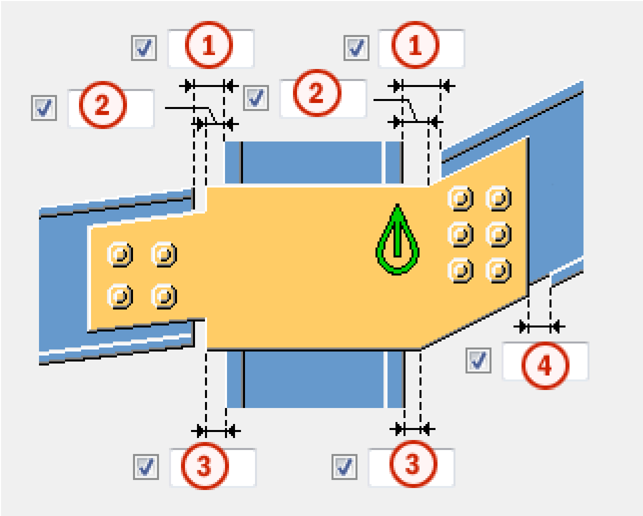
Shear plate tube column (189): Plates tab on page 380

Shear plate tube column (189): 1stSecBolts and 2ndSecBolts tabs on page 383

Shear plate tube column (189): Picture tab

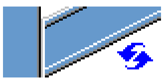
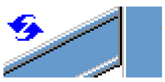
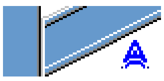
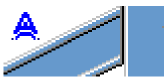
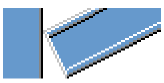
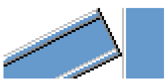
Use the **Picture** tab to control the position of the shear tab and to define how the beam ends are cut in the **Shear plate tube column (189)** connection.

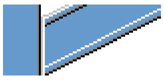
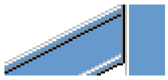
Dimensions



	Description	Default
1	Define the cut of the secondary part. Cutting the secondary part creates a gap between the main part and the secondary part.	`20 mm`
2	Define the distance from the edge of the main part to the top corner of the shear tab.	`5 mm`
3	Define the distance from the edge of the main part to the bottom corner of the shear tab.	`5 mm`
4	Define the 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.

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

Shear plate tube column (189): Plates tab

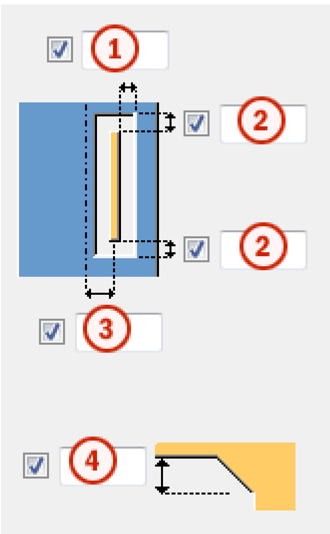
Use the **Plates** tab to control the size, position, number, orientation and shape of the shear tab in the **Shear plate tube column (189)** connection.

Shear tab plate

Part	Description
Shear plate	Define the plate thickness.

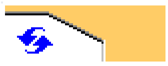
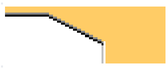
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Shear tab dimensions

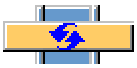


	Description
1	Define the horizontal size of the cut created for the shear tab. Equal size is created on both sides of the shear tab.
2	Define the vertical size of the cut created for the shear tab. Equal size is created at the top and bottom of the shear tab.
3	Define the distance from the center line 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	Define the vertical dimension of the shear tab chamfer.

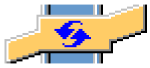
Chamfer type

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.

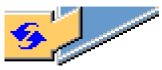
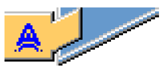
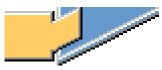
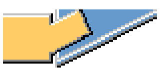
Option	Description
	Default Line AutoDefaults can change this option.
	Line
	Column top The upper edge of the shear tab is extended to the top of the main part.

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
		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

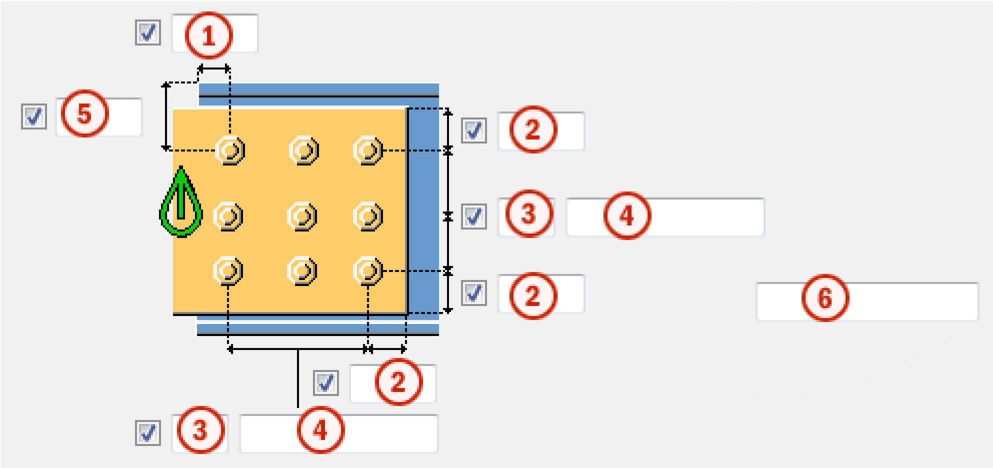
Shear tab position

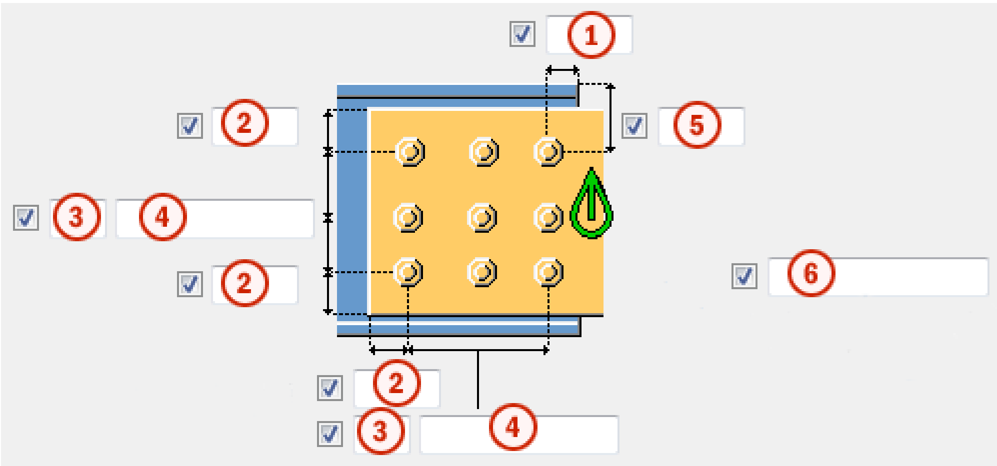
Option	Description
	Default Near side AutoDefaults can change this option.
	Automatic The shear tab is created to the near side when the angle between the main part and the secondary part is less than 90 degrees.
	Near side
	Both sides
	Far side

Shear plate tube column (189): 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 in the **Shear plate tube column (189)** connection.

Bolt group dimensions

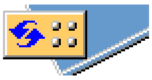
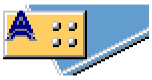
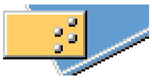
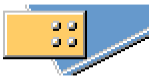
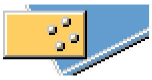




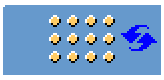
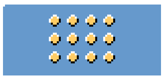
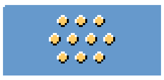
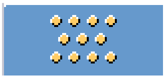
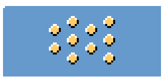
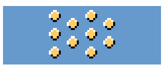
	Description
1	Define the dimension for horizontal bolt group position.
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.
4	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value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

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

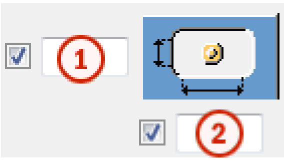
Bolt basic properties

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

Option	Description	Default
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

You can define slotted, oversized, or tapped holes.

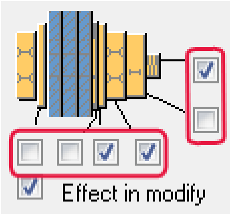


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

Bolt assembly

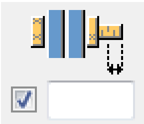
The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



2 Clip angle connections

This section introduces clip angle connection components available in Tekla Structures.

Click the links below to find out more:

- Clip angle (116) on page 388
- Two-sided clip angle (117) on page 398
- Clip angle (141) on page 407
- Two sided clip angle (143) on page 446

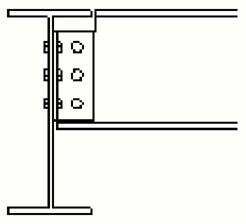
2.1 Clip angle (116)

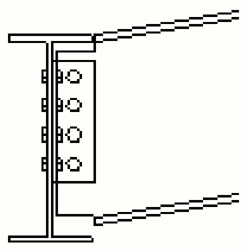
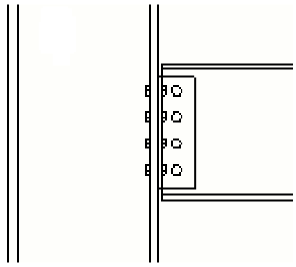
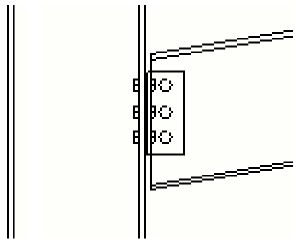
Clip angle (116) connects a beam to a beam or a column with a clip angle.

Objects created

- Clip angle (1 or 2)
- Bolts
- Cuts

Use for

Situation	Description
	Clip angle connection to a beam web.

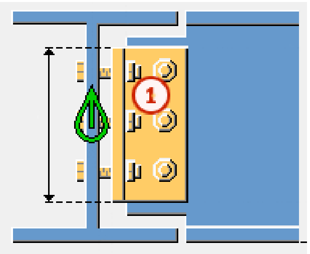
Situation	Description
	Clip angle connection to a beam web. The secondary beam is sloped.
	Clip angle connection to a column flange.
	Clip angle connection to a column flange. The secondary beam is sloped.

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

See also

Clip angle (116): Picture tab on page 390

Clip angle (116): Parts tab on page 391

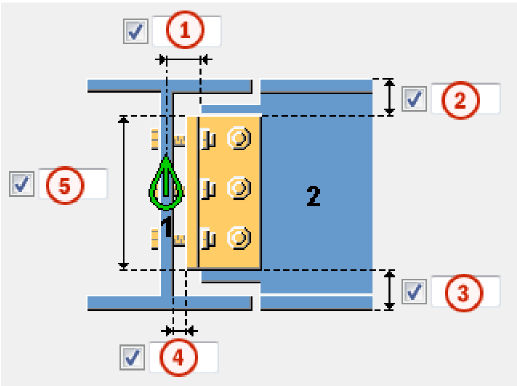
Clip angle (116): Notch tab on page 392

Clip angle (116): Bolts tab on page 394

Clip angle (116): Picture tab

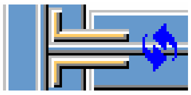
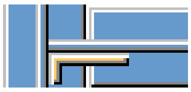
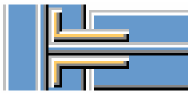
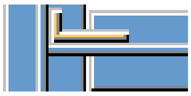
Use the **Picture** tab to control the clip angle dimensions and the clip angle position in the **Clip angle (116)** connection.

Dimensions



	Description	Default
1	Define the cut length for the secondary part.	
2	Define the 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	Define the 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	Define the gap between the main part and the clip angle.	
5	Define the 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.

Clip angle (116): Parts tab

Use the **Parts** tab to control the properties of the clip angle in the **Clip angle (116)** connection.

Clip angle

Part	Description
L profile	Define the clip angle profile by selecting it from the profile catalog.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

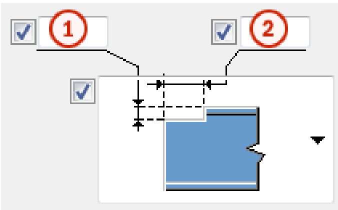
Clip angle (116): Notch tab

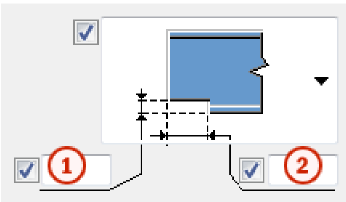
Use the **Notch** tab to create notches for the secondary beam and to control the notch properties in the **Clip angle (116)** connection.

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

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

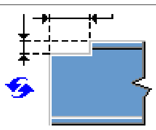
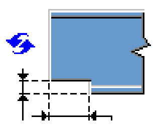
Notch dimensions Define the top and the bottom dimensions of the notch if you have set the **BCSA notch def** option to **No**.

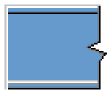
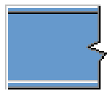
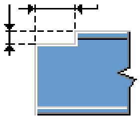
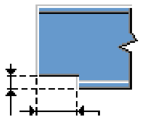
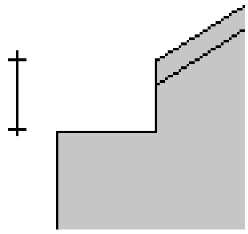
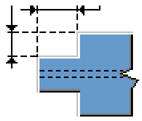
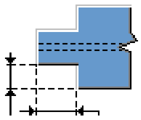
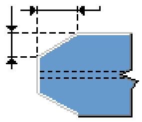
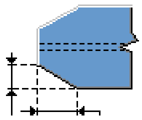
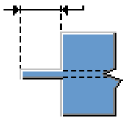
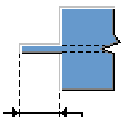
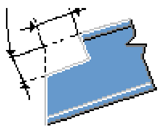
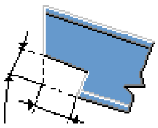




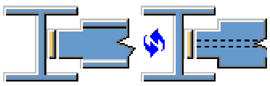
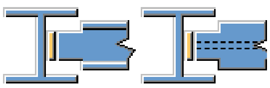
	Description
1	Define the vertical notch dimension.
2	Define the horizontal notch dimension.

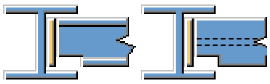
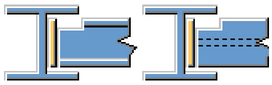
Notch shape Define the notch shape for the top and the bottom of the secondary beam.

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.

Option	Option	Description
		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, the depth is measured as shown in the picture. 
		Creates a notch on both sides of the secondary part. Define the notch dimensions.
		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.

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.

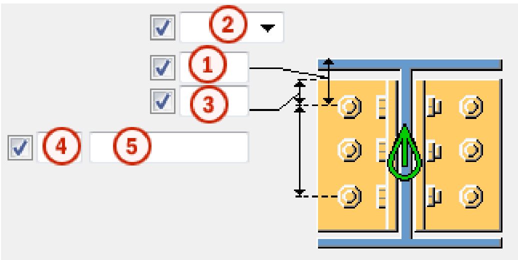
Option	Description
	Default Creates notches on both sides. AutoDefaults can change this option.
	Creates notches on both sides.

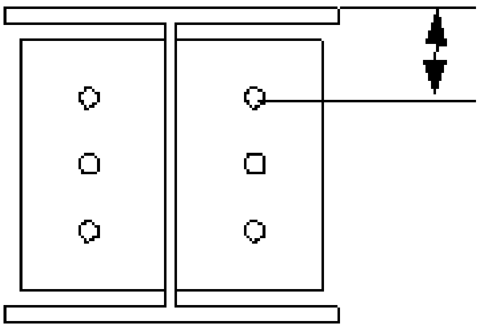
Option	Description
	Creates a notch on the left side.
	Creates a notch on the right side.

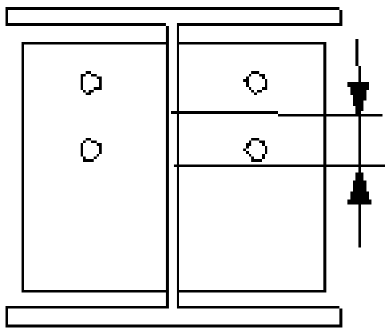
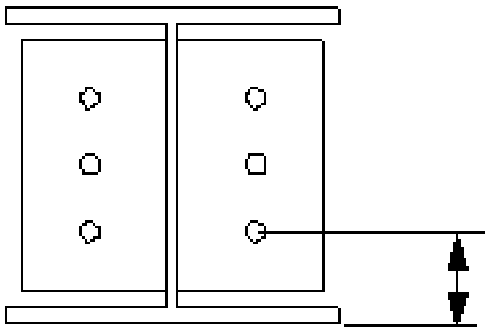
Clip angle (116): Bolts tab

Use the **Bolts** tab to control the bolt properties in the **Clip angle (116)** connection. 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.

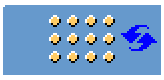
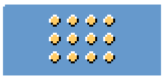
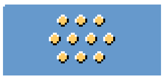
Bolt group dimensions

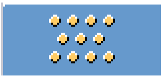
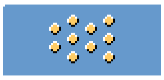
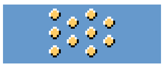


	Description
1	Define the dimension for vertical bolt group position.
2	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt. 

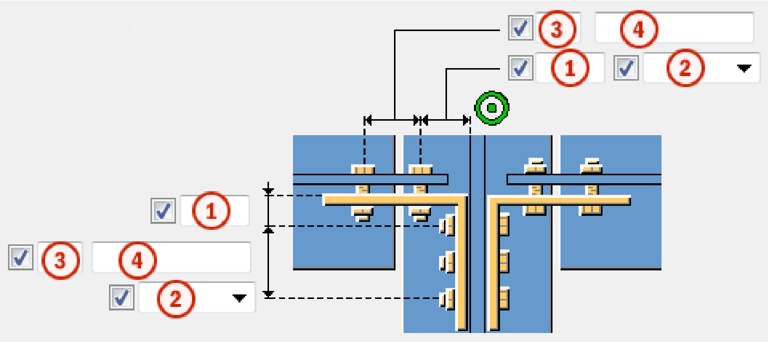
	Description
	• **Middle**: From the center line of the bolts to the center line of the secondary part.  • **Below**: From the lower edge of the secondary part to the lowest bolt. 
3	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Define the number of bolts.
5	Define the 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

Option	Description
	Staggered type 2
	Staggered type 3
	Staggered type 4

Bolt group dimensions

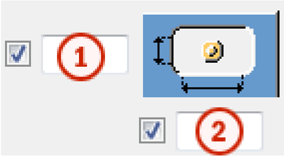


	Description
1	Define the bolt edge distance.
2	Define the location where the bolts should be attached.
3	Define the number of bolts.
4	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

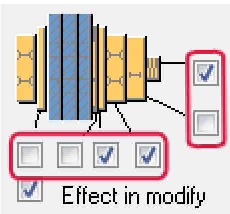
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

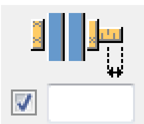
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



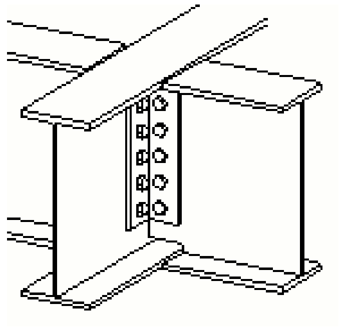
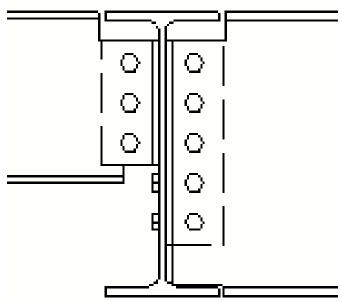
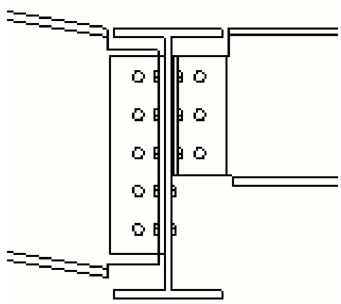
2.2 Two-sided clip angle (117)

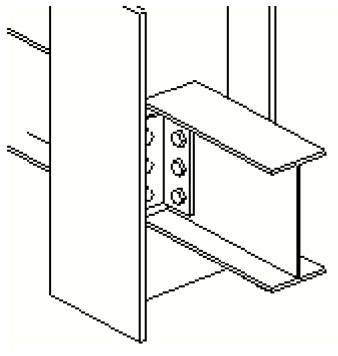
Two-sided clip angle (117) connects two beams to a beam or a column using clip angles. The clip angles are bolted to the secondary beams and to the main part.

Objects created

- Clip angles (2 or 4)
- Bolts
- Cuts

Use for

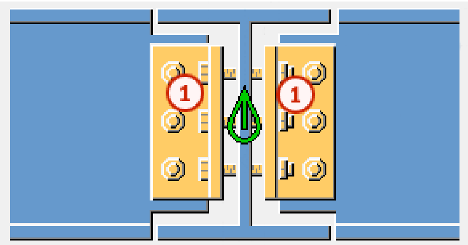
Situation	Description
	Clip angle connection to a beam web.
	Clip angle connection to a beam web. Two secondary beams with different heights.
	Clip angle connection to a beam web. The other secondary beam is sloped.

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

See also

Two-sided clip angle (117): Picture tab on page 399

Two-sided clip angle (117): Parts tab on page 401

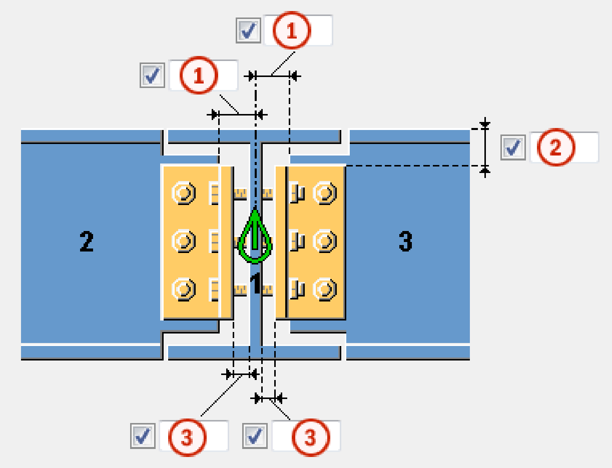
Two-sided clip angle (117): Notch tab on page 401

Two-sided clip angle (117): Bolts tab on page 403

Two-sided clip angle (117): Picture tab

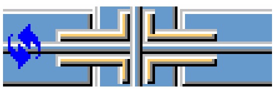
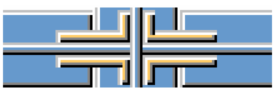
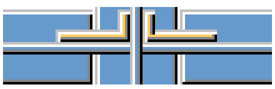
Use the **Picture** tab to control the dimensions and the position of the clip angle in the **Two-sided clip angle (117)** connection.

Dimensions



	Description	Default
1	Define the cut length for the secondary part.	`2.25 mm`
2	Define the 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	Define the 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.

Two-sided clip angle (117): Parts tab

Use the **Parts** tab to control the clip angle properties in the **Two-sided clip angle (117)** connection.

Clip angle

Part	Description
L profile, L profile 2	Define the clip angle profile by selecting it from the profile catalog.
Angle 1 length, Angle 2 length	Define the length of the clip angle both on the first secondary part and the second secondary part side.

Move cleats to smaller web

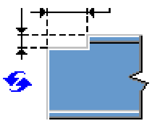
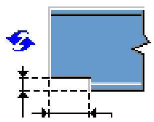
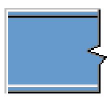
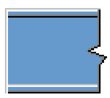
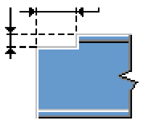
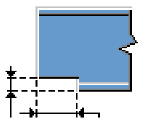
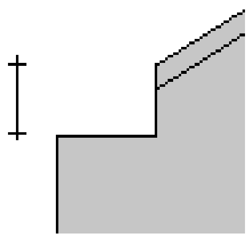
Define the position of the cleats.

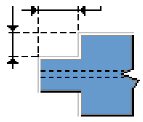
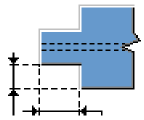
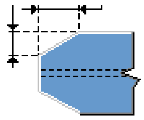
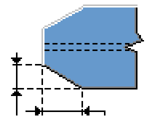
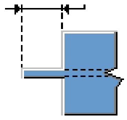
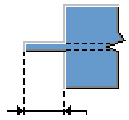
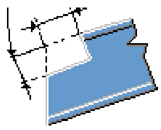
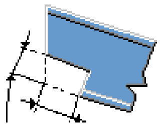
Two-sided clip angle (117): Notch tab

Use the **Notch** tab to create notches for the secondary beams and to control the notch properties in the **Two-sided clip angle (117)** connection. Define the notches for both secondary beams.

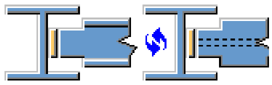
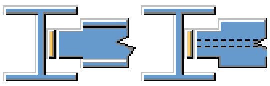
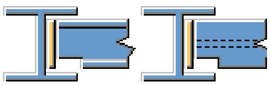
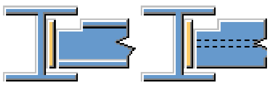
Notch shape

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

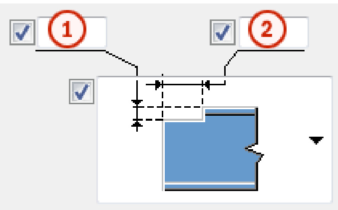
Option	Option	Description
		Default Creates a square notch on the top side or on the bottom side of the secondary beam. AutoDefaults can change this option.
		No notch
		Creates a square notch on the top side or on the bottom side of the secondary beam. Define the notch dimensions. In beam-to-beam connections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

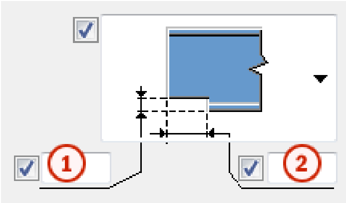
Option	Option	Description
		Creates a notch on both sides of the secondary part. Define the notch dimensions.
		Creates a chamfered notch on both sides of the secondary beam. Define the chamfer dimensions.
		Creates a strip. Define the length of the strip. The flanges are cut completely.
		Creates a 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.

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.

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	Define the vertical notch dimension.
2	Define the horizontal notch dimension.

BCSA notch definition

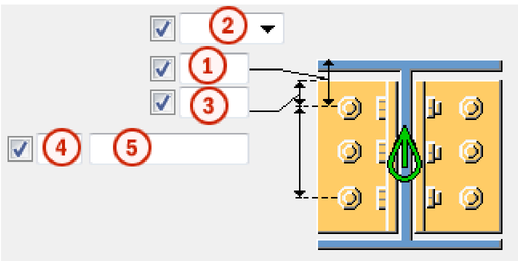
Define whether the notch is created according to British Constructional Steelwork Association (BCSA) specifications.

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

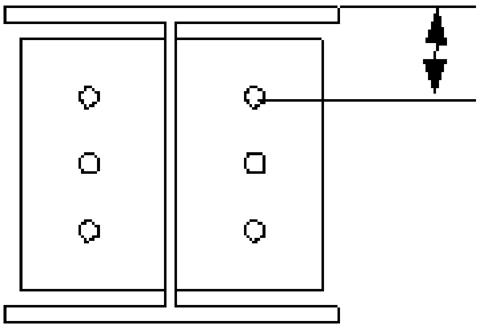
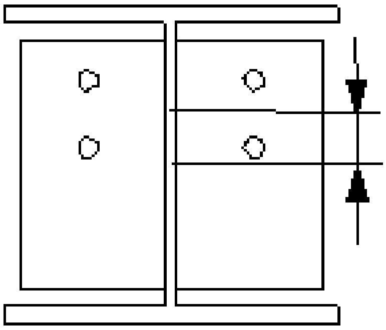
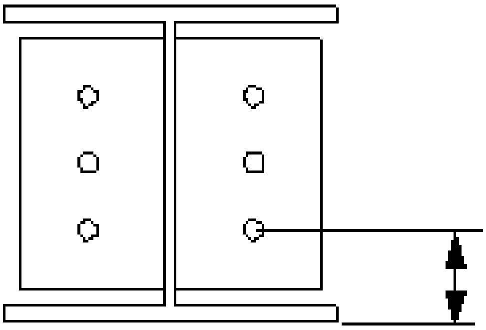
Two-sided clip angle (117): Bolts tab

Use the **Bolts** tab to control the bolt properties in the **Two-sided clip angle (117)** connection.

Bolt group dimensions

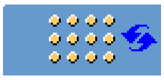
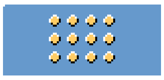
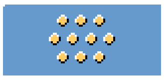
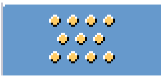
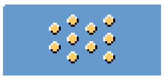
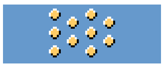


	Description
1	Define the dimension for vertical bolt group position.

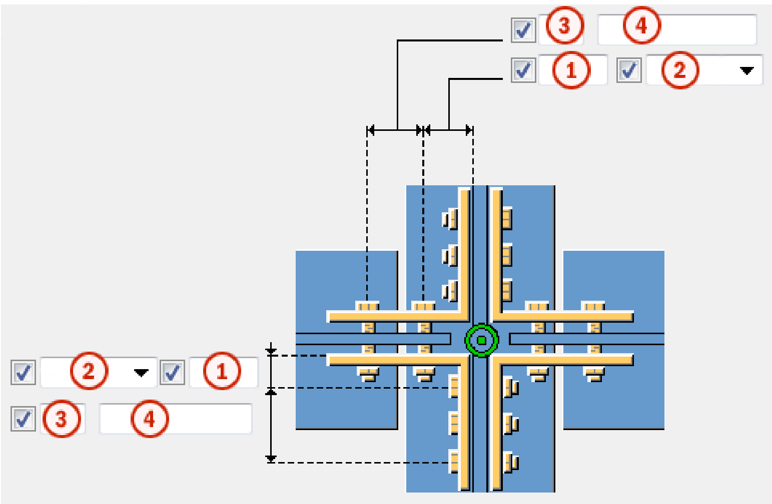
	Description
②	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt.  • **Middle**: From the center line of the bolts to the center line of the secondary part.  • **Below**: From the lower edge of the secondary part to the lowest bolt. 

	Description
3	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Define the number of bolts.
5	Define the 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



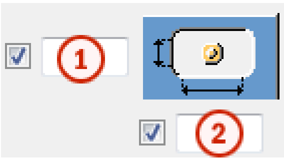
	Description
1	Define the bolt edge distance.
2	Define the location where the bolts should be attached.
3	Define the number of bolts.
4	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

You can define slotted, oversized, or tapped holes.

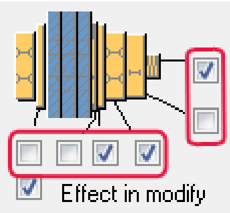


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	

Option	Description	Default
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

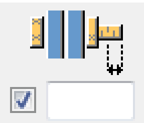
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



2.3 Clip angle (141)

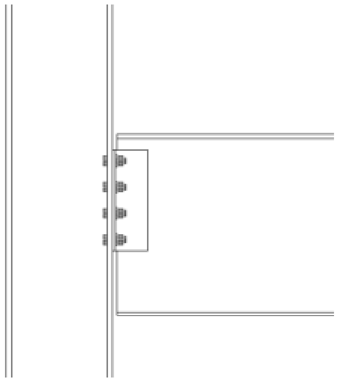
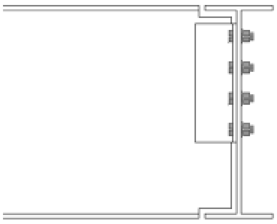
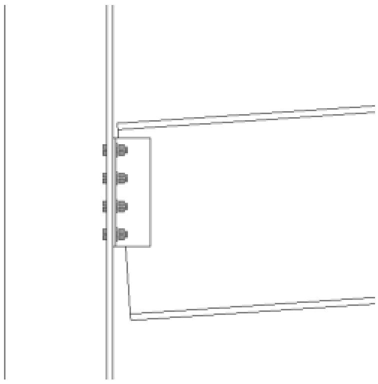
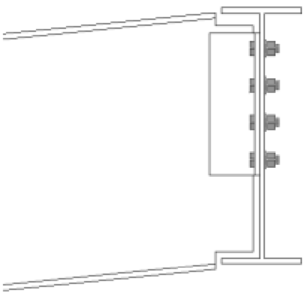
Clip angle (141) connects two beams, or a beam to a column, using bolted or welded clip angles. The secondary beam can be leveled or sloped. Welded haunch plates and seat angles are optional.

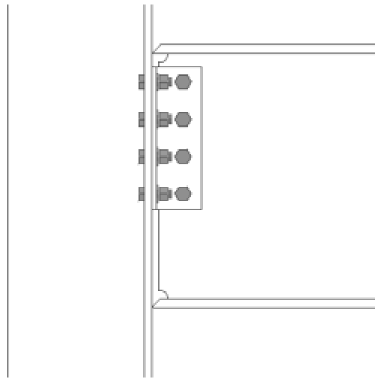
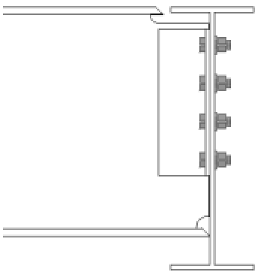
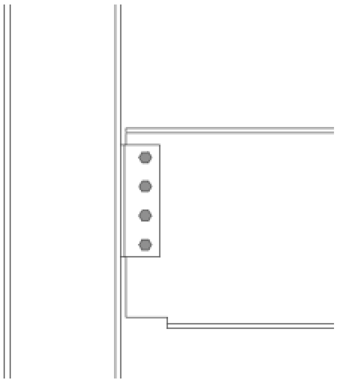
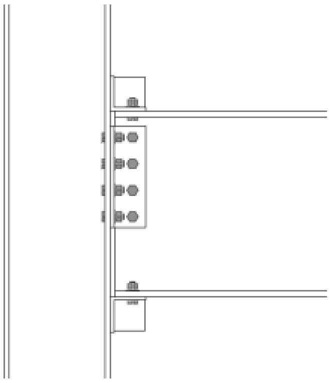
Objects created

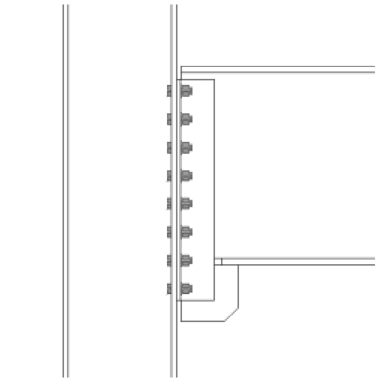
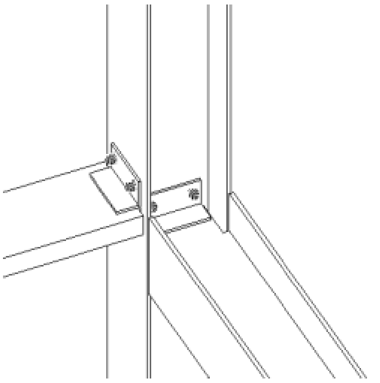
- Clip angles (1 or 2)
- Stiffeners (optional)
- Top and bottom haunch plate (optional)
- Seat angle (optional)
- Seat stiffeners (optional)
- Bolts
- Welds

- Cuts

Use for

Situation	Description
	Clip angle connection to column flange or web. Single-sided/double-sided clip. Welded/bolted, bolted/bolted, welded/welded options.
	Clip angle connection to beam web. Single-sided/double-sided clip.
	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.
	Clip angle connection to beam web. Single-sided/double-sided clip. The secondary part is sloped. There are several notching options.

Situation	Description
	Clip angle connection to column flange or web. Single-sided/double-sided clip. Weld preparation and weld access holes for moment connection.
	Clip angle connection to beam web. Single-sided/double sided clip. Option for weld preparation.
	Clip angle connection to column flange. Bottom flange is blocked or stripped for erection.
	Clip angle connection to column. Seat angle option. Top/Bottom/Both.

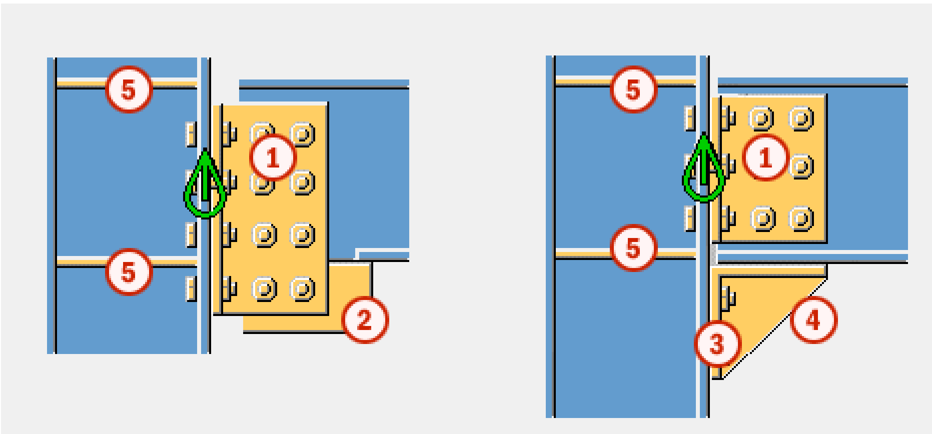
Situation	Description
	Clip angle connection to column flange or web. Single-sided/double-sided clip. Haunch option. Top/Bottom/Both.
	Clip angle connection to column flange or web. Single-sided/double-sided clip. Secondary part is rotated.

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

	Part
4	Seat stiffener
5	Web stiffeners

You can use the `joints.def` file to change the default values of this component.

See also

Clip angle (141): Picture tab on page 411

Clip angle (141): Parts tab on page 413

Clip angle (141): Stiffeners tab on page 416

Clip angle (141): Haunch tab on page 420

Clip angle (141): Notch tab on page 422

Clip angle (141): Bolts tab on page 426

Clip angle (141): Beam cut tab on page 433

Clip angle (141): Angle box tab on page 437

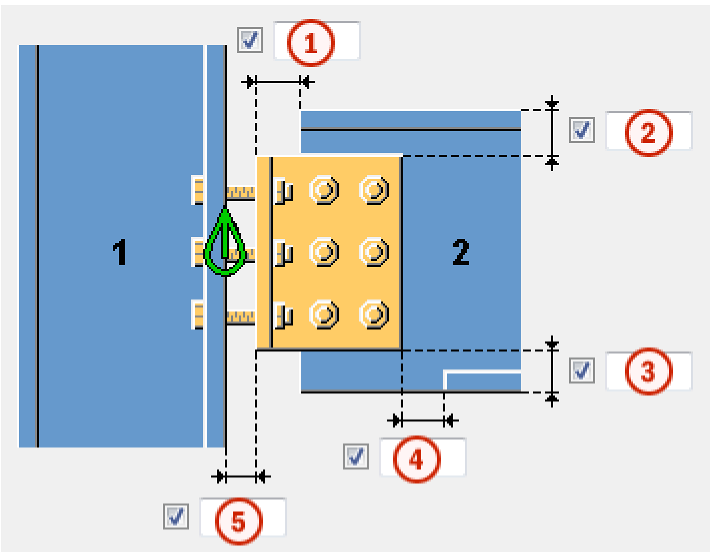
Clip angle (141): BoxPBolts tab on page 442

Clip angle (141): BoxSBolts tab on page 444

Clip angle (141): Picture tab

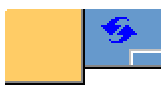
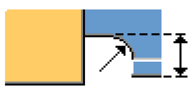
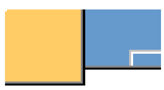
Use the **Picture** tab to control the clip angle dimensions and to define how the beam end is cut in the **Clip angle (141)** connection.

Dimensions

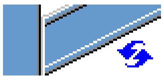
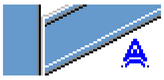
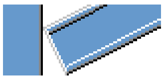
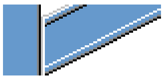


Field	Description	Default
1	Define the cut length for the secondary part. The cut is defined from the clip angle edge.	20 mm
2	Define the clip angle upper edge distance from the top of the secondary beam. The upper edge position of the angle modifies the clip angle height. Positive value moves the top 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	Define the 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	Define the 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.
	Bevel Cuts the end of the secondary beam parallel to the edge of the main part.

Clip angle (141): Parts tab

Use the **Parts** tab to control the size, position and orientation of the clip angles in the **Clip angle (141)** connection.

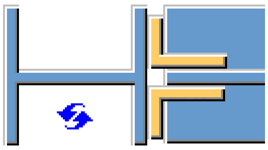
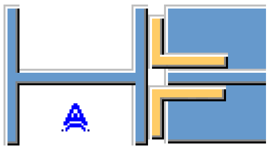
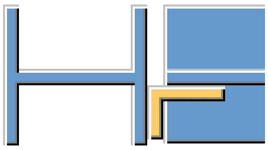
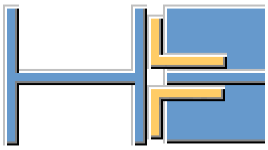
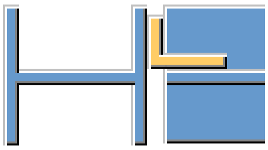
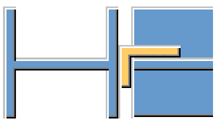
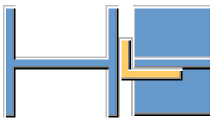
Profile NS/FS

Option	Description	Default
Profile NS	Define the near side clip angle profile by selecting it from the profile catalog.	Angle size is defined by the bolt diameter.
Profile FS	Define the far side clip angle profile by selecting it from the profile catalog.	Angle size determined by the bolt diameter.

Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	`ANGLE`

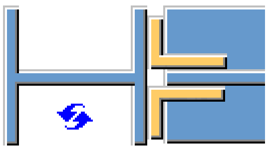
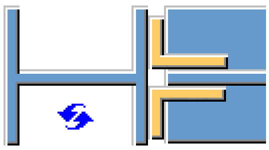
Clip angle position

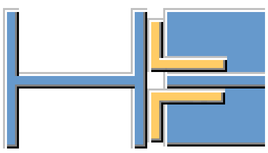
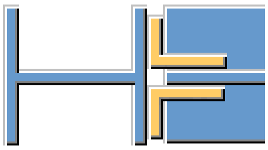
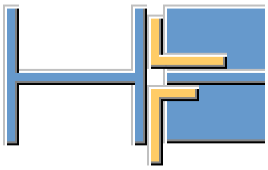
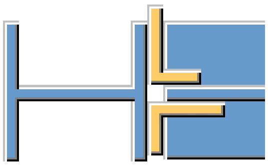
Define the number of clip angles and the side of the clip angle in single clip angle connections.

Option	Description
	Default Near side and far side clip angles are created. AutoDefaults can change this option.
	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.
	Wrapped angle. Far side clip angle is created.
	Wrapped angle. Near side clip angle is created.

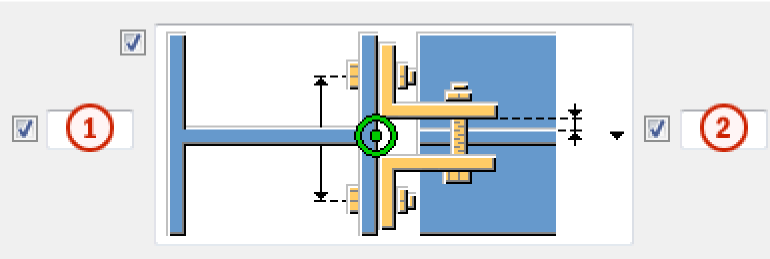
Clip angle orientation

These options switch the unequal legs of the far side and the near side clip angles.

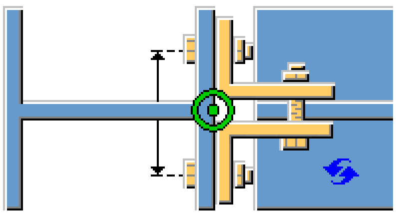
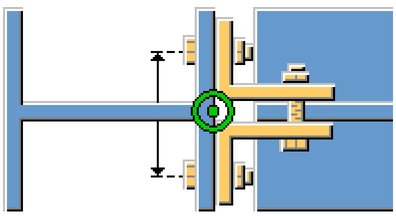
Option for near side	Option for far side	Description
		Default Not switched AutoDefaults can change this option.

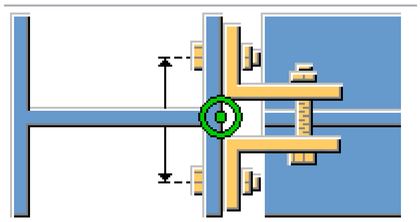
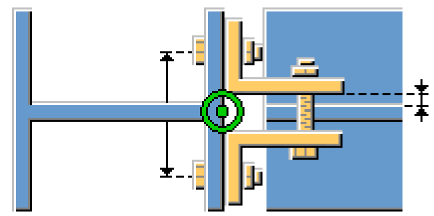
Option for near side	Option for far side	Description
		Not switched The clip angle is placed on a connection so that the longer leg is connected to the secondary part.
		Switched The clip angle legs are switched so that the longer leg is connected to the main part.

Bolt spacing and weld gap



Option	Description
1	Define the bolt spacing.
2	Define the 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

Clip angle (141): Stiffeners tab

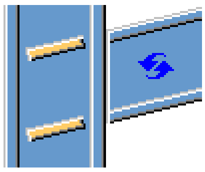
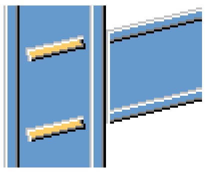
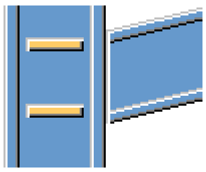
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position, and type in the **Clip angle (141)** connection.

Stiffener plate dimensions

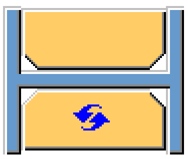
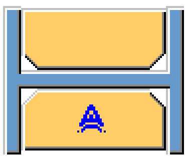
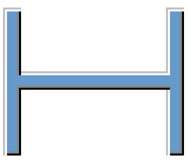
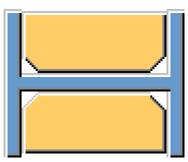
Part	Description
Top NS	Define the top near side stiffener thickness, width and height.
Top FS	Define the top far side stiffener thickness, width and height.
Bottom NS	Define the bottom near side stiffener thickness, width and height.
Bottom FS	Define the bottom far side stiffener thickness, width and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

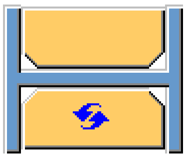
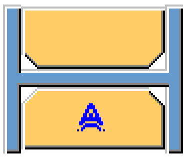
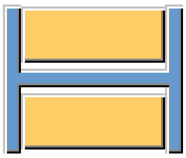
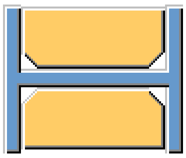
Stiffener orientation

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.

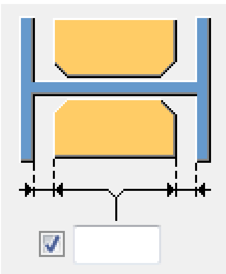
Stiffener creation

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

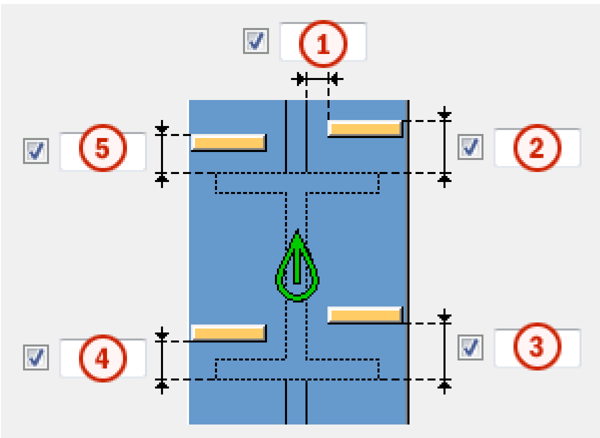
Stiffener shape

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
	Line chamfered stiffener plates

Stiffener gap

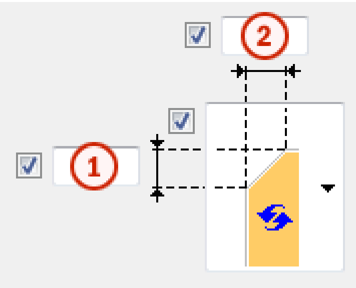
Option	Description
	Define the size of the gap between the flanges and the stiffener.

Stiffener positions



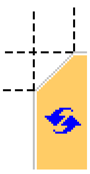
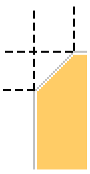
	Description
1	Define the size of the gap between the stiffener and the beam web edge.
2	Define the size of the gap between the top near side stiffener and the beam flange edge.
3	Define the size of the gap between the bottom near side stiffener and the beam flange edge.
4	Define the size of the gap between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

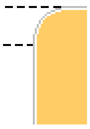
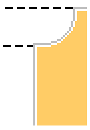
Chamfer dimensions



	Description	Default
1	Define the vertical dimension of the chamfer.	10 mm
2	Define the 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

Clip angle (141): Haunch tab

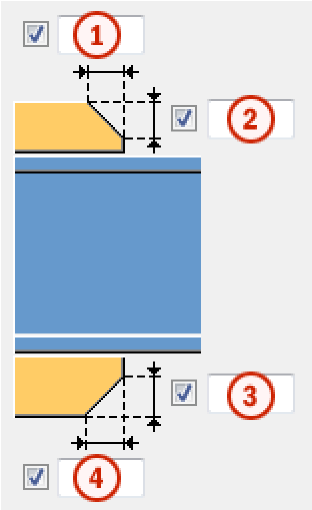
Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges in the **Clip angle (141)** connection.

Haunch plates

Part	Description
Top plate	Define the top haunch plate thickness, width and height.
Bottom plate	Define the bottom haunch plate thickness, width and height.

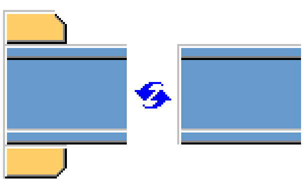
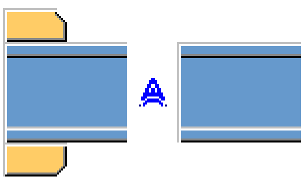
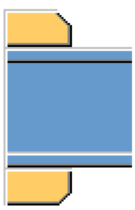
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

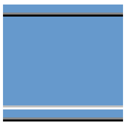
Haunch plate chamfers



	Description
1	Define the width of the top haunch plate chamfer.
2	Define the height of the top haunch plate chamfer.
3	Define the height of the bottom haunch plate chamfer.
4	Define the width of the bottom haunch plate chamfer.

Hauch 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.
	Top and bottom haunch plates are created. To create a single plate, enter 0 in the thickness (**t**) field for the plate you do not need (top or bottom plate).

Option	Description
	Haunch plates are not created.

Clip angle (141): Notch tab

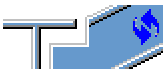
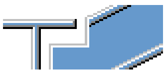
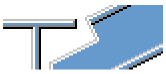
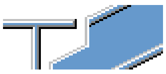
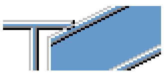
Use the **Notch** tab to automatically create notches for the secondary beams and to control the notch properties in the **Clip angle (141)** connection. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

Automatic notching

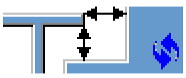
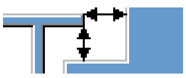
Automatic notching options affect both the top and the bottom flange.

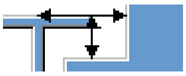
Notch shape

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

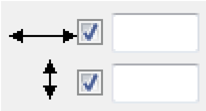
Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.
	Creates notches to the secondary 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

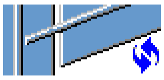
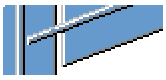
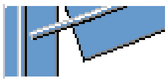
Option	Description
	Default The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam. AutoDefaults can change this option.
	The notch size is measured from the edge of the main beam flange and from underneath the top flange of the main beam.

Option	Description
	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.

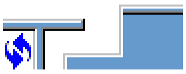
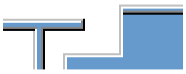
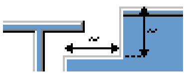


Flange cut shape

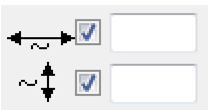
Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

Notch dimension rounding

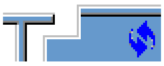
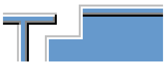
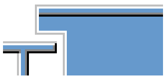
Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

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.

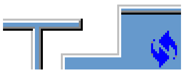
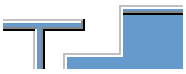
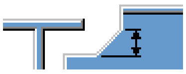
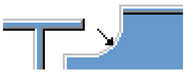
The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



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.

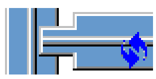
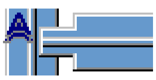
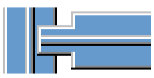
Enter a radius for the chamfer.

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.

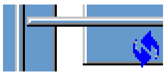
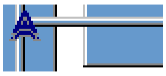
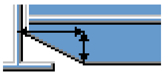
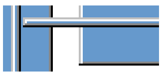
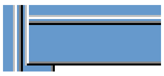
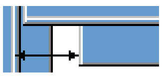
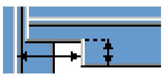
Side of flange notch

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

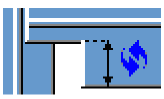
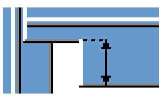
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.

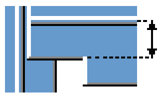
Option	Description
	Creates notches on the near side of the flange.
	Creates notches on the far side of the flange.

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 1 and 2.
	The flange is not cut.
	Creates cuts to the flange according to the value in the field 1 to make it flush with the web.
	Creates cuts to the flange according to the values in the fields 1 and 2.

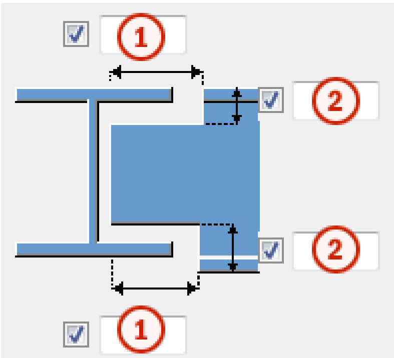
Flange notch depth

Option	Description
	Default Defines the flange notch depth. AutoDefaults can change this option.
	Defines the flange notch depth.

Option	Description
	Defines the 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

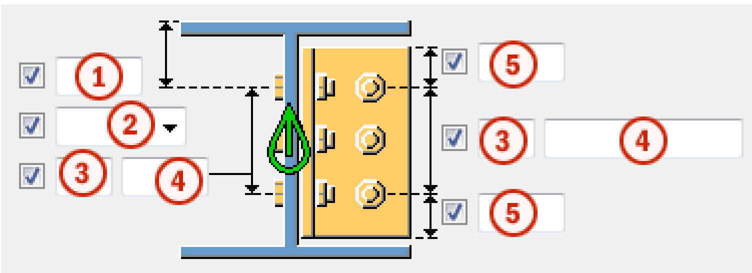


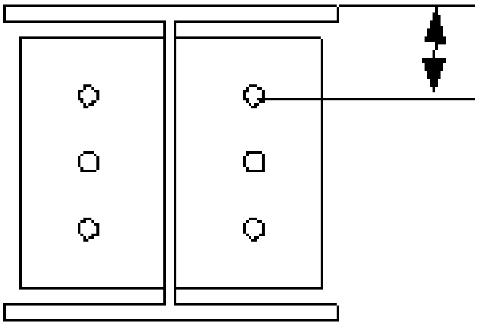
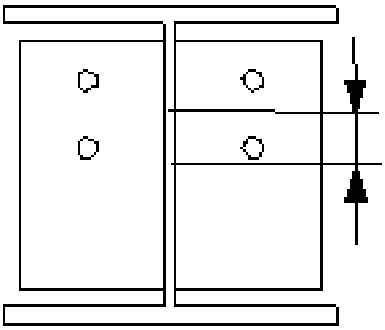
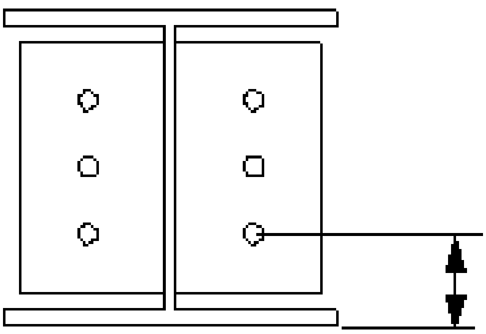
	Description	Default
1	Define the dimensions for the horizontal flange cuts.	10 mm
2	Define the dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

Clip angle (141): 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 in the **Clip angle (141)** connection.

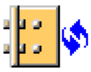
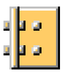
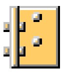
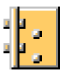
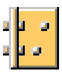
Bolt group dimensions



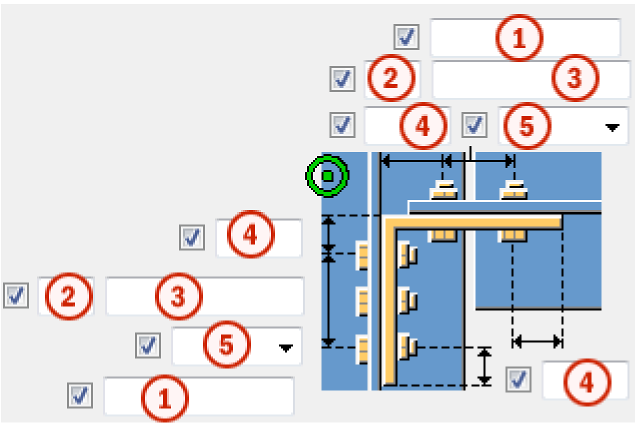
Option	Description
1	Define the dimension for vertical bolt group position.
2	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt.  • **Middle**: From the center line of the bolts to the center line of the secondary part.  • **Below**: From the lower edge of the secondary part to the lowest bolt. 

Option	Description
3	Define the number of bolts.
4	Define the 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 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

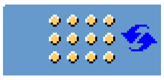
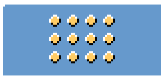
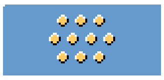
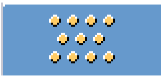
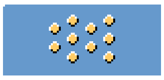
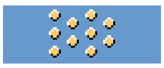
Option	Description
	Default Bolts are not staggered. AutoDefaults can change this option.
	Bolts are not staggered. The bolts that connect the clip angle to the secondary part are on the same horizontal level as the bolts that connect the clip angle to the main part.
	Bolts on the main part are staggered. 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

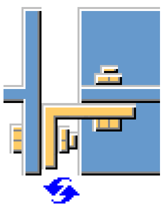


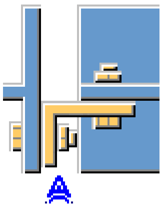
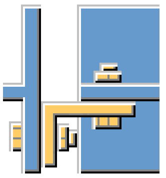
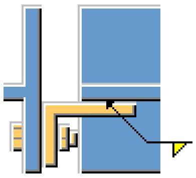
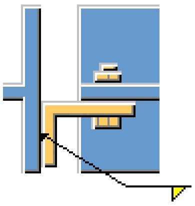
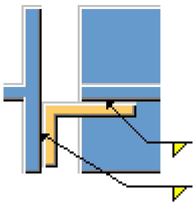
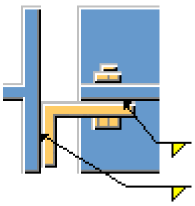
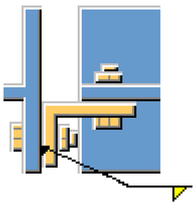
Option	Description
①	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.
②	Define the number of bolts.
③	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
④	Define the bolt edge distance.
⑤	Define the location where the bolts should be attached.

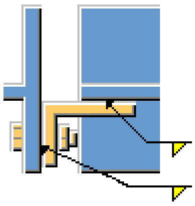
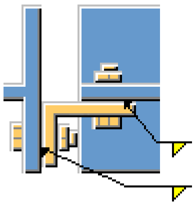
Staggering of bolts

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

Attachment type

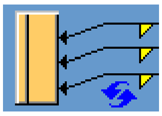
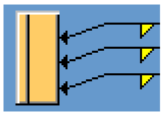
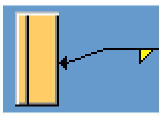
Option	Description
	Default Both parts are bolted. AutoDefaults can change this option.

Option	Description
	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.
	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.
	Main part is not bolted.
	Secondary part is not welded.

Option	Description
	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.

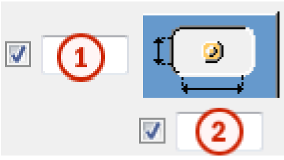
Bolt basic properties

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

Slotted holes

You can define slotted, oversized, or tapped holes.

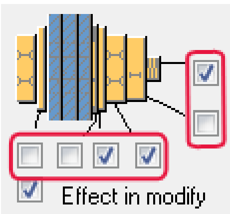


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(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.

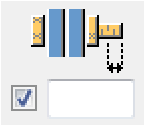
If you want to create a hole only, clear all the check boxes.



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 (141): Beam cut tab

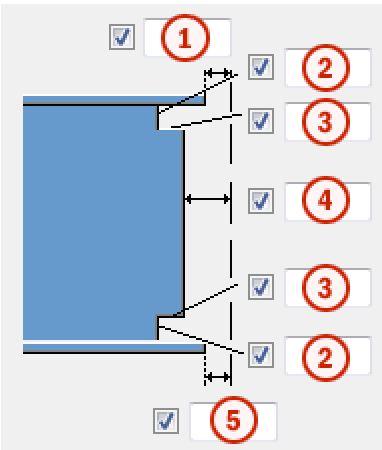
Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts in the **Clip angle (141)** connection.

Weld backing bar

Part	Description
Weld backing bar	Define the weld backing bar thickness and width.

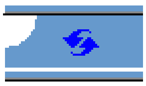
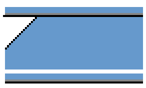
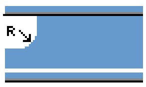
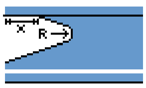
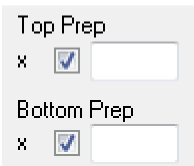
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

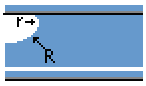
Weld access hole dimensions



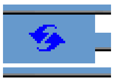
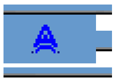
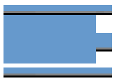
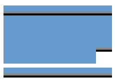
	Description
1	Define the gap between the secondary part top flange and the main part.
2	Define the vertical dimensions for the top and the bottom weld access holes.
3	Define the horizontal dimensions for the top and the bottom weld access holes.
4	Define the gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the **Picture** tab.
5	Define the 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 **Picture** tab.

Weld access holes

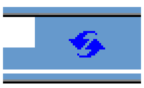
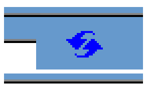
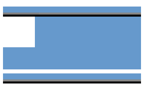
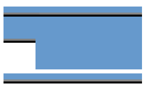
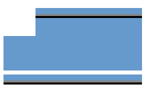
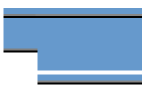
Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	
	Round weld access hole with a radius that you can define in 	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in  and 	

Option	Description	Default
	Cone-shaped weld access hole with radiuses that you can define in  and  Capital **R** defines the large radius (height). Small **r** defines the small radius.	`R = 35` `r = 10`

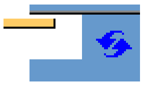
Beam end preparation

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.
	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

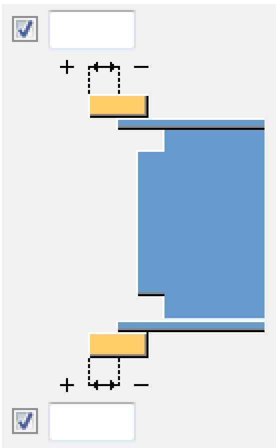
Option for top backing bar	Option for bottom backing bar	Description
		Default Backing bars are created inside the flanges. AutoDefaults can change this option.
		No backing bars are created.
		Backing bars are created inside the flanges.
		Backing bars are created outside the flanges.

Weld backing bar length

Enter the length of the weld backing bar in the field 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.

Clip angle (141): Angle box tab

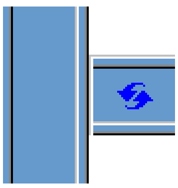
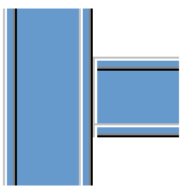
Use the **Angle box** tab to add a seat angle to the **Clip angle (141)** connection.

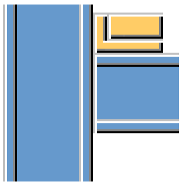
Seat angle The purpose of seat angles is to carry loads from the secondary part. Seat angles can be positioned to top, bottom or both flanges of the secondary part. The seat angle can be stiffened, and bolted or welded to the main and secondary parts.

Part	Description
Stiffeners	Define the stiffener thickness, width and height.
Profile	Define the seat angle profile by selecting it from the profile catalog.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

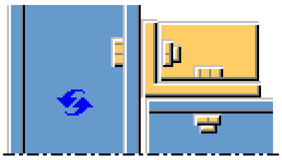
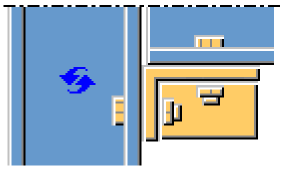
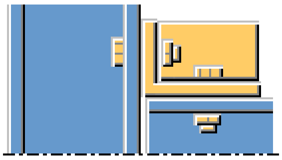
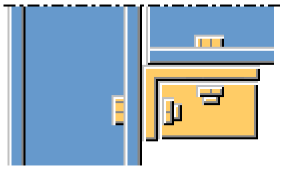
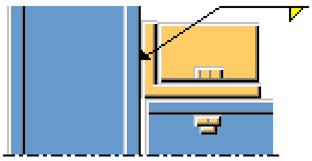
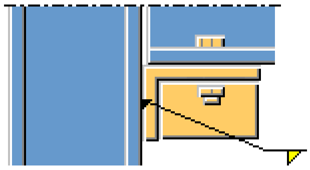
Seat angle position

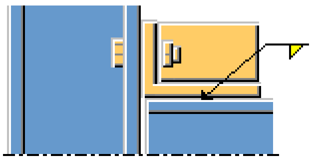
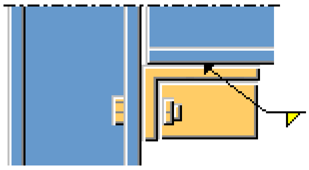
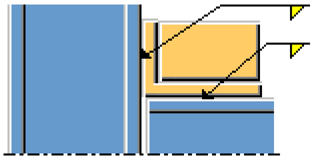
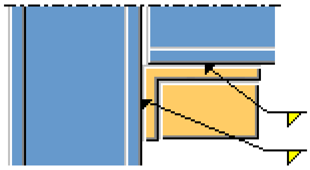
Option	Description
	Default No seat angle is created. AutoDefaults can change this option.
	No seat angle is created.

Option	Description
	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.

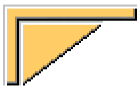
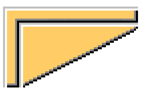
Seat angle attachment

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

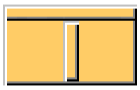
Option for top seat angle	Option for bottom seat angle	Description
		Default Bolted Seat angle is bolted to the main part and to the secondary part. AutoDefaults can change this option.
		Bolted Seat angle is bolted to the main part and to the secondary part.
		Welded-bolted Seat angle is welded to the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

Option for top seat angle	Option for bottom seat angle	Description
		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.

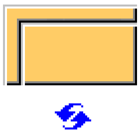
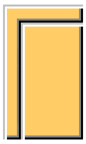
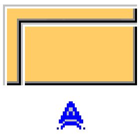
Stiffener type

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

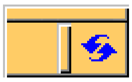
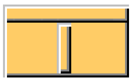
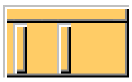
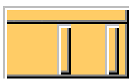
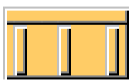
Seat angle rotation

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 **Middle stiffeners** option in the **Middle stiffener position** list.

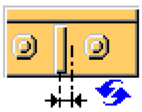
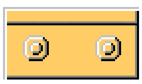
Seat angle orientation

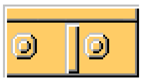
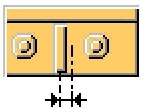
Option	Description
	Default The longer leg of the seat angle is connected to the secondary part. AutoDefaults can change this option.
	The longer leg of the seat angle is connected to the secondary part.
	The longer leg of the seat angle is connected to the main part.
	Automatic The longer leg of the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

Side stiffener position

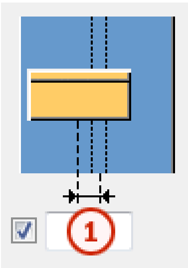
Option	Description
	Default No side stiffeners are created. AutoDefaults can change this option.
	No side stiffeners are created.
	Near side side stiffeners are created.
	Far side side stiffeners are created.
	Near side and far side stiffeners are created.

Middle stiffener position

Option	Description
	Default According to bolts AutoDefaults can change this option.
	No middle stiffener plate is created.

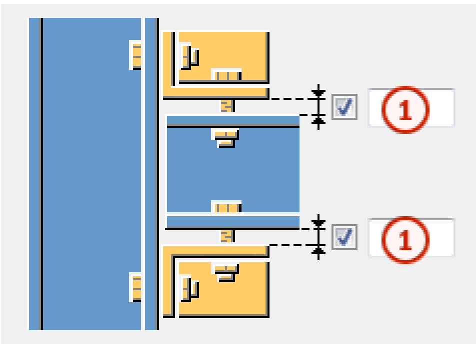
Option	Description
	Middle stiffeners The stiffener plate is positioned in the middle of the seat angle. Enter the number of middle stiffeners in the **Number of middle stiffeners** field. Multiple stiffeners are centered and equally spaced.
	According to bolts The stiffener plate is positioned between 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 field below the **According to bolts** option.

Seat angle offset



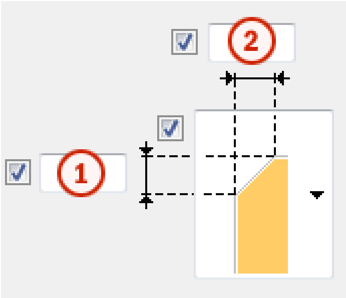
	Description
1	Define the seat angle horizontal offset from the center line of the main part.

Gap



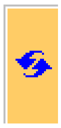
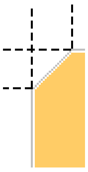
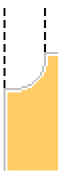
	Description
1	Define the top gap and the bottom gap between the seat angle and the secondary part.

Chamfer dimensions



	Description
1	Define the vertical dimension of the chamfer.
2	Define the horizontal dimension of the chamfer.

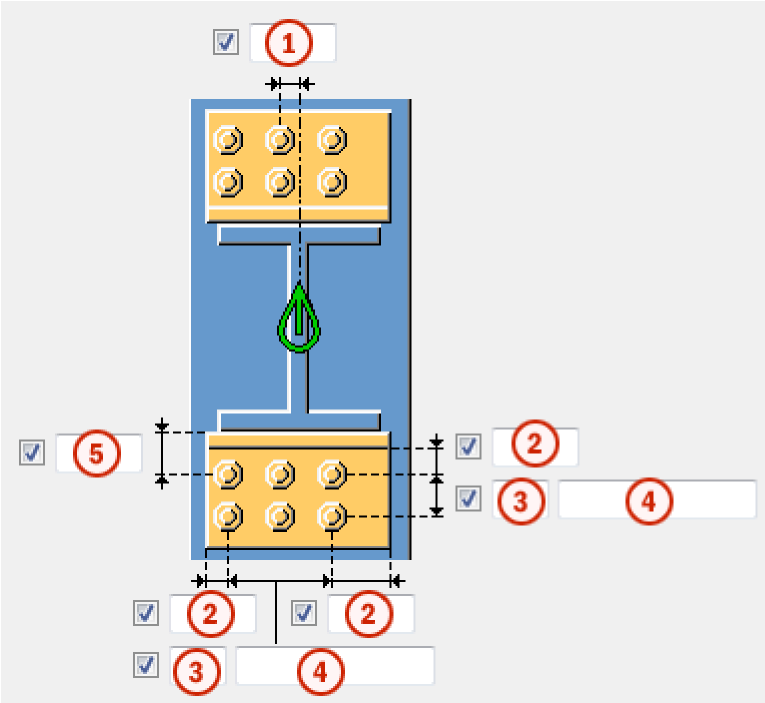
Chamfer type

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

Clip angle (141): BoxPBolts tab

Use the **BoxPBolts** tab to control properties of the bolts that connect the seat angle to the main part in the **Clip angle (141)** connection.

Bolt group dimensions



Option	Description
1	Define the dimension for horizontal bolt group position. The dimension is defined from the middle line of the secondary beam.
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.
4	Define the 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 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.

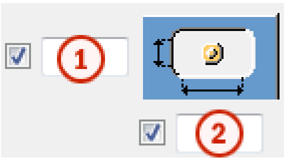
Bottom **Bottom** refers to the bolt group that connects the bottom seat angle to the main part.

Bolt basic properties

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

Option	Description	Default
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes You can define slotted, oversized, or tapped holes.

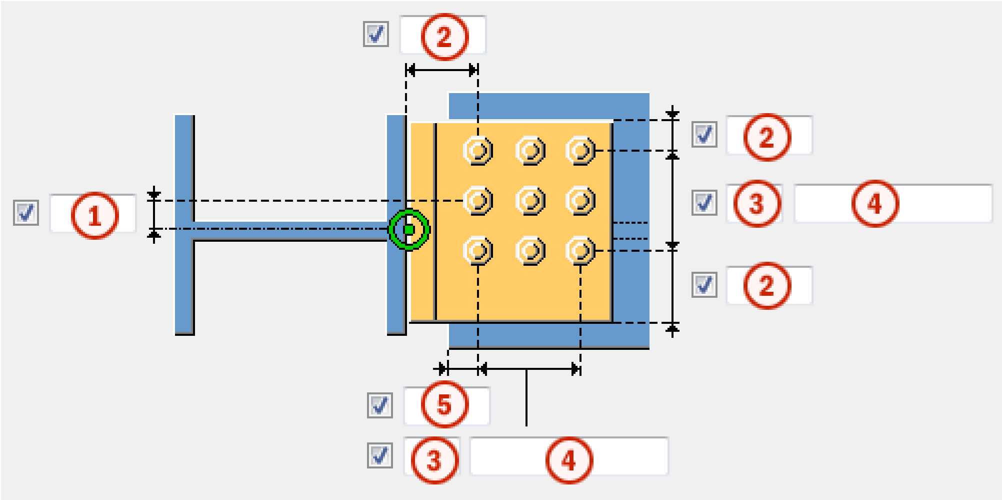


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

Clip angle (141): BoxSBolts tab

Use the **BoxSBolts** tab to control properties of the bolts that connect the seat angle to the secondary part in the **Clip angle (141)** connection.

Bolt group dimensions



Option	Description
①	Define the dimension for vertical bolt group position. The dimension is defined from the middle line of the secondary beam.
②	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
③	Define the number of bolts.
④	Define the 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 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.

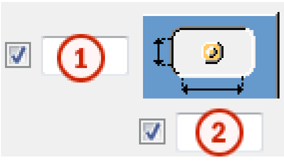
Bottom **Bottom** refers to the bolt group that connects the bottom seat angle to the secondary part.

Bolt basic properties

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

Option	Description	Default
	when bolts are used with a shaft. This has no effect when full-threaded bolts are used.	
Site/ Workshop	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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

2.4 Two sided clip angle (143)

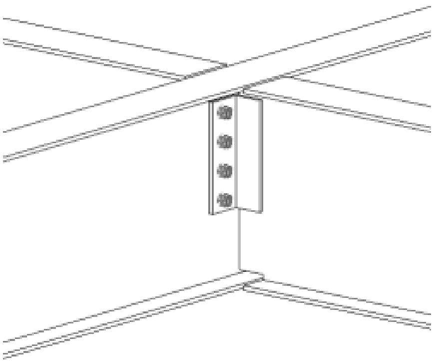
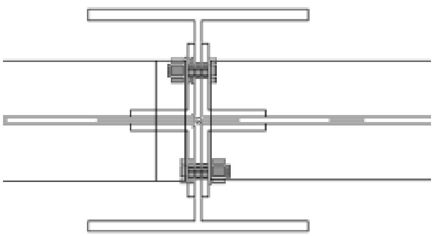
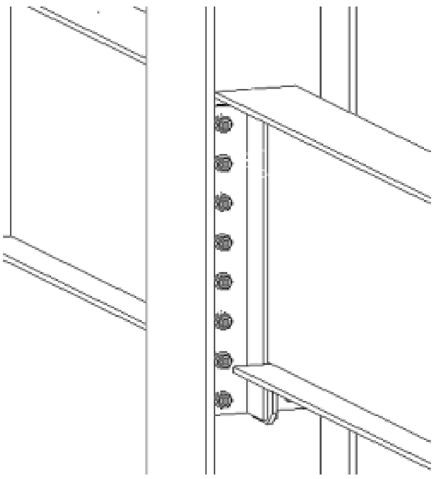
Two sided clip angle (143) connects two beams, or a beam to a column, using single or double clip angles. The secondary beam can be leveled or sloped. Welded haunch plates and a seat angle are optional.

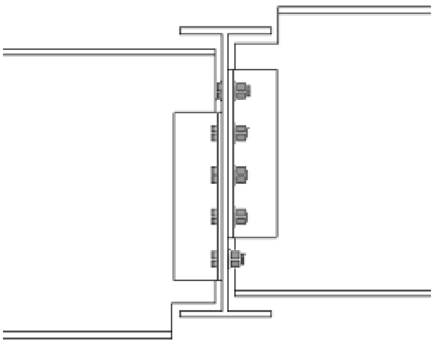
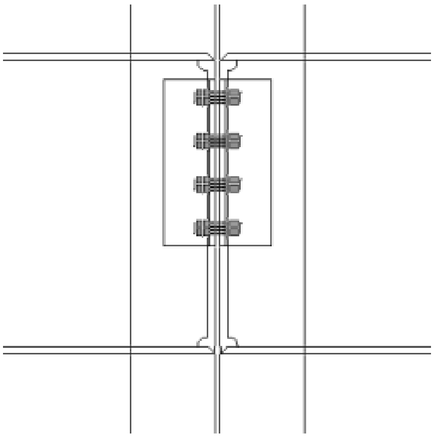
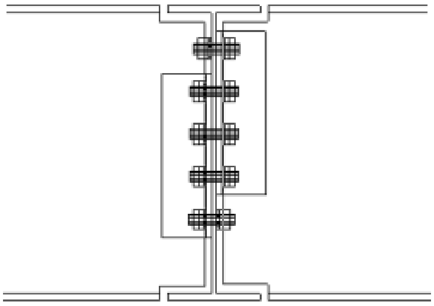
Objects created

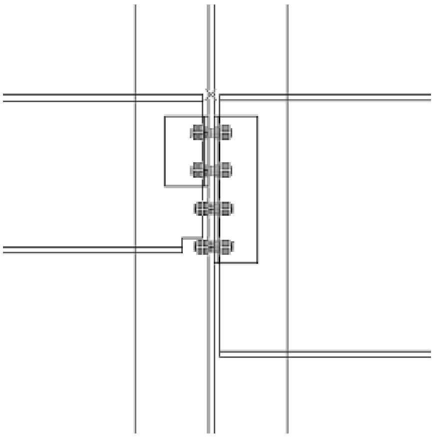
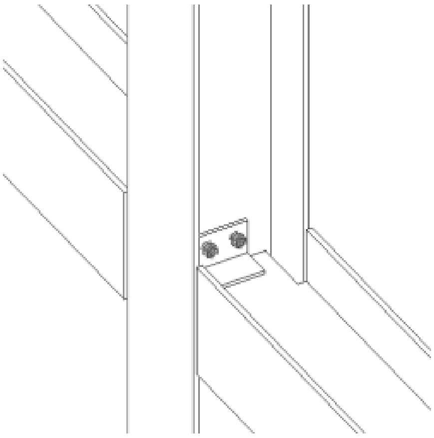
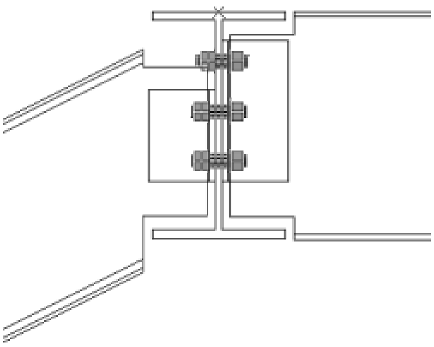
- Clip angles (2)
- Haunch plates (optional)
- Seat angle (optional)
- Weld backing bars (optional)

- Bolts
- Welds
- Cuts

Use for

Situation	Description
	Clip angle connection. Single-sided/double-sided clip. Two secondary parts. Bolted/bolted, welded/bolted, welded/welded options.
	Clip angle connection. Single-sided/double-sided clip. Two secondary parts. Bolted/bolted, welded/bolted, welded/welded options.
	Clip angle connection. Single-sided/double-sided clip. Two secondary parts. Haunch option. Top/Bottom/Both

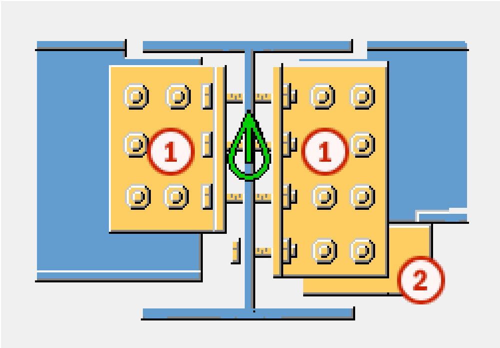
Situation	Description
	Clip angle connection. Single-sided/double-sided clip. Two secondary parts at different heights.
	Clip angle connection. Single-sided/double-sided clip. Two secondary parts. Weld preparation and weld access holes for moment connection.
	Clip angle connection. Single-sided/double-sided clip. Two secondary parts. Safety connection.

Situation	Description
	Clip angle connection. Automatic notching of secondary part to provide bolt clearance.
	Clip angle connection. Single-sided/double-sided clip. Two secondary parts rotated.
	Clip angle connection. Single-sided/double-sided clip. Two secondary parts, one sloped.

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 mddle mouse button to create the connection.

Part identification key



	Part
1	Clip angles
2	Haunch plate

You can use the `joints.def` file to change the default values of this component.

See also

Two sided clip angle (143): Picture tab on page 450

Two sided clip angle (143): Parts tab on page 453

Two sided clip angle (143): Haunch tab on page 457

Two sided clip angle (143): Notch tab on page 459

Two sided clip angle (143): Bolts tab on page 464

Two sided clip angle (143): Angle box tab on page 469

Two sided clip angle (143): BoxPBolts tab on page 475

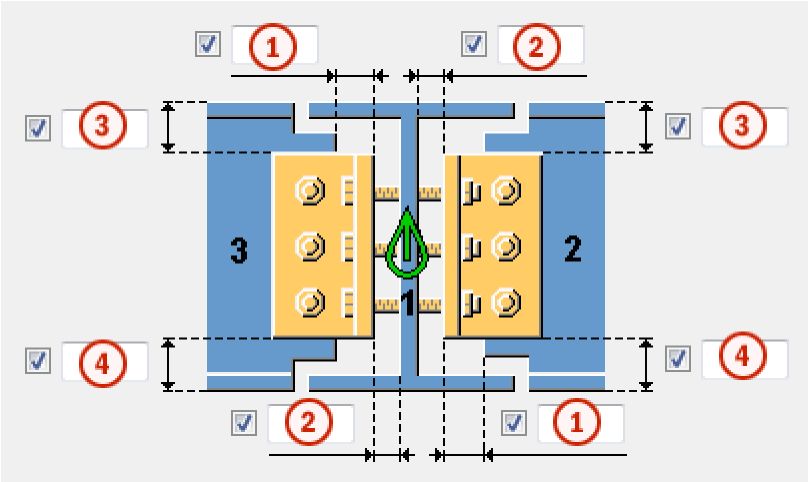
Two sided clip angle (143): BoxSBolts tab on page 477

Two sided clip angle (143): Beam cut tab on page 479

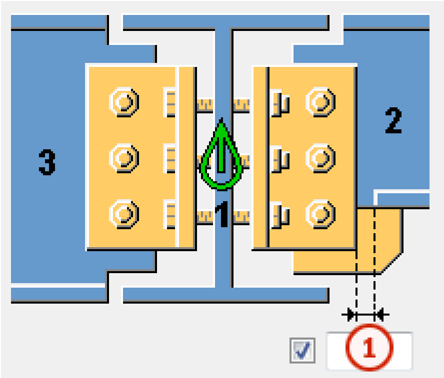
Two sided clip angle (143): Picture tab

Use the **Picture** tab to control the clip angle dimensions and to define how the beam end is cut in the **Two sided clip angle (143)** connection.

Dimensions

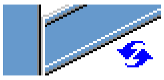
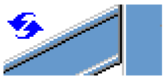
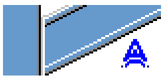
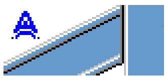
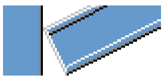
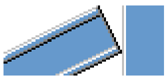
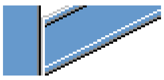
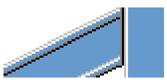


Option	Description	Default
①	Define the cut length for the secondary part. The cut is defined from the clip angle edge.	
②	Define the gap between the main part and the clip angle.	0
③	Define the clip angle upper edge distance from the top of the secondary beam. The upper edge position of the angle modifies 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.
④	Define the 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.

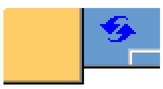
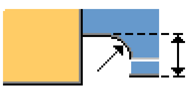


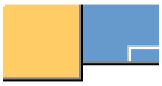
Option	Description	Default
1	Define the size of the strip made to the secondary part flange. The cutting point of the flange is defined from the clip angle edge.	The flange is automatically stripped when the clip angle crosses the flange.

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.

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.

Option	Description
	Flange cut The secondary beam flange is cut on the same side as the clip angle if the clip angle crosses the flange.

Two sided clip angle (143): Parts tab

Use the **Parts** tab to control the size, position and orientation of the clip angles in the **Two sided clip angle (143)** connection.

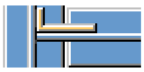
Profile NS/FS

Option	Description	Default
Profile NS **Profile 2 NS**	Define the 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.
Profile FS **Profile 2 FS**	Define the 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.

Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	`ANGLE`

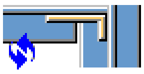
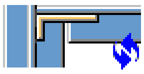
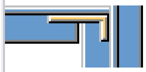
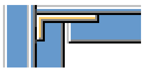
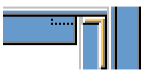
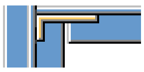
Clip angle position

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.

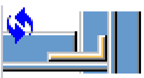
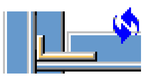
Near side clip angle orientation

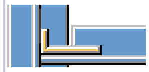
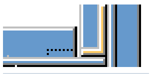
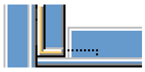
These options switch the unequal legs of the near side clip angles.

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.

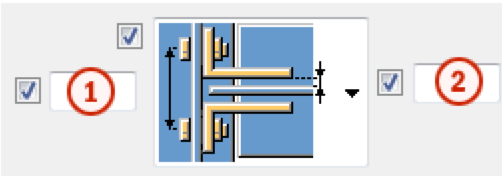
Far side clip angle orientation

These options switch the unequal legs of the far side clip angles.

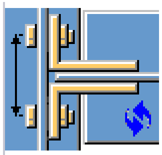
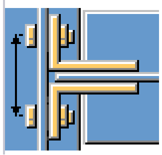
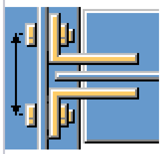
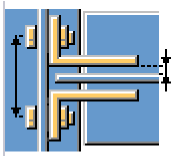
Option for the second secondary part	Option for the first secondary part	Description
		Default Not switched AutoDefaults can change this option.

Option for the second secondary part	Option for the first secondary part	Description
		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	Define the bolt spacing.
2	Define the weld gap.

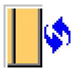
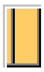
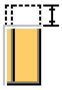
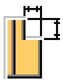
Option	Description
	Default Bolt spacing without weld gap AutoDefaults can change this option.
	Bolt spacing without weld gap
	Bolt spacing with weld gap
	Bolt spacing with weld gap that you can define.

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.

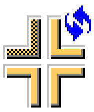
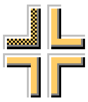
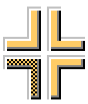
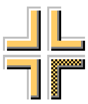
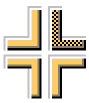
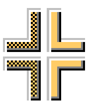
Safety connection type

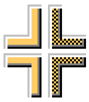
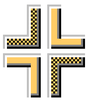
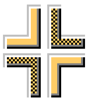
Define whether the created connection is a standard connection or a safety connection.

Option	Description
	Default No safety connection is created. AutoDefaults can change this option.
	No safety connection is created.
	Clip angles are moved down to create safety connection. Enter the dimension in the **Vertical cut/offset** field.
	Clip angles are notched to create safety connection. Enter the notch dimensions in the **Vertical cut/offset** and **Horizontal cut** fields.

Safety connection location

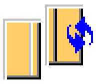
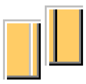
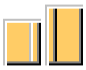
Define the location of the safety connection.

Option	Description
	Default On the first secondary beam AutoDefaults can change this option.
	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

Option	Description
	On the second secondary beam
	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.

Two sided clip angle (143): Haunch tab

Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges in the **Two sided clip angle (143)** connection.

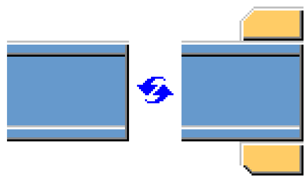
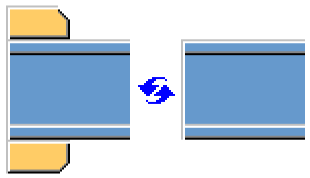
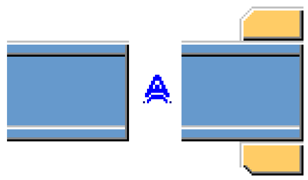
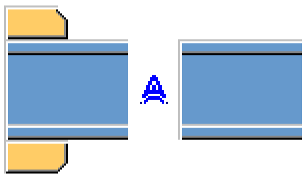
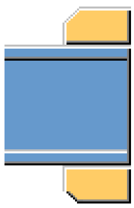
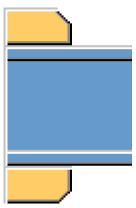
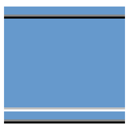
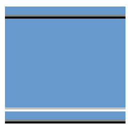
Haunch plates

Part	Description
Top plate	Define the top haunch plate thickness, width and height.
Bottom plate	Define the bottom haunch plate thickness, width and height.

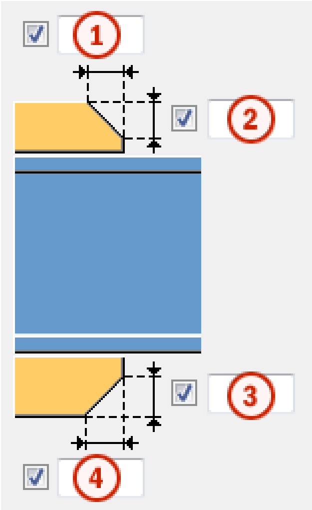
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

Option	Description	Default
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Hauch 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 (**t**) field for the haunch plate you do not need (top or bottom plate).
		Haunch plates are not created.

Haunch plate chamfers



	Description
1	Define the width of the top haunch plate chamfer.
2	Define the height of the top haunch plate chamfer.
3	Define the height of the bottom haunch plate chamfer.
4	Define the width of the bottom haunch plate chamfer.

Two sided clip angle (143): Notch tab

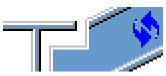
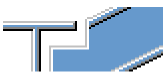
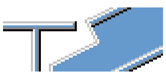
Use the **Notch** tab to automatically create notches for the secondary beams and to control the notch properties in the **Two sided clip angle (143)** connection. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

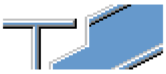
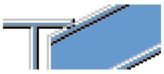
Automatic notching

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

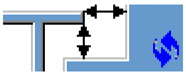
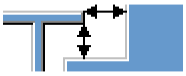
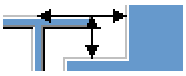
Notch shape

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

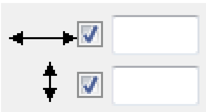
Option	Description
	Default Creates notches to the secondary beam. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.
	Creates notches to the secondary beam. The cuts are square to the secondary beam web.

Option	Description
	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.

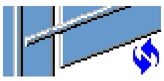
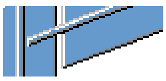
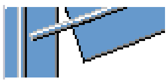
Notch size

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.

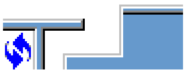
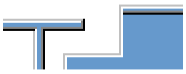
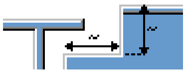


Flange cut shape

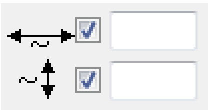
Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

Notch dimension rounding

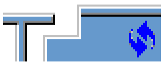
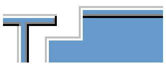
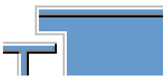
Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

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.

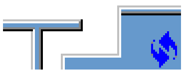
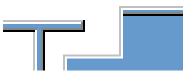
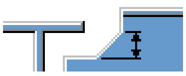
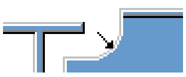
The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



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.

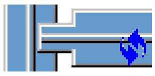
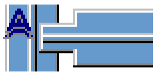
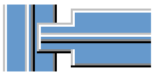
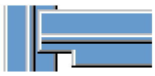
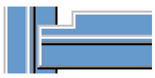
Notch chamfer

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.

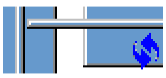
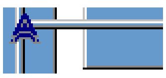
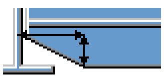
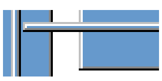
Enter a radius for the chamfer.

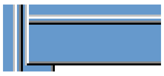
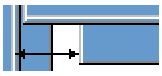
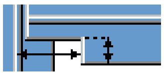
Manual notching Use manual notching when a part that does not belong to the connection clashes with the secondary beam. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.

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

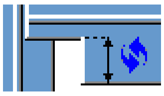
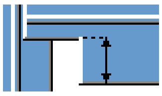
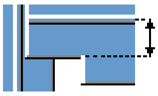
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the 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 1 and 2.

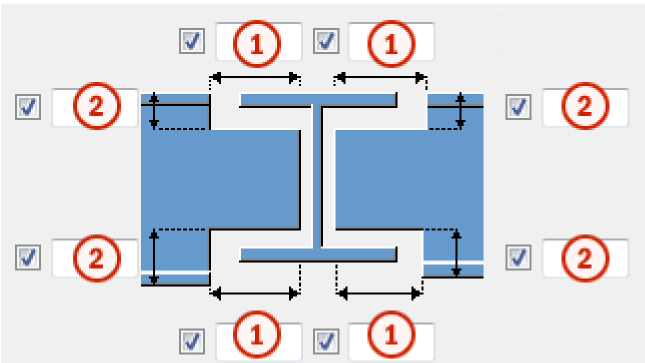
Option	Description
	The flange is not cut.
	Creates cuts to the flange according to the value in the field 1 to make it flush with the web.
	Creates cuts to the flange according to the values in the fields 1 and 2.

Flange notch depth

Option	Description
	Default Defines the flange notch depth. AutoDefaults can change this option.
	Defines the flange notch depth.
	Defines the 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



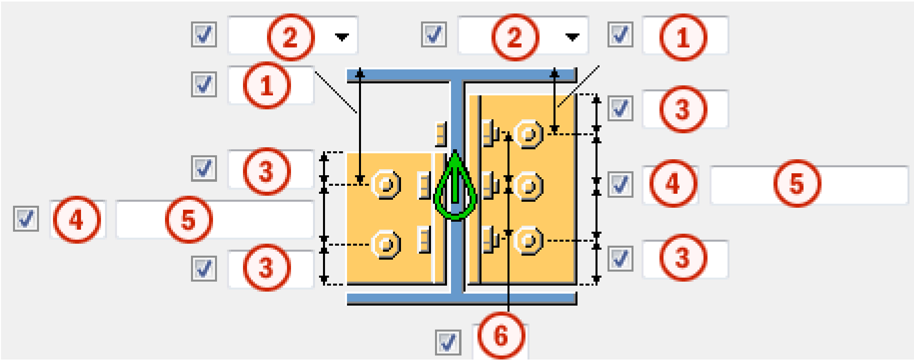
	Description	Default
1	Define the dimensions for the horizontal flange cuts.	`10 mm`
2	Define the dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is

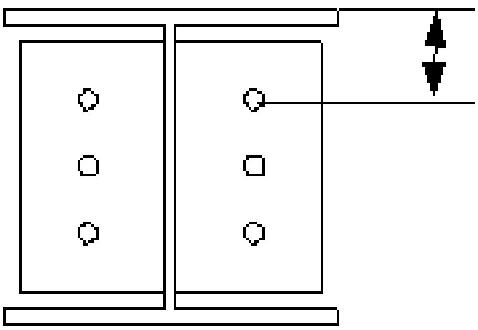
	Description	Default
		rounded up to the nearest 5 mm.

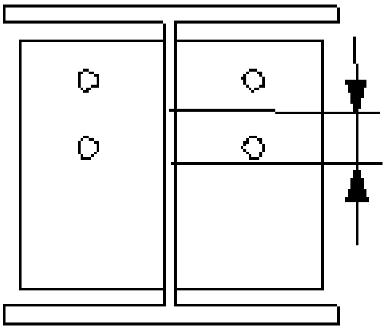
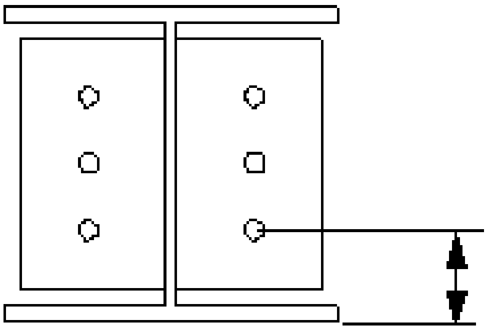
Two sided clip angle (143): Bolts tab

Use the **Bolts** tab to control bolts and welds that connect the clip angle to the main part and to the secondary part in the **Two sided clip angle (143)** connection.

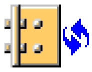
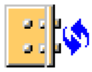
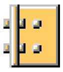
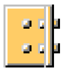
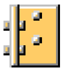
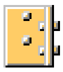
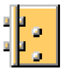
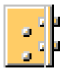
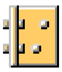
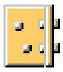
Bolt group dimensions



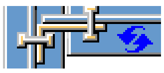
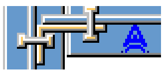
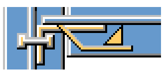
Option	Description
1	Define the dimension for vertical bolt group position.
2	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt. 

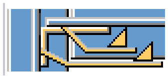
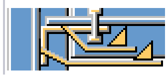
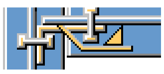
Option	Description
	• **Middle**: From the center line of the bolts to the center line of the secondary part.  • **Below**: From the lower edge of the secondary part to the lowest bolt. 
3	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Define the number of bolts.
5	Define the 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 the number of rows of bolts through the main part.

Staggering of bolts on clip angle

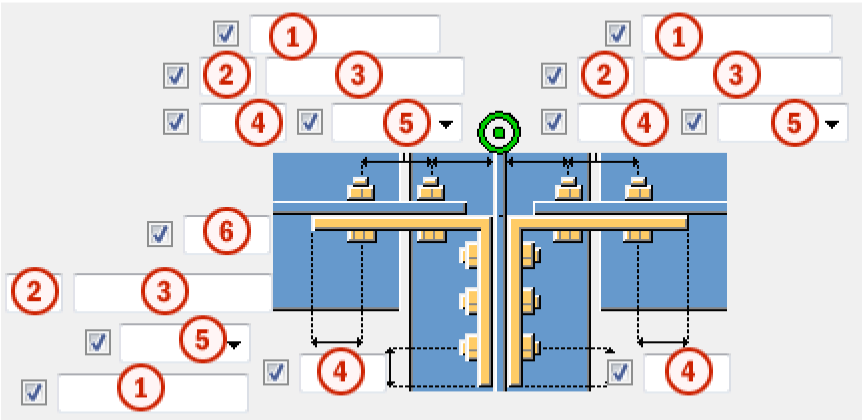
Option for second secondary	Option for first secondary	Description
		Default Bolts are not staggered. AutoDefaults can change this option.
		Bolts are not staggered. The bolts that connect the clip angle to the secondary part are on the same horizontal level as the bolts that connect the clip angle to 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
	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.
	Both parts are bolted.
	Main part is welded and secondary part is bolted.
	Main part is bolted and secondary part is welded.

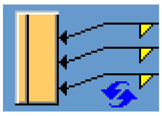
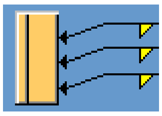
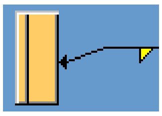
Option	Description
	Both parts are welded.
	Main part is not bolted.
	Secondary part is not welded.
	Secondary part is not bolted.
	Both parts are bolted and welded.

Bolt group dimensions



Option	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	Define the number of bolts.
3	Define the 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	Define the bolt edge distance.
5	Define the location where the bolts should be attached.
6	Define the angle leg length.

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.

Same bolt length for all

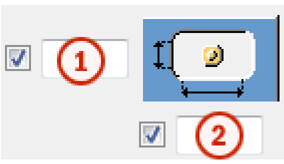
Set this option to **Yes** to have the same bolt length for all bolts. The longest bolt defines how long the shorter bolts are with extra length.

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

You can define slotted, oversized, or tapped holes.

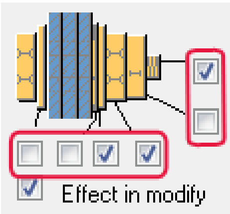


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.

Option	Description	Default
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

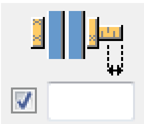
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



Two sided clip angle (143): Angle box tab

Use the **Angle box** tab to add a seat angle to the **Two sided clip angle (143)** connection.

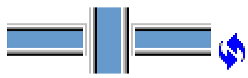
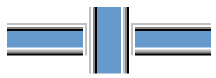
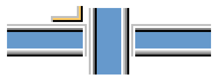
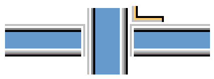
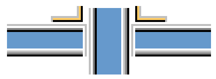
Seat angle The purpose of seat angles is to carry loads from the secondary part. Seat angles can be positioned to top, bottom or both flanges of the secondary part. The seat angle can be stiffened, and bolted or welded to the main and secondary parts.

Part	Description
Stiffeners	Define the stiffener thickness, width and height.

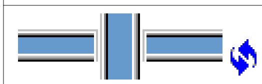
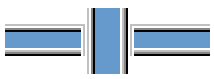
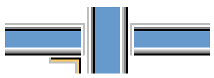
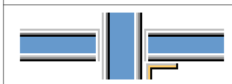
Part	Description
Profile	Define the seat angle profile by selecting it from the profile catalog.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

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.

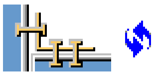
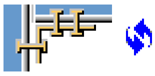
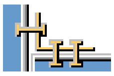
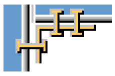
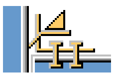
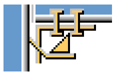
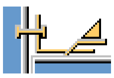
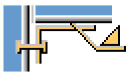
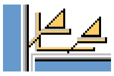
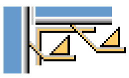
Bottom seat angle position

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 second secondary part flange.

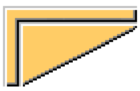
Option	Description
	Seat angles are created at the bottom of both flanges.

Seat angle attachment

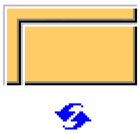
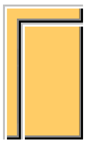
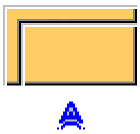
Seat angle is positioned at the top or at the bottom of the secondary part.

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.

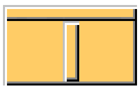
Stiffener type

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

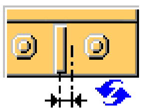
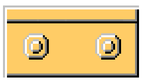
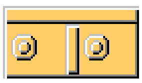
Seat angle orientation

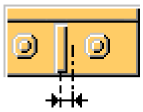
Option	Description
	Default The longer leg of the seat angle is connected to the secondary part. AutoDefaults can change this option.
	The longer leg of the seat angle is connected to the secondary part.
	The longer leg of the seat angle is connected to the main part.
	Automatic The longer leg of the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

Seat angle rotation

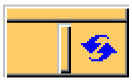
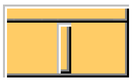
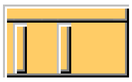
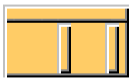
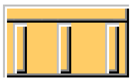
Option	Description
	Default Seat angle is not rotated. AutoDefaults can change this option.
	Seat angle is not rotated.
	Seat angle is rotated horizontally 90 degrees. To stiffen the rotated seat angle, select the **Middle stiffeners** option in the **Middle stiffener position** list.

Middle stiffener position

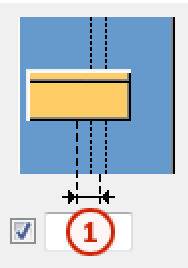
Option	Description
	Default According to bolts AutoDefaults can change this option.
	No middle stiffener plate is created.
	Middle stiffeners The stiffener plate is positioned in the middle of the seat angle.

Option	Description
	Enter the number of middle stiffeners in the **Number of middle stiffeners** field. 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 field below the **According to bolts** option.

Side stiffener position

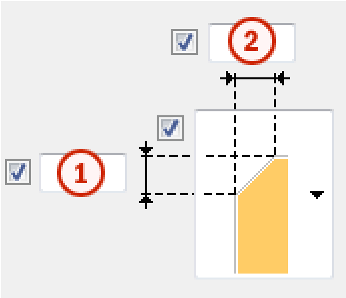
Option	Description
	Default No side stiffeners are created. AutoDefaults can change this option.
	No side stiffeners are created.
	Near side side stiffeners are created.
	Far side side stiffeners are created.
	Near side and far side stiffeners are created.

Seat angle offset



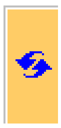
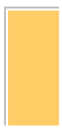
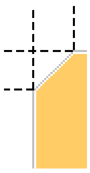
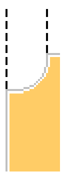
	Description
1	Define the seat angle horizontal offset from the center line of the main part.

Chamfer dimensions

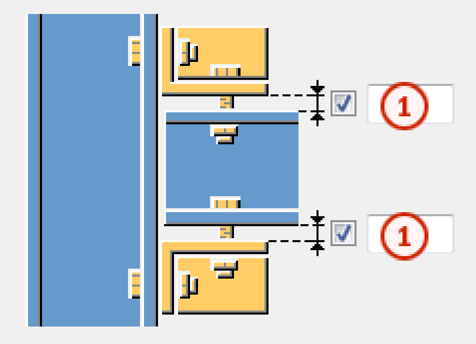


	Description
1	Define the vertical dimension of the chamfer.
2	Define the horizontal dimension of the chamfer.

Chamfer type

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

Gap

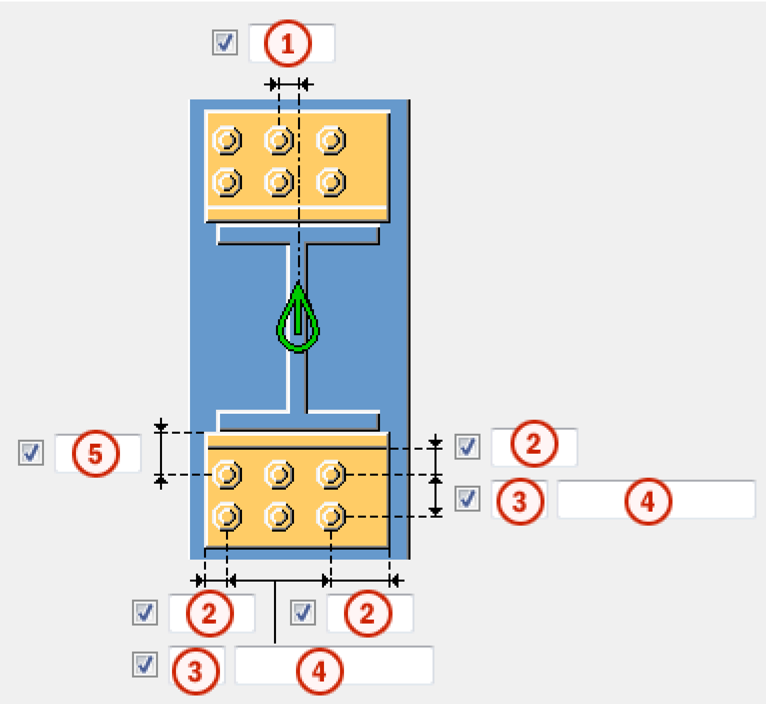


	Description
1	Define the top gap and the bottom gap between the seat angle and the secondary part.

Two sided clip angle (143): BoxPBolts tab

Use the **BoxPBolts** tab to control properties of the bolts that connect the seat angle to the main part in the **Two sided clip angle (143)** connection.

Bolt group dimensions



Option	Description
1	Define the dimension for horizontal bolt group position. The dimension is defined from the middle line of the secondary beam.

Option	Description
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.
4	Define the 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 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

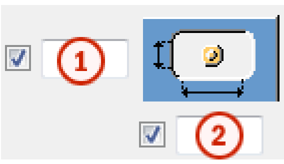
Bottom refers to the bolt group that connects the bottom seat angle to the main part.

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

You can define slotted, oversized, or tapped holes.



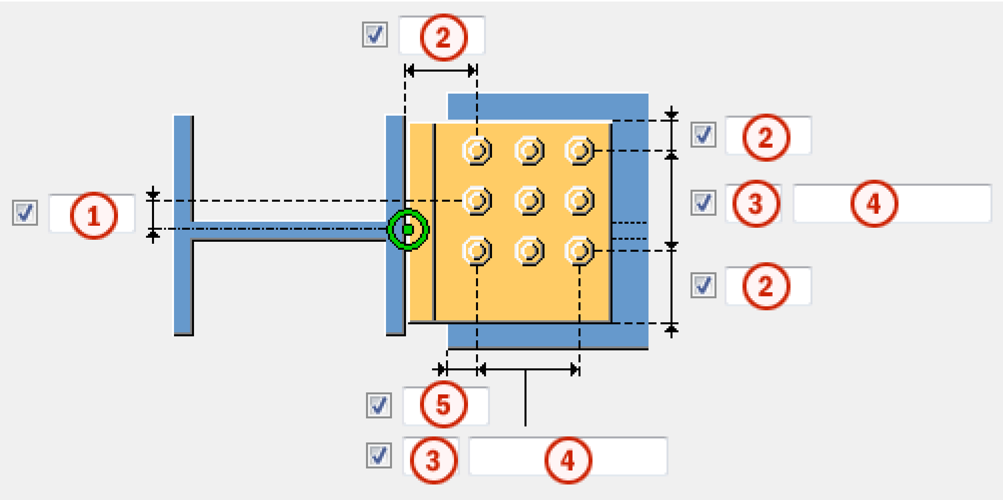
Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.

Option	Description	Default
②	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

Two sided clip angle (143): BoxSBolts tab

Use the **BoxSBolts** tab to control properties of the bolts that connect the seat angle to the secondary part in the **Two sided clip angle (143)** connection.

Bolt group dimension



Option	Description
①	Define the dimension for vertical bolt group position. The dimension is defined from the middle line of the secondary beam.
②	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
③	Define the number of bolts.

Option	Description
4	Define the 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 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

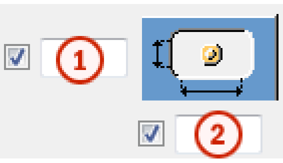
Bottom refers to the bolt group that connects the bottom seat angle to the secondary part.

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	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
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

Two sided clip angle (143): Beam cut tab

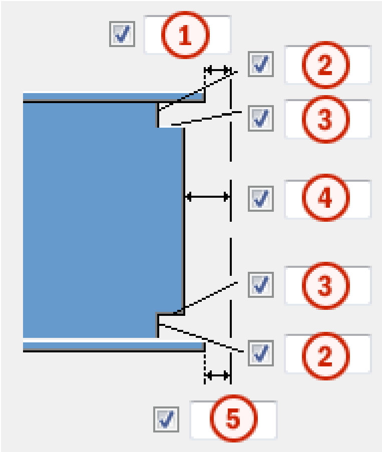
Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts in the **Two sided clip angle (143)** connection.

Weld backing bar

Part	Description
Weld backing bar	Define the weld backing bar thickness and width.

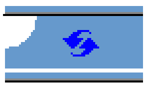
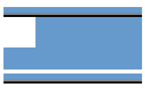
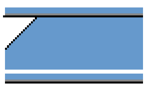
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

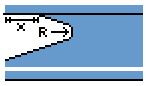
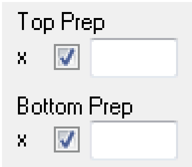
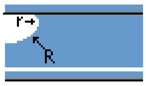
Weld access hole dimensions



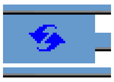
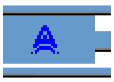
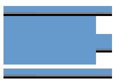
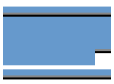
	Description
1	Define the gap between the secondary part top flange and the main part.
2	Define the vertical dimensions for the top and the bottom weld access holes.
3	Define the horizontal dimensions for the top and the bottom weld access holes.
4	Define the gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the **Picture** tab.
5	Define the 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 **Picture** tab.

Weld access holes

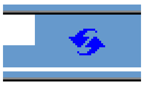
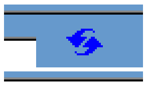
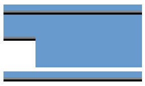
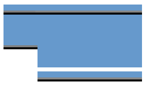
Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	

Option	Description	Default
	Round weld access hole with a radius that you can define in 	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in  and 	
	Cone-shaped weld access hole with radiuses that you can define in  and  Capital **R** defines the large radius (height). Small **r** defines the small radius.	`R = 35` `r = 10`

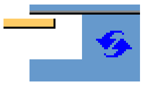
Beam end preparation

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.
	Top flange is prepared.
	Bottom flange is prepared.

Flange cut

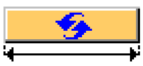
Option for top flange	Option for bottom flange	Description
		Default Flange is not cut. AutoDefaults can change this option.
		Flange is not cut.
		Flange is cut.

Weld backing bars

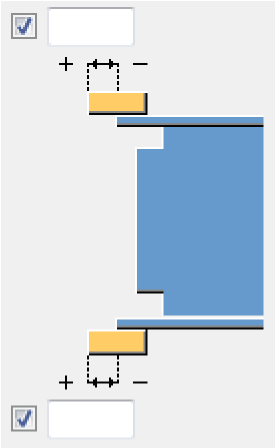
Option for top backing bar	Option for bottom backing bar	Description
		Default Backing bars are created inside the flanges. AutoDefaults can change this option.
		No backing bars are created.
		Backing bars are created inside the flanges.
		Backing bars are created outside the flanges.

Weld backing bar length

Enter the length of the weld backing bar in the field 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.

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 (190) on page 484

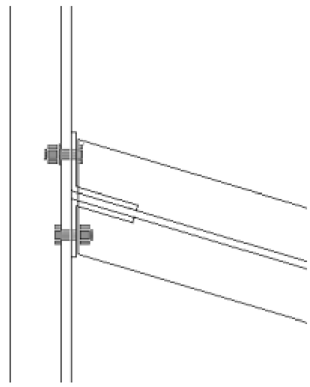
3.1 Bent plate (190)

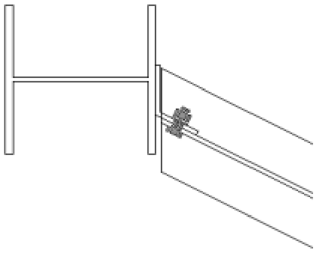
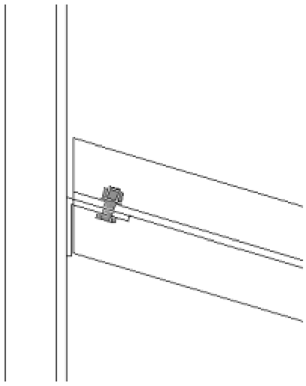
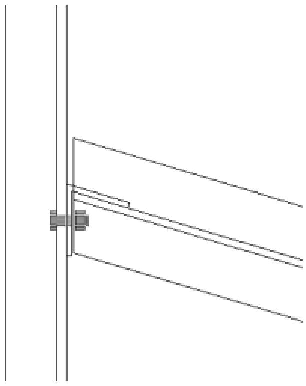
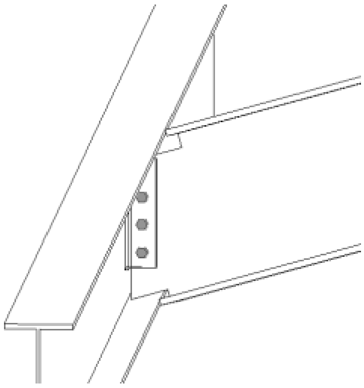
Bent plate (190) connects two beams or a beam and a column using one or two bolted or welded bent plates. The secondary beam can be leveled or sloped and/or skewed. Welded haunch plates are optional.

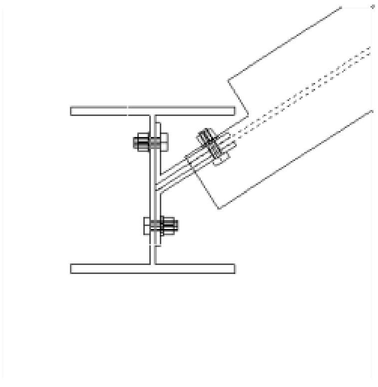
Objects created

- Bent plate (1 or 2)
- Stiffeners (optional)
- Top and bottom haunch plate (optional)
- Weld backing bars (optional)
- Bolts
- Welds
- Cuts

Use for

Situation	Description
	Bent plate connecting two beams. The secondary part is skewed.

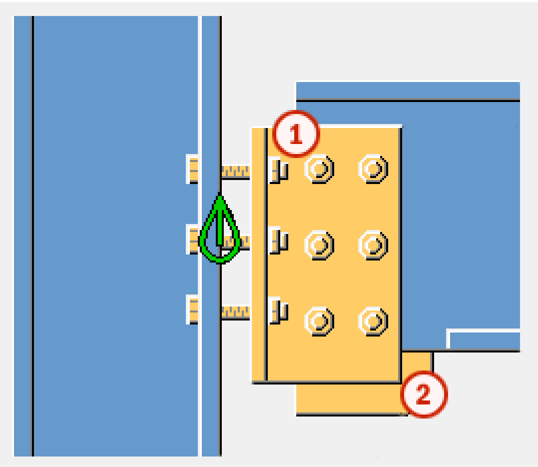
Situation	Description
	Bent plate connected to a column flange. The secondary part is skewed.
	Bent plate connecting two beams. The secondary part is skewed.
	Bent plate connecting two beams. The secondary part is skewed. The plate can be placed to various locations.
	Bent plate connecting two beams. The secondary part is skewed and sloped.

Situation	Description
	Bent plate connected to a column web. The secondary part is 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 part is selected.

Part identification key



	Part
1	Bent plate
2	Haunch plate

You can use the `joints.def` file to change the default values of this component.

See also

Bent plate (190): Picture tab on page 487

Bent plate (190): Plates tab on page 488

Bent plate (190): Stiffeners tab on page 491

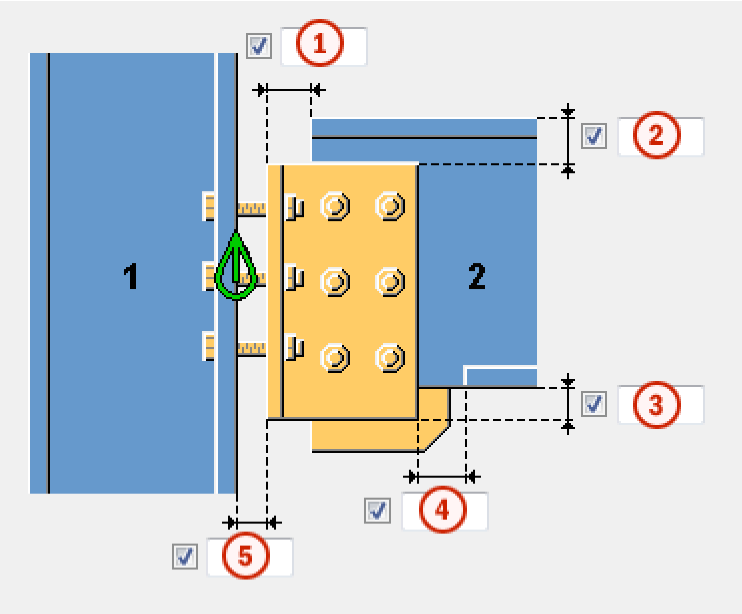
Bent plate (190): Haunch tab on page 495

[Bent plate (190): Notch tab on page 497]
[Bent plate (190): Bolts tab on page 501]
[Bent plate (190): Beam cut tab on page 506]

Bent plate (190): Picture tab

Use the **Picture** tab to control the position of the bent plate and to define how the beam end is cut in the **Bent plate (190)** connection.

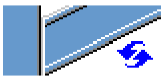
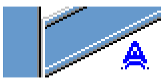
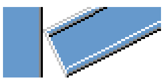
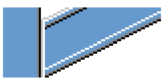
Dimensions



	Description	Default
1	Define the cut length for the secondary part. The cutting point is defined from the bent plate edge.	`20 mm`
2	Define the bent plate upper edge distance from the top of the secondary part. The upper edge position of the plate modifies the bent plate height. 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.	If no value is entered, bolts and bolt edge distances define the size of the plate.

	Description	Default
3	Define the 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	Define the 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	Define the 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.

Bent plate (190): Plates tab

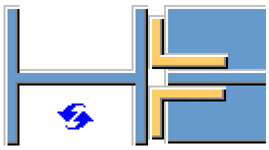
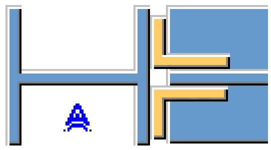
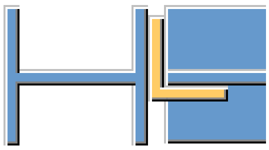
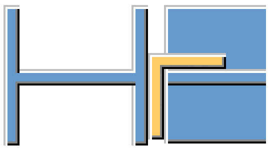
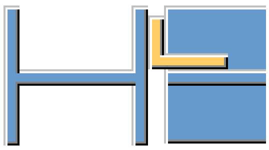
Use the **Plates** tab to control the thickness, position and attachment of the bent plate in the **Bent plate (190)** connection. The dimensions on the **Picture** tab and the **Bolts** tab also affect the size of the bent plate.

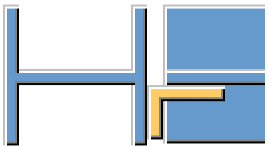
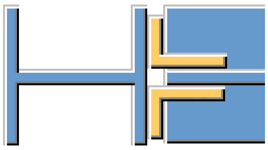
Bent plate NS/FS

Part	Description
Bent plate	Define the bent plate thickness.

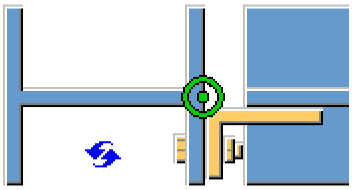
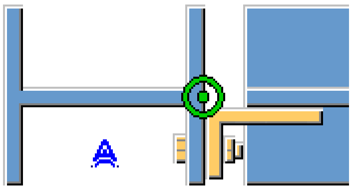
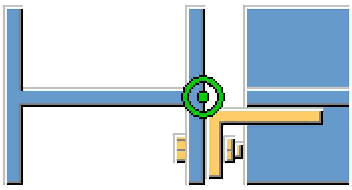
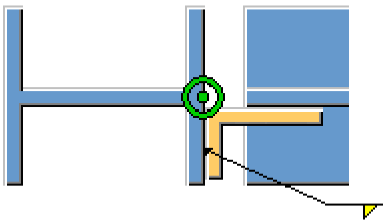
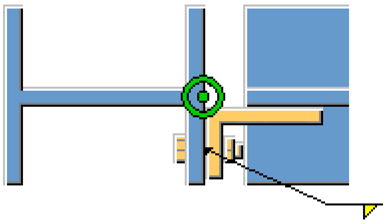
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

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.
	Far side switched Creates a far side bent plate with a leg pointing to the near side.
	Far side

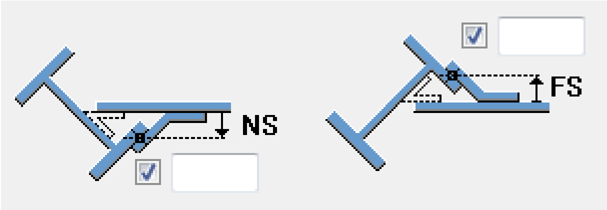
Option	Description
	Near side
	Near side and far side

Main and secondary part attachment type

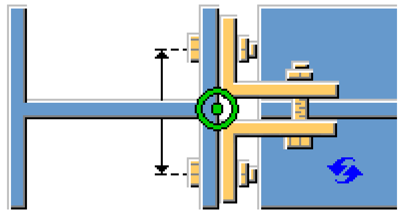
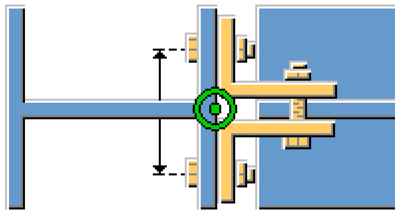
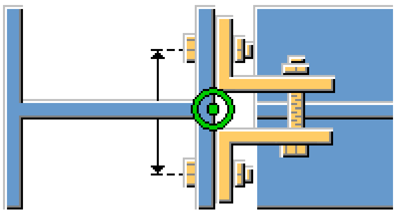
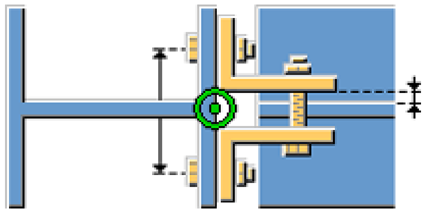
Option	Description
	Default Bent plate is bolted to the main part. AutoDefaults can change this option.
	Automatic Bolted
	Bolted
	Welded
	Bolted and welded

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
	Default Define the bolt spacing. Weld gap is not created. AutoDefaults can change this option.
	Define the bolt spacing. Weld gap is not created.
	Define the bolt spacing. Weld gap is created.
	Define the bolt spacing and the weld gap.

Bent plate (190): Stiffeners tab

Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position, and type in the **Bent plate (190)** connection.

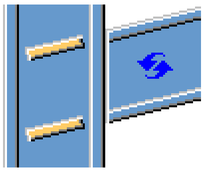
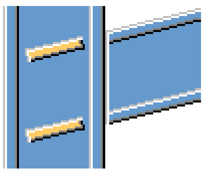
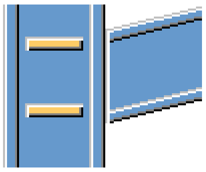
Stiffener plate dimensions

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.

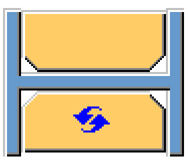
Part	Description
Bottom NS	Define the bottom near side stiffener thickness, width and height.
Bottom FS	Define the bottom far side stiffener thickness, width and height.

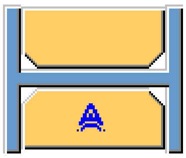
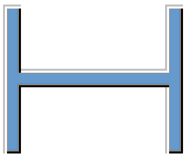
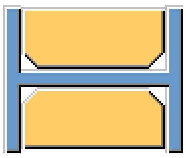
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Stiffener orientation

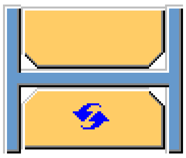
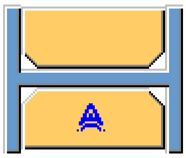
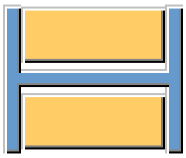
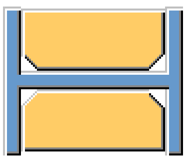
Option	Description
	Default Stiffeners are parallel to the secondary part. AutoDefaults can change this option.
	Stiffeners are parallel to the secondary part.
	Stiffeners are perpendicular to the main part.

Stiffener creation

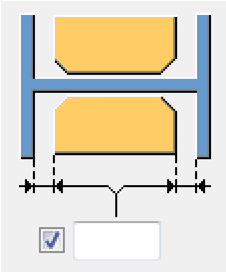
Option	Description
	Default Stiffeners are created. AutoDefaults can change this option.

Option	Description
	Automatic Stiffeners are created when necessary.
	No stiffeners are created.
	Stiffeners are created.

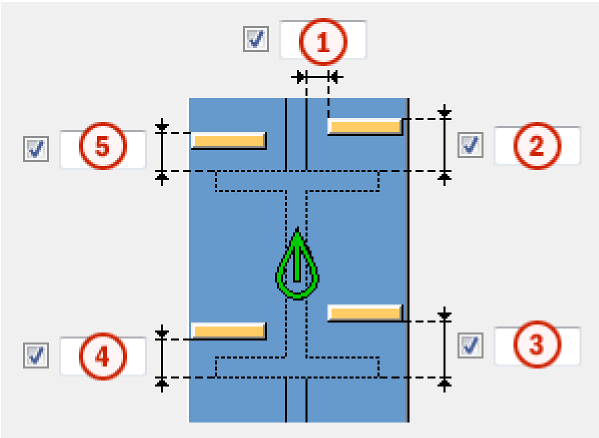
Stiffener shape

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
	Line chamfered stiffener plates

Stiffener gap

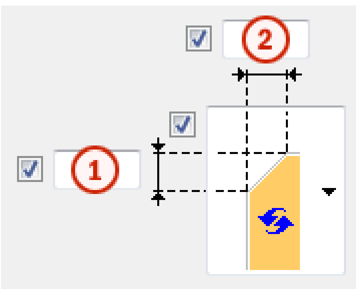
Option	Description
	Define the size of the gap between the flanges and the stiffener.

Stiffener positions



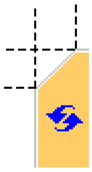
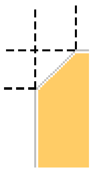
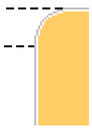
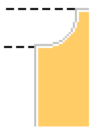
	Description
1	Define the size of the gap between the stiffener and the beam web edge.
2	Define the size of the gap between the top near side stiffener and the beam flange edge.
3	Define the size of the gap between the bottom near side stiffener and the beam flange edge.
4	Define the size of the gap between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

Chamfer dimensions



	Description	Default
1	Define the vertical dimension of the chamfer.	`10 mm`
2	Define the 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

Bent plate (190): Haunch tab

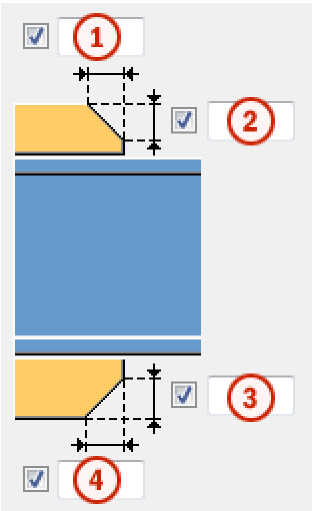
Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges in the **Bent plate (190)** connection.

Haunch plates

Part	Description
Top plate	Define the top haunch plate thickness, width and height.
Bottom plate	Define the bottom haunch plate thickness, width and height.

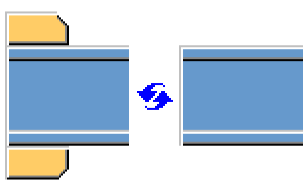
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

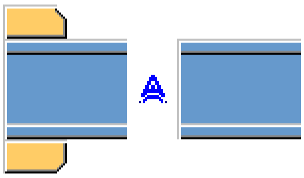
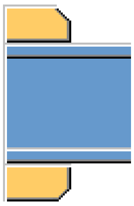
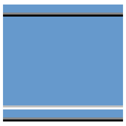
Haunch plate chamfers



	Description
1	Define the width of the top haunch plate chamfer.
2	Define the height of the top haunch plate chamfer.
3	Define the height of the bottom haunch plate chamfer.
4	Define the width of the bottom haunch plate chamfer.

Hauch plate creation

Option	Description
	Default Top and bottom haunch plates are created, if needed. AutoDefaults can change this option.

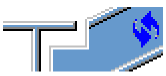
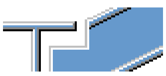
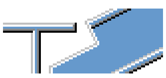
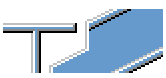
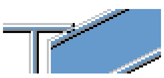
Option	Description
	Automatic Top or bottom haunch plate or both are created, if needed.
	Top and bottom haunch plates are created. To create a single plate, enter 0 in the thickness (**t**) field for the plate you do not need (top or bottom plate).
	Haunch plates are not created.

Bent plate (190): Notch tab

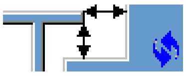
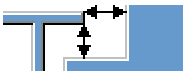
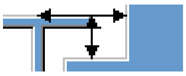
Use the **Notch** tab to automatically create notches for the secondary beams and to control the notch properties in the **Bent plate (190)** connection. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

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

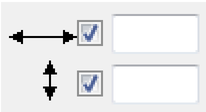
Notch shape Automatic notching is switched on when you select a notch shape.

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.

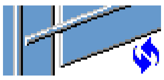
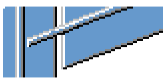
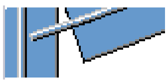
Notch size

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.

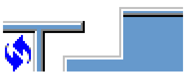
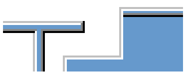
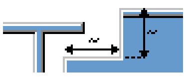


Flange cut shape

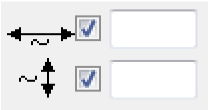
Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

Notch dimension rounding

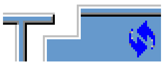
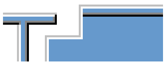
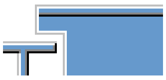
Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

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.

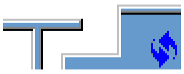
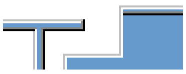
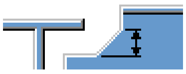
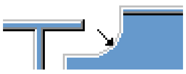
The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



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.

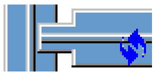
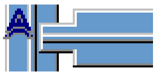
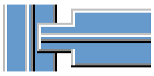
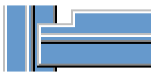
Enter a radius for the chamfer.

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.

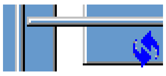
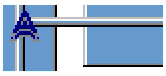
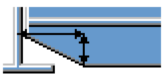
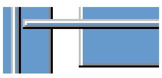
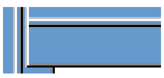
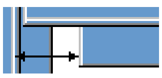
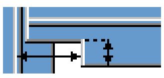
Side of flange notch

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

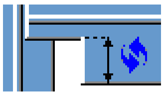
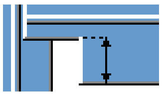
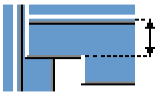
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the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

Flange notch shape

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

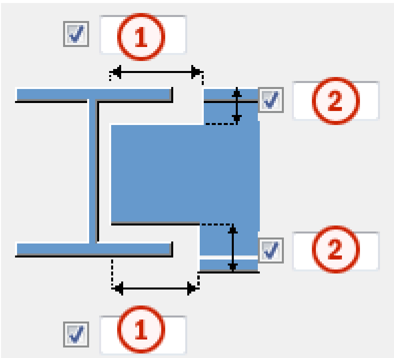
Option	Description
	Default The entire flange of the secondary beam is cut as far back as you define. AutoDefaults can change this option.
	Automatic The entire flange of the secondary beam is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. 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 1 and 2.
	The flange is not cut.
	Creates cuts to the flange according to the value in the field 1 to make it flush with the web.
	Creates cuts to the flange according to the values in the fields 1 and 2.

Flange notch depth

Option	Description
	Default Defines the flange notch depth. AutoDefaults can change this option.
	Defines the flange notch depth.
	Defines the 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

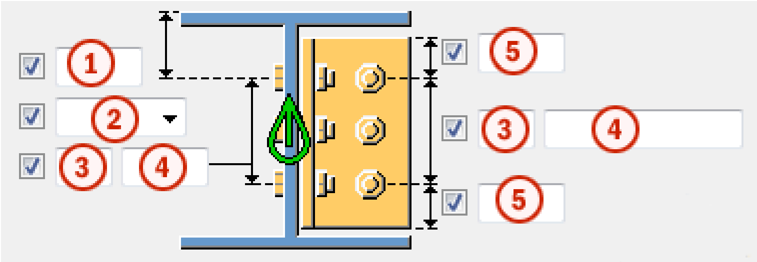


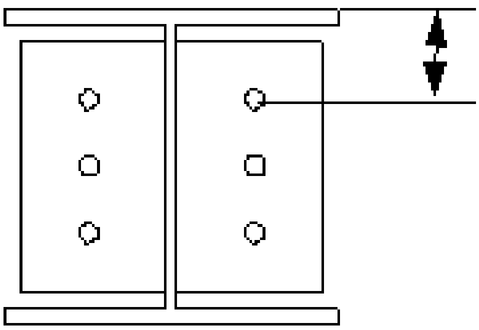
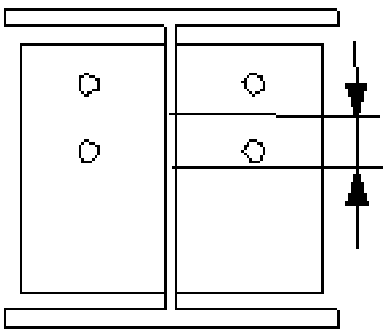
	Description	Default
1	Define the dimensions for the horizontal flange cuts.	10 mm
2	Define the dimensions for the vertical flange cuts.	The gap between the notch edge and the beam flange is equal to the main part web rounding. The notch height is rounded up to the nearest 5 mm.

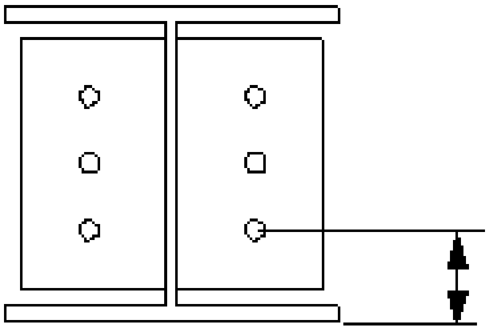
Bent plate (190): Bolts tab

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 in the **Bent plate (190)** connection.

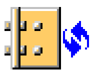
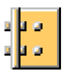
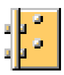
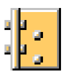
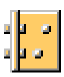
Bolt group dimensions



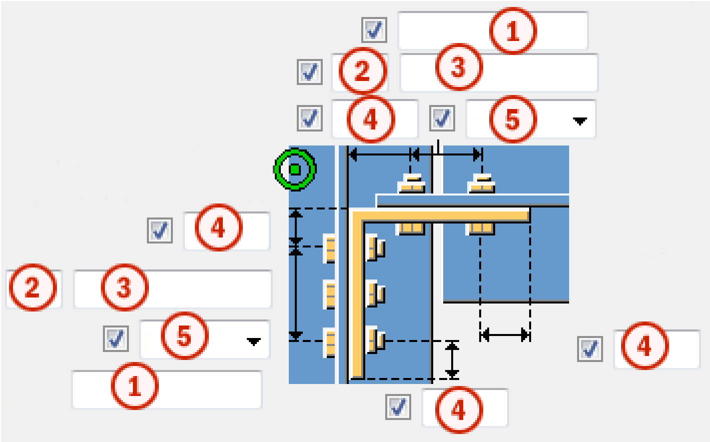
Option	Description
1	Define the dimension for vertical bolt group position.
2	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt.  • **Middle**: From the center line of the bolts to the center line of the secondary part. 

Option	Description
	• **Below**: From the lower edge of the secondary part to the lowest bolt. 
3	Define the number of bolts.
4	Define the 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 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

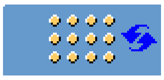
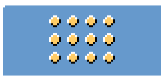
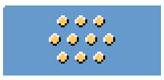
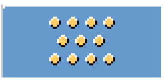
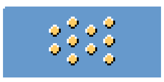
Option	Description
	Default Bolts are not staggered. AutoDefaults can change this option.
	Bolts are not staggered. The bolts that connect the bent plate to the secondary part are on the same horizontal level as the bolts that connect the bent plate to the main part.
	Bolts on the main part are staggered. 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.

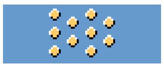
Bolt group dimensions



Option	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	Define the number of bolts.
3	Define the 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	Define the bolt edge distance.
5	Define the 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

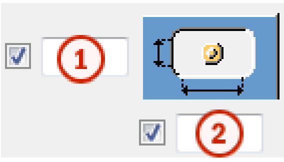
Option	Description
	Staggered type 4

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

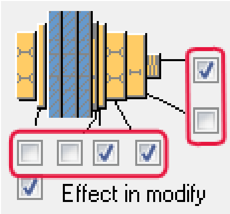
You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

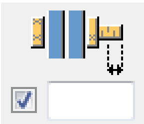
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



Bent plate (190): Beam cut tab

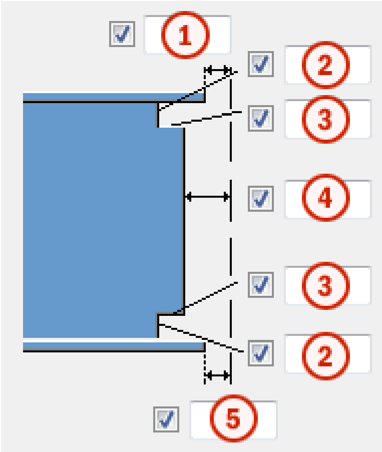
Use the **Beam cut** tab to control weld backing bars, weld access holes, beam end preparations, and flange cuts in the **Bent plate (190)** connection.

Weld backing bar

Part	Description
Weld backing bar	Define the weld backing bar thickness and width.

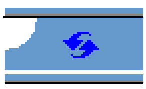
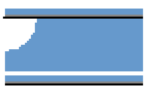
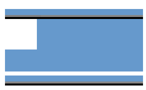
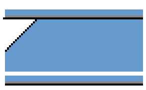
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

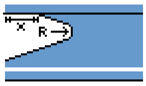
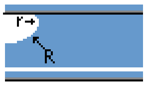
Weld access hole dimensions



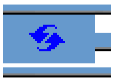
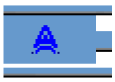
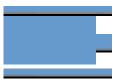
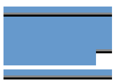
	Description
1	Define the gap between the secondary part top flange and the main part.
2	Define the vertical dimensions for the top and the bottom weld access holes.
3	Define the horizontal dimensions for the top and the bottom weld access holes.
4	Define the gap between the secondary part web and the main part. Tekla Structures adds the value you enter here to the gap you enter on the **Picture** tab.
5	Define the 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 **Picture** tab.

Weld access holes

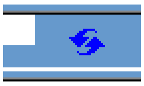
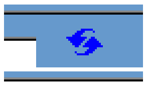
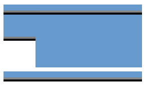
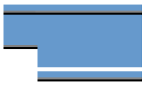
Option	Description	Default
	Default Round weld access hole AutoDefaults can change this option.	
	Round weld access hole	
	Square weld access hole	
	Diagonal weld access hole	

Option	Description	Default
	Round weld access hole with a radius that you can define in r	
	Extended cone-shaped weld access hole with a radius and dimensions that you can define in R and Top Prep x Bottom Prep x	
	Cone-shaped weld access hole with radiuses that you can define in R and r Capital **R** defines the large radius (height). Small **r** defines the small radius.	`R = 35` `r = 10`

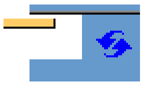
Beam end preparation

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.
	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

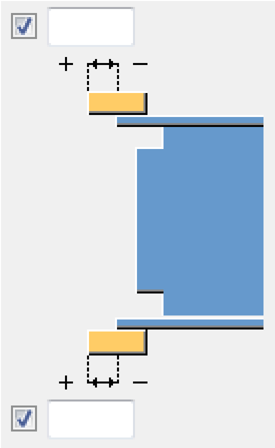
Option for top backing bar	Option for bottom backing bar	Description
		Default Backing bars are created inside the flanges. AutoDefaults can change this option.
		No backing bars are created.
		Backing bars are created inside the flanges.
		Backing bars are created outside the flanges.

Weld backing bar length

Enter the length of the weld backing bar in the field 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.

4 End plate connections

This section introduces end plate connection components available in Tekla Structures.

Click the links below to find out more:

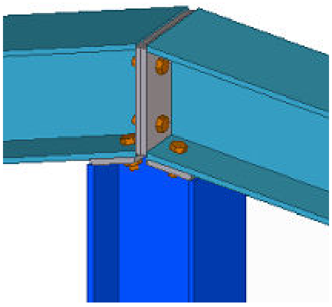
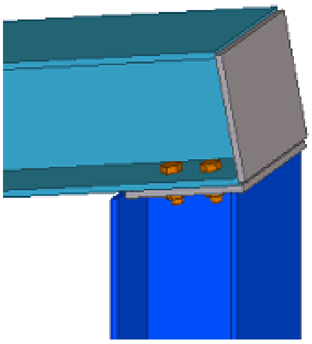
4.1 Column - 2 beams (14)

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

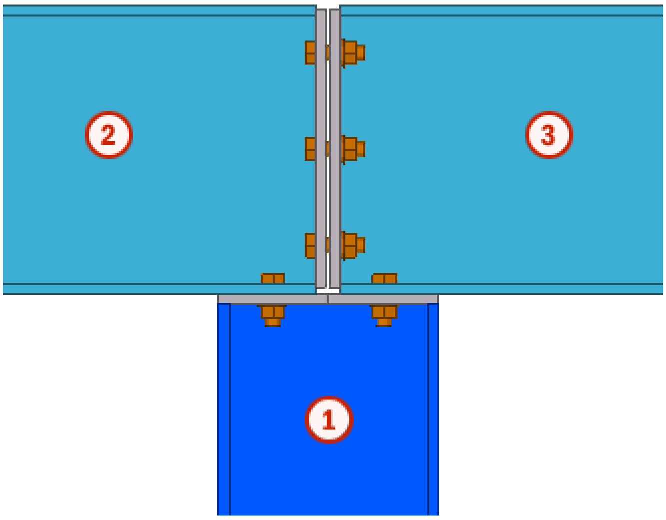
Use for

Situation	Description
	Connection between a column and two beams.
	Connection between a column and a beam. 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. If you use the component with only one secondary beam, enter a negative value for the gap between 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



	Part
1	Column
2	Beam
3	Beam

See also Column - 2 beams (14): Picture tab on page 513

Column - 2 beams (14): Bolts 1 - 2 tab on page 516

Column - 2 beams (14): Bolts 3/Bolts 4 tabs on page 520

Column - 2 beams (14): Picture tab

Use the **Picture** tab to control the plate sizes in the **Column - 2 beams (14)** connection.

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 colums and the beams.

Part	Description
Plate 1, 2, 3, 4	Define the plate thickness, width and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Plate 3 + 4 Define the type of the connection between the column and beams.

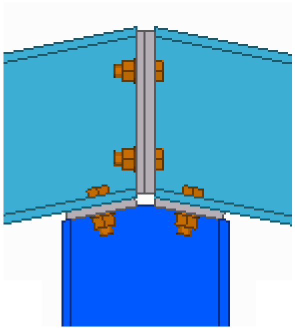
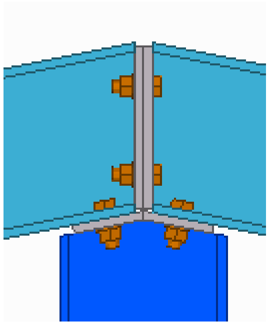
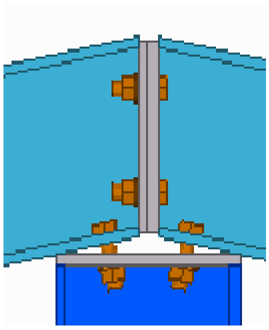
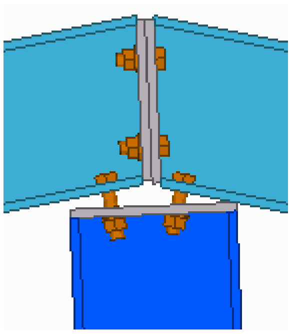
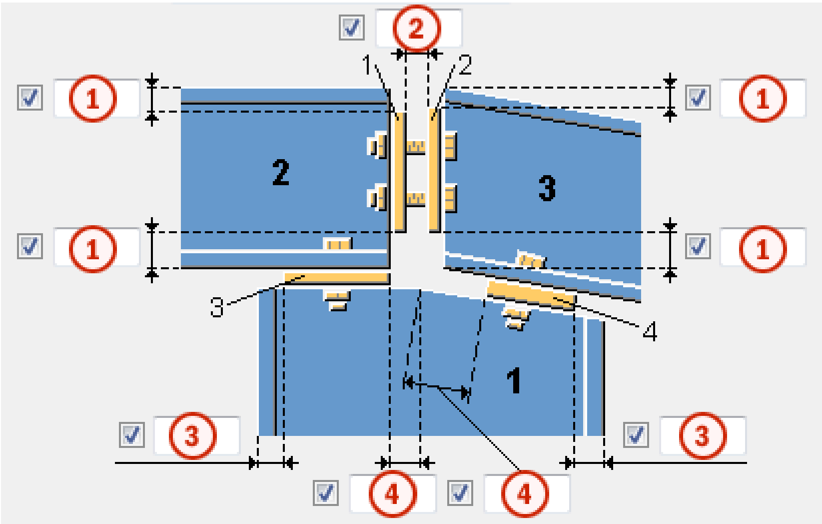
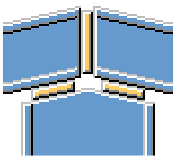
Option	Description	Example
2 plates	Two plates are created. The column is chamfered twice.	
Folded plate	A folded plate is created. The plate can be unfolded on a workshop drawing. The column is chamfered twice.	
1 plate	One plate is created. The plate is always oriented horizontally. The column is fitted perpendicularly.	
Plate perp to column	One plate is created. The column is fitted perpendicularly, even if the column is positioned in a skewed direction.	

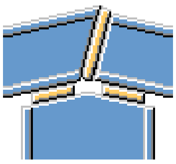
Plate distances

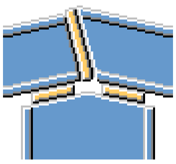


	Description	Default
1	Define the plate distance from the beam edge.	5 mm
2	Define the gap between the end plates. If you use the component with only one secondary beam, enter a negative value.	
3	Define the plate distance from the column edges.	
4	Define the plate distance from the column center.	

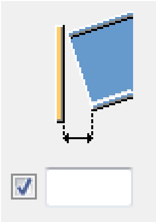
End plates Select how the end plates are positioned.







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.

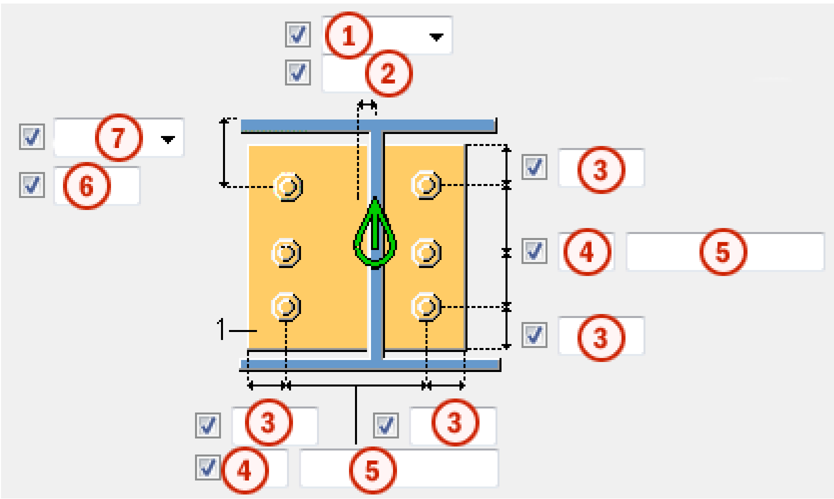
If the actual gap is larger than this value, the end is fitted to the end plate or to the cap plate.

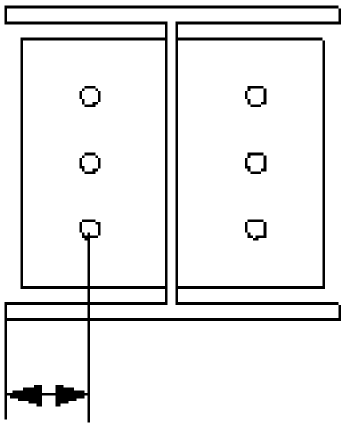
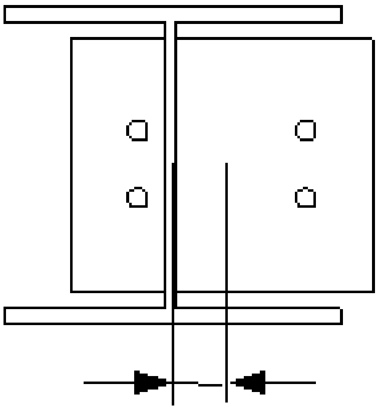
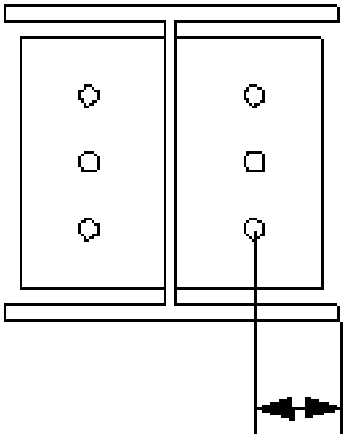
The default value is `5 mm`.

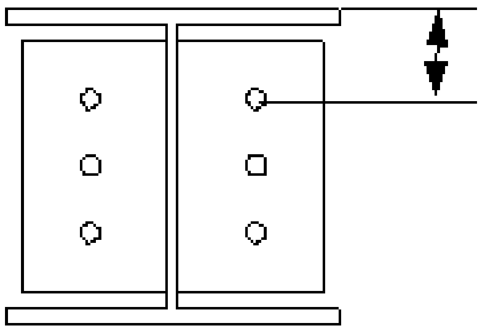
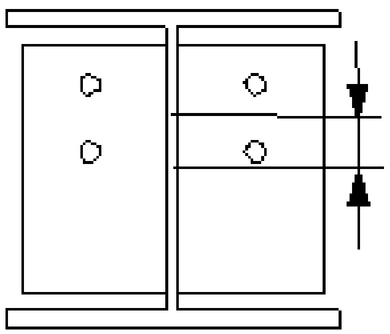
Column - 2 beams (14): Bolts 1 - 2 tab

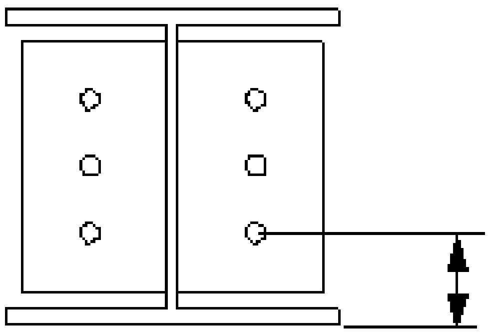
Use the **Bolts 1 - 2** tab to control the bolts that connect the end plates in the **Column - 2 beams (14)** connection.

Bolt group dimensions



	Description
1	Define 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.  • **Right**: From the right edge of the secondary part to the rightmost bolt. 

	Description
2	Define the dimension for horizontal bolt group position.
3	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Define the number of bolts.
5	Define the 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 the dimension for vertical bolt group position.
7	Define 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. 

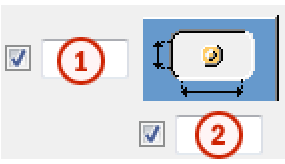
	Description
	• **Below**: From the lower edge of the secondary part to the lowest bolt. 

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

You can define slotted holes.

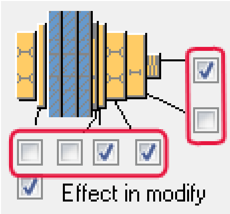


	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.

Bolt assembly

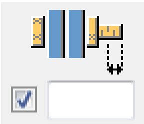
The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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**.

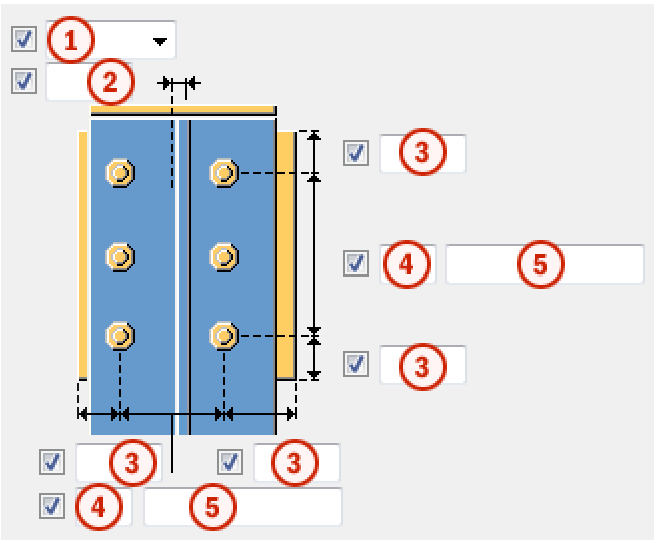
Bolt length increase Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.

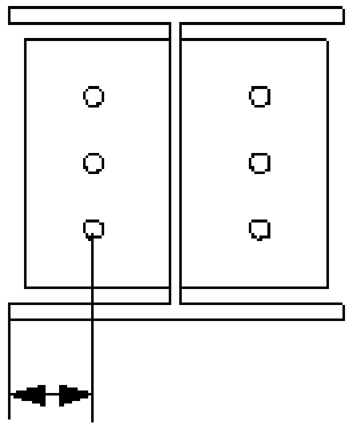
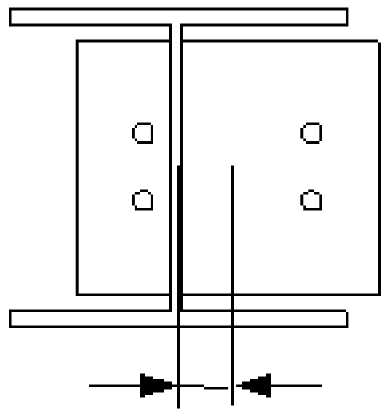


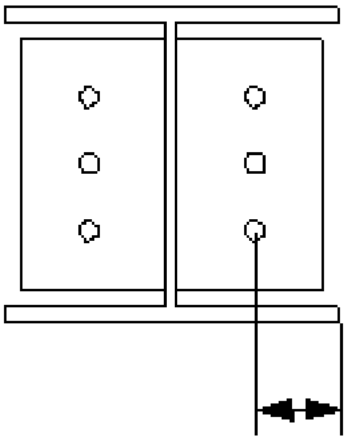
Column - 2 beams (14): Bolts 3/Bolts 4 tabs

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 in the **Column - 2 beams (14)** connection.

Bolt group dimensions



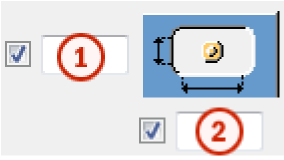
	Description
1	Define how to measure the dimensions for horizontal bolt group position. • **Left**: From the left edge of the secondary part to the leftmost bolt.  • **Middle**: From the center line of the secondary part to the center line of the bolts. 

	Description
	• **Right**: From the right edge of the secondary part to the rightmost bolt. 
2	Define the dimension for horizontal bolt group position.
3	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Define the number of bolts.
5	Define the 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
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes You can define slotted holes.



	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.

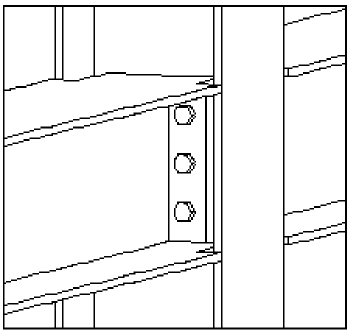
4.2 Two sided end plate (24)

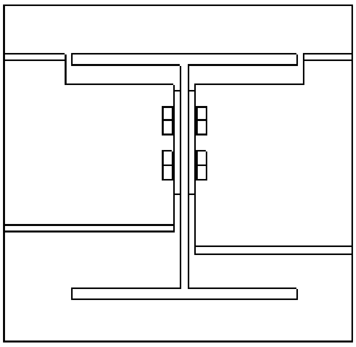
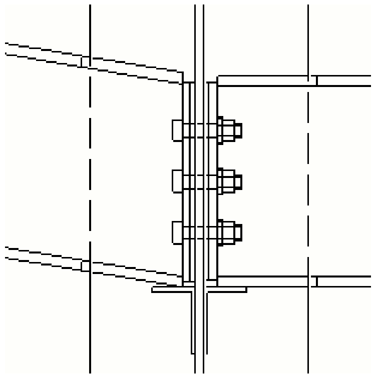
Two sided end plate (24) connects two beams to a column or to a beam using a bolted end plate. One bolt group goes through all the three parts. This connection is created and used in the same way as **End plate (29)** connection.

Objects created

- End plate
- Seat (plate or angle)
- Shim plates
- Stiffeners
- Welds
- Bolts
- Cuts

Use for

Situation	Description
	Beam-to-column end plate connection.

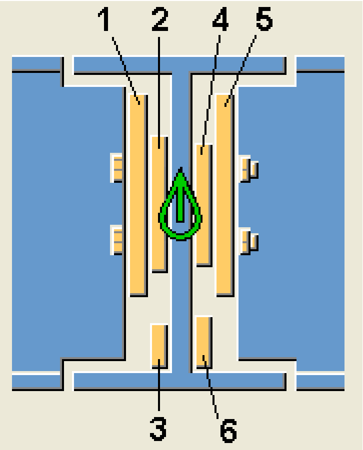
Situation	Description
	Beam-to-beam end plate connection.
	End plate connection with shim plates and a seat angle.

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

	Part
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

See also

Two sided end plate (24): Picture tab on page 525

Two sided end plate (24): Parts tab on page 526

Two sided end plate (24): Parameters tab on page 527

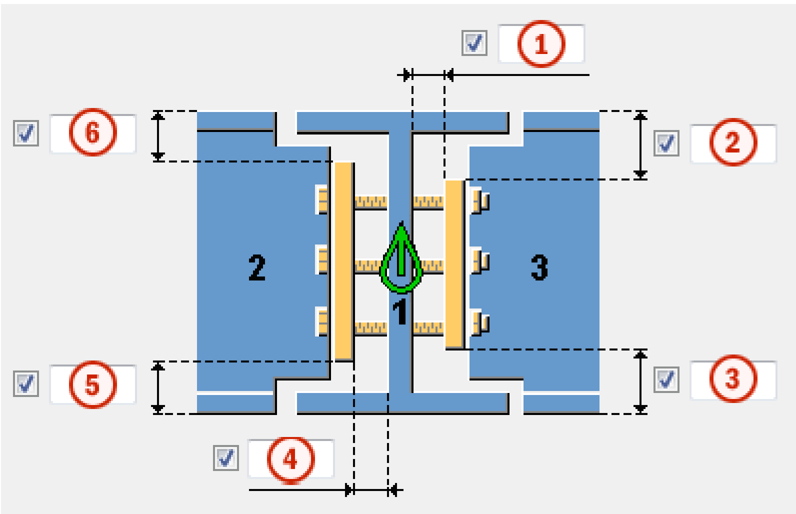
Two sided end plate (24): Notch tab on page 529

Two sided end plate (24): Bolts tab on page 529

Two sided end plate (24): Picture tab

Use the **Picture** tab to control the position of the end plate in the **Two sided end plate (24)** connection.

End plate position



	Description
1	Define a gap between the main part and the end plate or the shim plate of the second secondary beam.
2 3	Define the end plate edge distance from the top or bottom of the second secondary beam.
4	Define a gap between the main part and the end plate or the shim plate of the first secondary beam.

	Description
5 6	Define the end plate edge distance from the top or the bottom of the first secondary beam.

Two sided end plate (24): Parts tab

Use the **Parts** tab to define the properties of the parts created in the **Two sided end plate (24)** connection.

Plate

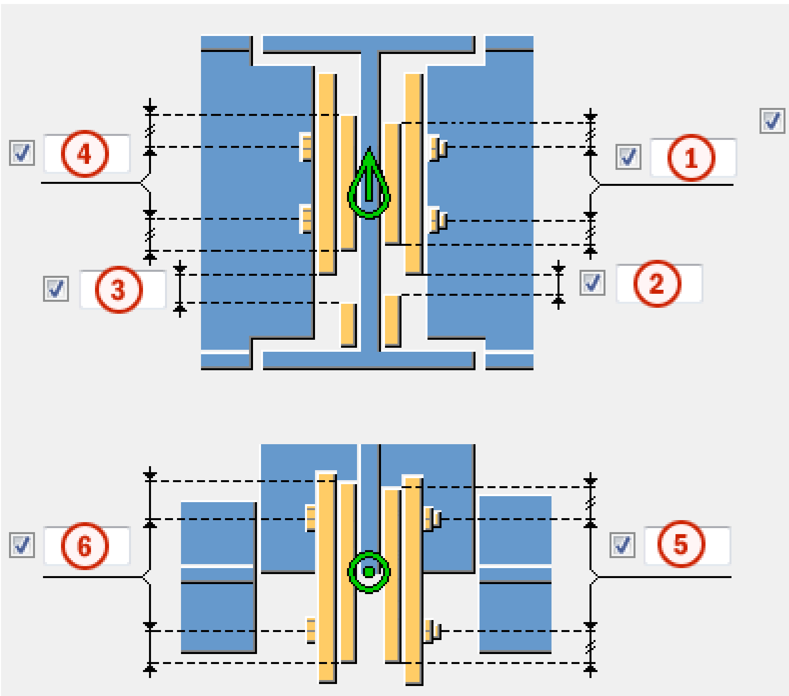
Part	Description	Default
End plate	Define the end plate thickness, width and height. The width and height are defined by the bolt group edge distances. The height can also be entered as a plate edge distance from the upper and lower edge of the secondary beam.	`half of the bolt diameter`
Seat	Define 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.	width = `end plate width` height = `secondary beam height`
L seat	Define whether a seat angle is created under the end plate. The length of the angle is defined by the seat width. 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. 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.	width = `end plate width`
Fitting plate	Define the shim plate thickness. The plate is created only if the plate thickness is entered.	width and height = `defined by the bolt group and the shim plate edge distances`
Number or fitting pl.	Define how many shim plates are created.	

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Two sided end plate (24): Parameters tab

Use the **Parameters** tab to control the shim plate and end plate positions in the **Two sided end plate (24)** connection.

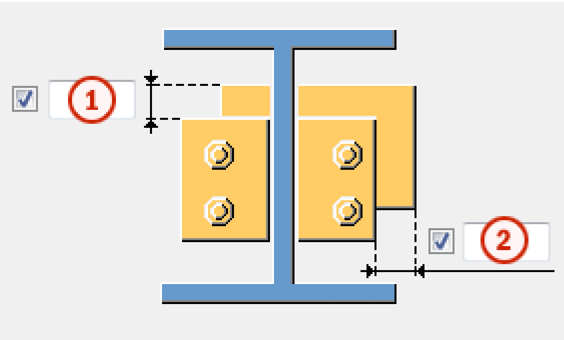
End plate dimensions



	Description	Default
1 4	Define the vertical bolt edge distance for the shim plates. The number and spacing of bolts affect the size of the shim plates.	`1.5*bolt diameter`
2 3	Define the gap between the end plate and the seat (plate or angle).	`0 mm`
5 6	Define the horizontal bolt edge distance for the shim plates.	

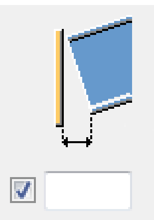
Shim plate and end plate positions

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.

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.

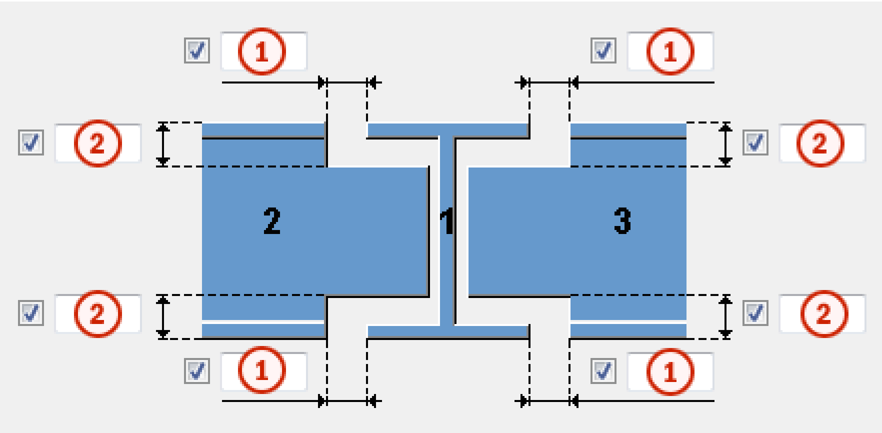
If the actual gap is smaller than this value, the beam end is left straight.

If the actual gap is larger than this value, the beam end is fitted to the end plate.

Two sided end plate (24): Notch tab

Use the **Notch** tab to modify the horizontal and vertical cuts in the **Two sided end plate (24)** connection.

Cut dimensions

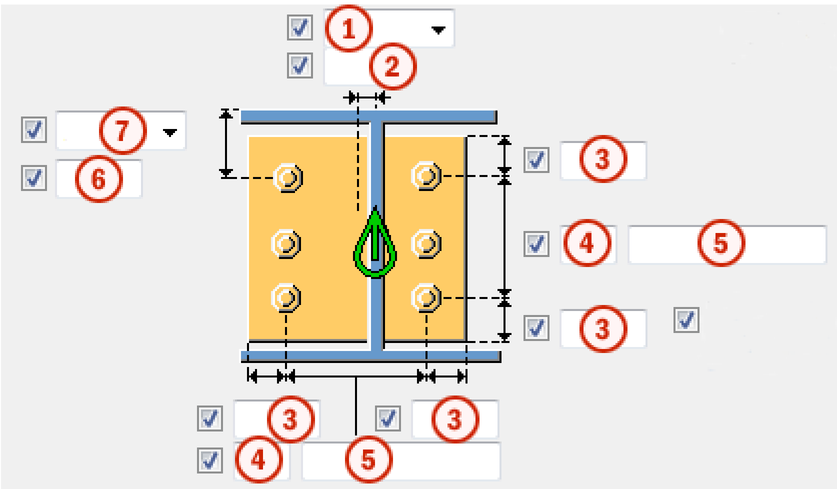


	Description	Default
1	Define the gap between the edge of the notch and the main part.	`10 mm`
2	Define the cut dimension in the vertical direction for the top and the bottom flanges.	gap = `main part web rounding`

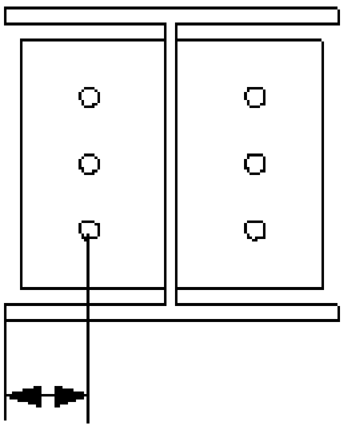
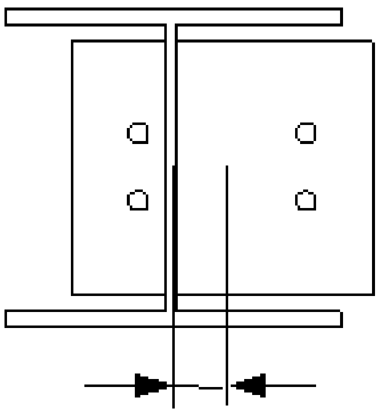
Two sided end plate (24): Bolts tab

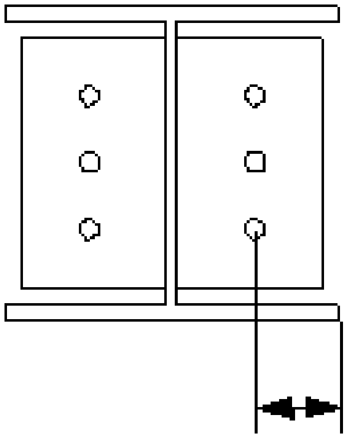
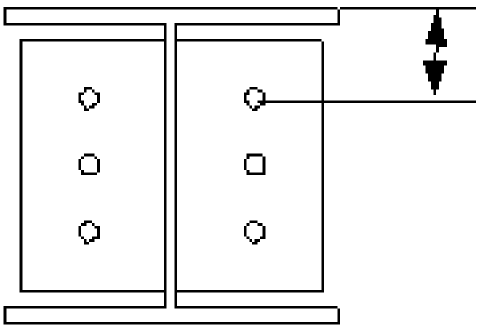
Use the **Bolts** tab to control the properties of the bolts used in the **Two sided end plate (24)** connection.

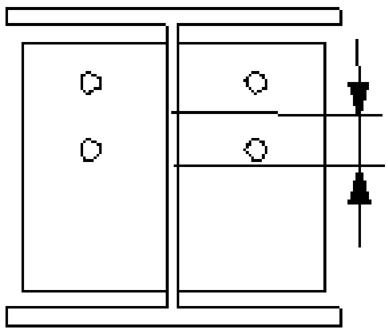
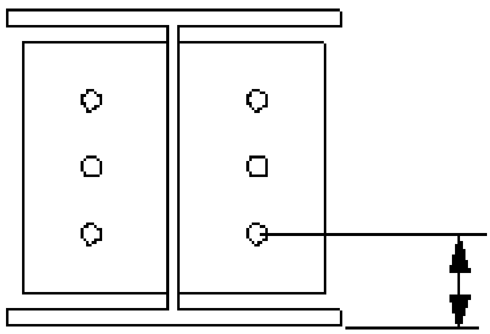
Bolt group dimensions



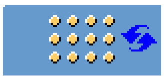
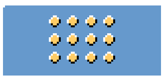
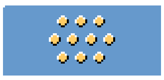
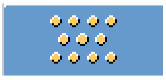
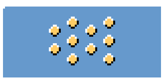
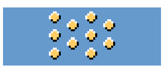
<table>
<tr><th></th><th>Description</th></tr>
<tr><td>①</td><td>Define how to measure the dimensions for horizontal bolt group position.

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.

</td></tr>
</table>

	Description
	• **Right**: From the right edge of the secondary part to the rightmost bolt. 
2	Define the dimension for horizontal bolt group position.
3	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Define the number of bolts.
5	Define the 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 the dimension for vertical bolt group position.
7	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt. 

	Description
	• **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

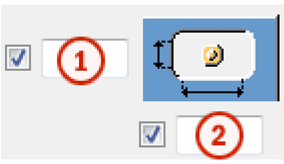
Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

You can define slotted, oversized, or tapped holes.

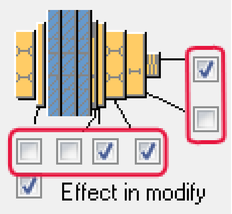


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(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.

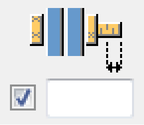
If you want to create a hole only, clear all the check boxes.



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.



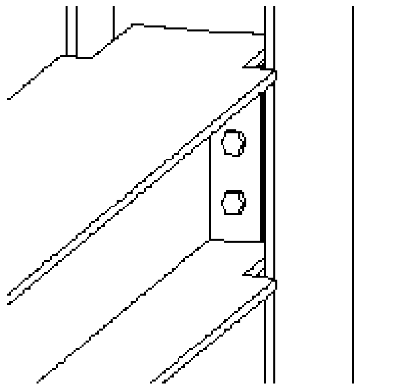
4.3 End plate (29)

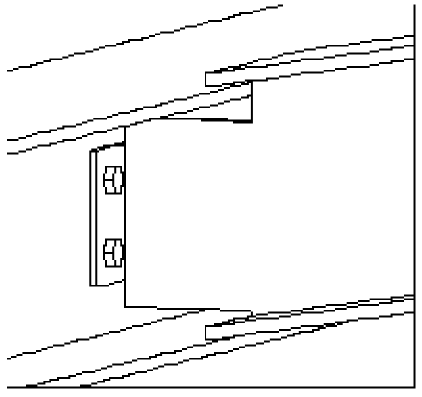
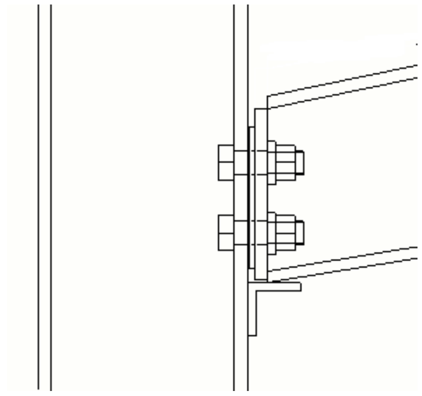
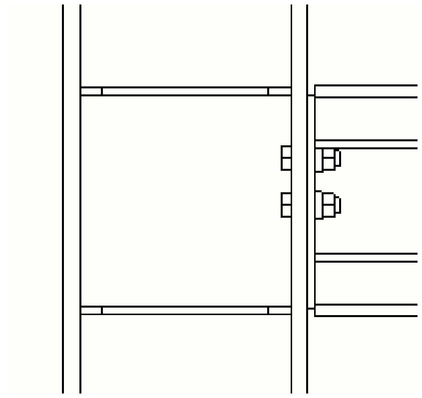
End plate (29) connects a beam to a column or two beams to each other using a bolted end plate. Stiffeners, seats and shim plates are optional.

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.

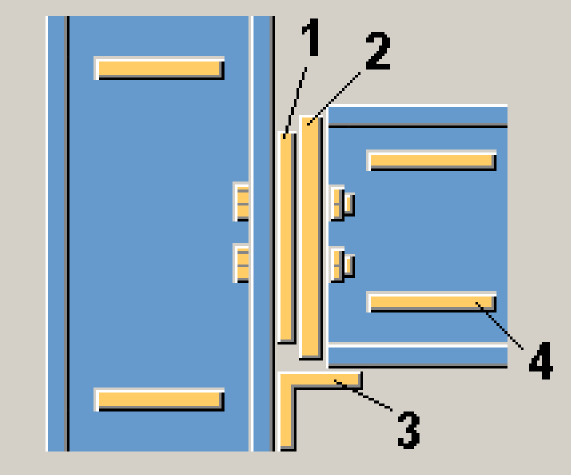
Situation	Description
	Beam-to-beam end plate connection.
	End plate connection with a shim plate and a seat angle.
	End plate connection with stiffeners.

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

See also

End plate (29): Picture tab on page 536

End plate (29): Parts tab on page 537

End plate (29): Parameters tab on page 539

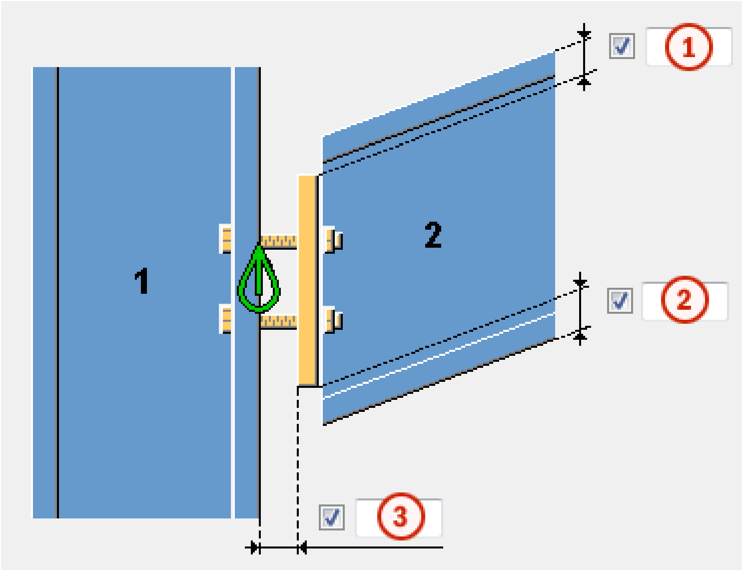
End plate (29): Bolts tab on page 542

End plate (29): Notch tab on page 547

End plate (29): Picture tab

Use the **Picture** tab to control the position of the end plate in the **End plate (29)** connection.

End plate position



	Description	Default
1	Define the 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	Define the end plate bottom position from the bottom of the secondary beam.	
3	Define a 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`

End plate (29): Parts tab

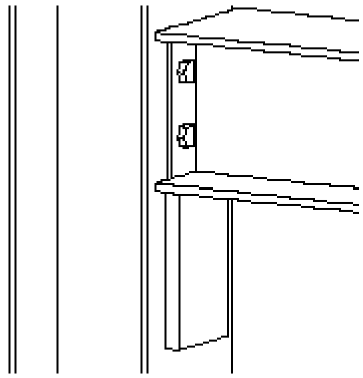
Use the **Parts** tab to define the properties of the parts created in the **End plate (29)** connection.

Plate

Part	Description	Default
End plate	Define the 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`

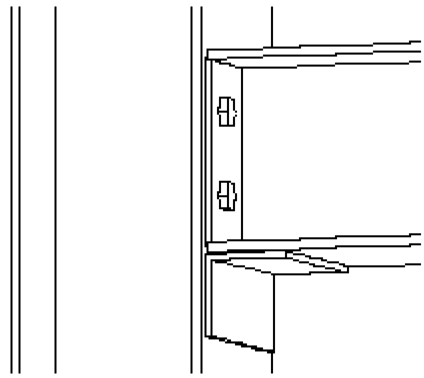
<table>
<tr><th>Part</th><th>Description</th><th>Default</th></tr>
<tr><td>Seat</td><td>Define whether a seat is created under the end plate.

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.</td><td>width = <code>end plate width</code>

height = <code>secondary beam height</code></td></tr>
<tr><td>L seat</td><td>Define whether a seat angle is created under the end plate. The length of the angle is defined by the seat width.



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.

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.</td><td>width = <code>end plate width</code></td></tr>
<tr><td>Fitting plate</td><td>Define the shim plate thickness.

The plate is created only if the plate thickness is entered.</td><td>width = <code>defined by the bolt group and the shim plate edge distances</code></td></tr>
</table>

Part	Description	Default
Number or fitting pl.	Define how many shim plates are created.	
Folded plate	Define the bent plate thickness, width and height. The plate is created only if the plate thickness is entered. Bent plate can also be used with ordinary shim plates.	width = `determined from the bolt group inner bolts`
Stiffeners	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`
Upper horiz stiffener **Lower horiz stiffener**	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`

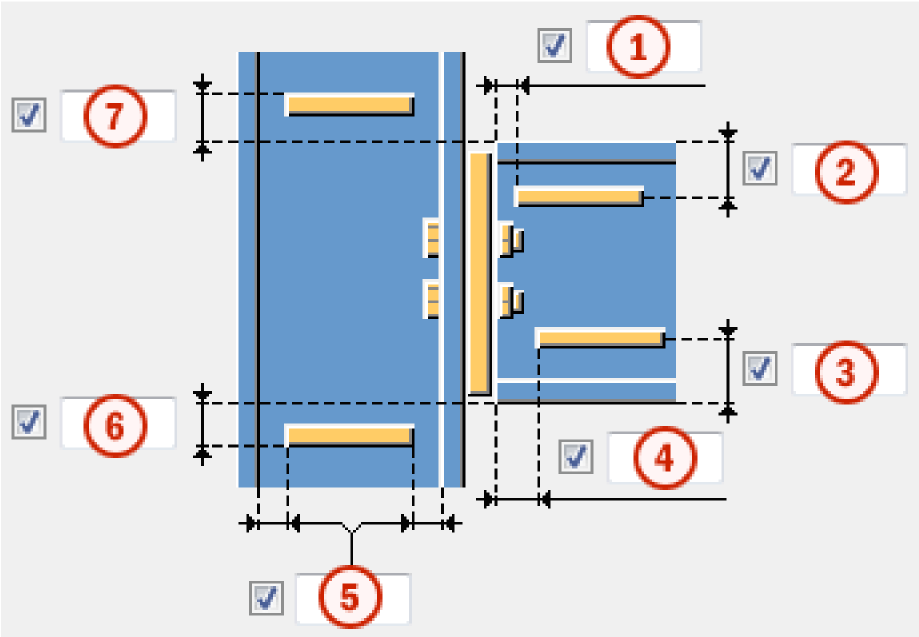
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

End plate (29): Parameters tab

Use the **Parameters** tab to control the stiffener position and orientation in the **End plate (29)** connection.

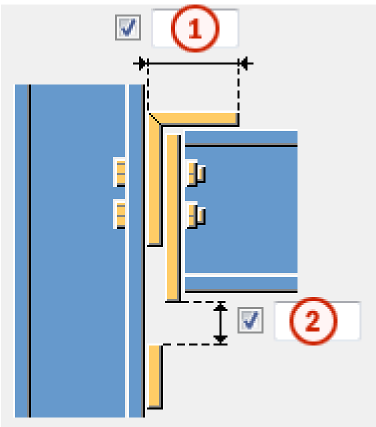
Material of folded plate Select the material of the bent plate. The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Folded plate** box.

Stiffener positions



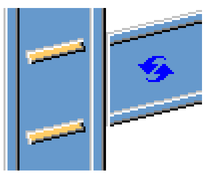
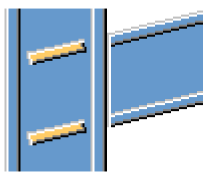
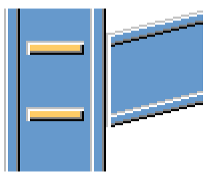
	Description	Default
1 4	Define the distance between the beam horizontal stiffener and the beam end.	
2 3	Define the distance between the beam horizontal stiffener and the beam flange.	`0.25*beam height`
5	Define the distance between the stiffener and the main part flange.	
6 7	Define the distance between the main part stiffener and the beam flange.	

Bent shim plate and seat length

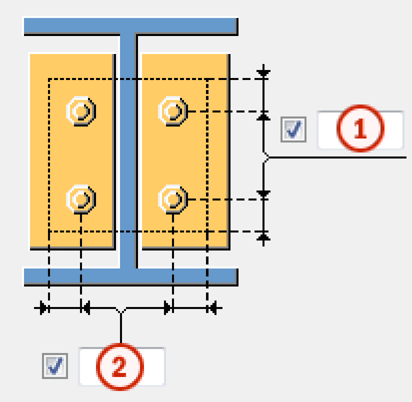


	Description	Default
1	Define the length of the horizontal part of the bent shim plate.	
2	Define the distance between the end plate and the seat. When using seat angles, change either this value or the size of the end plate to avoid collision between the secondary beam and the angle.	20 mm

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.

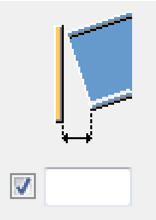
Bolt edge distances in shim plate



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	Define the 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	Define the 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.

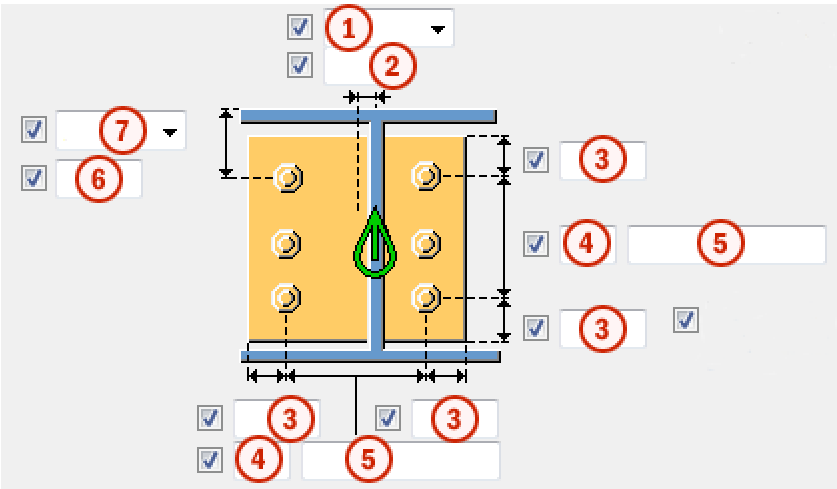
If the actual gap is smaller than this value, the beam end is left straight.

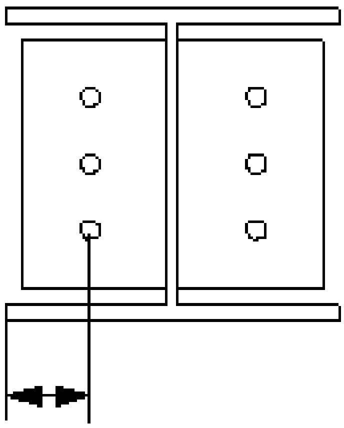
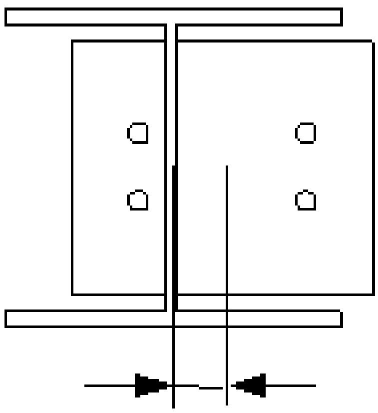
If the actual gap is larger than this value, the beam end is fitted to the end plate.

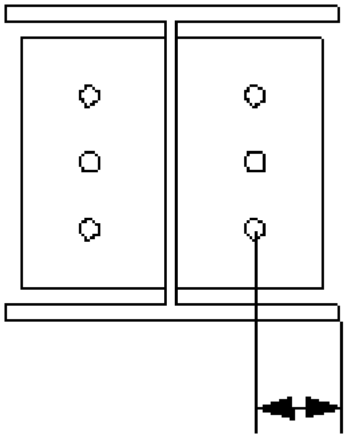
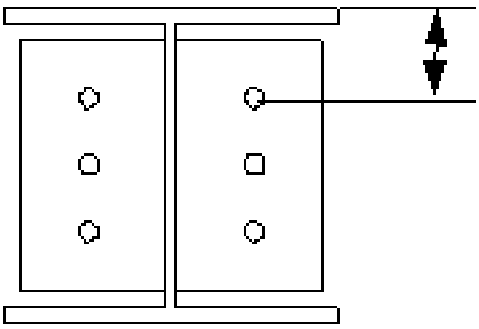
End plate (29): Bolts tab

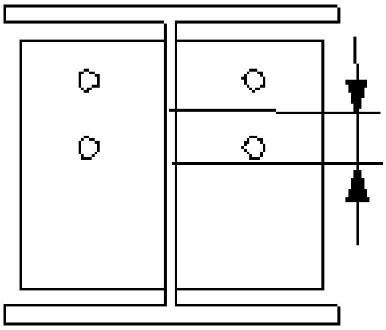
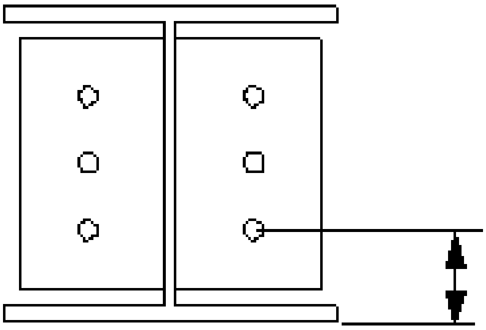
Use the **Bolts** tab to control the properties of the bolts used in the **End plate (29)** connection.

Bolt group dimensions

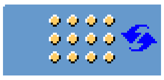
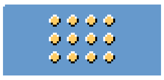
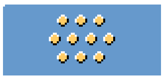
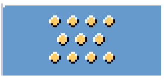
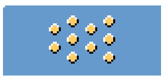
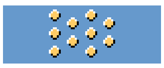


	Description
1	Define how to measure the dimensions for horizontal bolt group position. • **Left**: From the left edge of the secondary part to the leftmost bolt.  • **Middle**: From the center line of the secondary part to the center line of the bolts. 

	Description
	• **Right**: From the right edge of the secondary part to the rightmost bolt. 
2	Define the dimension for horizontal bolt group position.
3	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Define the number of bolts.
5	Define the 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 the dimension for vertical bolt group position.
7	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt. 

	Description
	• **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. 

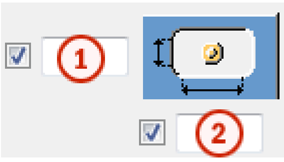
Staggering of bolts

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
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

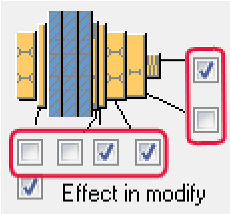
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(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.

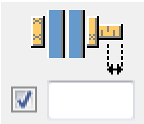
If you want to create a hole only, clear all the check boxes.



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

Bolt length increase

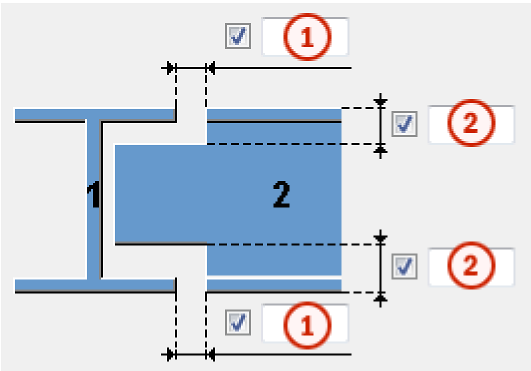
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



End plate (29): Notch tab

Use the **Notch** tab to modify the horizontal and vertical cuts in the **End plate (29)** connection.

Cut dimensions



	Description	Default
1	Define the gap between the edge of the notch and the main part.	10 mm
2	Define the cut dimension in the vertical direction for the top and bottom flanges.	gap = main part web rounding

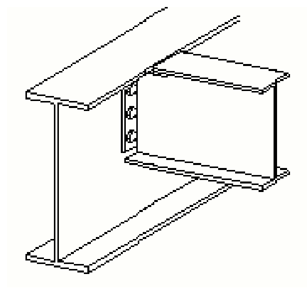
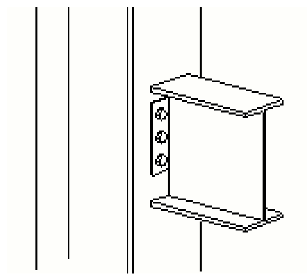
4.4 End plate (101)

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

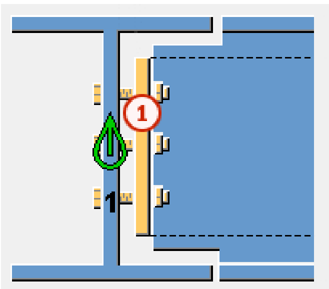
Situation	Description
	Beam to beam connection with a bolted end plate.
	Beam to column connection with a bolted end plate.

Selection order

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

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

Part identification key



	Part
1	End plate

See also End plate (101): Picture tab on page 549

End plate (101): End plate tab on page 549

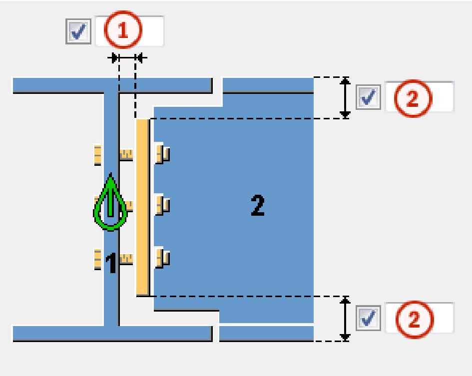
End plate (101): Notch tab on page 550

End plate (101): Bolts tab on page 552

End plate (101): Picture tab

Use the **Picture** tab to control the position of the end plate in the **End plate (101)** connection.

End plate position



	Description	Default
1	Define the gap between the main part and the end plate.	2 mm
2	Define the end plate edge distance to the secondary part flange.	

End plate (101): End plate tab

Use the **End plate** tab to control the properties of the end plate in the **End plate (101)** connection.

Plate

Part	Description
End plate	Define the end plate thickness and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

Option	Description	Default
	can enter the assembly position number.	
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

End plate edge type

Define how the end plate is cut. The default is **Rolled/Sawn**.

End plate (101): Notch tab

Use the **Notch** tab to create notches for the secondary beam and to control the notch properties in the **End plate (101)** connection.

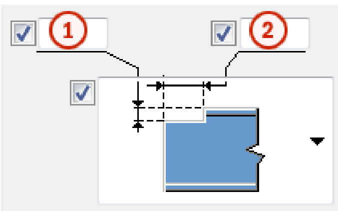
BCSA notch definition

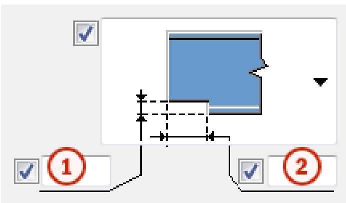
Define whether the notch is created according to British Constructional Steelwork Association (BCSA) specifications.

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

Notch dimensions

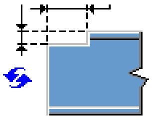
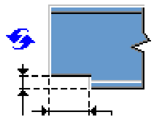
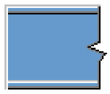
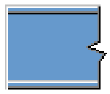
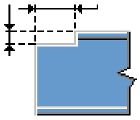
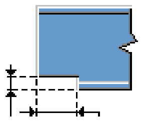
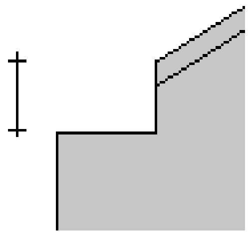
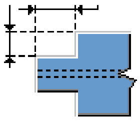
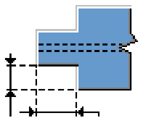
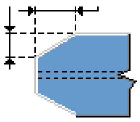
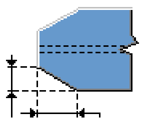
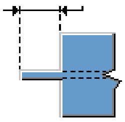
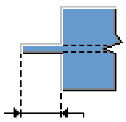
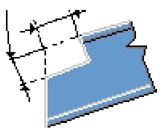
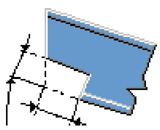
Define the top and the bottom dimensions of the notch if you have set the **BCSA notch def** option to **No**.



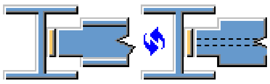
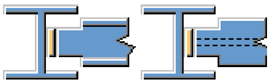
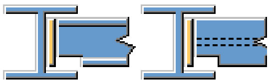
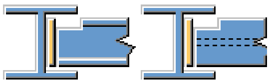


	Description
1	Define the vertical notch dimension.
2	Define the horizontal notch dimension.

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, the depth is measured as shown in the picture. 
		Creates a notch on both sides of the secondary part. Define the notch dimensions.
		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.

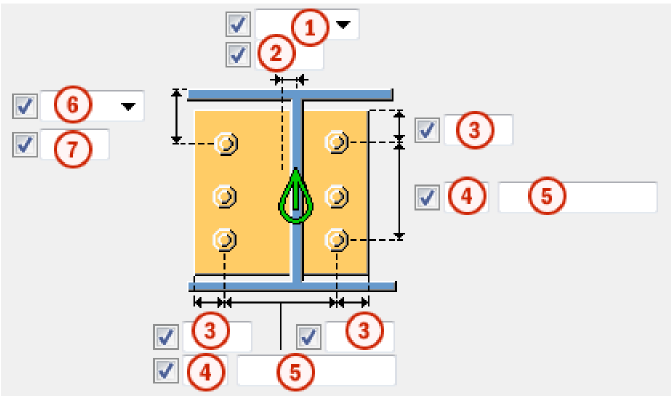
Notching side Define on which side of the secondary beam the notch is created. You can define the side for both the top and the bottom of the secondary beam.

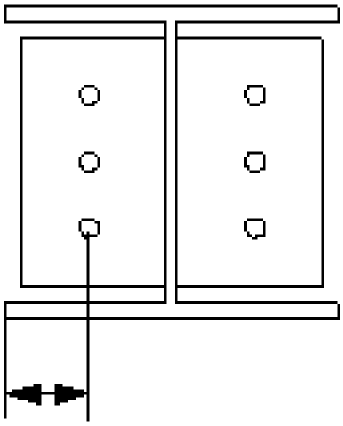
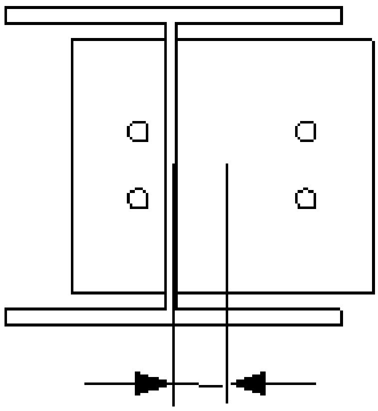
Option	Description
	Default Creates notches on both sides. AutoDefaults can change this option.
	Creates notches on both sides.
	Creates a notch on the left side.
	Creates a notch on the right side.

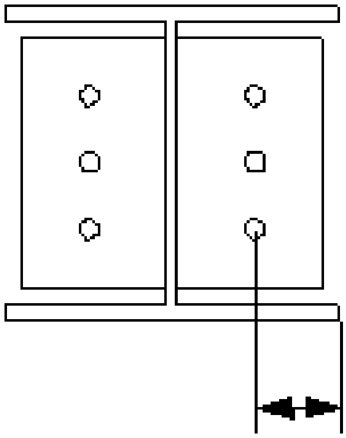
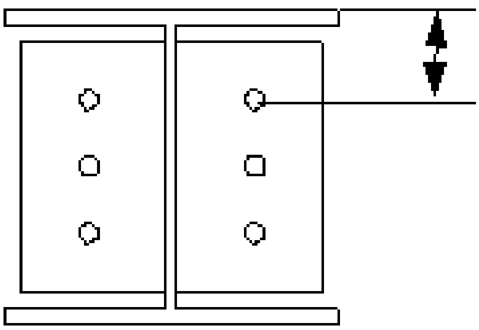
End plate (101): Bolts tab

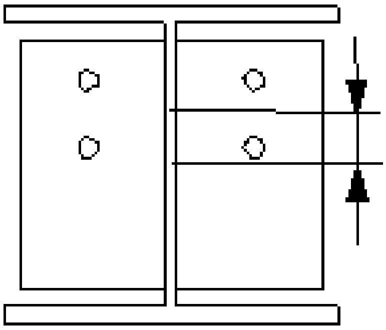
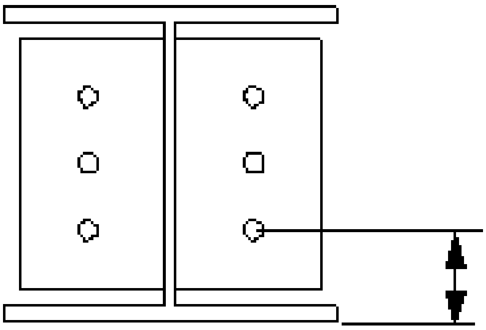
Use the **Bolts** tab to control the bolt properties in the **End plate (101)** connection.

Bolt group dimensions

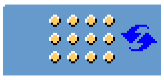
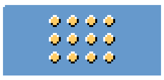
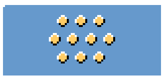
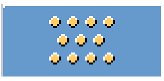
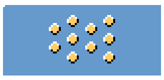


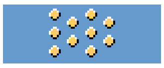
	Description
1	Define how to measure the dimensions for horizontal bolt group position. • **Left**: From the left edge of the secondary part to the leftmost bolt.  • **Middle**: From the center line of the secondary part to the center line of the bolts. 

	Description
	• **Right**: From the right edge of the secondary part to the rightmost bolt. 
2	Define the dimension for horizontal bolt group position.
3	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Define the number of bolts.
5	Define the 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 how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt. 

	Description
	• **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. 
7	Define the 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
	Staggered type 3

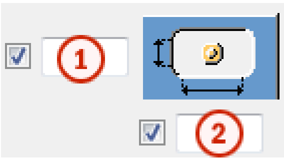
Option	Description
	Staggered type 4

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

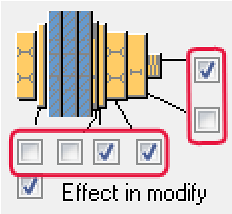
You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

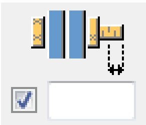
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



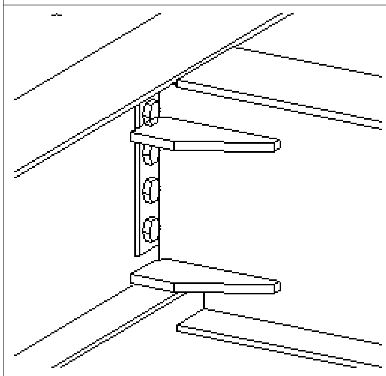
4.5 End plate with compensating flange plates (111)

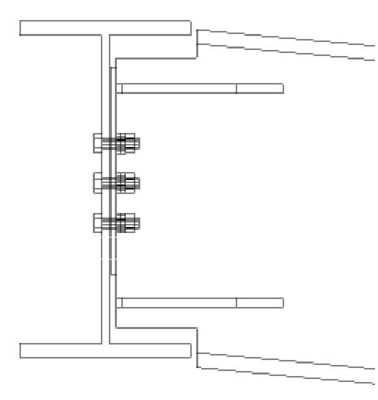
End plate with compensating flange plates (111) connects a beam to another beam using an end plate with compensating flange plates. The end plate is welded to the secondary beam and bolted to the main beam.

Objects created

- End plate
- Compensating flange plates
- Bolts
- Welds
- Cuts

Use for

Situation	Description
	Connection with an end plate and compensating flanges.

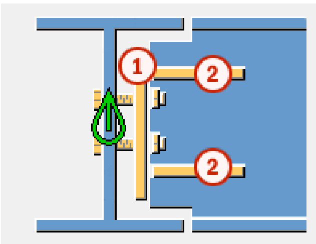
Situation	Description
	Connection with an end plate and compensating flange plates. The secondary beam is sloped.

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

See also

End plate with compensating flange plates (111): Picture tab on page 558

End plate with compensating flange plates (111): Parts tab on page 559

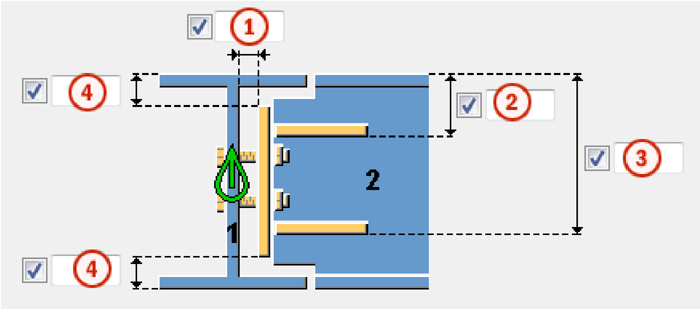
End plate with compensating flange plates (111): Notch tab on page 560

End plate with compensating flange plates (111): Bolts tab on page 562

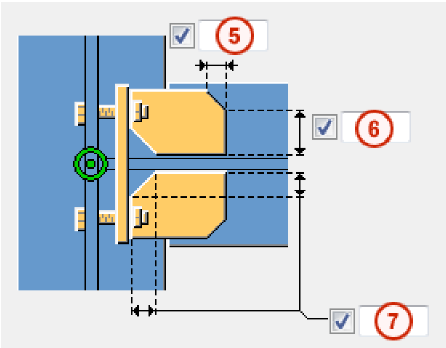
End plate with compensating flange plates (111): Picture tab

Use the **Picture** tab to control the position of the plates in the **End plate with compensating flange plates (111)** connection.

Dimensions



	Description
1	Define the gap between the main beam and the end plate.
2	Define the distance from the inner edge of the flange plate to the secondary beam flange.
3	Define the distance from the outer edge of the flange plate to the secondary beam flange.
4	Define the end plate edge distance to the main beam flange.



	Description
5	Define the horizontal chamfer dimension of the flange plate.
6	Define the flange plate dimension that remains when a chamfer is created.
7	Define the inner chamfer dimension of the flange plate.

End plate with compensating flange plates (111): Parts tab

Use the **Parts** tab to control the plate properties in the **End plate with compensating flange plates (111)** connection.

Plate

Part	Description
End plate	Define the end plate thickness and height.
Compensating flange plate	Define the flange plate thickness, width, and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

End plate with compensating flange plates (111): Notch tab

Use the **Notch** tab to create notches for the secondary beam and to control the notch properties in the **End plate with compensating flange plates (111)** connection.

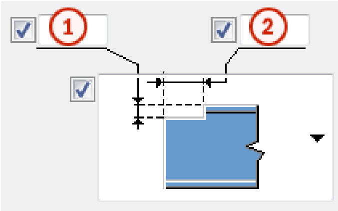
BCSA notch definition

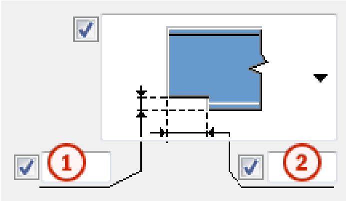
Define whether the notch is created according to British Constructional Steelwork Association (BCSA) specifications.

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

Notch dimensions

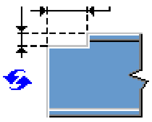
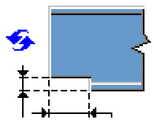
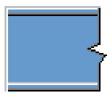
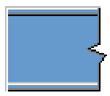
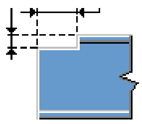
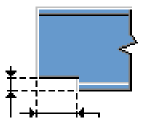
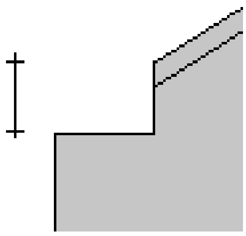
Define the top and the bottom dimensions of the notch if you have set the **BCSA notch def** option to **No**.

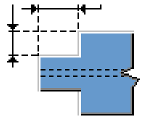
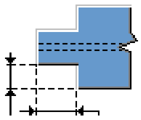
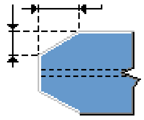
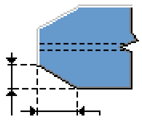
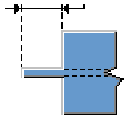
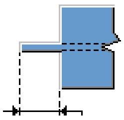
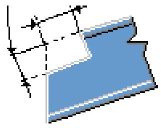
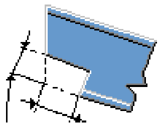




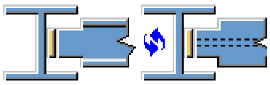
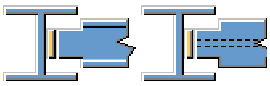
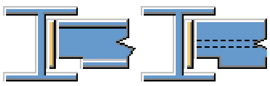
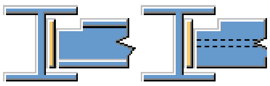
	Description
1	Define the vertical notch dimension.
2	Define the horizontal notch dimension.

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, the depth is measured as shown in the picture. 

Option	Option	Description
		Creates a notch on both sides of the secondary part. Define the notch dimensions.
		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.

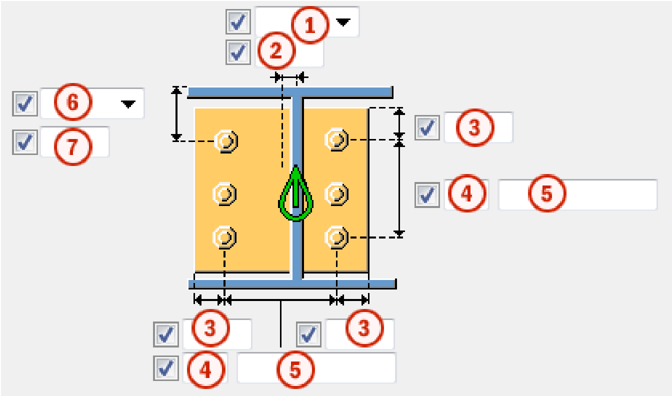
Notching side Define on which side of the secondary beam the notch is created. You can define the side for both the top and the bottom of the secondary beam.

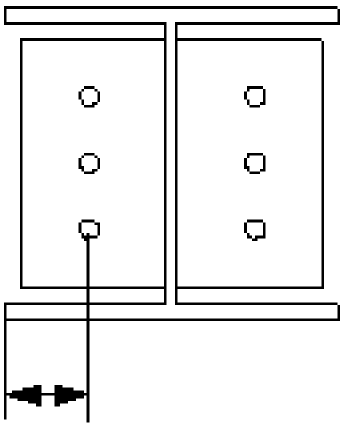
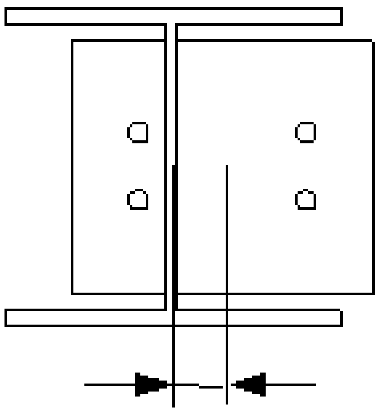
Option	Description
	Default Creates notches on both sides. AutoDefaults can change this option.
	Creates notches on both sides.
	Creates a notch on the left side.
	Creates a notch on the right side.

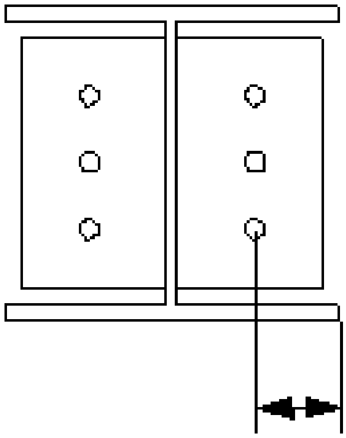
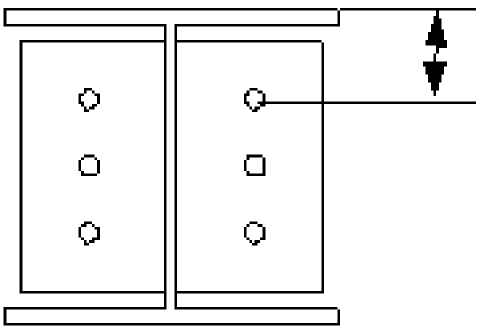
End plate with compensating flange plates (111): Bolts tab

Use the **Bolts** tab to control the bolt properties in the **End plate with compensating flange plates (111)** connection.

Bolt group dimensions

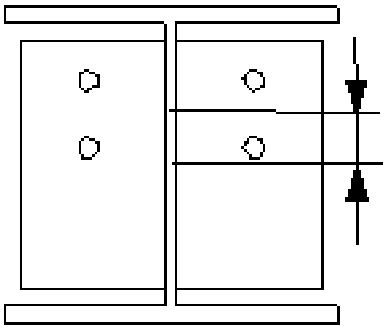


	Description
1	Define how to measure the dimensions for horizontal bolt group position. • **Left**: From the left edge of the secondary part to the leftmost bolt.  • **Middle**: From the center line of the secondary part to the center line of the bolts. 

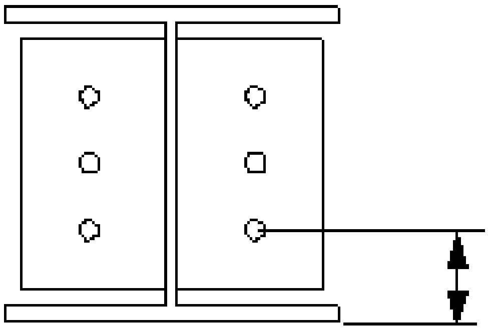
	Description
	• **Right**: From the right edge of the secondary part to the rightmost bolt. 
2	Define the dimension for horizontal bolt group position.
3	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Define the number of bolts.
5	Define the 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 how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt. 

<table>
<tr><th></th><th>Description</th></tr>
<tr><td></td><td>

- **Middle**: From the center line of the bolts to the center line of the secondary part.

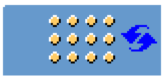
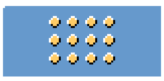
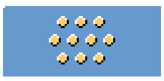
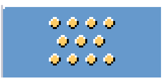
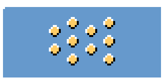


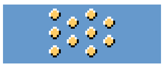
- **Below**: From the lower edge of the secondary part to the lowest bolt.



</td></tr>
<tr><td>7</td><td>Define the dimension for vertical bolt group position.</td></tr>
</table>

Staggering of bolts

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

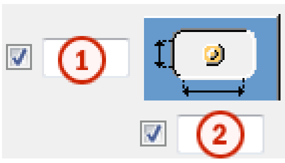
Option	Description
	Staggered type 4

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

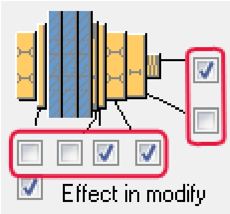
You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

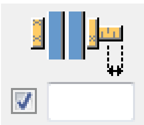
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



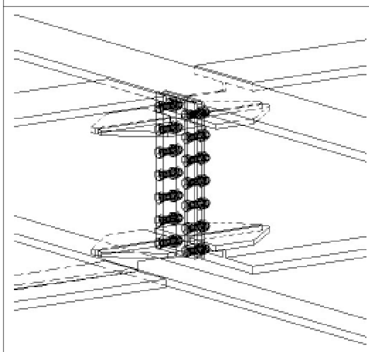
4.6 Two-sided end plate with compensating flange plates (112)

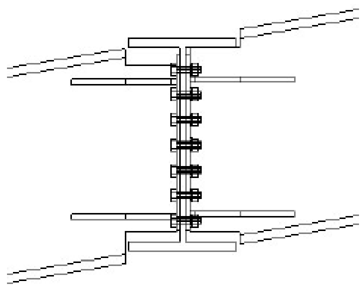
Two-sided end plate with compensating flange plates (112) connects a beam to two beams using end plates with compensating flange plates. The end plates are welded to the secondary beams and bolted to the main beam.

Objects created

- End plates
- Compensating flange plates
- Bolts
- Welds
- Cuts

Use for

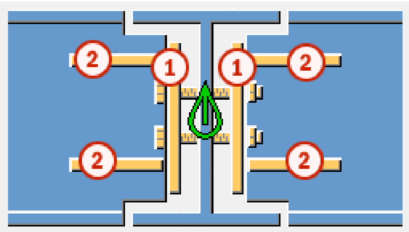
Situation	Description
	Connection with end plates and compensating flange plates.

Situation	Description
	Connection with end plates and compensating flange plates. Secondary beams are sloped.

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

See also

Two-sided end plate with compensating flange plates (112): Picture tab on page 568

Two-sided end plate with compensating flange plates (112): Parts tab on page 569

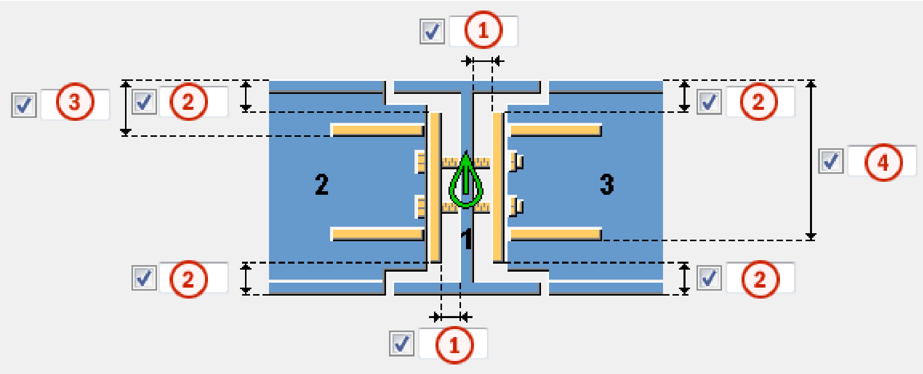
Two-sided end plate with compensating flange plates (112): Notch tab on page 570

Two-sided end plate with compensating flange plates (112): Bolts tab on page 573

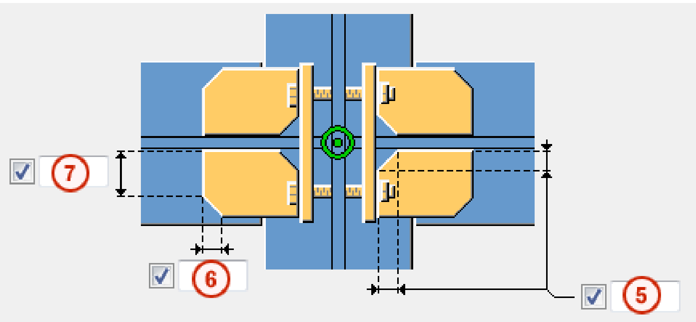
Two-sided end plate with compensating flange plates (112): Picture tab

Use the **Picture** tab to control the position of the end plates and compensating flange plates in the **Two-sided end plate with compensating flange plates (112)** connection.

Dimensions



	Description
1	Define the gap between the main beam and the end plate.
2	Define the end plate edge distance to the secondary beam flange.
3	Define the distance from the inner edge of the flange plate to the secondary beam flange.
4	Define the distance from the outer edge of the flange plate to the secondary beam flange.



	Description
5	Define the inner chamfer dimension of the flange plate.
6	Define the horizontal chamfer dimension of the flange plate.
7	Define the flange plate dimension that remains when a chamfer is created.

Two-sided end plate with compensating flange plates (112): Parts tab

Use the **Parts** tab to control the plate properties in the **Two-sided end plate with compensating flange plates (112)** connection.

Plate

Part	Description	Default
End plate, **Second end plate**	Define the end plate thickness and height. If you have defined the gap between the main beam and the end plate on the **Picture** tab, the length entered on the **Parts** 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`.
Compensating flange plate, **Second compensating flange plate**	Define the flange plate thickness, width, and height. The same values are used for the top and the bottom plates.	**Width** = The default value is based on rounding (beam flange width - beam web thickness) / 2.0. **Height** = `150mm` more than the notch length

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

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.

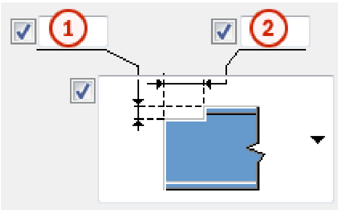
Two-sided end plate with compensating flange plates (112): Notch tab

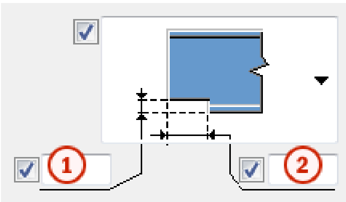
Use the **Notch** tab to create notches for the secondary beams and to control the notch properties in the **Two-sided end plate with compensating flange plates (112)** connection. Define the notches for both secondary beams.

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

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

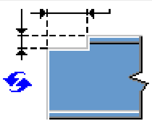
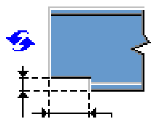
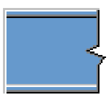
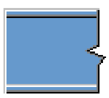
Notch dimensions Define the top and the bottom dimensions of the notch if you have set the **BCSA notch def** option to **No**.

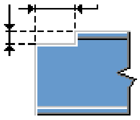
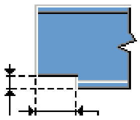
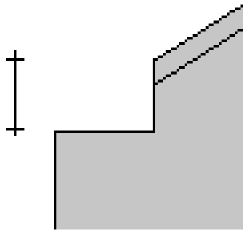
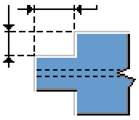
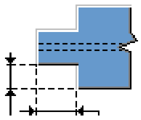
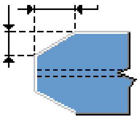
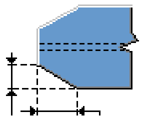
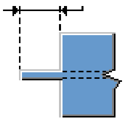
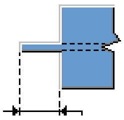
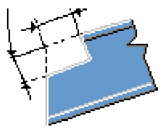
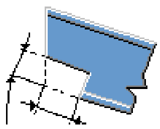




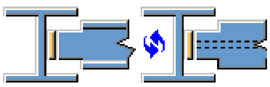
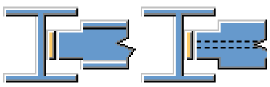
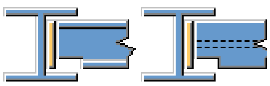
	Description
1	Define the vertical notch dimension.
2	Define the horizontal notch dimension.

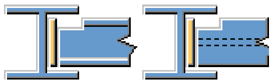
Notch shape Define the notch shape for the top and the bottom of the secondary beam.

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

Option	Option	Description
		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, the depth is measured as shown in the picture. 
		Creates a notch on both sides of the secondary part. Define the notch dimensions.
		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.

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.

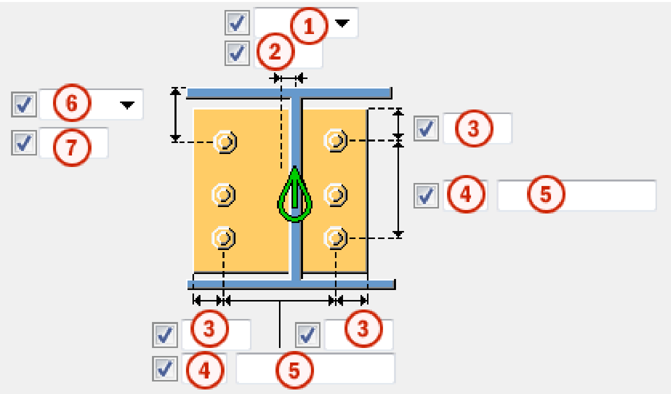
Option	Description
	Default Creates notches on both sides. AutoDefaults can change this option.
	Creates notches on both sides.
	Creates a notch on the left side.

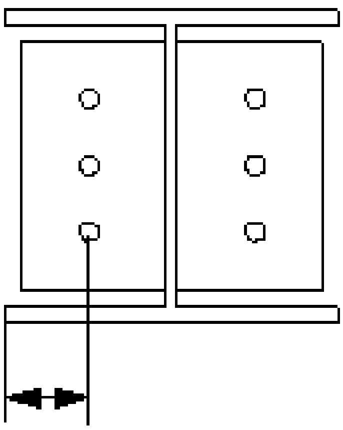
Option	Description
	Creates a notch on the right side.

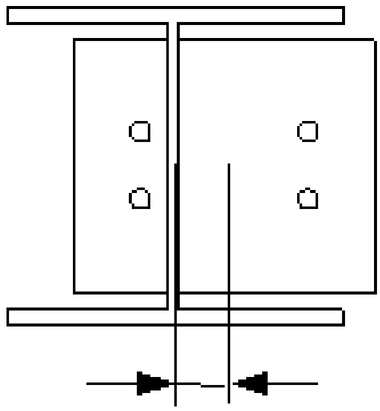
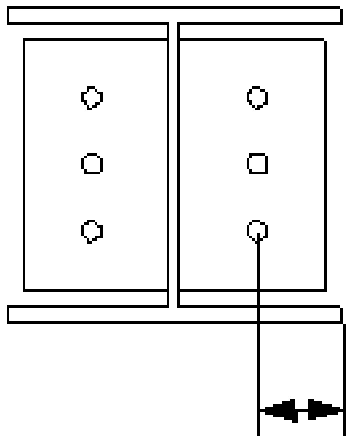
Two-sided end plate with compensating flange plates (112): Bolts tab

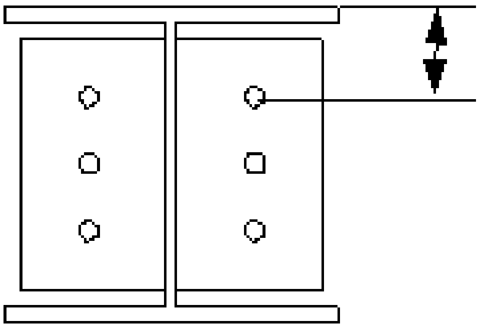
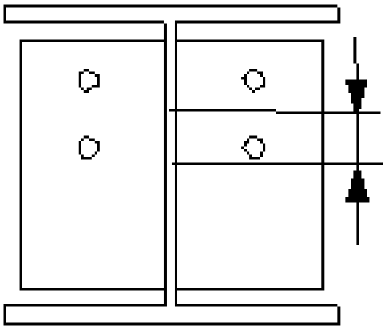
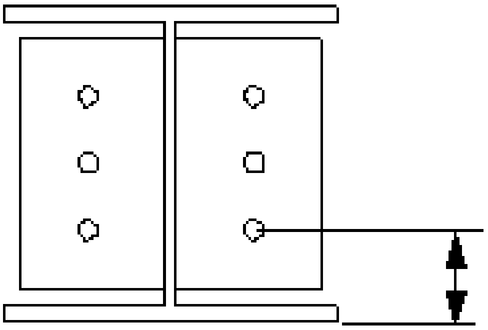
Use the **Bolts** tab to control the bolt properties in the **Two-sided end plate with compensating flange plates (112)** connection.

Bolt group dimensions

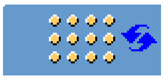
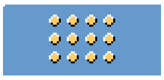
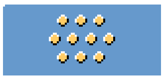
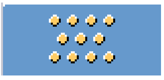
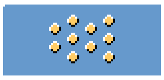
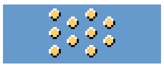


	Description
1	Define how to measure the dimensions for horizontal bolt group position. • **Left**: From the left edge of the secondary part to the leftmost bolt. 

	Description
	• **Middle**: From the center line of the secondary part to the center line of the bolts.  • **Right**: From the right edge of the secondary part to the rightmost bolt. 
②	Define the dimension for horizontal bolt group position.
③	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
④	Define the number of bolts.
⑤	Define the 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
6	Define 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. 
7	Define the dimension for vertical bolt group position.

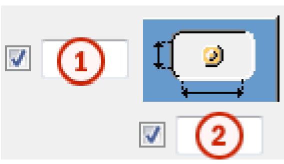
Staggering of bolts

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

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes You can define slotted, oversized, or tapped holes.

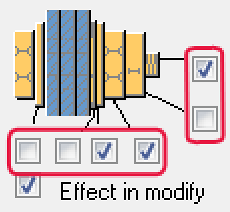


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.

Option	Description	Default
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

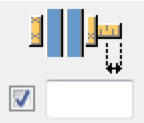
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



4.7 Two-sided end plate (115)

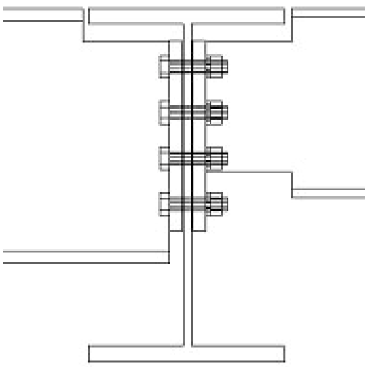
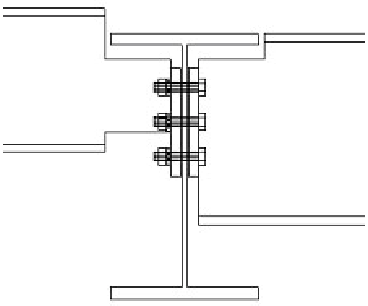
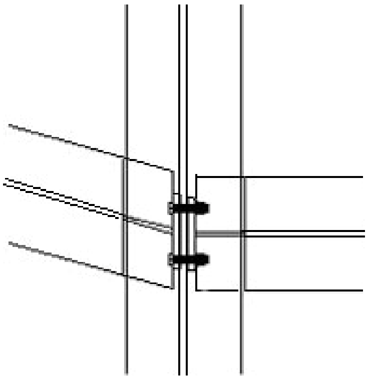
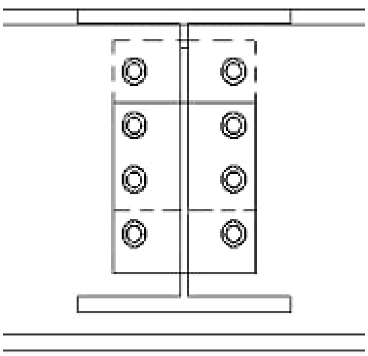
Two-sided end plate (115) connects two beams to a beam or a column using end plates. The end plates are welded to the secondary beams and bolted to the main part (beam or column).

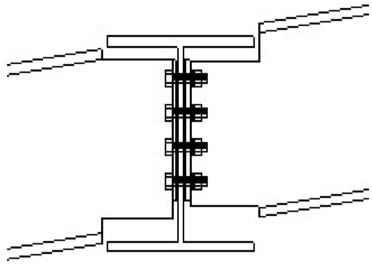
Objects created

- End plates (2)
- Bolts

- Welds
- Cuts

Use for

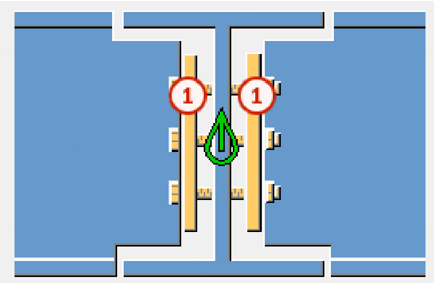
Situation	Description
	End plates with two secondary beams. Automatic notching for bolt clearance.
	End plates with two secondary beams at different heights.
	End plates with two secondary beams. A square and a skewed secondary beam.
	End plates with two secondary beams. Safety connection.

Situation	Description
	End plates with two sloped secondary beams. Various notching options.

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

See also

Two-sided end plate (115): Picture tab on page 579

Two-sided end plate (115): End plates tab on page 580

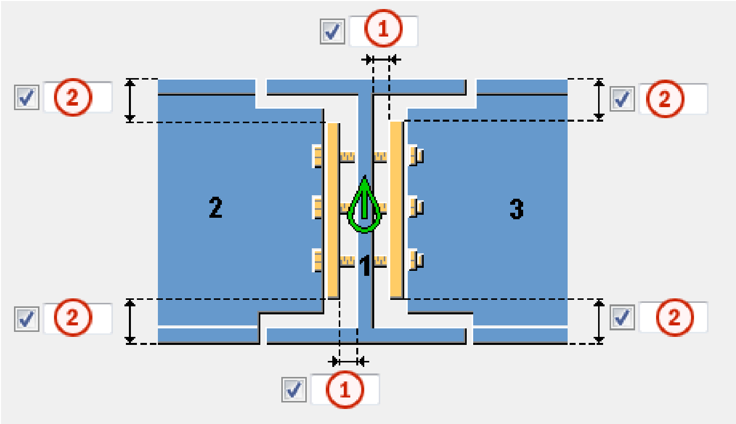
Two-sided end plate (115): Notch tab on page 581

Two-sided end plate (115): Bolts tab on page 583

Two-sided end plate (115): Picture tab

Use the **Picture** tab to control the position of the end plates in the **Two-sided end plate (115)** connection.

Dimensions



	Description	Default
1	Define the gap between the main part and the end plate.	2 mm
2	Define the end plate edge distance to the secondary beam flange.	50 mm

Two-sided end plate (115): End plates tab

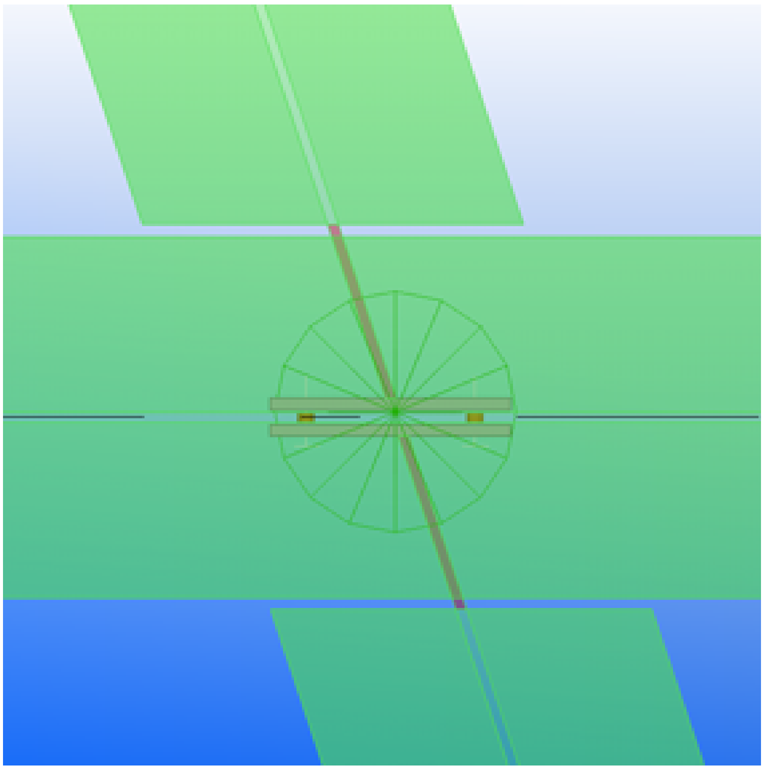
Use the **End plates** tab to control the properties of the end plates in the **Two-sided end plate (115)** connection.

Plate

Part	Description
End plate, Second end plate	Define the end plate thickness and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

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.

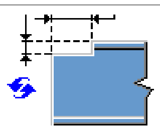
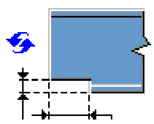


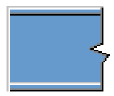
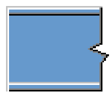
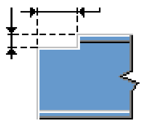
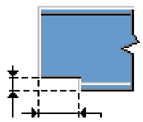
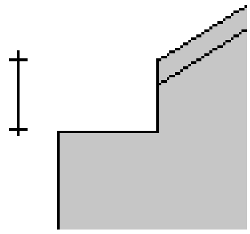
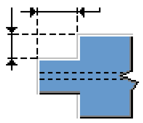
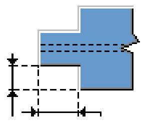
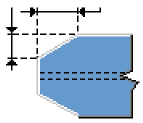
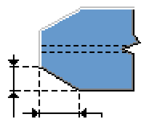
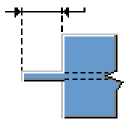
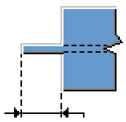
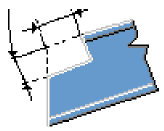
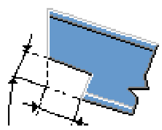
End plate edge type Define how the end plate is cut. The default is **Rolled/Sawn**.

Two-sided end plate (115): Notch tab

Use the **Notch** tab to create notches for the secondary beams and to control the notch properties in the **Two-sided end plate (115)** connection. Define the notches for both secondary beams.

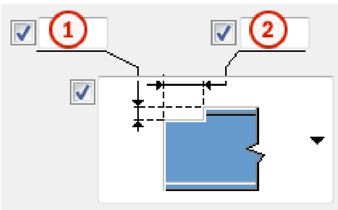
Notch shape Define the notch shape for the top and the bottom of the secondary beam.

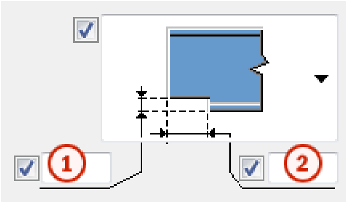
Option	Option	Description
		Default Creates a square notch on the top side or on the bottom side of the secondary beam. AutoDefaults can change this option.

Option	Option	Description
		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, the depth is measured as shown in the picture. 
		Creates a notch on both sides of the secondary part. Define the notch dimensions.
		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

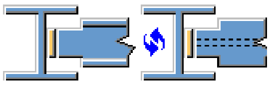
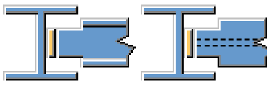
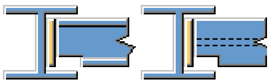
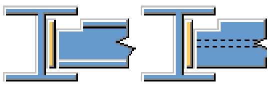
Define the top and the bottom dimensions of the notch if you have set the **BCSA notch def** option to **No**.





	Description
1	Define the vertical notch dimension.
2	Define the 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.

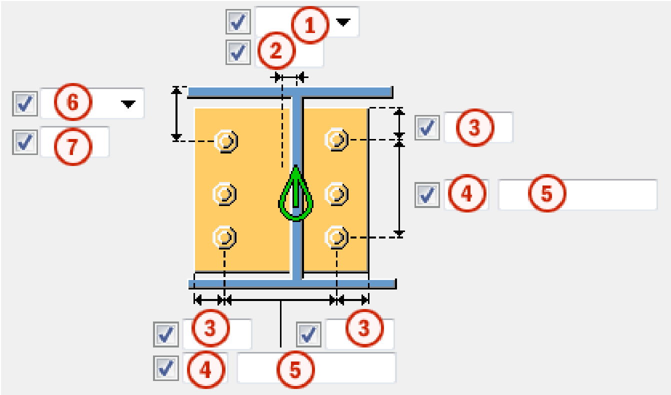
BCSA notch definition Define whether the notch is created according to British Constructional Steelwork Association (BCSA) specifications.

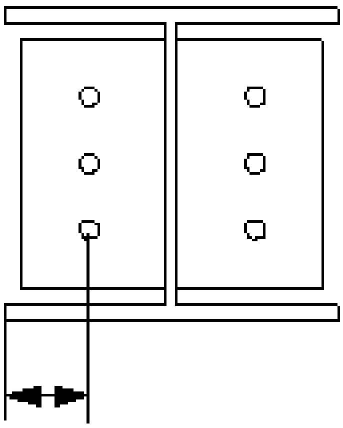
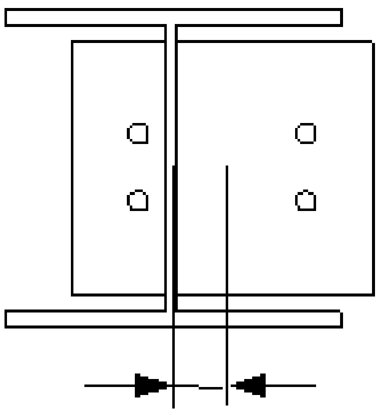
Option	Description
Default	Define the notch dimensions.
Yes	Creates a 50 mm notch for simple beam-to-beam connections.
No	Use the options on this **Notch** tab to define the notch dimensions.

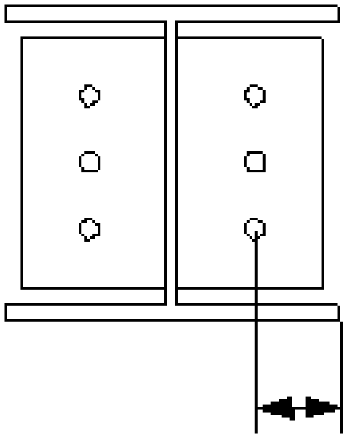
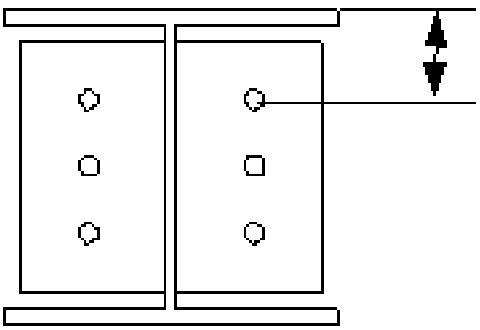
Two-sided end plate (115): Bolts tab

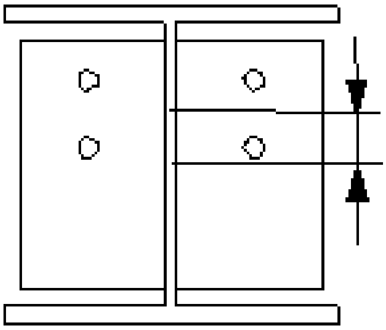
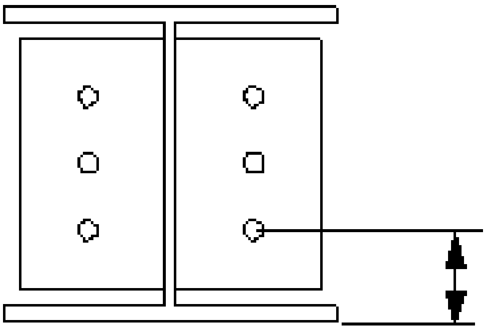
Use the **Bolts** tab to control the bolts properties in the **Two-sided end plate (115)** connection.

Bolt group dimensions

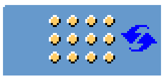
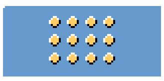
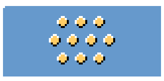
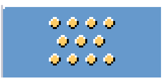
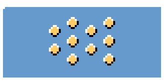


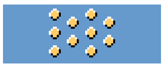
	Description
①	Define how to measure the dimensions for horizontal bolt group position. • **Left**: From the left edge of the secondary part to the leftmost bolt.  • **Middle**: From the center line of the secondary part to the center line of the bolts. 

	Description
	• **Right**: From the right edge of the secondary part to the rightmost bolt. 
②	Define the dimension for horizontal bolt group position.
③	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
④	Define the number of bolts.
⑤	Define the 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 how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt. 

	Description
	• **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. 
7	Define the dimension for vertical bolt group position.

Staggering of bolts

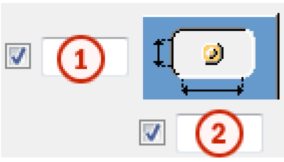
Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3

Option	Description
	Staggered type 4

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes You can define slotted, oversized, or tapped holes.

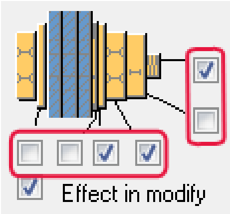


Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(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.

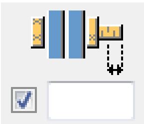
If you want to create a hole only, clear all the check boxes.



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.



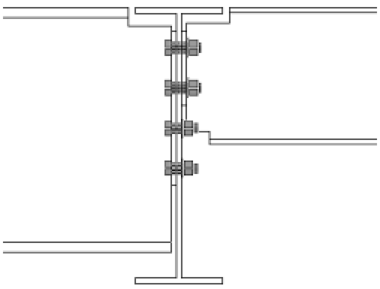
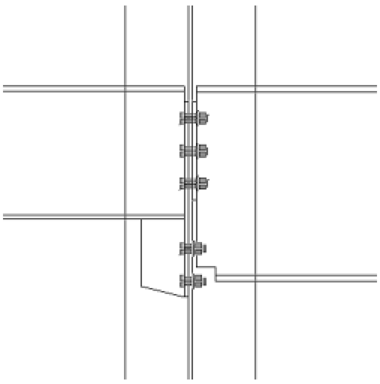
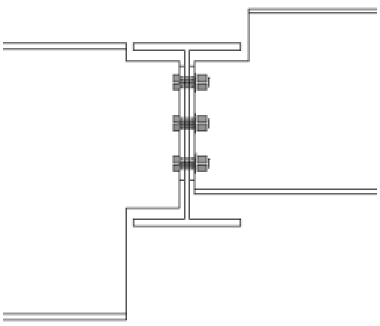
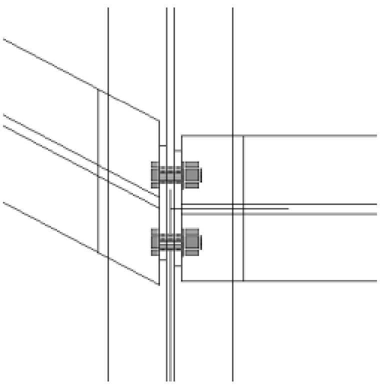
4.8 Two sided end plate (142)

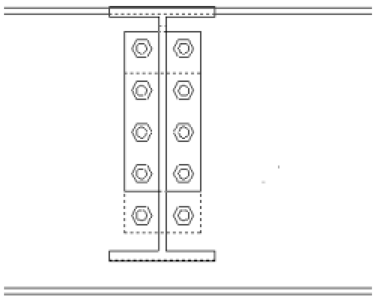
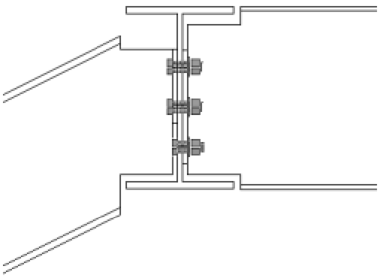
Two sided end plate (142) connects two beams to a beam or to a column using bolted end plates. One bolt group goes through all the three parts.

Objects created

- End plates
- Shim plates
- Haunch plates (optional)
- Holes
- Bolts
- Welds
- Cuts

Use for

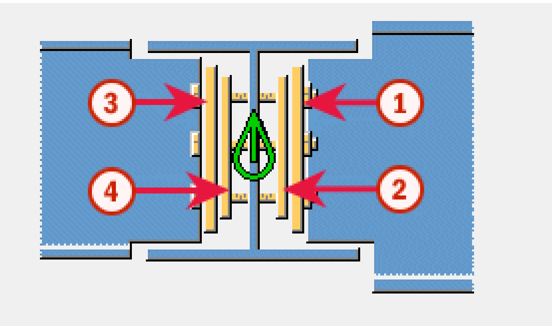
Situation	Description
	End plate connection with two secondary parts. Automatic notching for bolt clearance.
	End plate connection with two secondary parts and with a haunch plate. Automatic notching for bolt clearance.
	End plate connection with two secondary parts at different heights.
	End plate connection with two secondary parts. The secondary parts can be square and/or skewed.

Situation	Description
	End plate connection with two secondary parts. Safety connection.
	End plate connection with two secondary parts. The secondary parts can be leveled and/or sloped.

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
2	Shim plate for the first secondary part
3	End plate for the second secondary part
4	Shim plate for the second secondary part

You can use the `joints.def` file to change the default values of this component.

See also

Two sided end plate (142): Picture tab on page 591

Two sided end plate (142): Plates 1 tab on page 592

Two sided end plate (142): Plates 2 tab on page 596

Two sided end plate (142): Haunch tab on page 599

Two sided end plate (142): Notch tab on page 601

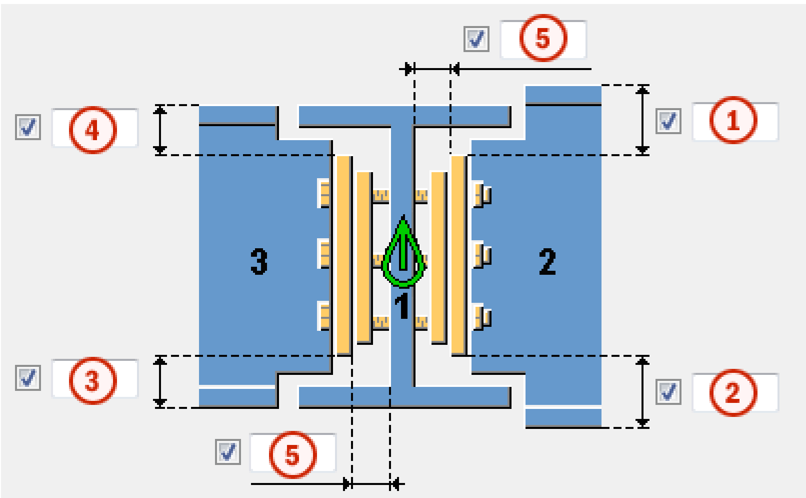
Two sided end plate (142): Bolts tab on page 606

Two sided end plate (142): Holes tab on page 608

Two sided end plate (142): Picture tab

Use the **Picture** tab to control the positions of the end plates in the **Two sided end plate (142)** connection.

End plate positions



Field	Description
1	Define the end plate upper edge distance from the top of the first secondary beam.
2	Define the end plate lower edge distance from the bottom of the first secondary beam.
3	Define the end plate lower edge distance from the bottom of the second secondary beam.
4	Define the end plate upper edge distance from the top of the second secondary beam.

Field	Description
5	Define a gap between the shim plates and the main part. Define the 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.

Sort secondaries by profile height

When **Two sided end plate (142)** connection is created, 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.

Two sided end plate (142): Plates 1 tab

Use the **Plates 1** tab to control the size of the end plate and shim plates for the first secondary beam in the **Two sided end plate (142)** connection.

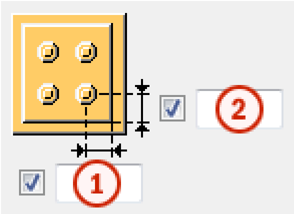
Plates

Field	Description	Default
End plate	Define the end plate thickness, width and height.	thickness = 10 mm
Fitting plate 1	Define the shim plate thickness. The plate is created only if the plate thickness is given. You can define up to three different shim plates.	0
Number of fitting plates	Define the number of shim plates for each thickness.	By default, 1 plate is created.

Field	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

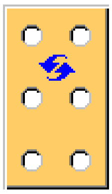
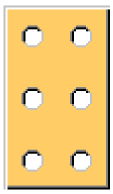
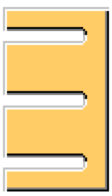
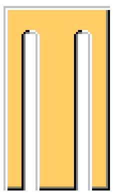
Bolt edge distances in shim plate

Define the bolt edge distances for shim plates. When these fields are empty, shim plates are of the same size as the end plate.



Field	Description	Default
1	Define the horizontal bolt edge distance in the shim plate.	30 mm
2	Define the vertical bolt edge distance in the shim plate.	30 mm

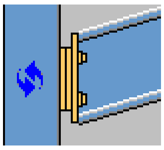
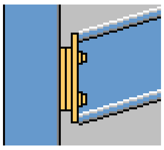
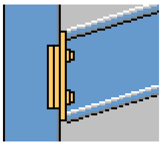
Shim plate shape

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.

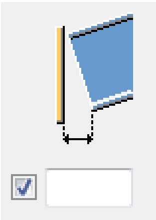
Tolerance

Define the tolerance for the slots in finger shim plates. The width of the slot is the bolt diameter + the tolerance.

Shim plate position

Option	Description
	Default option. Shim plates are outside the main part.
	Shim plates are outside the main part.
	Shim plates are inside the main part.

Gap size



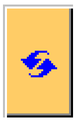
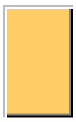
Define the limit value for the gap between the end plate and the secondary beam. Use this when the beam is slightly curved or sloped to decide if the end angle is so small that the beam end can be straight.

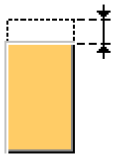
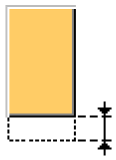
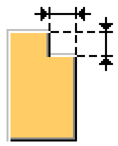
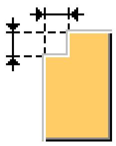
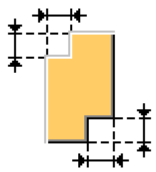
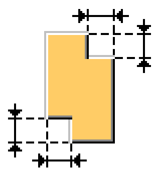
If the actual gap is smaller than this value, the end of the beam is left straight.

If the actual gap is larger than this value, the end of the beam is fitted to the end plate.

Safety connection

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.

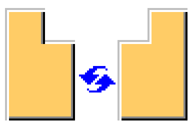
Option	Description
	Default End plate with no notches. AutoDefaults can change this option.
	End plate with no notches.

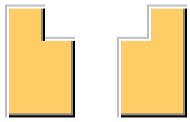
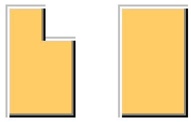
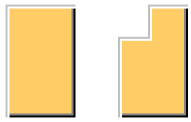
Option	Description
	One end plate is moved up to create a safety connection.
	One end plate is moved down to create a safety connection.
	One opposite upper corner of each end plate is notched to create a safety connection
	One opposite upper corner of each end plate is notched to create a safety connection.
	Diagonal opposite corners of each end plate are notched to create a safety connection.
	Diagonal opposite corners of each end plate are notched to create a safety connection.

Vertical cut/ offset Define the height of the notch or the vertical offset of the end plate.

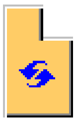
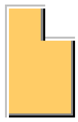
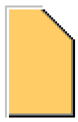
Horizontal cut Define the width of the notch in the end plate.

Safety connection location

Option	Description
	Default Affects both the near side and the far side end plates. AutoDefaults can change this option.

Option	Description
	Affects both the near side and the far side end plates.
	Affects only the near side end plate.
	Affects only the far side end plate.

Safety connection cut type

Option	Description
	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.
	Square cut
	Line cut

Two sided end plate (142): Plates 2 tab

Use the **Plates 2** tab to control the size of the end plate and shim plates for the second secondary beam in the **Two sided end plate (142)** connection.

Plates

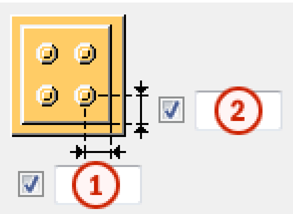
Field	Description	Default
End plate	Define end plate thickness, width and height.	thickness = `10 mm`
Fitting plate 1	Define the shim plate thickness. The plate is created only if the plate thickness is given. You can define up to three different shim plates.	0

Field	Description	Default
Number of fitting plates	Define the number of shim plates for each thickness.	By default, `1` plate is created.

Field	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

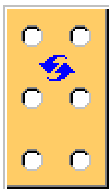
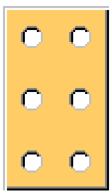
Bolt edge distances in shim plate

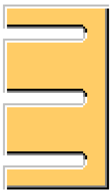
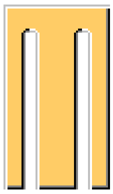
Define the bolt edge distances for shim plates. When these fields are empty, shim plates are of the same size as the end plate.



Field	Description	Default
1	Define the horizontal bolt edge distance in the shim plate.	`30 mm`
2	Define the vertical bolt edge distance in the shim plate.	`30 mm`

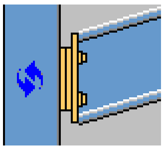
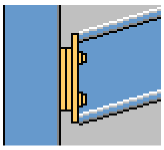
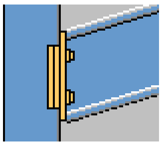
Shim plate shape

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.

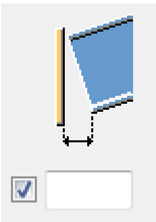
Option	Description
	Finger shim plate with horizontal slots. The plate can be installed from the right or the left side of the connection.
	Finger shim plate with vertical slots. The plate can be installed from the top of the connection.

Tolerance Define the tolerance for the slots in finger shim plates. The width of the slot is the bolt diameter + the tolerance.

Shim plate position

Option	Description
	Default option. Shim plates are outside the main part.
	Shim plates are outside the main part.
	Shim plates are inside the main part.

Gap size



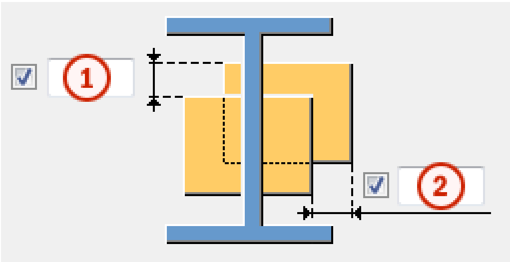
Define the limit value for the gap between the end plate and the secondary beam. Use this when the beam is slightly curved or sloped to decide if the end angle is so small that the beam end can be straight.

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.



Field	Description
1	Define how much the plates are moved in vertical direction.
2	Define how much the plates are moved in horizontal direction.

Two sided end plate (142): Haunch tab

Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges in the **Two sided end plate (142)** connection.

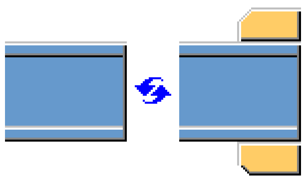
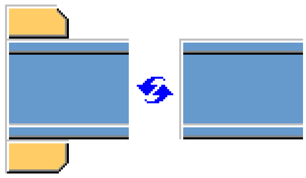
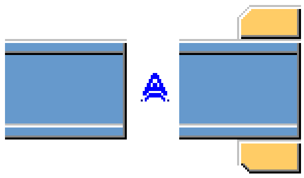
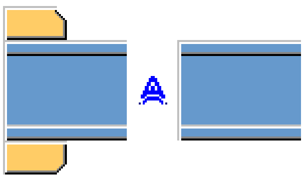
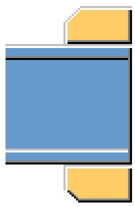
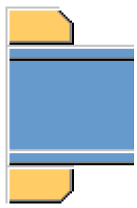
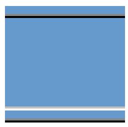
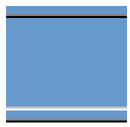
Haunch plates

Field	Description
Top plate	Define the top haunch plate thickness, width and height for the first secondary beam.
Bottom plate	Define the bottom haunch plate thickness, width and height for the first secondary beam.
Top plate 2	Define the top haunch plate thickness, width and height for the second secondary beam.
Bottom plate 2	Define the bottom haunch plate thickness, width and height for the second secondary beam.

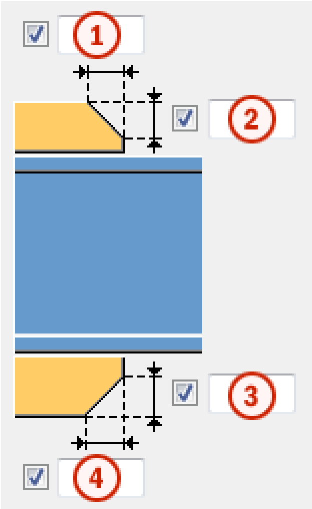
Field	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.

Field	Description	Default
Name	Define a name that is shown in drawings and reports.	

Haunch plate creation

Option for the second secondary beam	Option for the first secondary beam	Description
		Default If you have created clip angles, this option creates the top or bottom haunch plates or both, if needed. AutoDefaults can change this option.
		Automatic If you have created clip angles, this option creates the top or bottom haunch plates or both, if needed.
		Top and bottom haunch plates are always created. To create a single plate, enter 0 in the thickness (**t**) field for the haunch plate you do not need (top or bottom plate).
		Haunch plates are not created.

Haunch plate chamfers



Field	Description
1	Define the width of the top haunch plate chamfer.
2	Define the height of the top haunch plate chamfer.
3	Define the height of the bottom haunch plate chamfer.
4	Define the width of the bottom haunch plate chamfer.

Two sided end plate (142): Notch tab

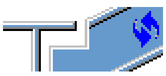
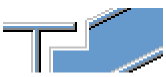
Use the **Notch** tab to automatically create notches for the secondary beams and to control the notch properties in the **Two sided end plate (142)** connection. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

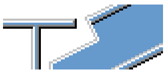
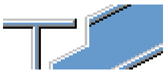
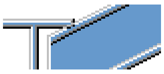
Automatic notching

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

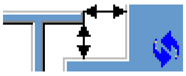
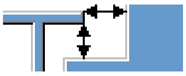
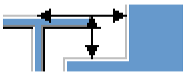
Notch shape

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

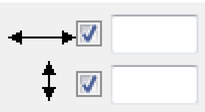
Option	Description
	Default Creates notches to the secondary beam. The cuts are square to the main beam web. AutoDefaults can change this option.
	Creates notches to the secondary beam. The cuts are square to the main beam web.

Option	Description
	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.

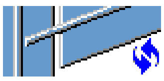
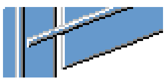
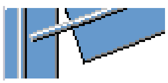
Notch size

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.

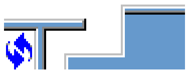
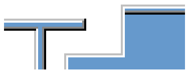
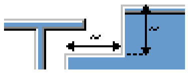


Flange cut shape

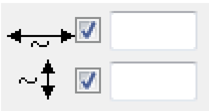
Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

Notch dimension rounding

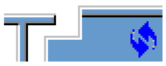
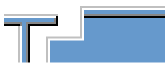
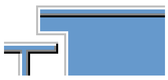
Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

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.

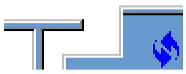
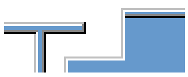
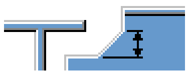
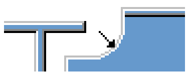
The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



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.

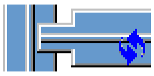
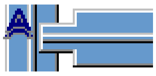
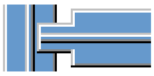
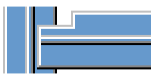
Notch chamfer

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.

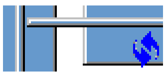
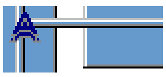
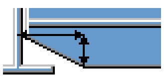
Enter a radius for the chamfer.

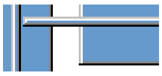
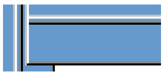
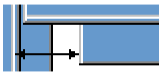
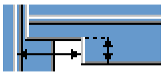
Manual notching Use manual notching when a part that does not belong to the connection clashes with the secondary part. When you use manual notching, the connection creates cuts using the values you enter in the fields on the **Notch** tab. You can use different values for the top and the bottom flange.

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

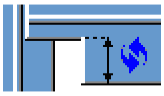
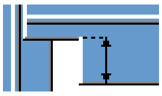
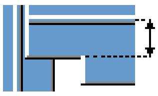
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the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

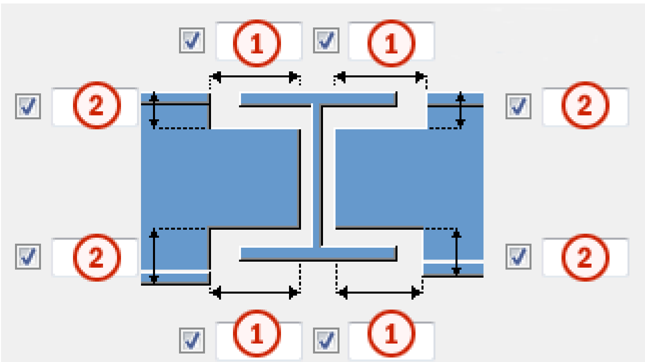
Option	Description
	Creates cuts to the flange with default values unless you enter values in the fields 1 and 2.
	The flange is not cut.
	Creates cuts to the flange according to the value in the field 1 to make it flush with the web.
	Creates cuts to the flange according to the values in the fields 1 and 2.

Flange notch depth

Option	Description
	Default Defines the flange notch depth. AutoDefaults can change this option.
	Defines the flange notch depth.
	Defines the 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



Field	Description
1	Define the horizontal flange cut dimensions for the top and the bottom flange. Enter values for the flange notch shapes.

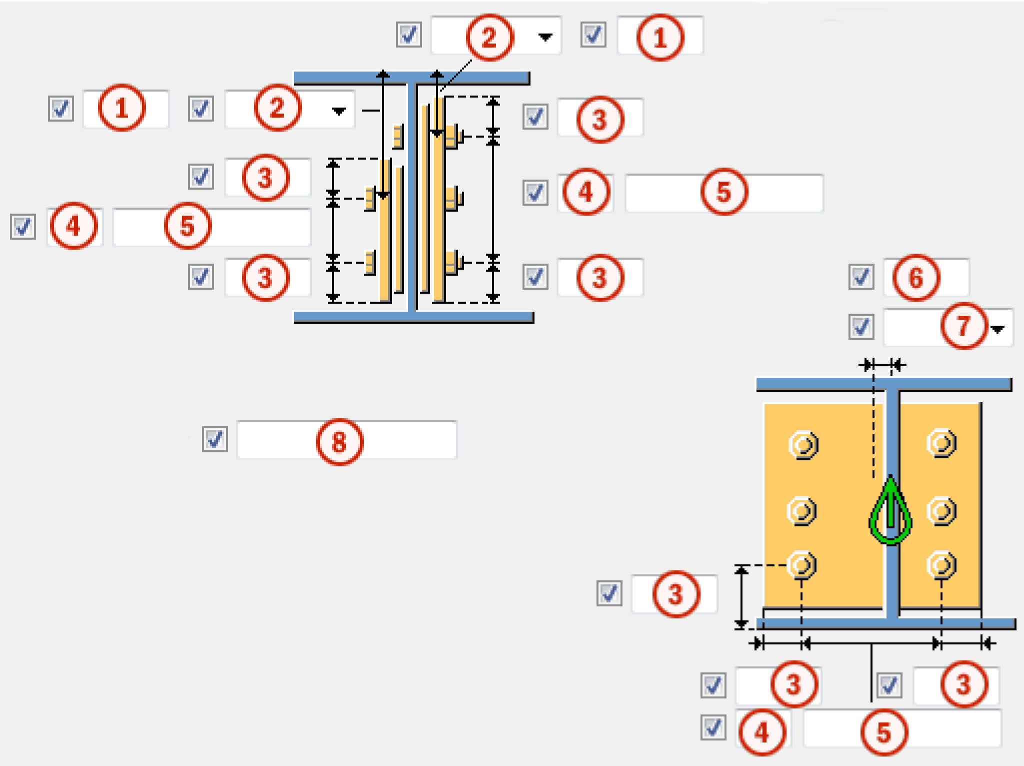
Field	Description
2	Define the vertical flange cut dimensions for the top and the bottom flange. Enter values for the flange notch shapes. The gap between the notch edge and the main beam flange is equal to the main beam web rounding. The notch height is rounded up to the nearest 5 mm.

Two sided end plate (142): Bolts tab

Use the **Bolts** tab to control the properties of bolts that connect the end plates to the main part in the **Two sided end plate (142)** connection.

Bolt group dimensions

Bolt group dimensions affect the size of the end plates.



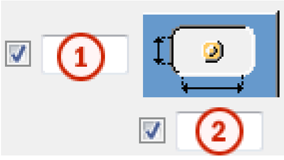
Field	Description
1	Define the dimension for vertical bolt group position.
2	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt.

Field	Description
	• **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.
3	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Define the number of bolts.
5	Define the 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 the dimension for horizontal bolt group position.
7	Define 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 center line of the bolts. • **Right**: From the right edge of the secondary part to the rightmost bolt.
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 down.

Bolt basic properties

Field	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	The bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	The gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

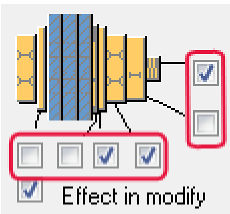
Slotted holes You can define slotted, oversized, or tapped holes.



Field	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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

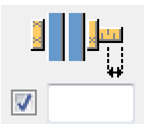
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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**.

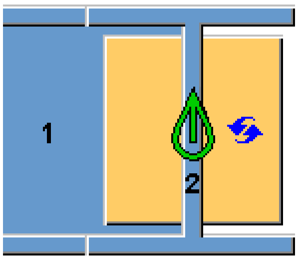
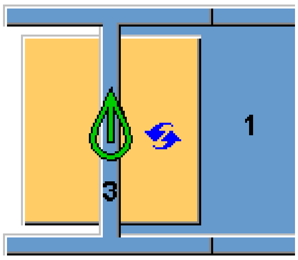
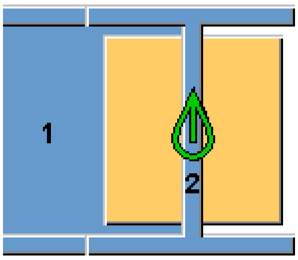
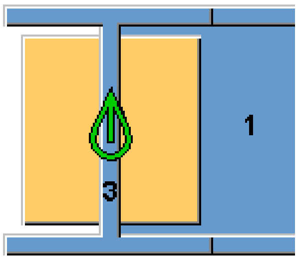
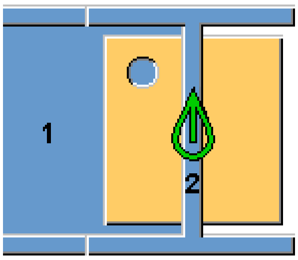
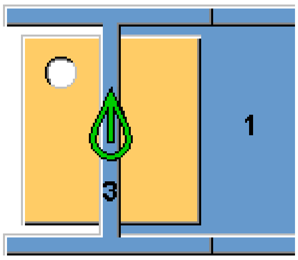
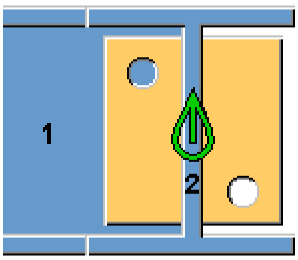
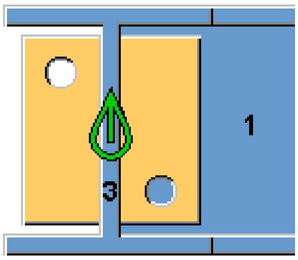
Bolt length increase Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.

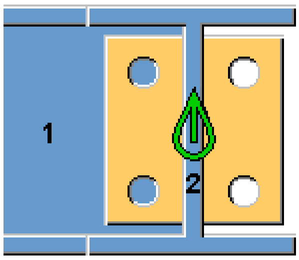
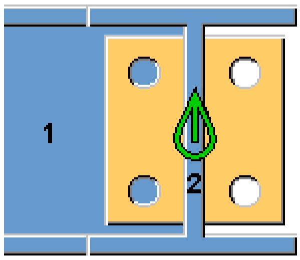


Two sided end plate (142): Holes tab

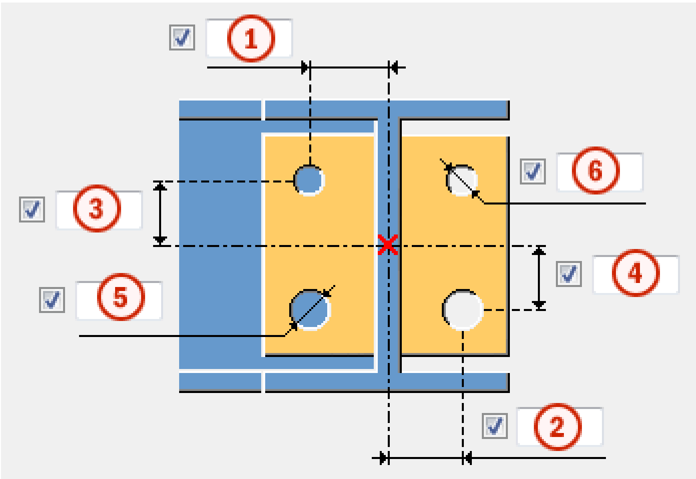
Use the **Holes** tab to control the galvanizing holes in the end plates in the **Two sided end plate (142)** connection.

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.

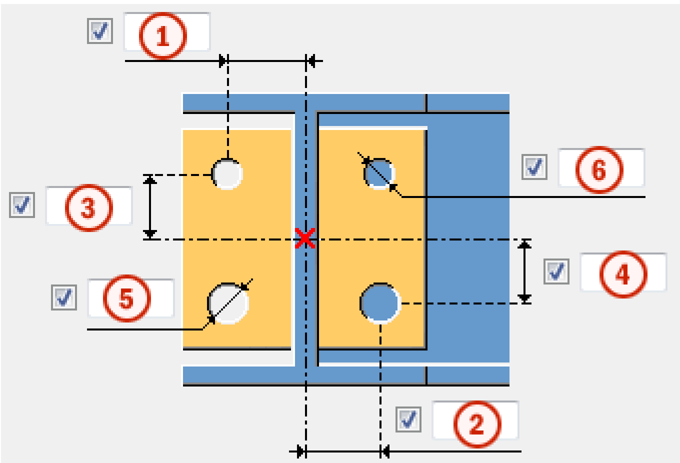
Option for the first secondary beam	Option for the second secondary beam	Description
		Default No holes AutoDefaults can change this option.
		No holes
		1 hole
		2 holes

Option for the first secondary beam	Option for the second secondary beam	Description
		4 holes

Hole posititions Hole positions in the end plate of the first secondary beam.



Hole positions in the end plate of the second secondary beam.



Field	Description
1	Define the horizontal distance between the secondary beam center and the upper hole.
2	Define the horizontal distance between the secondary beam center and the lower hole.

Field	Description
3	Define the vertical distance between the secondary beam center and the upper hole.
4	Define the vertical distance between the secondary beam center and the lower hole.
5	Define the diameter of the lower hole.
6	Define the diameter of the upper hole.

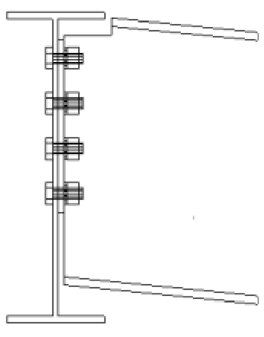
4.9 End plate (144)

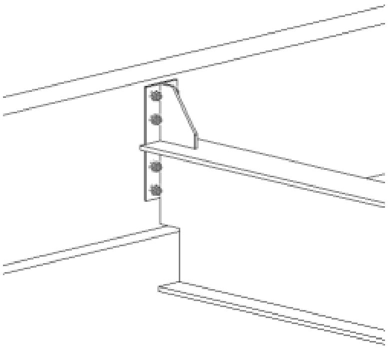
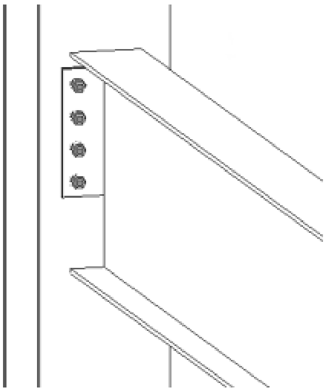
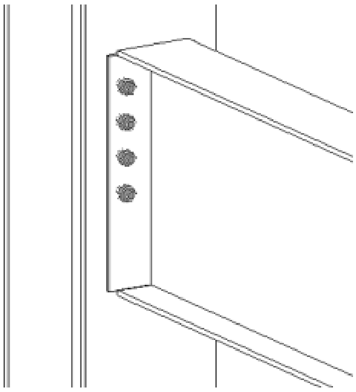
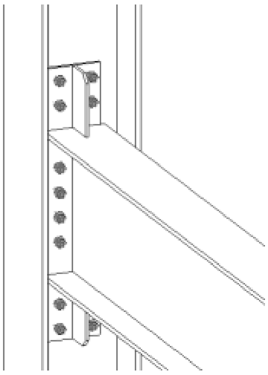
End plate (144) connects a beam to a column or two beams to each other using a bolted end plate. The secondary part can be leveled or sloped.

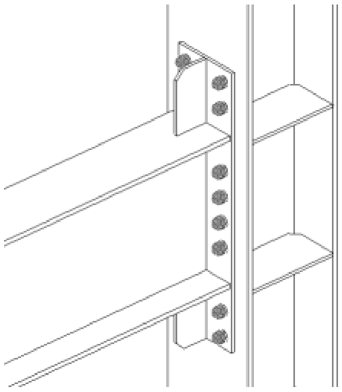
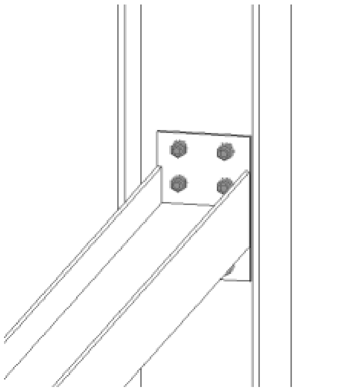
Objects created

- End plate
- Bent plate
- Shim plates (optional)
- Stiffeners (optional)
- Haunch plates (optional)
- Holes
- Bolts
- Seat angles
- Welds
- Cuts

Use for

Situation	Description
	Beam-to-beam end plate connection. The secondary part can either be leveled or sloped, or squared or skewed. There are several notching options.

Situation	Description
	Beam-to-beam end plate connection. Extended plate with or without haunch plates.
	End plate connection to a column flange or web. The secondary part can either be leveled or sloped, or squared or skewed.
	Full depth end plate connection to a column flange or web. The secondary part can either be leveled or sloped, or squared or skewed.
	End plate connection to a column web. Extended plate with haunch plates.

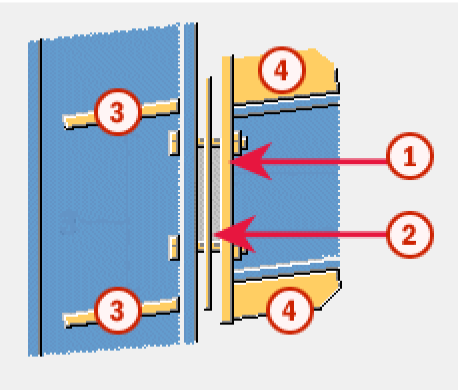
Situation	Description
	End plate connection to a column flange with column stiffener.
	Column end plate connection. The secondary part is rotated.

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

You can use the `joints.def` file to change the default values of this component.

See also

End plate (144): Picture tab on page 614

End plate (144): Plates tab on page 615

End plate (144): Stiffeners tab on page 618

End plate (144): Haunch tab on page 621

End plate (144): Notch tab on page 623

End plate (144): Bolts tab on page 627

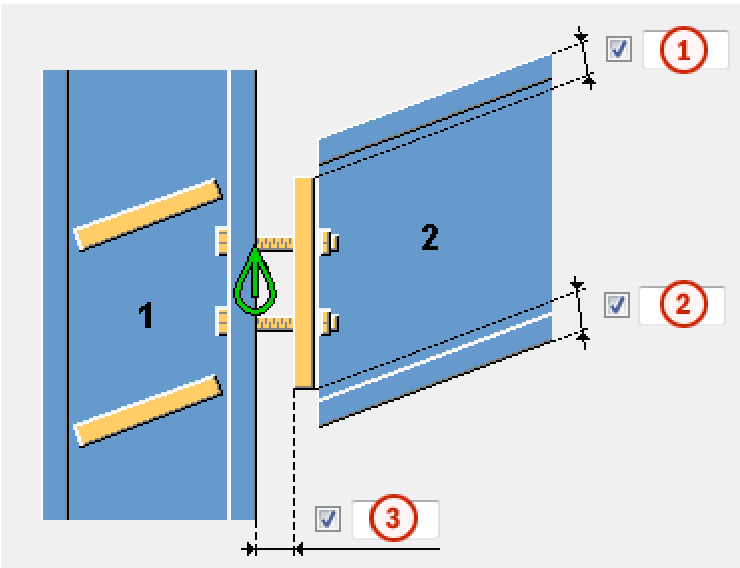
End plate (144): Holes tab on page 631

End plate (144): Angle box tab on page 633

End plate (144): Picture tab

Use the **Picture** tab to control the position of the end plate in the **End plate (144)** connection.

End plate position



Field	Description	Default
1	Define the 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`

Field	Description	Default
2	Define the end plate lower edge distance from the bottom of the secondary beam.	
3	Define a 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

End plate (144): Plates tab

Use the **Plates** tab to control the size of the end plate, bent plate, and shim plates in the **End plate (144)** connection.

Plates

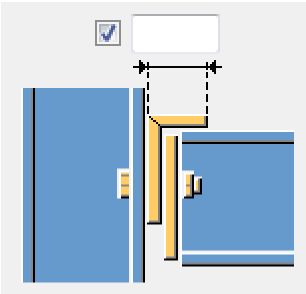
Field	Description	Default
End plate	Define the end plate thickness, width and height. The width and height are defined by the bolt group edge distances.	thickness = `10 mm`
Folded plate	Define the bent plate thickness, width and height. The plate is created only if the plate thickness is given.	thickness = `0` width = `bolt horizontal spacing value - (1.5*the bolt diameter)` height = `200 mm`
Fitting plate 1	Define the shim plate thickness. The plate is created only if the plate thickness is given. You can define up to three different shim plates.	`0`
Number of fitting plates	Define the number of shim plates for each thickness.	By default, `1` plate is created.

Field	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.

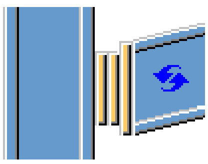
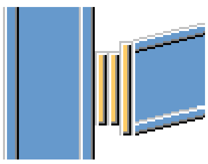
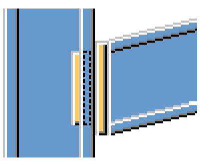
Field	Description	Default
Name	Define a name that is shown in drawings and reports.	

Bent shim plate length

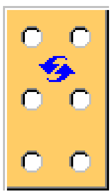
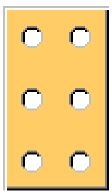
Define the horizontal length of the bent shim plate. The default is `10*bent plate thickness`.

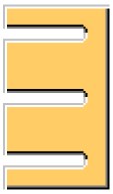
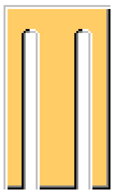


Shim plate position

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.

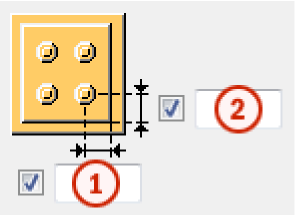
Shim plate shape

Option	Description
	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.

Option	Description
	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.

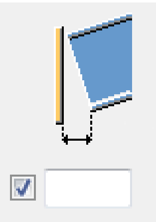
Tolerance Define the tolerance for the slots in finger shim plates. The width of the slot is the bolt diameter + the tolerance.

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.



Field	Description	Default
1	Define the horizontal bolt edge distance in the shim plate.	30 mm
2	Define the 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.

End plate (144): Stiffeners tab

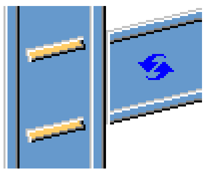
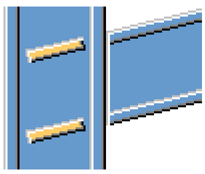
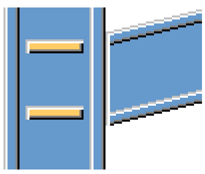
Use the **Stiffeners** tab to control the stiffener plate dimensions, orientation, position, and type in the **End plate (144)** connection.

Stiffener plate dimensions

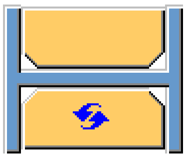
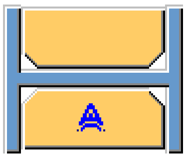
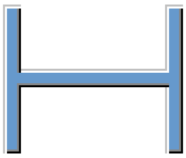
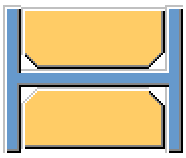
Field	Description
Top NS	Define the top near side stiffener thickness, width and height.
Top FS	Define the top far side stiffener thickness, width and height.
Bottom NS	Define the bottom near side stiffener thickness, width and height.
Bottom FS	Define the bottom far side stiffener thickness, width and height.

Field	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

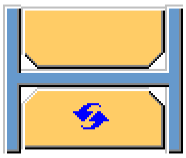
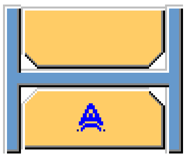
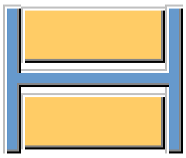
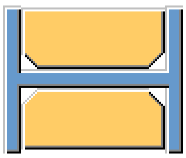
Stiffener orientation

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.

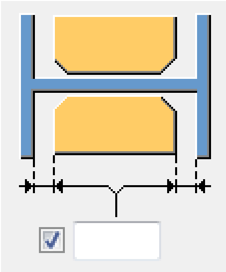
Stiffener creation

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

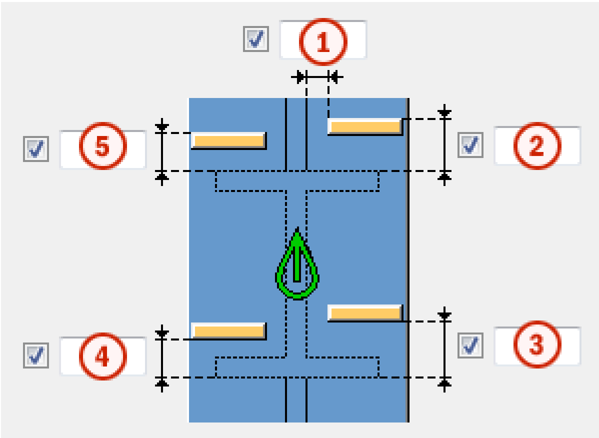
Stiffener shape

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

Stiffener gap

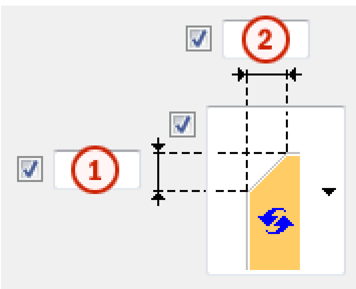
Field	Description
	Define the size of the gap between the flanges and the stiffener.

Stiffener positions



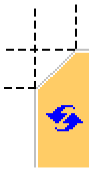
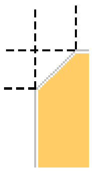
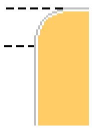
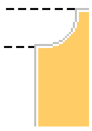
Field	Description
1	Define the size of the gap between the stiffener and the beam web edge.
2	Define the size of the gap between the top near side stiffener and the beam flange edge.
3	Define the size of the gap between the bottom near side stiffener and the beam flange edge.
4	Define the size of the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

Chamfer dimensions



Field	Description	Default
1	Define the vertical dimension of the chamfer.	`10 mm`
2	Define the 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

End plate (144): Haunch tab

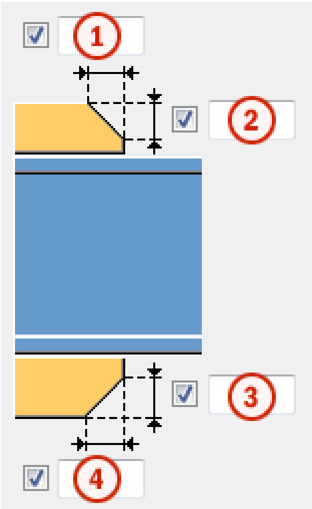
Use the **Haunch** tab to control the haunch plate creation and chamfers in the secondary beam flanges in the **End plate (144)** connection.

Haunch plates

Field	Description
Top plate	Define the top haunch plate thickness, width and height.
Bottom plate	Define the bottom haunch plate thickness, width and height.

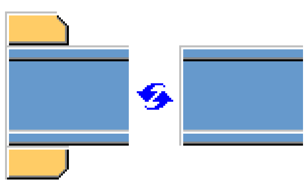
Field	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

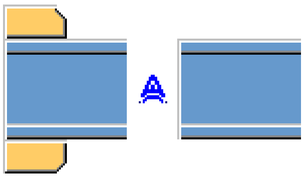
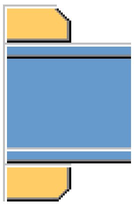
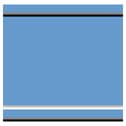
Haunch plate chamfers



Field	Description
1	Define the width of the top haunch plate chamfer.
2	Define the height of the top haunch plate chamfer.
3	Define the height of the bottom haunch plate chamfer.
4	Define the width of the bottom haunch plate chamfer.

Hauch plate creation

Option	Description
	Default If you have created clip angles, this option creates the top or bottom haunch plates or both, if needed. AutoDefaults can change this option.

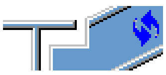
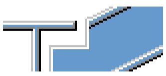
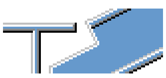
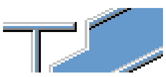
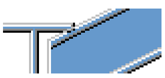
Option	Description
	Automatic If you have created clip angles, this option creates the top or bottom haunch plates or both, if needed.
	Top and bottom haunch plates are always created. To create a single plate, enter 0 in the thickness (**t**) field for the plate you do not need (top or bottom plate).
	Haunch plates are not created.

End plate (144): Notch tab

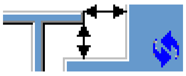
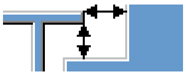
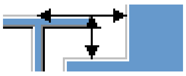
Use the **Notch** tab to automatically create notches for the secondary beam and to control the notch properties in the **End plate (144)** connection. The **Notch** tab has two sections: automatic properties (top section) and manual properties (bottom section). Automatic and manual notching properties work independently from each other.

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

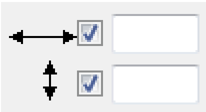
Notch shape Automatic notching is switched on when you select a notch shape.

Option	Description
	Default Creates notches to the secondary beam. The cuts are square to the main beam web. 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.

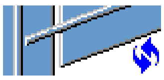
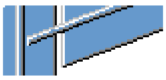
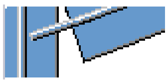
Notch size

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.

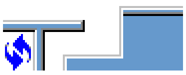
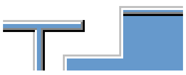
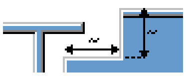


Flange cut shape

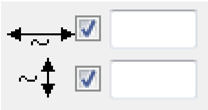
Option	Description
	Default Secondary beam flange is cut parallel to the main beam. AutoDefaults can change this option.
	Secondary beam flange is cut parallel to the main beam.
	Secondary beam flange is cut square.

Notch dimension rounding

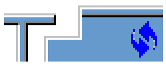
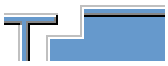
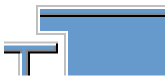
Use the notch dimension rounding options to define whether the notch dimensions are rounded up. Even if the dimension rounding is set to active, the dimensions are rounded up only when necessary.

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.

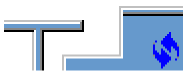
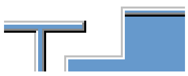
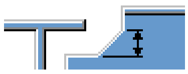
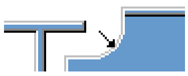
The dimensions are rounded up the nearest multiple of the value you enter. For example, if the actual dimension is 51 and you enter a round-up value of 10, the dimension is rounded up to 60.



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.

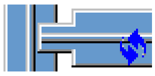
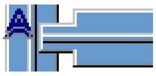
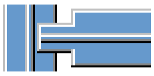
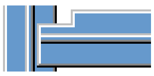
Enter a radius for the chamfer.

Manual notching

Use manual notching when a part that does not belong to the connection clashes with the secondary part. 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.

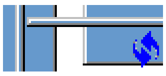
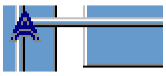
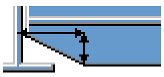
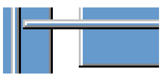
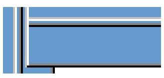
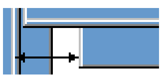
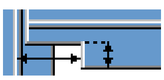
Side of flange notch

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

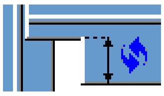
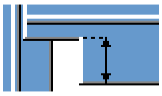
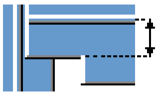
Option	Description
	Default Creates notches on both sides of the flange. AutoDefaults can change this option.
	Automatic Creates notches on both sides of the flange.
	Creates notches on both sides of the flange.
	Creates notches on the near side of the flange.
	Creates notches on the far side of the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

Flange notch shape

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

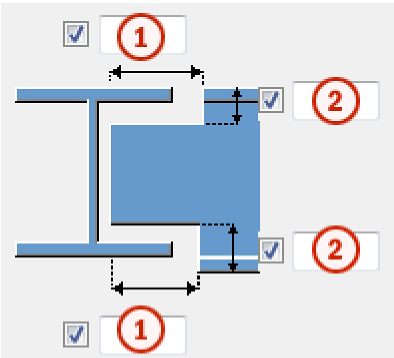
Option	Description
	Default The entire flange of the secondary part is cut as far back as you define. The default depth for the notch is twice the thickness of the secondary flange. The cut always runs the entire width of the secondary flange. AutoDefaults can change this option.
	Automatic The entire flange of the secondary part 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 1 and 2.
	The flange is not cut.
	Creates cuts to the flange according to the value in the field 1 to make it flush with the web.
	Creates cuts to the flange according to the values in the fields 1 and 2.

Flange notch depth

Option	Description
	Default Defines the flange notch depth. AutoDefaults can change this option.
	Defines the flange notch depth.
	Defines the 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



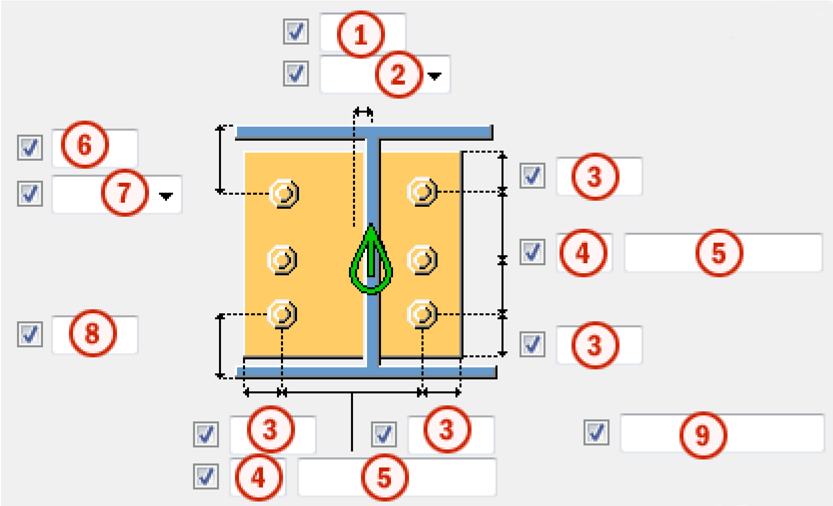
Field	Description
1	Define the horizontal flange cut dimensions for the top and the bottom flange. Enter values for the flange notch shapes.
2	Define the vertical flange cut dimensions for the top and the bottom flange. Enter values for the flange notch shapes. The gap between the notch edge and the main beam flange is equal to the main beam web rounding. The notch height is rounded up to the nearest 5 mm.

End plate (144): Bolts tab

Use the **Bolts** tab to control the properties of the bolts that connect the end plate to the main part in the **End plate (144)** connection.

Bolt group dimensions

Bolt group dimensions affect the size of the end plate.



Field	Description
1	Define the dimension for horizontal bolt group position.
2	Define 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 center line of the bolts. • **Right**: From the right edge of the secondary part to the rightmost bolt.
3	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Define the number of bolts.
5	Define the 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 the dimension for vertical bolt group position.
7	Define 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.
8	Define the distance from the bottom of the beam to the lowest bolt.

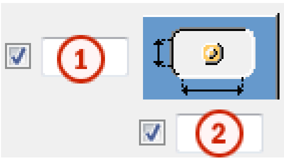
Field	Description
9	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to down.

Bolt basic properties

Field	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	The bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	The gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

You can define slotted, oversized, or tapped holes.



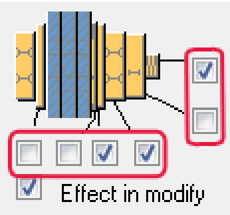
Field	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options	

Field	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.

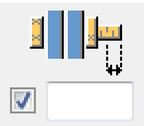
If you want to create a hole only, clear all the check boxes.



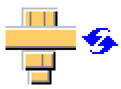
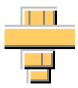
To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

Bolt length increase

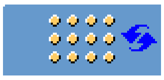
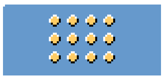
Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.

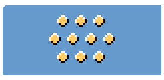
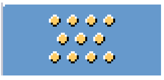
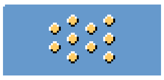
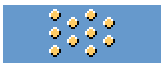


Bolting direction

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.
	Not staggered

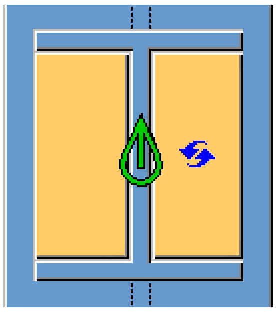
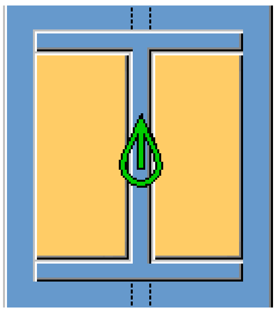
Option	Description
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

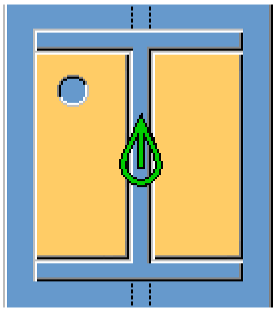
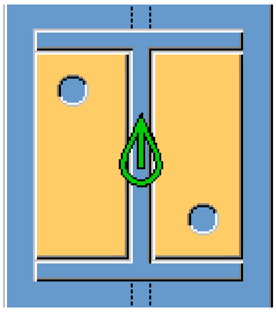
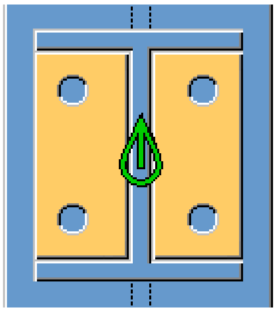
End plate (144): Holes tab

Use the **Holes** tab to control the galvanizing holes in the end plate in the **End plate (144)** connection.

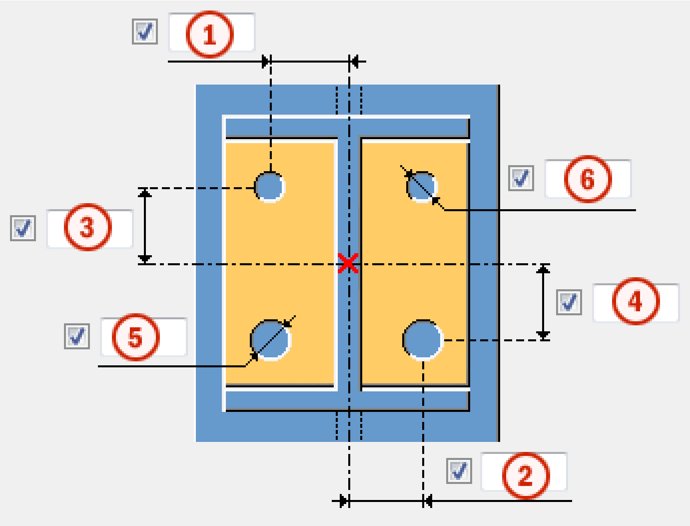
Number of holes

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

Option	Description
	1 hole
	2 holes
	4 holes

Hole positititions



Field	Description
1	Define the horizontal distance between the secondary beam center and the upper hole.
2	Define the horizontal distance between the secondary beam center and the lower hole.
3	Define the vertical distance between the secondary beam center and the upper hole.
4	Define the vertical distance between the secondary beam center and the lower hole.
5	Define the diameter of the lower hole.
6	Define the diameter of the upper hole.

End plate (144): Angle box tab

Use the **Angle box** tab to add a seat angle in the **End plate (144)** connection. The purpose of seat angles is to carry loads from the secondary beam.

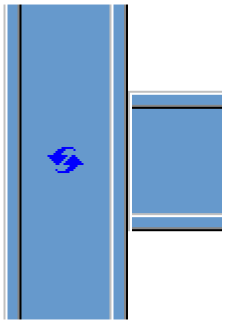
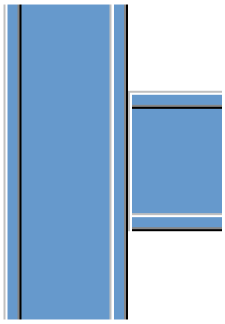
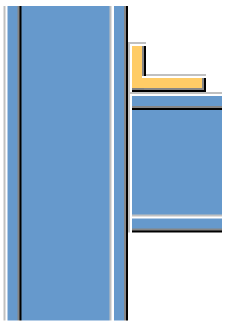
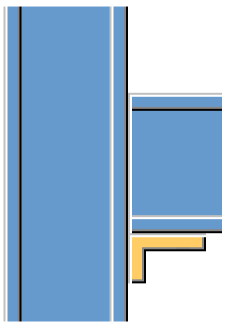
Seat angle

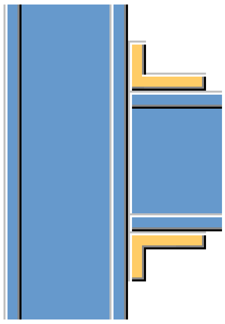
Option	Description
Profile	Define the seat angle thickness, width and height.

Field	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

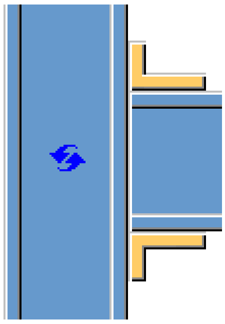
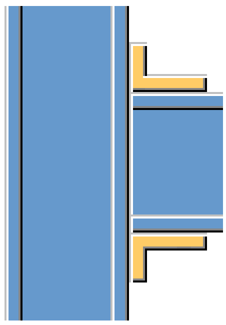
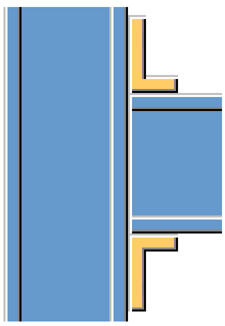
Seat angle position

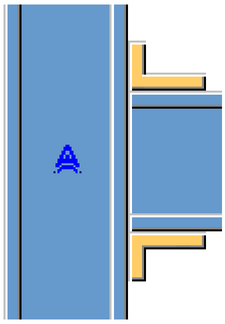
Seat angles can be located on the top, bottom or both flanges of the secondary part.

Option	Description
	Default No seat angle is created. AutoDefaults can change this option.
	No seat angle is created.
	A seat angle is created at the top of the flange of the beam.
	A seat angle is created at the bottom of the flange of the beam.

Option	Description
	Seat angles are created on both sides of the flange of the beam.

Seat angle orientation

Option	Description
	Default The longer leg of the seat angle is connected to the secondary beam. AutoDefaults can change this option.
	The longer leg of the seat angle is connected to the secondary beam.
	The longer leg of the seat angle is connected to the main part.

Option	Description
	Automatic The longer leg of the seat angle is connected to the part where bolts reach furthest from the angle seat corner.

5 Welded connections

This section introduces welded connection components available in Tekla Structures.

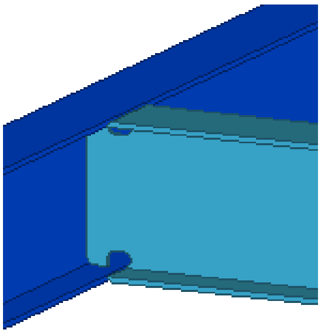
5.1 Offshore (9)

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

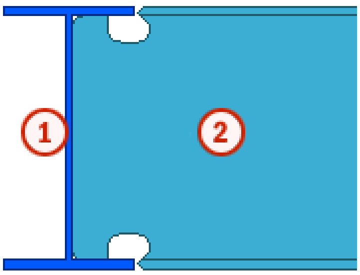
Situation	Description
	Connection between two beams.

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

See also

Offshore (9): Picture 1 tab on page 638

Offshore (9): Picture 2 tab on page 640

Offshore (9): Weld description tab on page 641

Offshore (9): Picture 1 tab

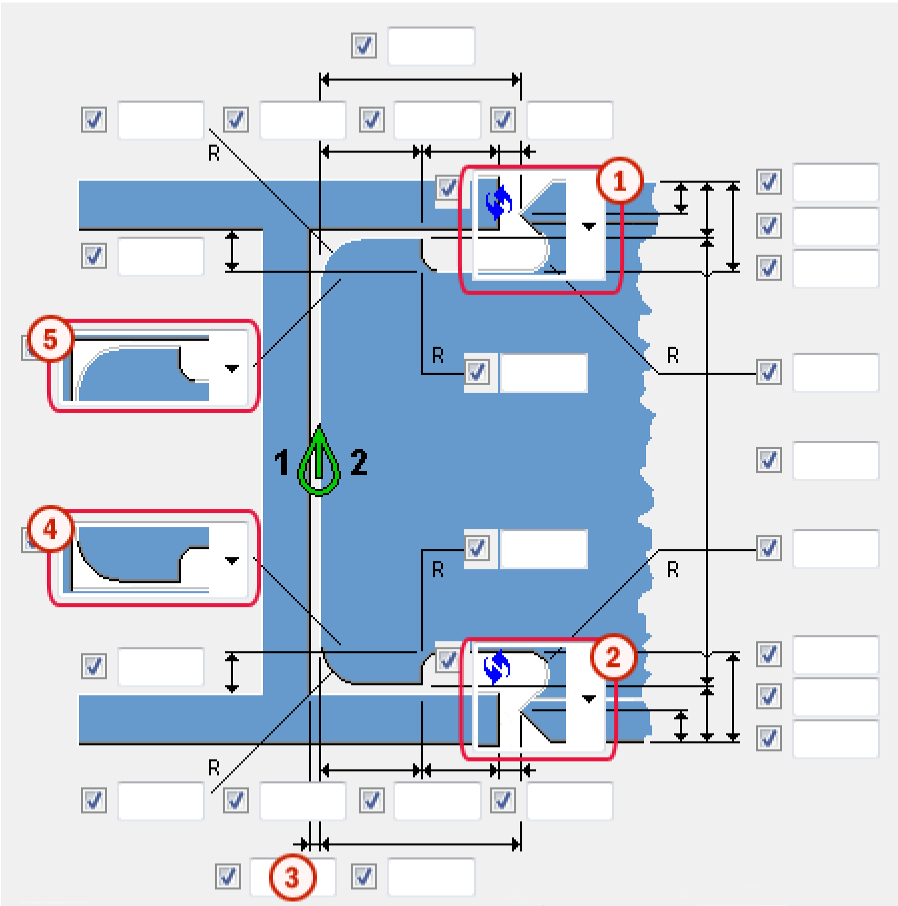
Use the **Picture 1** tab to create notches in the direction of the web in the **Offshore (9)** connection.

Notch type

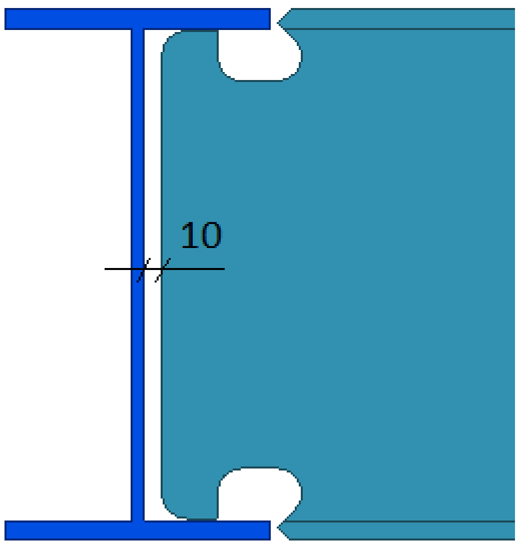
Select the notch type and enter the notch values, if needed.

Option	Description
Free	Enter the notch dimensions.
Heerema	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.
HSM	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.
No and clean up UDA	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.

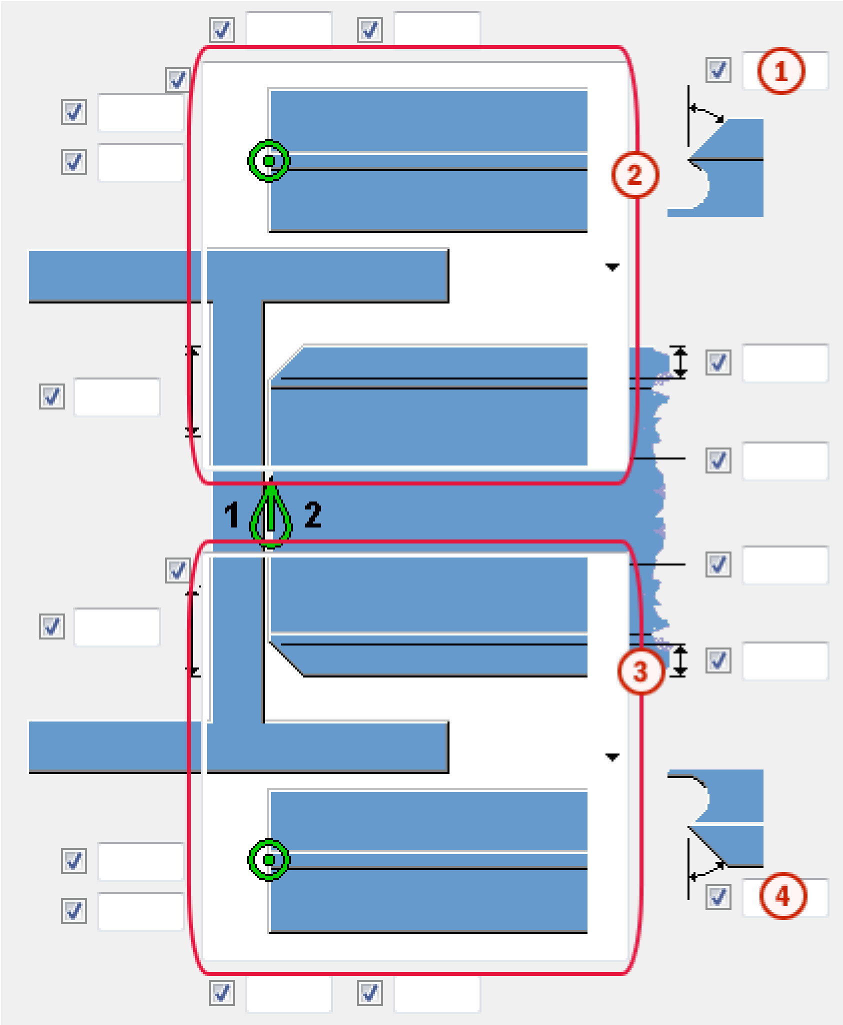
	Description
3	Define a gap between the main beam web and the secondary beam end. 
4	Define the bottom rounding and a possible weld access hole for the secondary beam.
5	Define the top rounding and a possible weld access hole for the secondary beam.

Fitting Select the type of the fitting.

Offshore (9): Picture 2 tab

Use the **Picture 2** tab to create notches in the direction of the flange in the **Offshore (9)** connection. 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.

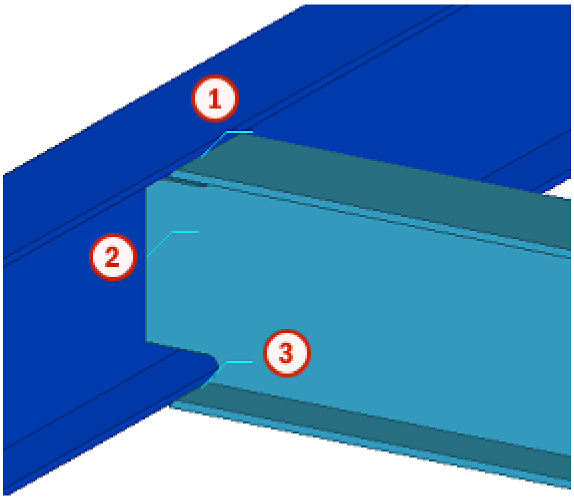
Notches



	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).

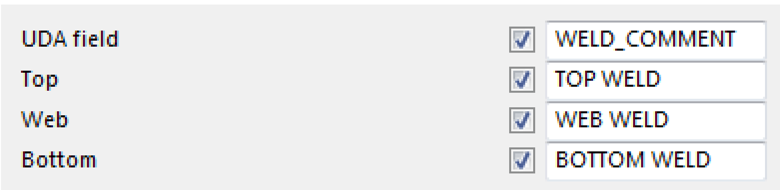
Offshore (9): Weld description tab

Use the **Weld description** tab to control weld descriptions for the top, web and bottom welds in the **Offshore (9)** connection.



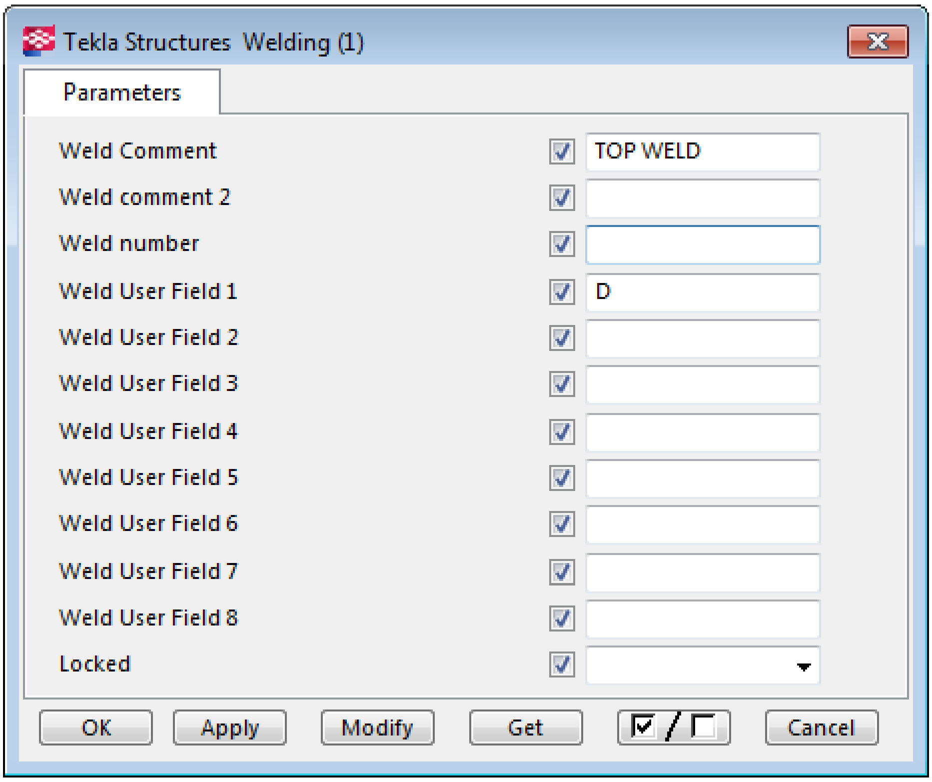
	Description
1	Top weld
2	Web weld
3	Bottom weld

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	WELD_COMMENT
Top	TOP WELD
Web	WEB WELD
Bottom	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.

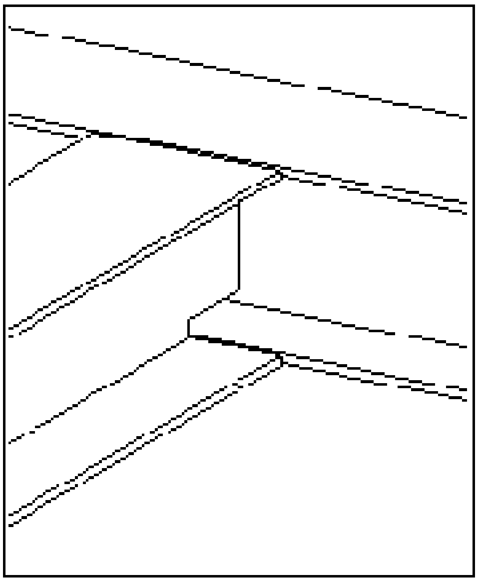
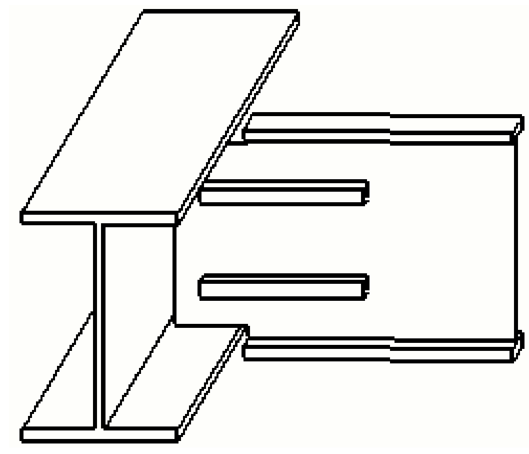


5.2 Fitting (13)

Fitting (13) connects a beam to a beam using welds.

Objects created

- Stiffeners (2) (optional)
- Welds

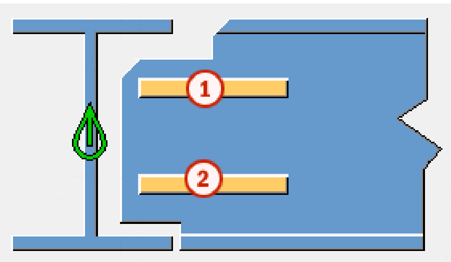
Use for	Situation	Description
		Fitting connection without stiffeners.
		Fitting connection with upper and lower stiffener.

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

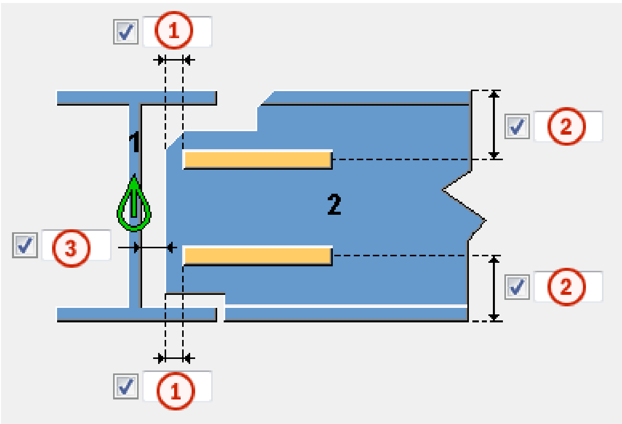
See also Fitting (13): Picture tab on page 645

Fitting (13): Parts tab on page 645

Fitting (13): Picture tab

Use the **Picture** tab to control the fitting dimensions in the **Fitting (13)** connection.

Dimensions



	Description
1	Define the stiffener horizontal distance from the secondary beam edge.
2	Define the stiffener vertical distance from the secondary beam edge.
3	Define the distance between the main beam and the secondary beam.

Weldings Define whether weldings are created.

Fitting (13): Parts tab

Use the **Parts** tab to control the stiffener properties in the **Fitting (13)** connection.

Stiffener

Part	Description
Upper stiffener	Define the thickness, width, and height of the upper stiffener.

Part	Description
Lower stiffener	Define the thickness, width, and height of the lower stiffener.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

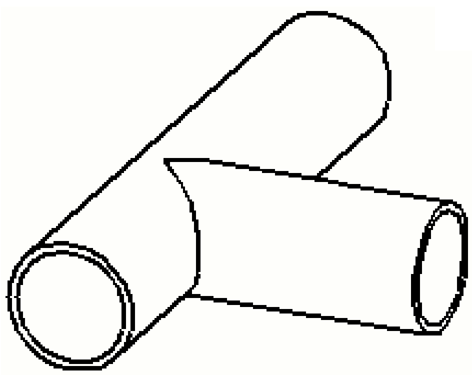
5.3 Round tube (23)

Round tube (23) connects two round tube profiles with a fitting and welds.

Objects created

- Fitting
- Welds

Use for

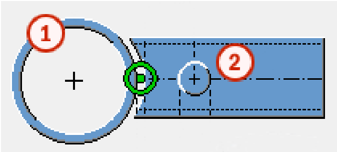
Situation	Description
	Connection between two round tubes. Fitting and welds are created.

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

See also

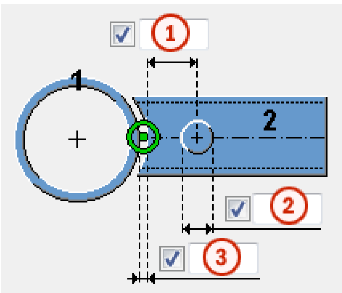
Round tube (23): Picture tab on page 647

Round tube (23): Parameters tab on page 648

Round tube (23): Picture tab

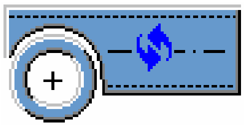
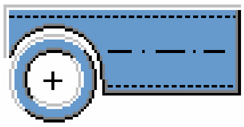
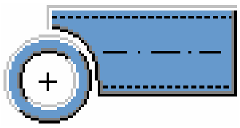
Use the **Picture** tab to control the dimensions of the secondary round tube fitting and the gap between the round tubes in the **Round tube (23)** connection.

Part dimensions



	Description	Default
1	Define the pop mark offset. You can define the offset if you have set the **Position of pop mark** option to **At minimum angle**, **At maximum angle**, or **Both**.	`100 mm`
2	Define the pop mark diameter. You can define the diameter if you have set the **Position of pop mark** to **At minimum angle**, **At maximum angle**, or **Both**.	`10 mm`
3	Define the 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.

Position of pop mark Select the position of the pop mark.

Round tube (23): Parameters tab

Use the **Parameters** tab to control whether welds are created and to define the rotation angle and cut tolerance in the **Round tube (23)** connection.

Weldings Define whether welds are created between the round tubes.

Rotation angle of cut part Define the rotation angle of the cut in the main round tube.

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.

Cut tolerance of sec Define the cut tolerance of the secondary round tube.

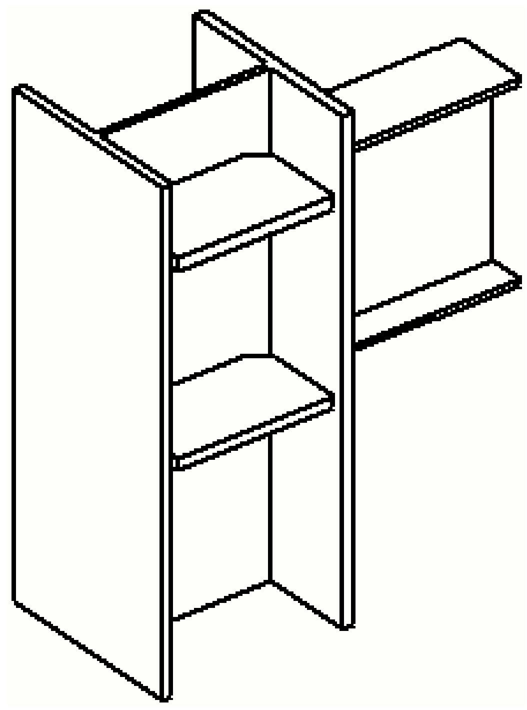
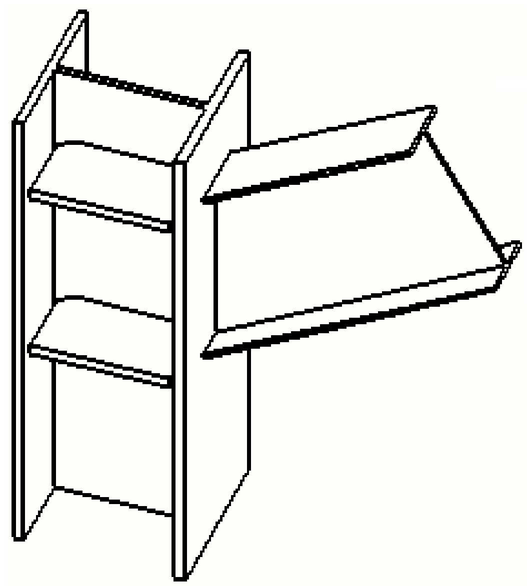
5.4 Welded column (31)

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

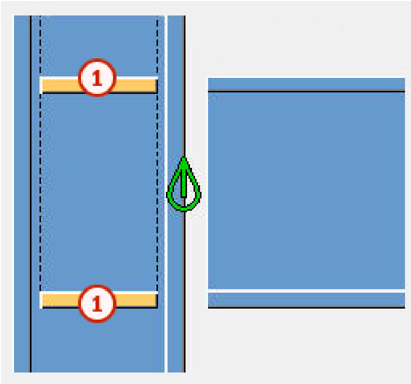
Situation	Description
	Beam welded to a column. Four stiffeners are created.
	Sloped beam welded to a column. Four stiffeners are created.

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
1	Stiffener

See also

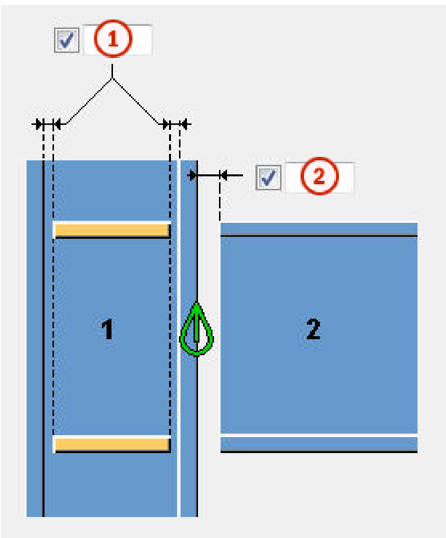
Welded column (31): Picture tab on page 650

Welded column (31): Parts tab on page 651

Welded column (31): Picture tab

Use the **Picture** tab to control the dimensions and stiffener positions in the **Welded column (31)** connection.

Dimensions



	Description
1	Define the distance between the stiffener and the column flange.

	Description
2	Define the distance between the column flange and the edge of the beam. You can define the distance if the **Fit secondary** option is set to **Default** or **Yes**.

Fit secondary Define whether the secondary beam can be fitted to the column.

Welded column (31): Parts tab

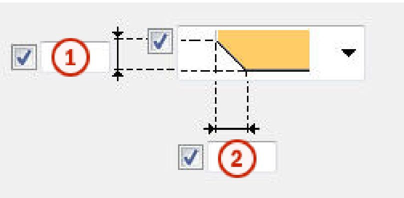
Use the **Parts** tab to control the stiffener properties in the **Welded column (31)** connection.

Stiffeners

Part	Description	Default
Stiffeners	Define the 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

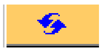
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Chamfer dimensions



	Description
1	Define the vertical chamfer dimension. You can define the vertical dimension for line chamfers.
2	Define the 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

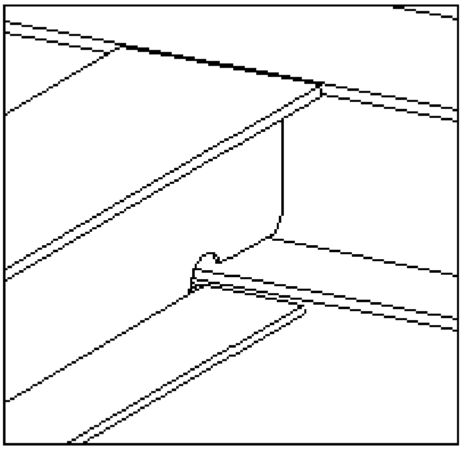
5.5 Weld preparation (44)

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

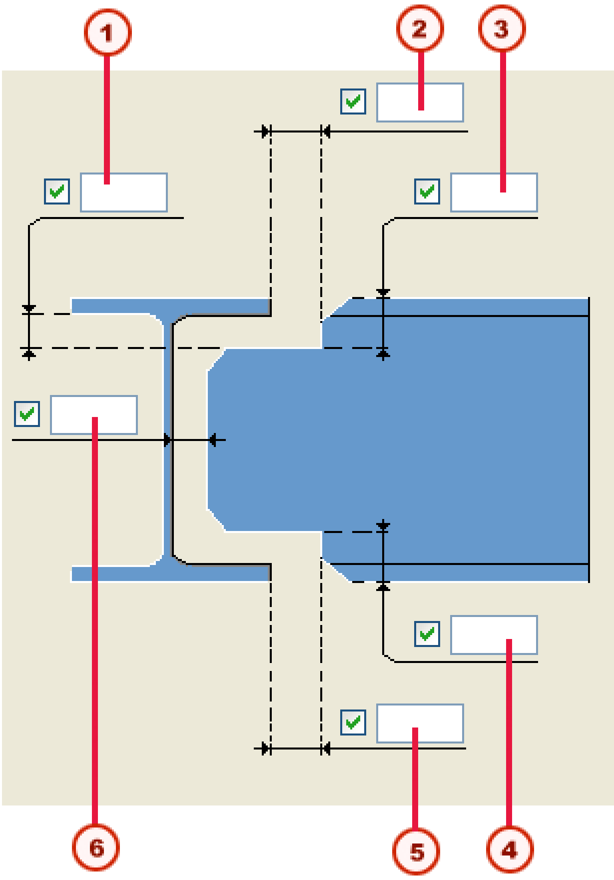
1. Beam (main part).
2. Beam (secondary part).

See also Weld preparation (44): Picture tab on page 653

Weld preparation (44): Picture tab

Use **Picture** tab to define the geometry of **Weld preparation (44)** connection.

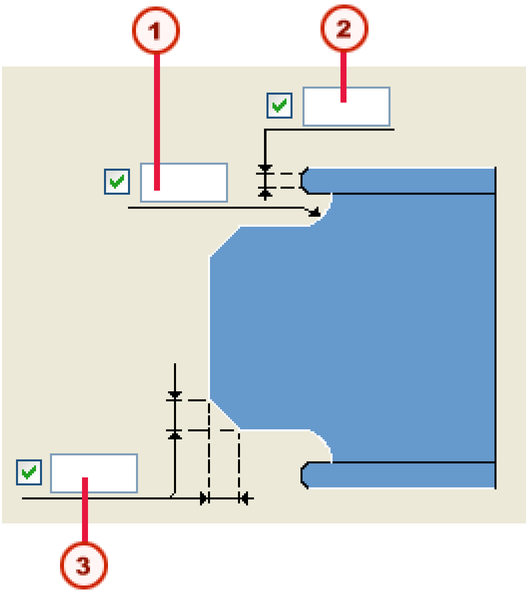
Dimension fields



Field	Description	Default
1	Vertical tolerance. Tolerance between the main part web and the secondary part flange.	0.2*secondary part flange thickness
2	Flange horizontal tolerance. Horizontal tolerance between the secondary part and the main part upper flange.	3 mm
3	Web upper vertical tolerance. Vertical distance between the secondary part upper edge and the top of the web.	
4	Web lower vertical tolerance. Vertical distance between the secondary part lower edge and the bottom of the web.	
5	Flange horizontal tolerance Horizontal tolerance between the secondary part and the main part lower flange.	3 mm

Field	Description	Default
6	Web horizontal tolerance. Tolerance between the webs of the beams.	0 mm

Beam end shape



Field	Description
1	Rat hole radius.
2	Flange straight distance.
3	Web chamfer Dimensions of the chamfers in the secondary part web.

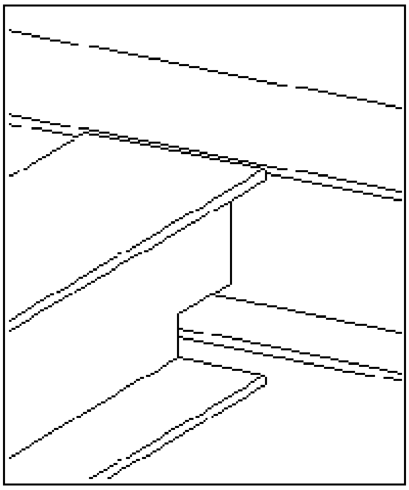
5.6 New notch (49)

Welds the 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

Situation	Description
	A beam welded to a beam. Bottom of the secondary beam web notched.

Before you start Create two beams.

Selection order

1. Beam (main part).
2. Beam to be cut (secondary part).

See also

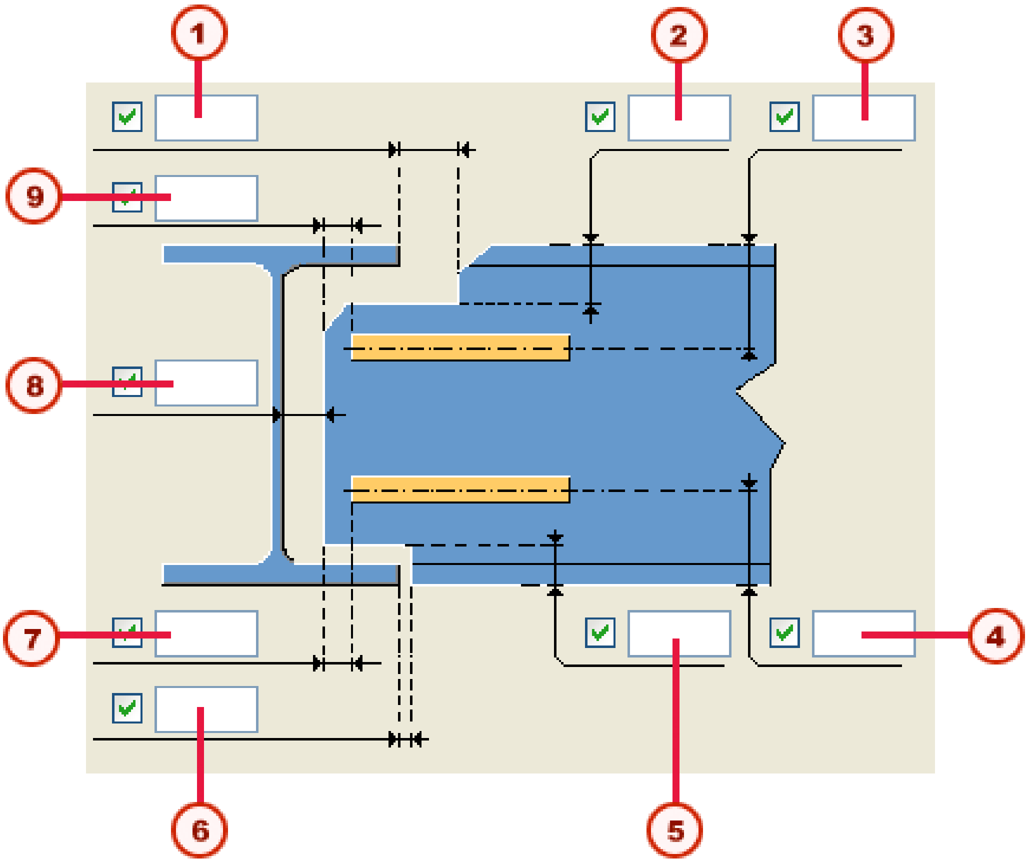
New notch (49): Picture tab on page 656

New notch (49): Parameters tab on page 659

New notch (49): Picture tab

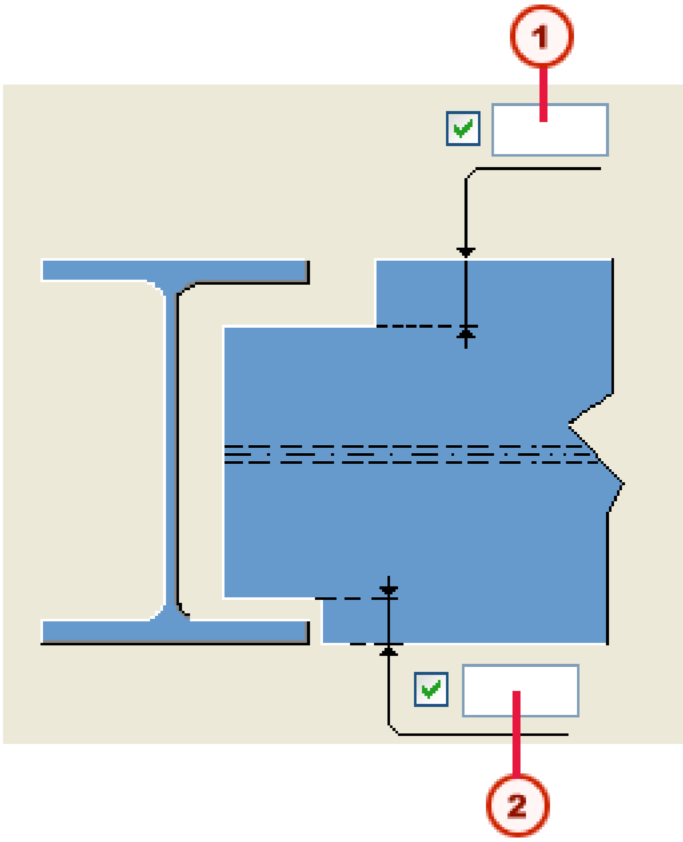
Use **Picture** tab to define the geometry of **New notch (49)** connection and the positions of the plates.

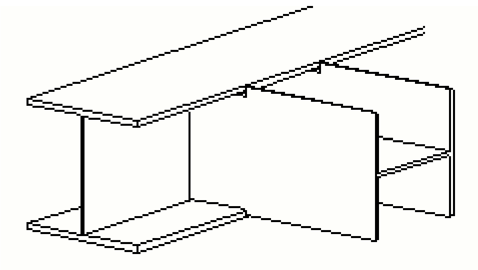
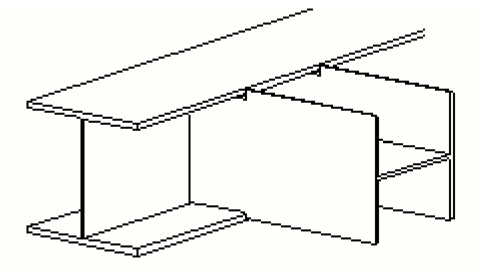
Dimension fields



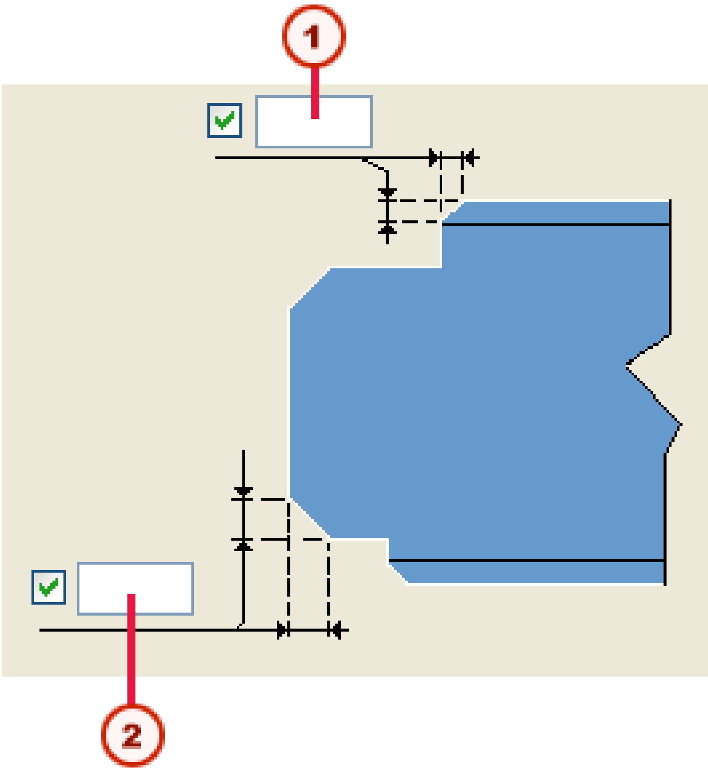
Field	Description	Default
1	Horizontal tolerance between the main part and the secondary part upper flanges.	0 mm
2	Upper notch height.	
3	Upper stiffener vertical distance from the upper flange.	Secondary beam height / 4
4	Lower stiffener vertical distance from the lower flange.	Secondary beam height / 4
5	Lower notch height.	
6	Lower flange horizontal tolerance between the main part and the secondary part lower flanges.	0 mm
7	Lower stiffener horizontal distance from the beam end.	0 mm
8	Web horizontal tolerance between the main part web and the secondary part web.	0 mm
9	Upper stiffener horizontal distance from the beam end.	0 mm

Secondary beam flange notch dimensions



Field	Description
1	Notch dimension of the secondary beam top or bottom flange, if the secondary beam is rotated as in the picture below. 
2	Notch dimension of the secondary beam top or bottom flange, if the secondary beam is rotated as in the picture below. 

Secondary beam end chamfer dimensions



Field	Description	Default
1	Flange chamfer dimension.	0 mm
2	Web chamfer dimension.	0 mm

New notch (49): Parameters tab

Upper / lower stiffeners

The stiffeners are created, if any dimension of either upper or lower stiffeners is given.

- **t** specifies the plate thickness. The default value is equal to the beam's upper / lower flange thickness.
- **b** specifies the plate width. The default value is 0.5*(upper / lower flange width-web thickness).
- **h** specifies the plate length. The default value is 300 mm.

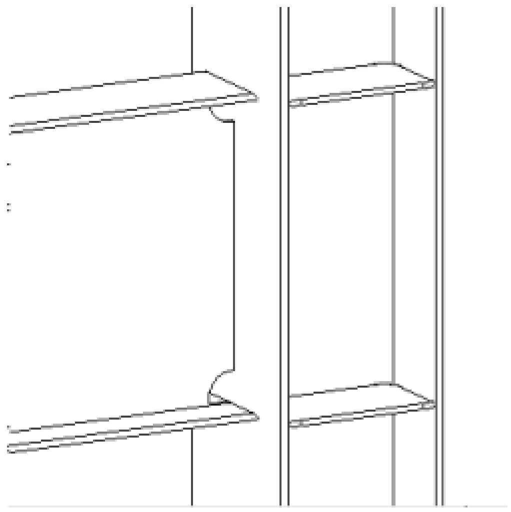
5.7 Welded column with stiffeners (128)

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.

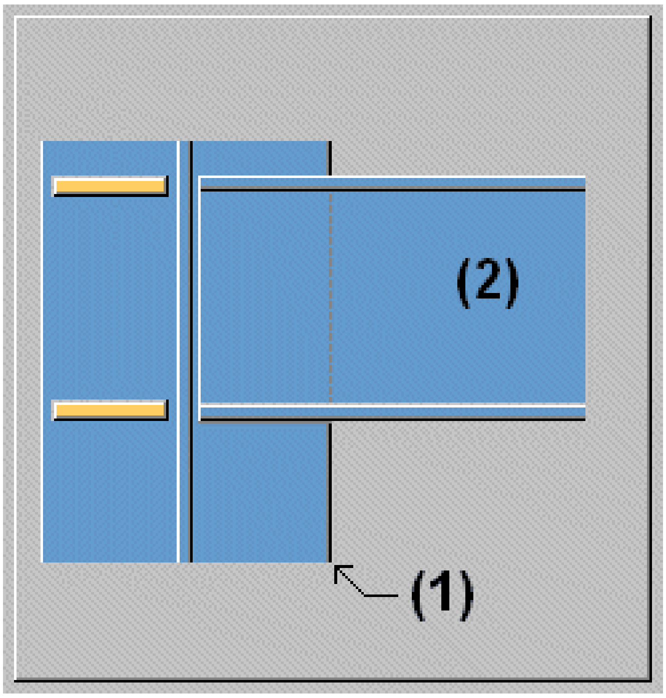
Objects created

- 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



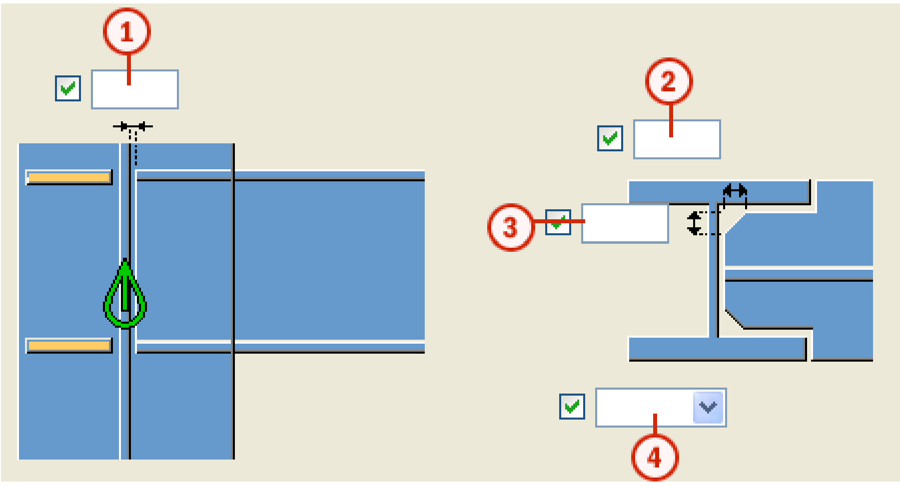
1. Pick the column (main part).
2. Pick the beam. Picking the secondary part creates the connection automatically.

See also Welded column with stiffeners (128): Picture tab on page 661

Welded column with stiffeners (128): Picture tab

Use **Picture** tab to control the gaps and shape of the secondary beam end cut in the **Welded column with stiffeners (128)** connection.

Dimension fields



Field	Description	Default
1	Cutting point of the secondary beam. The cutting point is defined as a gap between the primary and the secondary.	General / gap (0.0625”) 2 mm
2	Width of the secondary flange chamfer.	Equal to the fillet radius of primary profile.
3	Height of the secondary flange chamfer.	Equal to the fillet radius of primary profile.
4	Chamfer type. Options: No, Line, Cope, or Arc.	Line

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.

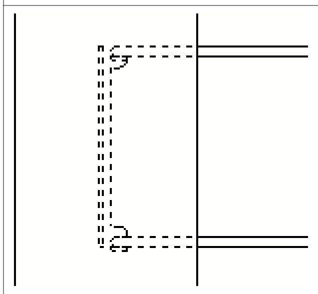
5.8 Beam prep (183)

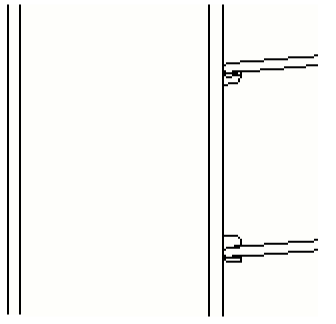
Creates a welded beam to column connection. The end of the beam can be prepared. Web doubler plate in the column is optional. Welds are defined in a separate dialog box that you can access by clicking the **Welds** button.

Objects created

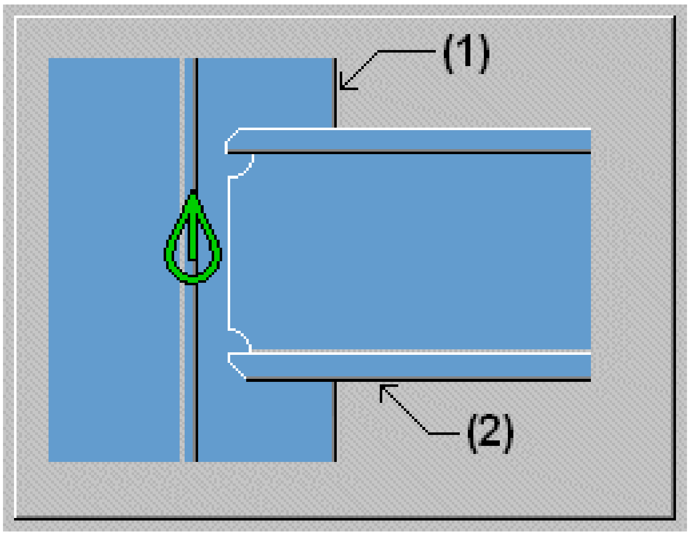
- Web doubler plate (optional)
- Weld backing bars (optional)
- Welds
- Cuts

Use for

Situation	Description
	Beam to column web. Web doubler plate on the opposite side of column web.

Situation	Description
	Sloping beam to column flange. Weld backing bars.

Selection order



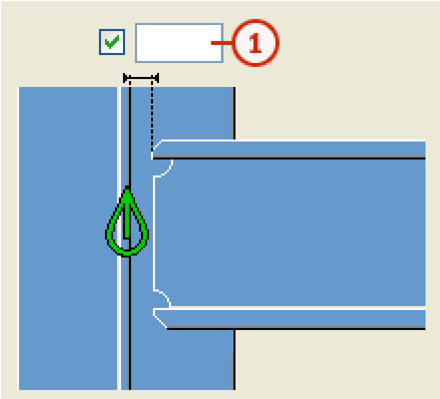
1. Pick the column (main part).
2. Pick the secondary beam. The connection is created automatically.

See also Beam prep (183): Picture tab on page 663

Beam prep (183): Picture tab

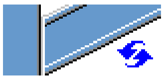
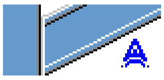
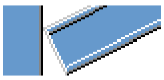
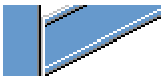
Use **Picture** tab to set the gap between the main and secondary parts and select the beam end cut type in **Beam prep (183)** connection.

Dimensions



Field	Description
1	Weld gap.

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

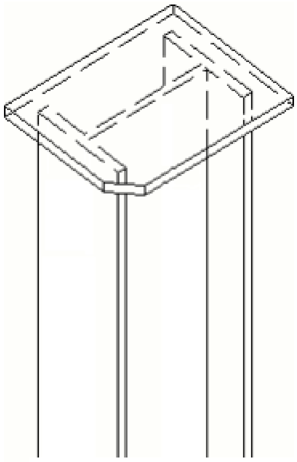
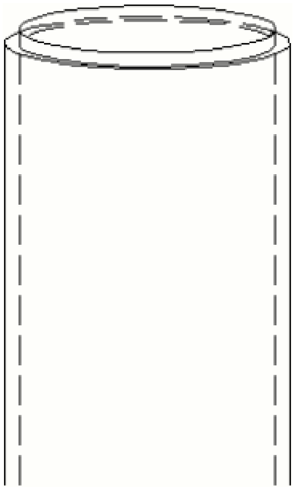
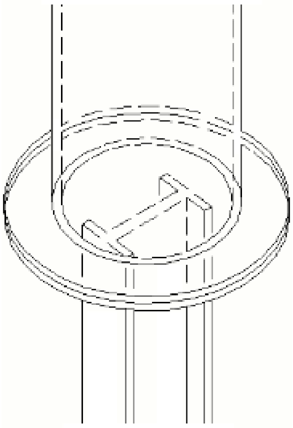
Option	Description
	Default Bevel AutoDefaults can change this option.
	Automatic If the secondary part slopes less than 10 degrees, a square cut is created. Otherwise, a bevel cut is made to the end of the secondary part.
	Square Creates a square cut to the end of the secondary part.
	Bevel Cuts the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

5.9 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	Situation	Description
		Cap plate with one chamfered corner created on an I profile column.
		Cap plate created on a pipe profile column.
		One cap plate created on a pipe profile column and another cap plate created on an I profile column.

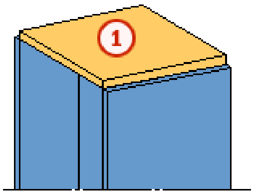
Selection order 1. Select the main part (beam, column, or polybeam).

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



	Part
1	Cap plate

See also

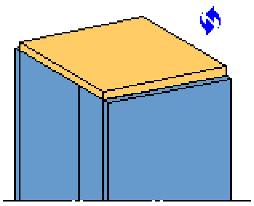
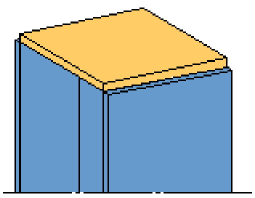
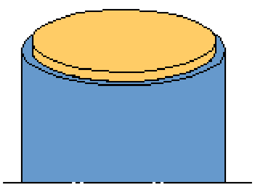
Cap plate detail: Picture tab on page 666

Cap plate detail: Parts tab on page 668

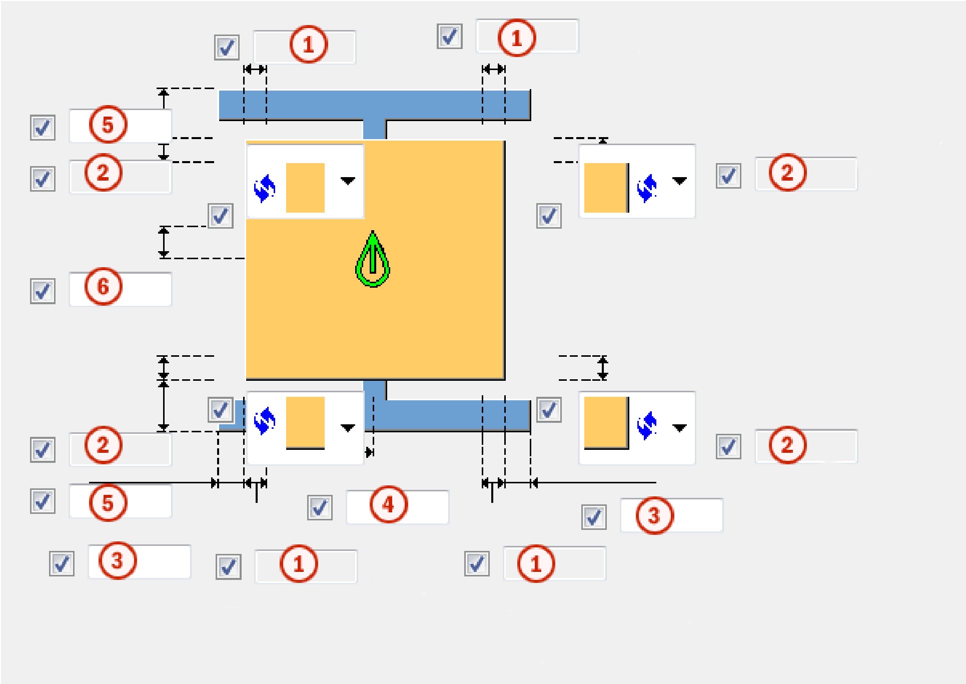
Cap plate detail: Picture tab

Use the **Picture** tab to control the shape and the dimensions the cap plate in the **Cap plate detail** connection.

Cap plate shape

Option	Description
	Default Rectangular AutoDefaults can change this option.
	Rectangular
	Circular

Rectangular cap plate dimensions

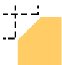


	Description	Default
1	Define the horizontal chamfer dimension. This option is not available if you have selected **No chamfer** in the chamfer options.	20 mm
2	Define the vertical chamfer dimension. This option is not available if you have selected **No chamfer** in the chamfer options.	20 mm
3	Define the horizontal edge distance of the cap plate. This option is used only when the plate width on the **Parts** tab is empty.	0 mm
4	Define the horizontal offset of the cap plate. This option is used only when the plate height on the **Parts** tab has a value.	0 mm
5	Define the vertical edge distance of the cap plate. This option is used only when the plate height on the **Parts** tab is empty.	10 mm

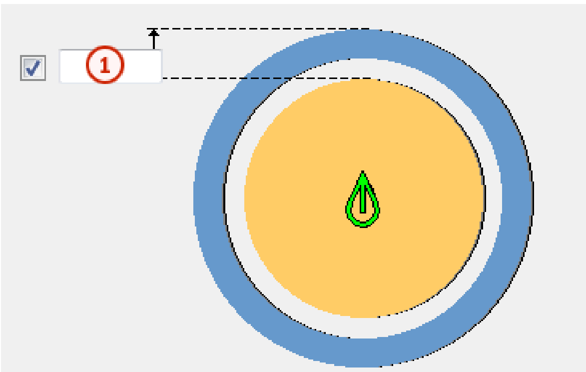
	Description	Default
6	Define the vertical offset of the cap plate. This option is used only when the plate height on the **Parts** tab has a value.	0 mm

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
	Concave arc chamfer

Circular cap plate dimensions



	Description
1	Define the cap plate edge distance.

Cap plate detail: Parts tab

Use the **Parts** tab to control the properties of the cap plate in the **Cap plate detail** connection.

Part

Part	Description	Default
Cap plate	Define the 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
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

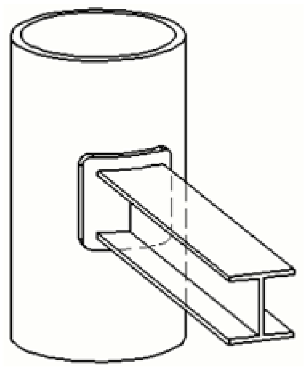
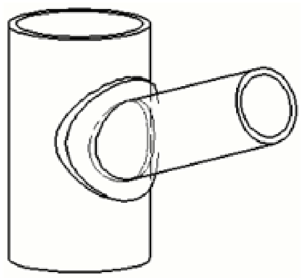
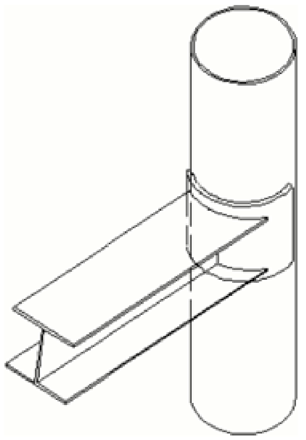
5.10 Pipe doubler plate

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

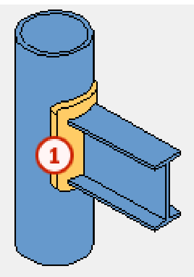
Situation	Description
	Rectangular doubler plate connecting a column and a beam.
	Circular doubler plate connecting a column and a beam. The secondary part is skewed.
	Rectangular doubler plate connecting a column and a beam. The secondary part is off-axis.

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

See also Pipe doubler plate: Picture tab on page 671

Pipe doubler plate: Parts tab on page 675

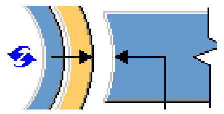
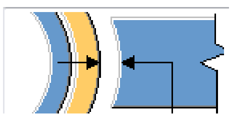
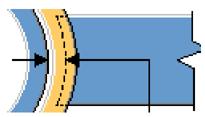
Pipe doubler plate: Picture tab

Use the **Picture** tab to control the type, position, and dimensions of the doubler plate in the **Pipe doubler plate** connection.

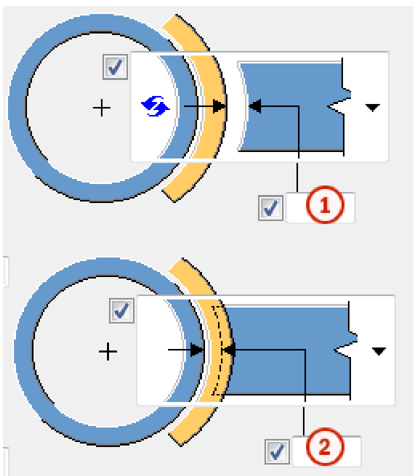
Doubler plate type

Option	Description
Doubler plate type	Select the doubler plate type: • **Rectangular** • **Circular**

Clearance type

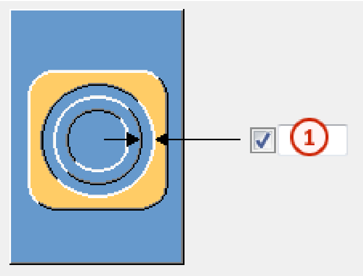
Option	Description
	Default Clearance between the doubler plate and the secondary part. AutoDefaults can change this option.
	Clearance between the doubler plate and the secondary part.
	Clearance between the main part and the secondary part.

Clearance dimension



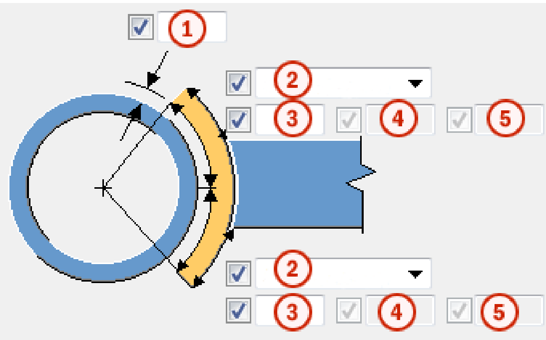
	Description
1	Define the clearance between the doubler plate and the secondary part.
2	Define the clearance between the main part and the secondary part.

Cut clearance

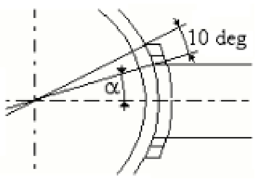


	Description
1	Define the cut clearance between the doubler plate and the secondary part.

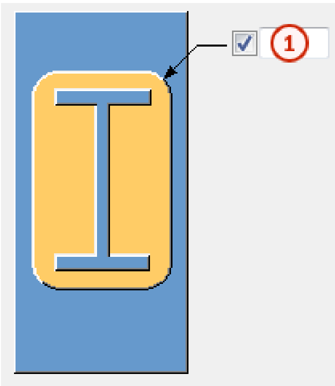
Rectangular doubler plate dimensions



	Description	Default
1	Define the offset between the column and the doubler plate.	0 mm
2	Define the measuring type for the doubler plate: • Angle (degrees) Define the angle of the doubler plate in degrees. • Dimension Define the arc length of the doubler plate.	Angle

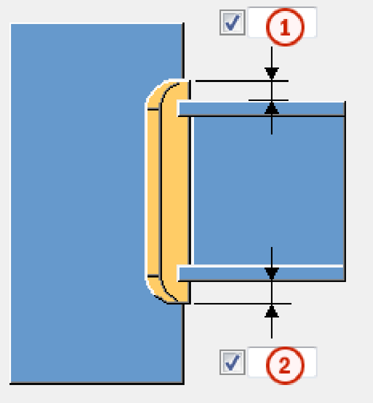
	Description	Default
	• Edge Define the arc length of the doubler plate edge.	
3	Define the angle of the doubler plate. The angle can be extended up to 360 degrees to go around the main part.	Angle +10 degrees 
4	Define the dimension value of the doubler plate. The dimension can be extended up to 360 degrees to go around the main part.	`length equivalent to the formula angle +10 degrees`
5	Define the 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



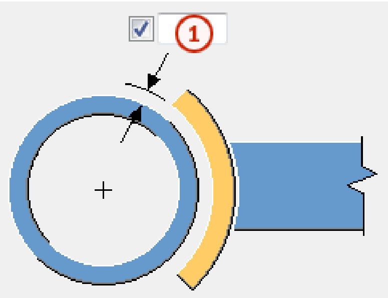
	Description
1	Define the corner rounding dimension for a rectangular doubler plate. Corners are not created with value `0`.

Doubler plate extension for rectangular plate



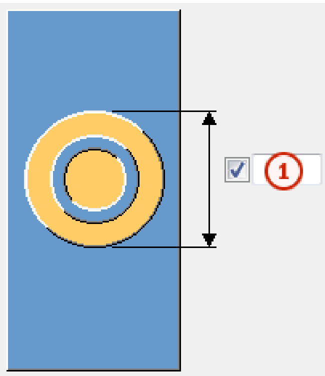
	Description
1	Define the vertical dimension from the secondary part top edge to doubler plate top edge.
2	Define the vertical dimension from the secondary part bottom edge to the doubler plate bottom edge.

Circular doubler plate dimensions



	Description
1	Define the offset between the column and the doubler plate.

Circular doubler plate diameter



	Description
1	Define the diameter of the circular doubler plate.

Pipe doubler plate: Parts tab

Use the **Parts** tab to control the position of the doubler plate in the **Pipe doubler plate** connection.

Part

Part	Description
Doubler plate	Define the thickness of the doubler plate.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

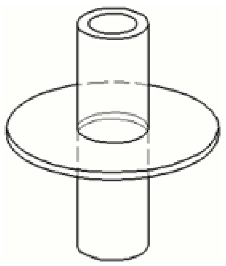
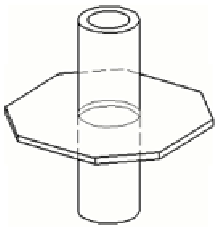
5.11 Ring plate

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

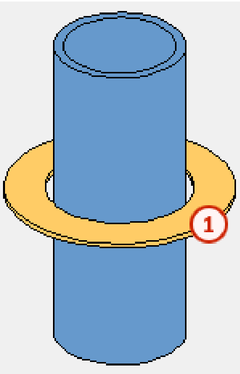
Situation	Description
	Circular ring plate on a tube column.
	Angular ring plate on a tube column.

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

See also

Ring plate: Picture tab on page 676

Ring plate: Parts tab on page 684

Ring plate: Chamfers tab on page 685

Ring plate: Picture tab

Use the **Picture** tab to control the shape and the dimensions of the ring plate in the **Ring plate** connection.

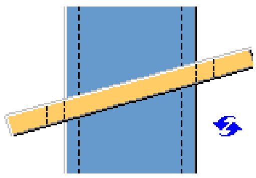
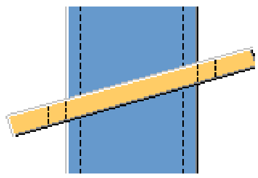
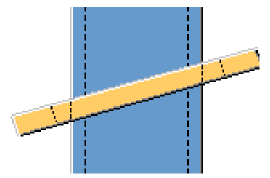
Ring plate type

Option	Description	Default
Ring plate	Select the ring plate type: • **Default** • **Circular** • **Elliptical** • **Angular**	Circular

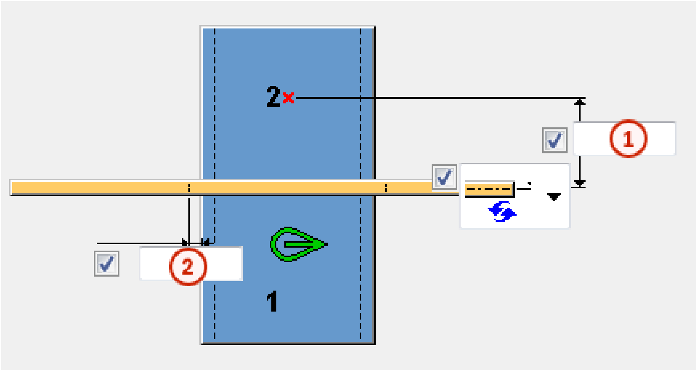
Ring plate measuring type

Option	Description	Default
Ring plate measuring type	Select how the ring plate dimension is measured: • **Default** • **Plate dimension** • **Plate absolute dimension**	Plate dimension

Cut direction

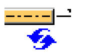
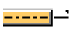
Option	Description
	Default The cut is created along the main part. AutoDefaults can change this option.
	The cut is created along the main part.
	The cut is created perpendicular on the plate.

Ring plate offset dimensions



	Description
1	Define the ring plate offset from the picked point.
2	Define the ring plate clearance from the outer edge of the main part.

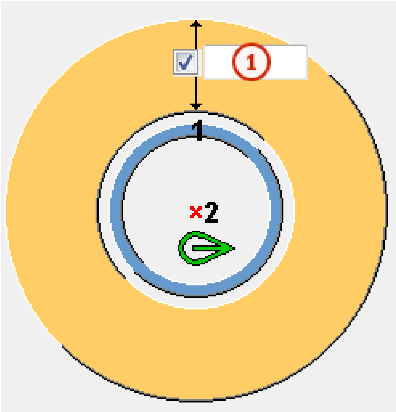
Ring plate offset measuring

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.

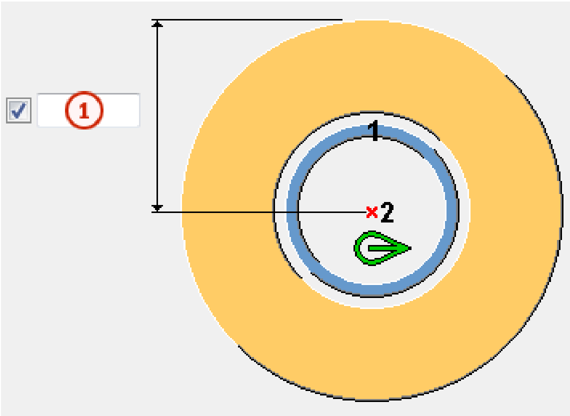
Create assembly

Option	Description	Default
Create assembly	Define how the parts are included in an assembly: • Default • **Yes** - All parts are in one single assembly. • **No** - Parts are not included in one single assembly.	**Yes**

Circular ring plate dimensions

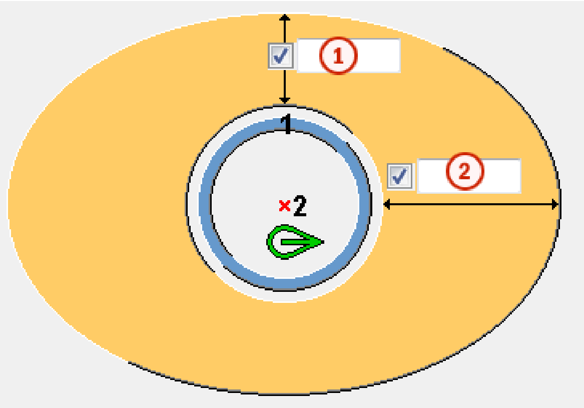


	Description	Default
1	**Plate dimension** Define the minimum width of the ring plate.	`200mm`

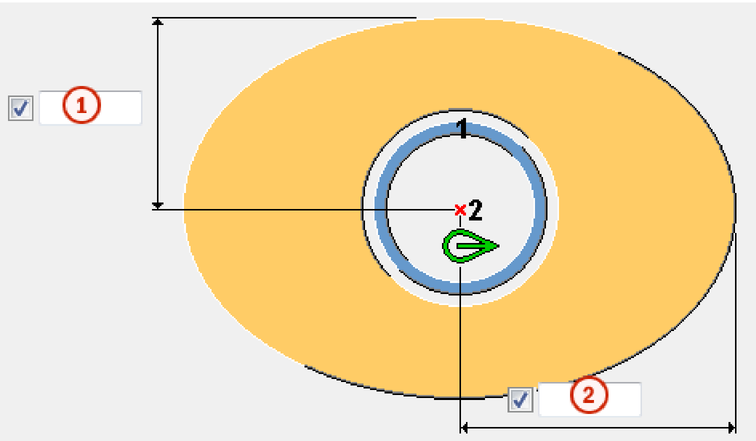


	Description	Default
1	**Plate absolute dimension** Define the absolute width of the ring plate from the center point.	`Minimum width + clearance + part height/2`

Elliptical ring plate dimensions



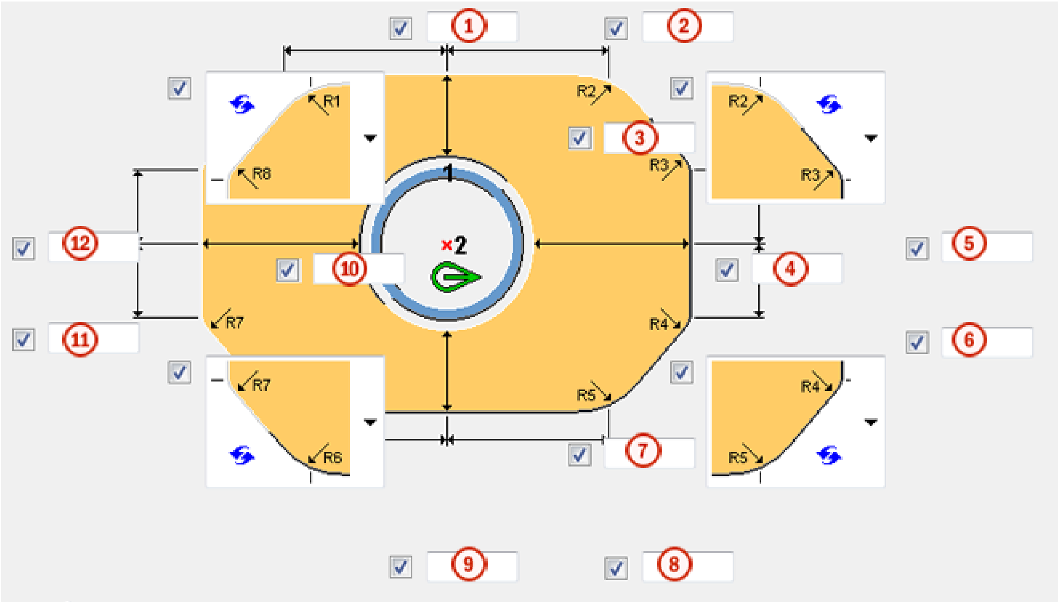
	Description	Default
1	Define the ring plate vertical width.	200mm
2	Define the ring plate horizontal width.	200mm



	Description	Default
1	Define the absolute vertical width of the ring plate from the center point.	Vertical width + clearance + part height/2
2	Define the absolute horizontal width of the ring plate from the center point.	Horizontal width + clearance + part height/2

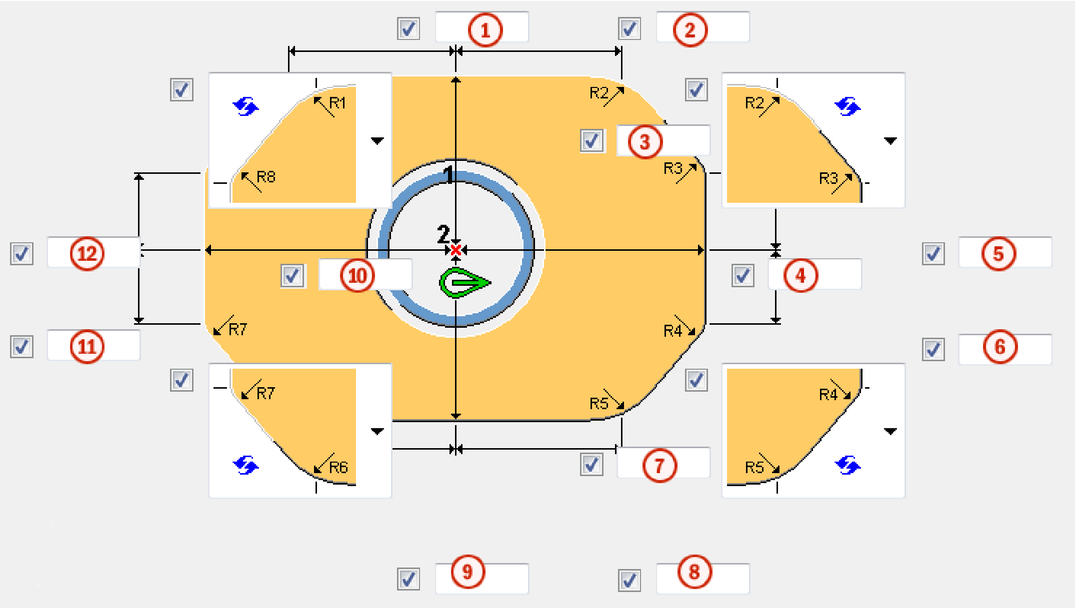
Angular ring plate dimensions

You can define the radius for each corner.



	Description	Default
1	Define the horizontal distance between corner radius R1 and the picked point.	150mm
2	Define the horizontal distance between corner radius R2 and the picked point.	150mm
3	Define the vertical distance between the plate top outer edge and the plate inner edge.	200mm
4	Define the horizontal distance between the plate right side edge and the plate inner center.	200mm
5	Define the vertical distance between corner radius R3 and the picked point.	150mm
6	Define the horizontal distance between corner radius R4 and the picked point.	150mm

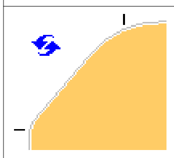
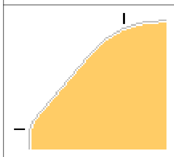
	Description	Default
7	Define the vertical distance between the plate bottom outer edge and the plate inner center.	200mm
8	Define the horizontal distance between corner radius R5 and the picked point.	150mm
9	Define the horizontal distance between corner radius R6 and the picked point.	150mm
10	Define the horizontal distance between the plate left side edge and the plate inner edge.	200mm
11	Define the vertical distance between corner radius R7 and the picked point.	150mm
12	Define the vertical distance between corner radius R8 and the picked point.	150mm



	Description	Default
1	Define the horizontal distance between corner radius R1 and the picked point.	150mm
2	Define the horizontal distance between corner radius R2 and the picked point.	150mm

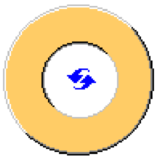
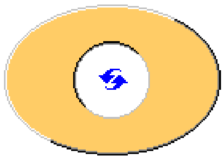
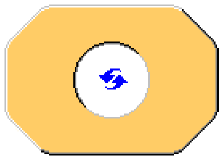
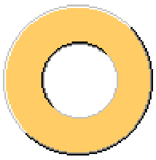
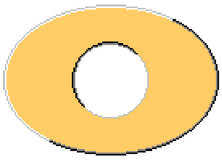
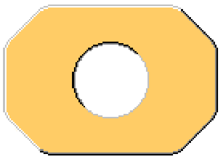
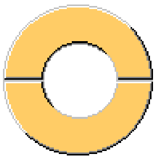
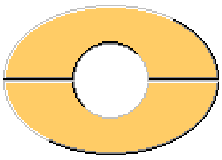
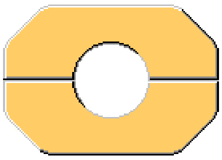
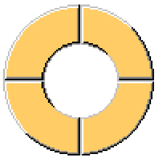
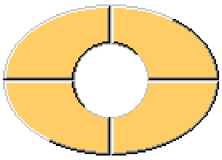
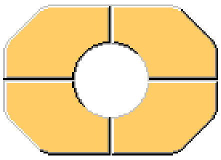
	Description	Default
3	Define the absolute vertical distance between the plate top outer edge and the center point.	`Vertical width + clearance + part height/2`
4	Define the absolute horizontal distance between the plate right side edge and the center point.	`Horizontal width + clearance + part height/2`
5	Define the vertical distance between corner radius R3 and the picked point.	`150mm`
6	Define the horizontal distance between corner radius R4 and the picked point.	`150mm`
7	Define the absolute vertical distance between the plate bottom outer edge and the center point.	`Vertical width + clearance + part height/2`
8	Define the horizontal distance between corner radius R5 and the picked point.	`150mm`
9	Define the horizontal distance between corner radius R6 and the picked point.	`150mm`
10	Define the absolute horizontal distance between the plate left side edge and the center point.	`Horizontal width + clearance + part height/2`
11	Define the vertical distance between corner radius R7 and the picked point.	`150mm`
12	Define the 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

Option	Description
	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
			Four quarter ring plates

Ring plate: Parts tab

Use the **Parts** tab to control the properties of the ring plate in the **Ring plate** connection.

Part

Part	Description	Default
Ring plate	Define the thickness of the ring plate.	10mm

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

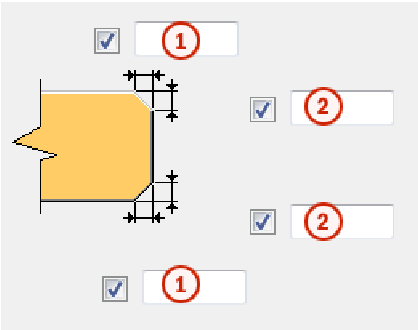
Option	Description	Default
	can enter the assembly position number.	
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Ring plate: Chamfers tab

Use the **Chamfers** tab to control the chamfer properties of the ring plate in the **Ring plate** connection.

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	Define the horizontal dimension of the chamfer.
2	Define the vertical dimension of the chamfer.

6 Seated connections

This section introduces seated connection components available in Tekla Structures.

Click the links below to find out more:

- Angle profile box (170) on page 686

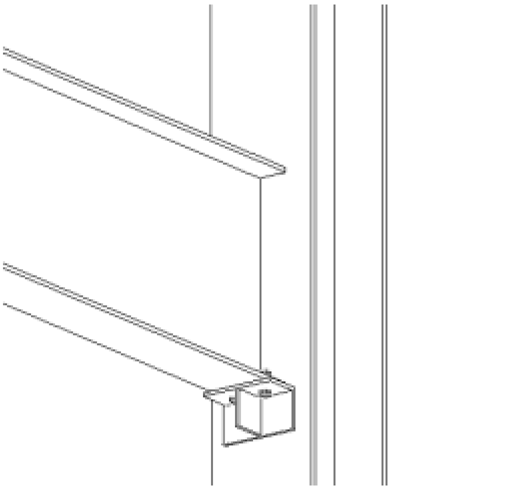
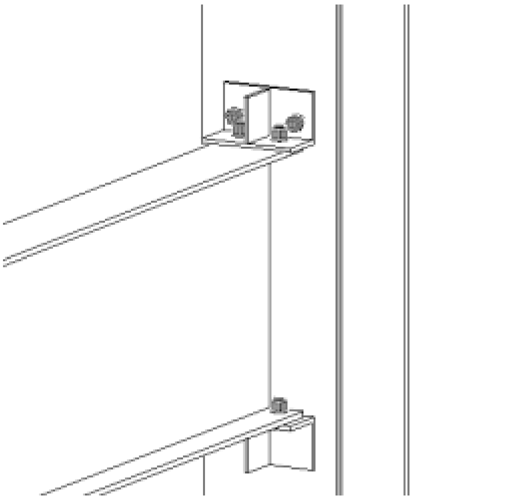
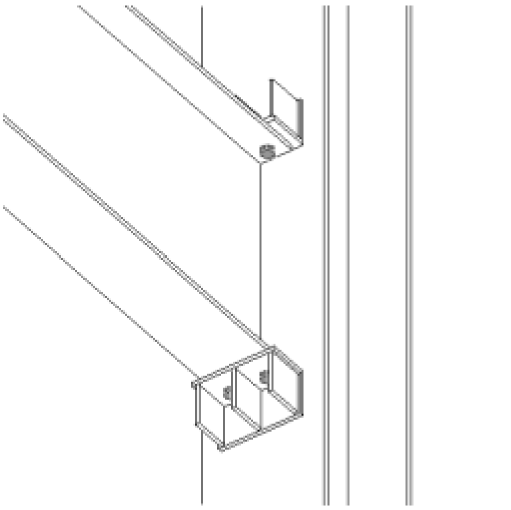
6.1 Angle profile box (170)

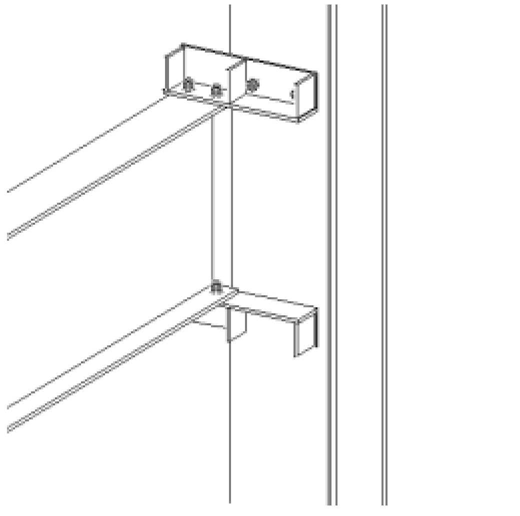
Connects a beam to a column with a seat angle. The angles can be placed at the top or bottom or both top and bottom flange of the secondary beam. Stiffener plates can be welded to the seat angles. Web stiffening plates can also be added to the secondary beam.

Objects created

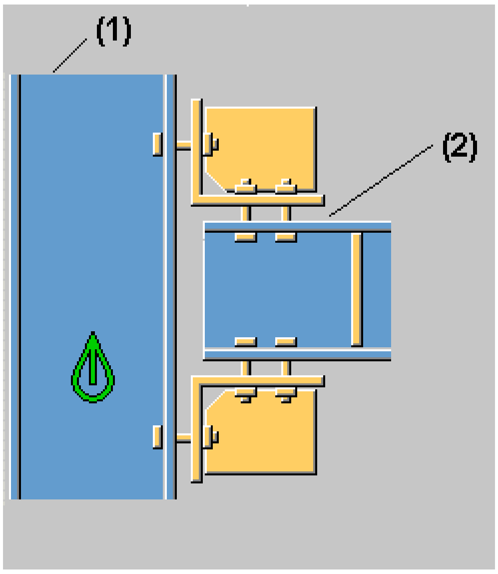
- Clip angles (1 or 2)
- Seat stiffeners (optional)
- Web stiffeners (optional)
- Bolts
- Welds
- Cuts

Use for

Situation	Description
	Beam seat with stiffeners.
	Beam seat top and bottom with stiffeners. Various bolting options.
	Beam seat. Multiple stiffener options.

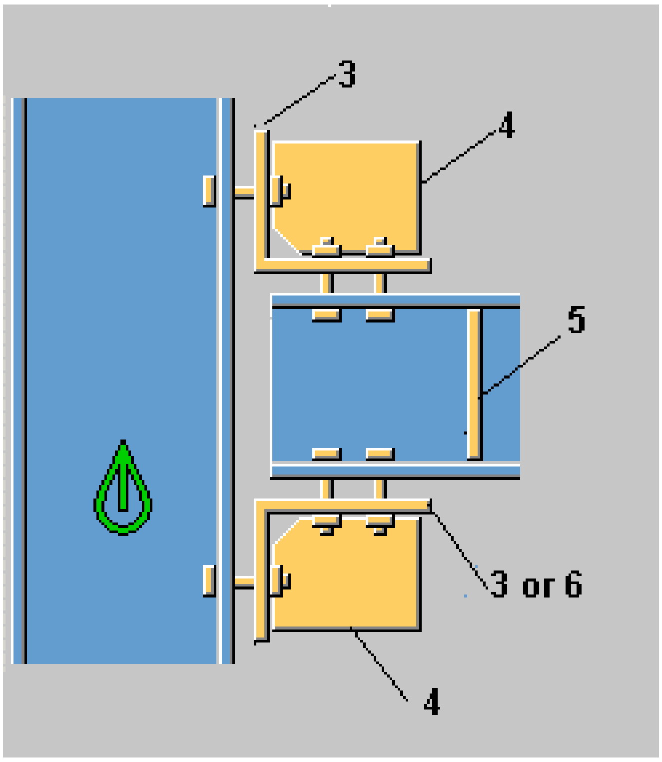
Situation	Description
	Beam seat. Offset secondary member.

Selection order



1. Pick the supporting column (main part).
2. Pick the supported beam (secondary part) to create the connection automatically.

Part identification key



Mark	Part
3	Clip angles
4	Seat stiffener
5	Web stiffeners
6	Bottom seat plate

See also

Angle profile box (170): Picture tab on page 689

Angle profile box (170): Parts tab on page 690

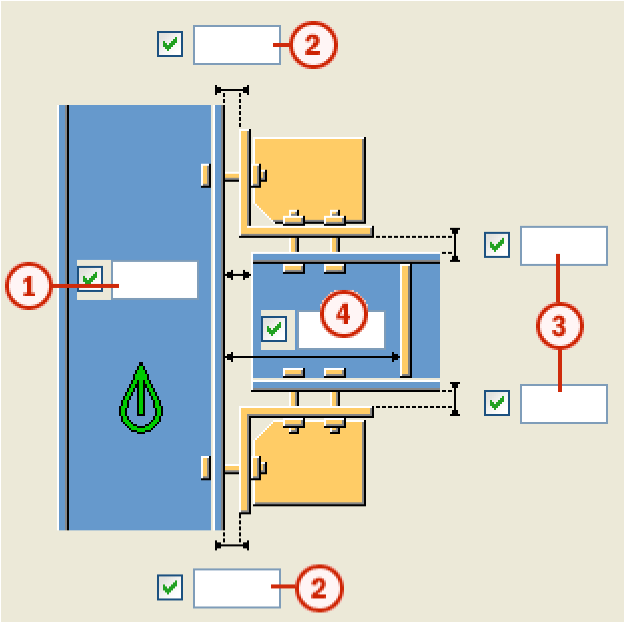
Angle profile box (170): Stiffeners tab on page 696

Angle profile box (170): SBoltsDown tab on page 697

Angle profile box (170): Picture tab

Use **Picture** tab to control the clearances between angles and the main and secondary parts in the **Angle profile box (170)** connection.

Dimensions



Field	Description	Default
1	Gap between secondary and primary.	GENERAL / beamedge (0.5")
		20 mm
2	Gap between angle profile and primary.	Zero
3	Gap between angle profile and secondary.	Zero
4	Distance of the secondary beam web stiffener from the face of the primary column.	

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.

Angle profile box (170): Parts tab

Use **Parts** tab to control the stiffeners, clip angle or bottom plate in the **Angle profile box (170)** connection.

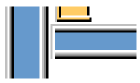
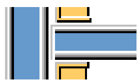
Upper stiffener / Lower stiffener

t controls the stiffener thickness, **b** the width and **h** the 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 `joints.def` file is GENERAL/ shearplatethk (0.375").

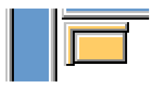
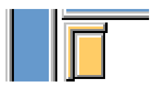
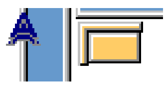
Bottom plate Enter values for thickness and width when a seat plate is required instead of a seat angle.

Profile Enter the desired seat angle profile. Default angle profile is **L150*100*10** or **L4X4X3/8**. Default value in the `joints.def` file is GENERAL / lsize.

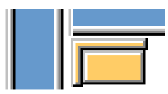
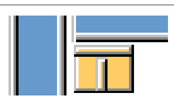
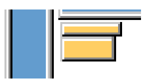
Seat position Controls the position of the seat(s) in the connection.

Option	Description
	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.

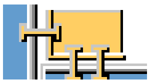
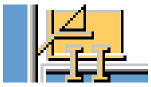
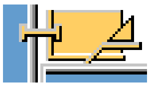
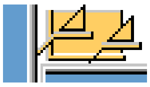
Seat angle orientation Controls the orientation of the seat when the seat is an angle with uneven legs.

Option	Description
	Normal Connects the longer leg of the angle profile to the secondary part.
	Rotated Connects the longer leg of the angle profile to the main part.
	Automatic Connects the longer leg of the angle profile to the part where bolts reach further from the angle corner.

Seat angle rotation Use the following options to define seat angle rotation. The **Angle profile box (170)** connection also includes an option to use a plate as the seat instead of the angle profile:

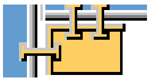
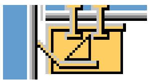
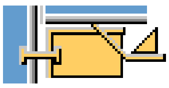
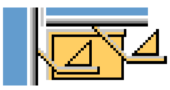
Option	Description
	Does not rotate the angle profile.
	Rotates the angle profile horizontally 90 degrees. To stiffen the rotated angle, select the **Middle** option in the **Middle stiffener position** list box.
	Uses a bottom plate as the seat instead of the angle profile.

Top seat angle attachment Controls the attachment of the top seat.

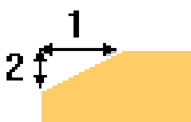
Option	Description
	Bolted Angle profile is bolted to both the main and the secondary parts (default).
	Welded-bolted Angle profile is welded to the main part and bolted to the secondary part.
	Bolted-welded Angle profile is bolted to the main part and welded to the secondary part.
	Welded Angle profile is welded to both the main and the secondary parts.

Bottom seat angle attachment

Controls the attachment of the bottom seat.

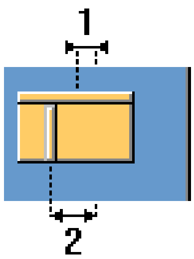
Option	Description
	Bolted Angle profile is bolted to both the main and the secondary part (default).
	Welded-bolted Angle profile is welded to the main part and bolted to the secondary part.
	Bolted-welded Angle profile is bolted to the main part and welded to the secondary part.
	Welded Angle profile is welded to both the main and the secondary part.

Chamfer size



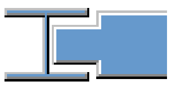
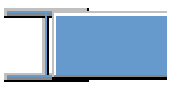
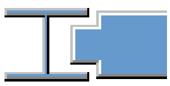
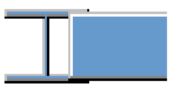
Option	Description	Default
1	The horizontal dimension of stiffener plate line chamfer.	Equal to angle profile rounding value
2	The vertical dimension of the stiffener plate line chamfer.	Equal to angle profile rounding value

Seat angle and stiffener offset

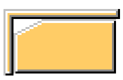
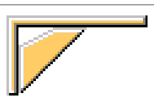


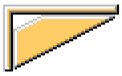
Option	Description	Default
1	The horizontal position of the angle profile defined as the distance between the center lines of the main part and the angle profile.	Zero
2	The horizontal position of the middle stiffener plate defined as the distance between the center lines of the main part and the stiffener plate. If more than one middle stiffener is created, the distance is measured from the center line of the main part to the center point of the middle stiffener group.	Zero

Notching When the connection is made to the primary part web, the secondary beam can be fitted to the web and notched by the primary part flanges.

Option	Description
	Fitted and Notched Secondary is fitted and notched.
	Fitted Secondary is fitted, but not notched.
	Notched Secondary is notched, but not fitted.
	None Secondary is not fitted or notched.

Stiffener type

Option	Description
	Rectangle Creates a rectangular stiffener plate.
	Triangle Creates a triangular stiffener plate with a side length equal to the inner edge length of the shorter leg of the angle profile.

Option	Description
	Shaped The stiffener plate shape is determined by a line connecting the ends of the angle profile legs.

Chamfer type

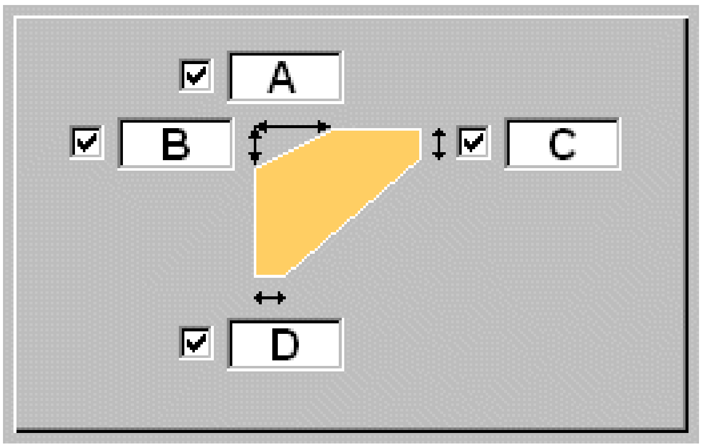
Option	Description
	None
	Line
	Rounding
	Arc

T plate chamfer type

Chamfer types of the bottom plate that is used as a seat instead of the angle.

Option	Description
	None
	Line
	Rounding
	Arc

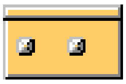
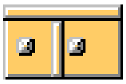
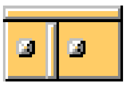
Chamfer size



Field	Description	Default
A	Horizontal dimension of stiffener plate line chamfer.	Equal to angle profile rounding.
B	Vertical dimension of stiffener plate line chamfer.	Equal to angle profile rounding.
C	Vertical dimension for stiffener plate shape cut line.	
D	Horizontal dimension for stiffener plate shape cut line.	

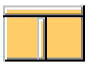
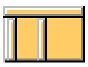
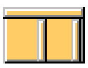
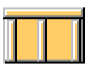
Middle stiffener position

Determines whether the middle stiffener is positioned according to the profile or bolt group.

Option	Description
	None No middle stiffener plate is created.
	Middle The stiffener plate is positioned in the middle of the angle profile. The number of middle stiffeners can be controlled with the field **Number of middle stiffeners**. Multiple stiffeners are created centered and equally spaced.
	According to bolts The stiffener plate is placed between the bolts in the middle of the bolt spacing. By default, a stiffener is created between every two bolts. The number of stiffeners used can be decreased using the field **Number of middle stiffeners.**

Side stiffener position

Determines the side stiffener position.

Option	Description
	None Does not create side stiffeners.
	Near side Creates a near side tiffener.
	Far side Creates a far side stiffener.
	Both Creates both side stiffeners.

Number of middle stiffeners

Enter the number of middle stiffeners.

Angle profile box (170): Stiffeners tab

Use **Stiffeners** tab to control the properties of near side and far side stiffeners created in the secondary part web in the **Angle profile box (170)** connection.

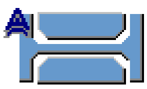
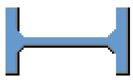
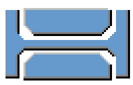
Stiffener NS / Stiffener FS

Near side and far side stiffener size and basic properties are:

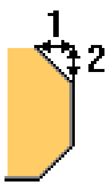
Field	Description	Default
t	Stiffener thickness.	Equal to clip angle thickness.
b	Stiffener width.	Determined by primary part flange distance.
h	Stiffener height.	
Pos_No	Part position number and Assembly position number.	Default part start number is defined in the **Options** dialog box.
Material	Stiffener plate material grade.	Material grade defined in the **Options** dialog box.
Name	Stiffener plate name.	Default part name is defined in the message file.

Stiffeners

Creates or removes stiffeners.

Option	Description
	Automatic Not available in all components.
	No stiffeners No stiffeners are created.
	Stiffeners Stiffeners are always created.

Chamfer size

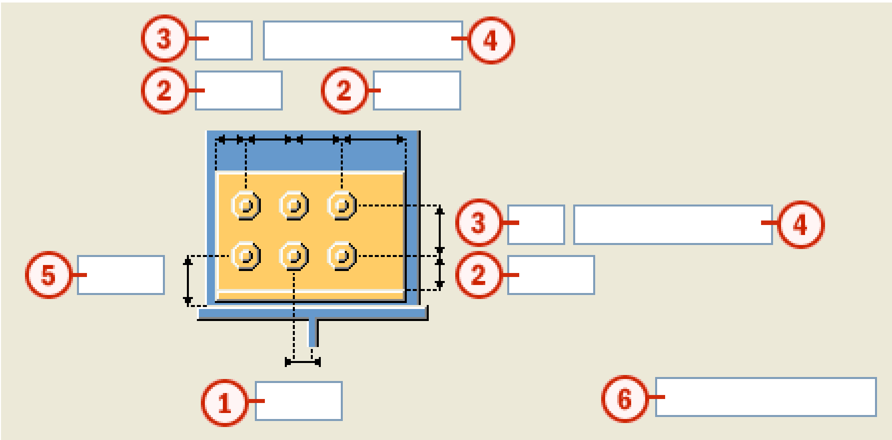


Option	Description
1	The horizontal dimension of the stiffener line chamfer or radius of arc type chamfer.
2	The vertical dimension of the stiffener line chamfer.
Chamfer type	The shape of the chamfer created in the corner of the stiffeners: **No**, **Line**, **Cope**, **Arc**.

Angle profile box (170): SBoltsDown tab

Use **SBoltsDown** tab to control the properties of the bolts connecting the bottom seat angle to a secondary part in the **Angle profile box (170)** connection.

Secondary bolt group dimensions



Field	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.
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

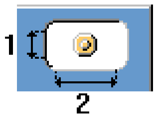
Field	Description	Default

Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
		`joints.def:GENERAL / boltdia`
		`16 mm (0.75”)`

Bolt standard	The bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.

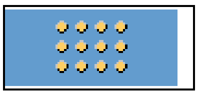
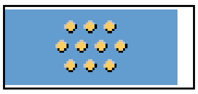
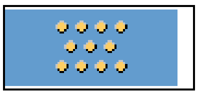
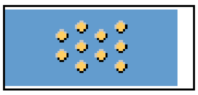
Field	Description	Default
Tolerance	The gap between the bolt and the hole.	
Thread in mat	Defines whether or not the thread may be within the bolted parts when using bolts with a shaft. This has no effect when using full-threaded bolts.	`Yes`
Site/ Workshop	Location where the bolts should be attached.	`Site`

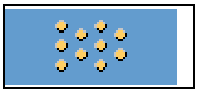
Slotted holes You can define slotted, oversized, or tapped holes with the following options.



Field	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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	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

Option	Description
	Staggered type 4

7 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) on page 700

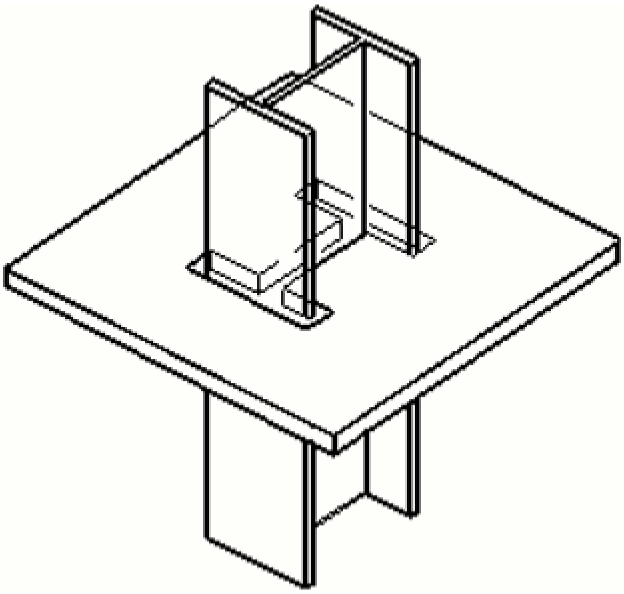
7.1 Create hole around part (92)

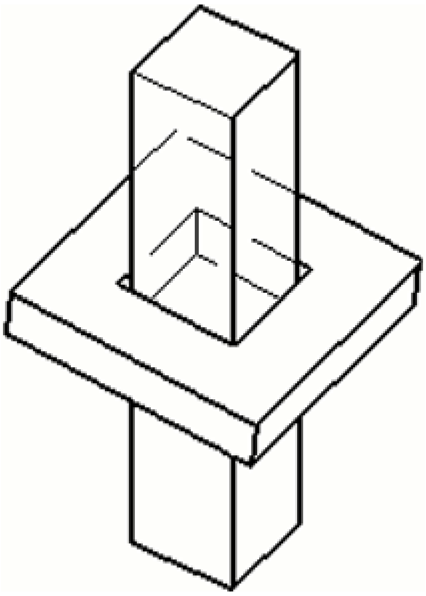
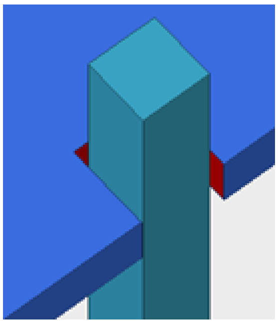
Create hole around part (92) cuts a hole to a part using another part. The part that cuts the hole is perpendicular to the part that is cut.

Objects created

- Cuts

Use for

Situation	Description
	Steel column creates a cut through a plate.

Situation	Description
	Concrete column creates a cut through a plate.
	Concrete column creates a cut in a plate.

Selection order

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

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

See also

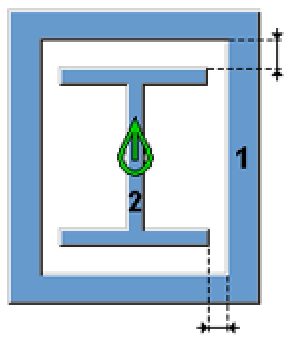
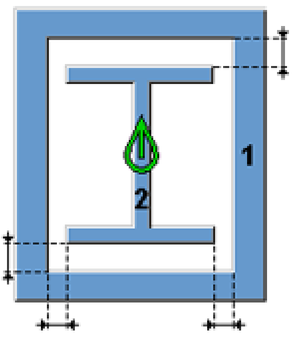
Create hole around part (92): Picture tab on page 701

Create hole around part (92): Parameters tab on page 703

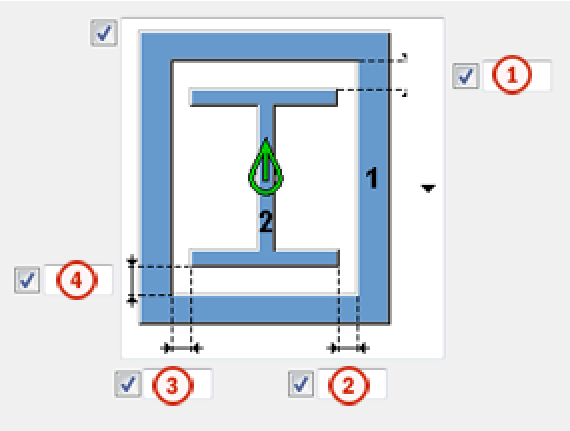
Create hole around part (92): Picture tab

Use the **Picture** tab to control the gap dimensions and whether the dimensions are the same on both sides of the gap in the **Create hole around part (92)** connection.

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	Define the gap between the column and the secondary part in the vertical direction.
2	Define the gap between the column and the secondary part in the horizontal direction.
3	Define the 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	Define the gap between the column and the secondary part in the vertical direction. To define this dimension, select the option that the gap is different on each side.

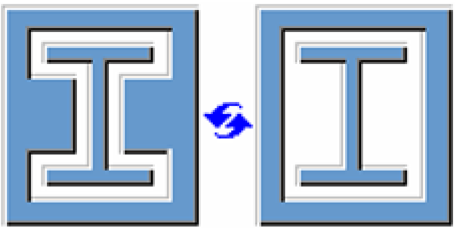
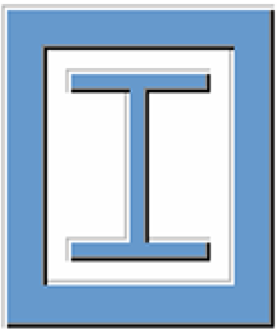
Create hole around part (92): Parameters tab

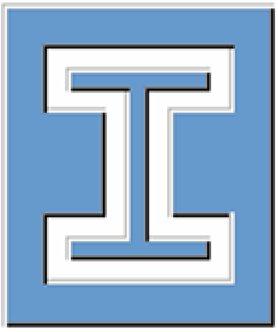
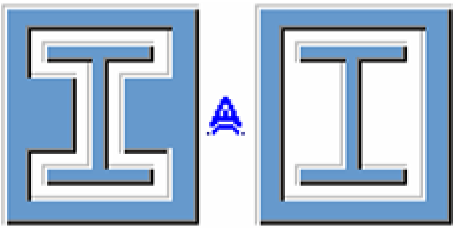
Use the **Parameters** tab to control the cut properties and type of the cut in the **Create hole around part (92)** connection.

Cut properties

Option	Description
Max. rectangle size	Define the maximum size of a rectangle cut.
Cut perpendicular to main part	Define whether the cut is perpendicular to the main part.
Cut part name	Define a name for the cut part.

Cut type

Option	Description
	Default Creates an exact or a rectangular cut. AutoDefaults can change this option.
	Rectangular Creates a rectangular cut using the coordinates of the cutting part edges.

Option	Description
	Exact Creates a cut along the edges of the cutting part. The cutting part has to be perpendicular to the part it cuts. You can use this option for I, round and tube profiles.
	Automatic This option selects the cut type depending on the cut size defined in **Max. rectangle size**. If the size of the cutting part is larger than the size defined in **Max. rectangle size**, an exact cut is created. Otherwise, a rectangular cut is created.

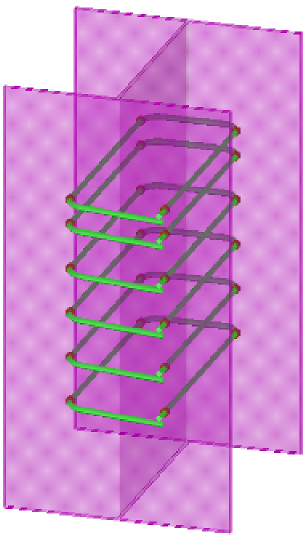
7.2 Rebar hole

Rebar hole creates holes for reinforcing bars in a steel column, beam, or contour plate.

Objects created

- Holes
- Cuts

Use for

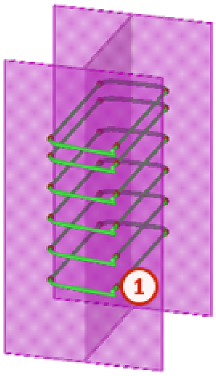
Situation	Description
	Holes created for reinforcing bars in a steel beam.

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

See also

Rebar hole: Parameters tab on page 705

Rebar hole: Advanced tab on page 706

Rebar hole: Parameters tab

Use the **Parameters** tab to control the properties of the reinforcing bar holes created in the **Rebar hole** modeling tool.

Reinforcing bar hole properties

Option	Description	Default
Bolt standard	Select the bolt standard: • **6914** • **7968** • **7990** • **ASS 1** • **ASS 2** • **UNDEFINED_BOLT**	`6914`
Rounding type	Select the rounding type: • **None** The rounding value is the reinforcing bar diameter + hole tolerance.	No default value Example dimensions: • Reinforcing bar diameter = `21.6 mm` • Hole tolerance = `3 mm`

Option	Description	Default
	• **Round off** The rounding value is the nearest integer number divisible by the rounding precision value. • **Round up** The rounding value is the next integer number divisible by the rounding precision value. • **Round down** The rounding value is the previous integer number divisible by the rounding precision value. • **Round by table** Define the reinforcing bar diameter, hole diameter, and the slotted hole extension.	• Rounding precision = `2 mm` • None, rounding = `24.6 mm` • Round off, rounding = `24 mm` • Round up, rounding = `26 mm` • Round by own, rounding = `24 mm`
Hole tolerance	Define the hole tolerance. When you select **Round by table** as the rounding type, you cannot define the hole tolerance.	`0 mm`
Rounding precision	Define the rounding precision. When you select **Round by table** as the rounding type, you cannot define the rounding precision.	`1 mm`
Dimension table	Define the reinforcing bar diameter, hole diameter, and slotted hole extension. To define the dimensions in the table, select the **Round by table** option as the rounding type. Use the **+** and the **–** buttons to add and delete rows from the table.	

Rebar hole: Advanced tab

Use the **Advanced** tab to control the hole type, vertical offset, and angle in the **Rebar hole** modeling tool.

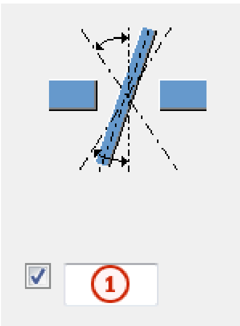
Hole type

Option	Description	Default
Hole type	Select the hole type: • **Bolt hole** • **Part cut** • **Bolt hole + part cut**	`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 is the hole is a circular hole.

Angle range dimension



	Description	Default
1	Define the 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`

8 Bracings

This section introduces components that can be used in steel bracings.

Click the links below to find out more:

- Tensioner (7) on page 708
- Tensioner brace (13) on page 725
- Generation of purlins (50) on page 733
- Gusset+T (1) on page 743

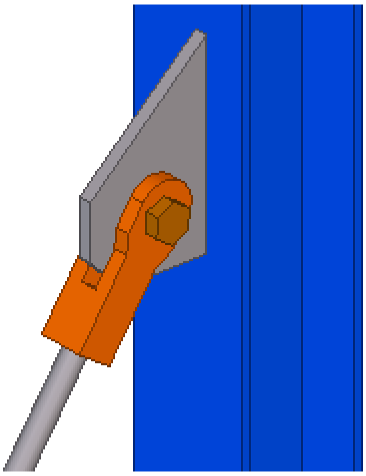
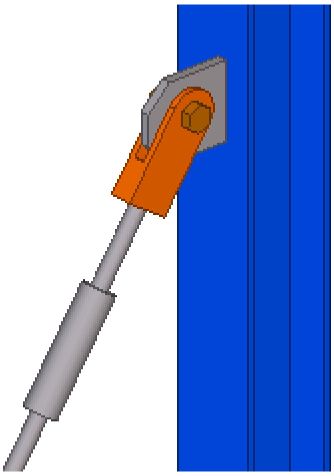
8.1 Tensioner (7)

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

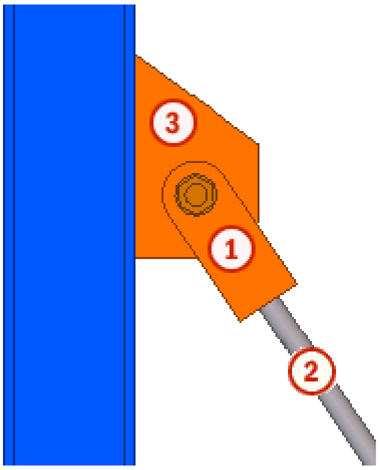
Situation	Description
	Forked plate is welded to a bracing rod and bolted to a gusset plate. The gusset plate is welded to the main part.
	Simplified tensioner in the bracing rod.

Selection order

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

Click the middle mouse button to create the component.

Part identification key



	Part
1	Connection plate (forked plate)
2	Bracing rod
3	Gusset plate

See also

Tensioner (7): Plate tab on page 710

Tensioner (7): Fork tab on page 712

Tensioner (7): Parameters tab on page 713

Tensioner (7): Bolts tab on page 715

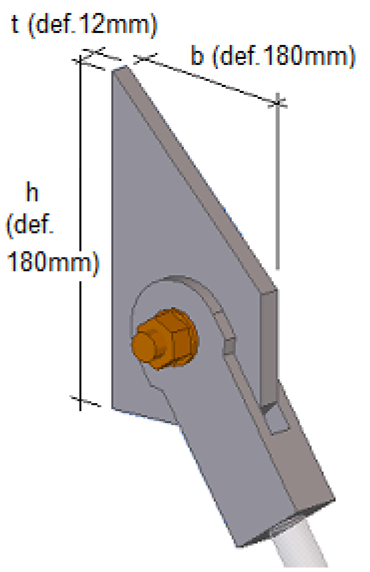
Tensioner (7): Tensioner tab on page 717

Tensioner (7): Extra tensioners tab on page 723

Tensioner (7): Plate tab

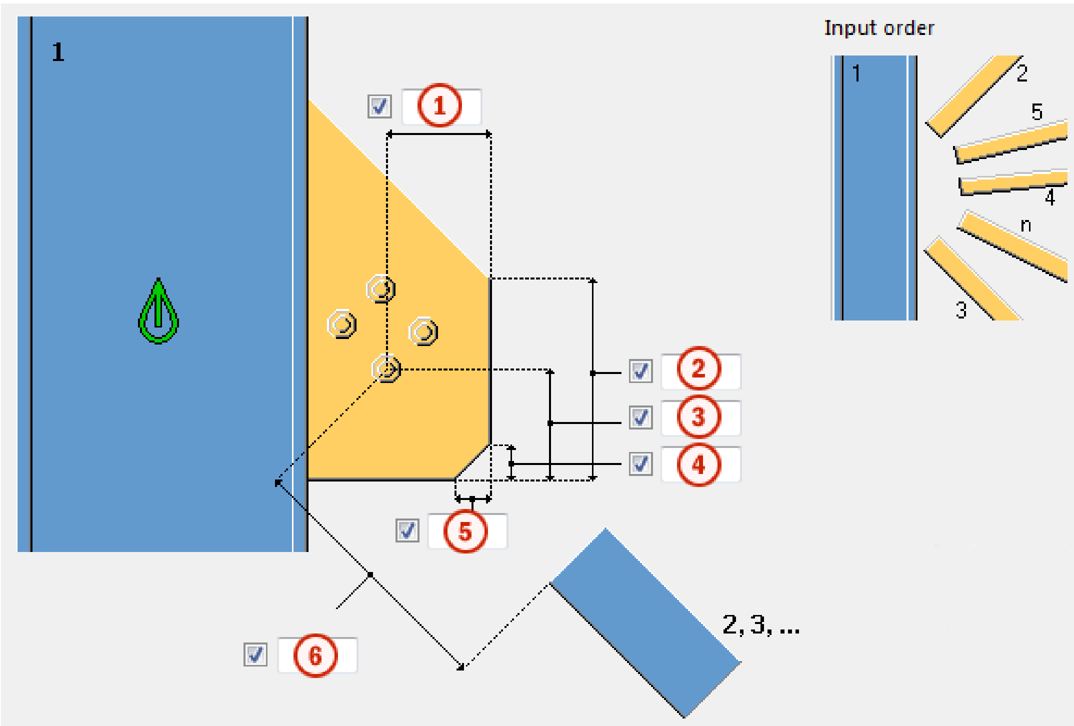
Use the **Plate** tab to control the gusset plate dimensions and shape in the **Tensioner (7)** connection.

Plate

Part	Description	Default
Gusset plate	Define the gusset plate thickness, width and height. 	12 mm 100 mm 180 mm

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

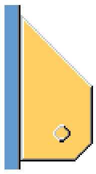
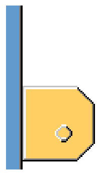
Gusset plate dimensions



	Description	Default
1	Define the horizontal bolt edge distance.	50 mm
2	Define the height of the gusset plate.	80 mm
3	Define the bottom vertical bolt edge distance.	50 mm

	Description	Default
4	Define the bottom vertical chamfer dimension.	`20 mm`
5	Define the bottom horizontal chamfer dimension.	`20 mm`
6	Define the bolt edge distance to the bracing rod.	`110 mm`

Gusset plate shape

Option	Description
	Sloped
	Perpendicular

Tensioner (7): Fork tab

Use the **Fork** tab to control the size, position, number, orientation and shape of the forked plate in the **Tensioner (7)** connection.

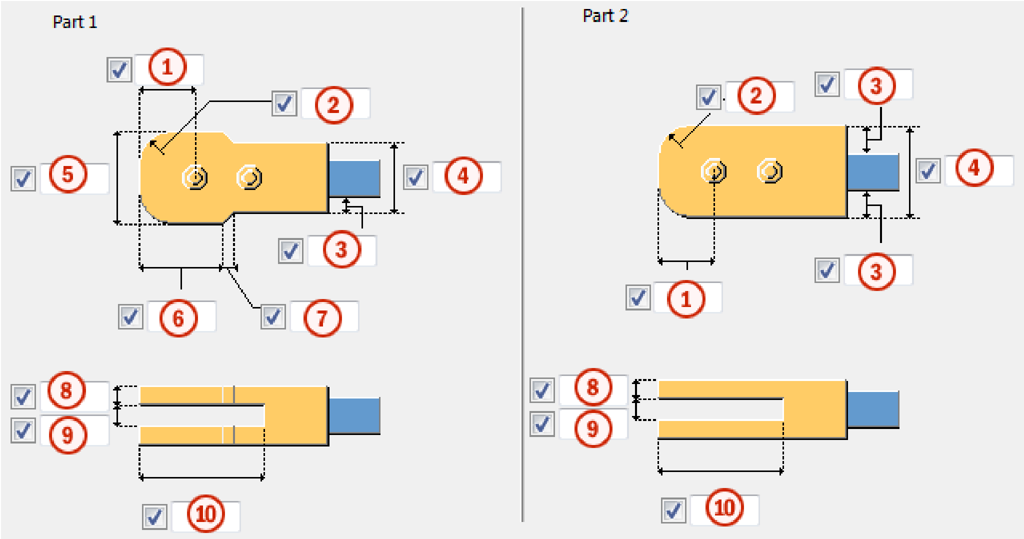
Forked plate

Part	Description	Default
Forked plate	Select the shape for the forked plate: • **Part 1** shape creates a plate with a circular part. • **Part 2** shape creates a simple plate.	

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.

Option	Description	Default
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Forked plate dimensions

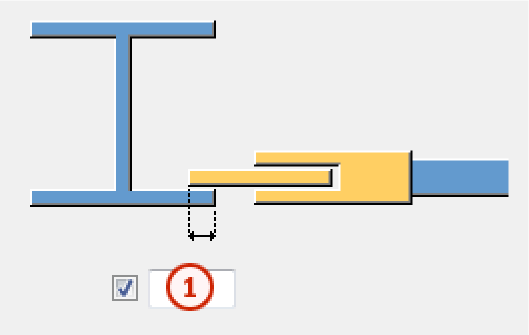


	Description
1	Define the horizontal bolt edge distance.
2	Define the chamfer radius of the forked plate.
3	Define the width of the extension part.
4	Define the width of the forked plate.
5	Define the width of the forked plate.
6	Define the length of the circular part of the forked plate.
7	Define the chamfer width of the forked plate.
8	Define the finger thickness of the forked plate.
9	Define the gap between the fingers of the forked plate.
10	Define the finger length in the forked plate.

Tensioner (7): 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 in the **Tensioner (7)** connection.

Gusset plate overlap



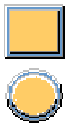
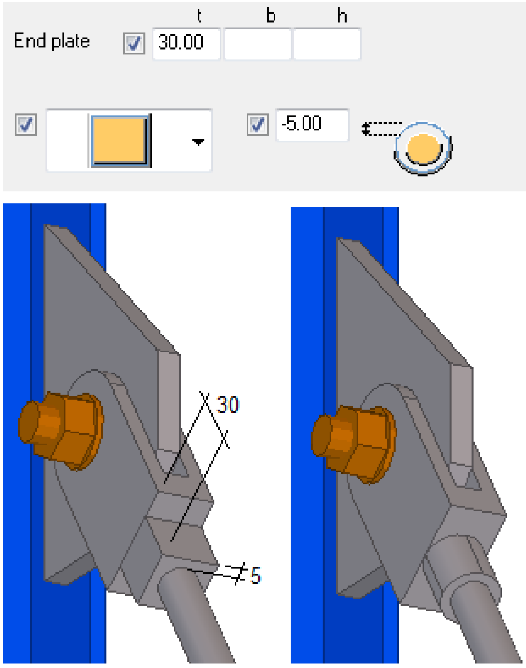
	Description
1	Define how much the gusset plate overlaps with the main part flange. If you do not enter any value, the gusset plate reaches the main part web.

End plate

Part	Description
End plate	Define the end plate thickness, width, and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

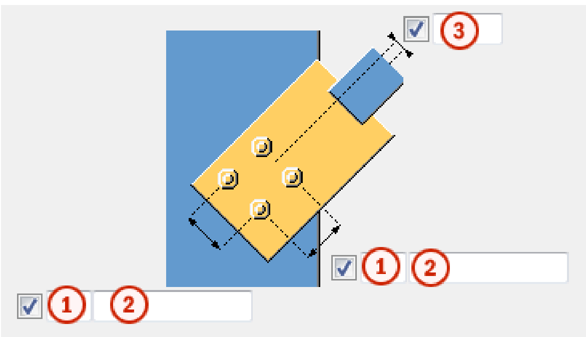
End plate shape

Option	Description
	Select the end plate shape.
	Define the end plate offset from the bracing rod.

Tensioner (7): Bolts tab

Use the **Bolts** tab to control the bolt properties in the **Tensioner (7)** connection.

Bolt group dimensions



	Description
1	Define the number of bolts.

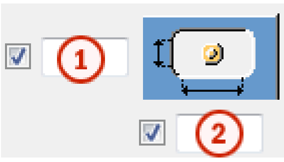
	Description
2	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
3	Define the bolt offset from the center line of the bracing rod.

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

You can define slotted, oversized, or tapped holes.



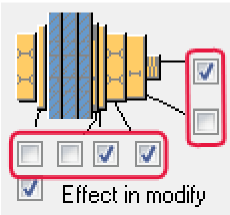
Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	

Option	Description	Default
Slots in	Member(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.

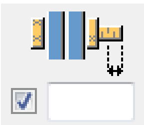
If you want to create a hole only, clear all the check boxes.



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 (7): Tensioner tab

Use the **Tensioner** tab to add a tensioner, to control the bracing levels and bracing offsets in the **Tensioner (7)** connection.

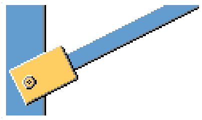
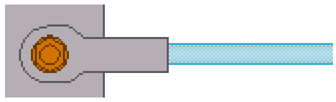
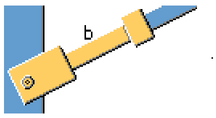
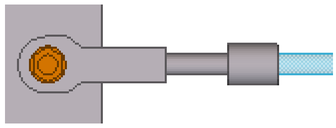
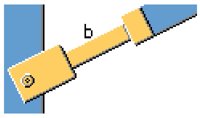
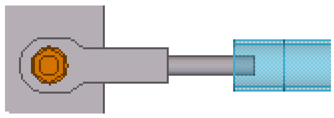
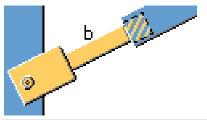
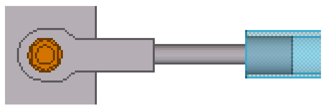
Part

Part	Description	Default
Tensioner T	Define the tensioner profile by selecting it from the profile catalog.	D40
Part B	If you have created a tensioner, define the extra windbracing profile by selecting it from the profile catalog.	

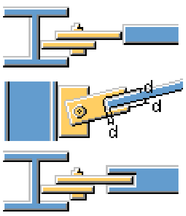
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

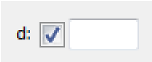
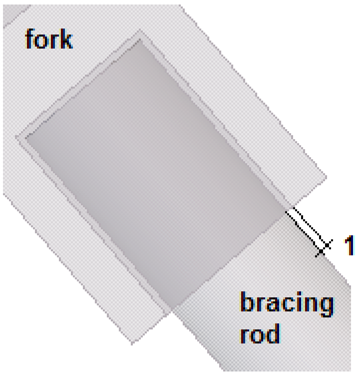
Option	Description	Default
	can enter the assembly position number.	
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Tensioner

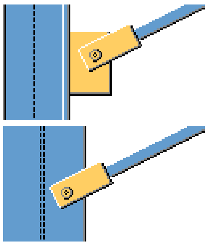
Option	Description	Example
	Tensioner is not created.	
	Tensioner is created.	
	Tensioner is created. Stopper part is added to the bracing. Used for compression tubes.	
	Tensioner is created. Stopper part is placed inside the compression tube.	

Opening in forked plate

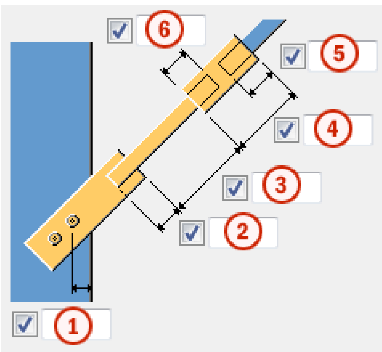
Option	Description	Example
	Select whether an opening is created in the forked plate. The opening is always square. You can define the opening if both the tensioner and extra windbracing are created.	

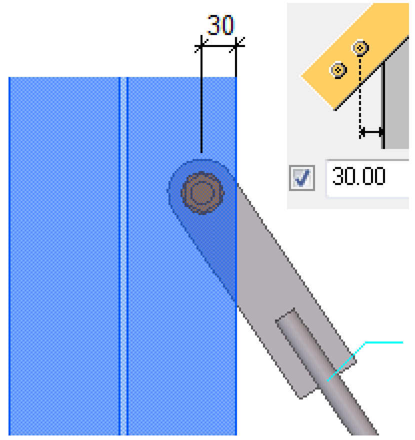
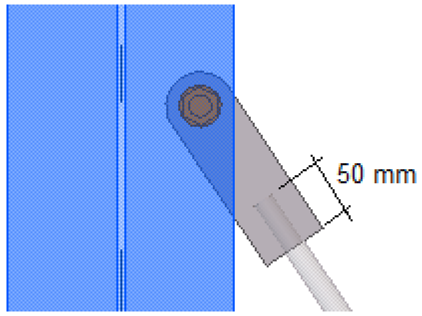
Option	Description	Example
	Define the gap for the opening. The default value is 1 mm.	 

Gusset plate

Option	Description
	Select whether a gusset plate is created. If you do not select a gusset plate, only the forked plate will be created.

Bracing dimensions



	Description	Example/Default
1	Define the bolt edge distance from the main part flange when there is no gusset plate. The default value is 30 mm .	
2	Define the bracing rod overlap.	
3	Define the length of the extra windbracing between the forked plate and the tensioner.	The default value is 300 mm.
4	Define the length of the tensioner.	The default value is 40 mm.
5	Define the bracing overlap in the tensioner.	The default value is 0 mm.
6	Define the extra windbracing overlap in the tensioner.	The default value is 0 mm.

Bracing position

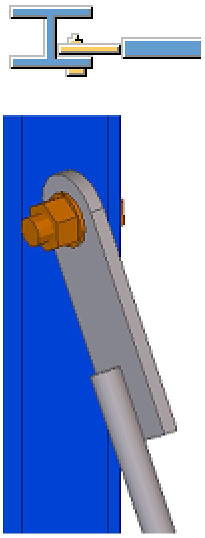
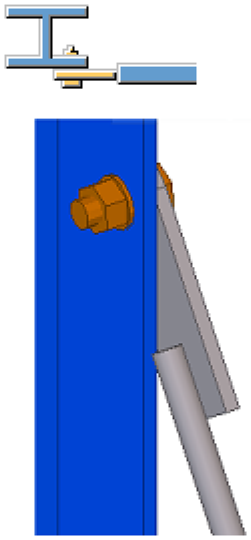
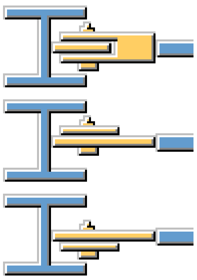
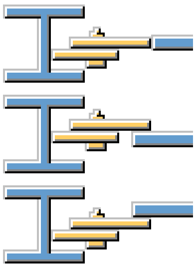
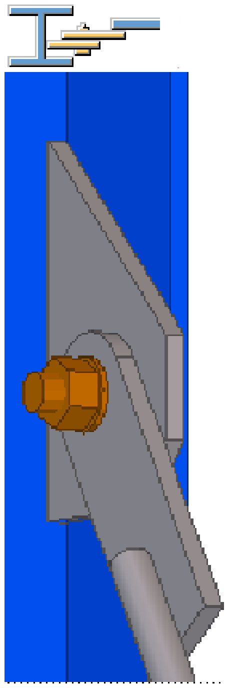
Option	Description
 	Define the position of the bracing on the main part flange. This option is useful especially if there is no gusset plate.

Plate position

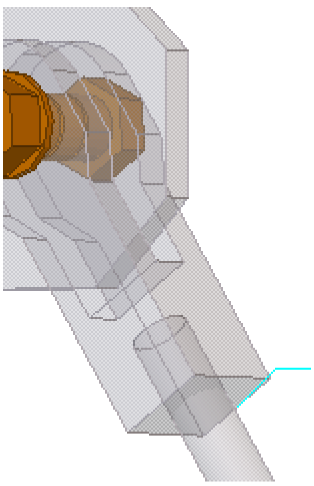
Option	Description
	Select the position of the forked plate on the main part web.

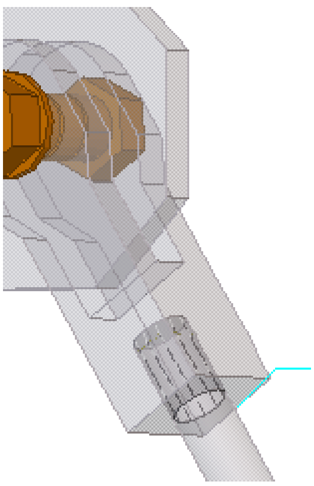
Forked plate position on bracing

Option	Description	Example
	Select the position of the forked plate on the bracing. This option is useful especially with flat plates.	

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.

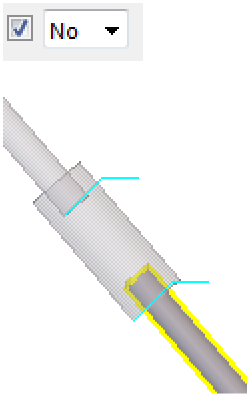


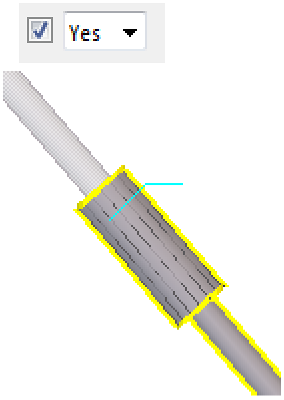


Tensioner T add to secondary

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.

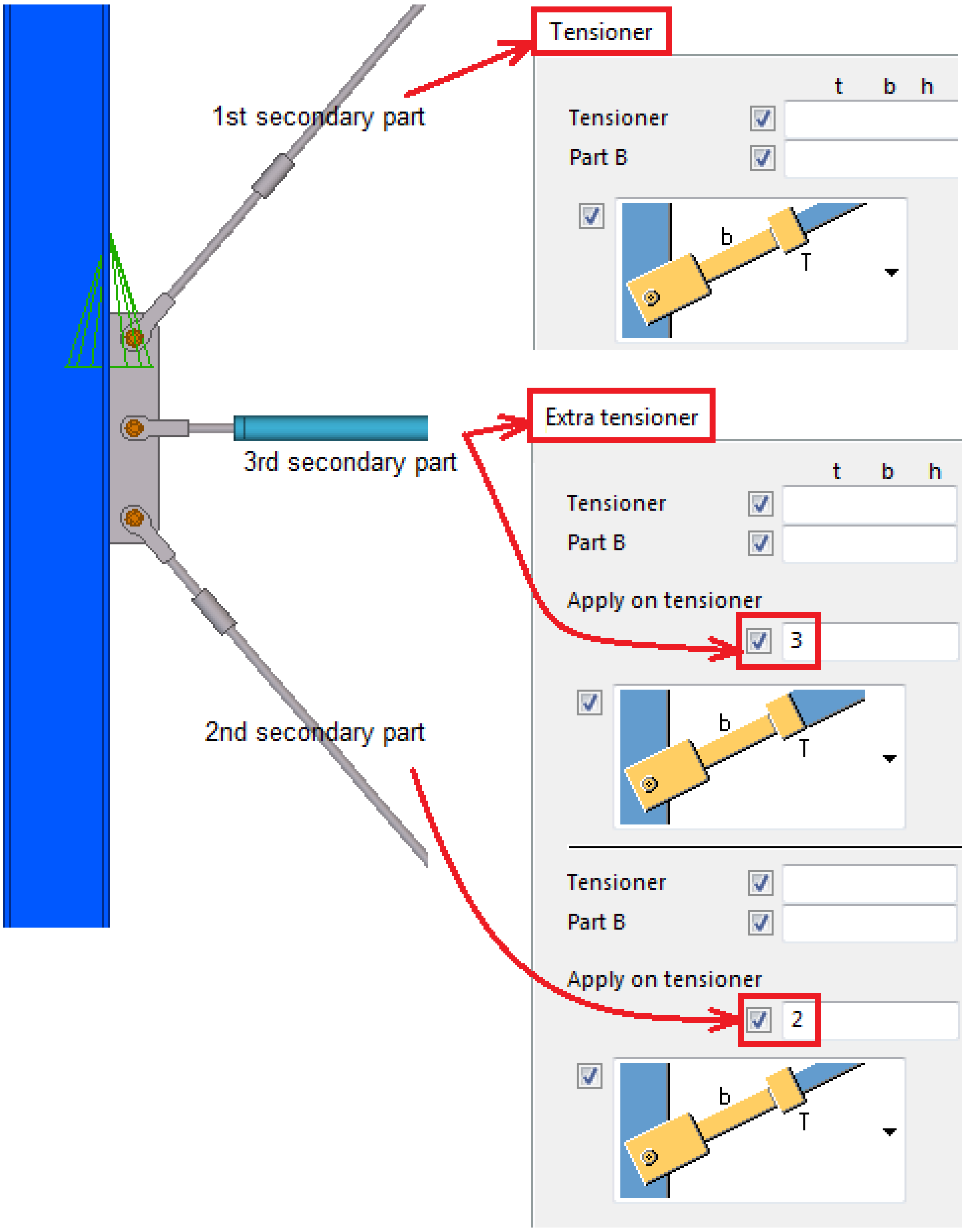




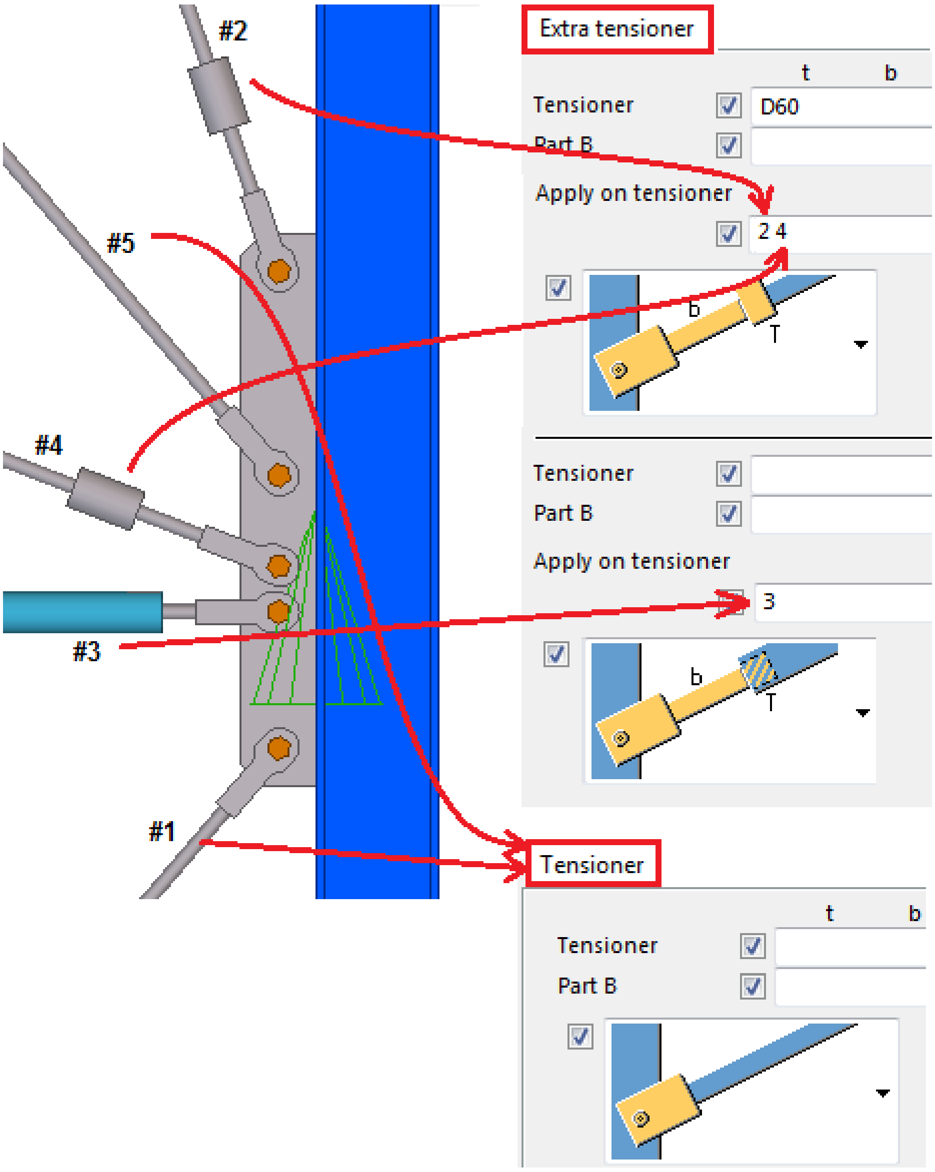
Tensioner (7): Extra tensioners tab

Use the **Extra tensioners** tab to add extra tensioners in the **Tensioner (7)** connection. 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 nr** box.



The tensioners whose numbers are not entered are created with the properties defined on the **Tensioner** tab.



See also Tensioner (7): Tensioner tab on page 717

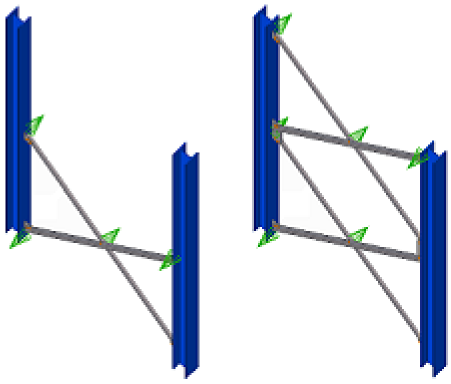
8.2 Tensioner brace (13)

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 bracings. You can define which connections are used.

Objects created

- Bracing cross (1 or 2)
- Connections between columns or beams and bracings
- Connections in bracing cross

Use for

Situation	Description
	One or two bracing crosses between two columns.

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`.

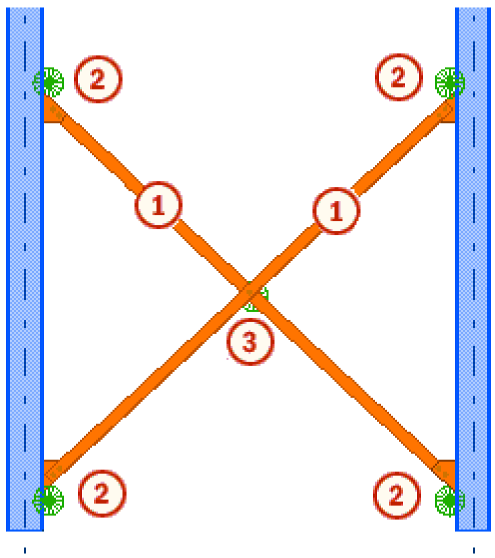
The **Auto** option does not work.

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



	Part
1	Diagonal bracing
2	Connection between the main part and the bracing

	Part
3	Connection in the bracing cross

See also Tensioner brace (13): Picture tab on page 727

Tensioner brace (13): Parts tab on page 728

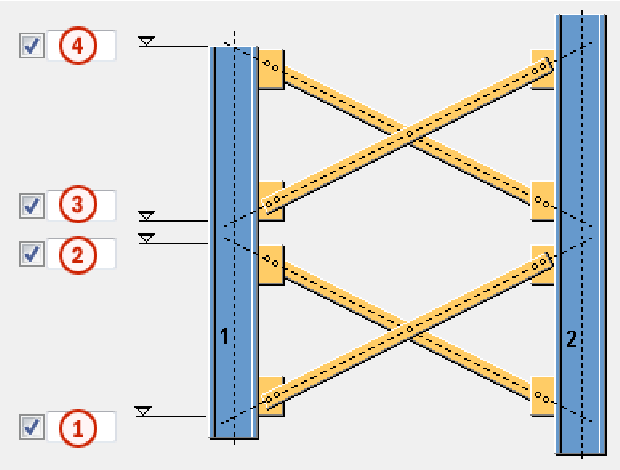
Tensioner brace (13): Joints tab on page 730

Tensioner brace (13): Joints direction tab on page 732

Tensioner brace (13): Picture tab

Use the **Picture** tab to control the bracing levels and bracing offsets in the **Tensioner brace (13)** connection.

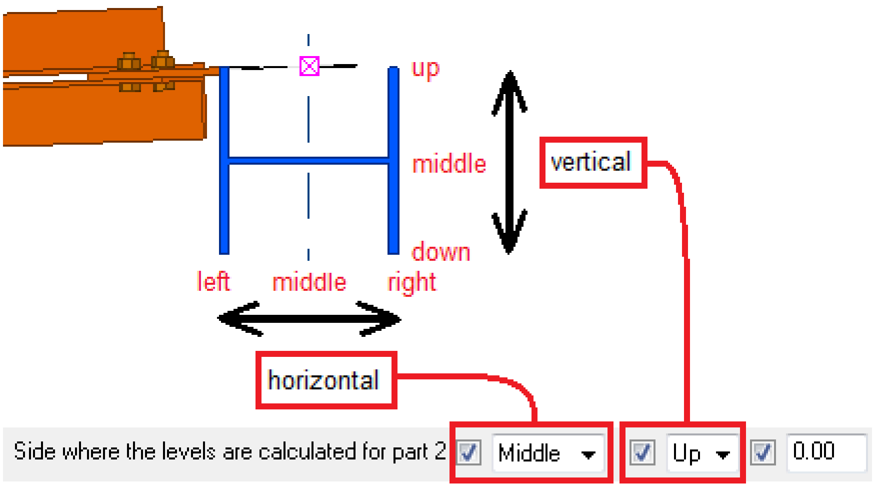
Bracing levels



	Description
1	Define the bottom level of the lower bracing cross.
2	Define the top level of the lower bracing cross.
3	Define the bottom level of the upper bracing cross.
4	Define the top level of the upper bracing cross.

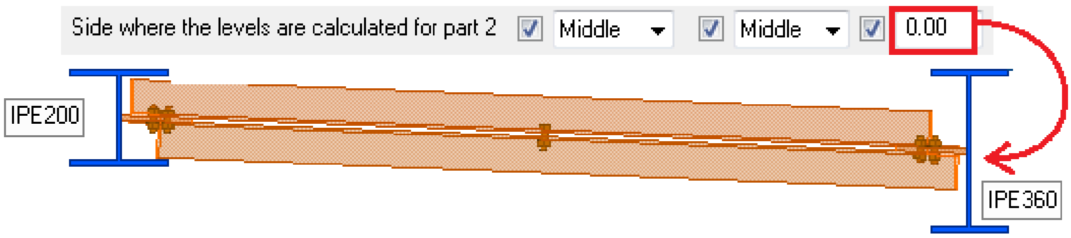
Bracing reference side For both main parts, define the reference side of the bracing levels. The reference side can be set for both the horizontal and the vertical direction.

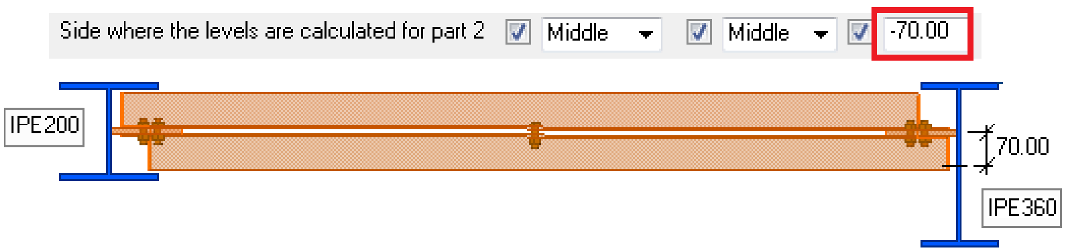
Example:



Offset Define the offset. The offset is useful in ensuring that the parts have the same height.

Example:





Tensioner brace (13): Parts tab

Use the **Parts** tab to control the bracing size, position, number and rotation in the **Tensioner brace (13)** connection. You can also define how the bracings are split and connected, and how two bracing crosses are connected to each other.

Windbracing

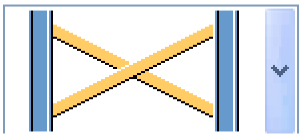
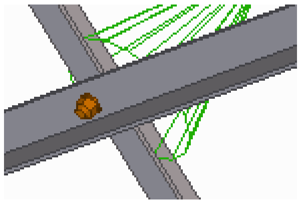
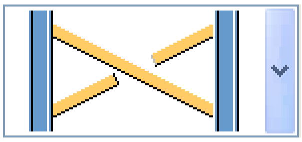
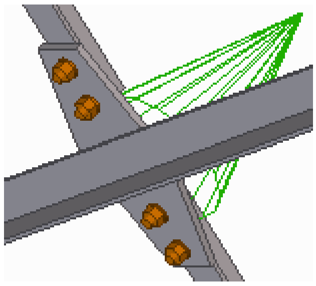
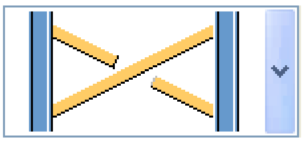
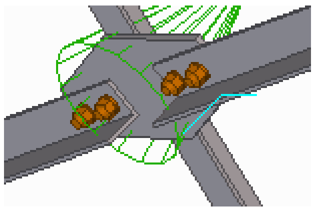
Part	Description
Windbracing	Define the bracing profile by selecting it from the profile catalog.

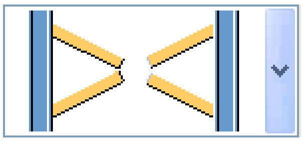
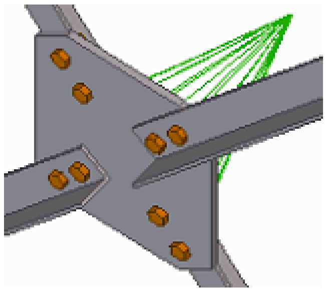
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Windbracing rotation Select the rotation for the first and the second bracing.

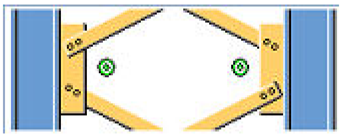
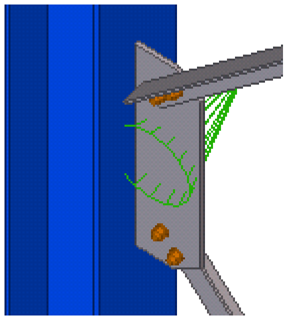
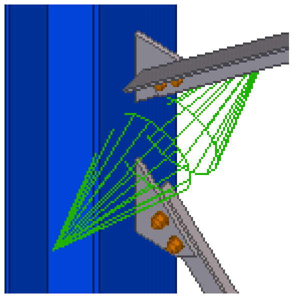
Windbracing translation Select the position of the first and the second bracing from the reference points. This option is useful when bracings must be positioned next to each other.

Connecting diagonal bracings Select how the diagonal bracings are connected. Define the connecting component on the **Joints** tab by entering the number of the component in the **Connect diagonals** box.

Option	Description	Example
	Diagonal bracings are not split. Possible component for connecting diagonals: **Seating (30)**.	
	The first diagonal bracing is split. Possible component for connecting diagonals: **Bolted gusset (11)**.	
	The second diagonal bracing is split. Possible component for connecting diagonals: **Bolted gusset (11)**.	

Option	Description	Example
	Both diagonal bracings are split. Possible component for connecting diagonals: **Central gusset (169)**.	

Connecting bracing crosses Define whether two bracing crosses next to each other are connected. Define the connecting component on the **Joints** tab by entering the number of the component in the **Connection number** box.

Option	Description	Example
	Bracing crosses are connected with a gusset connection. Possible component for connecting diagonals: **Bolted gusset (11)**.	
	Bracing crosses are not connected. Separate connection is created for each diagonal bracing. Possible component for connecting diagonals: **Bolted gusset (11)**.	

Distance between windbracings Define the distance between the bracings. Gusset plate thickness is usually used as the distance value.

Shorten windbracings Define how much the bracings are shortened. The entered value is written in the user-defined attributes of the bracings. The value is used in drawings.

Tensioner brace (13): Joints tab

Use the **Joints** tab to define the components used for connecting the columns or beams and the bracing crosses in the **Tensioner brace (13)** connection.

Creation of joints

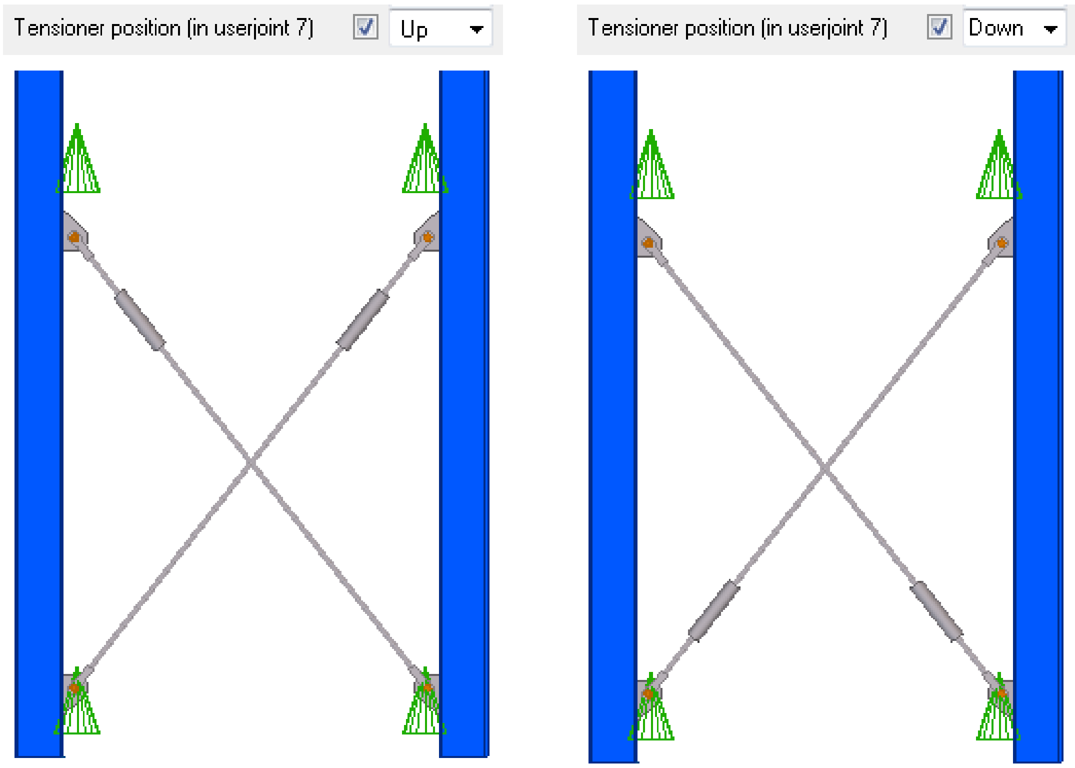
Define whether connections are created between the bracing elements.

Connecting bracing crosses

Option	Description
Connection number	Define the component used to connect the main part and the bracing cross. For example, if you enter `11`, the **Bolted gusset (11)** connection is used.
Configuration file for the joint	If there is a configuration file setting for the connection, define it here. For example, entering `CS_M13` means that a setting named CS_M13 must be available for the used connection.
Tensioner position	Define the tensioner position if the **Tensioner (7)** connection is used.

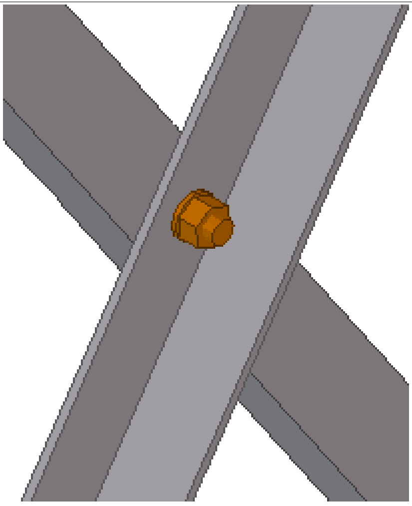
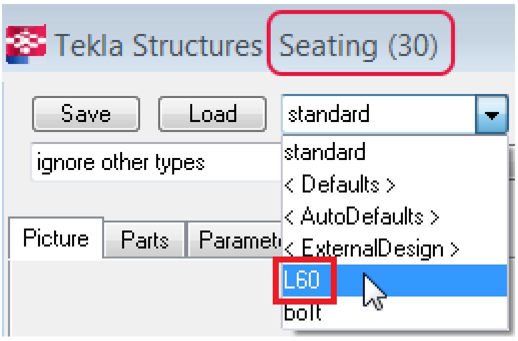
Tensioner position

Example of **Tensioner (7)** position in both the **Up** and the **Down** position.



Connecting diagonal bracings

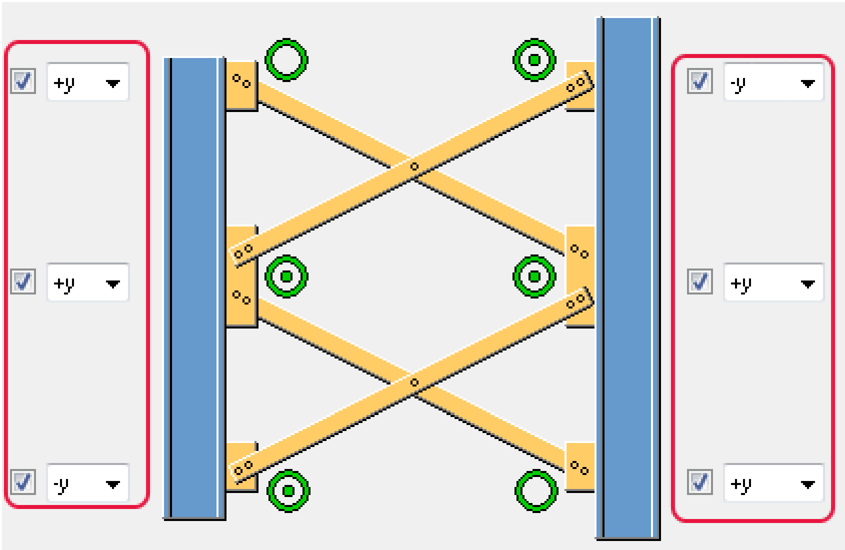
Option	Description
Connect diagonals	Define the component used to connect the bracings in the bracing cross. The default component is the **Seating (30)** connection. Example:

Option	Description
	
Joint direction	Define the direction of the connection.
Configuration file for the joint	If there is a configuration file setting for the connection, define it here. For example, entering `L60` means that a setting named L60 must be available for the used connection. Example: 

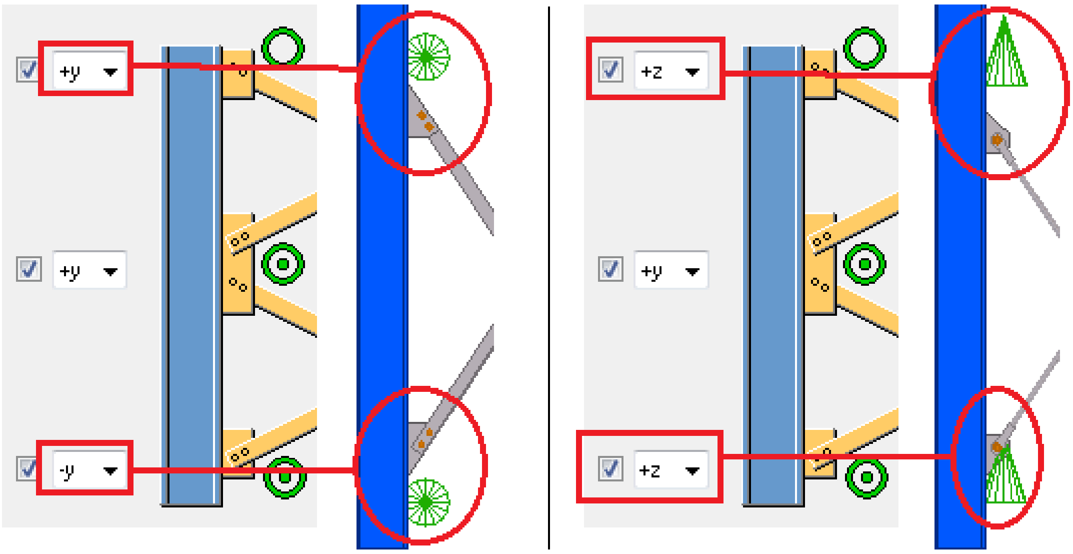
Tensioner brace (13): Joints direction tab

Use the **Joints dir** tab to control the directions of the connections used between the columns or beams and the diagonal bracings in the **Tensioner brace (13)** connection.

Connection direction Select the direction for both main parts.



Examples:



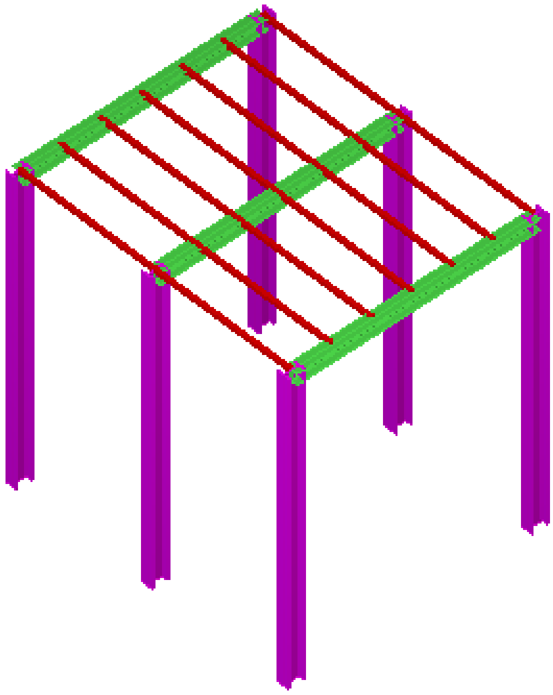
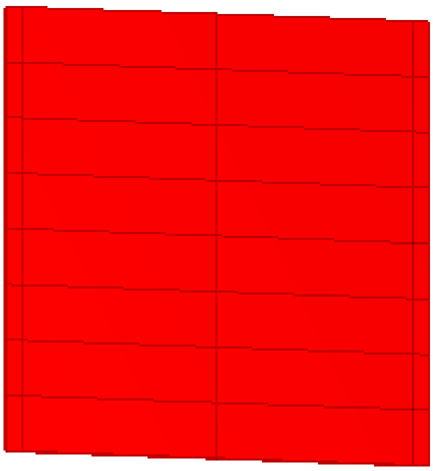
8.3 Generation of purlins (50)

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
	Purlins
	Wall panel

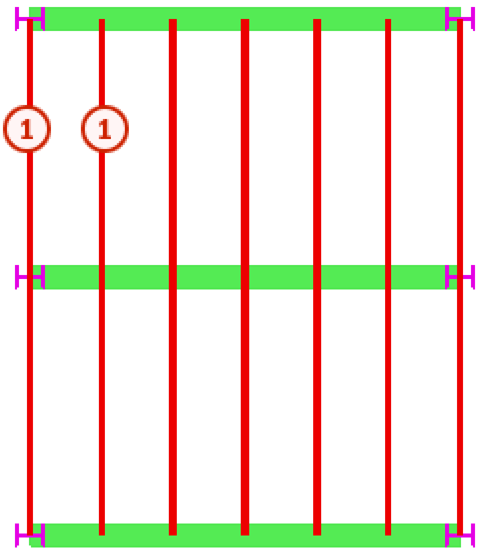
Selection order

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.

The placement of the purlins is defined by the work plane.

Part identification key



	Part
1	Purlin

See also

Generation of purlins (50): Picture tab on page 735

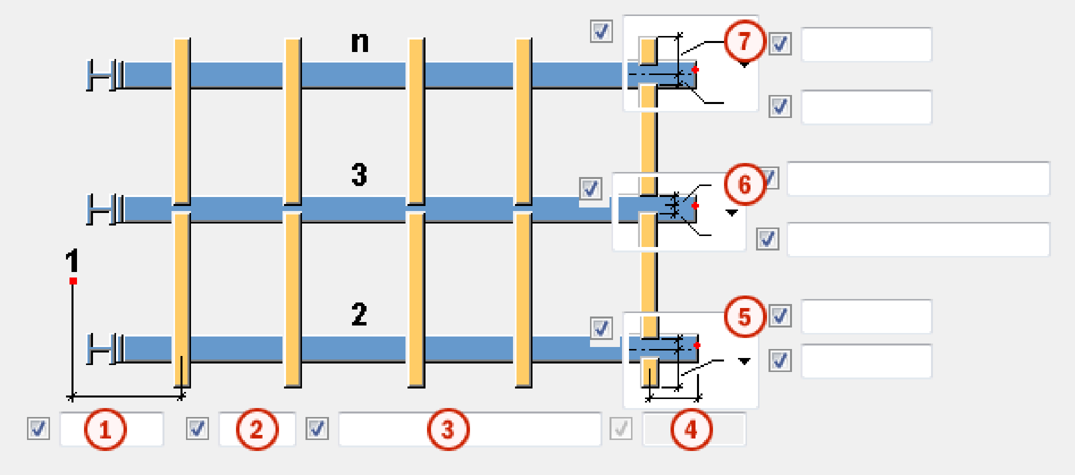
Generation of purlins (50): Parts tab on page 740

Generation of purlins (50): UDA tab on page 742

Generation of purlins (50): Picture tab

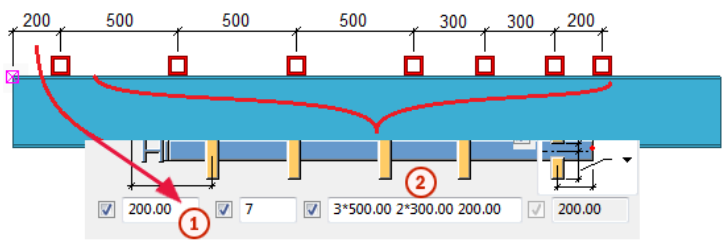
Use the **Picture** tab to control the number of purlins, distances between the purlins and purlin overhang lengths in the **Generation of purlins (50)** modeling tool.

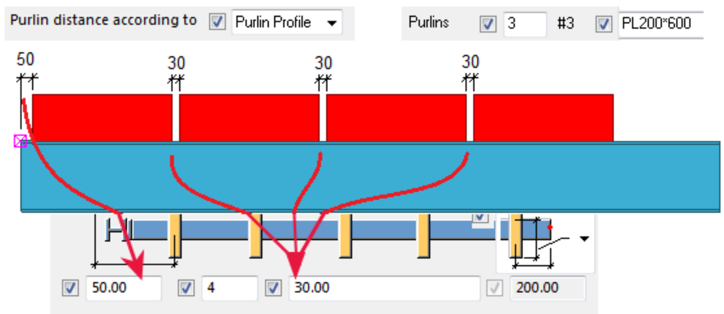
Purlin dimensions

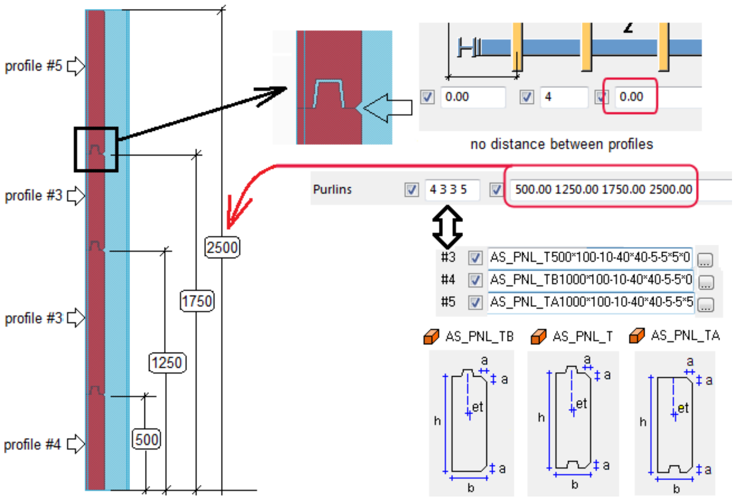


	Description
1	Define the edge distance from the picked point to the first purlin.
2	Define the number of purlins.
3	Define the distance between the purlins. The distances are calculated from center-to-center.
4	Define the edge distance from the last purlin to the part end point. The distance depends on the option **Purlin distance according to**.
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.

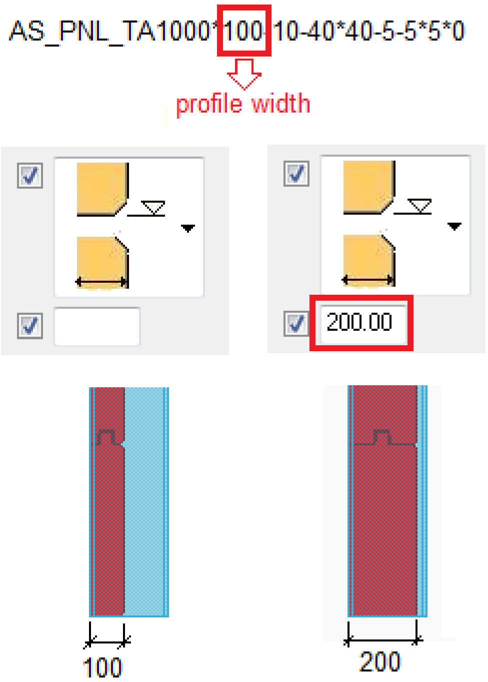
Option	Description
Exact number of purlins	Define the purlin start point with an edge distance 1. The remaining length is divided according to the values in 2. For example: 

Option	Description
Fill to the end	Define the purlin start point with an edge distance in 1. The remaining length is divided according to the values in 2, considering the edge distance in 3. 
Purlin profile	Intermediate distances Define the distances between the purlins. This is suitable especially for concrete floors. For example, define the distances on the **Picture** tab and the purlin profile properties on the **Parts** tab: 
Divide equally	Purlin distances are equally divided by the length of profiles.
Purlin type	This option is recommended for vertical profiles, such as concrete walls or panels. The height of the part that is set in the purlin profile properties on the **Parts** tab can be overridden by the levels defined in the **Top level purlin panels** option on the **Parts** tab. For example:

<table>
<tr><th>Option</th><th>Description</th></tr>
<tr><td></td><td>


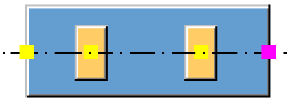
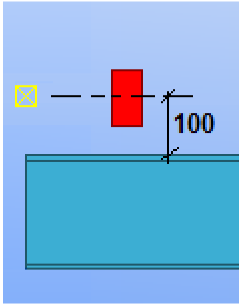
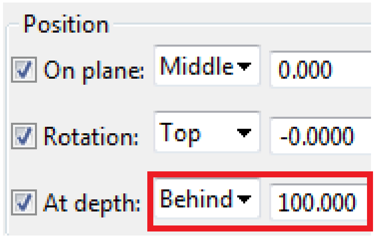
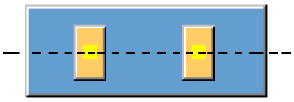
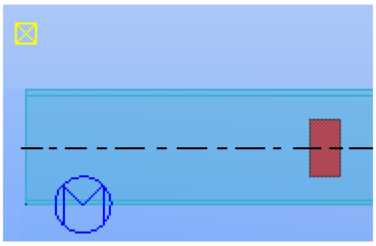
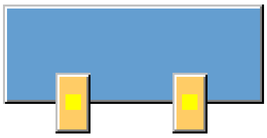
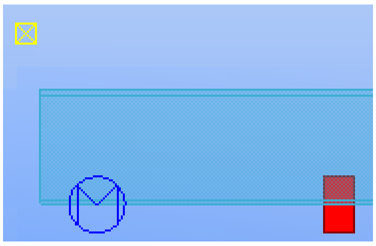
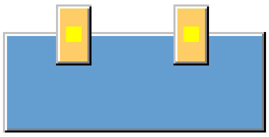
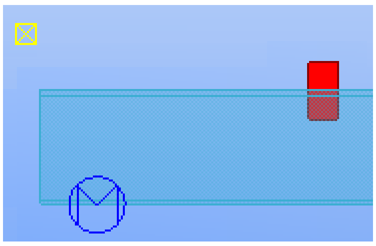
The width of the panel that is set in the purlin profile properties on the Parts tab can be overridden by the Plate thickness option on the Parts tab. If the Plate thickness option is empty, then the plate thickness in the profile properties is used.

For example:

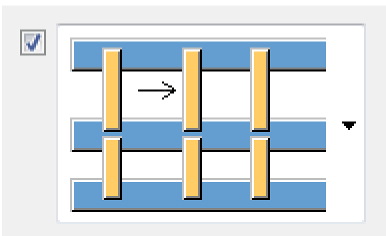


</td></tr>
</table>

Level Define the purlin level compared to the main part.

Option	Description
	Reference point of main part  
	Centerline of main part 
	Bottom face of main part 
	Top face of main part 

Purlin direction Define which direction is used for the new purlins.



Generation of purlins (50): Parts tab

Use the **Parts** tab to control the purlin properties and purlin positioning in the **Generation of purlins (50)** modeling tool.

Purlin profile

Option	Description
Purlin	Define the purlin thickness, width and height. The default value is PL100*100.

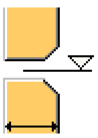
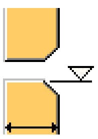
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

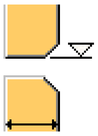
Purlin position

Option	Description
Purlins	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 **#1** and 4 purlins of type **#2**.
Inverse	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
On plane	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

Option	Description
	2 = right In the second box, enter a value to define a horizontal offset.
Rotation	In the first box, enter the rotation of the purlin. You can define the rotation separately for each purlin type. The options are: 0= back 1= below 2= front 3= top In the second box, enter an angle for other rotation angles.
At depth	In the first box, define the purlin position in the vertical plane. You can define the position separately for each purlin type. The options are: 0 = middle 1 = front 2 = behind In the second box, enter a value to define a vertical offset.
Purlin panel levels	Enter one or more values to define elevations. This is useful especially for panels. Separate the numbers with a space. Use this option only if you have set the **Purlin distance according to** option to **Purlin type** on the **Picture** tab.

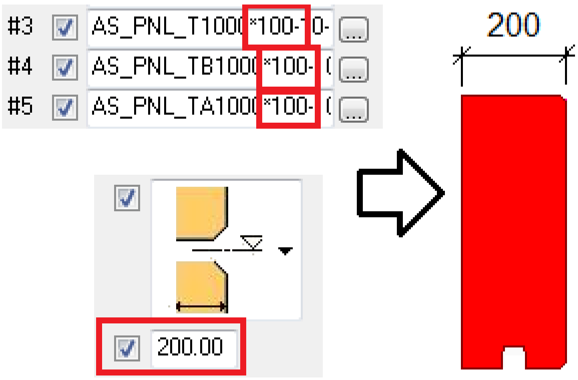
Elevation Define the reference for the purlin elevations, for example, for wall panels. The elevations are set in the **Top level purlin panels** option.

Option	Description
	Elevation is in between the parts.
	Elevation is on the top side of the bottom part.

Option	Description
	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
Plate thickness	For example: 	`100 mm`

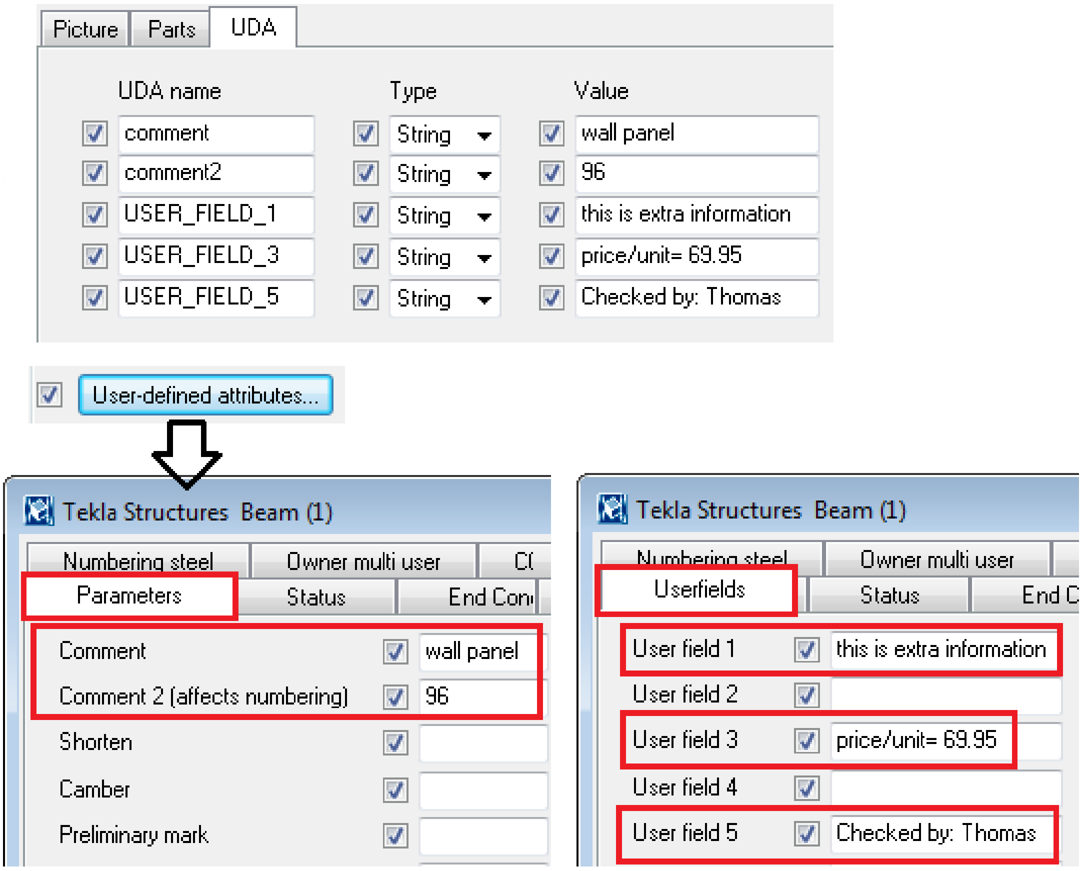
Generation of purlins (50): UDA tab

Use the **UDA** tab to add information in the parts' user-defined attributes (UDAs) in the **Generation of purlins (50)** modeling tool. You can define up to 5 UDA names.

Option	Description
UDA name	Enter the name of the user-defined attribute. For example, to add a comment UDA, open the `objects.inp` file in a text editor and search for `comment`. The following attribute is shown: `attribute("comment", "j_comment", string, "%s", no, none, "0.0", "0.0")` The first text between the quotation marks is the UDA name, `comment`. The entered name is case sensitive.

Option	Description
Type	Select the UDA type. Use **String** for text, **Integer** for numbers, **Float** for numbers with decimals and **Option** for selecting an item in a list. You can find the UDA type in the `objects.inp` file.
Value	Enter a value for the UDA. Use text and/or numbers, depending on the defined UDA type.

Example



8.4 Gusset+T (1)

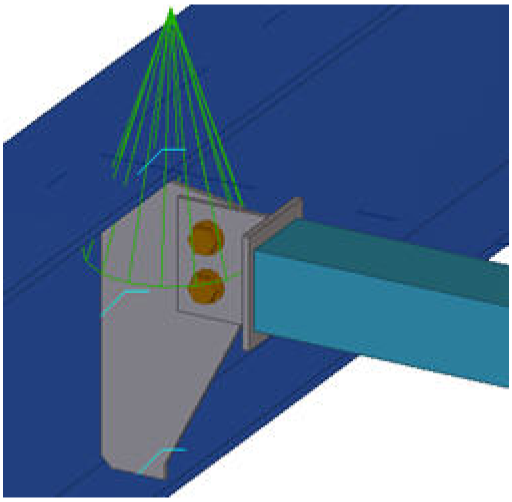
Gusset+T (1) connects a beam or a brace to another beam by welding a T profile to the end of the beam and bolting this profile to a shear plate gusset on the main part. The main part is typically an H or I profile, and the secondary part is typically a square or round hollow profile, though channels 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

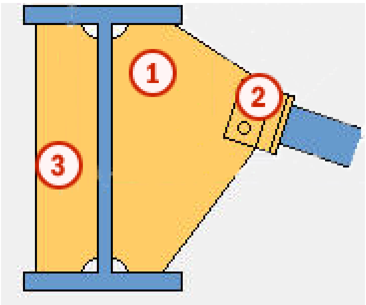
Use for

Situation	Description
	T profile welded to beam and bolted to gusset plate on main part.

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



Number	Part
1	Gusset plate
2	Brace connetion (T profile)
3	Stiffener

See also

Gusset+T (1): Picture tab on page 745

Gusset+T (1): Gusset tab on page 747

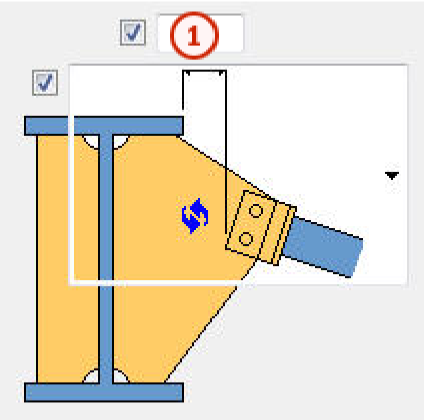
Gusset+T (1): Brace connection tab on page 749

Gusset+T (1): Bolts tab on page 751

Gusset+T (1): Picture tab

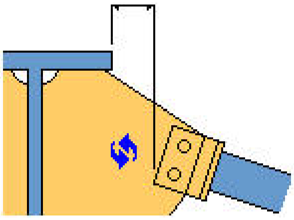
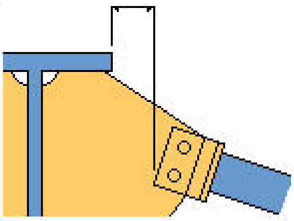
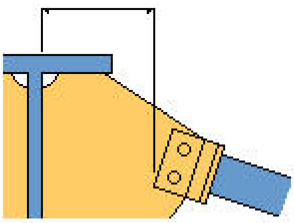
Use the **Picture** tab to control the gap and gusset plate dimensions and the shape of the gusset plate in the **Gusset+T (1)** connection.

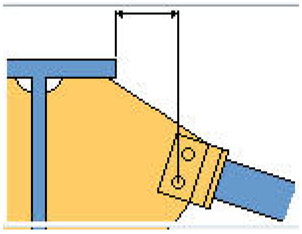
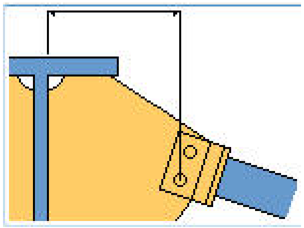
Gap dimension



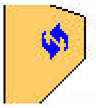
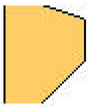
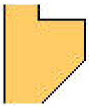
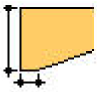
Option	Description	Default
1	Define the gap dimension.	10 mm

Gap dimension options

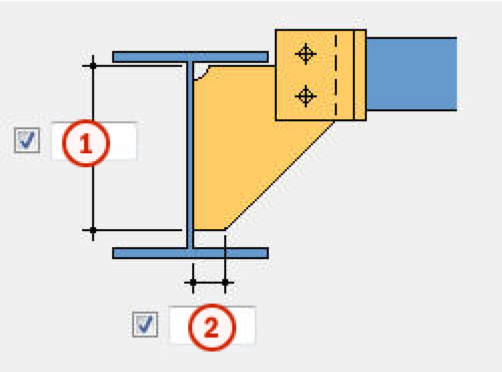
Option	Description
	Default Gap between the edge of the main part flange and the nearest corner of the gusset plate. AutoDefaults can change this option.
	Gap between the edge of the main part flange and the nearest corner of the gusset plate.
	Gap between the face of the main part web and the nearest 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
	Default Regular trapezoidal gusset plate. AutoDefaults can change this option.
	Regular trapezoidal gusset plate. You can use all the gap and straight portion settings on the **Gusset** tab page to modify this gusset plate. 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.
	Square corner on the upper side of the gusset plate. You can use all the gap options to modify this gusset plate. The lower flange straight edge can also be used.
	Partial depth gusset plate. Define the height and straight edge explained in **Gusset plate dimensions**. If the gusset plate extends above the upper flange, use the extended gusset plate chamfer dimensions.

Gusset plate dimensions



Option	Description	Default
1	Define the partial gusset plate height on the web.	
2	Define the partial gusset plate straight edge.	`20 mm`

Gusset+T (1): Gusset tab

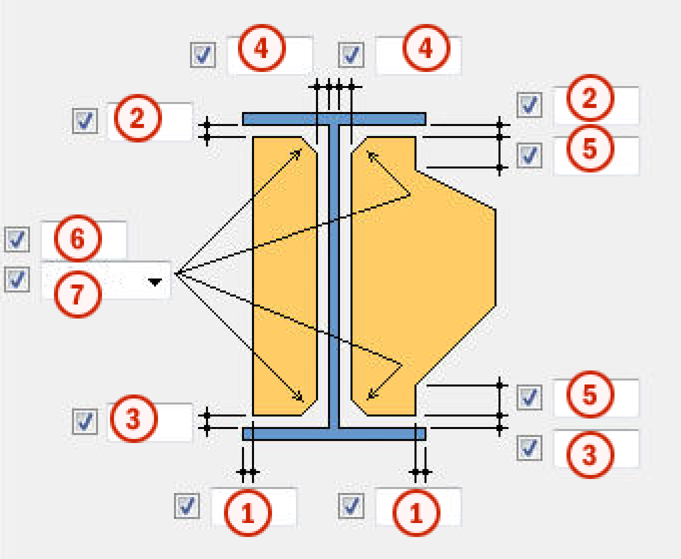
Use the **Gusset** tab to control the position and dimensions of the gusset plate and stiffener creation in the **Gusset+T (1)** connection.

Gusset and stiffener

Option	Description	Default
Gusset	Define the gusset plate thickness, width and height.	`6 mm`
Stiffener	Define the stiffener thickness, width and height.	`Gusset plate thickness`

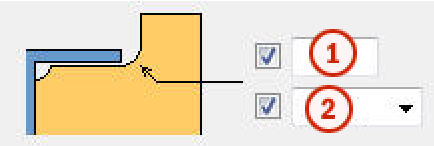
Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Gusset and stiffener dimensions

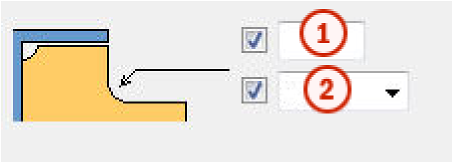


Option	Description	Default
1	Define the distance of the gusset plate/ stiffener from the edge of the flange.	
2	Define the gap between the upper flange and the gusset plate/stiffener.	
3	Define the gap between the lower flange and the gusset plate/stiffener.	
4	Define the gap between the web and the gusset plate/stiffener.	
5	Define the straight portion of the gusset plate from the flange before it begins to slope to the brace.	
6	Define the size of the gusset plate/ stiffener chamfer.	
7	Define the chamfer shape for the gusset plate/stiffener corners.	Line chamfer

Chamfer type and size

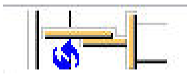
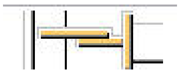
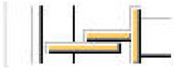


Option	Description	Default
1	Define the chamfer size for the gusset plate when the gusset plate extends above or below the main part flange.	5
2	Define the chamfer type for the extended gusset plate.	Concave arc chamfer

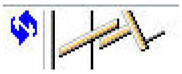
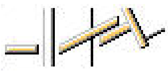
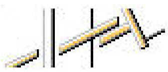
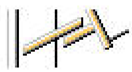


Option	Description	Default
1	Define the chamfer size for the square corner on the upper side of the gusset plate.	20
2	Define the chamfer type for the square corner.	Concave arc chamfer

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.

Gusset+T (1): Brace connection tab

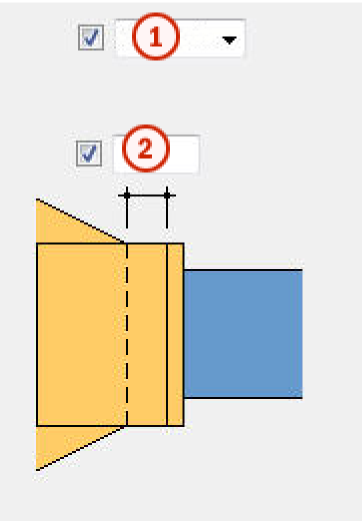
Use the **Brace connection** tab to define how the brace is connected to the gusset plate in the **Gusset+T (1)** connection.

Profile properties

Option	Description	Default
Cut T	Define the Cut T profile thickness, width and height by selecting the profile from the profile catalog.	`Gusset plate thickness`
Flange	Define the flange thickness for the Built up T profile. Note that you must first define the profile type to be **Built up T**.	`6 mm`
Web	Define the web thickness for the Built up T profile. Note that you must first define the profile type to be **Built up T**.	`6 mm`

Field	Description	Default
Pos_No	Define a prefix and a starting number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Brace connection profile

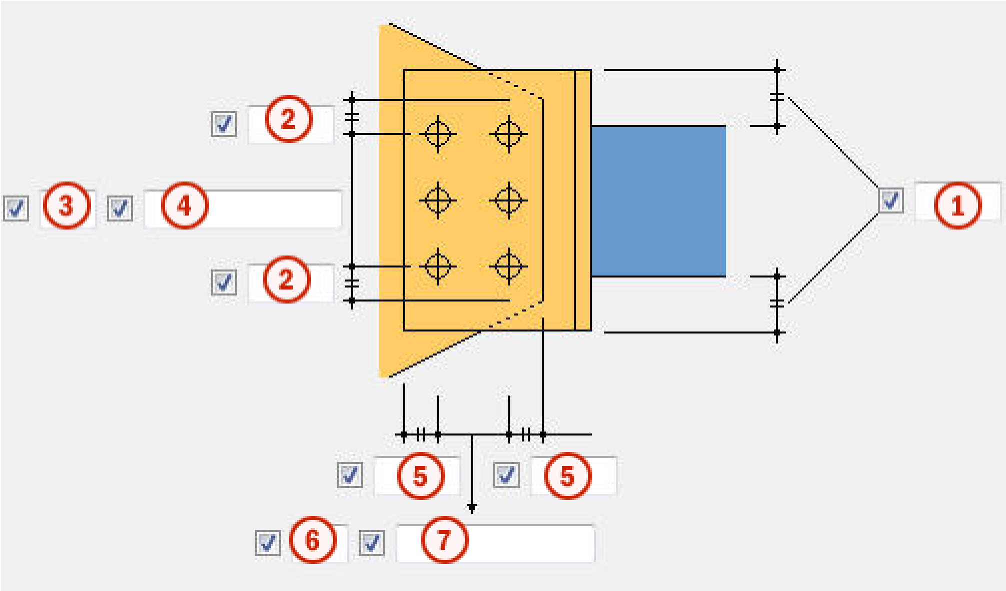


Option	Description	Default
①	Define the type of the T profile to be used in the brace connection. When you select **Built up T**, also define the gap between the gusset plate and the Built up T profile.	
②	Define the gap between the gusset plate edge and the flange of the Built up T profile.	`10 mm`

Gusset+T (1): Bolts tab

Use the **Bolts** tab to control the properties of bolts that connect the gusset plate to the T profile in the **Gusset+T (1)** connection.

Bolt group dimensions



Option	Description	Default
①	Define the minimum T profile extension for the top and bottom of the brace connection.	`10 mm`
②	Define the bolt edge distance.	`40 mm`
③	Define the number of bolts.	`2`
④	Define the 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`

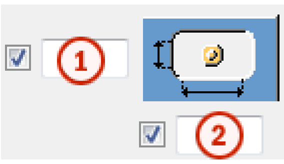
Option	Description	Default
5	Define the bolt edge distance.	`40 mm`
6	Define the number of bolts.	`1`
7	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.	`60 mm`

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

You can define slotted, oversized, or tapped holes.

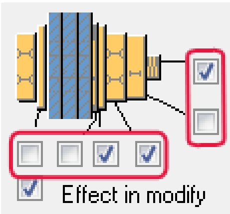


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	

Option	Description	Default
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

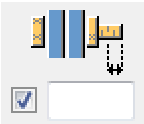
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



9 Tubes

This section introduces components that can be used in steel tube connections.

Click the links below to find out more:

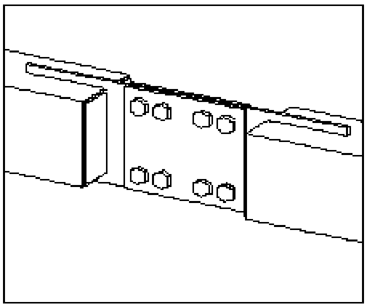
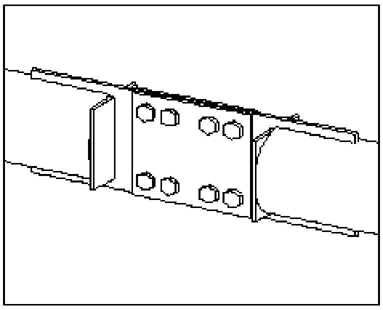
9.1 Tube splice (6)

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

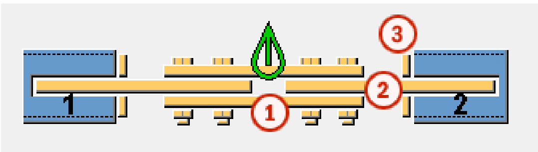
Situation	Description
	Tube splice connection to rectangular hollow core sections.
	Tube splice connection to round tubes.

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

See also

Tube splice (6): Picture tab on page 755

Tube splice (6): Parts tab on page 756

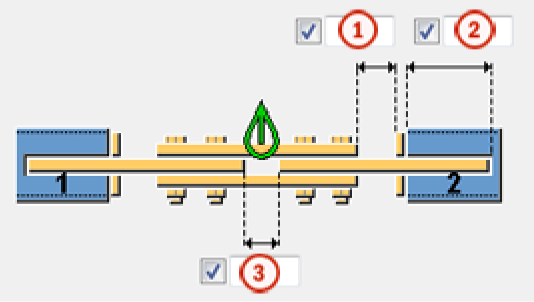
Tube splice (6): Bolts tab on page 757

Tube splice (6): End plates tab on page 759

Tube splice (6): Picture tab

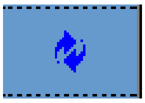
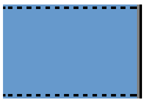
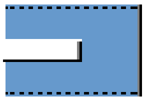
Use the **Picture** tab to control the positions of the plates in the **Tube splice (6)** connection.

Plate position



	Description	Default
1	Define the distance between the splice plate and the end plate.	`10 mm`
2	Define the connection plate cut depth. The cut depth affects the size of the connection plate.	`150 mm`
3	Define the distance between the connection plates.	`20 mm`

Cut creation Define whether the connection plates create cuts to the parts they connect.

Option	Description
	No cut Default
	No cut
	Creates a cut.

Tube splice (6): Parts tab

Use the **Parts** tab to control the size, position, material and name of the plates in the **Tube splice (6)** connection.

Plate

Part	Description
Splice plate	Define the splice plate thickness.
Connection plate	Define the connection plate thickness.

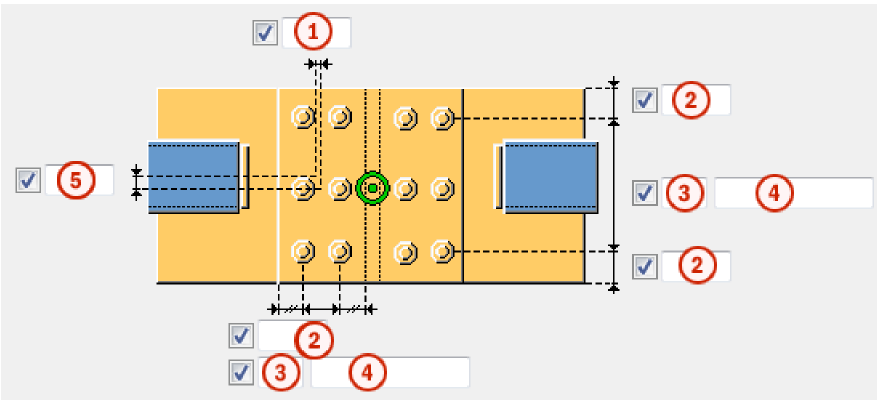
Part	Description
End plate	Define the end plate thickness.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Tube splice (6): Bolts tab

Use the **Bolts** tab to control the properties of the bolts that connect the splice plates and the connection plates in the **Tube splice (6)** connection.

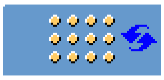
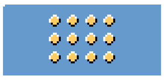
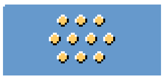
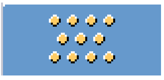
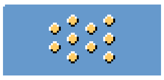
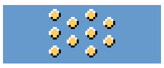
Bolt group dimensions



	Description
1	Define the dimension for horizontal bolt group position.
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.

	Description
4	Define the 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 dimension for the bolt group position from the center line of the connected parts.

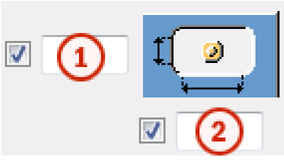
Staggering of bolts

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

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

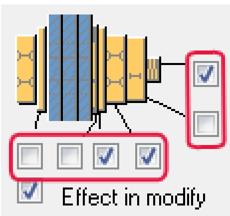
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

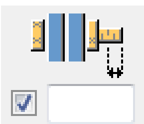
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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**.

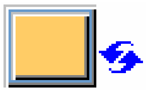
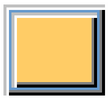
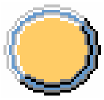
Bolt length increase Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



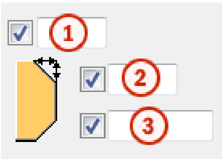
Tube splice (6): End plates tab

Use the **End plates** tab to control the shape and the dimensions of the end plate in the **Tube splice (6)** connection.

End plate shape

Option	Description
	Square Default
	Square
	Round

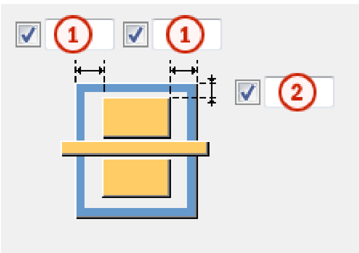
End plate chamfer dimensions



	Description
1	Define the horizontal chamfer dimension.
2	Define the vertical chamfer dimension.
3	Select the chamfer type.

End plate dimensions

Define the dimensions of the square end plate.

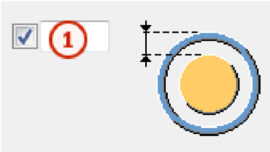


	Description
1	Define the horizontal dimension from the edge of the end plate to the flange of the column or the beam.
2	Define the vertical dimension from the edge of the end plate

	Description
	to the flange of the column or the beam.

End plate dimensions

Define the dimension of the round end plate.



	Description
1	Define the dimension from the edge of the end plate to the outer edge of the column or the beam.

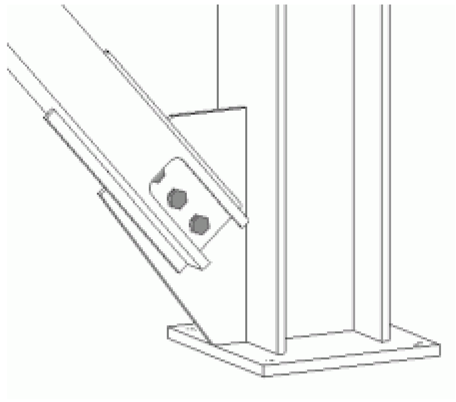
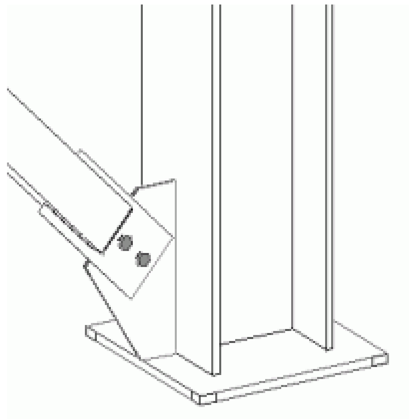
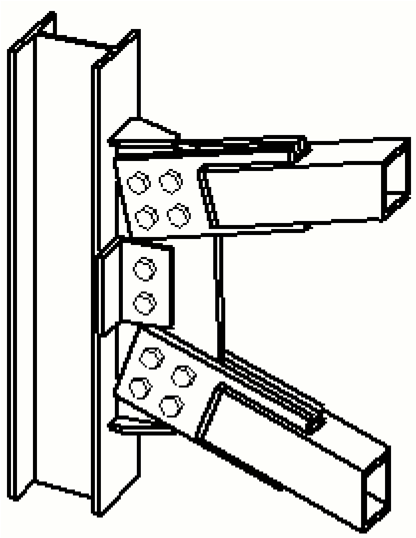
9.2 Tube gusset (20)

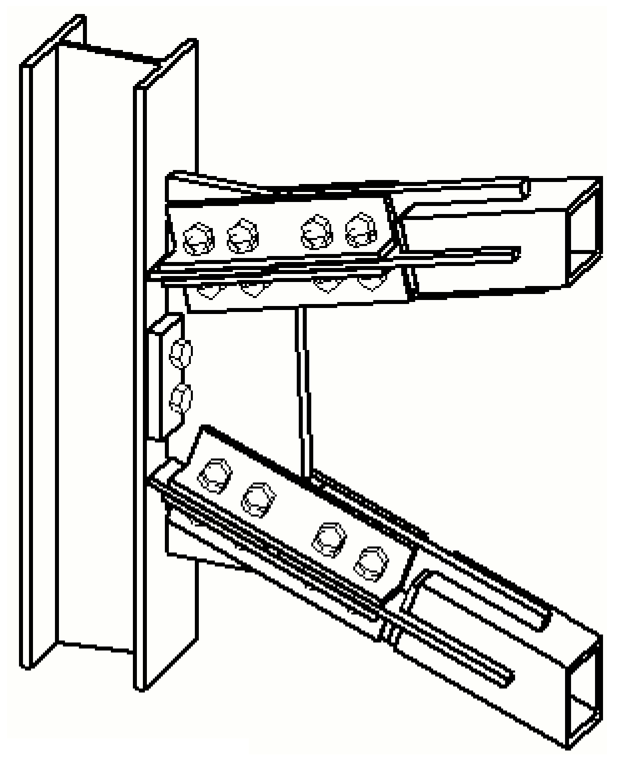
Tube gusset (20) connects 1 to 10 hollow braces to a beam or a column using a gusset plate. The braces need to have a rectangular hollow section (RHS) or a tube profile. The connection bolts the braces to the gusset plate using a connection plate and an optional tongue plate. The hollow braces can be 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

Situation	Description
	Gusset plate is welded to column flange. 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.
	Gusset plate is welded to column flange. Brace is bolted to gusset plate using a tongue plate.
	Gusset plate is connected to column flange with clip angles. Brace is bolted to gusset plate using a tongue plate. The braces are sealed with end plates, and stiffeners are created.

Situation	Description
	Gusset plate is connected to column flange with a connection plate. Cross plates and cover plates are created.

Limitations

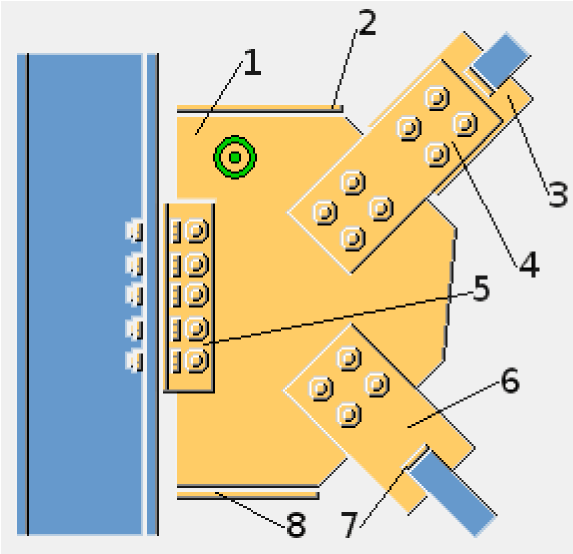
Tekla Structures uses values in the `joints.def` file to create this component. For more information, see About the joints.def file.

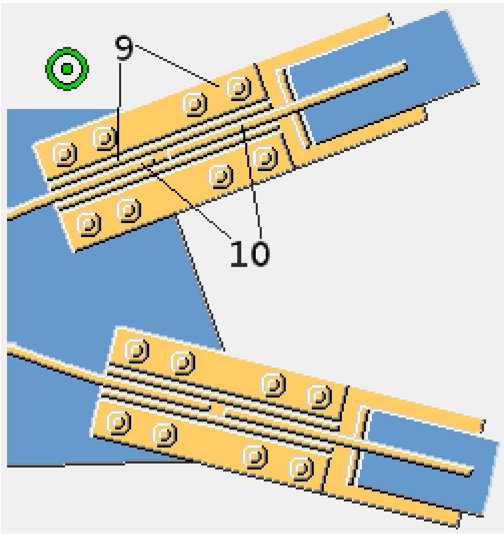
Before you start Create a beam or a column and 1 to 10 braces with RHS or tube profile.

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.

Part identification key





Number	Part
1	Gusset
2	Stiffener 1
3	Tongue plate
4	Cover plate Created on the **Brace conn** tab.
5	Clip angle
6	Connection plate Created on the **Brace conn** tab.
7	End plates (seal plates)
8	Stiffener 2

Number	Part
9	Cover plate Created on the **Cross plates** tab.
10	Cross plate

See also Tube gusset (20): Picture tab on page 765

Tube gusset (20): Gusset tab on page 767

Tube gusset (20): Brace conn tab on page 771

Tube gusset (20): Stiffeners tab on page 775

Tube gusset (20): Gusset conn tab on page 777

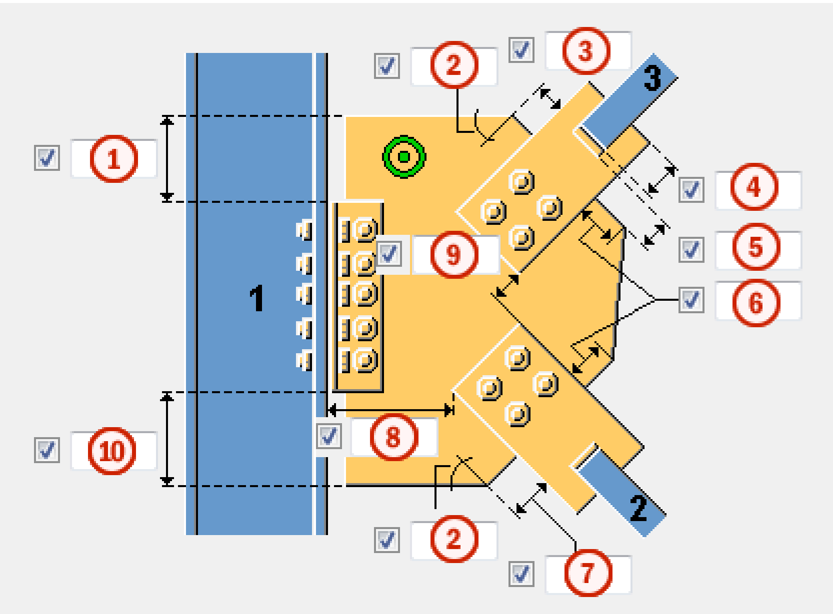
Tube gusset (20): Brace bolts 1/Brace bolts 2/Brace bolts 3 tab on page 780

Tube gusset (20): Cross plates tab on page 784

Tube gusset (20): Picture tab

Use the **Picture** tab to control the gusset plate dimensions and positioning in the **Tube gusset (20)** connection.

Dimensions



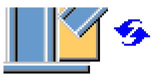
Option	Description	Default
1	Define the distance between the clip angle or connection plate upper edge and the gusset plate upper edge.	

Option	Description	Default
2	Define the corner angle of the gusset plate (in degrees). This value affects the gusset plate shape.	
3	Define the length of the edge of the gusset plate that is perpendicular to the uppermost brace. This value affects the gusset plate shape.	
4	Define the brace length on the connection plate. Enter a negative value to prevent the connection plate from being inside the brace.	`150 mm`
5	Define the 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	Define the length of the edges of the gusset plate perpendicular to the braces. This value affects the gusset plate shape.	
7	Define the length of the edge of the gusset plate that is perpendicular to the lowest brace. This value affects the gusset plate shape.	
8	Define the distance between the main part and the first picked brace.	
9	Define the distance between the braces.	
10	Define the distance between the clip angle or the connection plate lower edge and the gusset plate lower edge.	

The following examples show only some of the available options. You will find more options on the **Picture** tab.

Gusset plate positioning

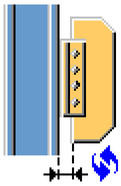
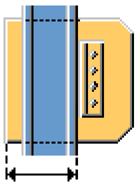
Define how the gusset plate is positioned when a base plate is used.

Option	Description
	Default Gusset plate is parallel to the main part. AutoDefaults can change this option.

Option	Description
	Gusset plate is parallel to the brace.

Gusset plate and main part

Define whether the gusset plate runs through the main part and the depth of the cut.

Option	Description
	Default Gusset plate does not run through the main part. Define the distance between the gusset plate and the main part. AutoDefaults can change this option.
	Gusset plate runs through the main part. Define the depth of the cut.

Tube gusset (20): Gusset tab

Use the **Gusset** tab to control to gusset plate properties, shape and position, and clip angle properties and orientation in the **Tube gusset (20)** connection.

Plates

Option	Description	Default
Gusset	Define the gusset plate thickness, width and height.	
Connection plates	Define the connection plate thickness and width.	`no connection plate is created`
L profile	Define the clip angle profile by selecting it from the profile catalog.	`L100*100*10`

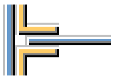
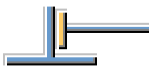
Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.

Option	Description	Default
Name	Define a name that is shown in drawings and reports.	

The following examples show only some of the available options. You will find more options on the **Gusset** tab.

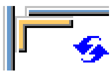
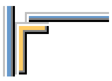
Gusset plate connection

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.

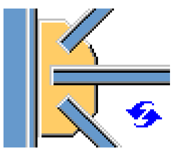
Clip angle orientation

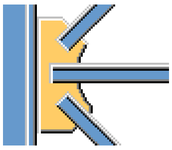
Define how the clip angle is placed on a connection.

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.

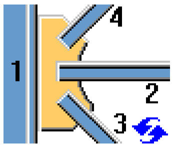
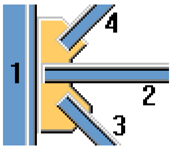
Gusset plate shape

Define the gusset plate shape.

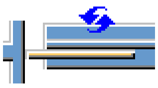
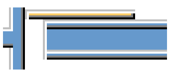
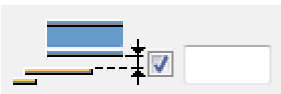
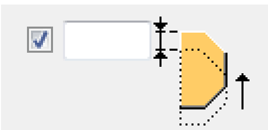
Option	Description
	Default AutoDefaults can change this option.

Option	Description
	This option optimizes the gusset plate weight.

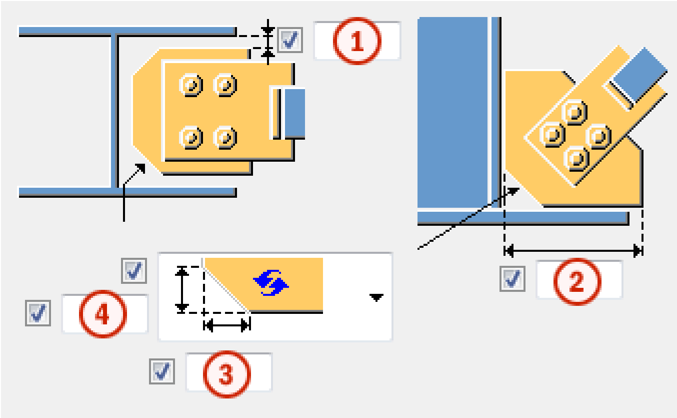
Brace position When you select the option to optimize the gusset plate weight, you can define whether the selection order of the braces affects the position of the braces.

Option	Description
	Default 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 y direction.

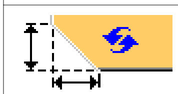
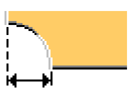
Option	Description
	Default Gusset plate is positioned in the middle of the brace. AutoDefaults can change this option.
	Gusset plate is positioned on the top flange of the brace.
	Define how much the gusset plate is moved in the z direction.
	Define how much the gusset plate is moved in the y direction.

Gusset plate chamfer Define the gusset plate chamfer type and dimensions.

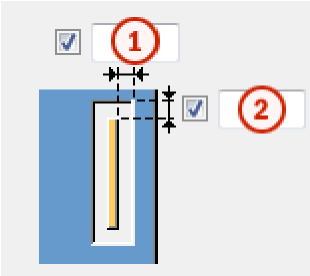


Option	Description	Default
1	Define the distance between the connection plate and the inner flange of the main part.	
2	Define the horizontal distance between the gusset plate edge and the flange of the main part.	
3	Define the horizontal dimension of the chamfer.	10 mm
4	Define the vertical dimension of the chamfer.	10 mm

Define the chamfer type.

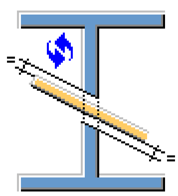
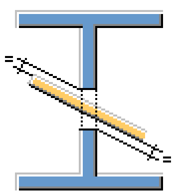
Option	Description
	Default Line chamfer AutoDefaults can change this option.
	Convex arc chamfer
	Concave arc chamfer

Cut size If the gusset plate runs through the main part, define the size of the cut created for the gusset plate.



Option	Description
1	Define the horizontal size of the cut.
2	Define the vertical size of the 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.

Tube gusset (20): Brace conn tab

Use the **Brace conn** tab to control connection plate, tongue plate, and end plate properties in the **Tube gusset (20)** connection.

Brace connection

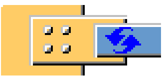
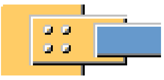
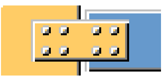
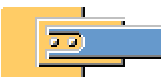
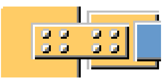
Option	Description	Default
Connection plate	Define the thickness, width and height of the connection plate.	`thickness = 20 mm`
End plates	Define the thickness, width and height of the end plate.	`thickness = 5 mm`
Tongue plate	Define the thickness and height of the tongue plate.	`no tongue plate is created`

Option	Description	Default
Cover plate	Define the thickness, width and height of the cover plate.	`no cover plate is created`

Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

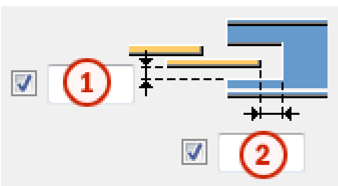
Brace connection types

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.

Tongue plate dimensions

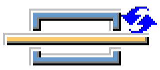
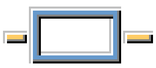
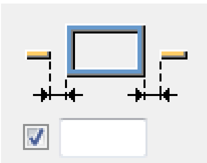
If you use the tongue plate to connect the brace, define the tongue plate dimensions.



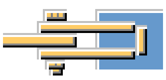
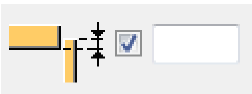
Option	Description
1	Define the vertical distance between the tongue plate and the brace.
2	Define the horizontal distance between the tongue plate and the brace.

The following examples show only some of the available options. You will find more options on the **Brace conn** tab.

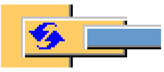
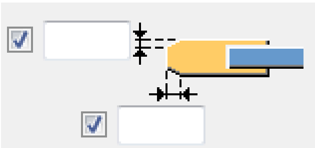
Connection plate Define whether the brace is notched or the connection plate cut when the connection plate is connected to the brace.

Option	Description
	Default Brace is notched. AutoDefaults can change this option.
	Connection plate is cut.
	If you cut the connection plate, you can define the size of the gap between the brace and the connection plate.

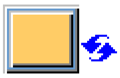
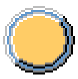
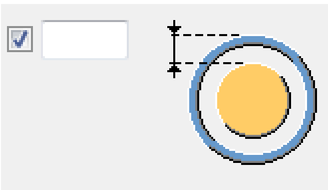
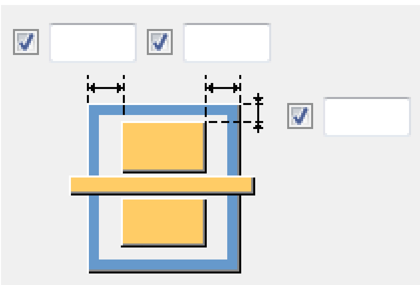
Number of connection plates Define whether one or two connection plates are used for connecting the brace to the gusset plate.

Option	Description
	Default One connection plate. AutoDefaults can change this option.
	Two connection plates and an end plate at the ends of the connection plates.
	If an end plate is created, you can define the width of the end plate.

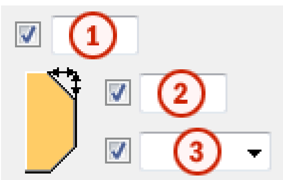
Connection plate chamfer Define whether the connection plate is chamfered.

Option	Description
	Default No chamfers are created. AutoDefaults can change this option.
	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.
 	Define the end plate edge distance from the brace outer edge.

End plate chamfer Define the end plate chamfer type and dimensions.



Option	Description
①	Define the horizontal dimension of the chamfer.
②	Define the vertical dimension of the chamfer.
③	Define the chamfer type.

Tube gusset (20): Stiffeners tab

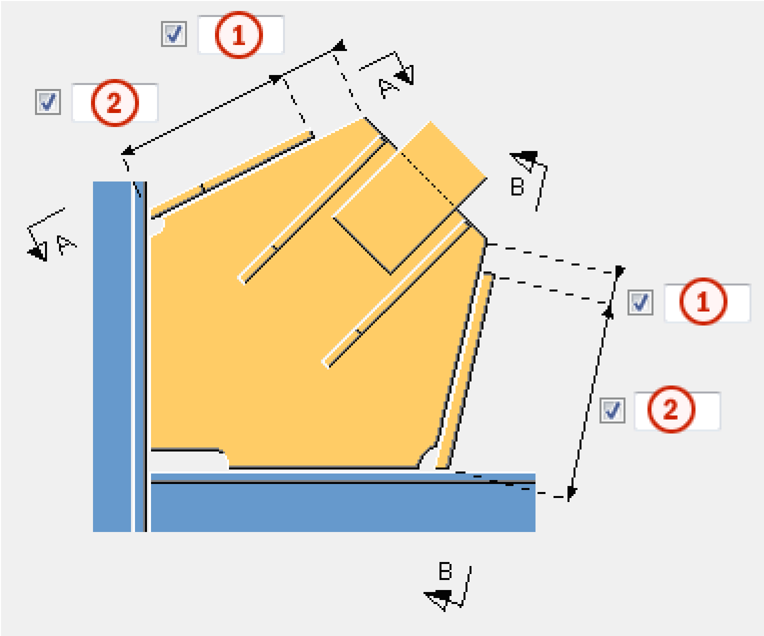
Use the **Stiffeners** tab to control the stiffener properties and dimensions in the **Tube gusset (20)** connection.

Stiffeners

Option	Description	Default
Stiffener 1, 2	Define the stiffener thickness.	`no stiffener is created`

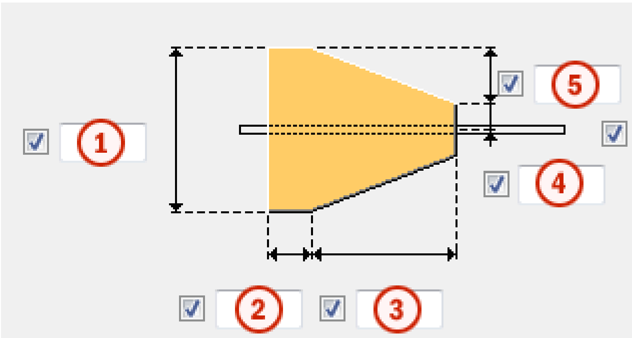
Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Stiffener length



Option	Description
1	Define the distance between the stiffener edge and the gusset plate edge.
2	Define the the length of stiffener.

Stiffener dimensions

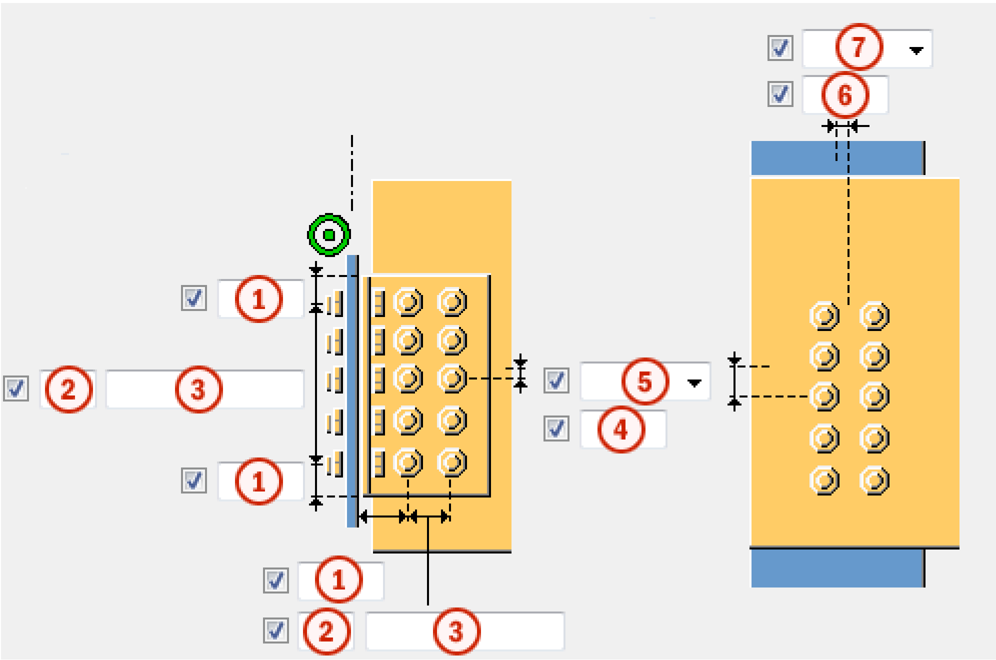


Option	Description
1	Define the width of the stiffener.
2	Define the length of the stiffener base.
3	Define the length of the skew part of the sfiffener.
4	Define the distance from the stiffener center line.
5	Define the vertical distance between the stiffener base and the skew part.

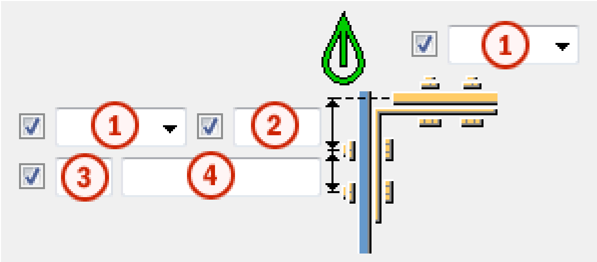
Tube gusset (20): Gusset conn tab

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 in the **Tube gusset (20)** connection.

Bolt group dimensions on gusset plate



Option	Description
1	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Define the number of bolts.
3	Define the 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	Define the dimension for vertical bolt group position.
5	Define how to measure the dimensions for vertical bolt group position.
6	Define the dimension for horizontal bolt group position.
7	Define how to measure the dimensions for horizontal bolt group position.

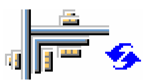
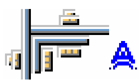
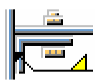
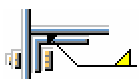


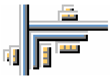
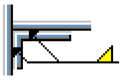
Option	Description
1	Define the location where the bolts should be attached.
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the number of bolts.
4	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

The following examples show only some of the available options. You will find more options on the **Gusset conn** tab.

Clip angle attachment type

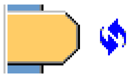
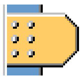
Define how the clip angle is attached to the gusset plate and to the main part.

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 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.

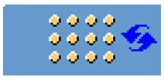
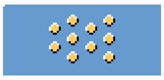
Bolts on gusset plate

Define whether the gusset plate is connected to the main part with bolts when no clip angles are used.

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

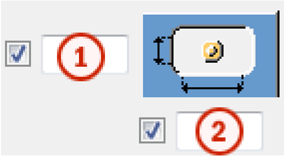
Define how the bolt group is staggered.

Option	Description
	Default Bolts are not staggered. AutoDefaults can change this option.
	Bolts are staggered.

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

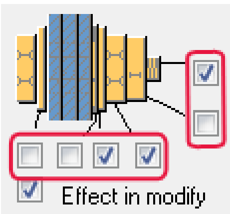
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

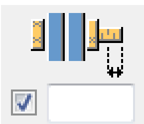
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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**.

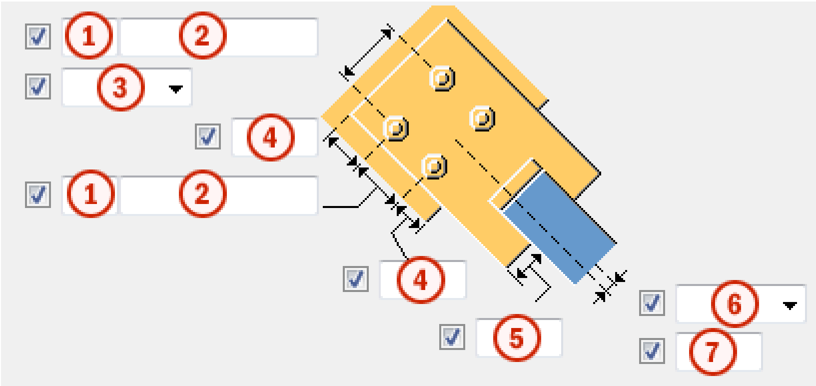
Bolt length increase Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.

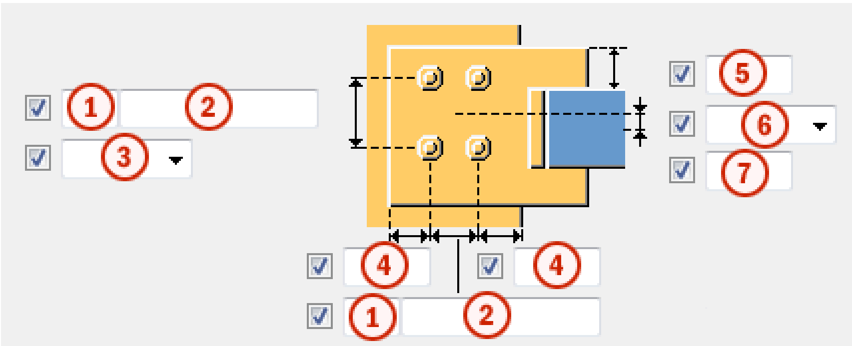


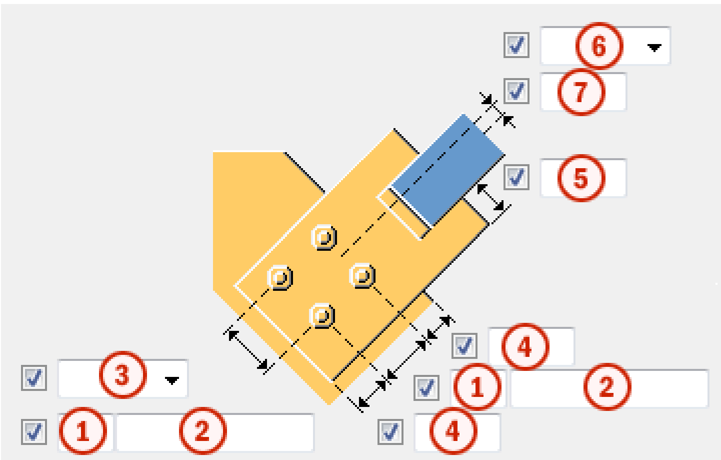
Tube gusset (20): Brace bolts 1/Brace bolts 2/Brace bolts 3 tab

Use the **Brace bolts 1/Brace bolts 2/Brace bolt 3** tabs to control the bolts that connect the first, the second, and the subsequent braces to the gusset plate in the **Tube gusset (20)** connection.

Bolt group dimensions on connection plates



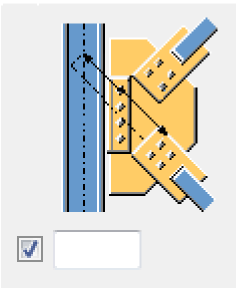


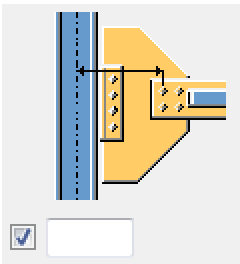


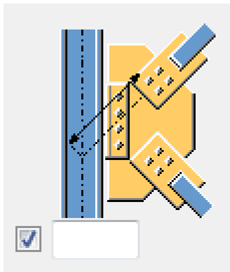
Option	Description
1	Define the number of bolts.

Option	Description
2	Define the 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 location where the bolts should be attached.
4	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
5	Define the distance between the brace and the connection plate edge.
6	Define how to measure the dimensions for vertical bolt group position.
7	Define the dimension for vertical bolt group position.

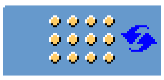
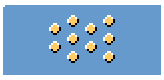
Bolt distance Define the minimum distance from the connection plate bolts to the intersection point of the main part and brace center lines. If a brace is perpendicular to the main part, the distance is measured from the main part center line to the nearest bolts.







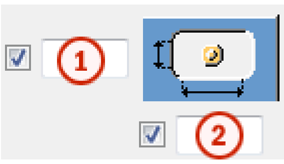
Staggering of bolts Define how the bolt group is staggered.

Option	Description
	Default Bolts are not staggered. AutoDefaults can change this option.
	Bolts are staggered.

Bolt basic properties

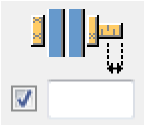
Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	Defines 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`
Site/ Workshop	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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(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.



Tube gusset (20): Cross plates tab

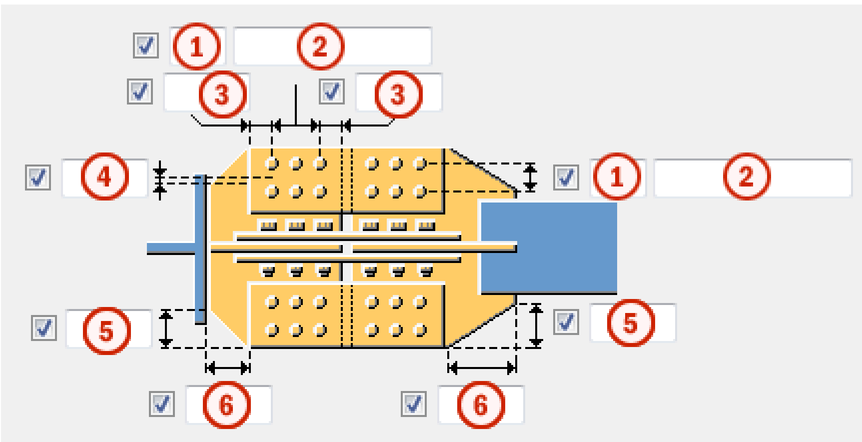
Use the **Cross plates** tab to control the cross plate and the cover plate properties and position in the **Tube gusset (20)** connection.

Cross plates

Option	Description	Default
Cross plate	Define the cross plate thickness, width and height.	`no cross plate is created`
Cover plate	Define the cover plate thickness, width and height.	`no cover plate is created`

Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Bolt group dimensions

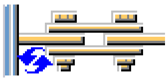


Option	Description
①	Define the number of bolts.
②	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
③	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
④	Define the dimension for the horizontal bolt group position.
⑤	Define the vertical dimension of the chamfer.
⑥	Define the horizontal dimension of the chamfer.

The following examples show only some of the available options. You will find more options on the **Cross plates** tab.

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 bottom of the cross plate.

9.3 Squeezed tube bolted (102)

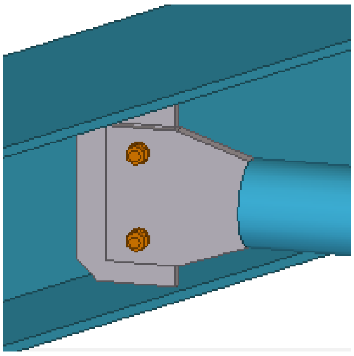
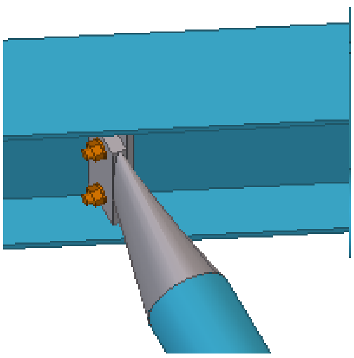
Squeezed tube bolted (102) creates a squeezed part between the main part and a tubular profile. The main part must be an I or H profile. The squeezed part can either be a tube that is squeezed at one end and then welded to a plate, or a contour plate.

Objects created

- Squeezed tube, or reducing contour plate
- Stiffeners

- Bolts
- Welds

Use for

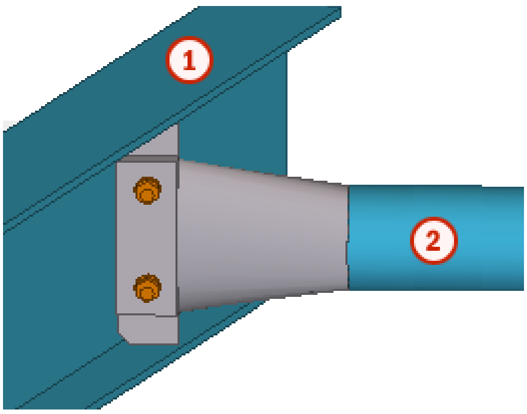
Situation	Description
	A tubular profile is welded to a bracing which is bolted to a gusset plate. The gusset plate is welded to the main part.
	A simplified tensioner profile.

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

See also Squeezed tube bolted (102): Picture tab on page 787

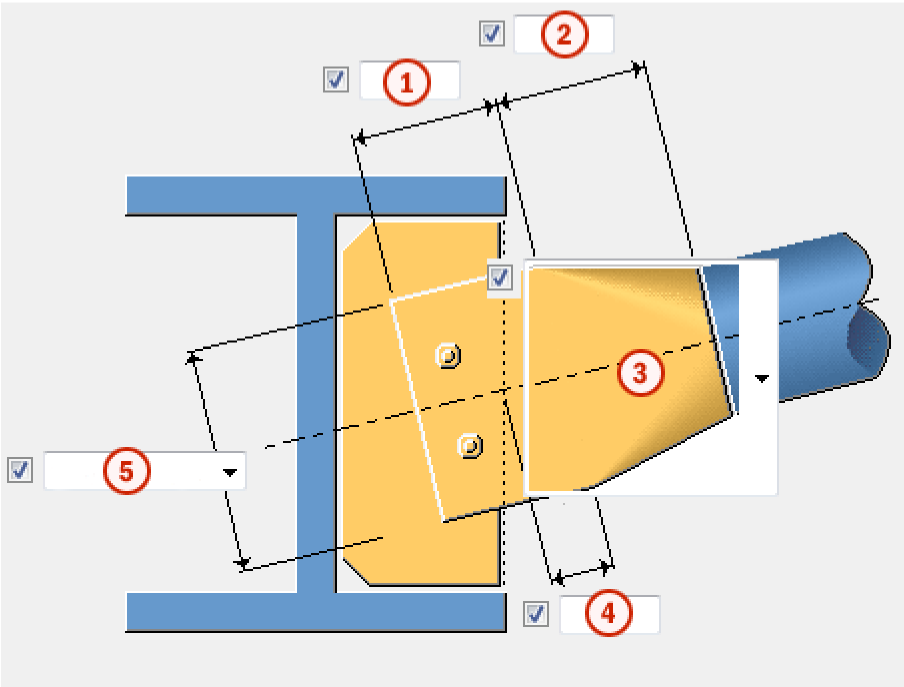
Squeezed tube bolted (102): Parts tab on page 789

Squeezed tube bolted (102): Stiffeners tab on page 792

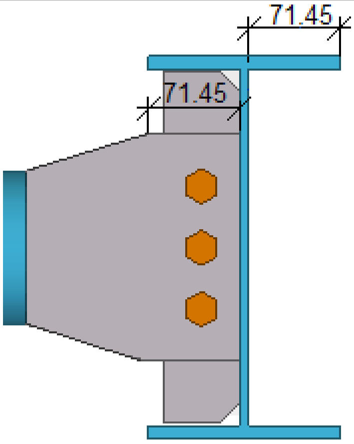
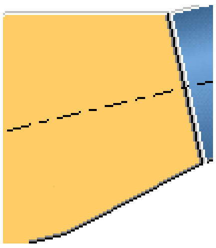
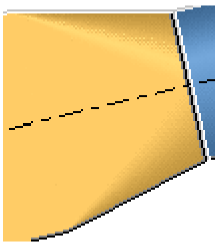
Squeezed tube bolted (102): Bolts tab on page 795

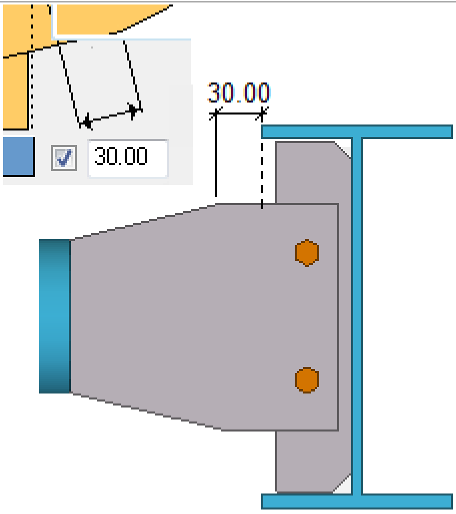
Squeezed tube bolted (102): Picture tab

Use the **Picture** tab to control the bracing levels and offsets in the **Squeezed tube bolted (102)** connection.



	Description	Default
1	Define the width of the squeezed part extension.	Depends on main part: `main part width - web thickness / 2.` Example:

	Description	Default
		
2	Define the width of the squeezed part.	120 mm
3	Select the type of the reducing part. Plate:  Squeezed tube: 	
4	Define the horizontal edge offset. Example:	0 mm

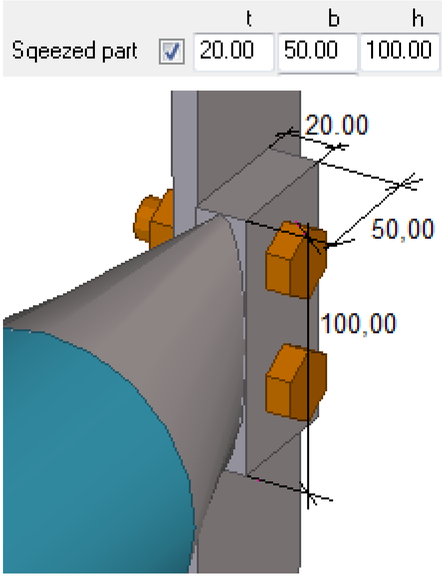
	Description	Default
		
5	Select how the height of the squeezed part extension is calculated.	

Squeezed tube bolted (102): Parts tab

Use the **Parts** tab to control the dimensions of the squeezed part and the stiffener properties in the **Squeezed tube bolted (102)** connection.

Squeezed part Define the dimensions and properties of the squeezed part extension.

Option	Description
Squeezed part	Define the thickness, width and height of the squeezed part extension. Example:

Option	Description
	 Use the second row to define the width of the squeezed part. The width defined on the **Parts** tab overrides the width defined on the **Picture** tab.

Parts add 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 secondary part.

Yes

Squeezed parts are part added to the tubular profile.

No

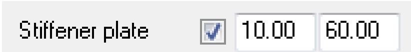
Squeezed parts remain loose parts.

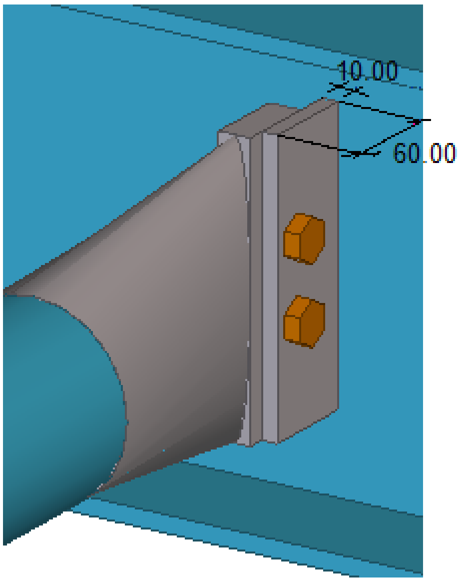
Stiffeners are Select whether the stiffeners are created as stiffeners or as plates.

If you select **Stiffeners**, define the stiffener dimensions on the **Stiffeners** tab. If you select **Plate stiffeners**, define the dimensions using the **Stiffener plate** boxes.

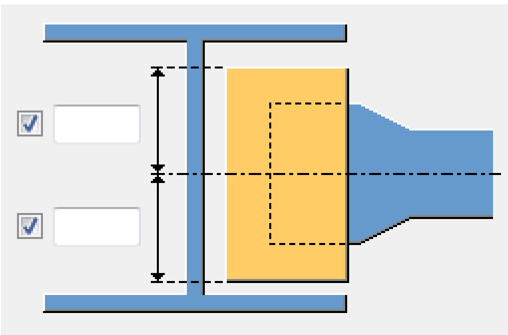
Stiffener plate Define the thickness and width of the stiffener plate.

You cannot define the plate height. The height is equal to squeezed part height defined on the **Picture** tab.





Stiffener height Define the stiffener plate height above and below the tubular profile center line. These values only take effect if you have set the **Stiffeners are** option to **Plate stiffeners**.



Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** -->

Option	Description	Default
		Options... --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

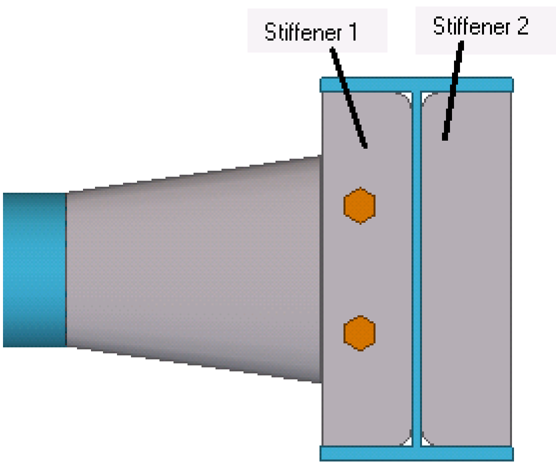
Squeezed tube bolted (102): Stiffeners tab

Use the **Stiffeners** tab to control the stiffener properties in the **Squeezed tube bolted (102)** connection.

Stiffener 1, Stiffener 2

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.

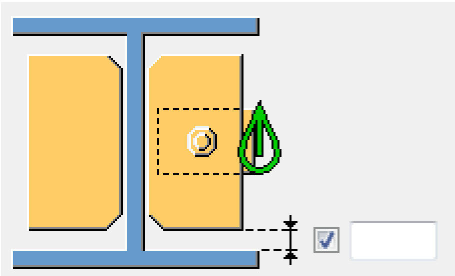


Define the thickness, width and height of the stiffeners.

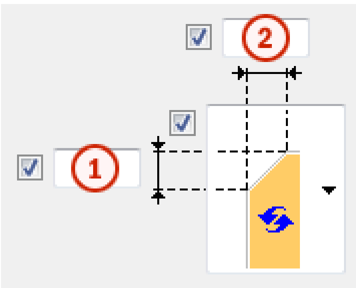
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

Option	Description	Default
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Stiffener gap Define the size of the gap between the beam flange and the stiffener.

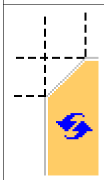
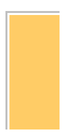


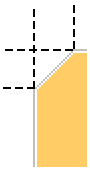
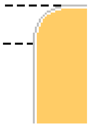
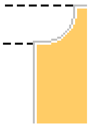
Chamfer dimensions



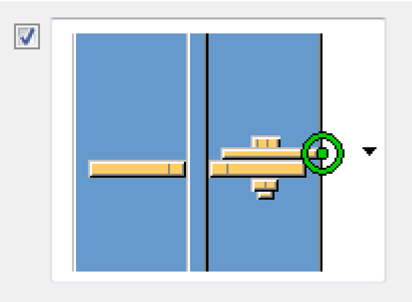
	Description
1	Define the vertical dimension of the chamfer.
2	Define the horizontal dimension of the chamfer.

Chamfer type

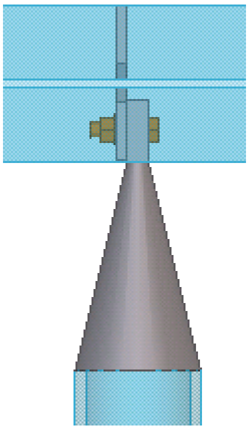
Option	Description
	Default. Line chamfer AutoDefaults can change this option.
	No chamfer

Option	Description
	Line chamfer
	Convex arc chamfer
	Concave arc chamfer

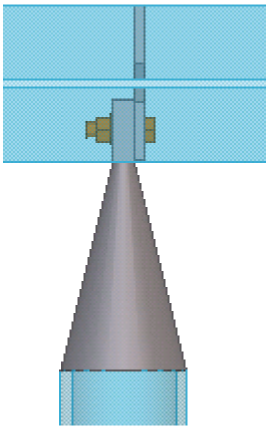
Stiffener side Define the side of the stiffeners.



On the left side of the squeezed part:



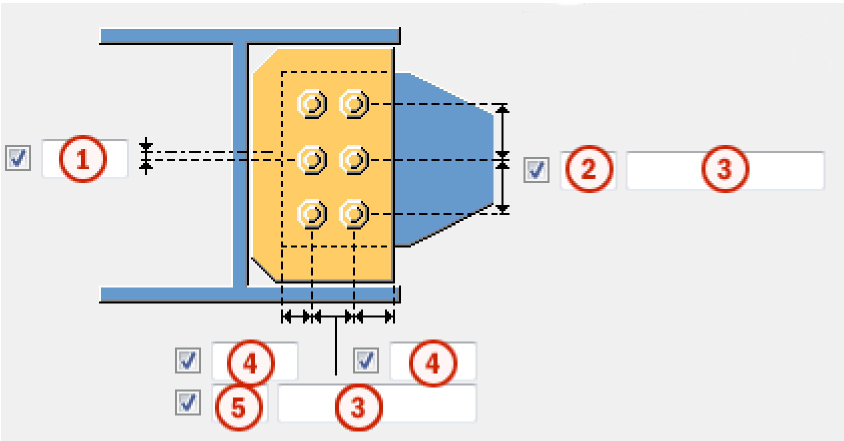
On the right side of the squeezed part:



Squeezed tube bolted (102): Bolts tab

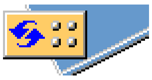
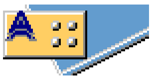
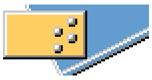
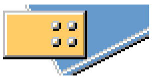
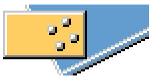
Use the **Bolts** tab to control the bolts used in the **Squeezed tube bolted (102)** connection.

Bolt group dimensions



	Description	Default
1	Define the bolt vertical offset from the center line.	0 mm
2	Define the number of bolts in vertical direction.	2
3	Define the 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	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.	55 mm
5	Define the number of bolts in horizontal direction.	1

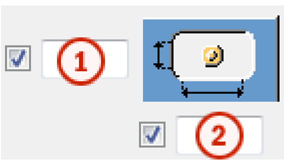
Bolt group orientation

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
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes You can define slotted, oversized, or tapped holes.

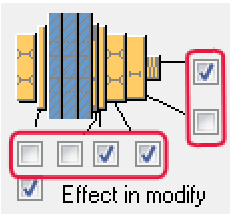


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.

Option	Description	Default
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

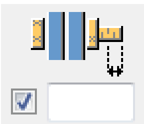
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



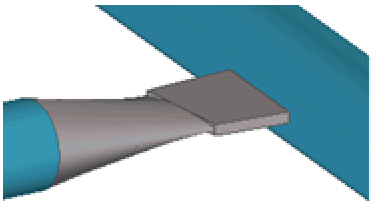
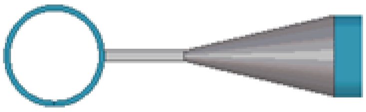
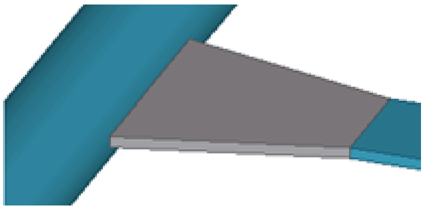
9.4 Squeezed tube (103)

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

Situation	Description
	Tube that is squeezed at one end and welded to a plate.
	Tube that is squeezed at one end and welded to a plate.
	Contour plate.

Selection order

1. Select the main part.
2. Select the secondary part.

   The squeezed part is created.

See also

Squeezed tube (103): Picture tab on page 798

Squeezed tube (103): Parts tab on page 800

Squeezed tube (103): Parameters tab on page 801

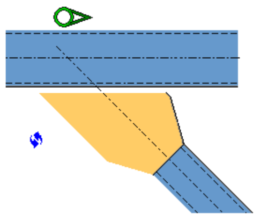
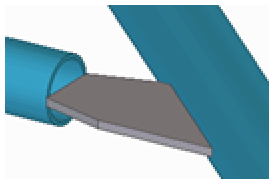
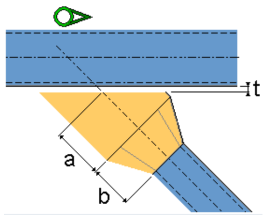
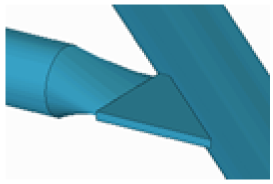
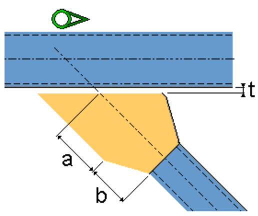
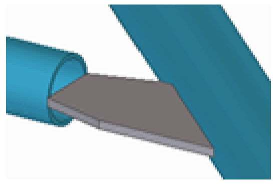
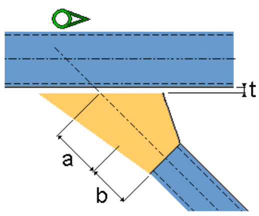
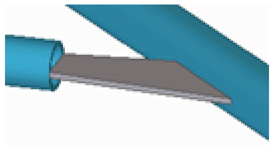
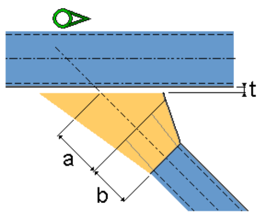
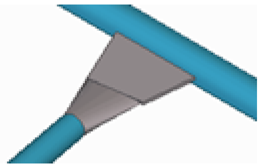
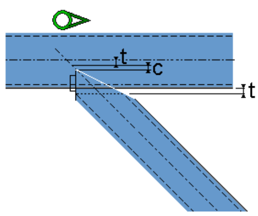
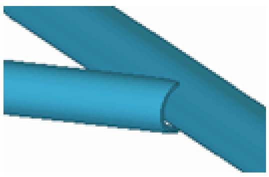
Squeezed tube (103): Picture tab

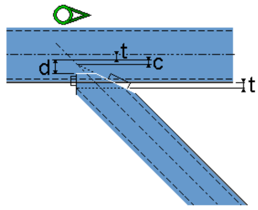
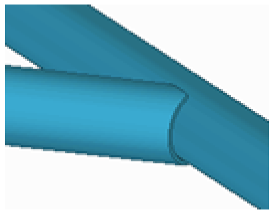
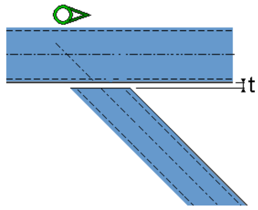
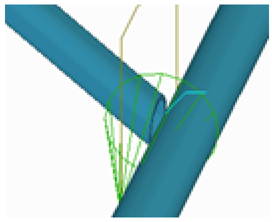
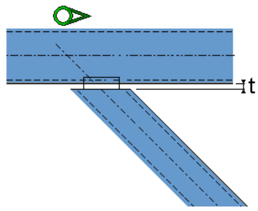
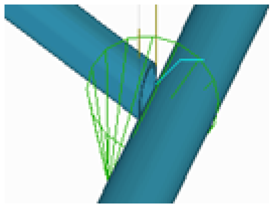
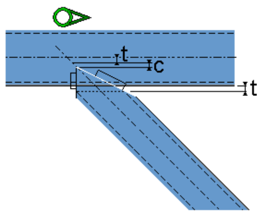
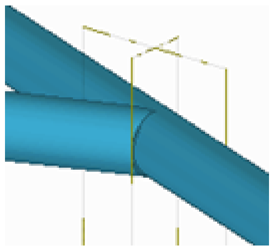
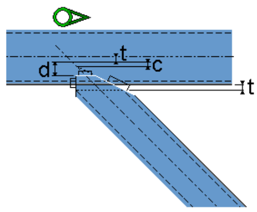
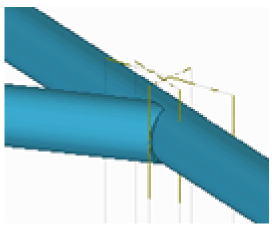
Use the **Picture** tab to define the shape and dimensions of the squeezed part, and whether the profiles are connected with a squeezed part or with cuts, fittings, or welds in the **Squeezed tube (103)** connection.

Squeezed part

The first five options create squeezed tubes and contour plates.

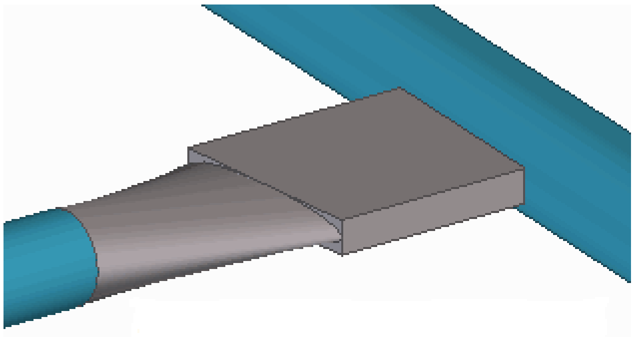
The last six options do not create new parts but line cuts, fittings and welds.

Option	Description	Example
	Default Main and secondary parts are tube profiles. A plate is used as a connecting profile, with one wide end and one parallel end.	
	A squeezed part and a contour plate are created. The tube profile reduces to a contour plate. You can define the length of the squeezed part using dimension **b**. Use dimension **t** to define the gap between the plate and the main part.	
	Same as the **Default** option. Use dimensions **a** and **b** to define the length of the wide part and the parallel part of the plate. Use dimension **t** to define the gap between the plate and the main part.	
	Use dimensions **a** and **b** to define the plate length. The plate widens along its length. Use dimension **t** to define the gap between the plate and the main part.	
	Use dimensions **a** and **b** to define the plate length. The widening starts at the squeezed part and continues along the contour plate. Use dimension **t** to define the gap between the plate and the main part.	
	No new parts are created. The secondary part is adapted to the main part using a fitting and a line cut. Use dimension **c** to define an offset from the centerline of the main part (default value = `15 mm`). Use dimension **t** to define the gap between the plate and the main part.	

Option	Description	Example
	No new parts are created. The secondary part is adapted to the main part using a fitting and two line cuts. Use dimension **d** to define the distance to the center of the main part. Use dimension **t** to define the gap between the plate and the main part.	
	No new parts are created. The secondary part is shortened with a fitting. Optionally, the secondary part can be welded to the main part. Use dimension **t** to define the gap between the plate and the main part.	
	No new parts are created. The secondary part is shortened with a line cut. Optionally, the secondary part can be welded to the main part. Use dimension **t** to define the gap between the plate and the main part.	
	No new parts are created. The secondary part is shortened with a line cut. Optionally, the secondary part can be welded to the main part. Use dimension **t** to define the gap between the plate and the main part.	
	No new parts are created. The secondary part is shortened with a line cut. Optionally, the secondary part can be welded to main part. Use dimension **t** to define the gap between the plate and the main part.	

Squeezed tube (103): Parts tab

Use the **Parts** tab to define the thickness and width of the squeezed part end in the **Squeezed tube (103)** connection.

Option	Description
Squeezed part	Define the thickness and width of the squeezed part end. The front end of the squeezed part has the same profile as the secondary part. The squeezed part end and the contour plate are of the same size. 

Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

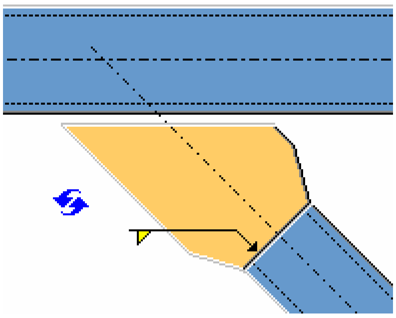
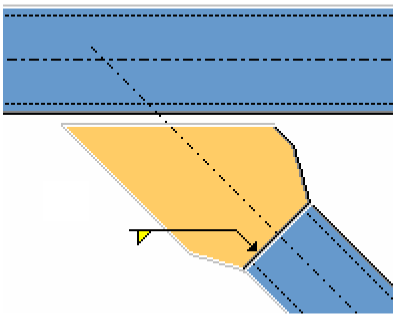
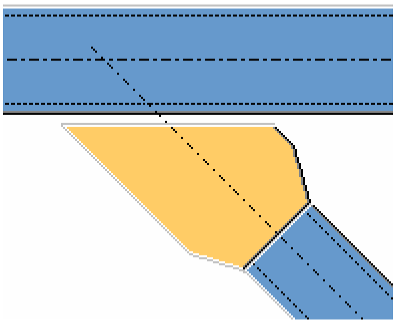
Squeezed tube (103): Parameters tab

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 in the **Squeezed tube (103)** connection.

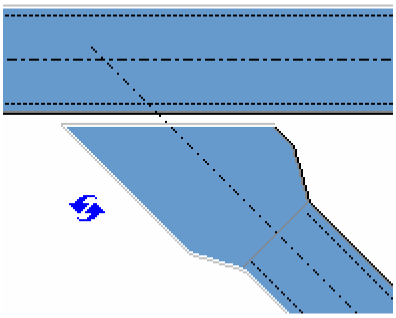
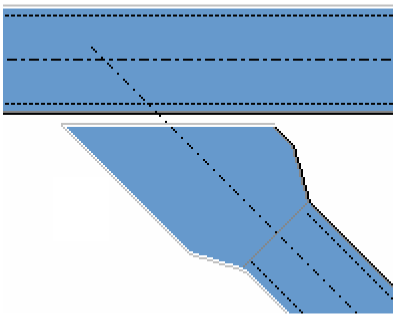
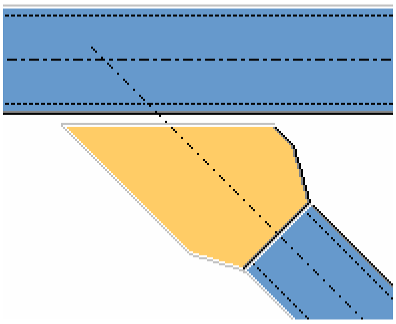
Option	Description
B squeezed part	Define how the squeezed part is flattened. The options are: • **((De – t) * pi + t) / 2** (default)

Option	Description
	• **(De * pi) / 2** **De** = secondary tube profile

Weldings 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
	Default Secondary part, the squeezed part and the contour plate are not handled as a single part. AutoDefaults can change this option.
	Secondary part, the squeezed part and the contour plate are not handled as a single part.
	Secondary part, the squeezed part and the contour plate are handled as a single part. The squeezed part gets the profile properties from the secondary part.

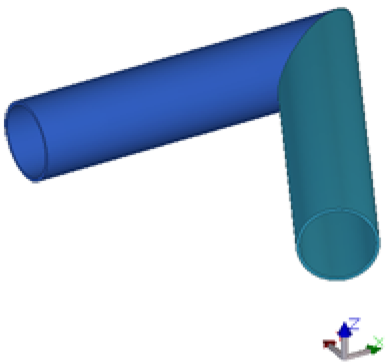
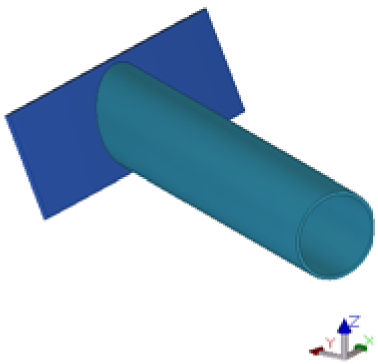
9.5 Tube-Chamfer (1)

Tube-Chamfer (1) 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).
2. Select the secondary part (round tube of equal diameter).

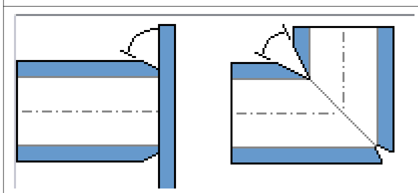
   The connection is created automatically when the secondary part is selected.

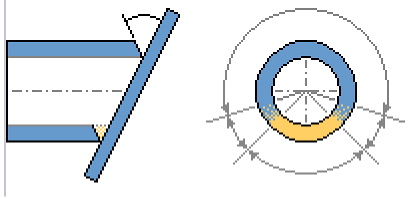
See also Tube-Chamfer (1): Parameters tab on page 804

Tube-Chamfer (1): Parameters tab

Use the **Parameters** tab to control the chamfers in the **Tube-Chamfer (1)** connection.

Connection options

Option	Description
	**Chamfer** Fits the secondary tube to a plate, or the main and secondary tubes along the median angle plane.

Option	Description
	**Offshore Chamfer** Creates back bevel during the tube NC file creation. No actual back bevel is created in the model.

Offshore Chamfer information is used only in NC data, and no actual back bevels are created in the model.

Tube NC Parameters

Option	Description
Bevel angle	The weld preparation angle created during NC processing of the tube. For a tube-to-tube chamfer this option creates a bevel to both tubes, adding up to the defined angle.
Root opening above	The gap between the parts. The gap is created in the model.
Shrinkage	The shrinkage considered during NC processing of the tube. The shrinkage value has no effect on the model.
Min torch angle	Define the minimum torch angle. The default is -70.0.
Max torch angle	Define the maximum torch angle. The default is 70.0.

Bevel angle information is used only in NC data, and no actual weld preparations are created in the model.

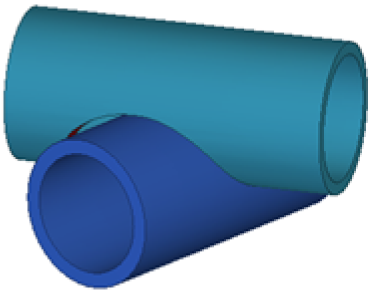
9.6 Tube-CrossingSaddle (1)

Tube-CrossingSaddle (1) connects a round tube to a round tube. The connection creates a saddle cut to the secondary tube.

Objects created

- Cuts
- Welds

Use for

Situation	Description
	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).

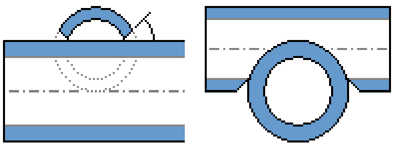
   The connection is created automatically when the secondary part is selected.

See also Tube-CrossingSaddle (1): Parameters tab on page 806

Tube-CrossingSaddle (1): Parameters tab

Use the **Parameters** tab to control the saddle cuts in the **Tube-CrossingSaddle (1)** connection.

Connection options

Option	Description
	**Crossing Saddle** Creates a crossing saddle to the secondary part.

Tube NC Parameters

Option	Description
Bevel angle	The weld preparation angle created during NC processing of the tube. The bevel is created to the secondary part.
Root opening above	The gap between the parts. The gap is created in the model.
Shrinkage	The shrinkage considered during NC processing of the tube. The shrinkage value has no effect on the model.
Min torch angle	Define the minimum torch angle. The default is -70.0.

Option	Description
Max torch angle	Define the maximum torch angle. The default is 70.0.

Bevel angle information is used only in NC data, and no actual weld preparations are created in the model.

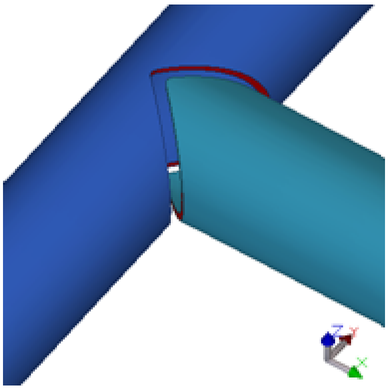
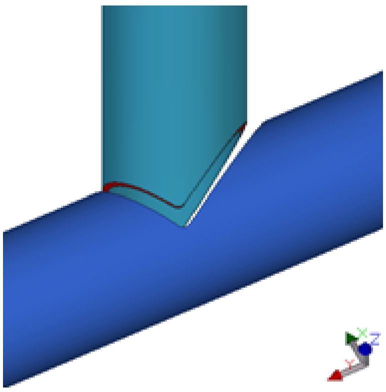
9.7 Tube-MitreSaddle+Hole (1)

Tube-MitreSaddle+Hole (1) 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

Situation	Description
 	Mitre saddle and hole connection.

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).

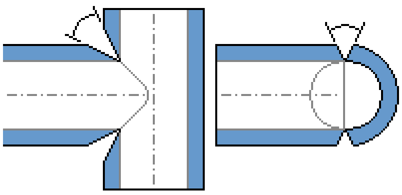
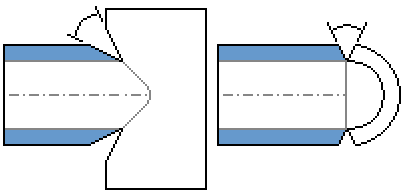
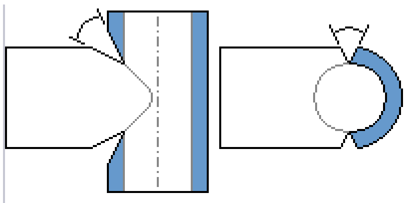
   The connection is created automatically when the secondary part is selected.

See also Tube-MitreSaddle+Hole (1): Parameters tab on page 808

Tube-MitreSaddle+Hole (1): Parameters tab

Use the **Parameters** tab to control the mitre holes and cuts in the **Tube-MitreSaddle+Hole (1)** connection.

Connection options

Option	Description
	**Saddle + Hole** Creates a mitre cut (double mitre) to the secondary part, and a mitre hole to the main part.
	**Saddle Only** Creates a mitre cut to the secondary part. No mitre hole is created to the main part.
	**Hole Only** Creates a mitre hole to the main part. No mitre saddle is created to the secondary part.

Tube NC Parameters

Option	Description
Bevel angle	The weld preparation angle created during NC processing of the tube.
Root opening above	The gap between the parts. The gap is created in the model.
Shrinkage	The shrinkage considered during NC processing of the tube. The shrinkage value has no effect on the model.
Min torch angle	Define the minimum torch angle. The default is -70.0.

Option	Description
Max torch angle	Define the maximum torch angle. The default is 70.0.

Bevel angle information is used only in NC data, and no actual weld preparations are created in the model.

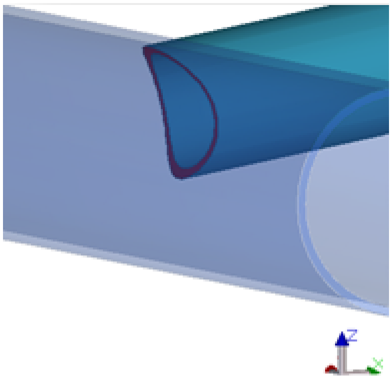
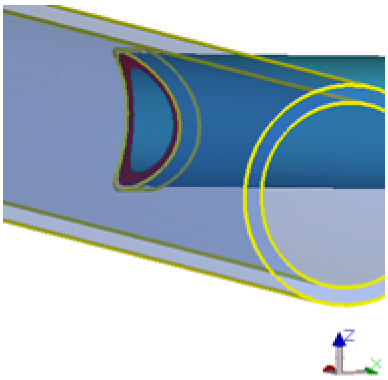
9.8 Tube-Saddle+Hole (1)

Tube-Saddle+Hole (1) 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).

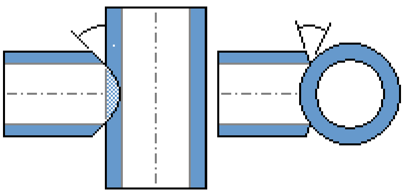
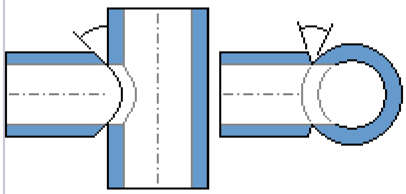
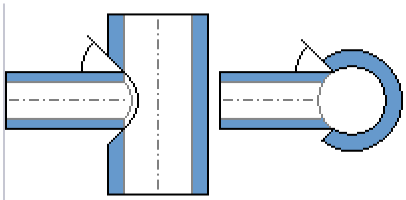
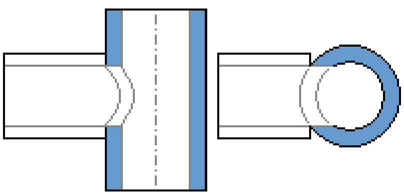
   The connection is created automatically when the secondary part is selected.

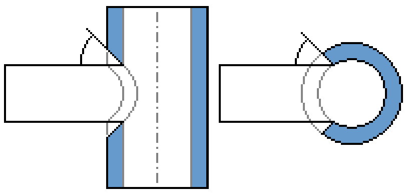
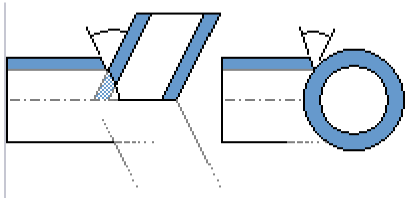
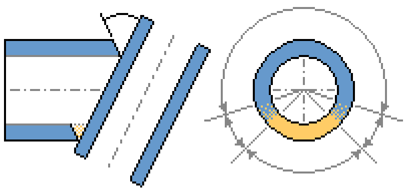
See also Tube-Saddle+Hole (1): Parameters tab on page 810

Tube-Saddle+Hole (1): Parameters tab

Use the **Parameters** tab to control the saddles and holes in the **Tube-Saddle+Hole (1)** connection.

Connection options

Option	Description
	**Saddle** 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.
	**Set-on Saddle+Hole** 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.
	**Set-in Saddle+ Hole** 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.
	**Set-on Hole Only** 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.

Option	Description
	**Set-in Hole Only** Creates a hole in the main part which matches the outer diameter of the secondary part. The secondary part is not modified in any way. Weld preparations are created to the hole on the main part during NC processing.
	**Edge Saddle** Creates a partial saddle on the secondary part to a main part which only partially overlaps with the secondary part. Weld preparations are created to the secondary part during NC processing.
	**Offshore Saddle** Creates back bevel during the tube NC file creation. No actual back bevel is created in the model.

Offshore Saddle information is used only in NC data, and no actual back bevels are created in the model.

Tube NC Parameters

Option	Description
Bevel angle	The weld preparation angle created during NC processing of the tube.
Root opening above	The gap between the parts. The gap is created in the model.
Shrinkage	The shrinkage considered during NC processing of the tube. The shrinkage value has no effect on the model.
Min torch angle	Define the minimum torch angle. The default is -70.0.
Max torch angle	Define the maximum torch angle. The default is 70.0.

Bevel angle information is used only in NC data, and no actual weld preparations are created in the model.

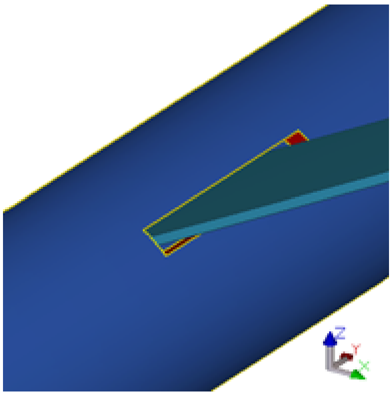
9.9 Tube-SlottedHole (1)

Tube-SlottedHole (1) connects a plate to a round tube. This connection creates a slotted hole to the main part.

Objects created

- Cuts
- Welds

Use for

Situation	Description
	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 (1)** 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.

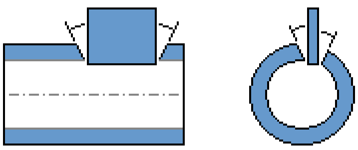
See also

Tube-SlottedHole (1): Parameters tab on page 812

Tube-SlottedHole (1): Parameters tab

Use the **Parameters** tab to control the slotted holes in the **Tube-SlottedHole (1)** connection.

Connection options

Option	Description
	**Slotted Hole** Creates a slotted hole to the main part.

Tube NC Parameters

Option	Description
Bevel angle	The weld preparation angle created during NC processing of the tube. The bevel is created to the slotted hole.
Root opening above	The gap between the plate and the tube. The gap is created in the model.
Min torch angle	Define the minimum torch angle. The default is -70.0.
Max torch angle	Define the maximum torch angle. The default is 70.0.

Bevel angle information is used only in NC data, and no actual weld preparations are created in the model.

10 Platework

This section introduces components that can be used in steel platework.

Click the links below to find out more:

- Rectangle to circle (17) on page 814
- Triangles generation (19) on page 821
- Unfold surface (21) on page 829

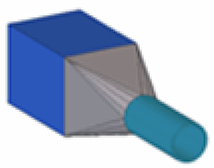
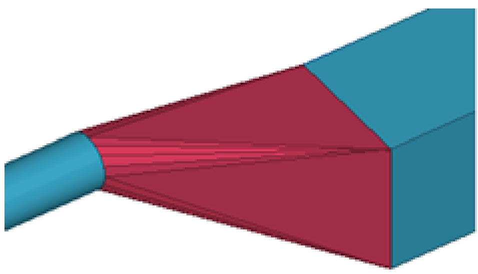
10.1 Rectangle to circle (17)

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

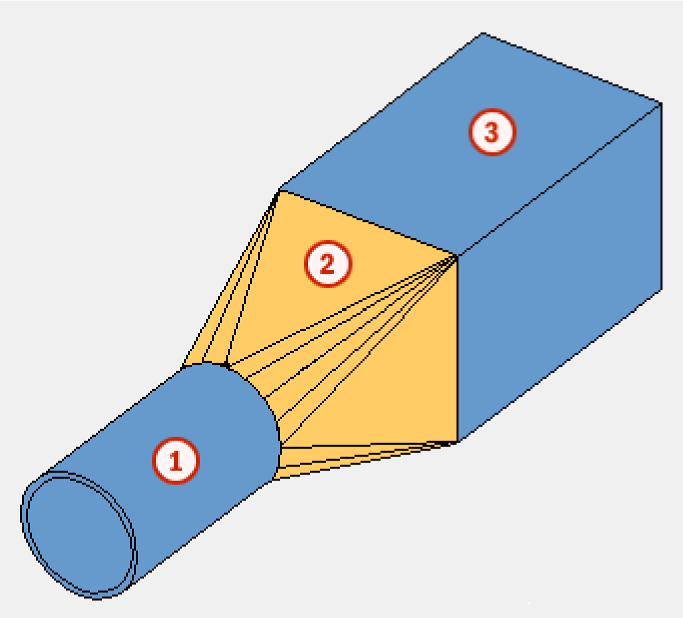
Situation	Description
	Reducing piece between rectangular and circular profile.
	

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



Option	Part
1	Circular profile
2	Reducing piece
3	Rectangular profile

See also

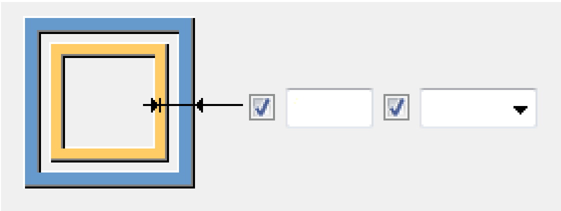
Rectangle to circle (17): Picture tab on page 815

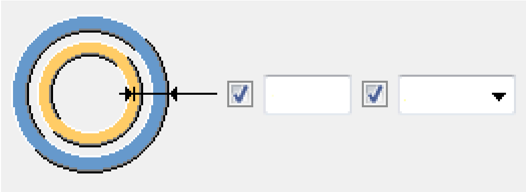
Rectangle to circle (17): Parts tab on page 817

Rectangle to circle (17): Parameters tab on page 818

Rectangle to circle (17): Picture tab

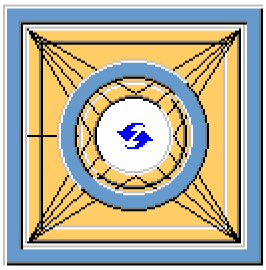
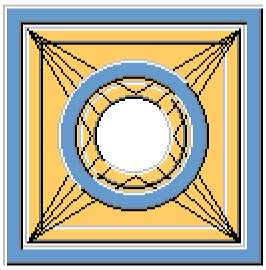
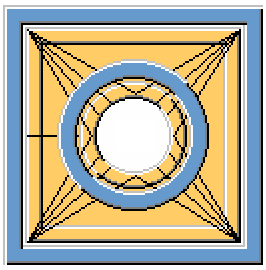
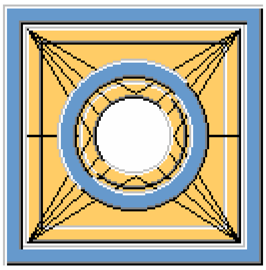
Use the **Picture** tab to define the number of parts which the reducing piece consists of, and the offset for the rectangular and circular profile end in the **Rectangle to circle (17)** modeling tool.

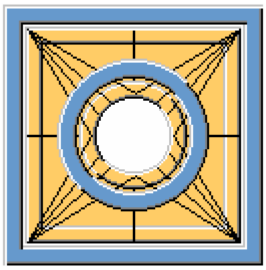
Option	Description
	Define the offset for the rectangular and the circular profile end. The options are:

Option	Description
	• **Offset** Fixed distance. • **% x t** Percentage of the plate thickness.

Number of cuts Define the number of parts which the reducing piece consists of.

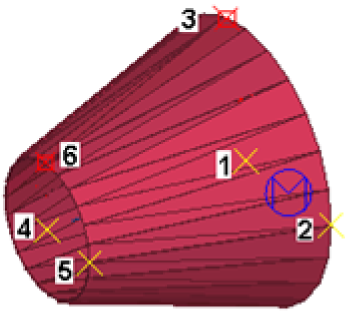
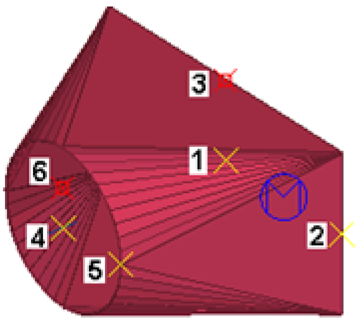
By default, there is one cut in the reducing piece.

Option	Description
	Default One cut AutoDefaults can change this option.
	No cuts
	One cut
	Two cuts

Option	Description
	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: • center point • horizontal distance • vertical distance
	

Rectangle to circle (17): Parts tab

Use the **Parts** tab to define the thickness of the triangular plates in the reducing piece and the reducing piece position in the **Rectangle to circle (17)** modeling tool.

Triangle

Option	Description
Triangle	Define the triangular plate thickness.

Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Rectangle to circle (17): Parameters tab

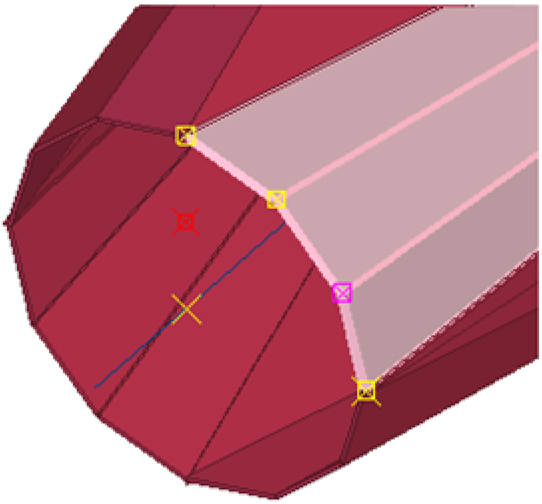
Use the **Parameters** tab to define the shape of the reducing piece end, to increase or decrease the number of triangular plates, and to define whether the triangular plates are welded in the **Rectangle to circle (17)** modeling tool.

Secondary segments

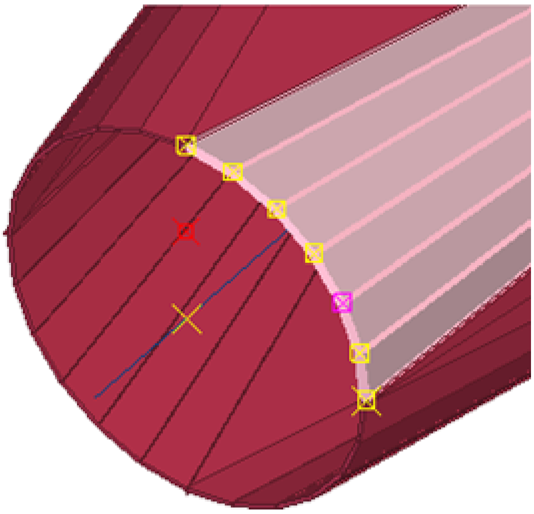
Define the number of the triangular plates in the reducing piece.

The more triangular plates are created, the more accurate is the shape of the reducing piece.

3 x 4 plates

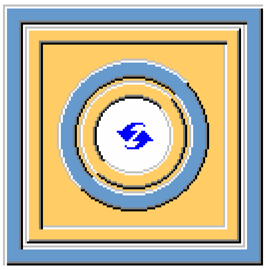
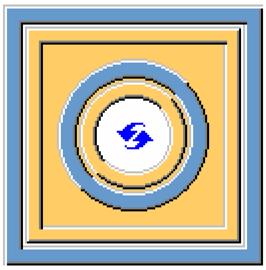


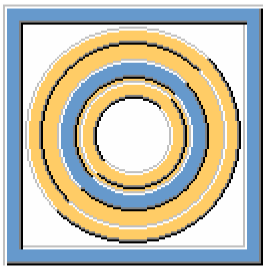
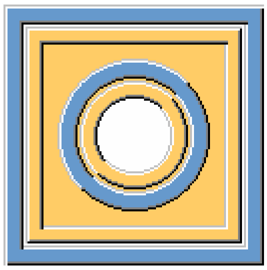
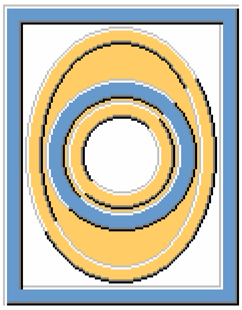
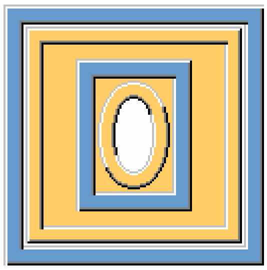
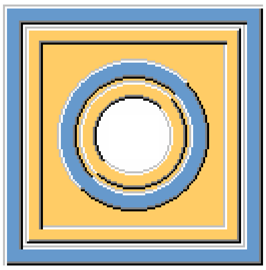
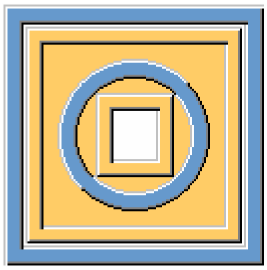
6 x 4 plates



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.

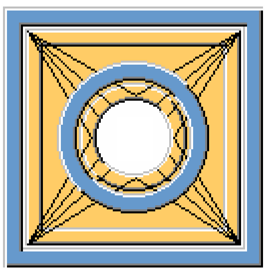
First shape	Second shape	Description
		Default Circle AutoDefaults can change this option.

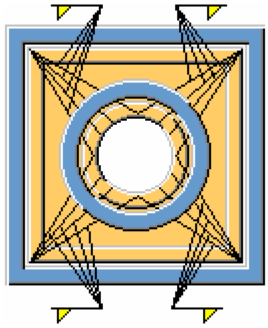
First shape	Second shape	Description
		Circle
		Ellipse This option works only if the main or secondary part has a rectangular profile.
		Rectangle

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.

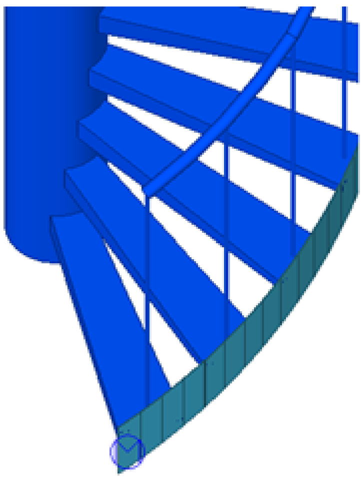
10.2 Triangles generation (19)

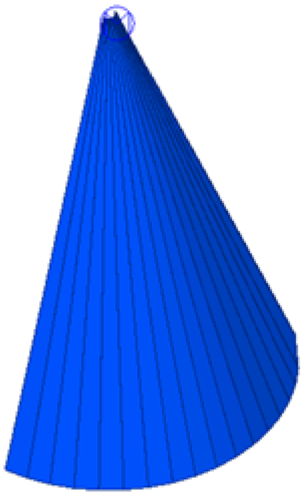
Triangles generation (19) creates triangular plates, or profiles, for double-curved surfaces, for example, for spiral stair stringers. A double-curved surface is created by placing multiple flat triangular plates side by side. The triangular plates are welded together to enable unfolding of the plates. If needed, you can unfold the triangular plates using the **Unfold surface (21)** modeling tool.

Objects 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.

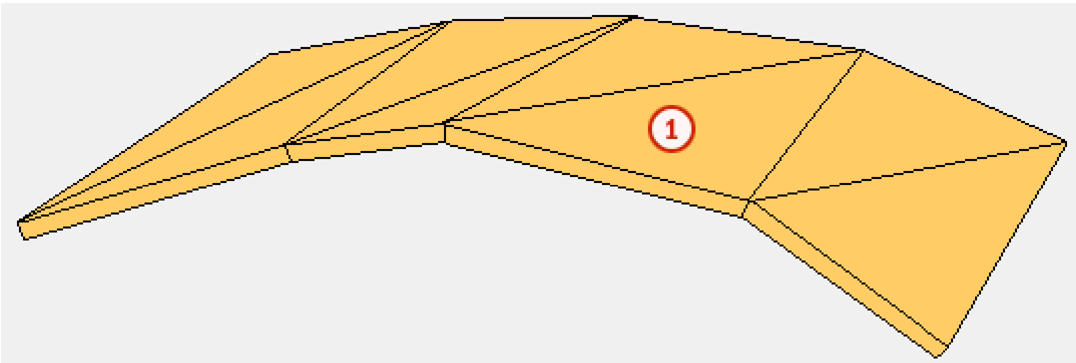
Alternatively, you can define the coordinates of the points in an ASCII file, and use the file to create the triangular plates. In ASCII files, the values are separated by spaces, and the decimals in values are separated by periods, for example:

```
0.0 0.0 0.0 6000.0 0.0 -0.0
1620.7 -2010.1 500.0 6995.1 -3159.4 500.0
```

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



Option	Part
1	Triangular plate

See also Triangles generation (19): Picture tab on page 823

Triangles generation (19): Parameters tab on page 823

Triangles generation (19): Plate tab on page 828

Triangles generation (19): Profile tab on page 829

Triangles generation (19): 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 in the **Triangles generation (19)** modeling tool.

Plate definition

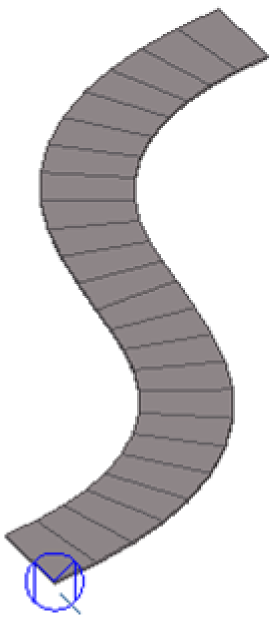
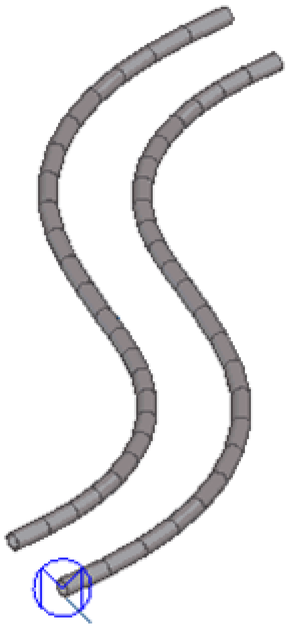
Option	Description
With picked points	Define the shape of the triangular plate by picking the points that you have previously created.
Read points in ASCII file	Define the shape of the triangular plate by giving the coordinates in an ASCII file.

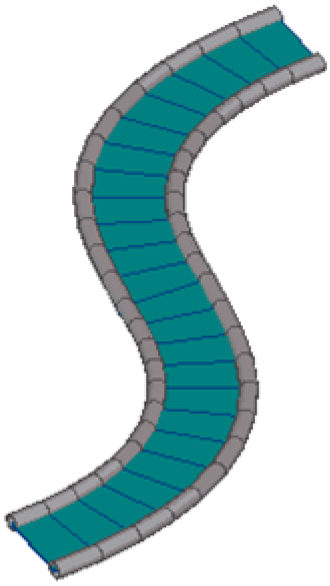
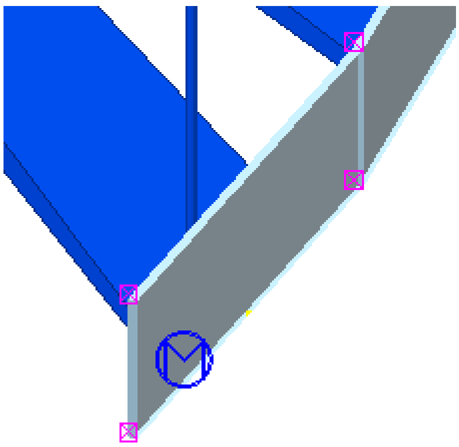
Offset Use **Global displacement** to define an offset for the created plates or profiles in x, y and/or z direction.

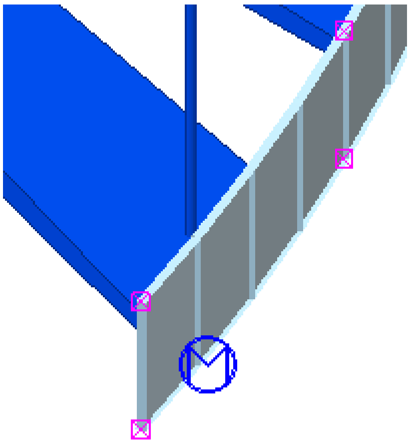
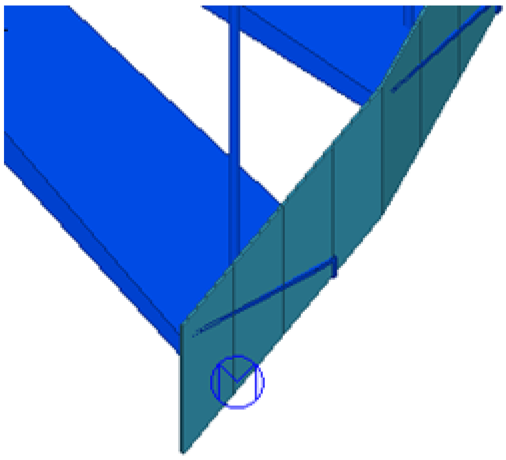
Triangles generation (19): Parameters tab

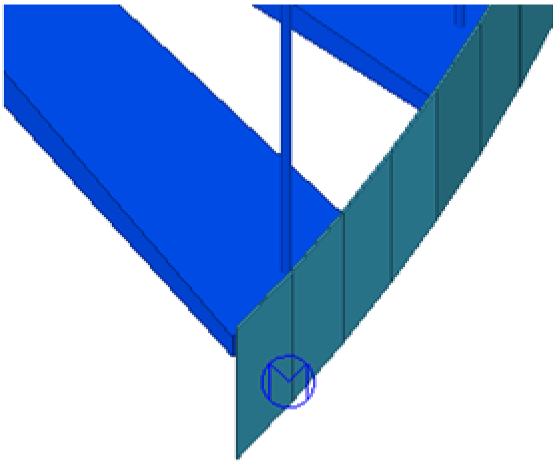
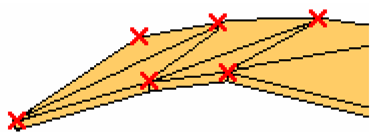
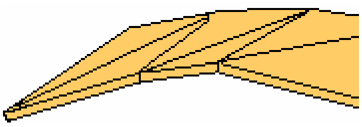
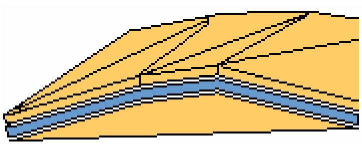
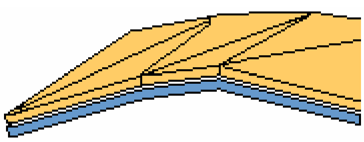
Use the **Parameters** tab to define the ASCII file, whether plates or profiles are created, and how extra points are handled in the **Triangles generation (19)** modeling tool.

Option	Description
File name	Enter the name of the ASCII file where you have defined the coordinates for the points. The file is searched from the model folder.
Create plates profiles	Define whether plates or profiles are created. By default, plates are created. You can define the plate properties on the **Plate** tab and the profile properties on the **Profile** tab.

Option	Description
	Plates are created: 
	Profiles are created: 

Option	Description
	Plates and profiles are created: 
Number of extra points	Define whether extra points are automatically created between the picked points, or set coordinates, to smoothen the plates.
	Number of extra points: 0 

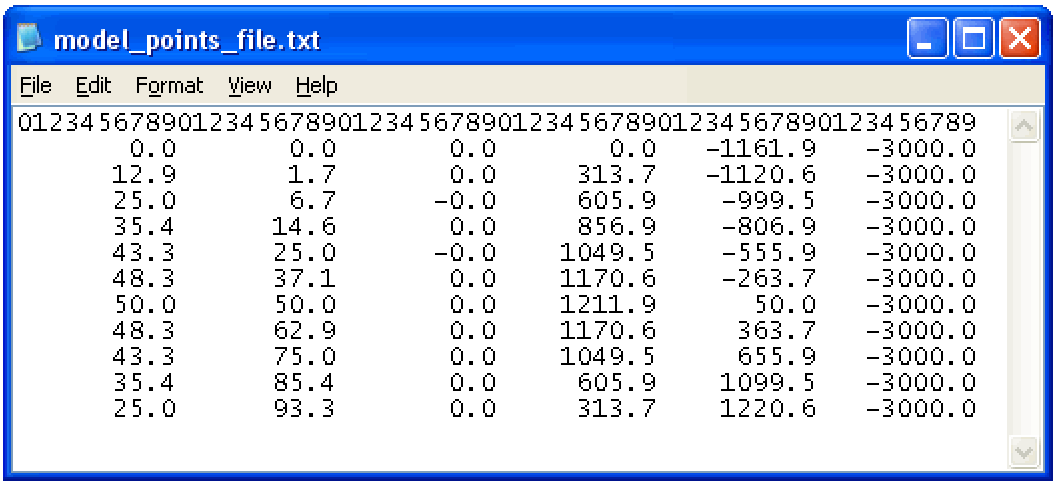
Option	Description
	Number of extra points: 3 
Method to calculate extra points	If the curved plates form an arc, define whether the arc is taken into account for extra point calculation.
	The **1st order** option does not take the arc into account for extra point calculation. 

Option	Description
	The **3rd order** option takes the arc into account, and the extra points are placed in the same arc as the original points. 
Smoothness spline 0-1	Define the smoothing spline.
Coplane distance	Define the coplane distance.
Create points	Define whether points are placed on every coordinate.
	Points are placed on every coordinate: 
	No points: 
Close curve	Define whether the countour is closed.
	Contour is closed: 
	Contour is not closed: 

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
0123456789012345678901234567890123456789012345678901234567890123456789
      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
```

Triangles generation (19): Plate tab

Use the **Plate** tab to define the plate properties and position in the **Triangles generation (19)** modeling tool.

Plate

Option	Description
Plate	Define the triangular plate thickness.

Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

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 using the **Unfold rules surface (21)** modeling tool.

Triangles generation (19): Profile tab

Use the **Profile** tab to define the profile properties and position in the **Triangles generation (19)** modeling tool.

Profile

Option	Description
Profile	Define the profile by selecting it from the profile catalog.

Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Profile orientation Use **Position in plane**, **Rotation** and **Position in depth** options to define the orientation of the profile.

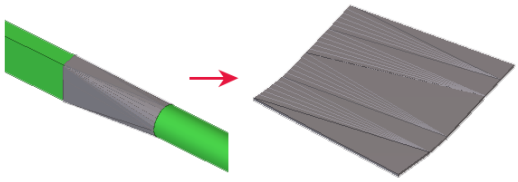
10.3 Unfold surface (21)

Unfold surface (21) unfolds welded plates. The unfolded plates are created to a location that you have defined. You can also create assembly drawings from the unfolded plates. Use **Unfold surface (21)** to unfold triangular plates created with, for example, the **Triangles generation (19)** modeling tool.

Objects created

- Unfolded plates

Use for

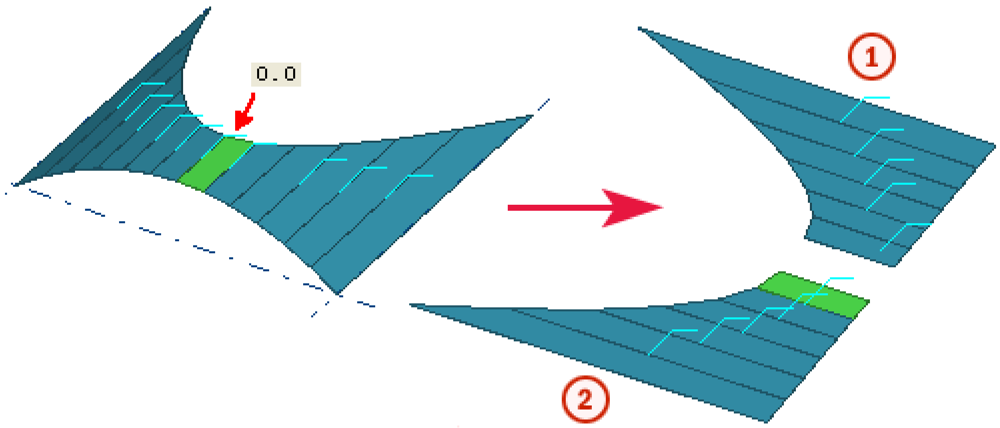
Situation	Description
	Unfolded triangular plates

Limitations

- **Unfold surface (21)** works only with contour plates. Do not use **Unfold surface (21)** to unfold beams or polybeams.
- We recommend that you use the same Pos-in-depth settings for all plates.
- In some cases an error can occur when unfolding complex surfaces that have holes. You can use the **Don't refine edges** option 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.

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
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.

See also Unfold surface (21): Plates tab on page 831

Unfold surface (21): Big plate tab on page 831

Unfold surface (21): Parameters tab on page 834

Unfold surface (21): Plates tab

Use the **Plates** tab to define the thickness of the unfolded plate and whether the properties of the triangular plates are exported to the unfolded plate in the **Unfold surface (21)** modeling tool.

Plate

Option	Description
Replace	Define the thickness of the unfolded plate. If you do not enter any value, the thickness of the triangular plates is used instead.

Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Exported properties

Option	Description
Zero welds	Define if the properties of the triangular plates are exported to the unfolded plate. To export the properties, select the second column of check boxes. If you are unfolding a plate created with **Rectangle to circle (17)**, and want to maintain the assembly position numbers defined in **Rectangle to circle (17)**, clear the second check box next to the **Profile** option.
Unfolding by	
Profile	
Name	
Material	
Class	

Unfold surface (21): Big plate tab

Use the **Big plates** tab to define the type of the unfolded plate and the accuracy of the plates in the **Unfold surface (21)** modeling tool.

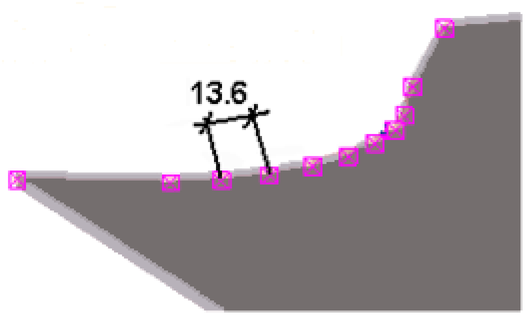
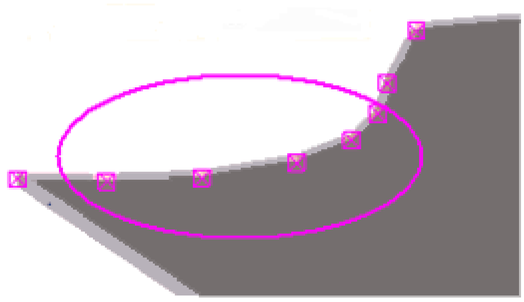
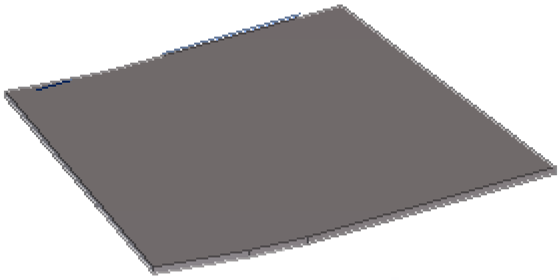
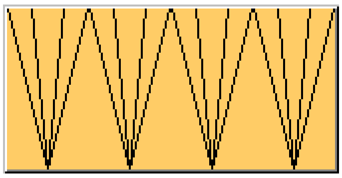
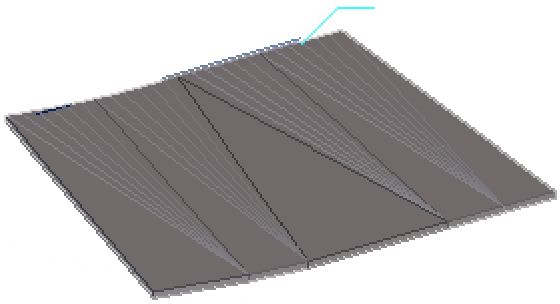
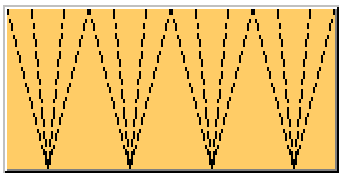
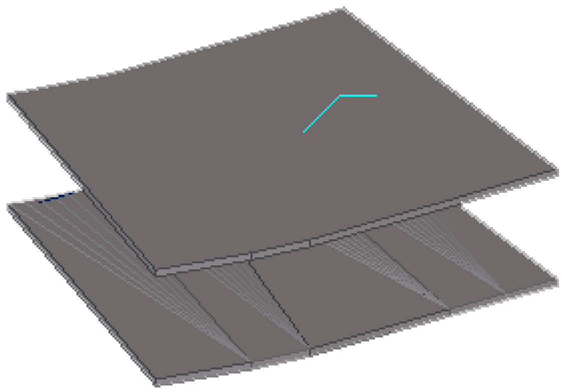
Option	Description
Merge points	Define the accuracy of the unfolded plate by adding or removing reference points.
Merge limit	If you want to merge points, define the limit for the merging. Points that are closer to each other than the set limit are merged.
	Points are not merged. 
	Points are merged, and the merge limit is `15.00`. 

Plate type and offset

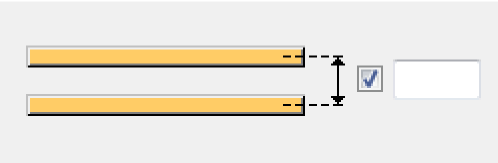
Define what kind of unfolded plate is created.

Optionq	Description
Type	The options are: **One plate**  One plate is created.

Optionq	Description
	
	Plates  Plates are welded together. 
	Both  Both one plate and a plate with welds are created.

Optionq	Description
	 If you select the **Both** option, you can define the distance between the plates using the **Offset** option.

Offset Define the distance between the unfolded plates.



Don't refine edges Prevents errors that may sometimes occur when unfolding complex surfaces that have holes.

Unfold surface (21): Parameters tab

Use the **Parameters** tab to define the weld reference text in an assembly drawing in the **Unfold surface (21)** modeling tool.

Text in drawings

Option	Description
Prefix	Define the first part of the text that is shown in assembly drawings, for example, `Angle=`.
Format	Define the format in which the size of the unfolding is displayed.
Postfix	Define the last part of the text that is shown in assembly drawings, for example, `degrees`.

11 Frames

This section introduces components that can be used in steel frames.

Click the links below to find out more:

- Truss (S78) on page 835
- Opening Frame (1) on page 844

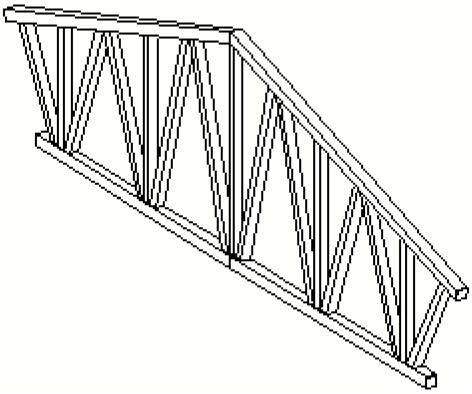
11.1 Truss (S78)

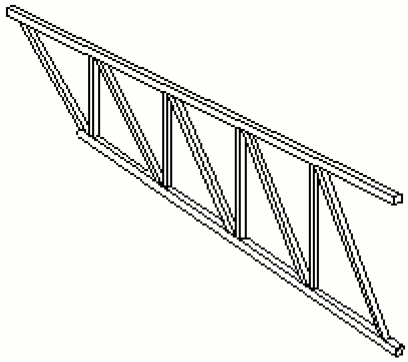
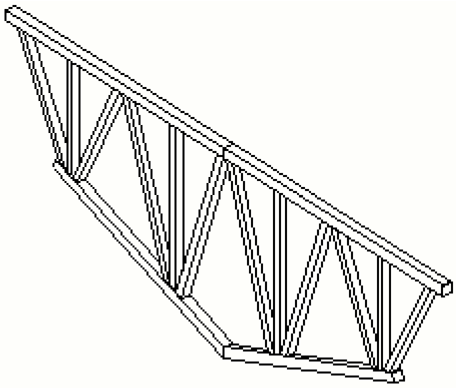
Truss (S78) creates a truss between selected points. **Truss (S78)** does not create any connections to existing parts.

Objects created

- Top chord
- Bottom chord
- Diagonals
- Verticals between diagonals
- Cap plates

Use for

Situation	Description
	Truss with top chord, tilted bottom chord, cap plates, diagonals and verticals.

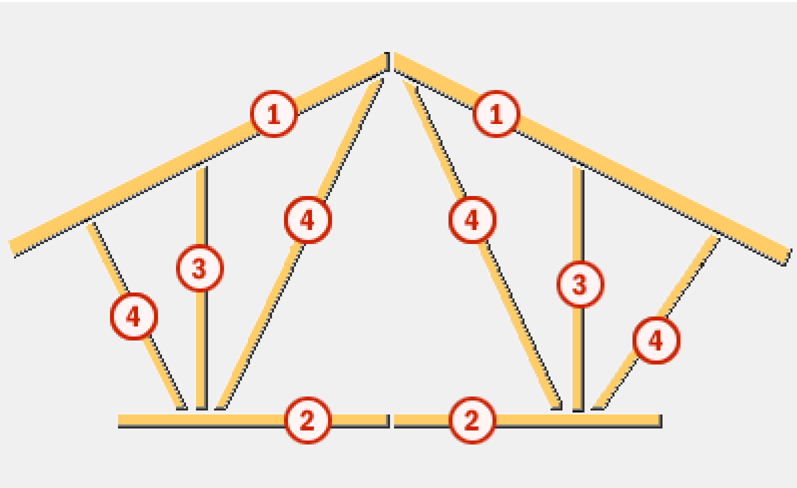
Situation	Description
	Truss with top chord, bottom chord, cap plates, diagonals and verticals.
	Truss with top chord, bottom chord, cap plates, diagonals and verticals.

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



Option	Part
1	Top chord
2	Bottom chord

Option	Part
3	Vertical
4	Diagonal

See also Truss (S78): Picture tab on page 837

Truss (S78): Parts tab on page 839

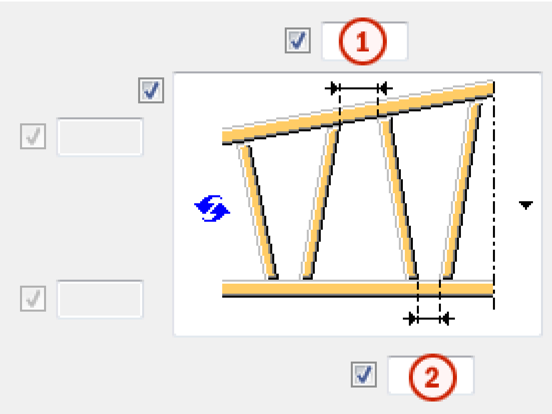
Truss (S78): Parameters tab on page 841

Truss (S78): Cap Plate tab on page 844

Truss (S78): Picture tab

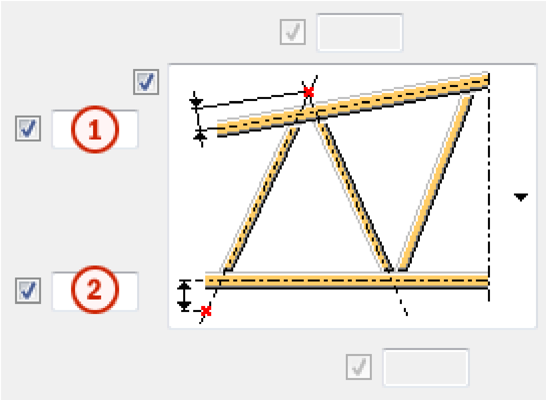
Use the **Picture** tab to control the gap created between diagonals, the eccentricity of the diagonals, and the dimensions of the parts created in the **Truss (S78)** modeling tool.

Gap dimensions



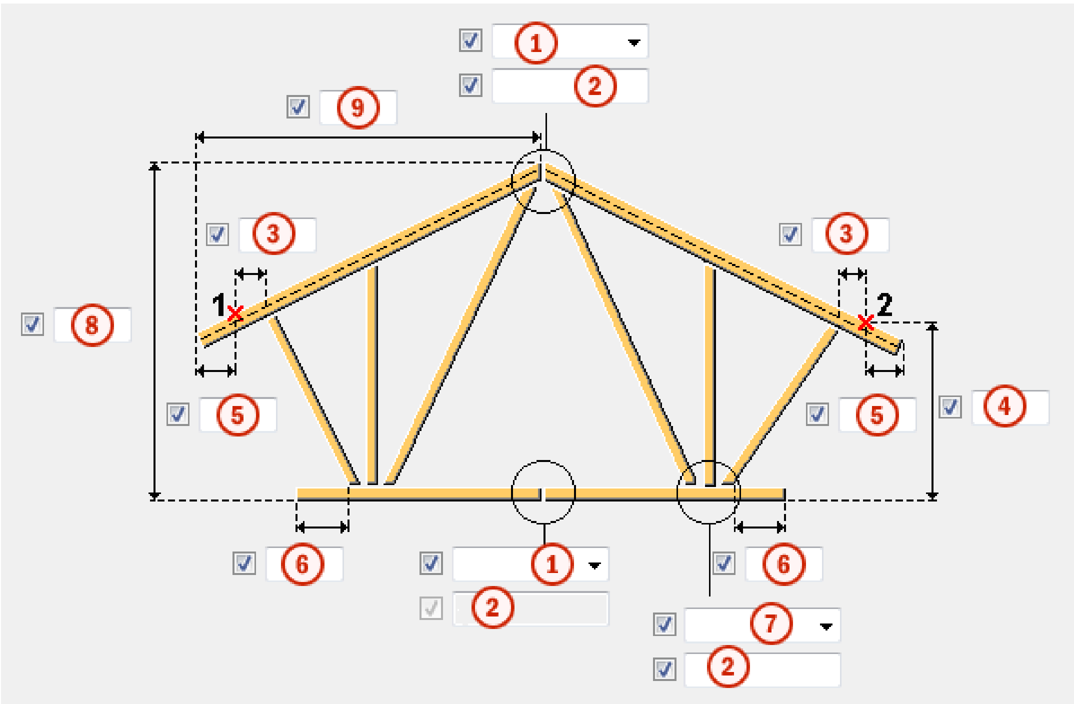
Option	Description	Default
1	Define the gap between the diagonals at the top chord.	20 mm
2	Define the gap between the diagonals at the bottom chord.	20 mm

Eccentricity dimensions



Option	Description	Default
①	Define the eccentricity of the diagonal intersection at the top chord.	20 mm
②	Define the eccentricity of the diagonal intersection at the bottom chord.	20 mm

Part dimensions



Option	Description	Default
①	Define how the top and bottom chords are connected. The options are:	Welded

Option	Description	Default
	• **Apex haunch (106)** Use with top and bottom chord I profiles. • **Joining plates (14)** • **Welded** • **Continuous** Creates a continuous top or bottom chord.	
2	Select an attribute file for the connection.	`standard`
3	Define the horizontal distance between the start/end point of the truss and the first/last diagonal.	`200 mm`
4	Define the vertical distance between the start/end point of the truss and the bottom level of the bottom chord.	`1000 mm`
5	Define the top chord extension from the start/end point of the truss.	`0 mm`
6	Define the bottom chord extension from the first and the last diagonal/vertical to the chord end.	`240 mm`
7	Define how the chords, diagonals and verticals are connected. The options are: • **Gusset plate (11)** • **Round tube (23)** Used with round tube profiles. • **Welded**	`Welded`
8	Define the vertical distance between the truss apex and the bottom level of the bottom chord.	`2000 mm`
9	Define the horizontal distance between the top chord extension and the truss apex.	`entire truss length/2`

Truss (S78): Parts tab

Use the **Parts** tab to control the profiles for chords, diagonals and verticals in the **Truss (S78)** modeling tool.

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
Top Chord	Define the top chord profile by selecting it from the profile catalog.	`CFRHS100*4`
Bottom Chord	Define the bottom chord profile by selecting it from the profile catalog.	`CFRHS100*4`
Profile 1 - Profile 7	Define a profile by selecting it from the profile catalog.	`CFRHS80*4`

Field	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Diagonals and verticals creation for left (1) and right (2) side

Option	Description
1	Define how the diagonals are created using the above profiles. • The diagonals are created by multiplying the number of diagonals with the type of profile, `number*profile`. For example, `2*3` creates two diagonals of the type **Profile 3**. For example, `1*2` is the same as `2`, and creates one diagonal of the type **Profile 2**. • The number of diagonals results from the pattern. For example, `2 2*3 1` creates 4 diagonals. • The diagonals are created from the start/end point towards the truss center. If you have set the **Truss type** to **Single pitch truss** on the **Parameters** tab, the second **Diagonals** row is ignored. The diagonals are created from the start point to the end point of the truss.

Option	Description
2	Define how verticals are created using the above profiles. The verticals are positioned between the diagonals, and the maximum number of verticals results from the number of diagonals.

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.

Truss (S78): Parameters tab

Use the **Parameters** tab to control the truss assembly, and the diagonals and verticals creation in the **Truss (S78)** modeling tool.

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**

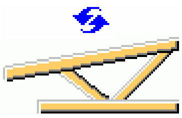
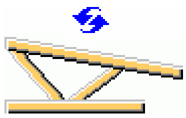
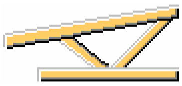
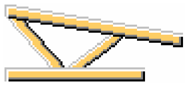
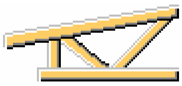
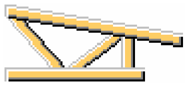
  Additional welds are created between the truss and the right bottom chord.

- **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.

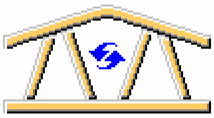
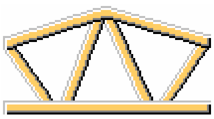
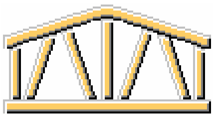
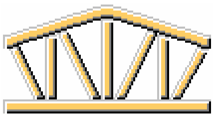
Verticals at truss end

Define whether a vertical is created to the truss ends.

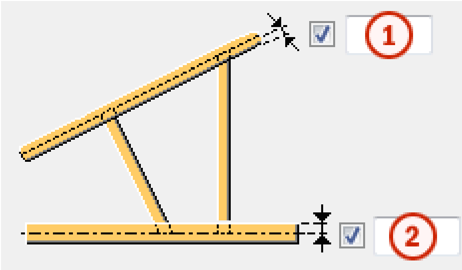
Option for start point	Option for end point	Description
		Default No vertical is created to the end. AutoDefaults can change this option.
		No vertical is created to the end.
		Vertical is created to the end.

Middle verticals

Define whether the verticals are created between diagonals.

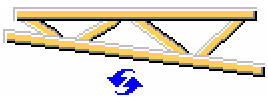
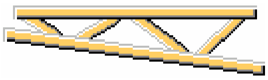
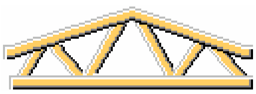
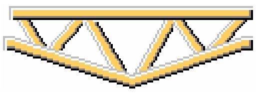
Option	Description
	Default No middle verticals are created. AutoDefaults can change this option.
	No middle verticals are created.
	Verticals are created between the diagonals.
	Verticals are created between the diagonals. Verticals and diagonals form an N-type truss.

Extension for verticals and diagonals

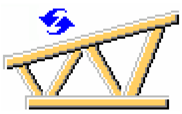
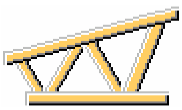
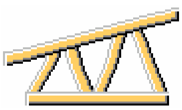


Option	Description	Default
1	Define the extension for diagonals and verticals in the top chord.	0 mm
2	Define the extension for diagonals and verticals in the bottom chord.	0 mm

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.
	WWW The first diagonal begins from the top chord.
	AAA The first diagonal begins from the bottom chord.

Truss (S78): Cap Plate tab

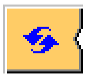
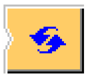
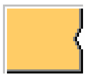
Use the **Cap Plate** tab to control the cap plate creation in the **Truss (S78)** modeling tool.

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.

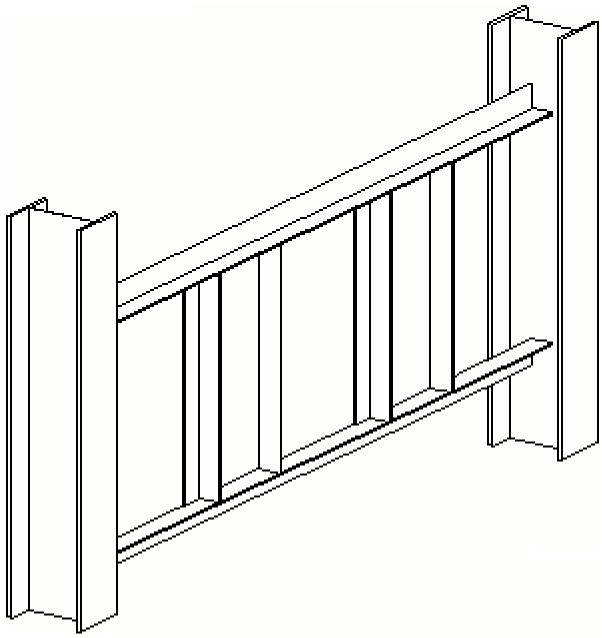
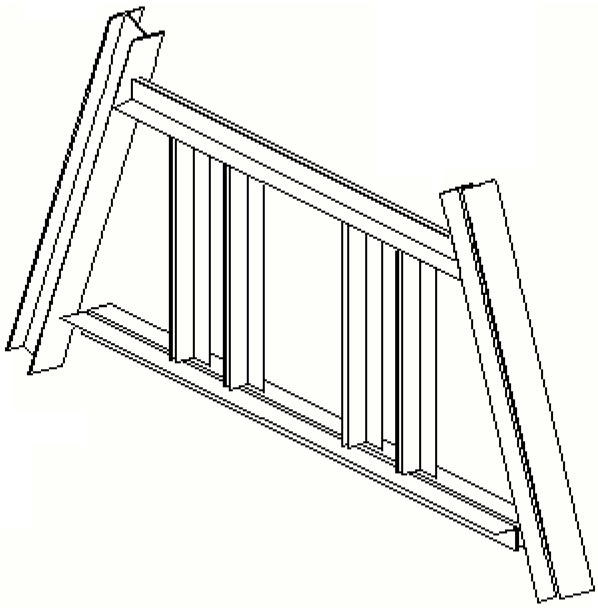
11.2 Opening Frame (1)

Opening Frame (1) 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

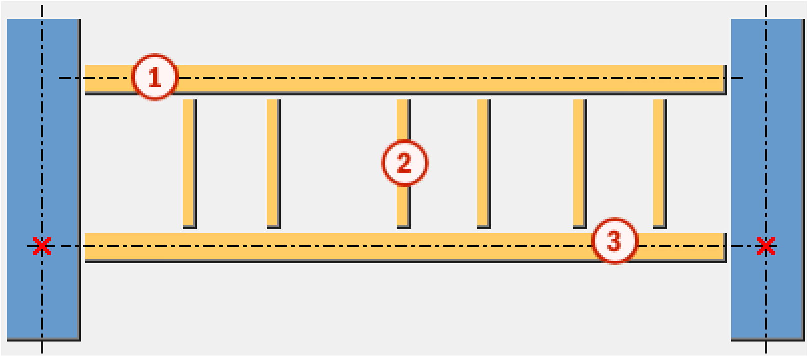
Situation	Description
	Open frame between two columns with top frame, bottom frame, and two pairs of vertical posts.
	Open frame between two skew columns with top frame, bottom frame, and two pairs of vertical posts.

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



Option	Part
①	Top frame
②	Vertical post
③	Bottom frame

See also

Opening Frame (1): Picture tab on page 846

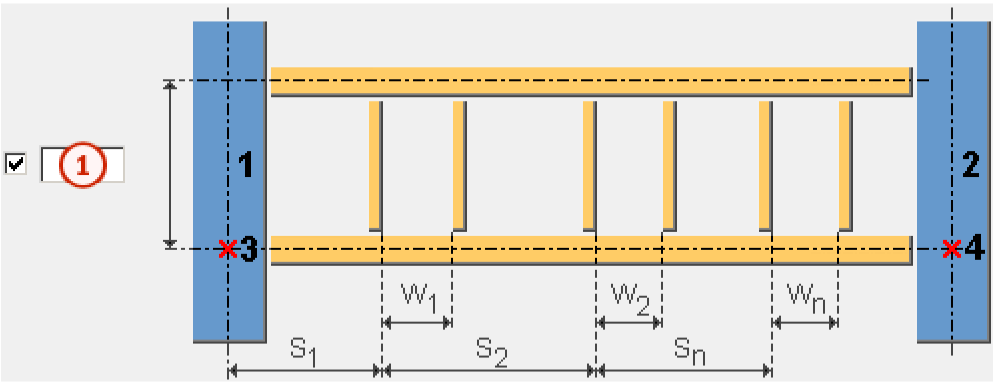
Opening Frame (1): Parts tab on page 850

Opening Frame (1): Connections tab on page 851

Opening Frame (1): Picture tab

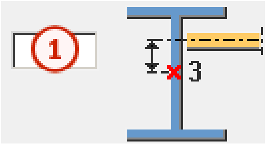
Use the **Picture** tab to control the frame position, offsets, and spacings in the **Opening Frame (1)** modeling tool.

Frame distance



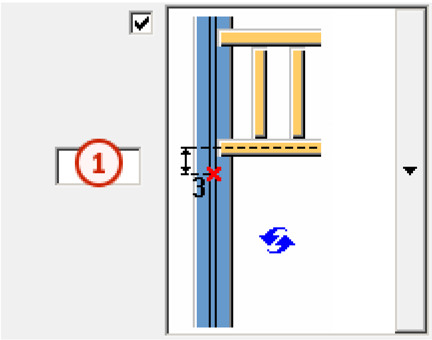
Option	Description	Default
①	Define the distance between the top and the bottom frames.	1200 mm

Frame horizontal offset



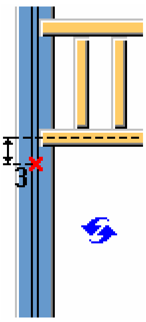
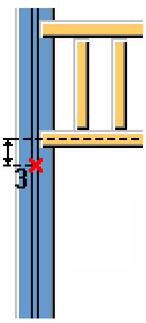
Option	Description	Default
1	Define the horizontal offset of the frame from the start/end point.	0 mm

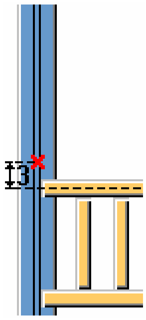
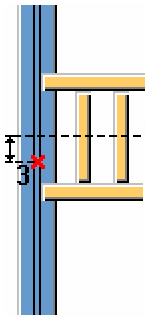
Frame vertical offset



Option	Description	Default
1	Define the vertical offset of the frame from the start/end point.	0 mm

Frame position

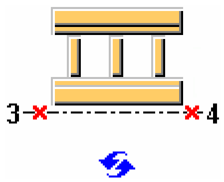
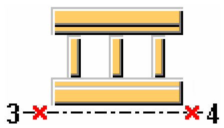
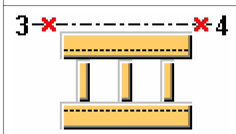
Option	Description
	Default Top AutoDefaults can change this option.
	Top

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
Frames to create	Define whether top, bottom, or both frames are created.	Both
Pairs vertical posts	Define how many pairs of vertical posts are created.	3

Option	Description	Default
Spacing pairs (S1, S2, Sn)	Define the spacing between the pairs. 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. • 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. • 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. For example, if **Pairs vertical posts** = `4` and **Spacing pairs** = `100 200`, the spacing values are `100 200 200`.	`1800 mm`
Spacing vertical posts (W1, W2, Wn)	Define the spacing between the vertical posts in the pairs. The spacing is measured from the first vertical post inner side to the second vertical post inner side. 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.	`500 mm`
Create welds	Define whether welds are created. The options are: • **Posts-Frames (5)** Welds are created only for posts on frames. • **Columns-Frames (1-4)** Welds are created only for frames on column. • **All** All welds are created. • **No** No welds are created.	`Posts-Frames(5)`

Opening Frame (1): Parts tab

Use the **Parts** tab to define the part properties in the **Opening Frame (1)** modeling tool.

Dimensions

Option	Description	Default
Top Frame	Define the top frame profile by selecting it from the profile catalog.	`L100*50*5`
Bottom Frame	Define the bottom frame profile by selecting it from the profile catalog.	`L100*50*5`
Vertical Posts	Define the vertical post profiles by selecting them from the profile catalog.	`L100*50*5`

Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Twin profiles

Option	Description	Default
Twin profiles	• **No** Top frame, bottom frame, or vertical posts are created using single profiles. • **Yes** 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.	`No`

Type Define the profile rotation for single profiles or for twin profiles.

Options for single profile:

Option	Description
	Type 1
	Type 2
	Type 3

Option	Description
┐	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
Clearance	Define the clearance between the twin profiles. You can define the clearance only if the **Twin Profile** field is set to **Yes**.	`0 mm`

Position

Option	Description	Default
On plane	Define the part position on work plane.	`Middle`
Rotation	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 **Type** field.	`Front`
At depth	Define the part position, in terms of depth, perpendicular to the work plane.	`Middle`

Opening Frame (1): Connections tab

Use the **Connections** tab to define the properties of connection components that are created between the parts in the **Opening Frame (1)** modeling tool.

Connection properties

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 displayd.

Option	Description	Default
Connection number	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.	
Attribute file	Select an attribute file for the connection.	`standard`

12 Stairs

This section introduces components that can be used in steel stairs.

Click the links below to find out more:

12.1 Stairs (S71)

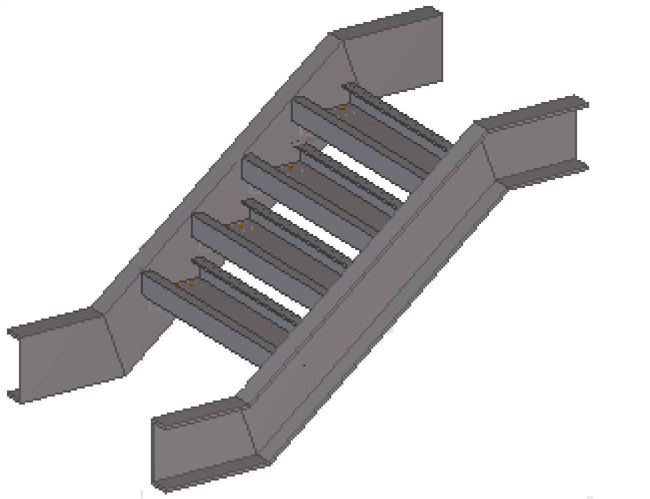
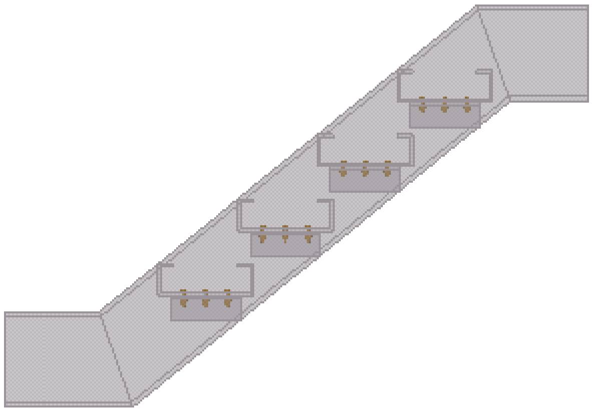
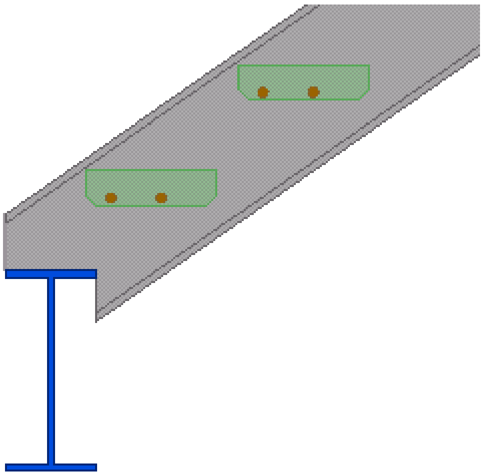
Creates straight stairs with optional upper and lower landings. The stairs consist of stringers, possible landings and the actual steps.

Objects created

- Stringers
- Steps
- Landings (optional)
- Brackets
- Plates to the stringer ends (optional)

- Cuts to notch the stringer (optional)
- Bolts
- Welds

Use for

Situation	Description
	Stairs with horizontal top and bottom landings.
	Steps are U-pan profiles, whose dimensions are defined in the Stairs (S71): Steps tab on page 865 tab. Brackets support the steps and they are welded to stringers and bolted to steps.
	Stairs with stringers notched to the supporting beam. Steps are catalog steps. You may also use your own custom components as steps.

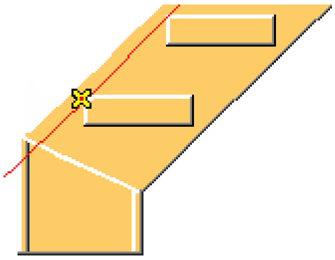
Limitations

If you modify the component, all connected components will be deleted, so modifying stairs deletes the stanchions, railings etc. components connected to it.

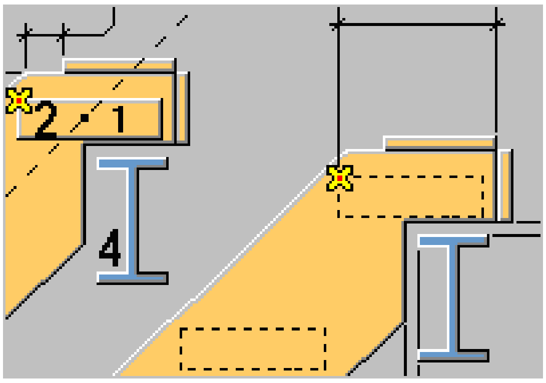
Before you start If the stringers are notched to bear on the supporting beams, create the supporting beams before creating the stairs.

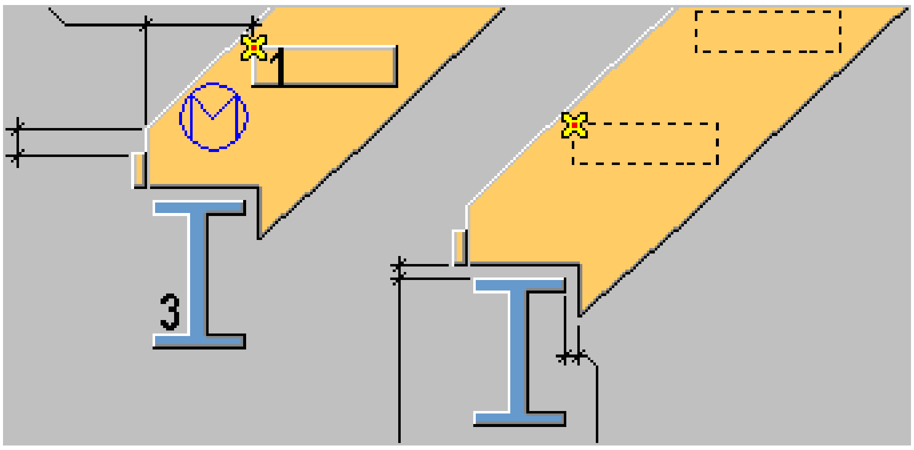
Selection order When all options are set to default, the picking order is the following:

1. Pick a point to indicate the nosing point of the first step.



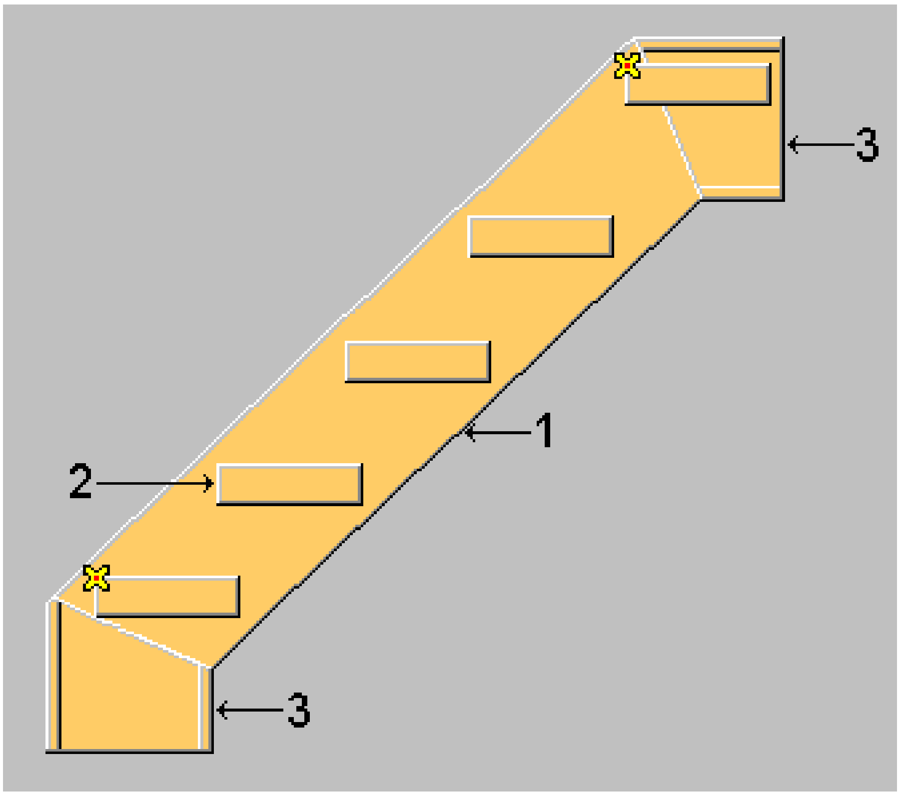
2. Pick another point to indicate the nosing point of the last step.
3. Click the middle mouse button, or if you have selected the following options on the **Picture** tab, pick the supporting beams and then click the middle mouse button.





The order in which the points are picked has no effect.

Part identification key



Number	Part
1	Stringer
2	Step
3	Landings

See also

Stairs (S71): Picture tab on page 856

Stairs (S71): Stair setup tab on page 862

Stairs (S71): Steps tab on page 865

Stairs (S71): Bracket tab on page 869

Bracket position on page 872

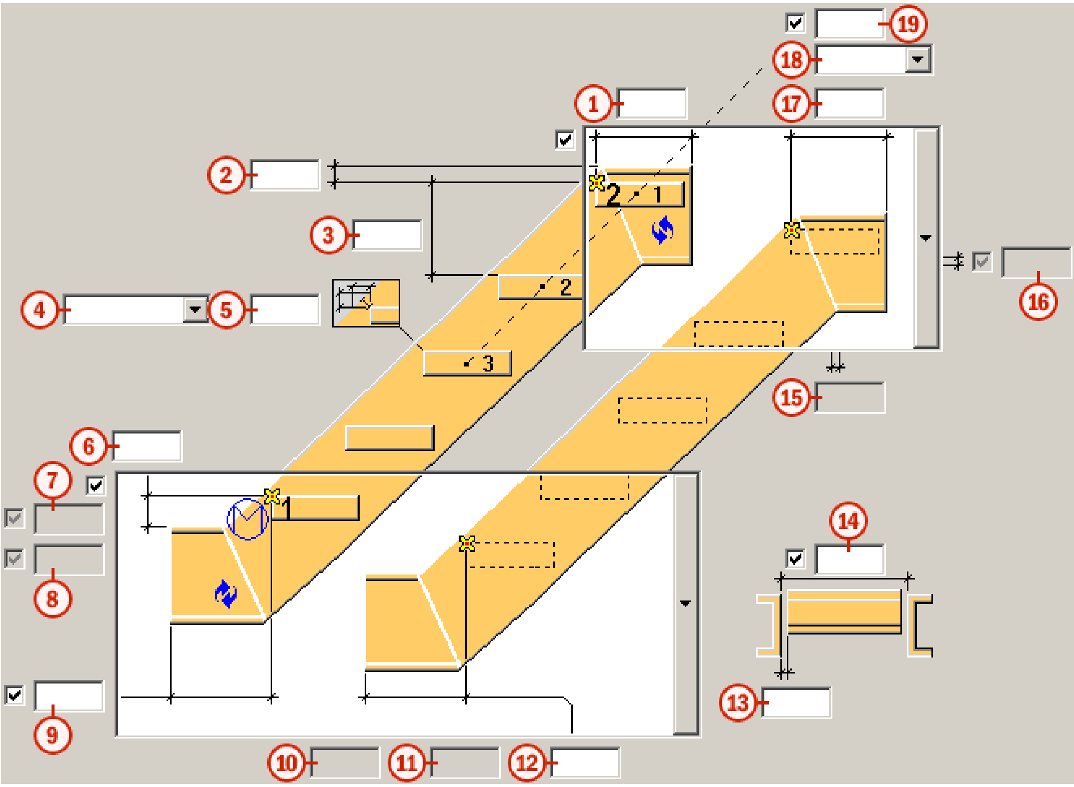
Bracket to step connection type on page 873

Bracket to stringer connection type on page 874

Stairs (S71): Picture tab

Use **Picture** tab to control the shape of the stringers and the location of stringers in relation to the points you picked when creating the **Stairs (S71)** component.

Stair dimension fields



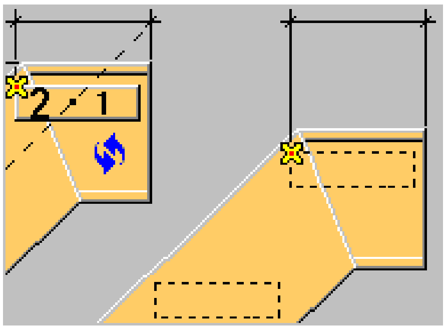
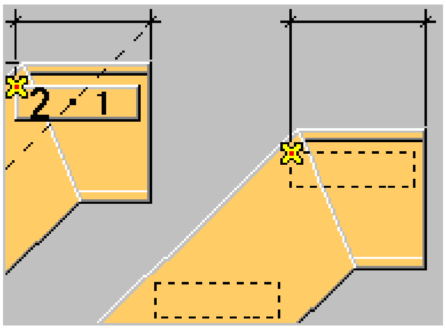
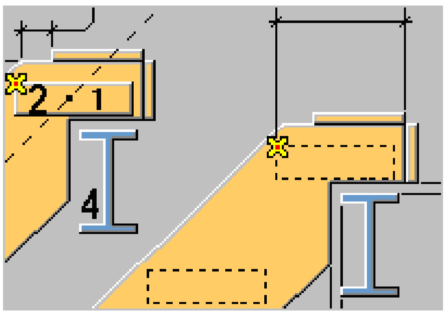
	Description	Default
1	The distance between the upper point and the end of the left upper landing. If the value is set to 0 mm, the left upper landing is not created. If **Top landing type** is set to **Notched**, this field sets the gap for the horizontal plate, taken from the stringer edge.	`0 mm`
2	The vertical distance from the upper point to the top of steel (TOS) of the upper landing. If the upper landing is not created, the stringers TOS is used. If **Top landing type** is set to **Notched**, this field sets the vertical distance from the upper point to the stringer top horizontal cut.	`200 mm`
3	The maximum distance allowed between two consecutive steps. The resulting spacing between steps is calculated using the steps spacing type (18) and the number of steps (19). If a step height of 200 mm is required, the **Exact** setting creates steps of exactly this height (the number of stairs	`(Z*220)/(Z+220) mm`, where Z is the vertical distance

	Description	Default
	required is entered as an integer), whereas the **Equal** setting creates the required number of stairs from the bottom to the top, with the height calculated as close to 200 mm as possible.	between the 2 picked points.
4	The direction of the nosing dimension entered in the field 5. The options are: • **Vertical** • **Horizontal** • **Perpendicular** Not available in the **Wooden steps pan (S72)** component.	`Vertical`
5	The nosing dimension of the steps. The field 4 sets the direction for it. Not available in the **Wooden steps pan (S72)** component.	`0 mm`
6	Dimension field that depends on the selected **Bottom landing type** option: • With **Horizontal** or **Horizontal lowered point** this field sets the VERTICAL distance between the lower point and the TOS of the dog leg. • With **Vertical** or **Vertical lowered point** this field sets the HORIZONTAL distance between the lower picked point and the most distant face of the bottom landing. • With **Notched** option this field sets the horizontal distance from lower point to the stringer vertical cut. By default the cut is made at the supporting member edge.	`150 mm`
7	Dimension field that depends on the selected **Bottom landing type** option and step spacing type (18). This field is used only if steps spacing type field (18) is set to **Equal**. If the **Bottom landing type** is **Vertical lowered point** or **Horizontal lowered point** this field sets the vertical distance from lower picked point to the first step.	`Equal with vertical spacing between steps`
8	The gap for the vertical plate, taken from the stringer edge.	`0 mm`

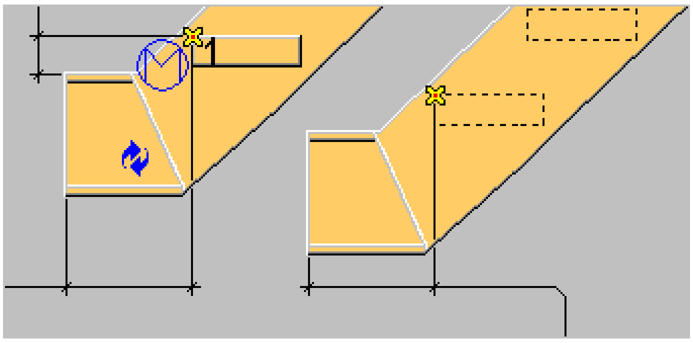
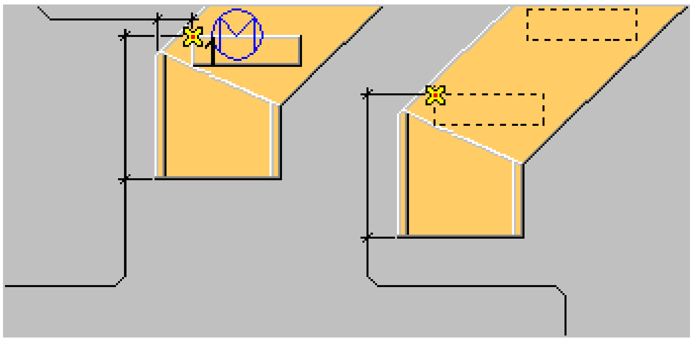
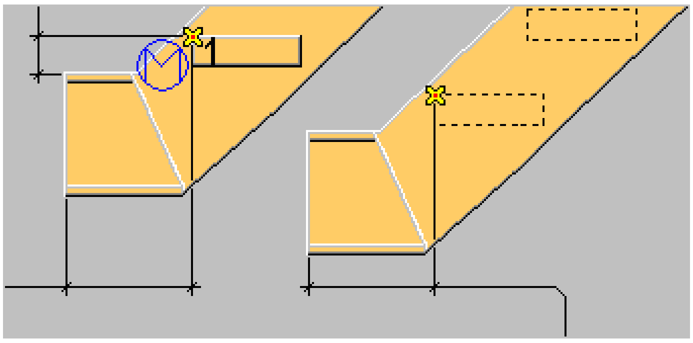
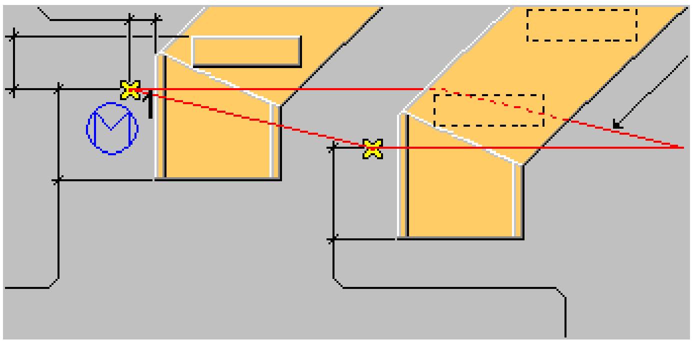
	Description	Default
9 12	Dimension field that depends on the selected **Bottom landing type** option: • With **Horizontal** or **Horizontal lowered point**, this field sets the HORIZONTAL distance between the lower point and the end of the bottom landing. • With **Vertical** or **Vertical lowered point**, this field sets the VERTICAL distance between the lower point and the lowest point of the bottom landing. • With **Notched** this field is not used.	`600 mm`
10	The vertical gap between the lower supporting member and the stringer cut. Used only if **Bottom landing type** is set to **Notched**.	`0 mm`
11	The horizontal gap between the lower supporting member and the stringer cut. Used only if **Bottom landing type** is set to **Notched**.	`0 mm`
13	Dimension that shortens the steps equally on both sides.	`0 mm`
14	The width of the steps.	`1000 mm`
15	The horizontal gap between the upper supporting member and the stringer cut. Used only if **Top landing type** is set to **Notched**.	`0 mm`
16	The vertical gap between the upper supporting member and the stringer cut. Used only if **Top landing type** is set to **Notched**.	`0 mm`
17	The distance between the upper point picked and the end of the stringer. If the value is set to 0 mm, the upper landing is not created. This field depends on the selected **Top landing type**. If **Notched** is selected, sets the horizontal distance from the upper point picked to the stringer vertical cut. By default the cut is made at the supporting member edge.	`0 mm`
18	Step spacing type. Defines how the vertical spacing between the steps is calculated. The options are: • **Exact** • **Equal** If **Exact** is selected and **Bottom landing type** is set to **Horizontal** or **Vertical lower point**, the steps are spaced from the upper point to lower point. In all other cases the steps are spaced from lower point to the upper point.	`Equal`

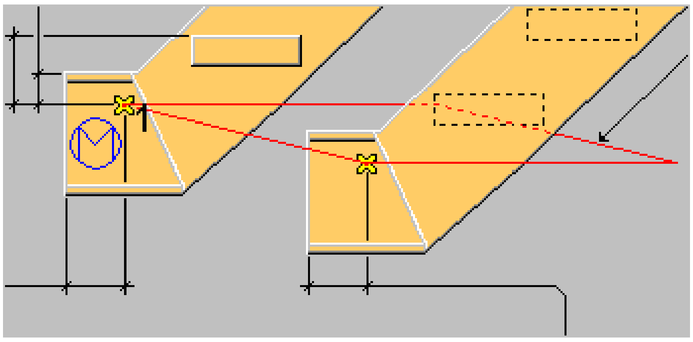
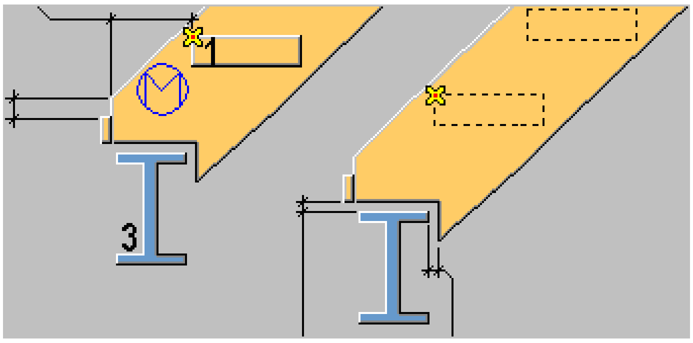
	Description	Default
19	The number of steps. Depends of step spacing type (18) and step spacing dimension (3). If step spacing type is set to **Exact** or step spacing type is set to **Equal** and spacing dimension is not **Default**, then the number of steps created will be equal to the number of steps you define.	Calculated from the vertical distance between the picked points and the spacing between steps (3)

Top landing type Specifies the type of the stringer top part. The options are:

Option	Description
	Default
	Horizontal landing
	Notched Top of the stringer is on the supporting member. Vertical and horizontal plates are welded at the end of the stringer.

Bottom landing type Specifies the type of the stringer lower part. The options are:

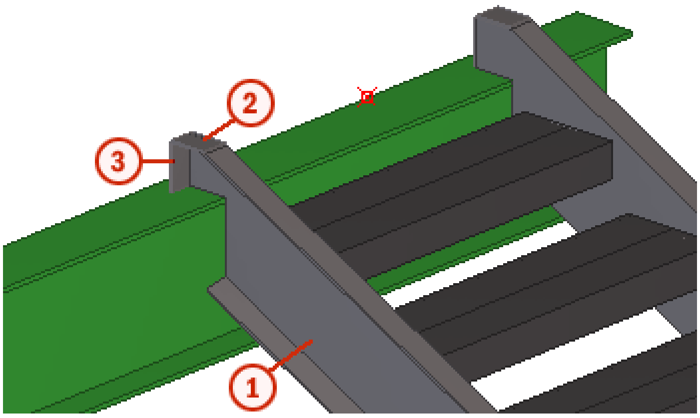
Option	Description
	Default
	Vertical Creates vertical landing where the lower point picked is on the last step top plane.
	Horizontal Creates horizontal landing where the lower point picked is on the last step top plane.
	Vertical lowered point The point is at top of steel or finish floor.

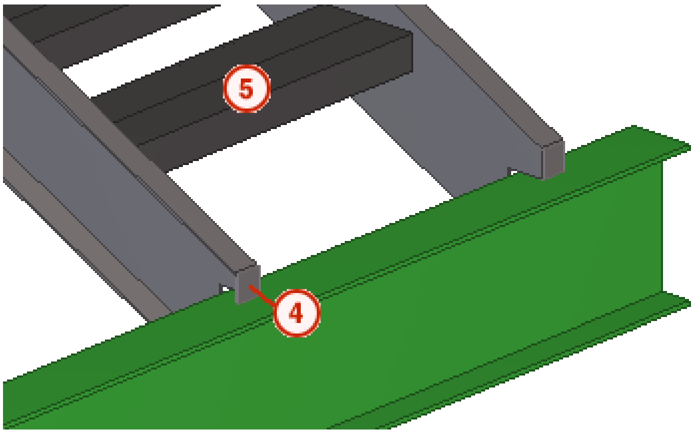
Option	Description
	Horizontal lowered point The point is at top of steel or finish floor.
	Notched Copes the bottom of the stringer to bear on the supporting member. A vertical plate is welded at the end of the stringer.

Stairs (S71): Stair setup tab

Use **Stairs setup** tab to control the properties of parts the **Stairs (S71)** component creates. It also defines whether the top or bottom steps are created, what is the position of the stairs on the horizontal plane and how the stringers and the steps are rotated.

Stair part properties





Stair part	Description	Default profile / thickness
Stringer 1	Always created.	BLU400*200*10
Upper H plate 2	Created only if the top of the stringers is on the supporting beam.	6 mm
Upper V plate 3	Created only if the top of the stringers is on the supporting beam.	6 mm
Lower V plate 4	Created only if the bottom of the stringers is on the supporting beam.	6 mm
Catalog step 5	Only available in the **Stairs (S71)** component. Created only if **Step Type** is set to **Catalogue step**. In this case the U-pan steps, brackets, and bolts defined in the other tabs are ignored.	First profile from the Catalogue list, defined in the steps.dat text file in the ..\Tekla Structures\<version>\environments\<environment>\system folder. The list changes according to the selected environment.

Option	Description	Default
Pos_No	To ensure correct numbering, define a prefix and a start number for the part position number of stair parts. Enter the assembly position number of the stair parts on the second row.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	**Stringer** = `STRINGER` **Upper H plate** = `PLATE` **Upper V plate** = `PLATE` **Lower V plate** = `PLATE` **Catalog step** = `STEP`
Class	Define the part class number.	`1`

Step type Type of the steps created. Options are:

- **Steps**: The steps are created from the steel pan that is defined on the **Steps** tab.
- **Catalogue step**: The steps are created from the profile defined in the **Catalogue step** field. The options on the **Steps** and **Bracket** tabs are ignored.

Create assembly Specifies which parts of the stair component form an assembly:

- **No**
- **All**
- **Stringers** (default)

Stringer reference line Specifies a reference line for the stringers. The reference line will be used for the workshop drawings. Options are:

- **Above**: The line positioned on the inside of the stair on the top face is used as the reference line.
- **Nosing**: The nosing line of the steps is used as the reference line.

Steps rotation Sets the rotation of the step around its axis. Options are:

- **Front**
- **Top** (default)
- **Back**
- **Below**

Position in plane Sets the position of the stairs on plane referenced to the middle line of the steps. Options are:

- **Left**
- **Middle**
- **Right** (default)

Offset Sets the offset of the stairs on plane from the position that is set in the **Position in plane** field. The default offset is 0 mm.

Stringer rotation Sets the rotation of the stringer around its axis. Options are:

- **Front**
- **Top** (default)
- **Back**
- **Below**

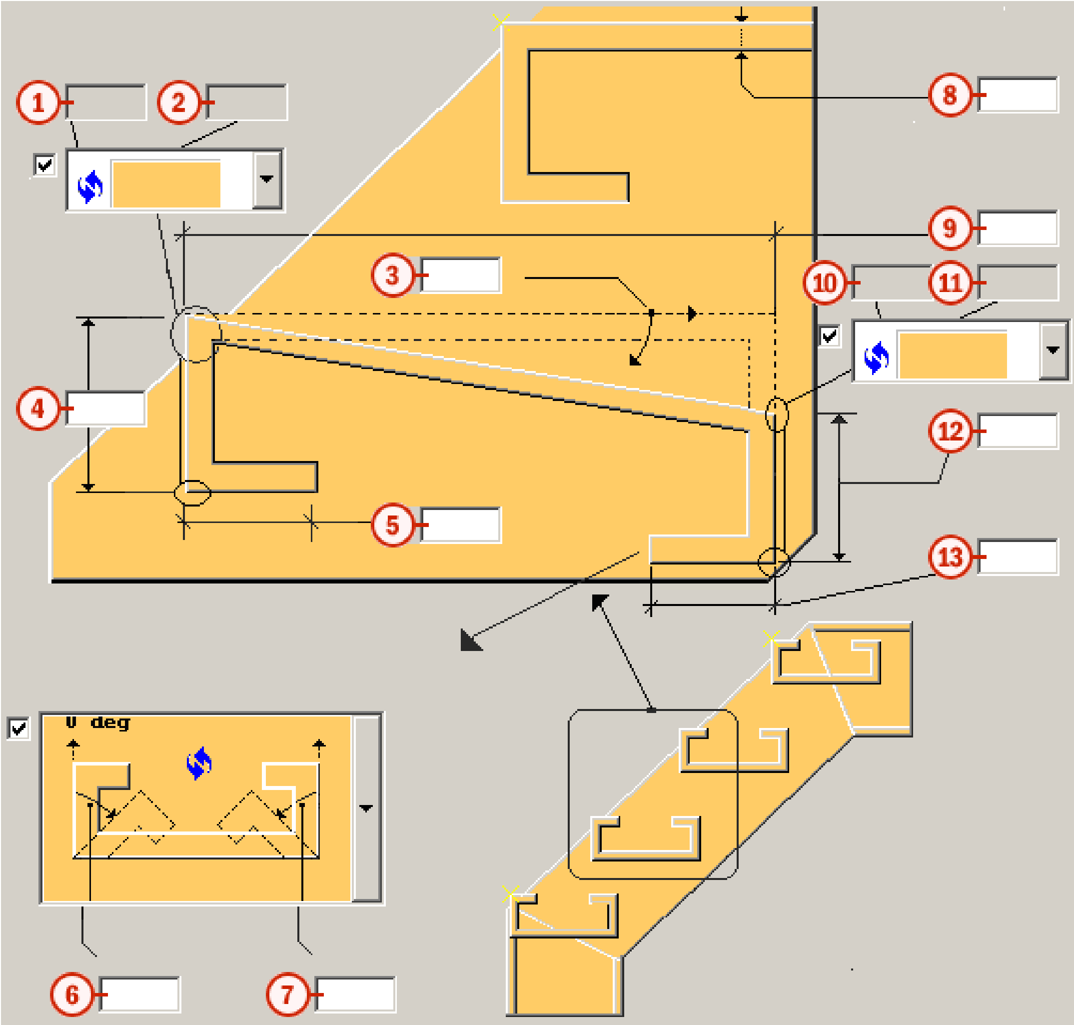
Create top step Specifies whether to create the first step of the stair (the highest step).

Create bottom step Specifies whether to create the last step of the stair (the lowest step).

Stairs (S71): Steps tab

Use **Steps** tab to control the shape and size of U-pan steps. Instead of U-pan, you can create the steps by using a catalog profile or custom part or component.

U-pan step dimensions You can enter following dimensions for U-pan steps.



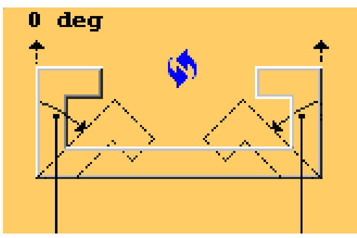
	Description	Default
1 2 10 11	The chamfer values on both sides of the step. If **Chamfer type** is set to **No chamfer**, the corresponding chamfer dimension fields are disabled.	`15 mm`
3	Angle of the thread relative to a horizontal line. The angle can be positive or negative.	`0 (zero) degree`
4 12	Height of the thread.	`100 mm`
5	Length of the horizontal portion of the U-pan.	`50 mm`

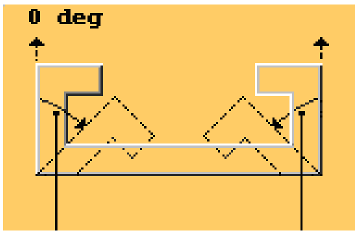
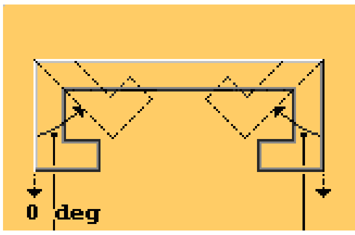
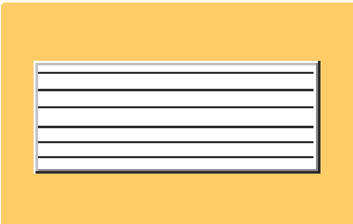
	Description	Default
13		
6 7	Angle of the vertical portion of the thread relative to the vertical line. The angle can be positive or negative.	`0 (zero) degree`
8	Thickness of the U-pan step material.	`10 mm`
9	Width of the step.	`Calculated` `Bracket length * 1/0.7`

Chamfer type Sets the shape of the front and back corner of the step. The options are:

Option	Description
	Default
	No chamfer
	Line
	Convex arc
	Concave arc

Step type Defines the type of step. The options are:

Option	Description
	Default

Option	Description
	U Pan legs up
	U Pan legs down
	Custom When selected the corresponding fields from Custom profile become available.

Step profile Select the catalog profile to be used as steps. These fields are only available if **Step type** is set to **Custom**.

Part name	Default profile	Default name
Step profile	Created only if **Step type** is set to **Custom** and the **Custom part name/no** is empty.	`PL100*80`
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Plate material grade.	The part gets the material grade defined in the Setup Preferences.
Name		`STEP`

Custom Select the custom connection or custom part to be used as steps. These fields are only available if **Step type** is set to **Custom**.

Part name	Default profile	Default
Part name/joint no.	Click ... to open the **Component catalog**, select a custom part or connection, and click **OK**.	
Attribute file	Enter the file name of the custom connection or part properties.	`standard`
Vertical position	Sets the depth position of the step created as a custom part. If the selected component is a custom connection, this field is ignored.	**Middle**
Horizontal position	Sets the on plane position of the step created as a custom part. If the selected component is a custom connection, this field is ignored.	**Middle**

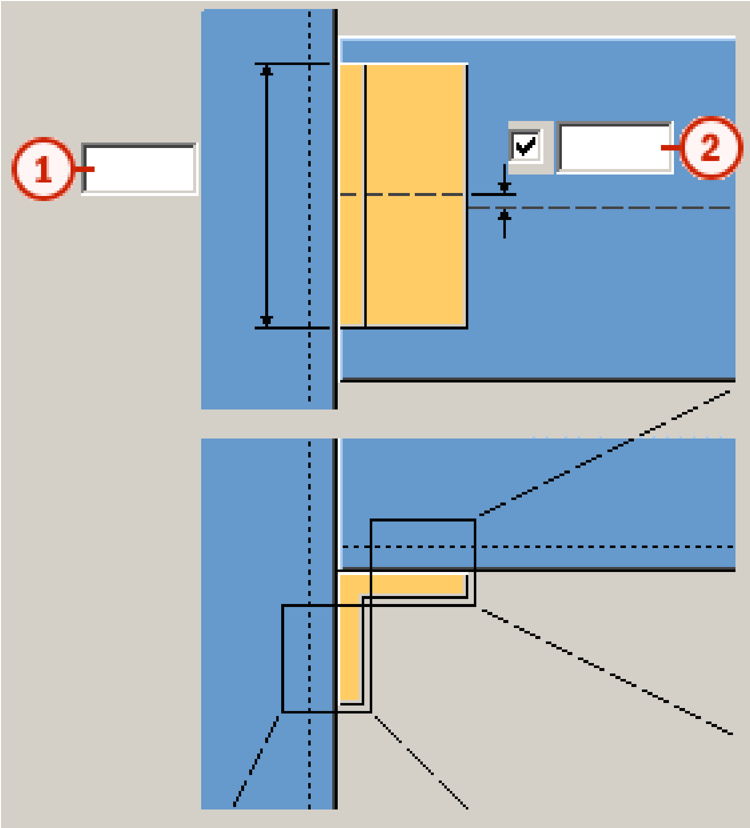
Stairs (S71): Bracket tab

The **Bracket** tab contains fields for setting up brackets and the connection between the brackets and the steps and stringers. The brackets are supporting angle profiles underneath the treads.

L profile

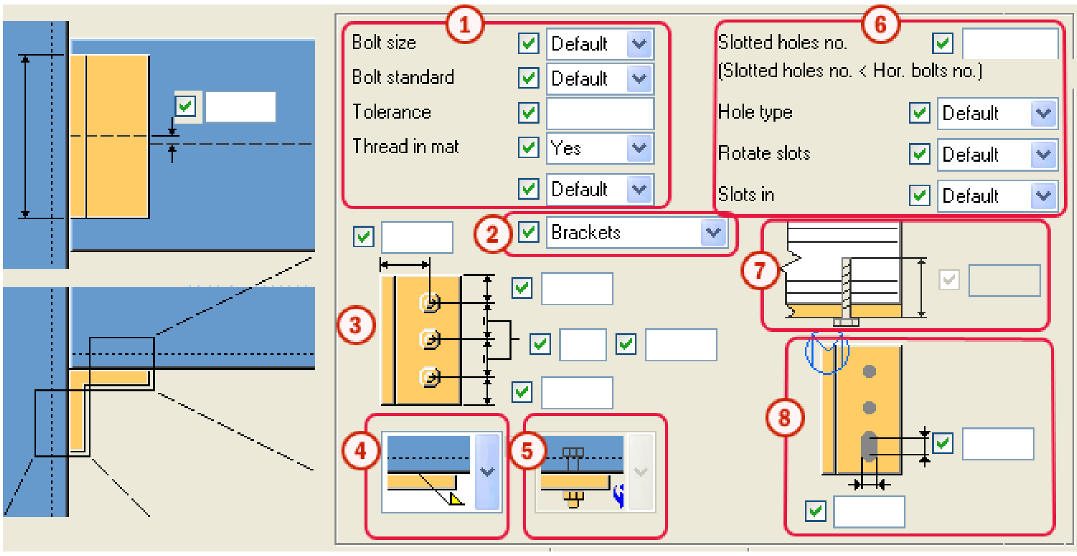
Part name	Description	Default
L profile	Created only if brackets are created. For more information, see **Bracket-to-step connection** below.	BLL80*80*10
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name		L_Profile
Class		1

Bracket dimensions



	Description
1	The length of the bracket. The default length is calculated according to bracket-to-step or bracket-to-stringer bolt dimensions, depending which one is bigger.
2	The dimension to offset the bracket from the center line of the thread. The default is 0 mm.

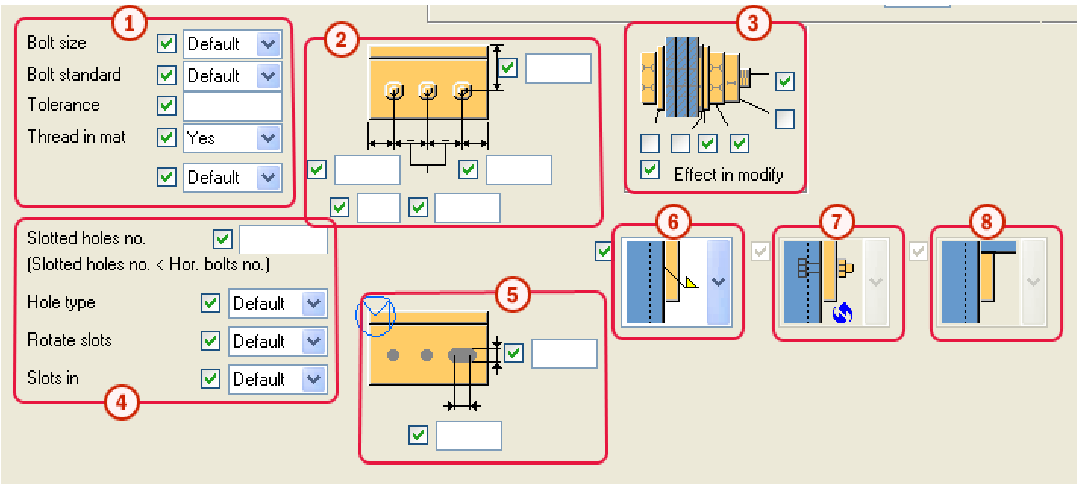
Bracket-to-step connection Use the following fields to define the properties of the bolts connecting the bracket to the step.

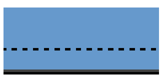


	Description	Default
1	Bolt group basic properties.	
2	Defines whether to create the brackets. • **Brackets** • **No Brackets**	
3	Bolt group dimensions.	
4	Sets the type of connection between steps and brackets.	Bracket to step connection type on page 873
5	Sets the direction of the bolts.	
6	Slotted hole properties.	
7	Sets the exact length of the bracket-to-step bolts.	This field is only available in the **Stairs (S71)** component, if Step type on the **Steps** tab is set to **Custom** step.
8	The dimensions of the slotted hole.	

Bracket-to-stringer connection

Use the following fields to define the properties of bolts connecting the bracket to the stringer.

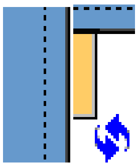
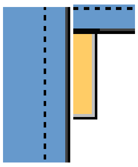
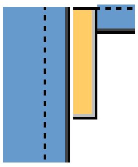


	Description	Default
1	The basic properties of the bracket-to-stringer bolt group.	
2	Edge distances, number of bolts, and bolt spacing dimensions.	
3	Bolt assembly.	
4	Slotted hole properties.	
5	Dimensions of the slotted hole.	
6	Sets the type of connection between the stringer and the brackets.	Bracket to stringer connection type on page 874
7	Sets the direction of bolts.	
8	Sets the position of the brackets: below the step or between the step and the stringer. This field is available only if the bracket is created as a plate instead of an angle. 	

Bracket position

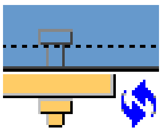
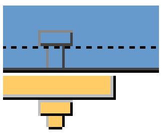
Sets the position of the plate-type bracket. The bracket can be positioned below the step or between the step and the stringer.

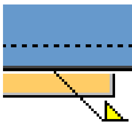
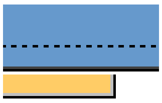
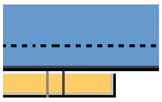
This field is available only if the bracket is a created as a plate instead of an angle.

Option	Description
	Default.
	Below the step.
	Between the stringer and step.

Bracket to step connection type

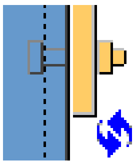
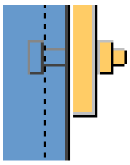
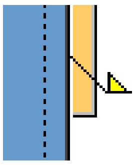
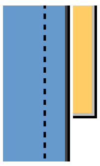
Sets the type of connection between steps and brackets.

Option	Description
	Default.
	Bolted.

Option	Description
	Welded.
	No connection.
	No bracket angle leg. The bracket is a plate instead of an angle.
	Holes only.

Bracket to stringer connection type

Sets the type of connection between stringers and brackets.

Option	Description
	Default.
	Bolted.
	Welded.
	No connection.

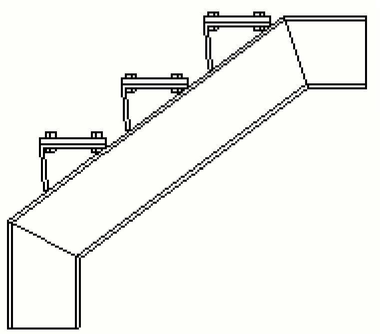
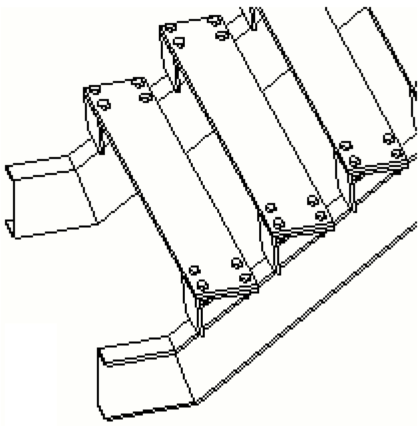
12.2 Wooden steps pan (S72)

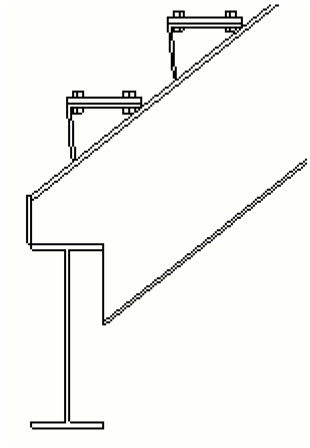
Creates straight stairs with optional upper and lower landings. The stairs consist of stringers, possible landings and the actual steps.

Objects created

- Stringers
- Steps
- Landings (optional)
- Brackets
- Plates to the stringer ends (optional)
- Bolts
- Welds

Use for

Situation	Description
	Stairs with wooden steps. Vertical bottom landing type.
	Stairs with C-shaped stringers. Horizontal bottom landing type. Wooden steps are bolted to steel brackets.

Situation	Description
	Stairs with stringers notched to the supporting beam.

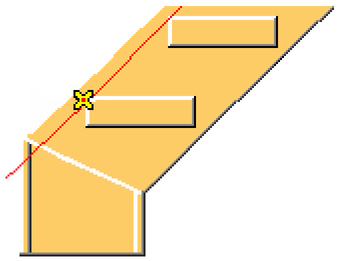
Limitations

If you modify the component, all connected components will be deleted, so modifying stairs deletes the stanchions, railings etc. components connected to it.

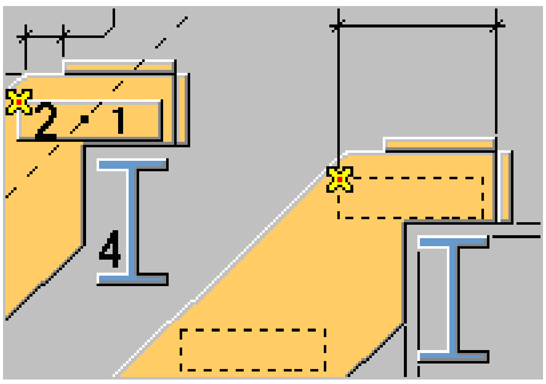
Before you start If the stringers are notched to bear on the supporting beams, create the supporting beams before creating the stairs.

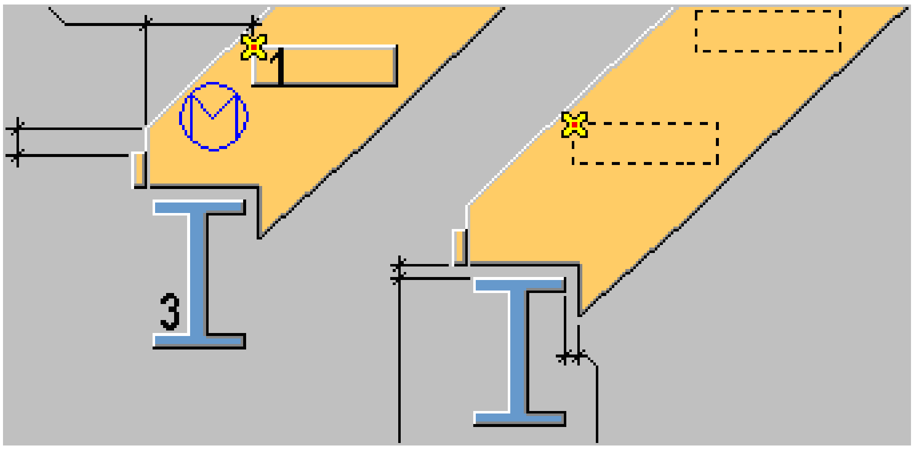
Selection order

1. Pick a point to indicate the nosing point of the first step.



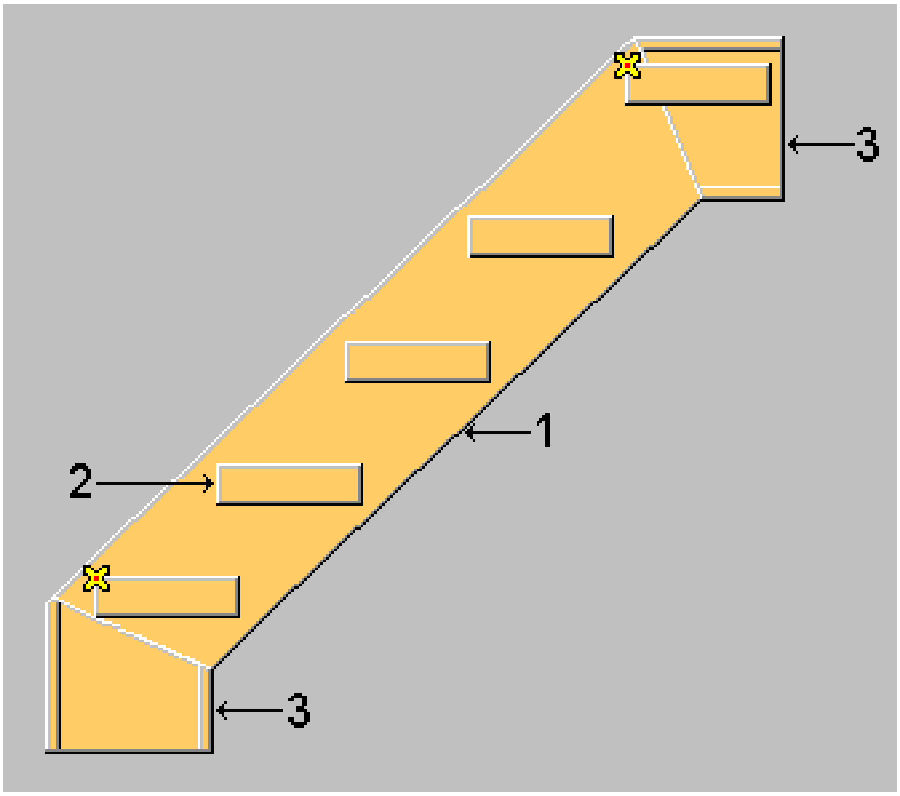
2. Pick another point to indicate the nosing point of the last step.
3. Click the middle mouse button, or if you have selected the following options on the **Picture** tab, pick the supporting beams and then click the middle mouse button.





The order in which the points are picked has no effect.

Part identification key



Number	Part
1	Stringer
2	Step
3	Landings

See also Wooden steps pan (S72): Picture tab on page 878

Wooden steps pan (S72): Stair setup tab on page 883

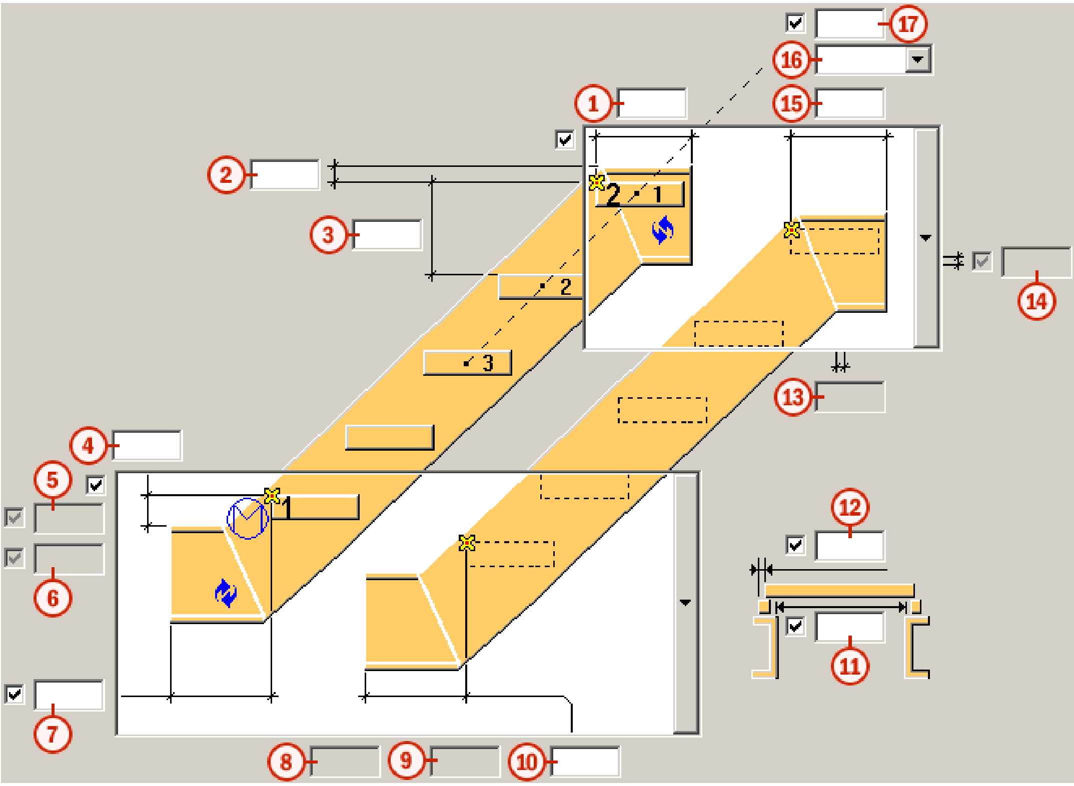
Wooden steps pan (S72): Bolts tab on page 886

Wooden steps pan (S72): Wooden pan tab on page 888

Wooden steps pan (S72): Picture tab

Use **Picture** tab to control the stringers geometry and the steps nosing points in **Wooden steps pan (S72)** component.

Stair dimensions



	Description	Default
1	The distance between the upper point and the end of the left upper landing. If the value is set to 0 mm, the left upper landing is not created. If **Top landing type** is set to **Notched**, this field sets the gap for the horizontal plate, taken from the stringer edge.	0 mm

	Description	Default
2	The vertical distance from the upper point to the top of steel (TOS) of the upper landing. If the upper landing is not created, the stringers TOS is used. If **Top landing type** is set to **Notched**, this field sets the vertical distance from the upper point to the stringer top horizontal cut.	`200 mm`

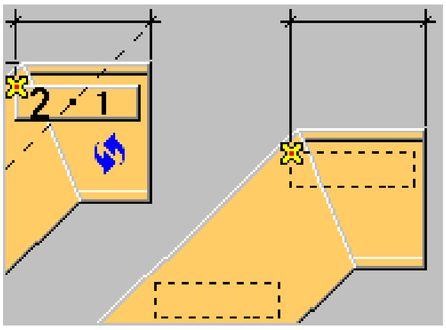
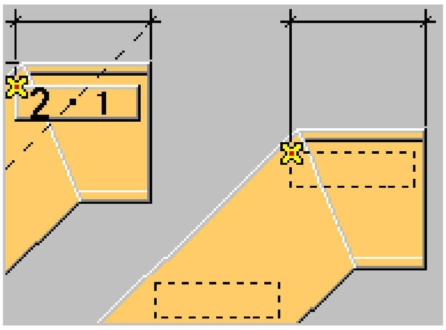
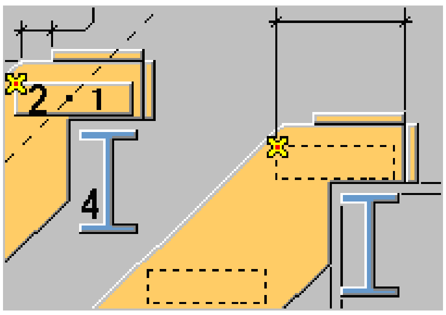
3	The maximum distance allowed between two consecutive steps. The resulting spacing between steps is calculated using the steps spacing type (18) and the number of steps (19).
	
	Dimension field that sets the maximum allowed distance between 2 consecutive steps. The resulting spacing between steps is calculated using also the steps spacing type (16) and the number of steps (17).
	
	If a step height of 200 mm is required, using the Exact setting will create steps of exactly this height (the number of stairs required is input as an integer), whereas the Equal setting will create the required number of stairs from the bottom to the top, with the height calculated as close to 200 mm as possible.
		`(Z*220)/(Z+220) mm,`
		
		`where Z is the vertical distance between the 2 picked points.`

4	Dimension field that depends of the Dog Leg options list. If the Dog Leg is Horizontal or Horizontal Lowered Working Point, this field sets the VERTICAL distance between the lower picked point and the TOS of the Dog Leg. If the Dog Leg is Vertical or Vertical Lowered Working Point, this field sets the HORIZONTAL distance between the lower picked point and the most distant face of the Dog Leg. If No Dog Leg is selected then this field sets the horizontal distance from lower picked point to the stringer vertical cut. By default the cut is made at the suporting member edge.	`150 mm`
5	Dimension field that depends of the Dog Leg options list and steps spacing type field (16). This field is used only if steps spacing type field (16) is set on Equal. If the Dog Leg is Vertical Lower Working Point or Dog Leg Horizontal Lower Working Point this field sets the vertical distance from lower picked point to the first step.	`equal with vertical spacing between steps`
6	This field sets the gap for vertical plate, taken from the stringer edge	`0 mm`

	Description	Default
7 10	Dimension field that depends of the Dog Leg options list. If the Dog Leg is Horizontal or Horizontal Lower Working Point, this field sets the HORIZONTAL distance between the lower picked point and the end of the Dog Leg. If the Dog Leg is Vertical or Vertical Lower Working Point, this field sets the VERTICAL distance between the lower picked point and the lowest point of the Dog Leg. If No Dog Leg is selected then this field is not used.	600 mm
8	Vertical gap between lower suporting member and the stringer cut. Used only if lower landing is set on No Dog Leg.	0 mm
9	Horizontal gap between lower suporting member and the stringer cut. Used only if lower landing is set on No Dog Leg.	0 mm
11	Dimension field that shortens the steps equally on both sides.	0 mm
12	Dimension field that sets the length of the steps.	1000 mm
13	Horizontal gap between upper suporting member and the stringer cut. Used only if upper landing is set on No Landing.	0 mm
14	Vertical gap between lower suporting member and the stringer cut. Used only if upper landing is set on No Landing.	0 mm
15	This field depends of the upper landing options list. Dimension field that sets the distance between the upper picked point and the end of the. If the value is set to 0 mm, the upper landing is not created. If No Landing is selected then this field sets the horizontal distance from upper picked point to the stringer vertical cut. By default the cut is made at the suporting member edge.	0 mm
16	Options list that sets how the vertical spacing between the steps is considered. Options are: Exact, Equal If Exact and Horizontal or Vertical Lower Working Point is selected on Dog Leg options list then the steps are spaced starting from upper picked point to lower picked point; in all other cases the steps are spaced from lower picked point to upper working point.	Equal

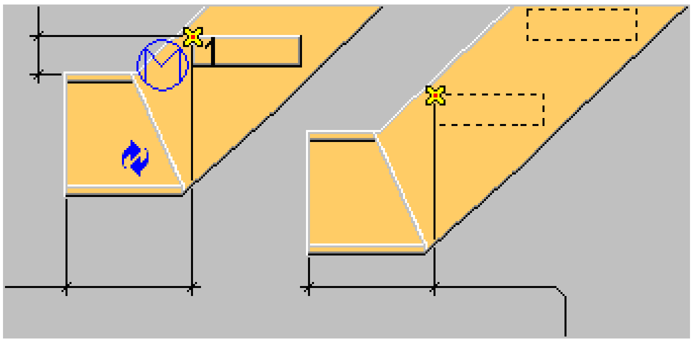
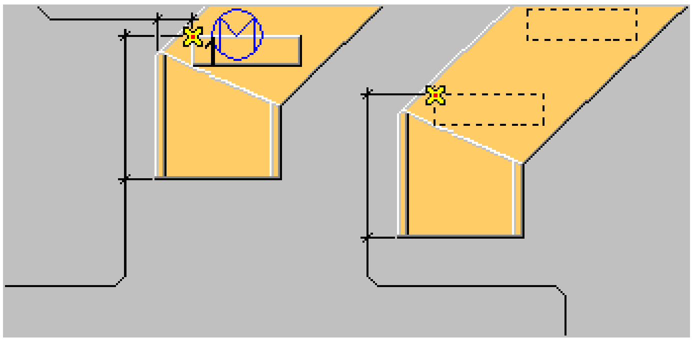
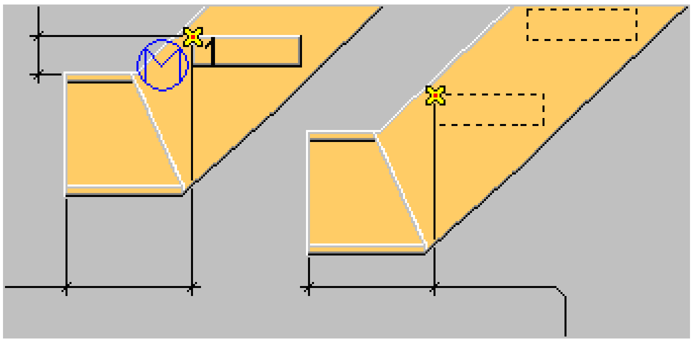
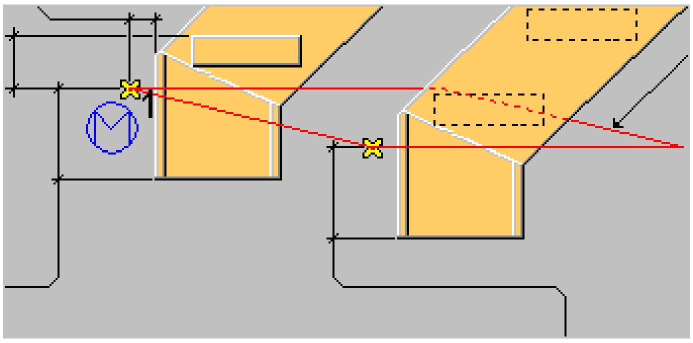
	Description	Default
17	Number field that sets the number of steps depending of steps spacing type (16) and steps spacing dimension (3). If steps spacing type is set on Exact or steps spacing type is set on Equal and spacing dimension is not Default, then the number of steps created will be equal to the number of steps you define.	`Calculated from the vertical distance between the 2 picked points and the spacing between steps (3)`

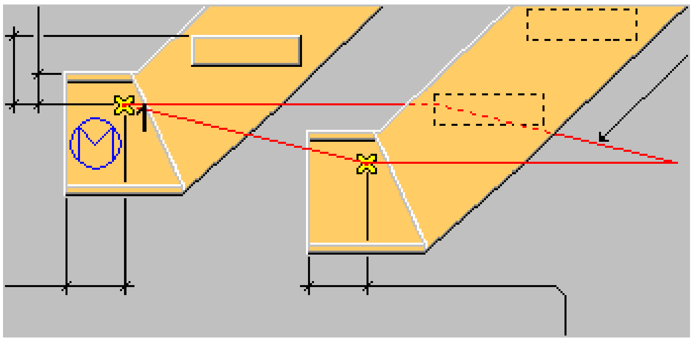
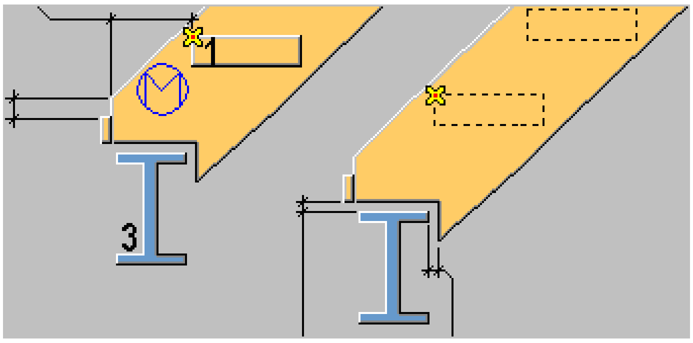
Top landing type Specifies the type of the stringer top part. The options are:

Option	Description
	Default
	Horizontal landing
	Notched Top of the stringer is on the supporting member. Vertical and horizontal plates are welded at the end of the stringer.

Bottom landing type

Specifies the type of the stringer lower part. The options are:

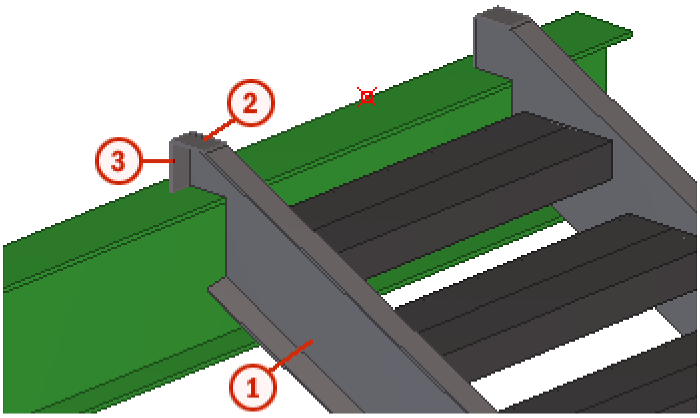
Option	Description
	Default
	Vertical Creates vertical landing where the lower point picked is on the last step top plane.
	Horizontal Creates horizontal landing where the lower point picked is on the last step top plane.
	Vertical lowered point The point is at top of steel or finish floor.

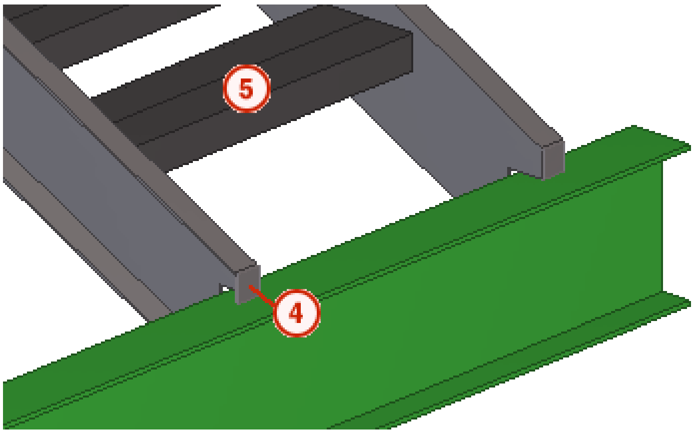
Option	Description
	Horizontal lowered point The point is at top of steel or finish floor.
	Notched Copes the bottom of the stringer to bear on the supporting member. A vertical plate is welded at the end of the stringer.

Wooden steps pan (S72): Stair setup tab

Use **Stair setup** tab to control the properties of parts the **Wooden steps pan (S72)** component creates. It also defines whether the top or bottom steps are created, what is the position of the stairs on the horizontal plane and how the stringers and the steps are rotated.

Stair part properties





Stair part	Description	Default profile / thickness
Stringer 1	Always created.	`BLU400*200*10`
Upper H plate 2	Created only if the top of the stringers is on the supporting beam.	`6 mm`
Upper V plate 3	Created only if the top of the stringers is on the supporting beam.	`6 mm`
Lower V plate 4	Created only if the bottom of the stringers is on the supporting beam.	`6 mm`
Catalog step 5	Only available in the **Stairs (S71)** component. Created only if **Step Type** is set to **Catalogue step**. In this case the U-pan steps, brackets, and bolts defined in the other tabs are ignored.	First profile from the Catalogue list, defined in the `steps.dat` text file in the `..\Tekla Structures\<version>\environments\<environment>\system` folder. The list changes according to the selected environment.

Option	Description	Default
Pos_No	To ensure correct numbering, define a prefix and a start number for the part position number of stair parts. Enter the assembly position number of the stair parts on the second row.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	**Stringer** = `STRINGER` **Upper H plate** = `PLATE` **Upper V plate** = `PLATE` **Lower V plate** = `PLATE` **Catalog step** = `STEP`
Class	Define the part class number.	`1`

Create assembly Specifies which parts of the stair component form an assembly:

- **No**
- **All**
- **Stringers** (default)

Stringer reference line Specifies a reference line for the stringers. The reference line will be used for the workshop drawings. Options are:

- **Above**: The line positioned on the inside of the stair on the top face is used as the reference line.
- **Nosing**: The nosing line of the steps is used as the reference line.

Steps rotation Sets the rotation of the step around its axis. Options are:

- **Front**
- **Top** (default)
- **Back**
- **Below**

Position in plane Sets the position of the stairs on plane referenced to the middle line of the steps. Options are:

- **Left**
- **Middle**

- **Right** (default)

Offset Sets the offset of the stairs on plane from the position that is set in the **Position in plane** field. The default offset is 0 mm.

Stringer rotation Sets the rotation of the stringer around its axis. Options are:

- **Front**
- **Top** (default)
- **Back**
- **Below**

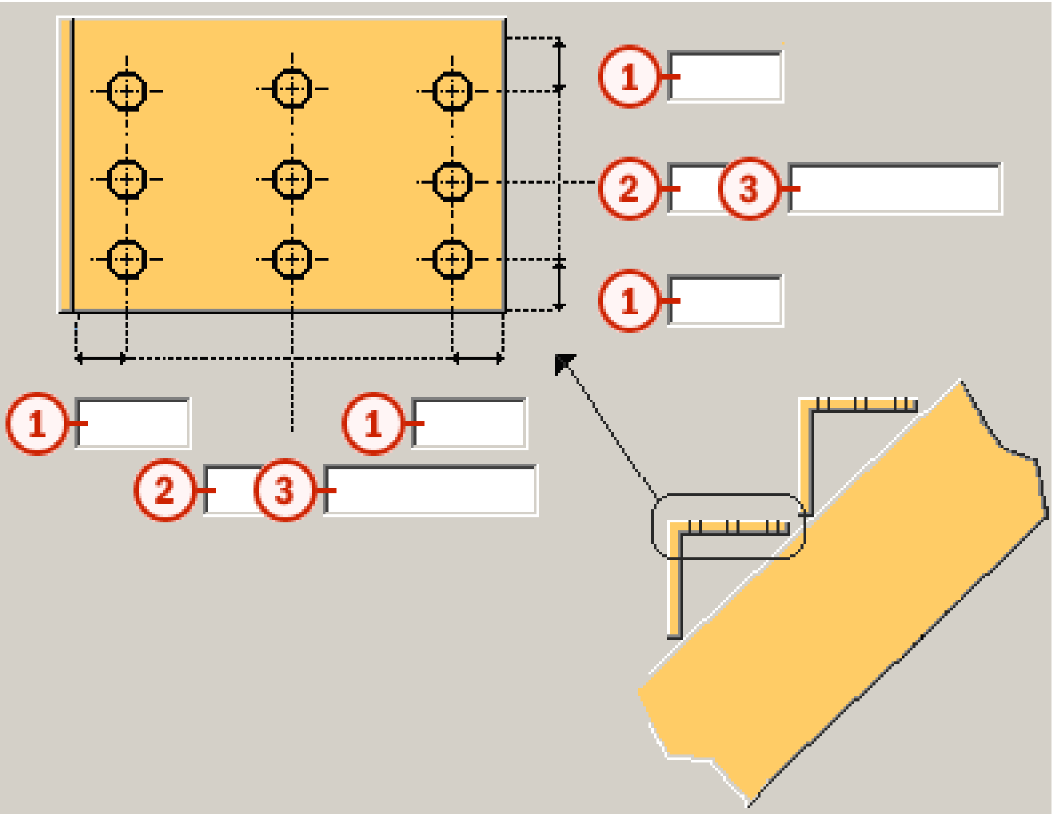
Create top step Specifies whether to create the first step of the stair (the highest step).

Create bottom step Specifies whether to create the last step of the stair (the lowest step).

Wooden steps pan (S72): Bolts tab

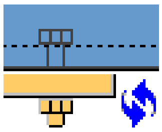
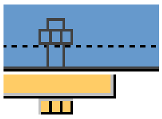
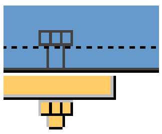
Use **Bolts** tab to control the properties of the bolt group connecting wooden steps to the brackets in the **Wooden steps pan (S72)** component.

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`

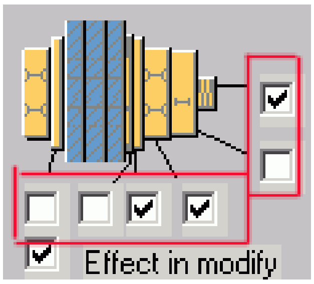
Bolting direction Use to change the direction of bolts.

Option	Description
	Default.
	Bolted from the bracket to the step.
	Bolted from the step to the bracket.

Bolt basic properties

Field	Description	Default
Bolt size	Bolt diameter.	`20 mm`
Bolt standard	The bolt standard to be used inside the component.	`7990`
Tolerance	The gap between the bolt and the hole.	`2 mm`
Thread in mat	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`
Site/Workshop	Location where the bolts should be attached.	`Site`

Bolt assembly Select checkboxes to define the component objects to be used in the bolt assembly (bolt, washers, and nuts).



To create only a hole, clear all checkboxes.

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

Wooden steps pan (S72): Wooden pan tab

The **Wooden pan** tab contains fields for creating the steps and setting the properties of the folded plate brackets.

Step bracket

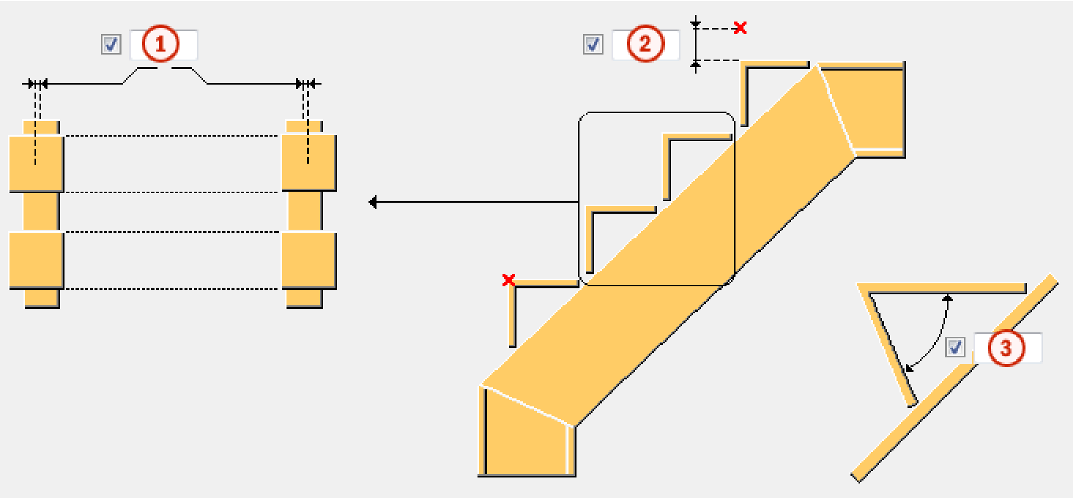
Field	Description	Default
t b h	Always created.	PL10*150
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name		BRACKET
Class		1

Step profile Step is created only if you define a profile name.

Field	Description	Default
t b h		No profile
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...**

Field	Description	Default
		--> **Components** tab, in the **Part material** field.
Name		STEP
Class		1

Bracket dimensions



	Description	Default
1	Offset dimension that moves the folded bracket plates relative to the center line of the stringer.	0 mm
2	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	Angle for the bracket to be folded, in degrees.	0

12.3 Polybeam pan (S73)

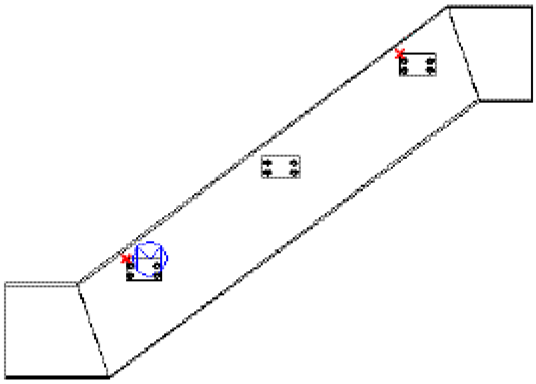
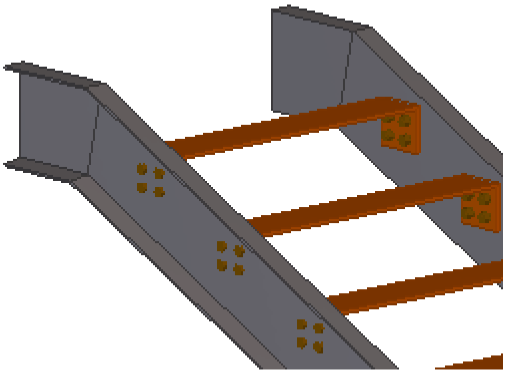
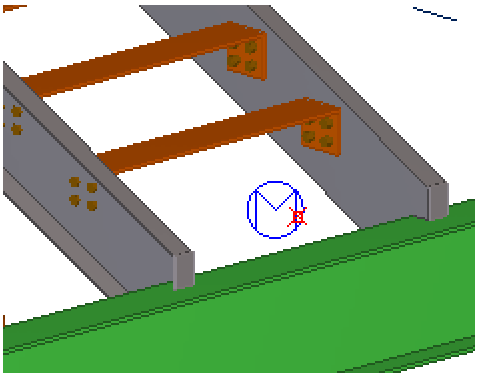
Creates straight stairs with optional top and bottom landings. The stairs consist of stringers, possible landings and the actual steps created with plate.

Objects created

- Stringers
- Steps
- Landings (optional)
- Cuts to notch the stringer (optional)
- Plates (optional)
- Bolts

- Welds

Use for

Situation	Description
	Polybeam pan stairs.
	Top of the stringer is created as horizontal landing.
	Bottom of the stringer is notched to bear on the supporting beam. The same option is also available for the top of the stringer.

Limitations

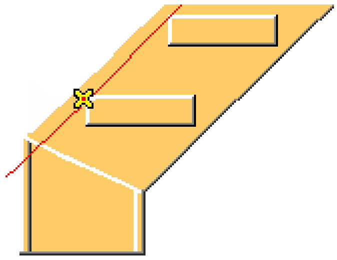
If you modify the component, all connected components will be deleted, so modifying stairs deletes the stanchions, railings etc. components connected to it.

Before you start

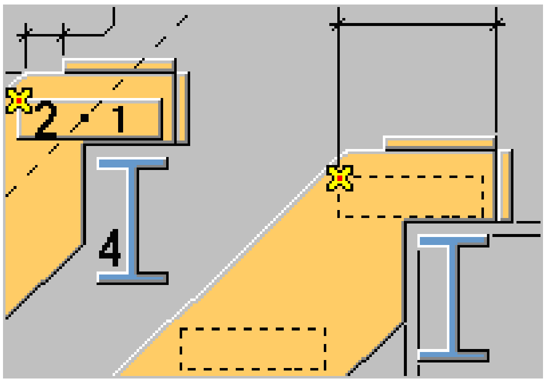
If the stringers are notched to bear on the supporting beams, create the supporting beams before creating the stairs.

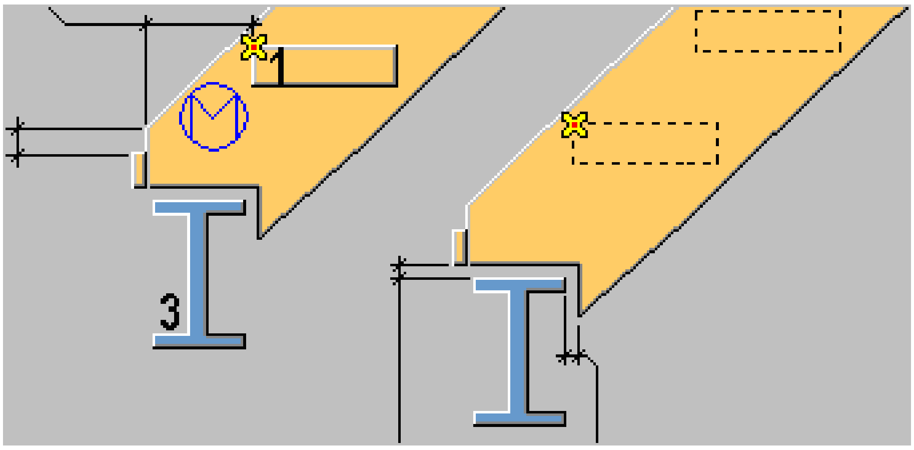
Selection order

1. Pick a point to indicate the nosing point of the first step.



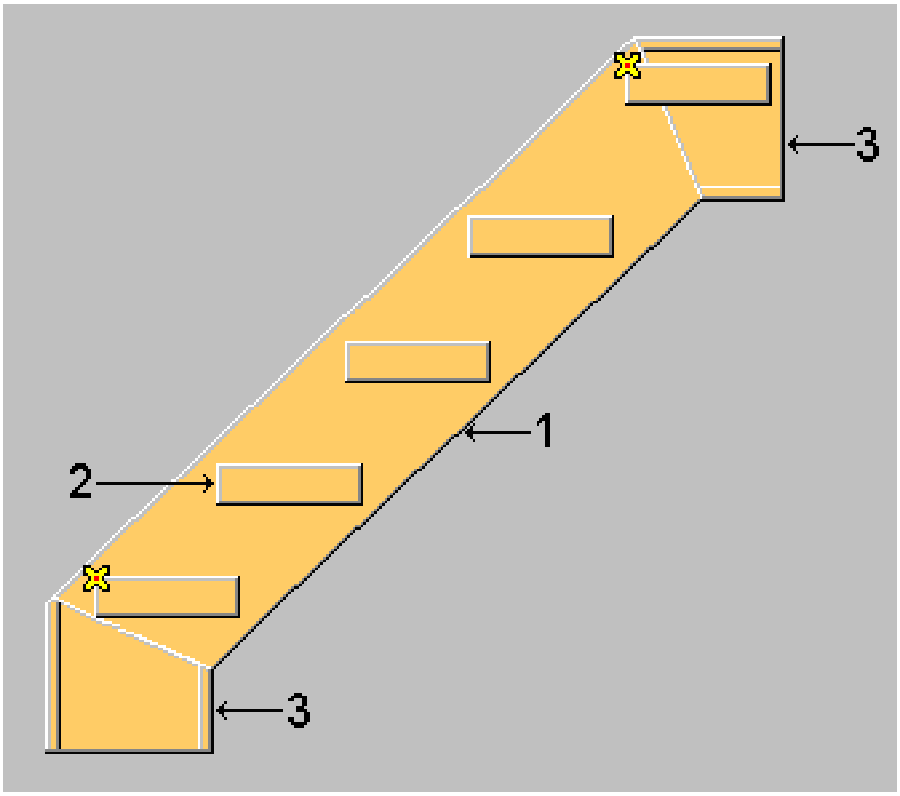
2. Pick another point to indicate the nosing point of the last step.
3. Click the middle mouse button, or if you have selected the following options on the **Picture** tab, pick the supporting beams and then click the middle mouse button.





The order in which the points are picked has no effect.

Part identification key



Number	Part
1	Stringer
2	Step
3	Landings

See also

Polybeam pan (S73): Picture tab on page 892

Polybeam pan (S73): Stair setup tab on page 898

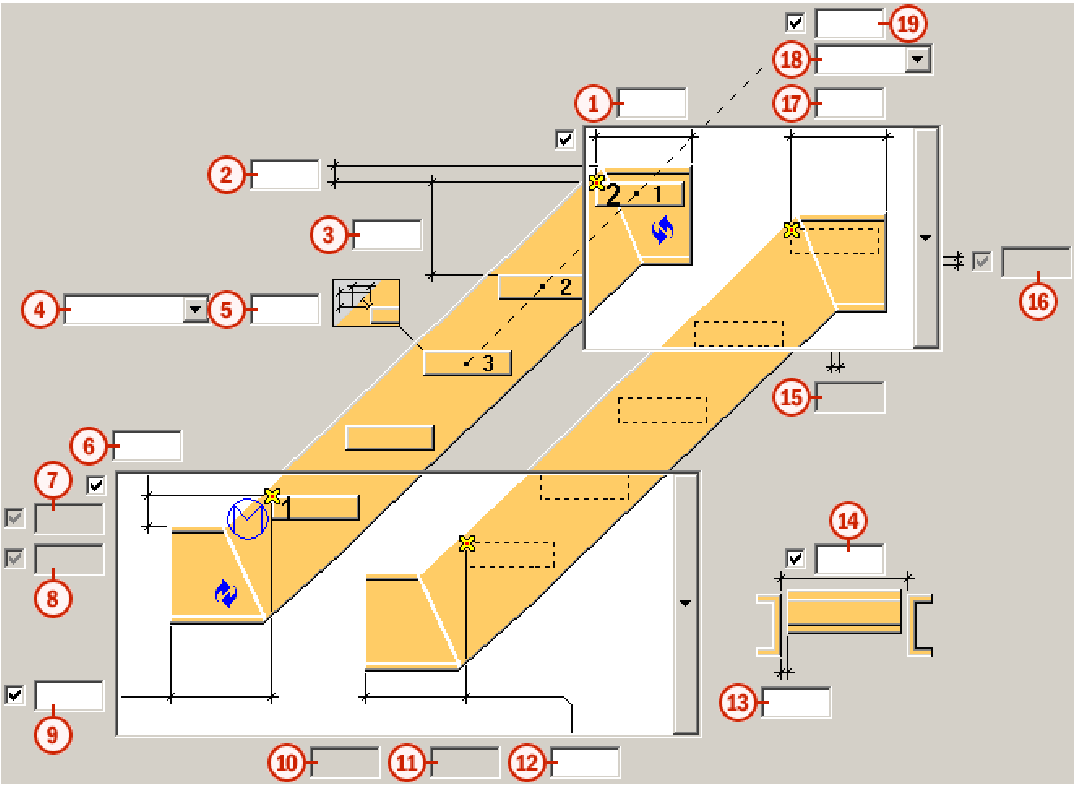
Polybeam pan (S73): Bolts tab on page 901

Polybeam pan (S73): Polybeam pan tab on page 904

Polybeam pan (S73): Picture tab

Use **Picture** tab to control the stringers geometry and the steps' nosing points in **Polybeam pan (S73)** component.

Stair dimension fields



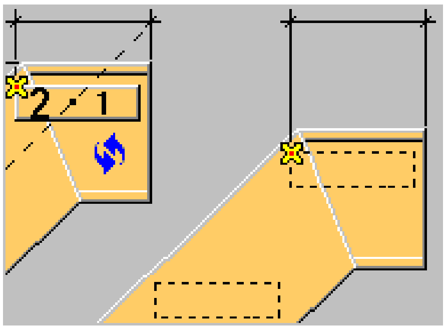
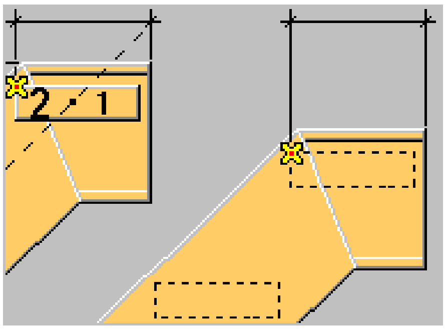
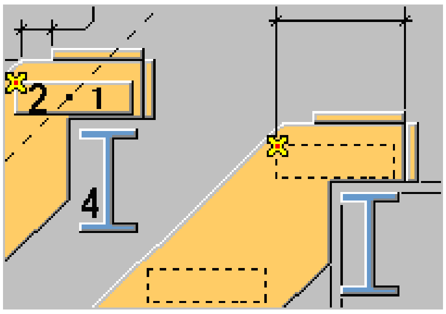
	Description	Default
1	The distance between the upper point and the end of the left upper landing. If the value is set to 0 mm, the left upper landing is not created. If **Top landing type** is set to **Notched**, this field sets the gap for the horizontal plate, taken from the stringer edge.	`0 mm`
2	The vertical distance from the upper point to the top of steel (TOS) of the upper landing. If the upper landing is not created, the stringers TOS is used. If **Top landing type** is set to **Notched**, this field sets the vertical distance from the upper point to the stringer top horizontal cut.	`200 mm`
3	The maximum distance allowed between two consecutive steps. The resulting spacing between steps is calculated using the steps spacing type (18) and the number of steps (19). If a step height of 200 mm is required, the **Exact** setting creates steps of exactly this height (the number of stairs required is entered as an integer), whereas the **Equal** setting creates the required number of stairs from the bottom to the top, with the height calculated as close to 200 mm as possible.	`(Z*220)/(Z+220) mm`, where Z is the vertical distance between the 2 picked points.

	Description	Default
4	The direction of the nosing dimension entered in the field 5. The options are: • **Vertical** • **Horizontal** • **Perpendicular** Not available in the **Wooden steps pan (S72)** component.	`Vertical`
5	The nosing dimension of the steps. The field 4 sets the direction for it. Not available in the **Wooden steps pan (S72)** component.	`0 mm`
6	Dimension field that depends on the selected **Bottom landing type** option: • With **Horizontal** or **Horizontal lowered point** this field sets the VERTICAL distance between the lower point and the TOS of the dog leg. • With **Vertical** or **Vertical lowered point** this field sets the HORIZONTAL distance between the lower picked point and the most distant face of the bottom landing. • With **Notched** option this field sets the horizontal distance from lower point to the stringer vertical cut. By default the cut is made at the supporting member edge.	`150 mm`
7	Dimension field that depends on the selected **Bottom landing type** option and step spacing type (18). This field is used only if steps spacing type field (18) is set to **Equal**. If the **Bottom landing type** is **Vertical lowered point** or **Horizontal lowered point** this field sets the vertical distance from lower picked point to the first step.	`Equal with vertical spacing between steps`
8	The gap for the vertical plate, taken from the stringer edge.	`0 mm`
9 12	Dimension field that depends on the selected **Bottom landing type** option: • With **Horizontal** or **Horizontal lowered point**, this field sets the HORIZONTAL distance between the lower point and the end of the bottom landing.	`600 mm`

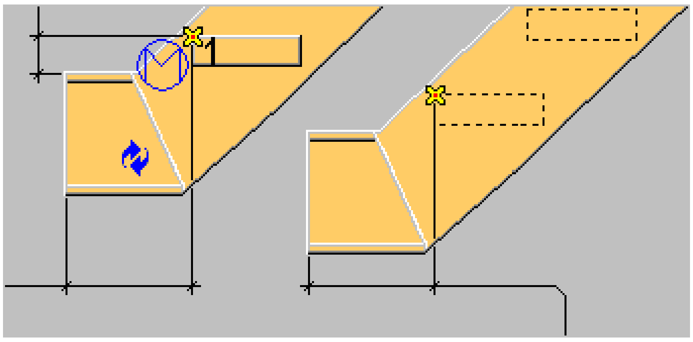
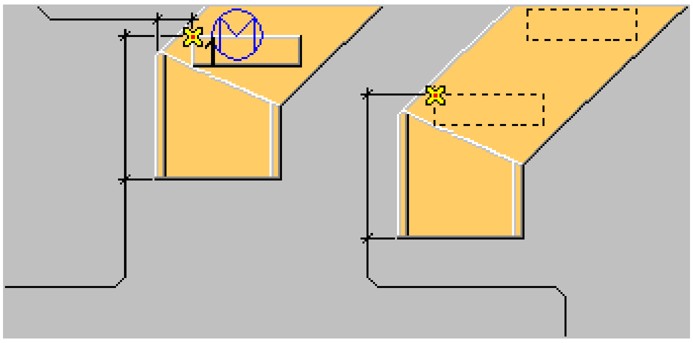
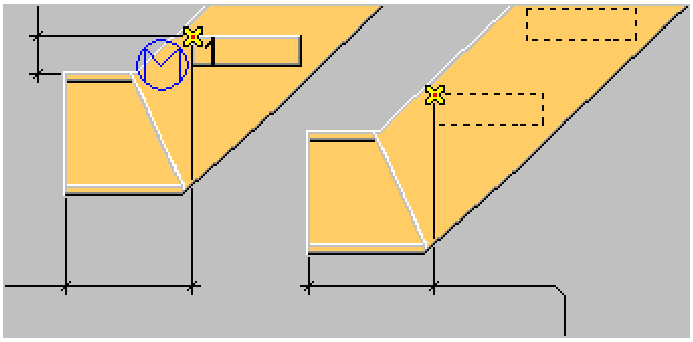
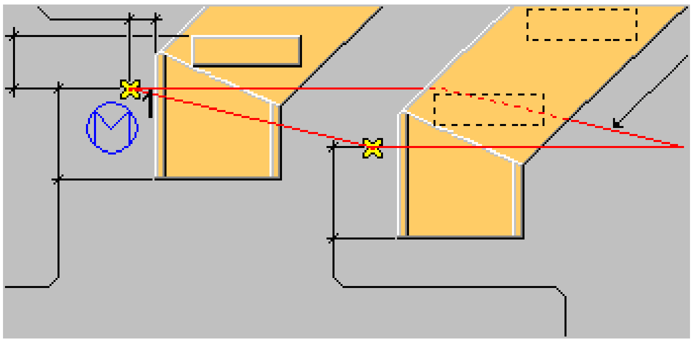
	Description	Default
	• With **Vertical** or **Vertical lowered point**, this field sets the VERTICAL distance between the lower point and the lowest point of the bottom landing. • With **Notched** this field is not used.	
10	The vertical gap between the lower supporting member and the stringer cut. Used only if **Bottom landing type** is set to **Notched**.	`0 mm`
11	The horizontal gap between the lower supporting member and the stringer cut. Used only if **Bottom landing type** is set to **Notched**.	`0 mm`
13	Dimension that shortens the steps equally on both sides.	`0 mm`
14	The width of the steps.	`1000 mm`
15	The horizontal gap between the upper supporting member and the stringer cut. Used only if **Top landing type** is set to **Notched**.	`0 mm`
16	The vertical gap between the upper supporting member and the stringer cut. Used only if **Top landing type** is set to **Notched**.	`0 mm`
17	The distance between the upper point picked and the end of the stringer. If the value is set to 0 mm, the upper landing is not created. This field depends on the selected **Top landing type**. If **Notched** is selected, sets the horizontal distance from the upper point picked to the stringer vertical cut. By default the cut is made at the supporting member edge.	`0 mm`
18	Step spacing type. Defines how the vertical spacing between the steps is calculated. The options are: • **Exact** • **Equal** If **Exact** is selected and **Bottom landing type** is set to **Horizontal** or **Vertical lower point**, the steps are spaced from the upper point to lower point. In all other cases the steps are spaced from lower point to the upper point.	`Equal`
19	The number of steps. Depends of step spacing type (18) and step spacing dimension (3). If step spacing type is set to **Exact** or step spacing type is set to **Equal** and spacing dimension is not **Default**, then	`Calculated from the vertical distance between`

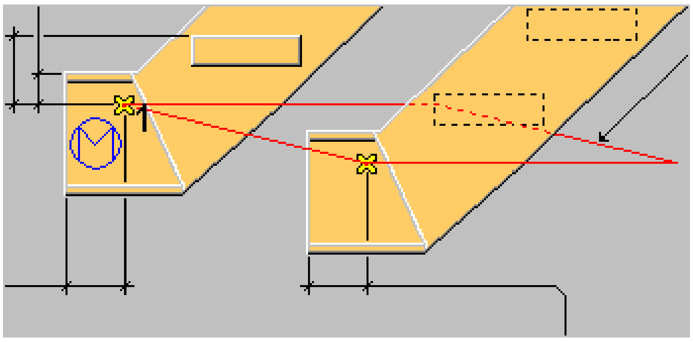
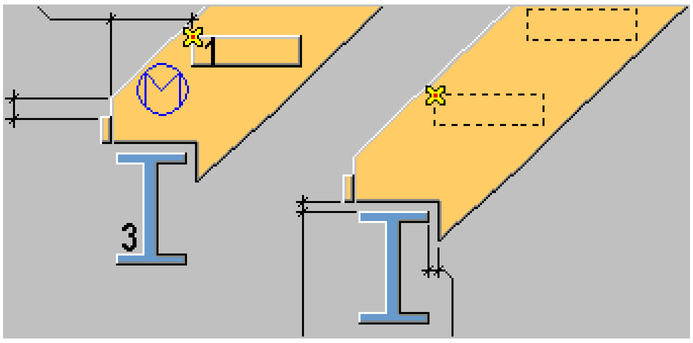
	Description	Default
	the number of steps created will be equal to the number of steps you define.	the picked points and the spacing between steps (3)

Top landing type Specifies the type of the stringer top part. The options are:

Option	Description
	Default
	Horizontal landing
	Notched Top of the stringer is on the supporting member. Vertical and horizontal plates are welded at the end of the stringer.

Bottom landing type Specifies the type of the stringer lower part. The options are:

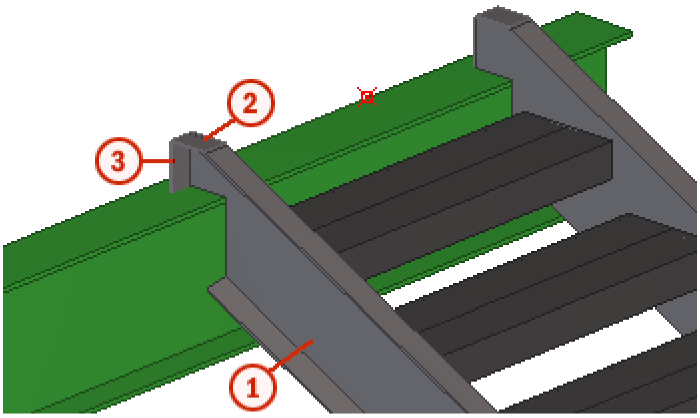
Option	Description
	Default
	Vertical Creates vertical landing where the lower point picked is on the last step top plane.
	Horizontal Creates horizontal landing where the lower point picked is on the last step top plane.
	Vertical lowered point The point is at top of steel or finish floor.

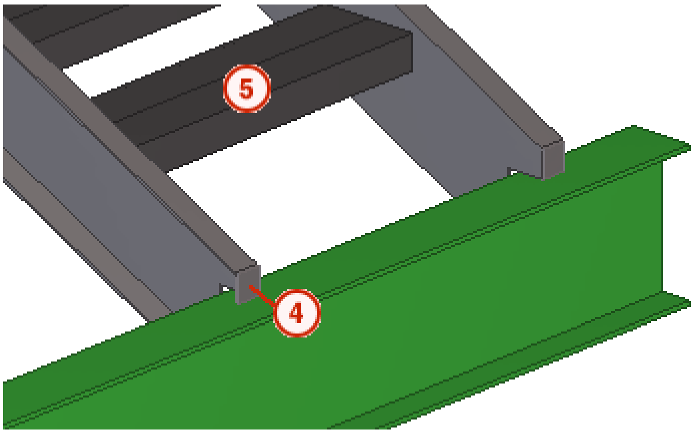
Option	Description
	Horizontal lowered point The point is at top of steel or finish floor.
	Notched Copes the bottom of the stringer to bear on the supporting member. A vertical plate is welded at the end of the stringer.

Polybeam pan (S73): Stair setup tab

Use **Stairs setup** tab to control the properties of parts the **Polybeam pan (S73)** component creates. It also defines whether the top or bottom steps are created, what is the position of the stairs on the horizontal plane and how the stringers and the steps are rotated.

Stair part properties





Stair part	Description	Default profile / thickness
Stringer 1	Always created.	`BLU400*200*10`
Upper H plate 2	Created only if the top of the stringers is on the supporting beam.	`6 mm`
Upper V plate 3	Created only if the top of the stringers is on the supporting beam.	`6 mm`
Lower V plate 4	Created only if the bottom of the stringers is on the supporting beam.	`6 mm`
Catalog step 5	Only available in the **Stairs (S71)** component. Created only if **Step Type** is set to **Catalogue step**. In this case the U-pan steps, brackets, and bolts defined in the other tabs are ignored.	First profile from the Catalogue list, defined in the `steps.dat` text file in the `..\Tekla Structures\<version>\environments\<environment>\system` folder. The list changes according to the selected environment.

Option	Description	Default
Pos_No	To ensure correct numbering, define a prefix and a start number for the part position number of stair parts. Enter the assembly position number of the stair parts on the second row.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	**Stringer** = `STRINGER` **Upper H plate** = `PLATE` **Upper V plate** = `PLATE` **Lower V plate** = `PLATE` **Catalog step** = `STEP`
Class	Define the part class number.	`1`

Create assembly Specifies which parts of the stair component form an assembly:

- **No**
- **All**
- **Stringers** (default)

Stringer reference line Specifies a reference line for the stringers. The reference line will be used for the workshop drawings. Options are:

- **Above**: The line positioned on the inside of the stair on the top face is used as the reference line.
- **Nosing**: The nosing line of the steps is used as the reference line.

Steps rotation Sets the rotation of the step around its axis. Options are:

- **Front**
- **Top** (default)
- **Back**
- **Below**

Position in plane Sets the position of the stairs on plane referenced to the middle line of the steps. Options are:

- **Left**
- **Middle**

- **Right** (default)

Offset Sets the offset of the stairs on plane from the position that is set in the **Position in plane** field. The default offset is 0 mm.

Stringer rotation Sets the rotation of the stringer around its axis. Options are:

- **Front**
- **Top** (default)
- **Back**
- **Below**

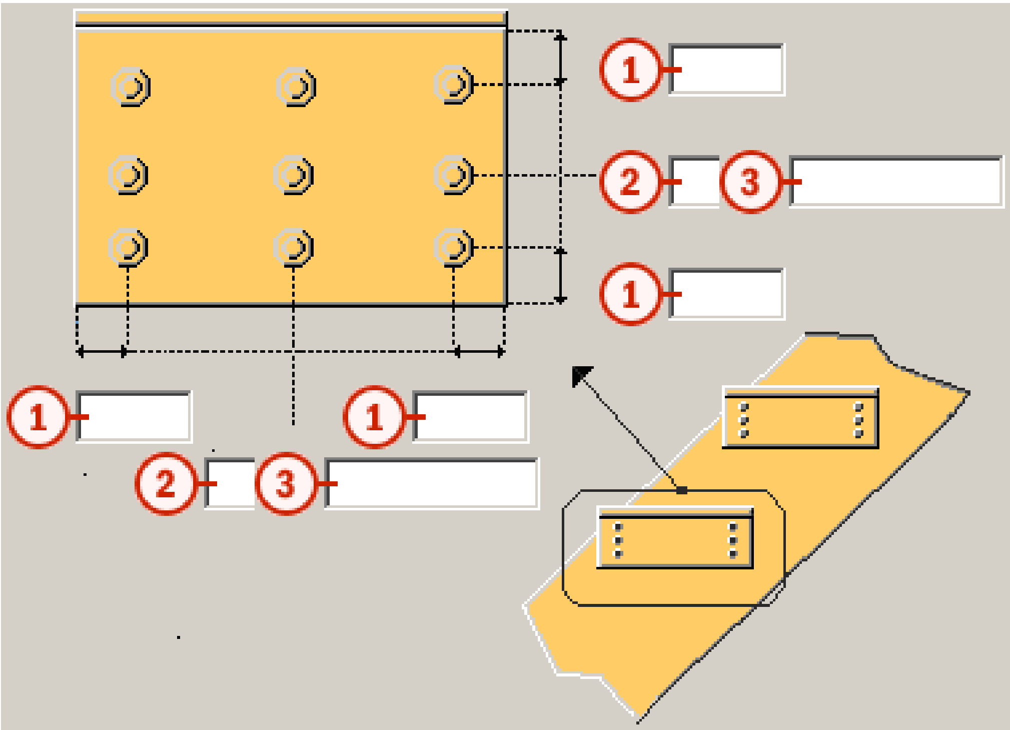
Create top step Specifies whether to create the first step of the stair (the highest step).

Create bottom step Specifies whether to create the last step of the stair (the lowest step).

Polybeam pan (S73): Bolts tab

Use **Bolts** tab to control the properties of bolt group connecting the steps to the stringers in the **Polybeam pan (S73)** component.

Bolt group dimensions The fields on the right side affect the vertical dimension of the step, if the field 1 in the **Polybeam Pan** tab is empty. Changing those values will change the step dimensions.

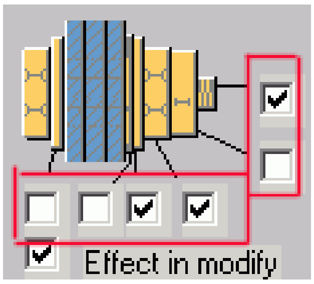


	Description	Default
1	Bolt edge distance.	`bolt diameter * 1.5`
2	Number of bolts.	`2`
3	Bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.	`100 mm`

Bolt basic properties

Field	Description	Default
Bolt size	Bolt diameter.	20 mm
Bolt standard	The bolt standard to be used inside the component.	7990
Tolerance	The gap between the bolt and the hole.	2 mm
Thread in mat	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
Site/Workshop	Location where the bolts should be attached.	Site

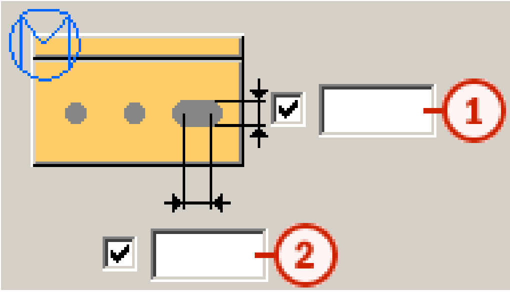
Bolt assembly Select checkboxes to define the component objects to be used in the bolt assembly (bolt, washers, and nuts).



To create only a hole, clear all checkboxes.

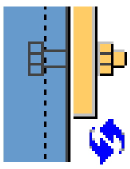
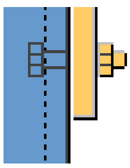
To modify the bolt assembly in an existing component, select the **Effect in modify** checkbox and click **Modify**.

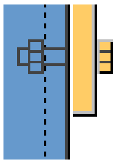
Slotted holes You can define slotted or oversize holes with the following options



Field	Description	Default
1	Slotted hole width.	0 mm
2	Slotted hole length.	bolt diameter + bolt tolerance
Slotted hole no	Number of bolt columns containing slotted holes.	0 (zero)
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	Slotted
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	Parallel
Slots in	Member(s) in which slotted holes are created. The options depend on the component.	Both

Bolting direction Use to change the direction of bolts.

Option	Description
	Default.
	Bolt from stringer to step.

Option	Description
	Bolt from step to stringer.

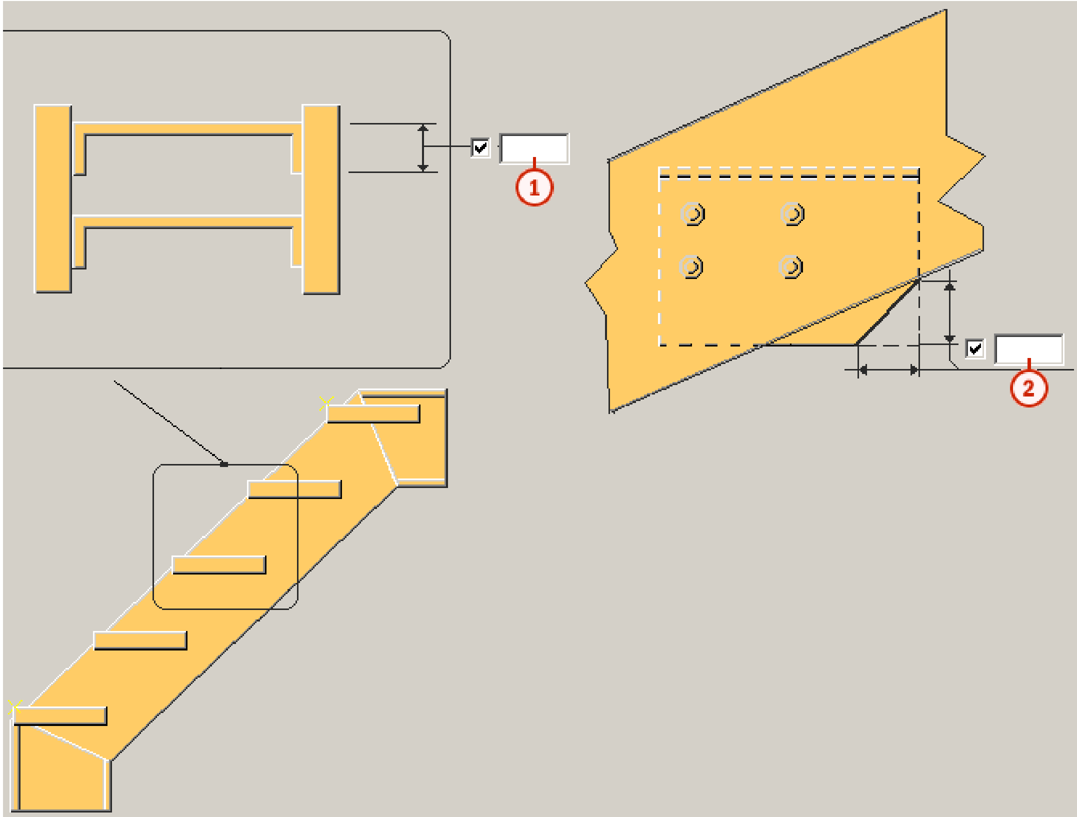
Polybeam pan (S73): Polybeam pan tab

Polybeam pan tab contains fields for setting the step profile and dimensions in the **Polybeam pan (S73)** component.

Plate profile

Field	Description	Default
Plate profile	Select the profile for the step plate.	PL10*150
Pos_No	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 on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name		STEP
Class		1

Step profile dimensions



	Description	Default
1	Height of the vertical part of the step.	Resulting value from bolts definition from fields 2, 3, 4, 5 on **Bolts** tab.
2	Creates symmetric chamfer for the back corner of the all step plates.	0 mm

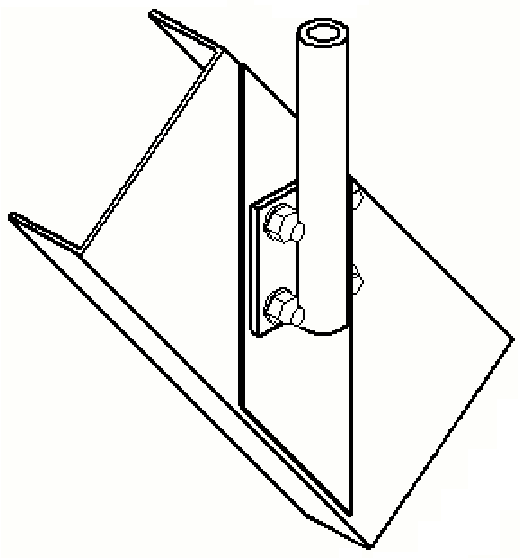
12.4 Handrail 1 (74)

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

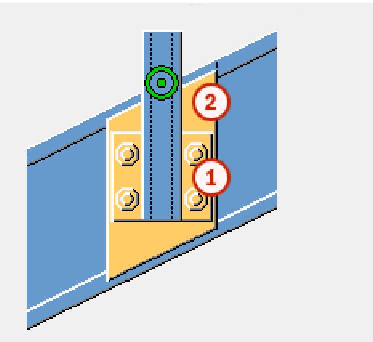
Situation	Description
	Beam to column connection.

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

See also

Handrail 1 (74): Picture tab on page 906

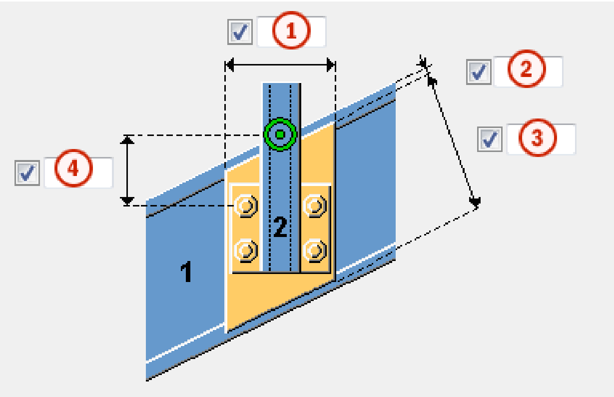
Handrail 1 (74): Parts tab on page 907

Handrail 1 (74): Bolts tab on page 908

Handrail 1 (74): Picture tab

Use the **Picture** tab to control the plate dimensions in the **Handrail 1 (74)** connection.

Plate dimensions



	Description
1	Define the horizontal dimension of the cover plate.
2	Define the distance between the upper edge of the cover plate and the beam flange.
3	Define the vertical dimension of the cover plate.
4	Define the bolt edge distance.

Handrail 1 (74): Parts tab

Use the **Parts** tab to control the plate properties in the **Handrail 1 (74)** connection.

Plate

Part	Description
Cover plate	Define the cover plate thickness.
End plate	Define the end plate thickness.

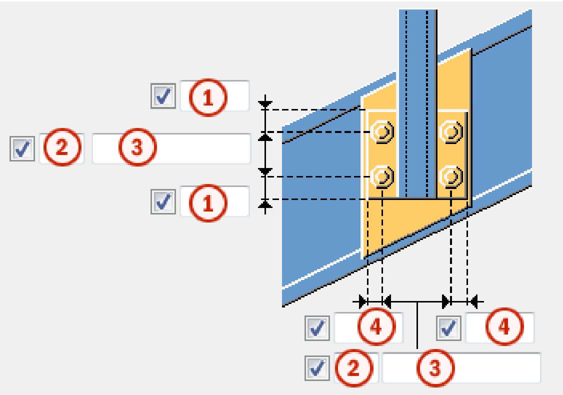
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

Option	Description	Default
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Handrail 1 (74): Bolts tab

Use the **Bolts** tab to control the bolt properties in the **Handrail 1 (74)** connection.

Bolt group dimensions



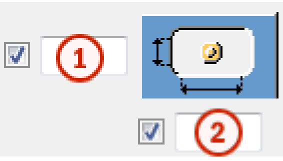
	Description
1	Define the dimension for vertical bolt group position.
2	Define the number of bolts.
3	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
4	Define the dimension for horizontal bolt group position.

Bolt basic properties

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

Option	Description	Default
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

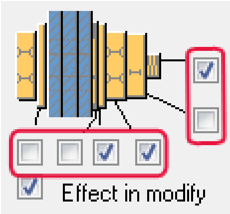
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

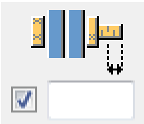
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



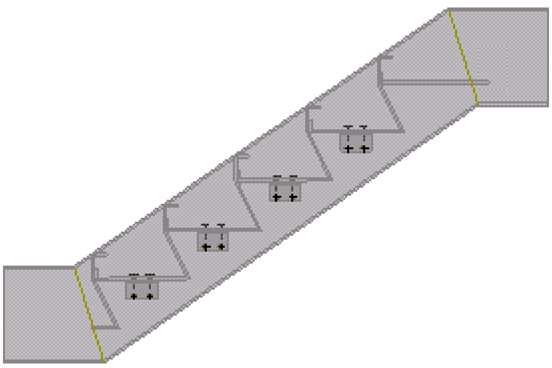
12.5 Z pan (S74)

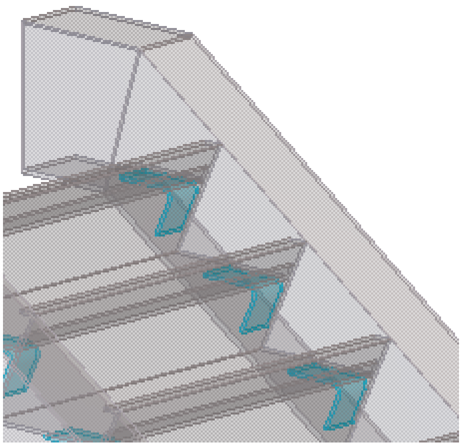
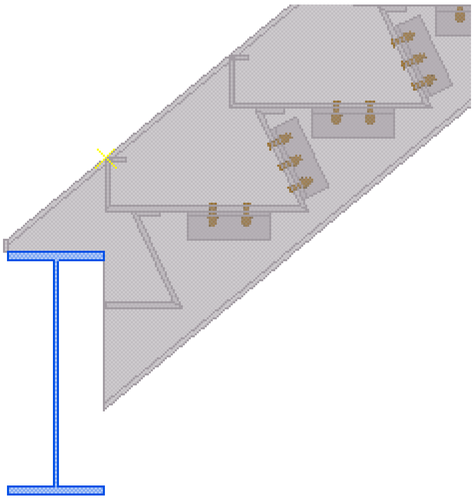
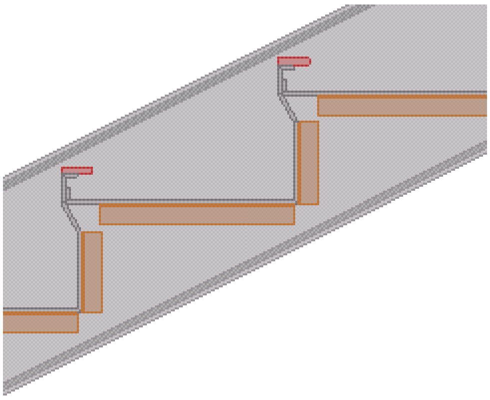
Creates straight stairs with optional upper and lower landings. The stairs consist of stringers, possible landings and the actual steps. The steps can be connected to stringers with horizontal bracket, vertical bracket or with bent plate bracket.

Objects created

- Stringers
- Steps
- Landings (optional)
- Brackets
- Bolts
- Welds

Use for

Situation	Description
	Stairs with Z-pan steps. Horizontal top and bottom landings. Steps are connected to stringers with bolted horizontal brackets.

Situation	Description
	Stairs with bent plate brackets. Steps are connected to stringers with bent plate brackets.
	Stairs with stringers notched to the supporting beam. Steps are connected to stringers with vertical and horizontal brackets.
	Stairs with 90 degree bends at the top and bottom of the treads. Steps are connected to stringers with vertical and horizontal brackets. Red nose profile at the front edge of the steps.

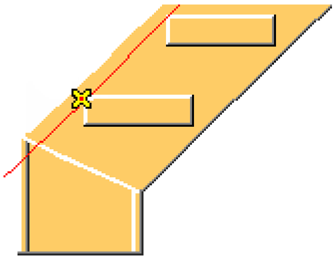
Limitations

If you modify the component, all connected components will be deleted, so modifying stairs deletes the stanchions, railings etc. components connected to it.

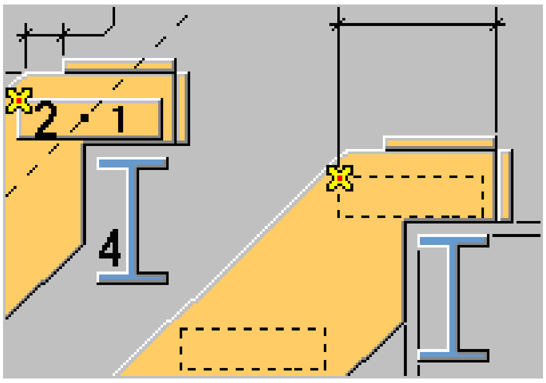
Before you start If the stringers are notched to bear on the supporting beams, create the supporting beams before creating the stairs.

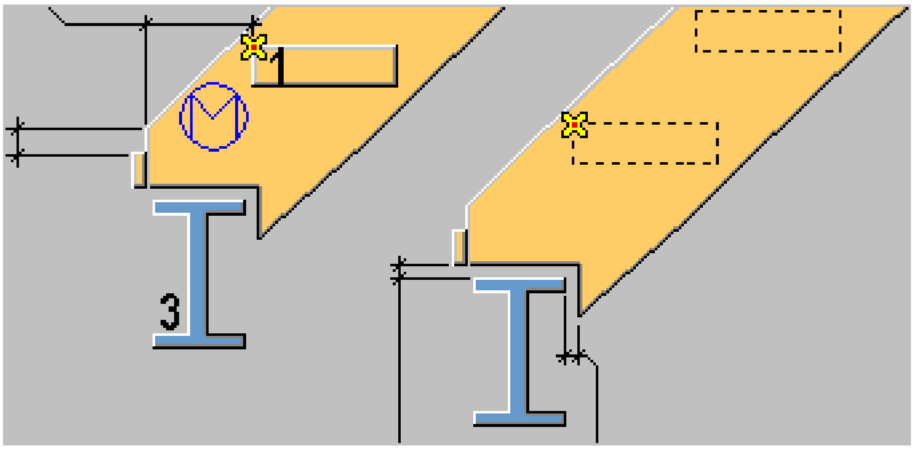
Selection order

1. Pick a point to indicate the nosing point of the first step.



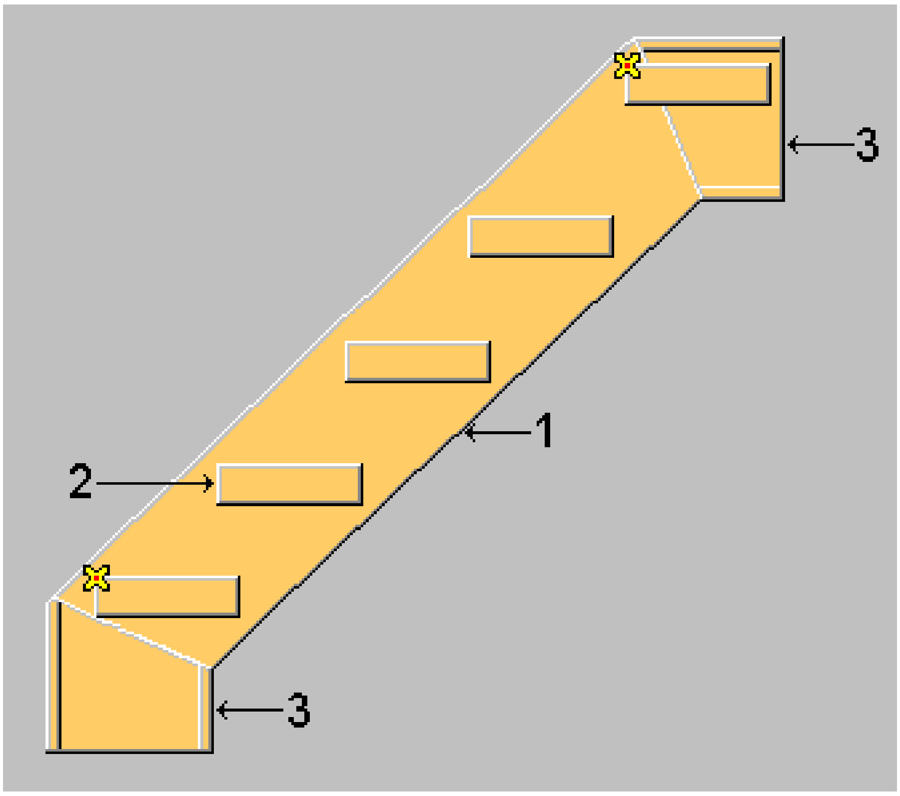
2. Pick another point to indicate the nosing point of the last step.
3. Click the middle mouse button, or if you have selected the following options on the **Picture** tab, pick the supporting beams and then click the middle mouse button.





The order in which the points are picked has no effect.

Part identification key



Number	Part
1	Stringer
2	Step
3	Landings

See also

Z pan (S74): Picture tab on page 913

Z pan (S74): Stair setup tab on page 919

Z pan (S74): Z pan tab on page 922

Z pan (S74): Horizontal bracket tab on page 927

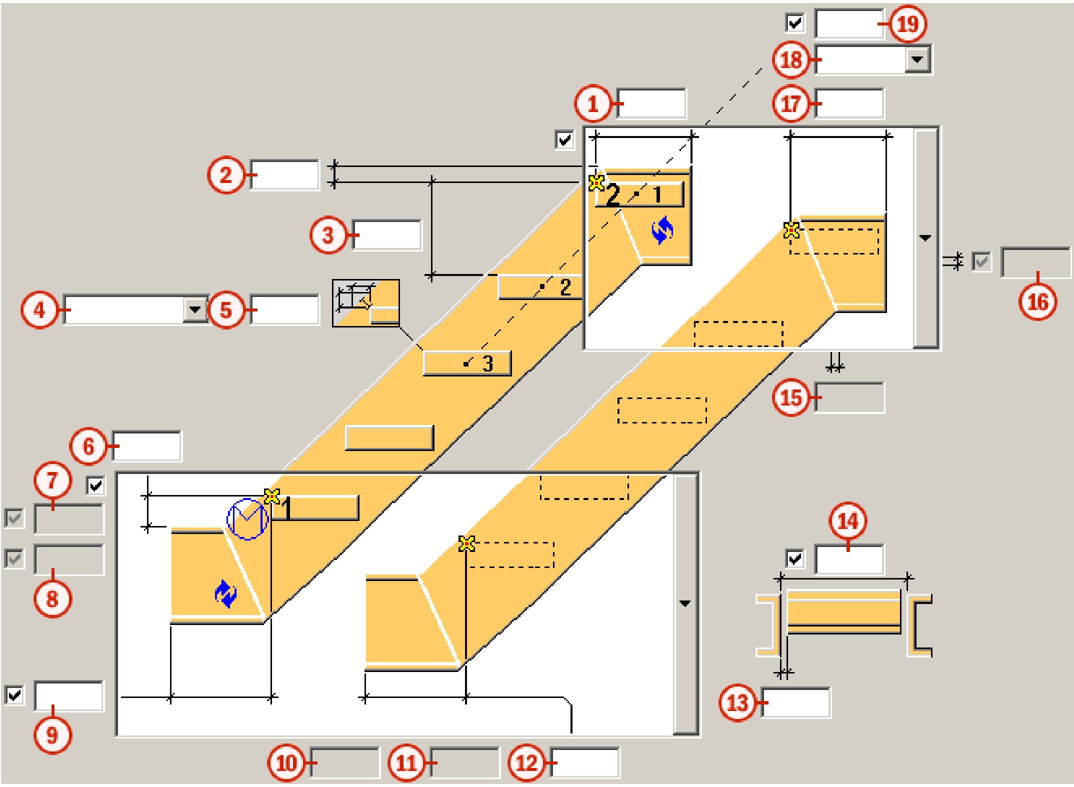
Z pan (S74): Vertical bracket tab on page 932

Z pan (S74): Bent plate bracket tab on page 936

Z pan (S74): Picture tab

Use **Picture** tab to control the stringers geometry and the steps nosing points in **Z pan (S74)**.

Stair dimension fields



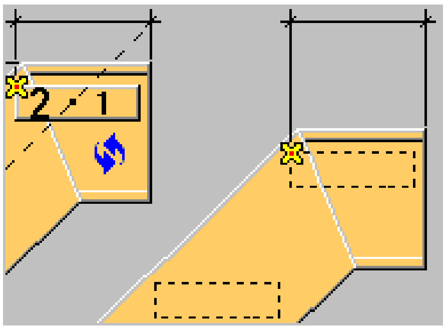
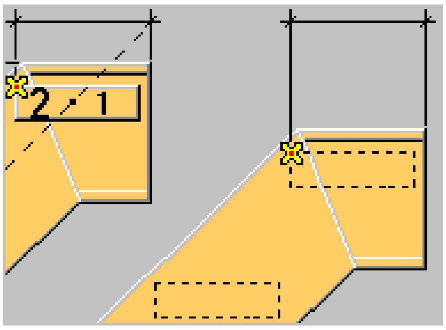
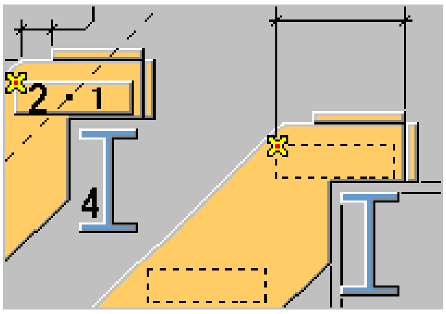
	Description	Default
1	The distance between the upper point and the end of the left upper landing. If the value is set to 0 mm, the left upper landing is not created. If **Top landing type** is set to **Notched**, this field sets the gap for the horizontal plate, taken from the stringer edge.	`0 mm`
2	The vertical distance from the upper point to the top of steel (TOS) of the upper landing. If the upper landing is not created, the stringers TOS is used. If **Top landing type** is set to **Notched**, this field sets the vertical distance from the upper point to the stringer top horizontal cut.	`200 mm`
3	The maximum distance allowed between two consecutive steps. The resulting spacing between steps is calculated using the steps spacing type (18) and the number of steps (19). If a step height of 200 mm is required, the **Exact** setting creates steps of exactly this height (the number of stairs required is entered as an integer), whereas the **Equal** setting creates the required number of stairs from the bottom to the top, with the height calculated as close to 200 mm as possible.	`(Z*220)/(Z+220) mm`, where Z is the vertical distance between the 2 picked points.

	Description	Default
4	The direction of the nosing dimension entered in the field 5. The options are: • **Vertical** • **Horizontal** • **Perpendicular** Not available in the **Wooden steps pan (S72)** component.	`Vertical`
5	The nosing dimension of the steps. The field 4 sets the direction for it. Not available in the **Wooden steps pan (S72)** component.	`0 mm`
6	Dimension field that depends on the selected **Bottom landing type** option: • With **Horizontal** or **Horizontal lowered point** this field sets the VERTICAL distance between the lower point and the TOS of the dog leg. • With **Vertical** or **Vertical lowered point** this field sets the HORIZONTAL distance between the lower picked point and the most distant face of the bottom landing. • With **Notched** option this field sets the horizontal distance from lower point to the stringer vertical cut. By default the cut is made at the supporting member edge.	`150 mm`
7	Dimension field that depends on the selected **Bottom landing type** option and step spacing type (18). This field is used only if steps spacing type field (18) is set to **Equal**. If the **Bottom landing type** is **Vertical lowered point** or **Horizontal lowered point** this field sets the vertical distance from lower picked point to the first step.	`Equal with vertical spacing between steps`
8	The gap for the vertical plate, taken from the stringer edge.	`0 mm`
9 12	Dimension field that depends on the selected **Bottom landing type** option: • With **Horizontal** or **Horizontal lowered point**, this field sets the HORIZONTAL distance between the lower point and the end of the bottom landing.	`600 mm`

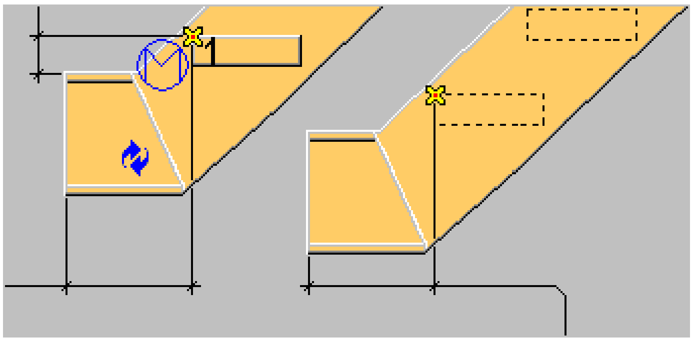
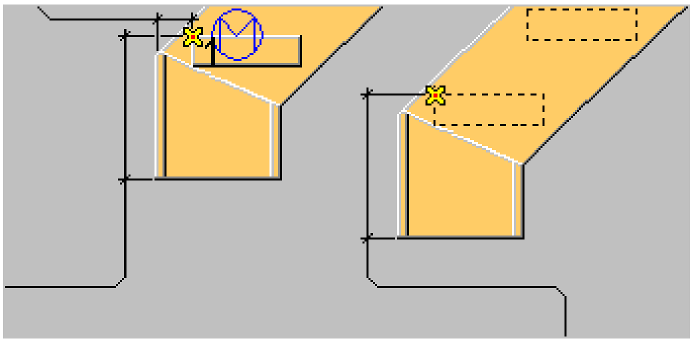
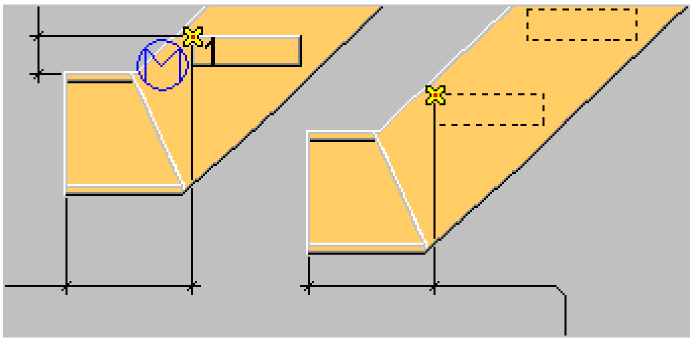
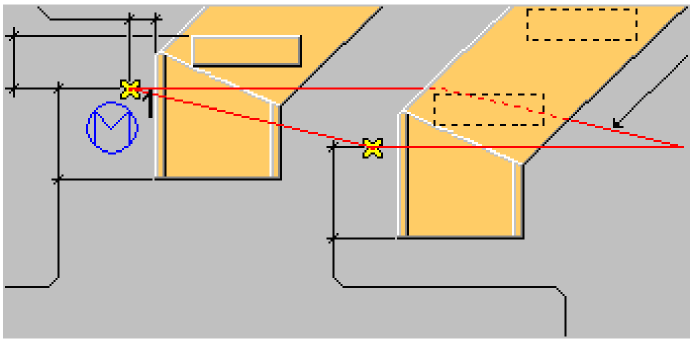
	Description	Default
	• With **Vertical** or **Vertical lowered point**, this field sets the VERTICAL distance between the lower point and the lowest point of the bottom landing. • With **Notched** this field is not used.	
10	The vertical gap between the lower supporting member and the stringer cut. Used only if **Bottom landing type** is set to **Notched**.	`0 mm`
11	The horizontal gap between the lower supporting member and the stringer cut. Used only if **Bottom landing type** is set to **Notched**.	`0 mm`
13	Dimension that shortens the steps equally on both sides.	`0 mm`
14	The width of the steps.	`1000 mm`
15	The horizontal gap between the upper supporting member and the stringer cut. Used only if **Top landing type** is set to **Notched**.	`0 mm`
16	The vertical gap between the upper supporting member and the stringer cut. Used only if **Top landing type** is set to **Notched**.	`0 mm`
17	The distance between the upper point picked and the end of the stringer. If the value is set to 0 mm, the upper landing is not created. This field depends on the selected **Top landing type**. If **Notched** is selected, sets the horizontal distance from the upper point picked to the stringer vertical cut. By default the cut is made at the supporting member edge.	`0 mm`
18	Step spacing type. Defines how the vertical spacing between the steps is calculated. The options are: • **Exact** • **Equal** If **Exact** is selected and **Bottom landing type** is set to **Horizontal** or **Vertical lower point**, the steps are spaced from the upper point to lower point. In all other cases the steps are spaced from lower point to the upper point.	`Equal`
19	The number of steps. Depends of step spacing type (18) and step spacing dimension (3). If step spacing type is set to **Exact** or step spacing type is set to **Equal** and spacing dimension is not **Default**, then	`Calculated from the vertical distance between`

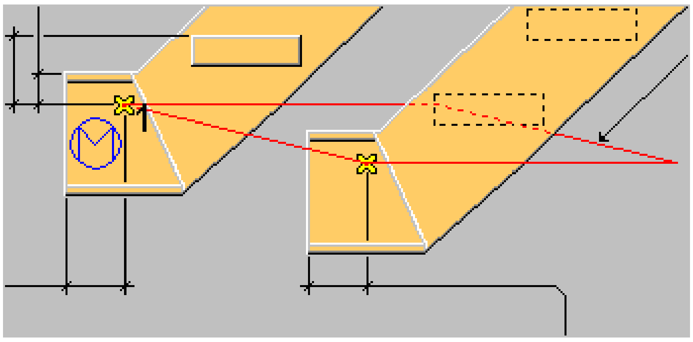
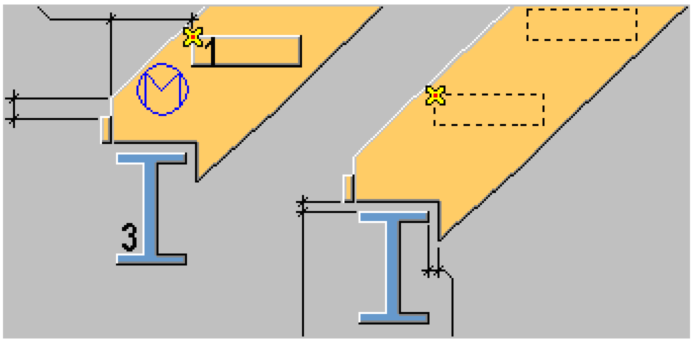
	Description	Default
	the number of steps created will be equal to the number of steps you define.	`the picked points and the spacing between steps (3)`

Top landing type Specifies the type of the stringer top part. The options are:

Option	Description
	Default
	Horizontal landing
	Notched Top of the stringer is on the supporting member. Vertical and horizontal plates are welded at the end of the stringer.

Bottom landing type Specifies the type of the stringer lower part. The options are:

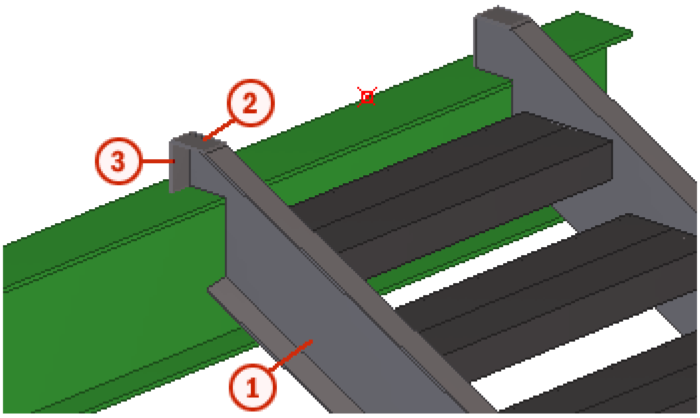
Option	Description
	Default
	Vertical Creates vertical landing where the lower point picked is on the last step top plane.
	Horizontal Creates horizontal landing where the lower point picked is on the last step top plane.
	Vertical lowered point The point is at top of steel or finish floor.

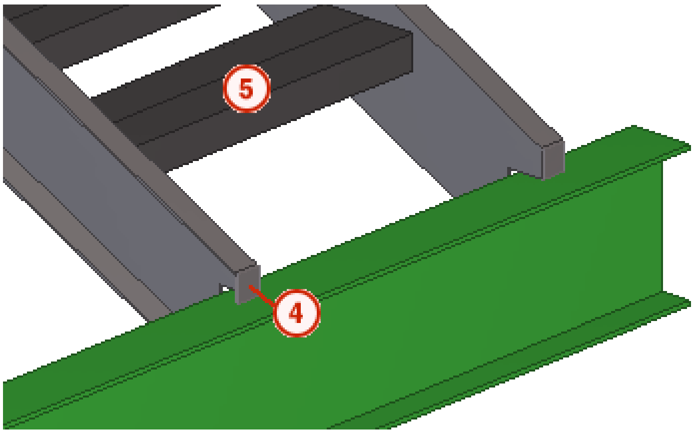
Option	Description
	Horizontal lowered point The point is at top of steel or finish floor.
	Notched Copes the bottom of the stringer to bear on the supporting member. A vertical plate is welded at the end of the stringer.

Z pan (S74): Stair setup tab

Use **Stairs setup** tab to control the properties of parts the **Z pan (S74)** component creates. It also defines whether the top or bottom steps are created, what is the position of the stairs on the horizontal plane and how the stringers and the steps are rotated.

Stair part properties





Stair part	Description	Default profile / thickness
Stringer 1	Always created.	`BLU400*200*10`
Upper H plate 2	Created only if the top of the stringers is on the supporting beam.	`6 mm`
Upper V plate 3	Created only if the top of the stringers is on the supporting beam.	`6 mm`
Lower V plate 4	Created only if the bottom of the stringers is on the supporting beam.	`6 mm`
Catalog step 5	Only available in the **Stairs (S71)** component. Created only if **Step Type** is set to **Catalogue step**. In this case the U-pan steps, brackets, and bolts defined in the other tabs are ignored.	First profile from the Catalogue list, defined in the `steps.dat` text file in the `..\Tekla Structures\<version>\environments\<environment>\system` folder. The list changes according to the selected environment.

Option	Description	Default
Pos_No	To ensure correct numbering, define a prefix and a start number for the part position number of stair parts. Enter the assembly position number of the stair parts on the second row.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	**Stringer** = `STRINGER` **Upper H plate** = `PLATE` **Upper V plate** = `PLATE` **Lower V plate** = `PLATE` **Catalog step** = `STEP`
Class	Define the part class number.	`1`

Create assembly Specifies which parts of the stair component form an assembly:

- **No**
- **All**
- **Stringers** (default)

Stringer reference line Specifies a reference line for the stringers. The reference line will be used for the workshop drawings. Options are:

- **Above**: The line positioned on the inside of the stair on the top face is used as the reference line.
- **Nosing**: The nosing line of the steps is used as the reference line.

Position in plane Sets the position of the stairs on plane referenced to the middle line of the steps. Options are:

- **Left**
- **Middle**
- **Right** (default)

Offset Sets the offset of the stairs on plane from the position that is set in the **Position in plane** field. The default offset is 0 mm.

Stringer rotation Sets the rotation of the stringer around its axis. Options are:

- **Front**

- **Top** (default)
- **Back**
- **Below**

Create top step Specifies whether to create the first step of the stair (the highest step).

Create bottom step Specifies whether to create the last step of the stair (the lowest step).

Z pan (S74): Z pan tab

Use **Z pan** tab to control the size and shape of the Z pan steps in the **Z pan (S74)** component.

Step profile

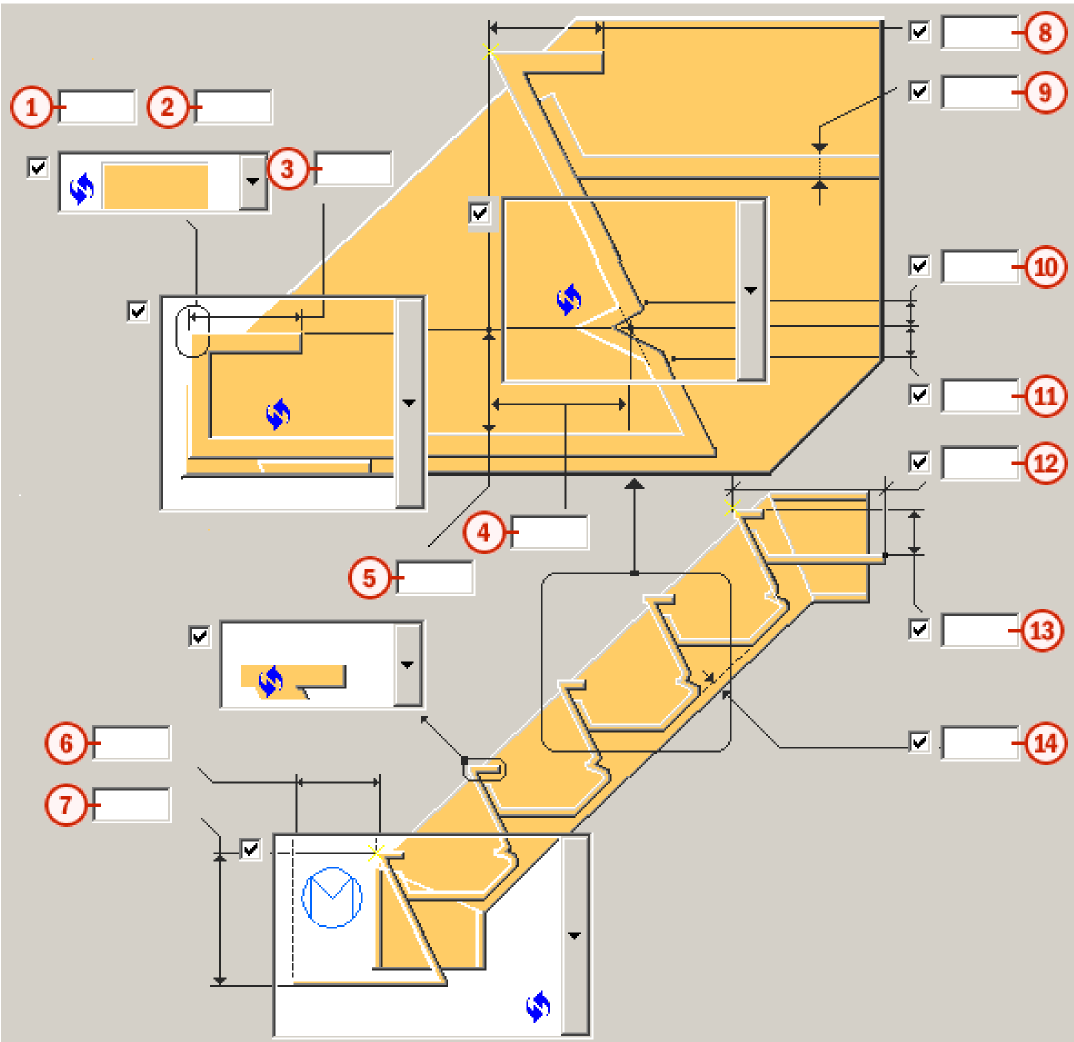
Field	Description	Default
t b h	No profile, it will be calculated from the thickness entered in the field number nine.	
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name		STEP
Class		1
UDA	This only applies to the imperial environment: Select an appropriate material for the step profile. Tekla Structures saves the selected material in the **Gage material** user-defined attribute of the step profile. You are then able to use this information in reports and in bill of material of drawings.	

Nose profile

Field	Description	Default
t b h	Created only if **Nosing piece** is set to **Create nose**. 	PL160*10

Field	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name		NOSE
Class		1

Z pan dimensions



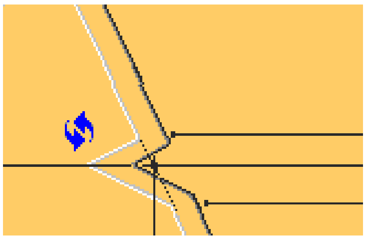
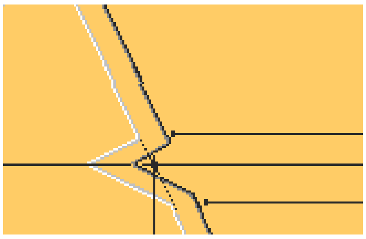
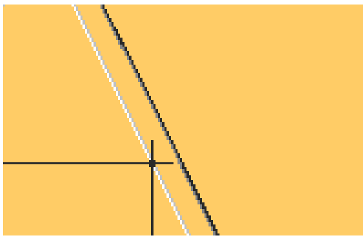
	Description	Default
1 2	Chamfer values for the Front edge.	`15 mm`
3	Length of the front part of the step according to the selected Front edge type option.	`40 mm`
4	Back wall slope which is the width between the nosing point (yellow cross) vertical line and the Z-pan back wall (concrete level lip set off point).	`100 mm`
5	Height of the inner step dimension, where the concrete will be poured.	`100 mm`
6 7	Width and height of the bottom step.	`height = 200 mm` `width = 0 mm`
8	Horizontal dimension for the Z-pans having a skewed front edge.	`60 mm`
9	Thickness of the Z Pan plate.	`10 mm`
10 11	Lip dimensions of the back wall of the step. These fields are active only if **Back wall type** is set to **Lip**.	`15 mm`
12	Horizontal length of the top step. The horizontal distance between the top nosing point and the end of the top step horizontal section.	`300 mm`
13	Height of the top step. The vertical distance between the top nosing point and the end of the top step horizontal end.	`100 mm`
14	Bottom line clearance for the steps that prevents the bottom portion of the Z-pan overlapping the bottom end of the stringer.	`20 mm`

Chamfer type Sets the shape of the front edge of the step.

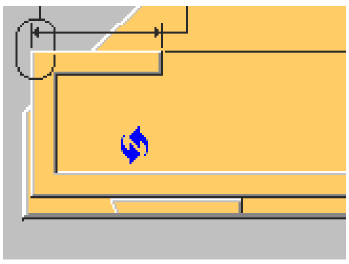
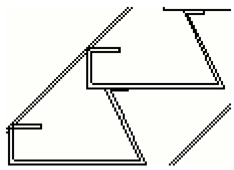
Option	Description
	None
	Line

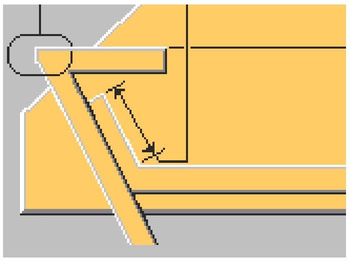
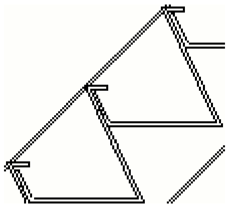
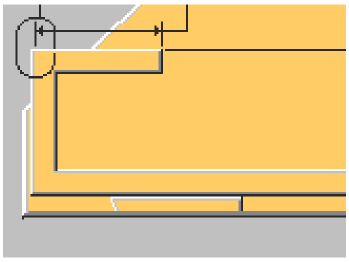
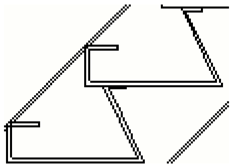
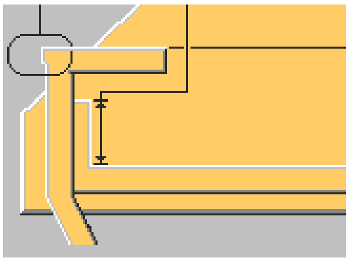
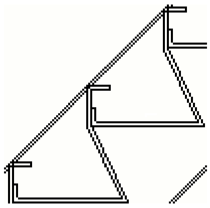
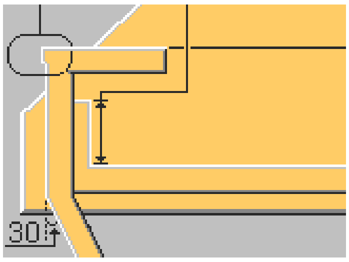
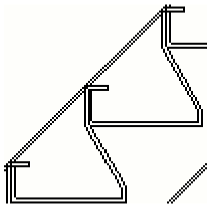
Option	Description
	Rounding
	Arc

Back wall type Sets the form of the Z pan back wall and specifies whether or not there is a lip.

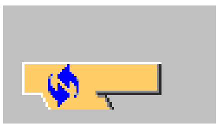
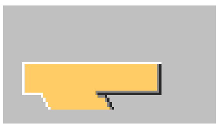
Option	Description
	Default
	Lip
	Straight

Front edge type Option field that sets how a pan connects to the pan below.

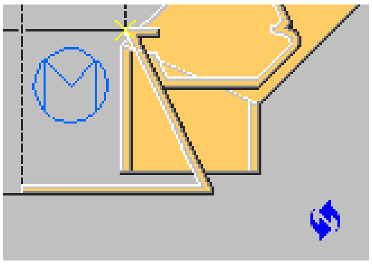
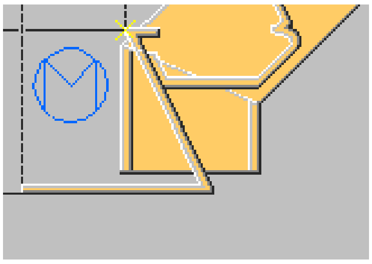
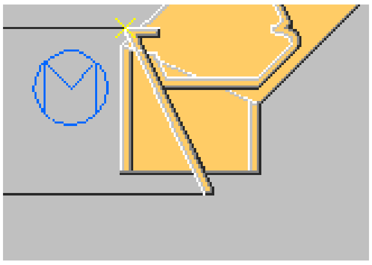
Option	Description	Example
	Default.	

Option	Description	Example
	Skewed front edge. Pan overlaps the lower one and continues in the same angle as the back wall.	
	Rectangular front edge. Pans do not overlap each other.	
	Rectangular front edge. Pan overlaps the lower one and continues in the same angle as the back wall.	
	Rectangular front edge. Pan overlaps the lower one and continues at 30 degrees angle.	

Nosing piece Sets whether to create the nosing piece on top of the step.

Option	Description
	Default.
	Create nose.
	No nose.

Horizontal part Specifies 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) to the field number six.

Option	Description
	Default.
	Create horizontal part.
	No horizontal part.

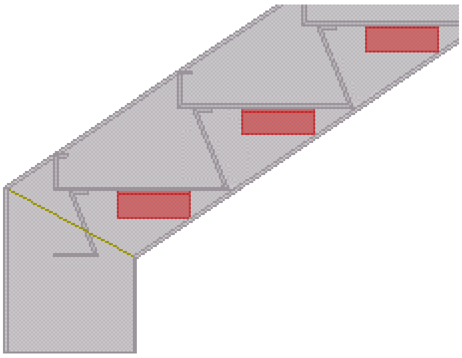
Z pan (S74): Horizontal bracket tab

Use **Horizontal bracket** tab to control the properties and attachment of the horizontal brackets in the **Z pan (S74)** component. The horizontal brackets are angle profiles underneath the treads.

Preconditions Before you can set the properties of the horizontal brackets, set the following option:

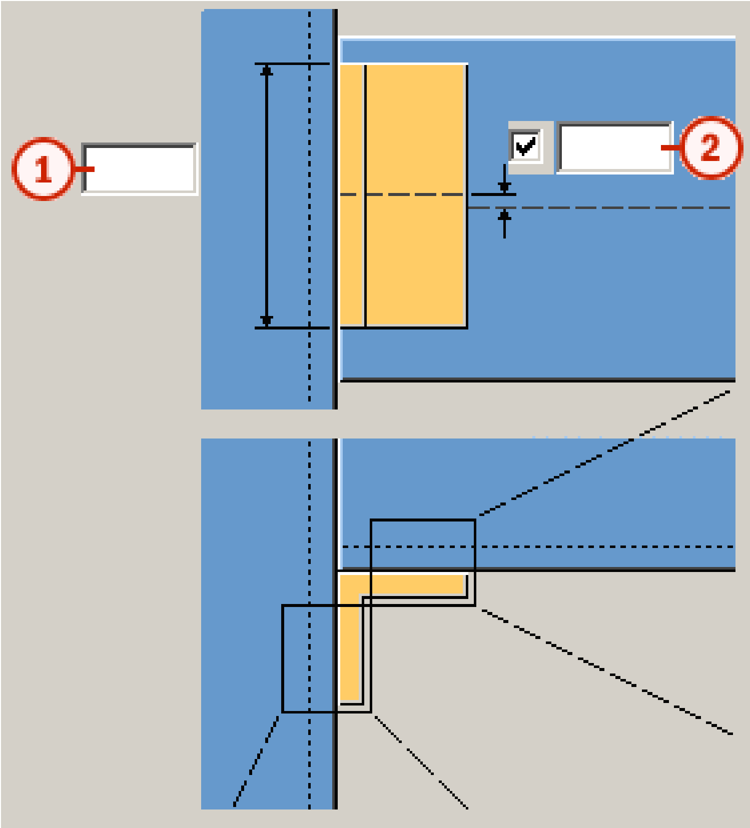
- On the **Bent plate bracket** tab, set **Bracket** to **Horizontal bracket** or **Horizontal and vertical brackets**.

L profile



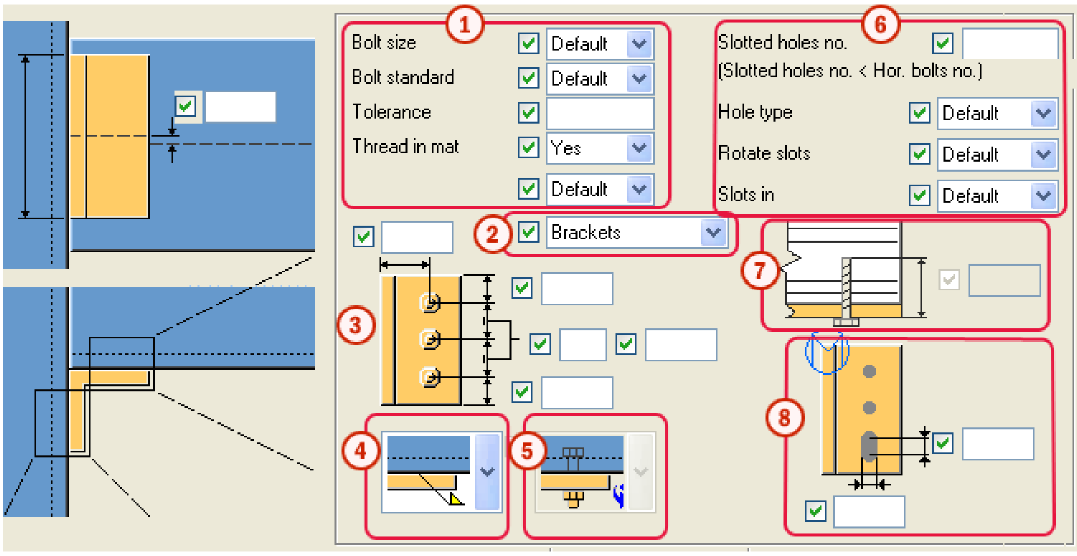
Part name	Description	Default
L profile	Created only if brackets are created. For more information, see the field number two in the **Bracket-to-step connection** below.	BLL80*80*10
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name		L_Profile
Class		1

Bracket dimensions



	Description
1	The length of the bracket. The default length is calculated according to bracket-to-step or bracket-to-stringer bolt dimensions, depending which one is bigger.
2	The dimension to offset the bracket from the center line of the thread. The default is 0 mm.

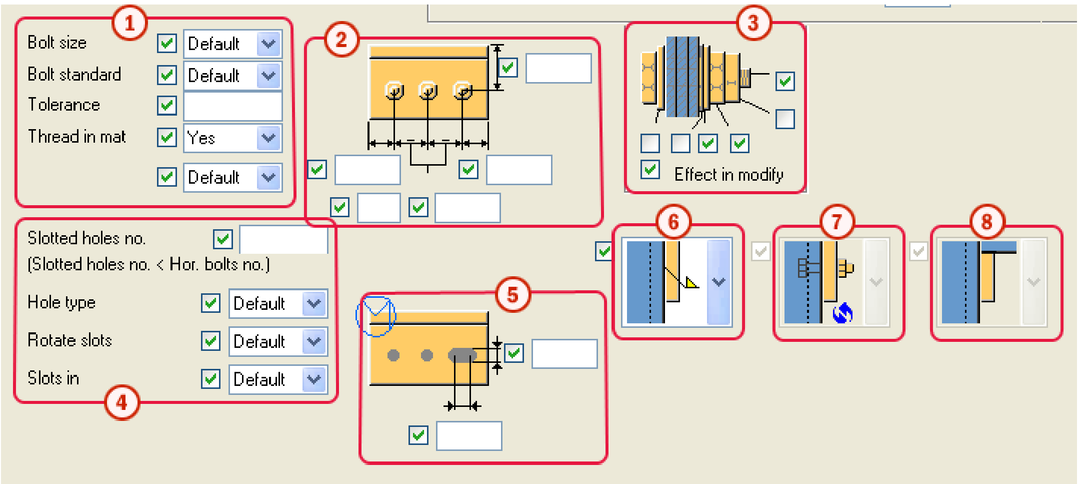
Bracket-to-step connection Use the following fields to define the properties of the bolts connecting the bracket to the step.



	Description	Default
1	Bolt group basic properties.	Default values: • Size: 20 mm • Standard: 7990 • Tolerance: 2 mm
2	Defines whether to create the brackets. • **Brackets** • **No Brackets**	
3	Bolt group dimensions.	Default values: • Edge distance: 65 mm / 1,5* bolt diameter • Two bolts • Spacing: 100 mm
4	Sets the type of connection between steps and brackets.	Bracket to step connection type on page 873
5	Sets the direction of the bolts.	
6	Slotted hole properties.	
7	Sets the exact length of the bracket-to-step bolts.	This field is only available in the **Stairs (S71)** component, if Step type on the **Steps** tab is set to **Custom** step.
8	The dimensions of the slotted hole.	

Bracket-to-stringer connection

Use the following fields to define the properties of bolts connecting the bracket to the stringer.



	Description	Default
1	The basic properties of the bracket-to-stringer bolt group.	Default values: • Size: 20 mm • Standard: 7990 • Tolerance: 2 mm
2	Edge distances, number of bolts, and bolt spacing dimensions.	Default values: • Edge distance: 65 mm / 1,5* bolt diameter • Two bolts • Spacing: 100 mm
3	Bolt assembly.	
4	Slotted hole properties.	
5	Dimensions of the slotted hole.	
6	Sets the type of connection between the stringer and the brackets.	Bracket to stringer connection type on page 874
7	Sets the direction of bolts.	
8	Sets the position of the brackets: below the step or between the step and the stringer.	Bracket position on page 872

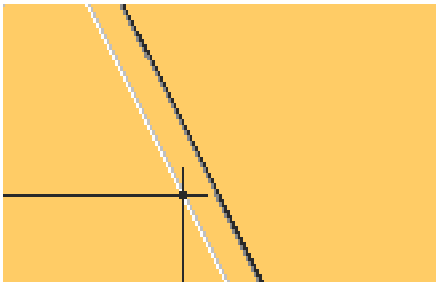
	Description	Default
	This field is available only if the bracket is created as a plate instead of an angle. 	

Z pan (S74): Vertical bracket tab

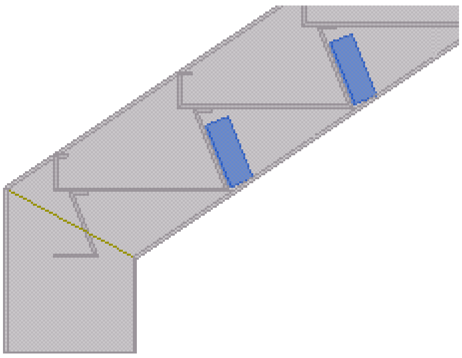
Use **Vertical bracket** tab to control the properties and attachment of the vertical brackets in the **Z pan (S74)** component. The vertical brackets are angle profiles underneath the treads and they support the vertical portion of the stair treads.

Preconditions Before you can set the properties of the vertical brackets, set the following options:

- On the **Bent plate bracket** tab, set **Bracket** to **Horizontal and vertical brackets**.
- On the **Z pan** tab, set **Back wall type** to **Straight**.



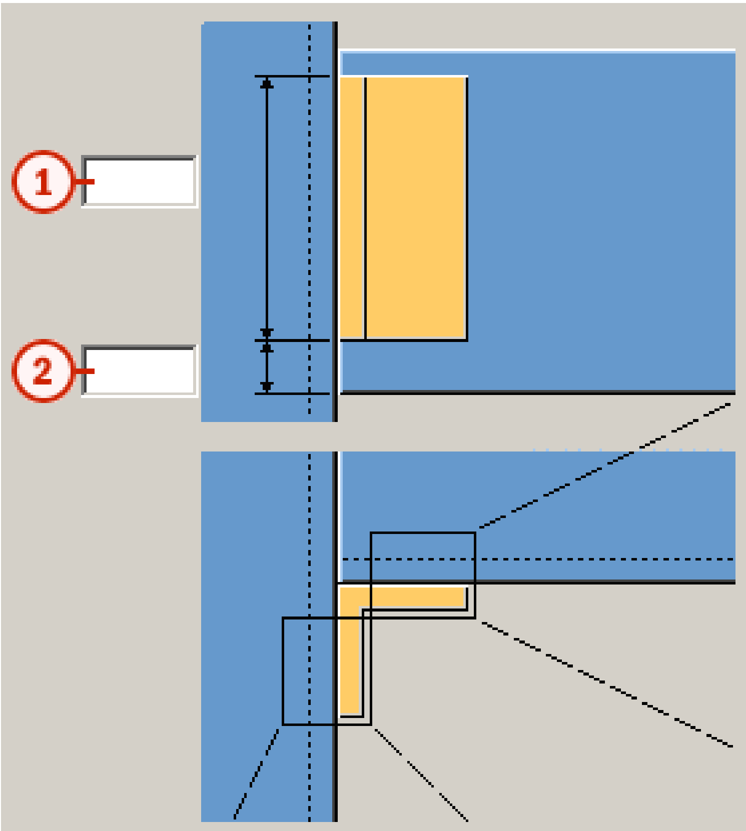
L profile



Part name	Description	Default
L profile	Created only if brackets are created. For more information, see the field number two in the **Bracket-to-**	BLL80*80*10

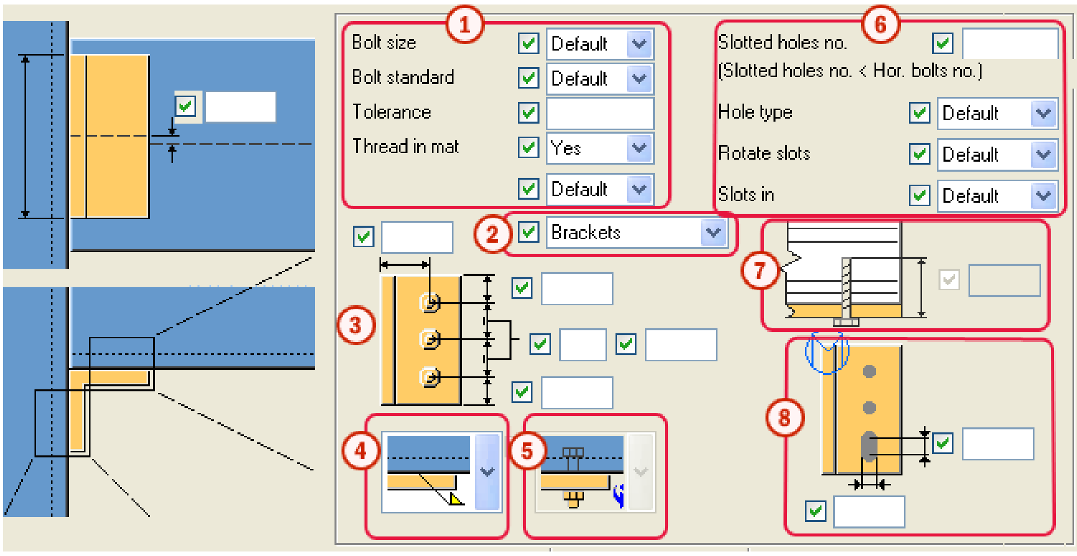
Part name	Description	Default
	step connection below.	
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name		L_Profile
Class		1

Bracket dimensions



	Description	Default
1	Height of the bracket.	Default height is calculated according to bracket-to-step or bracket-to-stringer bolt dimensions, depending which one is bigger.
2	Dimension to offset the bracket from the Z pan edge.	25 mm

Bracket-to-step connection Use the following fields to define the properties of the bolts connecting the bracket to the step.

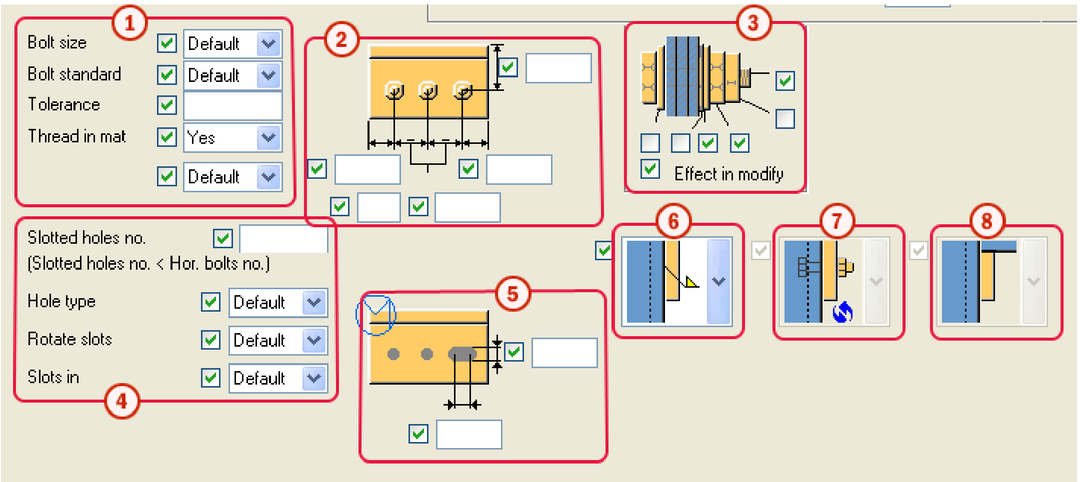


	Description	Default
1	Bolt group basic properties.	Default values: • Size: 20 mm • Standard: 7990 • Tolerance: 2 mm
2	Defines whether to create the brackets. • **Brackets** • **No Brackets**	
3	Bolt group dimensions.	Default values: • Edge distance: 65 mm / 1,5* bolt diameter • Two bolts • Spacing: 100 mm
4	Sets the type of connection between steps and brackets.	Bracket to step connection type on page 873
5	Sets the direction of the bolts.	
6	Slotted hole properties.	
7	Sets the exact length of the bracket-to-step bolts.	This field is only available in the **Stairs (S71)** component, if Step type on the **Steps** tab is set to **Custom** step.

	Description	Default
8	The dimensions of the slotted hole.	

Bracket-to-stringer connection

Use the following fields to define the properties of bolts connecting the bracket to the stringer.



	Description	Default
1	The basic properties of the bracket-to-stringer bolt group.	Default values: • Size: 20 mm • Standard: 7990 • Tolerance: 2 mm
2	Edge distances, number of bolts, and bolt spacing dimensions.	Default values: • Edge distance: 65 mm / 1,5* bolt diameter • Two bolts • Spacing: 100 mm
3	Bolt assembly.	
4	Slotted hole properties.	
5	Dimensions of the slotted hole.	
6	Sets the type of connection between the stringer and the brackets.	Bracket to stringer connection type on page 874
7	Sets the direction of bolts.	

	Description	Default
8	Sets the position of the brackets: below the step or between the step and the stringer. This field is available only if the bracket is created as a plate instead of an angle. 	Bracket position on page 872

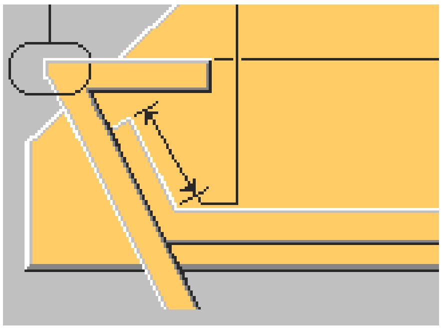
Z pan (S74): Bent plate bracket tab

Use **Bent plate bracket** tab to control the dimensions and other properties of the bent plate bracket in the **Z pan (S74)** component. 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 **Bent plate bracket** tab, set **Bracket** to **Bent plate bracket**.
- On the **Z pan** tab, set **Front edge type** to the following option:



Bent plate profile

Part name	Description	Default
t b h	Created if the **Bracket** field is set to **Bent plate bracket** in the **Stair setup** tab.	BPL80*10
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name		PLATE

Part name	Description	Default
Class		1

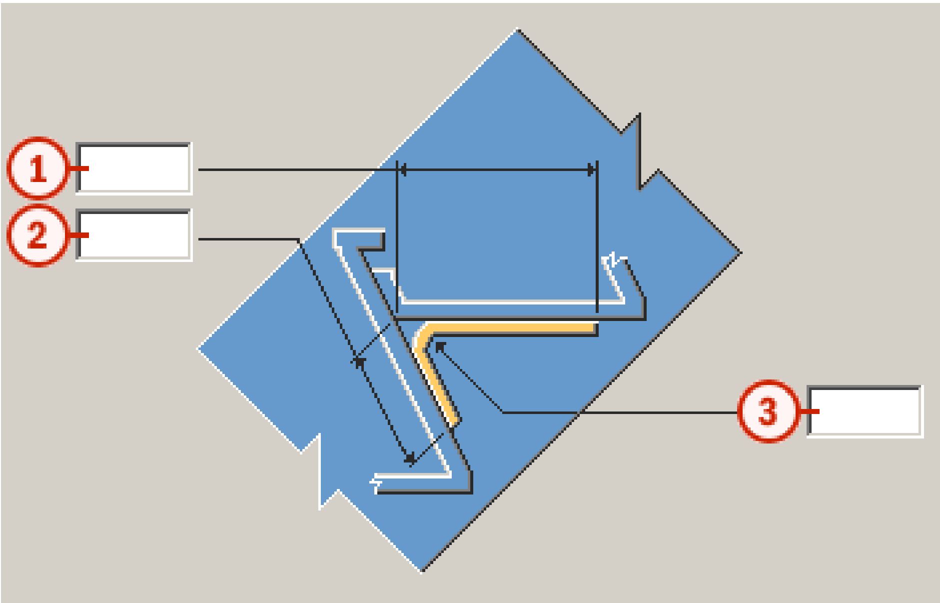
Bracket Specifies how the steps are connected to the stringers:

- **Default**
- **Horizontal bracket**
- **Horizontal and vertical brackets**
- **Bent plate bracket**

Create top step bent plate bracket Defines whether to create the bent bracket for the top step. By default it is not created.

Create bottom step bent plate bracket Defines whether to create the bent bracket for the bottom step. By default it is not created.

Bent bracket dimensions



	Description	Default
1	Horizontal dimension. Specifies the horizontal distance from the steps corner to the bent plate edge.	`200 mm`
2	Vertical dimension. Specifies the vertical distance from the steps corner to the bent plate edge.	`100 mm`
3	The radius of the round bending.	`1 / 3 * vertical dimension`

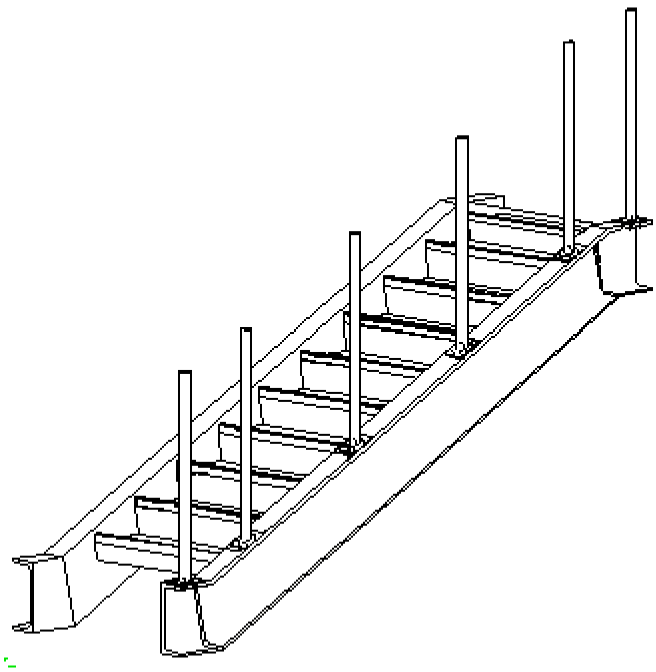
12.6 Stanchions (S76)

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

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

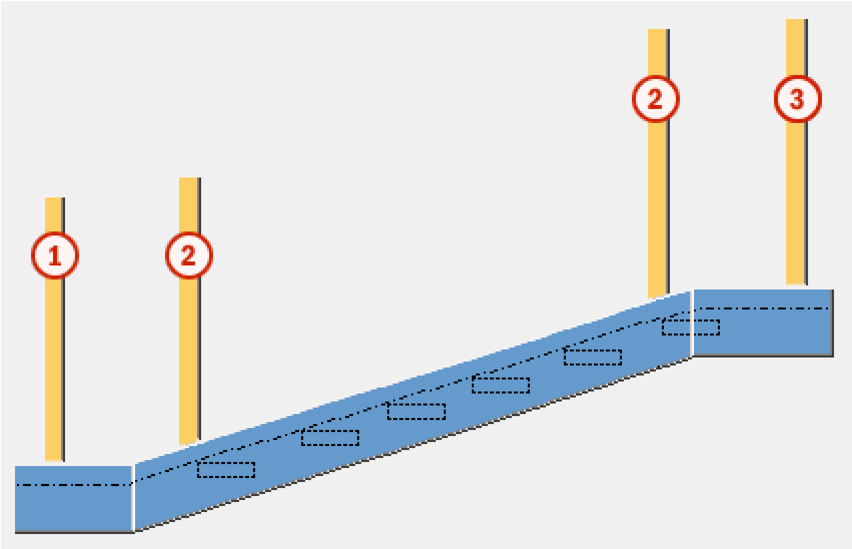
Create stringers, beams, or slabs or other parts to connect the stanchions.

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



Option	Part
1	First stanchion
2	Middle stanchions
3	Last stanchion

See also

Stanchions (S76): Picture tab on page 939

Stanchions (S76): Parts tab on page 941

Stanchions (S76): Parameters tab on page 943

Stanchions (S76): Picture tab

Use the **Picture** tab to control the stanchion creation in the **Stanchions (S76)** modeling tool.

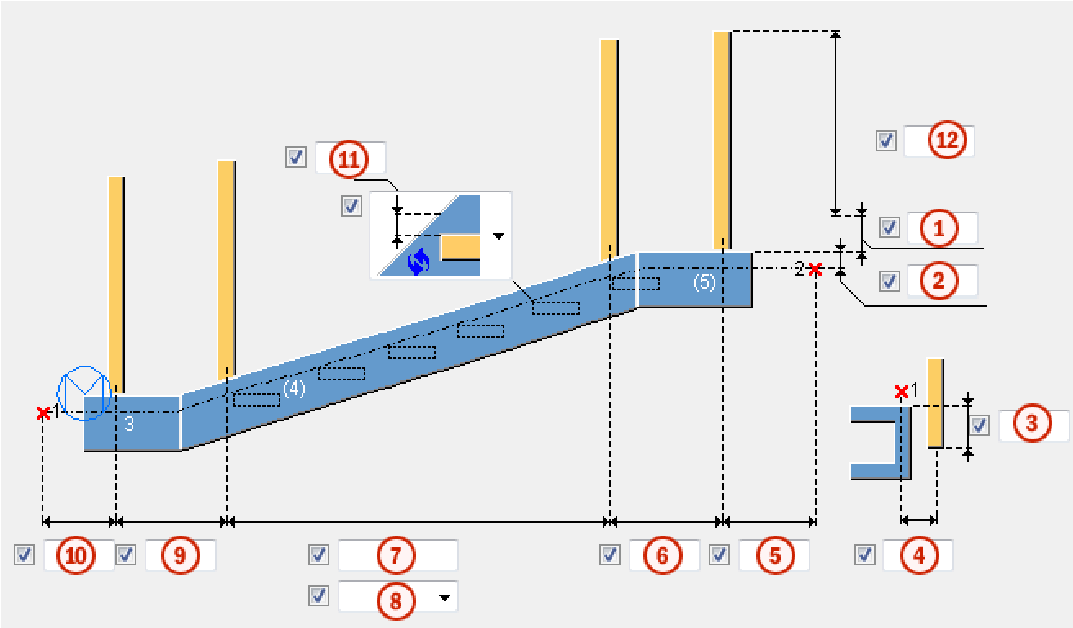
Stair parts selection

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

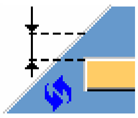
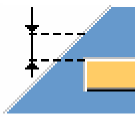
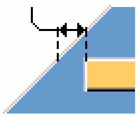
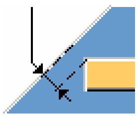


Option	Description	Default
1	Define additional height to the stanchion.	
2	Define the height of the floor level.	1300 mm
3	Define the stanchion bottom point vertical offset.	0 mm
4	Define the stanchion bottom point horizontal offset.	0 mm
5	Define the distance between the second selected point and the last stanchion.	300 mm
6	Define the distance between the last two stanchions.	0 mm
7	Define the space between the stanchions. Use the field 8 to define the spacing type.	1000 mm
8	Define the stanchion spacing type. • Maximum The spacing value in the field 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.	Maximum

Option	Description	Default
	• Exact The space between the middle stanchions is exactly the spacing value in the field 7. Enter the spacing values using the following formats: `6*950` or `1000 800 800 1000 800`.	
9	Define the distance between the first two stanchions.	`0 mm`
10	Define the distance between the first selected point and the first stanchion.	`300 mm`
11	Define the nosing dimension of the steps.	
12	Define the 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

Stanchions (S76): Parts tab

Use the **Parts** tab to control the stanchion profiles in the **Stanchions (S76)** modeling tool.

Stanchion profile

Option	Description
First stanchion	Define the first stanchion profile by selecting it from the profile catalog. First stanchion is always created.

Option	Description
Middle Stanchion	Define the middle stanchion profile by selecting it from the profile catalog. Middle stanchion is always created.
Last Stanchion	Define the last stanchion profile by selecting it from the profile catalog. Last stanchion is always created.

Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	`STANCHION`
Class	Define the class number for the parts.	

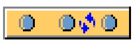
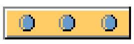
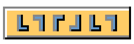
Stanchion profile rotation

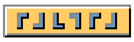
Define the stanchion profile rotation and position.

Option	Description	Default
Profile rotation	Define the stanchion profile rotation and position.	Rotation = `Front` Position = `Middle`
Rotation value	Define the 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

Option	Description
	Type 5

Stanchions (S76): Parameters tab

Use the **Parameters** tab to control how the stanchions are connected to the stairs in the **Stanchions (S76)** modeling tool.

Connection properties

Option	Description
Connection setting type	Define whether pre-defined or custom settings are used for connecting the stanchions to the stairs. By default, the pre-defined settings are used.
Stanchion connection type	Define the connection type for stanchions. By default, the weld default connection type is used. This field is active only if you have set the **Connection setting type** to **Pre-defined settings**.
Connection number	Define a connection that connects stanchions to the stairs by selecting it from the component catalog.
Connection properties	Select an attribute file for the connection.
Direction	Define the connection direction.

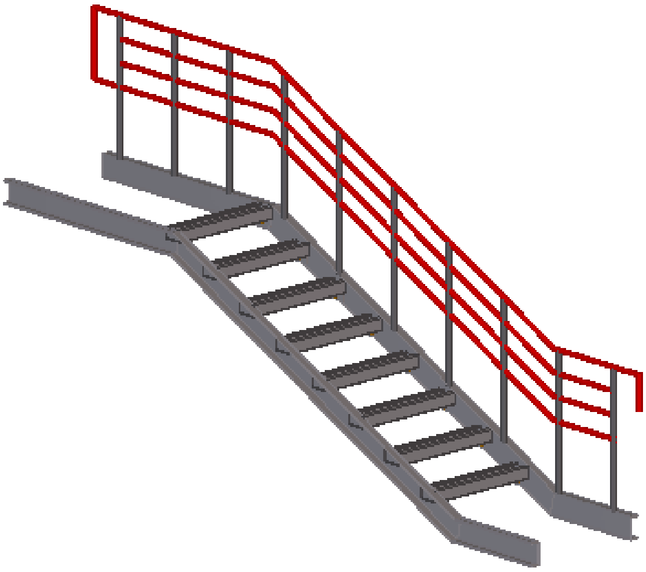
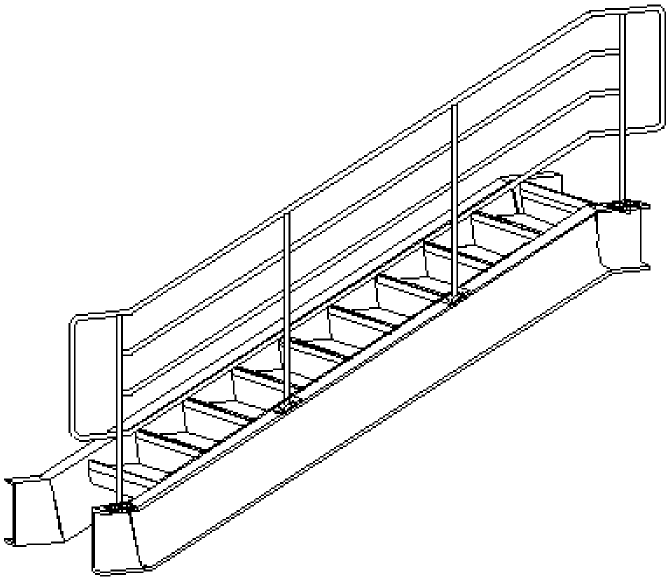
12.7 Railings (S77)

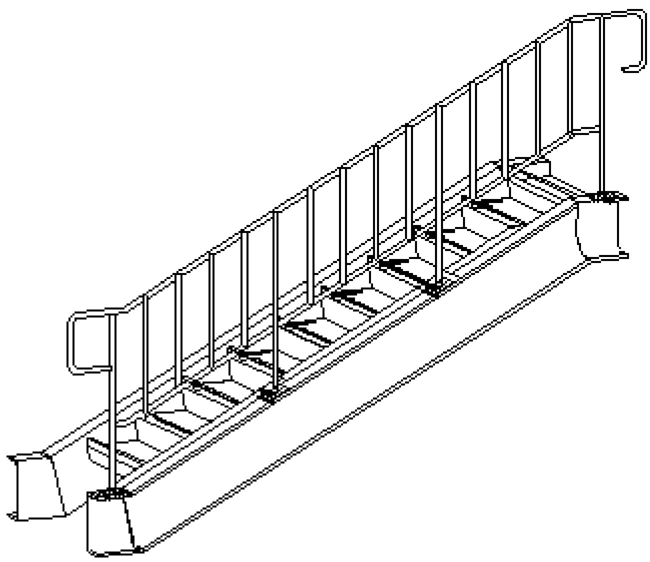
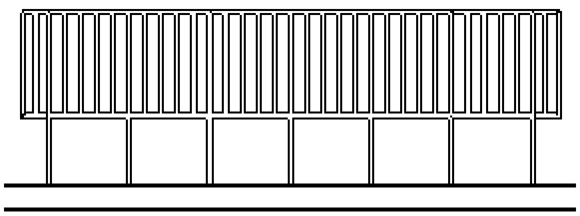
Railings (S77) creates railings connected to two or more stanchions. The railings can be handrails in stairs or guardrails in a horizontal beam or slab.

Objects created

- Top rail
- Middle rails (horizontal or vertical)
- Bottom rail
- Panels
- Bends

Use for

Situation	Description
	Horizontal railings
	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)** modeling tool.

Selection order

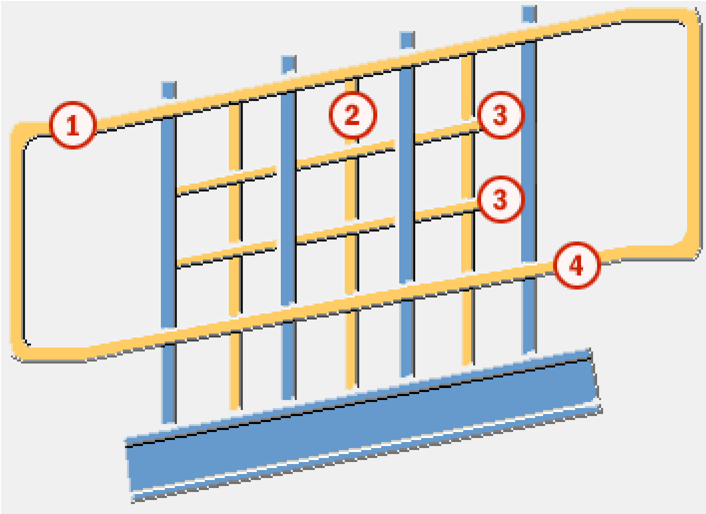
1. Select the first stanchion.
2. If the stanchions are created with the **Stanchions (S76)** modeling tool, and on the **Picture** tab the **Stanchion selection** is set to **Use all** or **Default**, the railings are created when you click the middle mouse button.

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



Option	Part
1	Top rail
2	Vertical rails
3	Middle rails
4	Bottom rail

See also

Railings (S77): Picture tab on page 946

Railings (S77): Parameters tab on page 950

Railings (S77): Rails tab on page 954

Railings (S77): Middle Rails tab on page 957

Railings (S77): Vertical Rails tab on page 963

Railings (S77): Panels tab on page 966

Railings (S77): Bends tab on page 968

Railings (S77): Picture tab

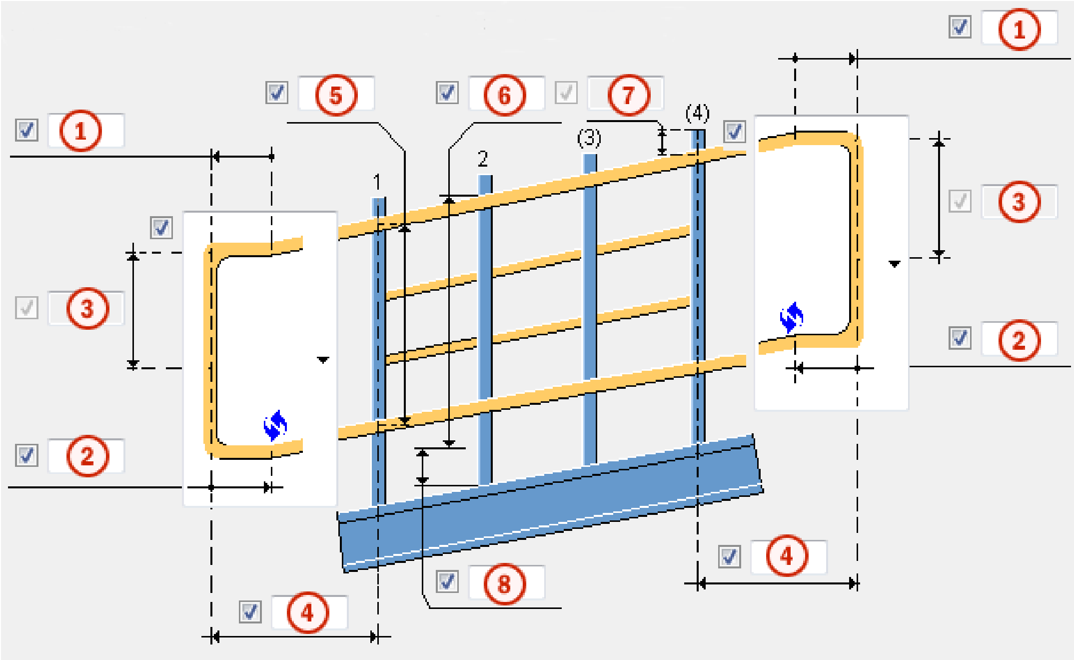
Use the **Picture** tab to control the railings and the closures in the **Railings (S77)** modeling tool.

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 the **Stanchions (S76)** modeling tool.

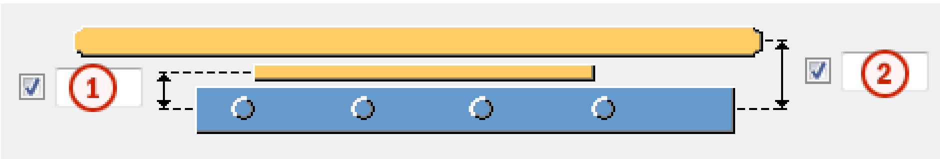
Part positions



Option	Description	Default
1	Define the 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 field, the top and bottom rails are shortened.	150 mm
2	Define the horizontal length of the closure in the bottom rail. When you use the closure type 4 and the value in the field 1 is 0, you can shorten the bottom rails by entering a positive value in this field.	150 mm
3	Define the vertical length of the closure. Available for closure types 2 and 3.	half the value of 5
4	Define the full horizontal length of the closure from the first or the last stanchion.	300 mm
5	Define the 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

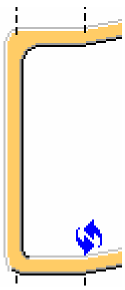
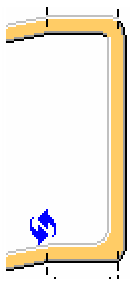
Option	Description	Default
6	Define the height of the railing from the floor level. If you modify the floor level, the height of the railing is modified as well.	defined by the height of the stanchion
7	Define the length of the stanchion extension over the railing. Use this field if the **Top rail to stanchion fitting** is set to **Stanchion partcut** on the **Parameters** tab.	0 mm
8	Define the 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

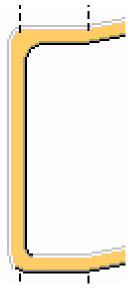
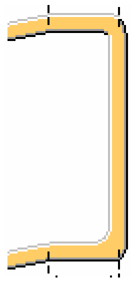
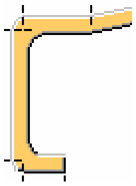
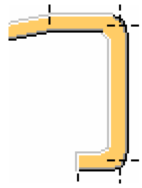
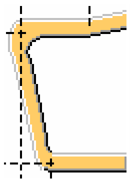
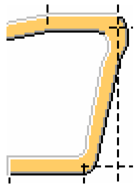
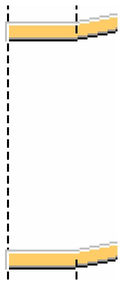
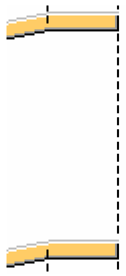
Railing offset



Option	Description
1	Define the vertical distance between the middle rails and the stanchion center.
2	Define the vertical distance between the top or the bottom rail and the stanchion center.

Left and right closure

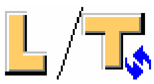
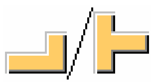
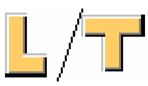
Option		Description
		Default Type 1 AutoDefaults can change this option.

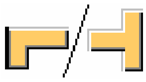
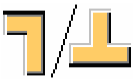
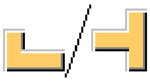
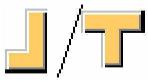
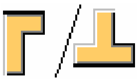
Option		Description
		Type 1
		Type 2
		Type 3
		Type 4

Railing position Define the horizontal railing position.

By default, the **Middle** option is used.

Profile rotation Define the profile rotation for all horizontal rails.

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2

Option	Description
	Type 3
	Type 4
	Type 5
	Type 6
	Type 7
	Type 8

Railings (S77): Parameters tab

Use the **Parameters** tab to control the cuts, fitting, and gaps between the railing parts in the **Railings (S77)** modeling tool.

Continuity profile

Option	Description
Continuity profile top	Define the continuity profile by selecting it from the profile catalog. The top continuity profile is created if the length of the continuous profile is more than 0 and **Top rail parts gap** is set to **Yes**.
Continuity profile middle	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 **Middle rail parts gap** is set to **Yes**.
Continuity profile bottom	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 **Bottom rail parts gap** is set to **Yes**.

Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	`RAIL`
Class	Define the part class number.	`1`

Rail length

Option	Description	Default
Top rail max length	Define the maximum length of the top rail.	`3000 mm`
Middle rail max length	Define the maximum length of the middle rail.	`3000 mm`
Bottom rail max length	Define the maximum length of the bottom rail.	`3000 mm`

Rail fittings

Option	Desciption
Top rail to stanchion fitting	Define the fitting type between the top rail and the stanchions. By default, no fitting is created. • **None** No fitting is created. • **Fit to rail** Stanchions are fitted to rail, using the fitting distance defined in **Top rail to stanchion fitting distance**. • **Fit horizontal** Stanchions are cut by a horizontal plane, using the fitting distance defined in **Top rail to stanchion fitting distance**. • **Stanchion partcut** Stanchions are cut by the rails, using the tolerance defined in **Top rail to stanchion cut tolerance**.

Option	Desciption
	• **Rail partcut** Rails are cut by the stanchions, using the tolerance defined in **Top rail to stanchion cut tolerance**.
Top rail to stanchion fitting distance	Define the fitting distance between the top rail center line and the stanchion.
Top stanchion cut tolerance	Define the cut tolerance between the top rail and the stanchions.

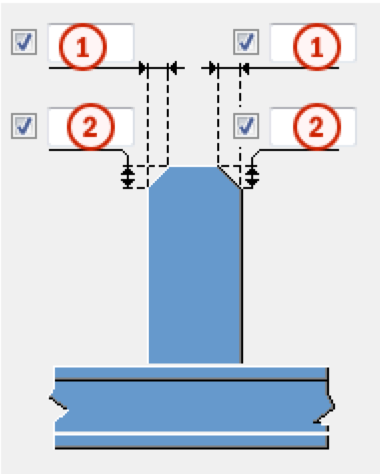
Option	Description
Other rail to stanchion fitting	Define the fitting type between the middle or bottom rail and the stanchions. By default, no cuts are created. • **None** No cut is created. • **Stanchion partcut** Stanchions are cut by the rails, using the tolerance in **Other stanchion cut tolerance**. • **Rail partcut** Rails are cut by the stanchions, using the tolerance in **Other stanchion cut tolerance**. • **Stanchion sloted hole** Stanchions are cut by the rails through a slotted hole, using the tolerance in **Other stanchion cut tolerance**.
Other stanchion cut tolerance	Define the part cut tolerance between the middle or the bottom rail and the stanchions.

Rail cuts

Option	Description
Top rail cuts	Define how the top rail is cut. By default, the **At max stanchion** option is used. • **At max stanchion** Starting from the first stanchion, without the closures, the **Top rail max. length** is measured along the rail and the cut is made at the last stanchion included in the measured distance.

Option	Description
	• **At max length** Starting from the first point of the rail, including the closure, the **Top rail max. length** is measured along the rail and the cut is made at the maximum length. • **Every stanchion** A cut is made to the rail at each stanchion. • **At max length no closure** Starting from the first stanchion, without the closures, the **Top rail max. length** is measured along the rail and the cut is made at the maximum length.
Middle rail cuts	Defines how to cut the middle rail. By default, the **At max stanchion** option is used.
Bottom rail cuts	Defines how to cut the bottom rail. By default, the **At max stanchion** option is used.

Chamfer dimensions

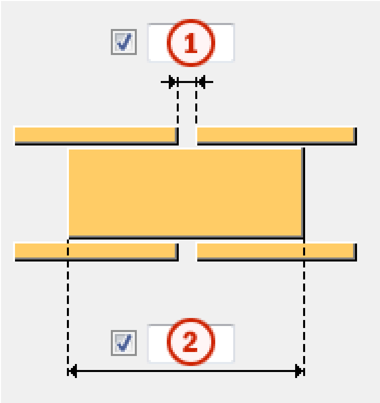


Option	Description
1	Define the horizontal chamfer dimension for the stanchions.
2	Define the vertical chamfer dimension for the stanchions.

Gap

Option	Description
Top rail parts gap **Midd. rail parts gap** **Bott. rail parts gap**	Select whether a gap is created between the rail parts. By default, no gap is created.

Gap between parts



Option	Description
1	Define the size of the gap between two consecutive rail parts.
2	Define the length of the continuous profile.

Assembly

Option	Description
Create assembly	Select which part of the railing is the main part of the assembly. By default, no assembly is created. • **No** No assembly is created. • **To first stanchion** The first stanchion is the main part of the assembly. • **To last stanchion** The last stanchion is the main part of the assembly. • **To first rail** The first rail part after the first stanchion is the main part of the assembly. If you have created continuous profiles for all the rails, multiple assemblies are created.

Railings (S77): Rails tab

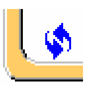
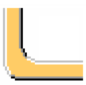
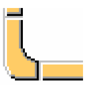
Use the **Rails** tab to control the profiles, bending cuts, and connections for the top and the bottom rails in the **Railings (S77)** modeling tool.

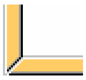
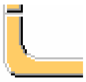
Rail and closure profiles

Option	Description
Top rail profile	Define the top rail profile by selecting it from the profile catalog. Top rail is always created.
Bottom rail profile	Define the bottom rail profile by selecting it from the profile catalog. Bottom rail is always created.
Start closure	Define the start closure by selecting it from the profile catalog. By default, the **Start closure** profile is the same as the **Top rail profile**.
End closure	Define the end closure by selecting it from the profile catalog. By default, the **End closure** profile is the same as the **Top rail profile**.

Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

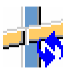
Closure bending cuts

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 **Bends** tab.

Option	Description
	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 **Bends** tab.
	Right side cut The rail corner is cut at the right side. The dimensions for the cut are defined on the **Bends** tab.

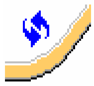
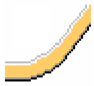
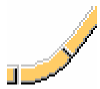
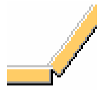
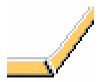
Cut position of the rails

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.
	Closure near side cut The rail passes through the first or the last stanchion and is cut at its surface. The closure is cut at the near side surface of the stanchion, without intersecting it.
	Middle stanchion cut The rail passes through the first or the last stanchion and is cut at its middle line. The closure is cut at the middle line of the stanchion, intersecting it.
	Closure far side cut The rail is cut at the surface of the stanchion, without intersecting it. The closure is cut at the other far side surface of the stanchion, intersecting it.

Cut position for the other bending

Define the cut position for the other bendings than the corners of the closures.

Option	Description
	Default No cut is created. AutoDefaults can change this option.
	No cut is created.
	Both side cuts The rail bending is cut at the left and the right side. The dimensions for the cut are defined on the **Bends** 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.

Connection properties

Option	Description
Connection number	Define the number of the component that connects the top and the bottom rails to the stanchions by selecting if from the component catalog. You cannot use a custom component.
Attribute file	Select an attribute file for the component.

Railings (S77): Middle Rails tab

Use the **Middle Rails** tab to control the horizontal middle rails in the **Railings (S77)** modeling tool.

Rail profile

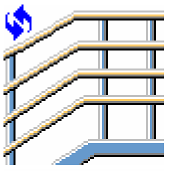
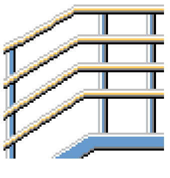
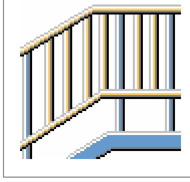
Option	Description
1 **2** **3** **4**	Define the middle rail profile by selecting it from the profile catalog. By default, the size of middle rail profile is the same as the size of the top rail profile.

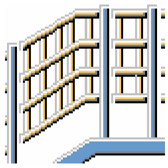
Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

Option	Description	Default
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	`MIDDLE RAIL`
Class	Define the part class number.	

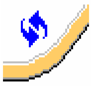
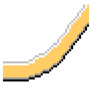
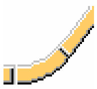
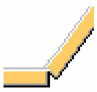
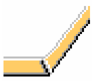
Middle rail type

Option	Description
Middle rail profile(s)	Define the number of rails and the rail profile used for middle rails. For example, `3*2` creates three horizontal middle rails, with the profile defined in field **2** in **Rail profile**. For example, `2*2 1` creates two horizontal middle rails, with the profile defined in field **2** and one or more rails (depending of the number of rails needed), with the profile defined in field **1** in **Rail profile**. For example, `3` creates horizontal middle rails with the profile defined in field **3** in **Rail profile**. The number of rails is defined by the number set for the horizontal or vertical middle rails. By default, only rails with profile from field **1** in **Rail profile** are created.

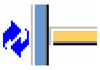
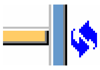
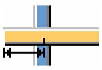
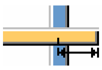
Option	Description
	Default Creates horizontal middle rails. AutoDefaults can change this option.
	Creates horizontal middle rails.
	Creates vertical middle rails (pickets) defined on the **Vertical rails** tab.

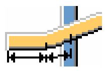
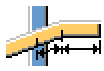
Option	Description
	Creates panels.

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 **Bends** 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.

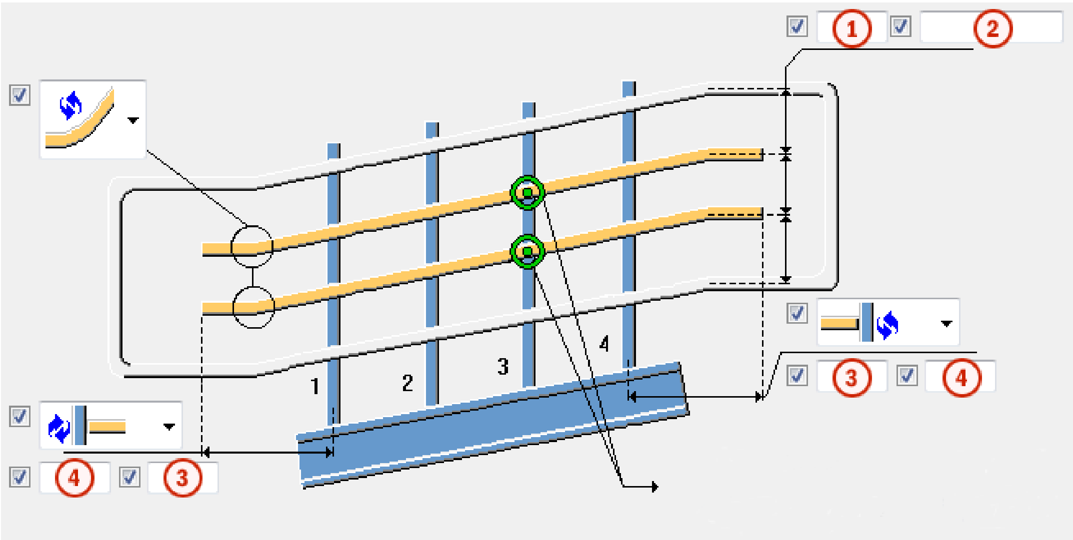
Horizontal middle rail extension

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 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 field 3.

Option		Description
		Horizontal and skew extension The middle rails are extended by two horizontal dimensions. 3 is for the horizontal rail length and 4 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**.

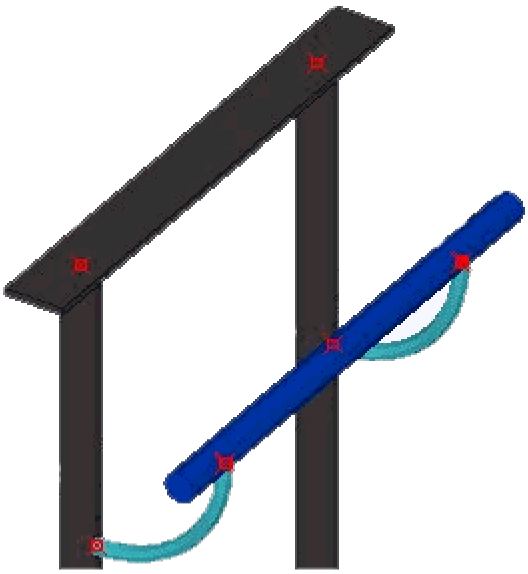


Option	Description
1	Define the number of horizontal middle rails.
2	Define the spacing between the horizontal middle rails.
3	Define the length of the middle rail horizontal extension inside the closure. The rail can be shortened by entering a negative value. Use this field when **Middle horizontal rail extension** is set to **Horizontal extension**.
4	Define the length of the middle rail horizontal and skew extension. The middle rails are extended by two horizontal dimensions. 3 is for the horizontal rail length and 4 is for the skew rail length. Use this field when **Middle horizontal rail extension** is set to **Horizontal and skew extension**.

Connection properties

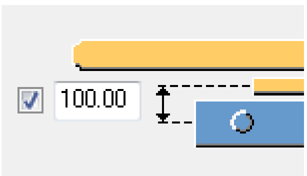
Option	Description
Connection number	Define the number of the component that connects the middle rails to the stanchions by selecting it from the component catalog. You can also use a custom component.
Attribute file	Select an attribute file for the component.
Seam dir.	Define the component direction for a custom seam.

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.

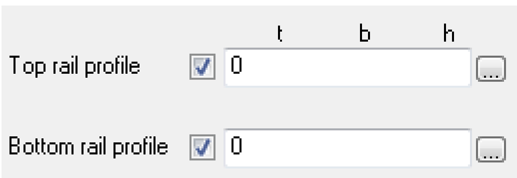


To create a grab rail:

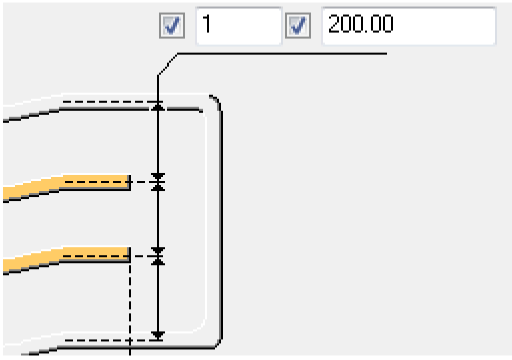
1. On the **Picture** tab, offset the middle rails from the stanchions.



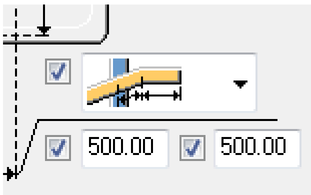
2. On the **Rails** tab, set the profile for top and bottom rails to 0 so that those rails are not created.



3. On the **Middle rails** tab, set the number of horizontal rails to `1` and adjust the spacing for the handrail.

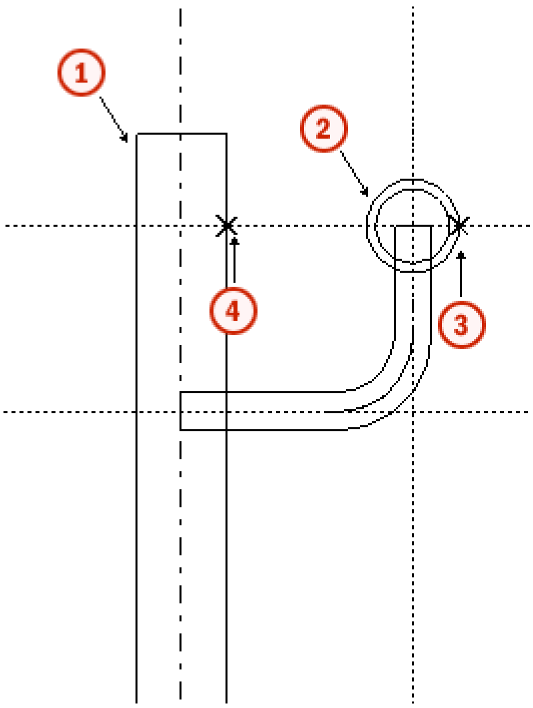


4. If you want to extend the end of the grab rail and have a horizontal part, select the **Horizontal and skew extension** option on the **Middle rails** tab, and enter the skew and horizontal distances.



5. Create the custom seam.

   Pick the points on the outer extension of the main and secondary parts.



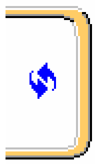
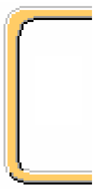
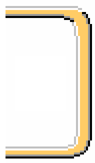
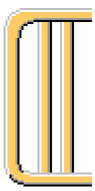
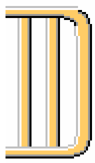
Option	Description
1	Main part
2	Secondary part
3	First picked point
4	Second picked point

6. Save the **standard** properties for the custom seam.
7. On the **Middle rails** tab, use the custom seam name and properties and set the component direction.

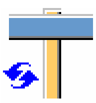
Railings (S77): Vertical Rails tab

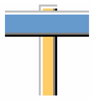
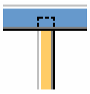
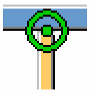
Use the **Vertical Rails** tab to control the vertical rails (pickets) in the **Railings (S77)** modeling tool. This tab is active only if you have set the **Middle Rails Type** to **Vertical middle rails** on the **Middle Rails** tab.

Pickets

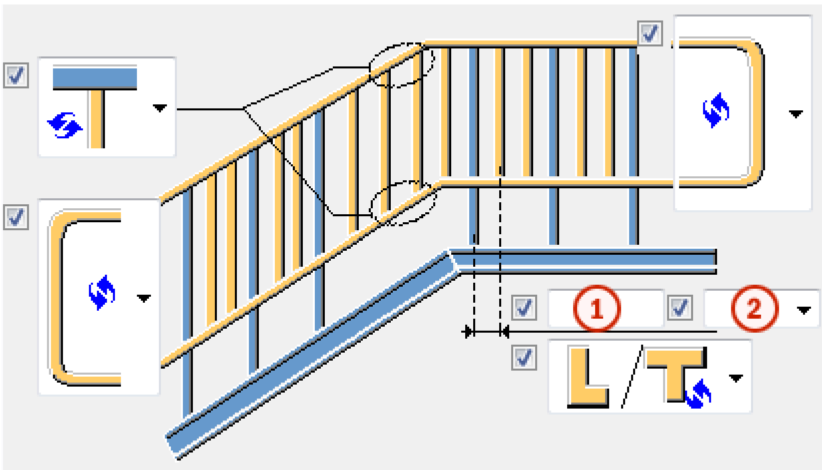
Option		Description
		Default Pickets are not created inside the closure. AutoDefaults can change this option.
		Pickets are not created inside the closure.
		Pickets are created inside the closure when you use the closure type 1 or 4.

Connection type between the pickets and the top and bottom rails

Option	Description
	Default None AutoDefaults can change this option.

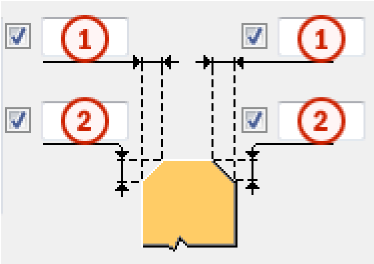
Option	Description
	None The pickets are created from the top rail center to the bottom rail center.
	Fitted The pickets are fitted at the creation points by a plane that follows the slope of the horizontal rails.
	Part cut The pickets are cut on both sides by the horizontal rail profiles.
	Connection The pickets are connected to the top and bottom rail with a system connection.

Picket spacing



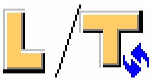
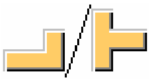
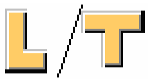
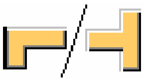
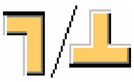
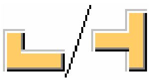
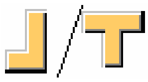
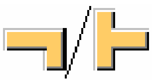
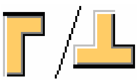
Option	Description
1	Define the picket spacing between two consecutive stanchions.
2	Define the spacing type. By default, the Equal spacing option is used. • Exact The space between two consecutive pickets is exactly the spacing value 1. As many pickets as possible are positioned between two consecutive 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. • Equal The spacing value 1defines the maximum spacing. The pickets are placed evenly between the stanchions.

Chamfer dimensions



Option	Description
1	Define the horizontal chamfer dimension for the pickets.
2	Define the 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
	Type 8

Connection properties

Option	Description
Vertical rail top joint	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.
Vertical rail bottom joint	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.

Railings (S77): Panels tab

Use the **Panels** tab to create panels between the stanchions in the **Railings (S77)** modeling tool. No other vertical or horizontal rails are created when the panels are created. This tab is active only if you have set the **Middle Rails 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
Part name/Joint no.	Define the number of the custom component used in panel creation by selecting it from the component catalog.
Attribute file	Select an attribute file for the custom component.
Seam dir.	Define the seam direction.

Panel type

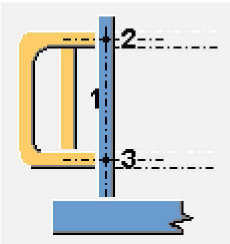
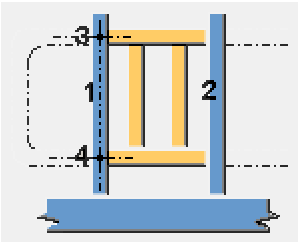
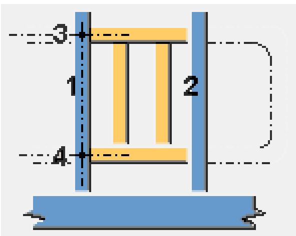
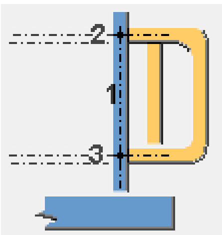
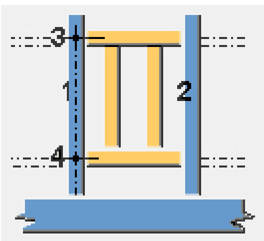
For custom details the numbers in the images correspond to the following parts:

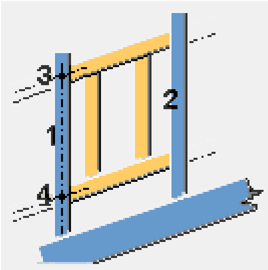
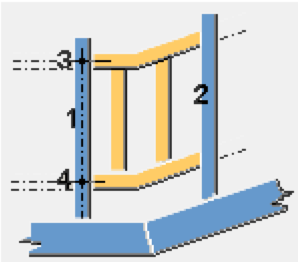
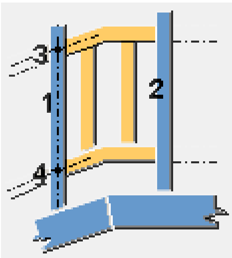
Number	Part
1	First stanchion, which is the main part of the detail.
2	Point at the top of the first stanchion, which is the first input point of the detail.
3	Point at the bottom of the first stanchion, which is the second input point of the detail.

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.

Number	Part
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
	Left closure panel Use a custom detail to create the panel. The panel connects to one stanchion only.
	First panel Use a custom seam to create the panel. The panel can be of different size than the rest of the panels.
	Last panel Use a custom seam to create the panel. The panel can be of different size than the rest of the panels.
	Right closure panel Use a custom detail to create the panel. The panel connects to one stanchion only.
	Regular horizontal panel Use a custom seam to create the panel.

Option	Description
	Regular skew panel Use a custom seam to create the panel.
	Horizontal panel, skew junction (bottom) Use a custom seam to create the panel.
	Horizontal panel, skew junction (top) Use a custom seam to create the panel.

Railings (S77): Bends tab

Use the **Bends** tab to set the bending cut position on the rails and the profiles for the bent rails parts in the **Railings (S77)** modeling tool.

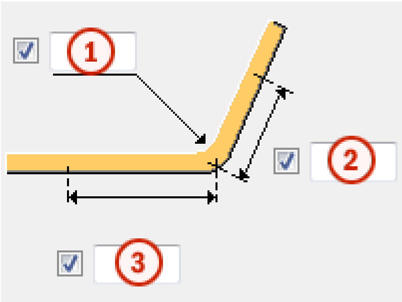
Bend profile

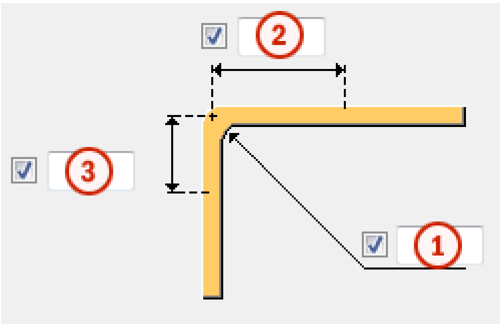
Option	Description
Bend	Define the bend rail profile by selecting it from the profile catalog. Created only if you have set the **Closure bend cuts** to **Both side cut**, **Left side cut**, or **Right side cut** on the **Rails** tab.
90 degree	Define the rail profile by selecting it from the profile catalog. Created only if you have set the **Cut position for the bending** to **Both side cut** on the **Rails** or **Middle Rails** tab.

Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

Option	Description	Default
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Bend dimensions





Option	Description	Default
1	Define the bending radius for the rail parts.	50 mm
2	Define the cut distance along the rails on the right side of the bending.	75 mm
3	Define the cut distance along the rails on the left side of the bending.	75 mm

12.8 Stringer to Channel (127)

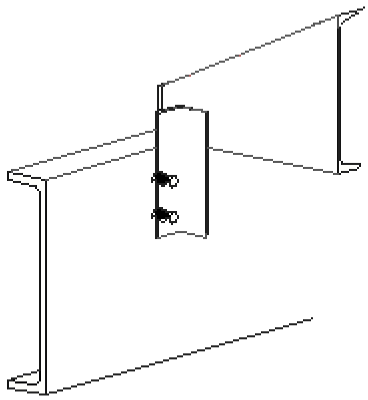
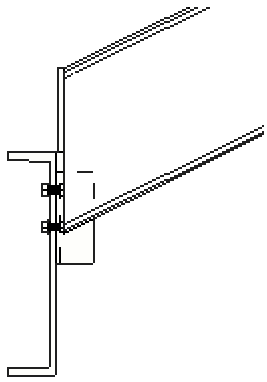
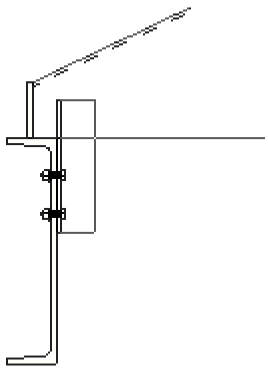
Stringer to Channel (127) connects a stringer to a channel with an angle profile. The angle profile is welded to the stringer and bolted to the channel. A vertical plate is welded to the end of the stringer.

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.
	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.

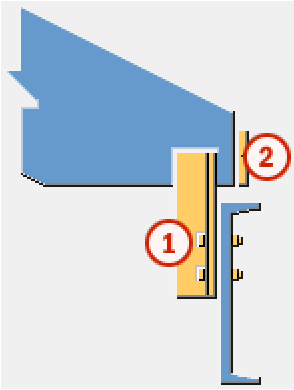
Selection order

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

See also

Stringer to Channel (127): Picture tab on page 971

Stringer to Channel (127): Parts tab on page 973

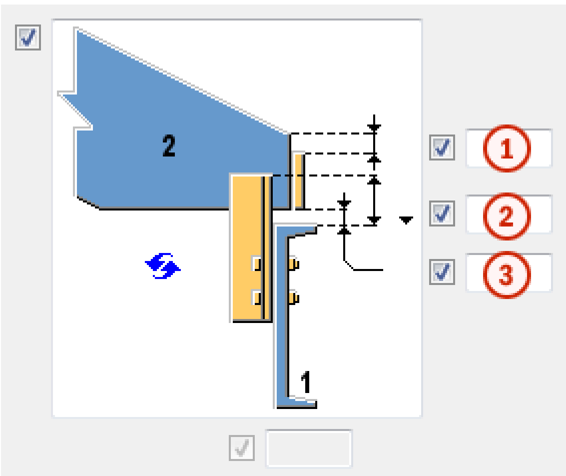
Stringer to Channel (127): Parameters tab on page 973

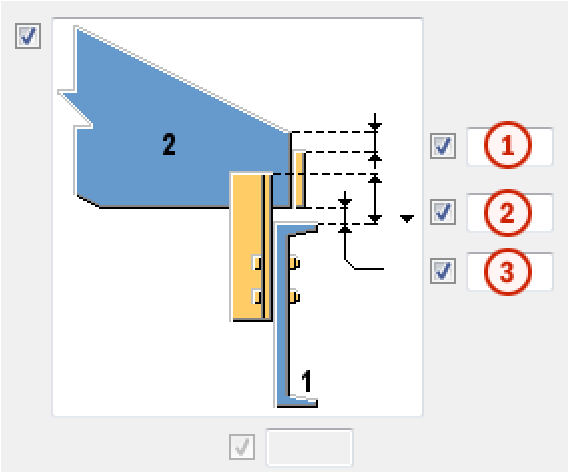
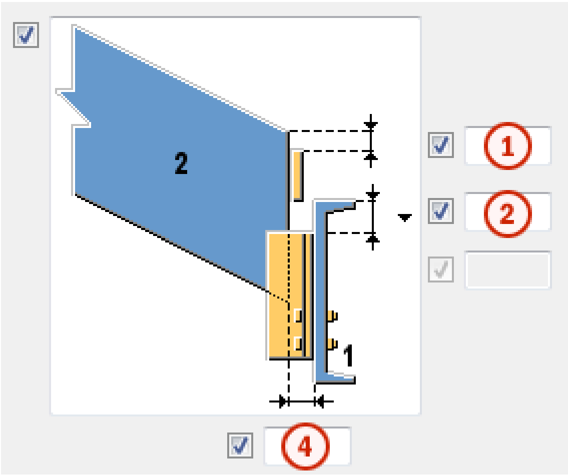
Stringer to Channel (127): Bolts tab on page 974

Stringer to Channel (127): Picture tab

Use the **Picture** tab to define the position of the angle profile and the vertical plate, and whether the stringer is cut in the **Stringer to Channel (127)** connection.

Stringer cut

Option	Description
	Option 1 Default

Option	Description
	Option 2 The stringer is cut horizontally to the top level of the channel
	Option 3 No horizontal cut in the stringer.

	Description	Default
1	Position of the vertical plate. Define the vertical distance from the stringer top edge to the vertical plate top.	`0`
2	Position of the angle profile. Define the vertical distance from the channel top to the angle profile top.	Option 1 or 2: • metric: `65 mm` • imperial: `2"1/2` Option 3: • `0`
3	Location of the stringer cut. 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.	• metric: `12 mm` • imperial: `1/2"`

	Description	Default
4	Location of the stringer cut. Define the horizontal distance from the channel web to the stringer.	• metric: `12 mm` • imperial: `1/2"`

Stringer to Channel (127): Parts tab

Use the **Parts** tab to control the properties of the vertical plate and the angle profile in the **Stringer to Channel (127)** connection.

Vertical plate and angle profile

Option	Description	Default
Vertical plate	Define the vertical plate thickness. If you set the value to 0, no vertical plate is created.	metric: `10 mm` imperial: `3/8"`
Angle	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`

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.

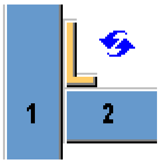
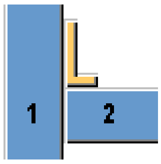
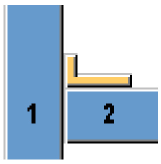
Name	Define a name that is shown in drawings and reports.	`PROFILE`
		
		`ANGLE`

Stringer to Channel (127): Parameters tab

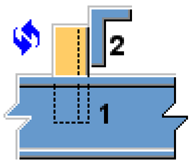
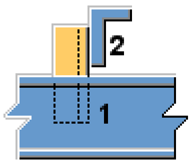
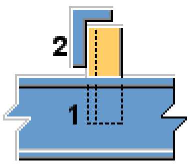
Use the **Parameters** tab to control the leg orientation and the position of the angle profile in the **Stringer to Channel (127)** connection.

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.

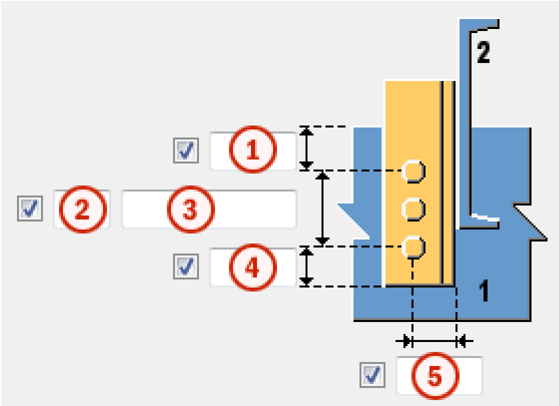
Angle profile position

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.

Stringer to Channel (127): Bolts tab

Use the **Bolts** tab to control the bolts that connect the angle profile to the channel in the **Stringer to Channel (127)** connection.

Bolt group dimensions

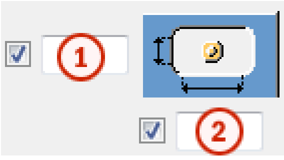


	Description	Default
1	Define the vertical distance from the top of the channel to the center of the top bolt.	metric: 75 mm imperial: 3"
2	Define the number of bolts.	2
3	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.	metric: 75 mm imperial: 3"
4	Define the vertical distance from the bottom of the angle profile to the center of the bottom bolt.	metric: 40 mm imperial: 1"1/2
5	Define the 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
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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
Site/ Workshop	Location where the bolts should be attached.	Site

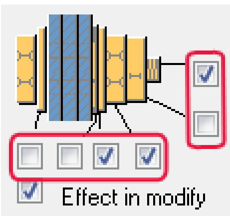
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

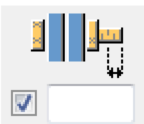
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



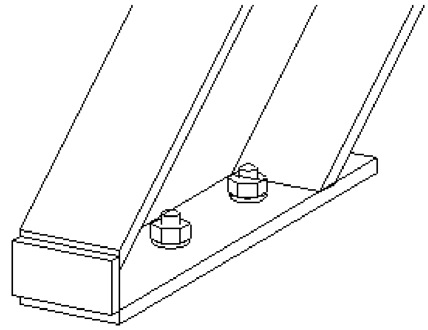
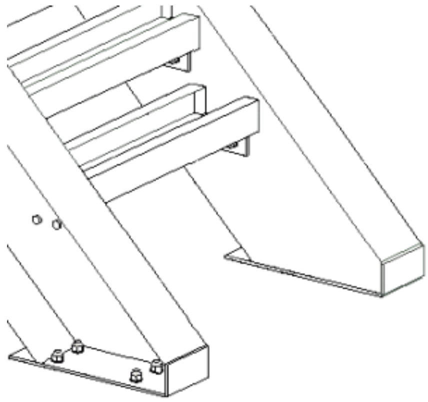
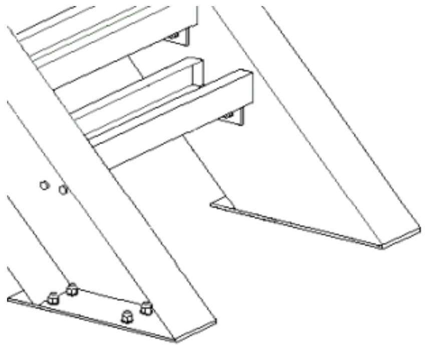
12.9 Stair Base Detail (1038)

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

Situation	Description
	Stair base detail with horizontal and vertical plates.
	Stair base detail with horizontal and vertical plates.
	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**.

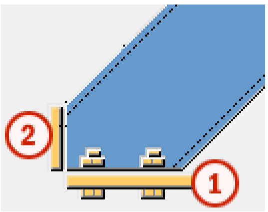
Before you start Create a stringer.

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

See also

Stair Base Detail (1038): Picture tab on page 978

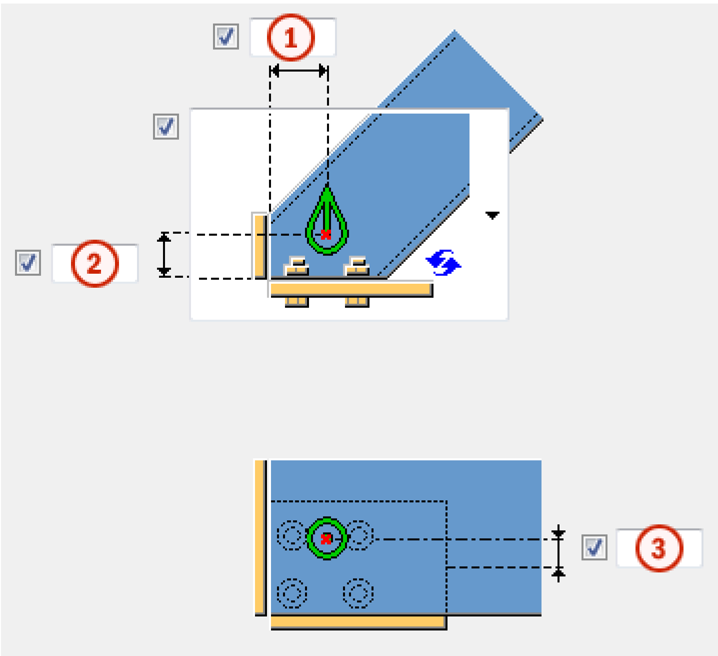
Stair Base Detail (1038): Parts tab on page 979

Stair Base Detail (1038): Bolts tab on page 980

Stair Base Detail (1038): Picture tab

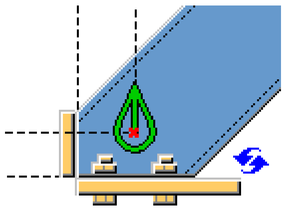
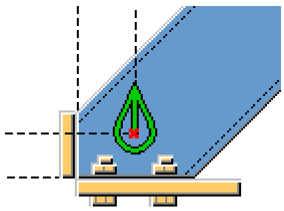
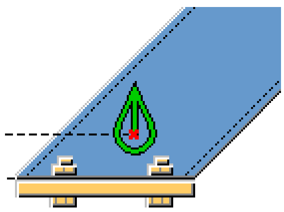
Use the **Picture** tab to control the horizontal and vertical plate positions in **Stair Base Detail (1038)**.

Plate positions



	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	Plate position. Define the vertical distance from the picked point to the top face of the horizontal plate.	`0 mm`
③	Define the horizontal plate offset relative to the component's up direction.	`0 mm`

Vertical plate creation

Option	Description
	Default. Vertical plate is created.
	Vertical plate is created.
	No vertical plate is created.

Stair Base Detail (1038): Parts tab

Use the **Parts** tab to control the horizontal and vertical plate properties in **Stair Base Detail (1038)**.

Horizontal plate/ Vertical plate

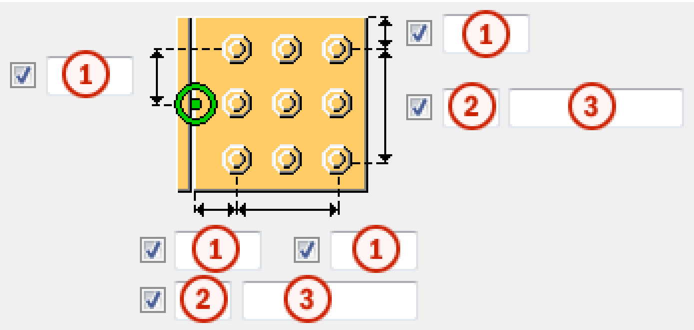
Option	Description
Horizontal plate **Vertical plate**	Define the plate thickness, width and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	`PLATE`

Stair Base Detail (1038): Bolts tab

Use the **Bolts** tab to control the bolt properties in the horizontal plate in **Stair Base Detail (1038)**.

Bolt group dimensions



	Description
1	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Define the number of bolts.
3	Define the 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.

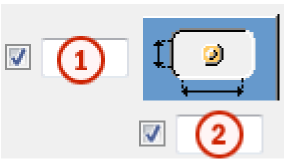
Bolt basic properties

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

Option	Description	Default
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

You can define slotted, oversized, or tapped holes.

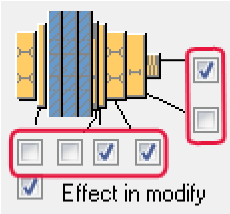


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

Bolt assembly

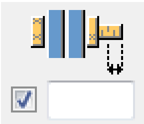
The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



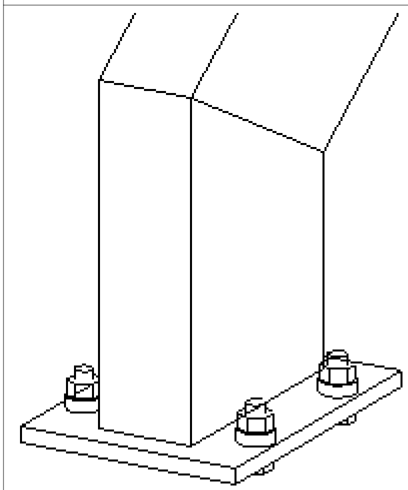
12.10 Stair Base Detail (1039)

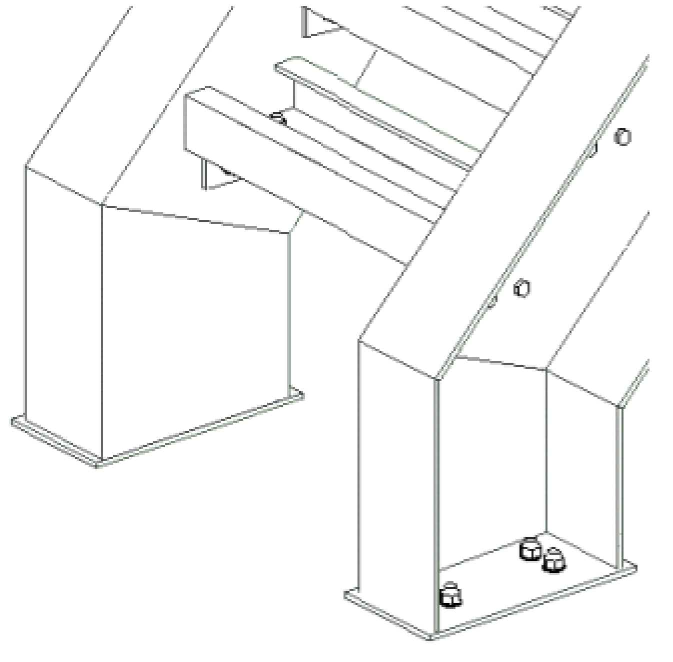
Stair Base Detail (1039) creates a bolted horizontal plate at the picked point on the stringer. The plate is welded to the stringer.

Objects created

- Horizontal plate
- Bolts
- Welds
- Cuts to shape the end of the stringer

Use for

Situation	Description
	Stair base detail with a horizontal plate.

Situation	Description
	Stair base detail with a horizontal plate.

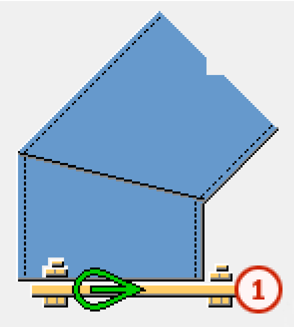
Before you start Create a stringer.

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

See also

Stair Base Detail (1039): Picture tab on page 983

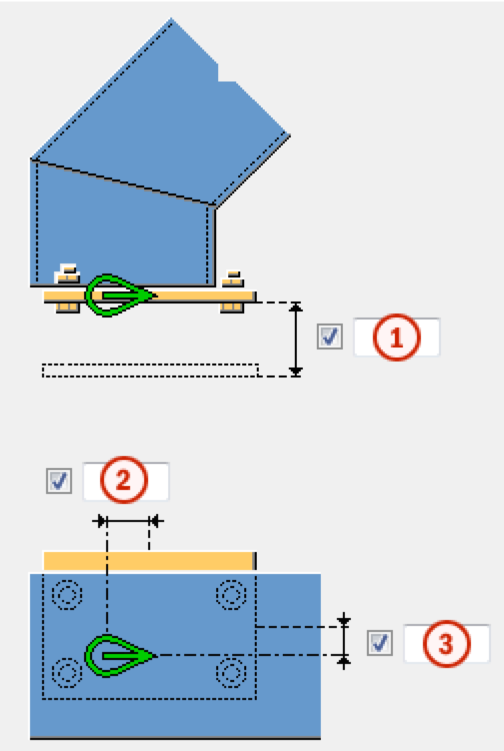
Stair Base Detail (1039): Parts tab on page 984

Stair Base Detail (1039): Bolts tab on page 985

Stair Base Detail (1039): Picture tab

Use the **Picture** tab to control the horizontal plate position in **Stair Base Detail (1039)**.

Horizontal plate position



	Description
1	Plate position. Define the vertical distance from the picked point to the top face of the horizontal plate.
2	Horizontal plate offset in the z direction, relative to the component's up-direction.
3	Horizontal plate offset in the y direction, relative to the component's up-direction.

Stair Base Detail (1039): Parts tab

Use the **Parts** tab to control the horizontal plate properties in **Stair Base Detail (1039)**.

Horizontal plate

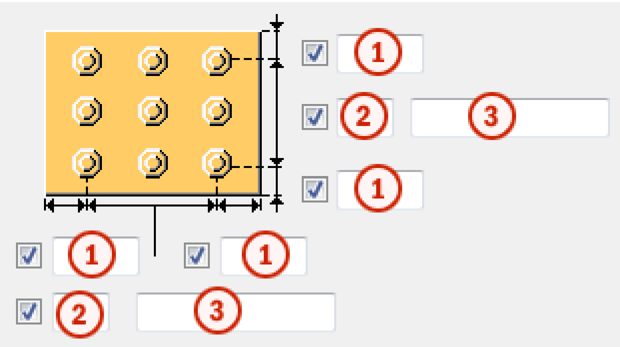
Option	Description
Horizontal plate	Define the plate thickness, width and height.

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	`PLATE`

Stair Base Detail (1039): Bolts tab

Use the **Bolts** tab to control the bolt properties in the horizontal plate in **Stair Base Detail (1039)**.

Bolt group dimensions



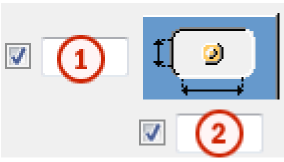
	Description
1	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Define the number of bolts.
3	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.

Bolt basic properties

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

Option	Description	Default
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

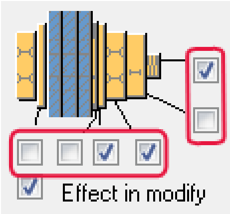
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

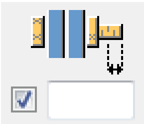
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



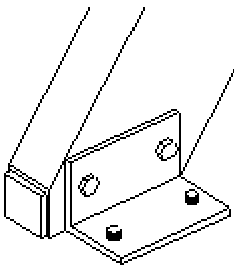
12.11 Stair Base Detail (1043)

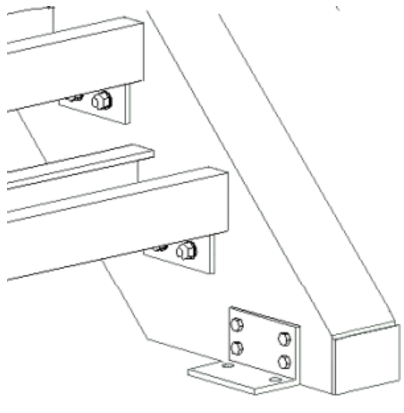
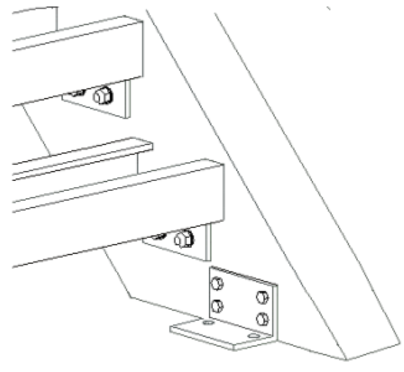
Stair Base Detail (1043) creates a bolted clip angle and an optional vertical plate (nose plate) at a picked point on a stringer. The clip angle is bolted and the vertical plate is welded to the stringer.

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.

Situation	Description
	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**.

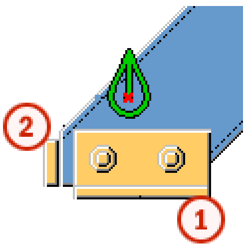
Before you start Create a stringer.

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

See also Stair Base Detail (1043): Picture tab on page 989

Stair Base Detail (1043): Parts tab on page 990

Stair Base Detail (1043): Parameters tab on page 991

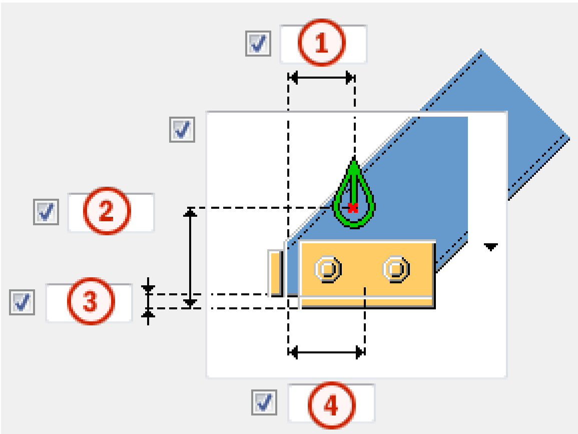
Stair Base Detail (1043): PBolts tab on page 992

Stair Base Detail (1043): SBolts tab on page 994

Stair Base Detail (1043): Picture tab

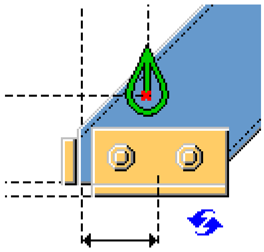
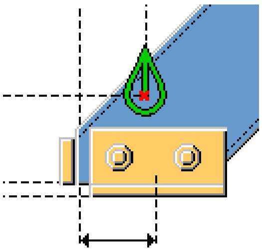
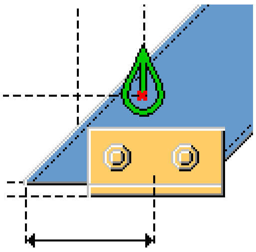
Use the **Picture** tab to control the clip angle and the vertical plate positions in **Stair Base Detail (1043)**.

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"
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.
	Vertical plate is created.
	No vertical plate is created.

Stair Base Detail (1043): Parts tab

Use the **Parts** tab to control the vertical plate and the clip angle properties in **Stair Base Detail (1043)**.

Vertical plate and angle cleat profile

Option	Description
Vertical plate	Define the plate thickness, width and height.
Angle cleat profile	Define the clip angle profile by selecting it from the profile catalog.

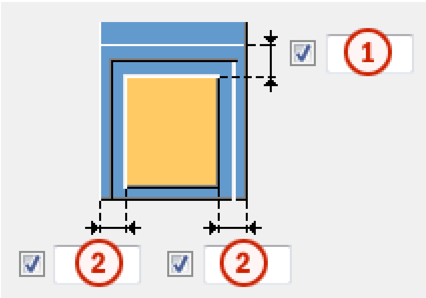
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

Option	Description	Default
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	PLATE CLEAT

Stair Base Detail (1043): Parameters tab

Use the **Parameters** tab to control the vertical plate and the clip angle positions in **Stair Base Detail (1043)**.

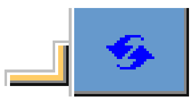
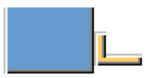
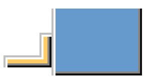
Vertical plate position



	Description
1	Define the dimension from the top of the vertical plate to the front edge of the stringer.
2	Define the dimension from the edges of the vertical plate to the edges of the stringer.

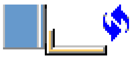
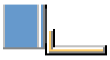
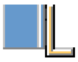
Clip angle location

Select on which side of the stringer the clip angle is created.

Option	Description
	Default
	Clip angle is created on the right side of the stringer.
	Clip angle is created on the left side of the stringer.

Clip angle position

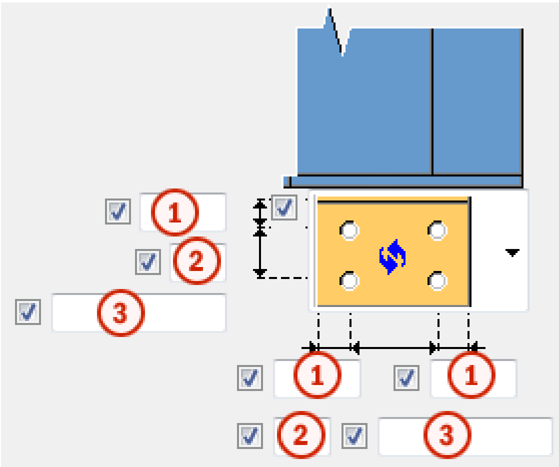
If the legs of the clip angle are of uneven length, you can switch their position.

Option	Description
	Default
	The shorter leg of the clip angle is connected to the stringer.
	The longer leg of the clip angle is connected to the stringer.

Stair Base Detail (1043): PBolts tab

Use the **PBolts** tab to control how the clip angle is attached to the base in **Stair Base Detail (1043)**.

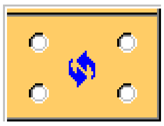
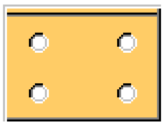
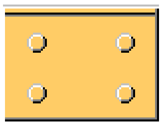
Bolt group dimensions



	Description
1	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
2	Define the number of bolts.
3	Define the 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

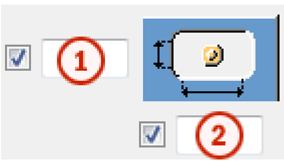
Select how the clip angle is attached to the base.

Option	Description
	Default
	Holes are created.
	Bolts and holes are created.
	No holes or bolts are created.

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes You can define slotted, oversized, or tapped holes.

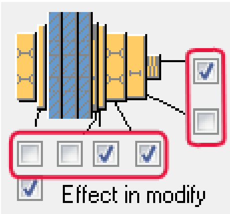


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.

Option	Description	Default
②	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

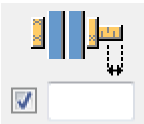
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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**.

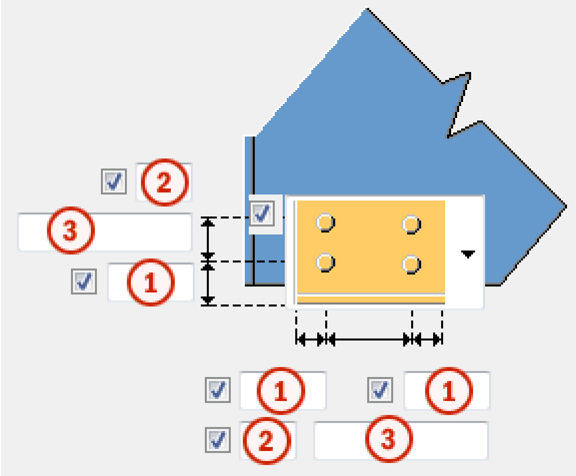
Bolt length increase Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



Stair Base Detail (1043): SBolts tab

Use the **SBolts** tab to control how the clip angle is attached to the stringer in **Stair Base Detail (1043)**.

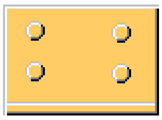
Bolt group dimensions



	Description
①	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
②	Define the number of bolts.
③	Define the 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.

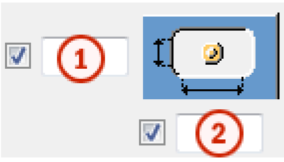
Option	Description
	Default
	No bolts are created.
	Bolts are created.

Bolt basic properties

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

Option	Description	Default
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

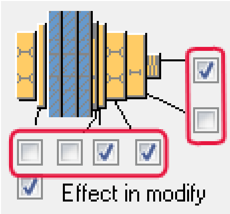
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

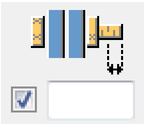
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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.



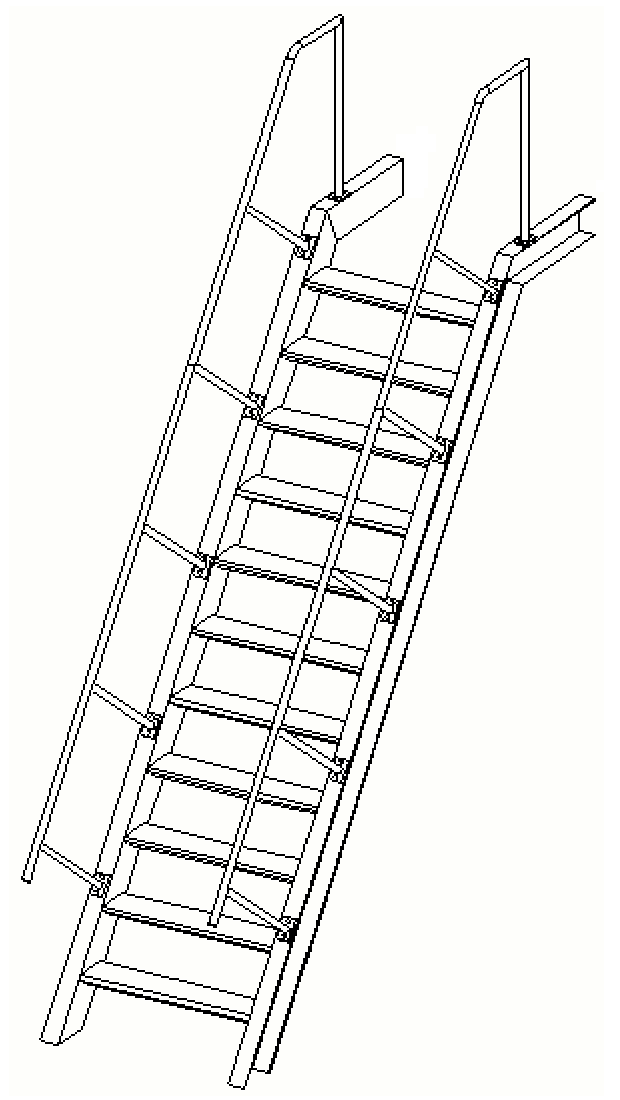
12.12 Ship Ladder (1)

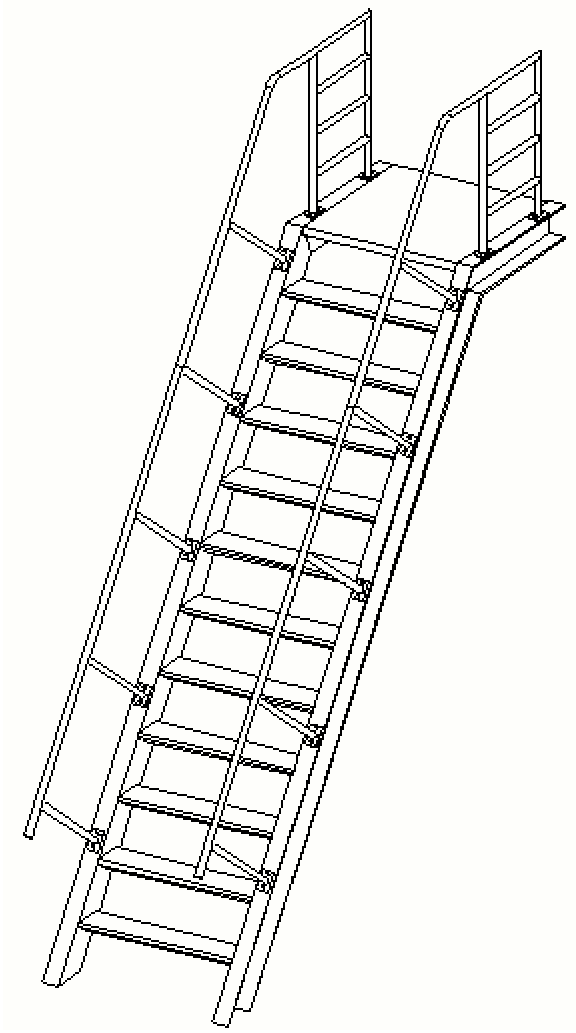
Ship Ladder (1) creates stairs for ships and oil platforms.

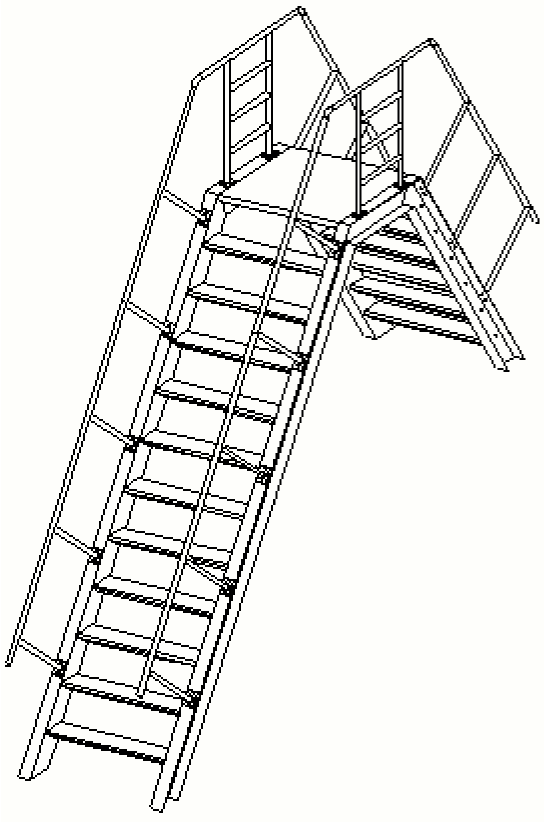
Objects created

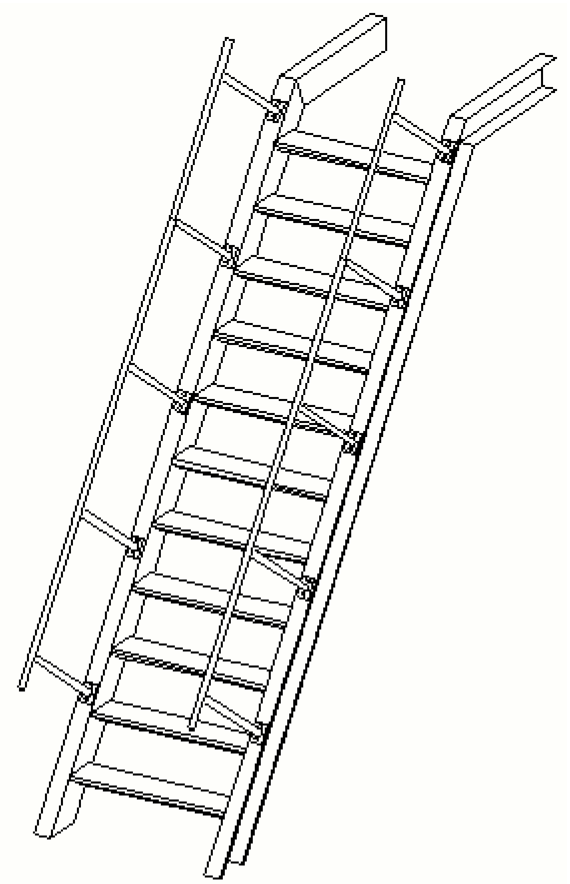
- Stanchions
- Stringers
- Steps
- Handrails and elbows
- Middle rails
- Platform
- Platform support
- Bolts
- Welds
- Additional component (optional)

Use for

Situation	Description
	Type 1 Ship ladder with stringers, steps, stanchions, and handrails.

Situation	Description
	Type 2 Ship ladder with stringers, steps, stanchions, platform, and handrails with middle rails.

Situation	Description
	Type 3 Ship ladder with stringers, steps, stanchions, platform, handrails with middle rails.

Situation	Description
	Type 4 Ship ladder with stringers, steps, stanchions, and handrails.

Limitations **Ship Ladder (1)** 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 (1)** modeling tool for the first time in your environment, or when you change your Tekla Structures environment.

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 loosing 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.

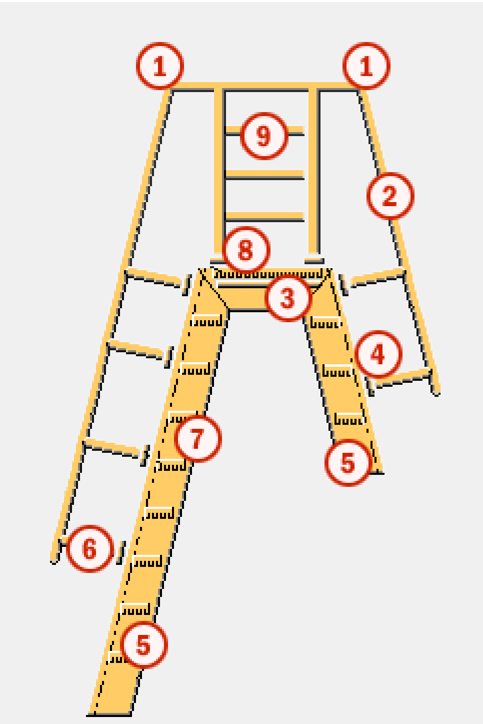
4. Set `XS_DO_NOT_OVERWRITE_PLUGIN_INP_FILE = TRUE` in `teklastructures.ini` file.
5. Run `Steps.exe`.
6. Restart Tekla Structures

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



Option	Part
1	Elbow
2	Handrail
3	Platform support
4	Plate
5	Stringer
6	Stanchion

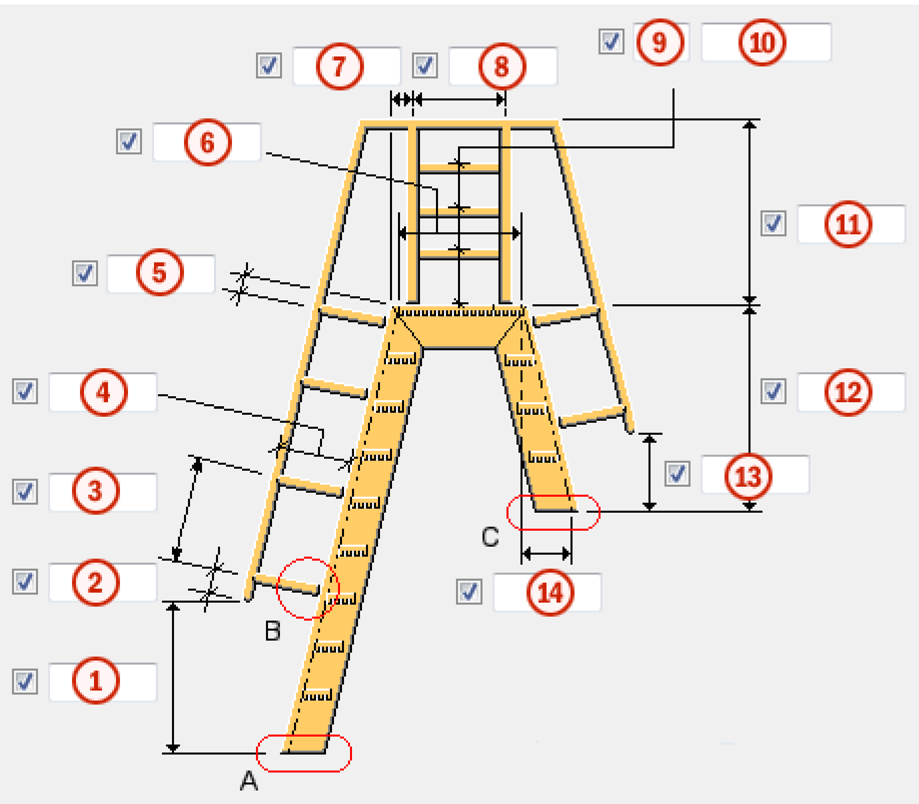
Option	Part
7	Step
8	Platform
9	Middle rail

See also Ship Ladder (1): Picture tab on page 1003
Ship Ladder (1): Parts tab on page 1007
Ship Ladder (1): Platform tab on page 1008
Ship Ladder (1): Steps tab on page 1011
Ship Ladder (1): Rails tab on page 1012
Ship Ladder (1): Detail B tab on page 1013

Ship Ladder (1): 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 in the **Ship Ladder (1)** modeling tool.

Dimensions



Option	Description	Default
1	Define the vertical distance between up stringer bottom and handrail bottom.	`1000 mm`
2	Define the first stanchion offset along handrail, measured from the handrail bottom.	`200 mm`
3	Define the maximum distance between middle stanchions.	`1000 mm`
4	Define the distance between stringer and handrail.	`800 mm`
5	Define the last stanchion offset along handrail, measured from the stringer top.	`200 mm`
6	• For **Type 1**, **2** and **4**: Define the distance between up nosing line top point and horizontal stringer end. • For **Type 3**: Define the distance between up nosing line top points.	`1000 mm`
7	Define the horizontal offset for the first stanchion, measured from horizontal stringer start. This option is not active for **Type 4**.	`200 mm`
8	Define the distance between the first and the last horizontal stanchions. This option is not active for **Type 1** or **Type 4**.	`600 mm`
9	Define the number of middle rails. This option is not active for **Type 1** or **Type 4**.	`3`
10	Define the 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 **Type 1** or **Type 4**.	`Value of option` 3 `divided by number of spaces.`
11	Define the vertical distance between handrail top and platform top. This option is not active if for **Type 4**.	`1000 mm`
12	Define the vertical distance between platform top and down stringer bottom. This option is active only for **Type 3**.	`2000 mm`

Option	Description	Default
13	Define the vertical distance between handrail bottom and down stringer bottom. This option is active only for **Type 3**.	`1000 mm`
14	Define the horizontal distance between up nosing line end and down nosing line end. This option is active only for **Type 3**.	`The up stringer and down stringers have the same inclination.`

Step and assembly creation

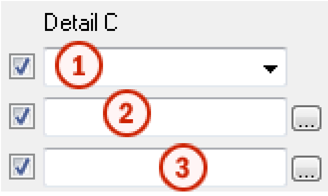
Option	Description
Create top step	Define whether the top step is created.

Create assembly	Define which parts form an assembly.
	
	The options are:
	
	• **No**
	No assembly is created.
	
	• **All**
	All parts are included in an assembly.
	
	• **Stingers/Rails**
	Parts form several assemblies:
	  • Each of the stringer assemblies includes up, horizontal and down stringers.
	  • Each of the rail assemblies includes up, horizontal and down handrails, middle rails, stanchions and plates.
	  • The platform, each platform support and each step form its own assembly.

Detail A and Detail C

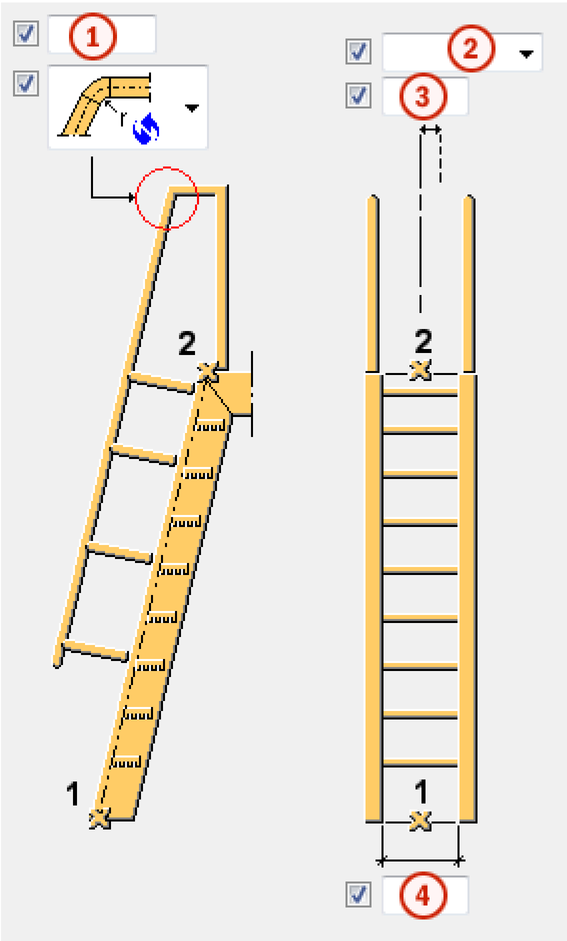
Use **Detail A** to connect the up stringer end to an end detail.

Use **Detail C** to connect the down stringer end to an end detail.



Option	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

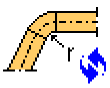
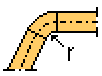
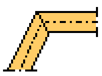
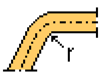
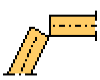


Option	Description	Default
1	Define the handrail elbow radius. This option is not active for **Type 4**.	100 mm

Option	Description	Default
2	Define how to measure the dimension for the horizontal offset of the ship ladder. The options are: • **Left** To the left from the line defined by the picked points. • **Middle** The line defined by the picked points is the center line. • **Right** To the right from the line defined by the picked points.	`Middle`
3	Define the horizontal offset. This option is not active for **Default** or **Middle**.	`0 mm`
4	Define the 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.

Ship Ladder (1): Parts tab

Use the **Parts** tab to control the properties of parts created in the **Ship Ladder (1)** modeling tool.

Part properties

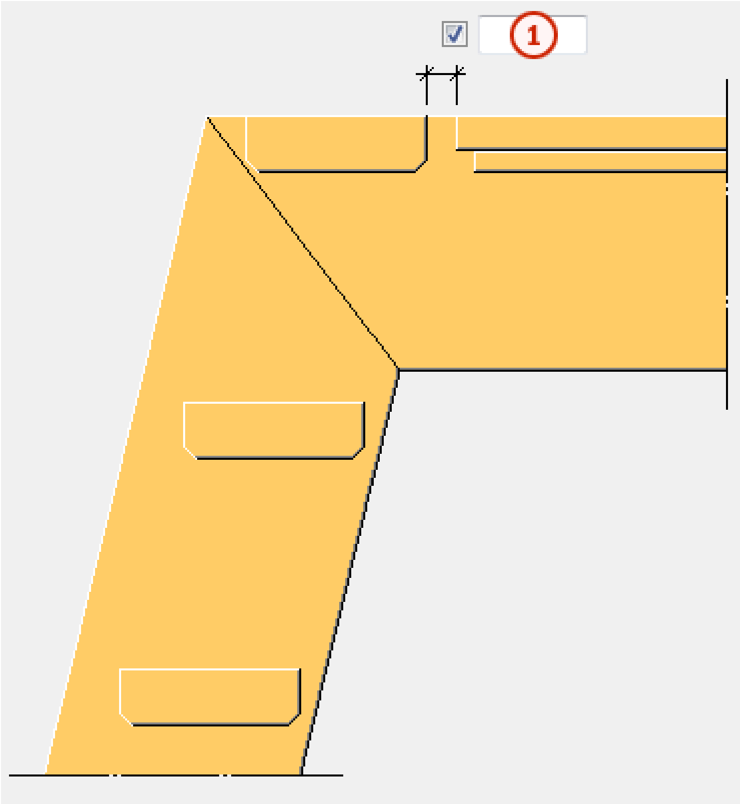
Option	Description	Default
Elbow **Handrail** **Middle rail** **Stanchion**	Define the elbow profile by selecting it from the profile catalog.	`PD40*2`
Plate in Detail B	Define the thickness of the plate.	`5 mm`
Support	Define the thickness of the platform support.	`5 mm`
Step	Select whether to use catalogue steps or 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.	
Stringer	Define the stringer profile by selecting it from the profile catalog.	`C200*100*5`
Platform	Define the thickness of the platform.	`50 mm`
Bracket	Define the bracket profile by selecting it from the profile catalog.	

Option	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Ship Ladder (1): Platform tab

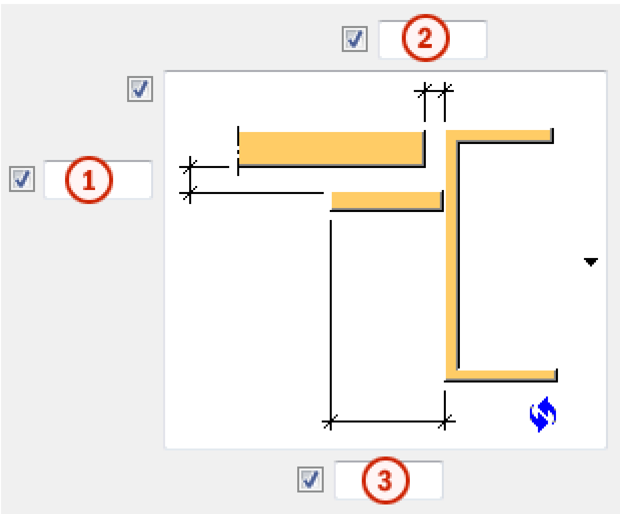
Use the **Platform** tab to control the platform offset and support in the **Ship Ladder (1)** modeling tool.

Platform offset



Option	Description	Default
1	Define the 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

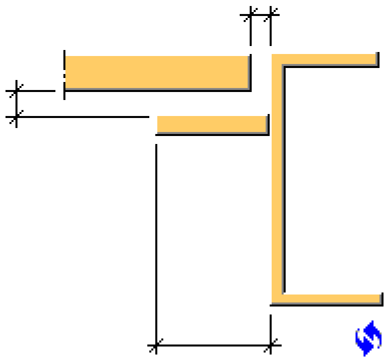
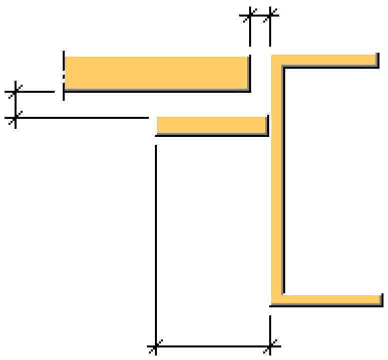
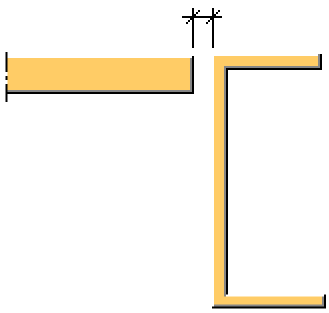
Platform offset and support



Option	Description	Default
1	Define the platform support vertical offset from the platform bottom.	0 mm
2	Define the platform horizontal offset from the stringer.	0 mm
3	Define the width of the platform support.	50 mm

Platform support creation

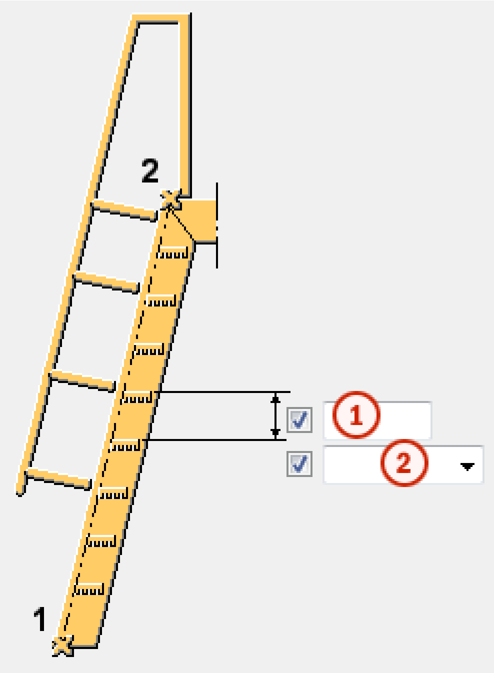
The top of the platform is always on the same level as the top of the stringer.

Option	Description
	Default Platform support is created. AutoDefaults can change this option.
	Platform support is created.
	Platform support is not created.

Ship Ladder (1): Steps tab

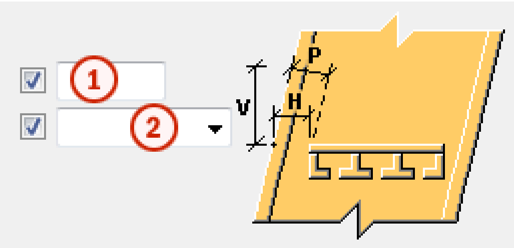
Use the **Steps** tab to control the step spacing and offset in the **Ship Ladder (1)** modeling tool.

Step spacing



Option	Description	Default
1	Define the vertical spacing between the steps. The spacing depends on the step spacing type.	300 mm
2	Define the step spacing type. The steps are spaced from the second picked point to the first picked point **Equal** represents the maximum distance between the steps. **Exact** represents the exact distance between the steps.	Equal

Step offset



Optio n	Description	Default
①	Define the step offset from the stringers.	`0 mm`
②	Define type of the step offset.	`Horizontal (H)`

Ship Ladder (1): Rails tab

Use the **Rails** tab to control the handrail and middle rail properties in the **Ship Ladder (1)** modeling tool.

Middle rail and Handrail

Option	Description	Default
Middle rail to stanchion **Handrail to stanchion**	Define how the middle rails or handrails are connected to the stanchions.	Middle rails = `Connection` Handrails = `Weld`
Connection number	Define a connection that connects the rails to stanchion by selecting it from the component catalog.	`Round tube (23)`
Connection properties	Select an attribute file for the connection.	`standard`

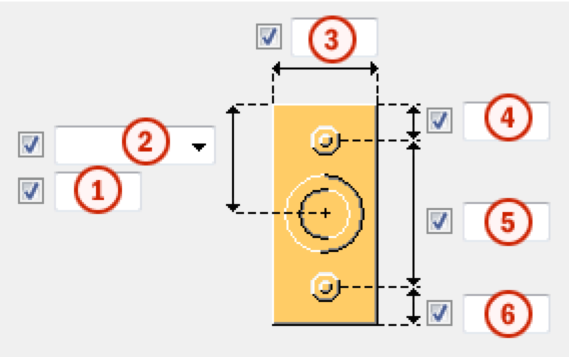
Handrail options

Optin	Description	Default
Handrail max. length	Define the maximum length of the handrail.	`3000 mm`
Handrail cuts	Define how the handrails are cut. The options are: • **At max. stanchion** Starting from the handrail end, the **Handrail max. length** is measured along the handrail and the cut is made at the last stanchion included in the measured distance. • **At max. length** Starting from the handrail end, the **Handrail max. length** is measured along the rail and the cut is made at the maximum length. • **Every stanchion** A cut is made to the handrail at each stanchion.	`At max. stanchion`

Ship Ladder (1): Detail B tab

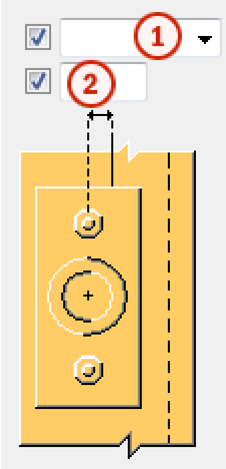
Use the **Detail B** tab to control the bolt properties on a plate that connects stanchions to stringers in the **Ship Ladder (1)** modeling tool.

Vertical offset



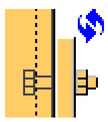
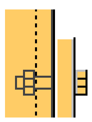
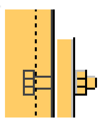
Option	Description
1	Define the plate vertical offset.
2	Define how to measure the dimension for the plate vertical offset. • **Top** From the top of the plate to the stanchion center. • **Middle** From the horizontal center line of the plate to the stanchion center. • **Below** From the bottom of the plate to the stanchion center.
3	Define the plate width.
4	Define the distance between top bolt and plate top.
5	Define the distance between the bolts.
6	Define the distance between bottom bolt and plate bottom.

Horizontal offset



Option	Description
1	Define how to measure the dimension for the horizontal plate offset. • **Left** • From the left of the plate to the stanchion center. • **Middle** From the horizontal center line of the plate to the stanchion center. • **Right** • From the right of the plate to the stanchion center.
2	Define the horizontal plate offset.

Bolting direction

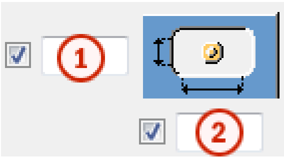
Option	Description
	Default From plate to stringer AutoDefaults can change this option.
	From stringer to plate
	From plate to stringer

Bolt basic properties

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

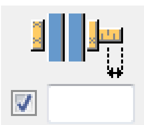
Option	Description	Default
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.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

Slotted holes You can define slotted, oversized, or tapped holes.



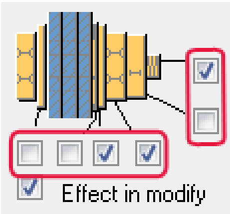
Option	Description	Default
1	Vertical dimension of slotted hole.	0, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	0, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(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**.

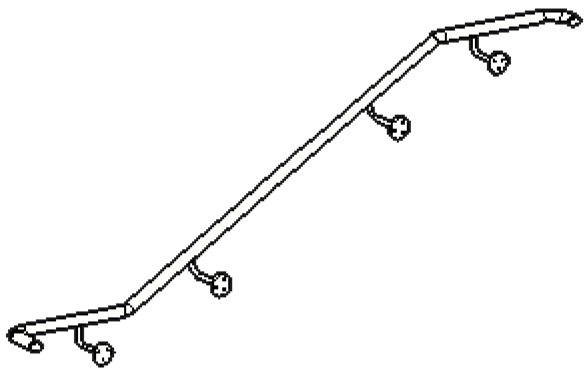
12.13 Wall Rails (1)

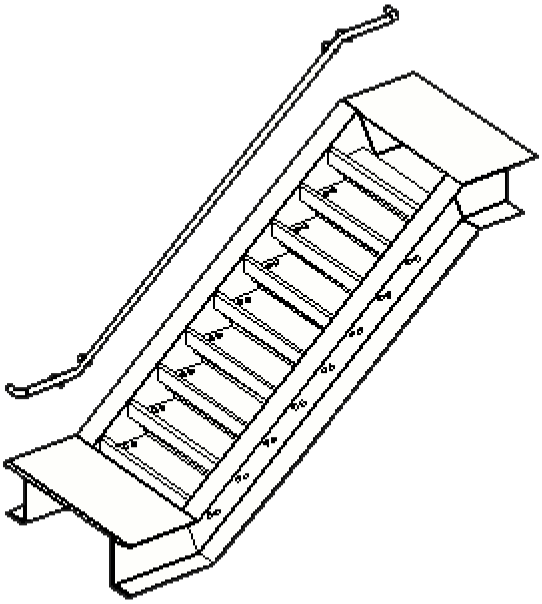
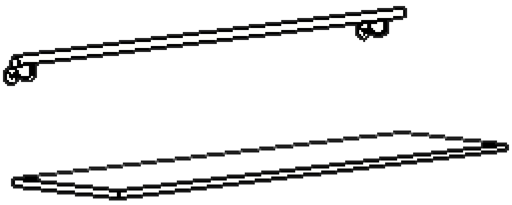
Wall Rails (1) creates a horizontal or a sloped handrail with supporting elements. The handrail is connected to a wall.

Objects created

- Rail
- Elbows
- Endings
- Bracket arm
- Bracket base
- Bolts
- Welds

Use for

Situation	Description
	Rail with elbows, endings, and brackets.

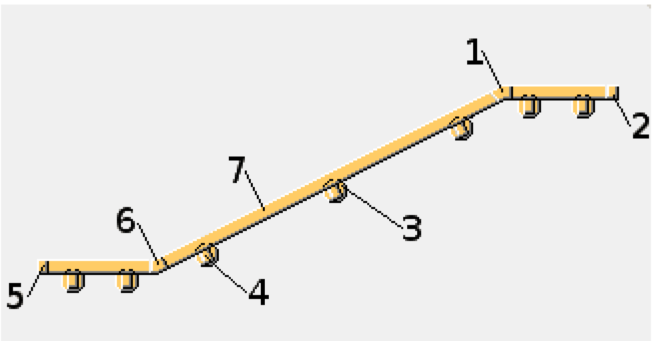
Situation	Description
	Rail on one side of a ladder, with elbows, endings, and brackets.
	Straight rail with brackets.

Selection order

1. Pick the start point
2. Pick the end point.

   The rail is created automatically.

Part identification key



Option	Part
1	Rail
2	Right elbow
3	Left elbow
4	Right ending

Option	Part
5	Left ending
6	Bracket arm
7	Bracket base

See also

Wall Rails (1): General tab on page 1018

Wall Rails (1): Endings tab on page 1020

Wall Rails (1): Elbows tab on page 1024

Wall Rails (1): Brackets tab on page 1025

Wall Rails (1): Bolts tab on page 1029

Wall Rails (1): Parts tab on page 1031

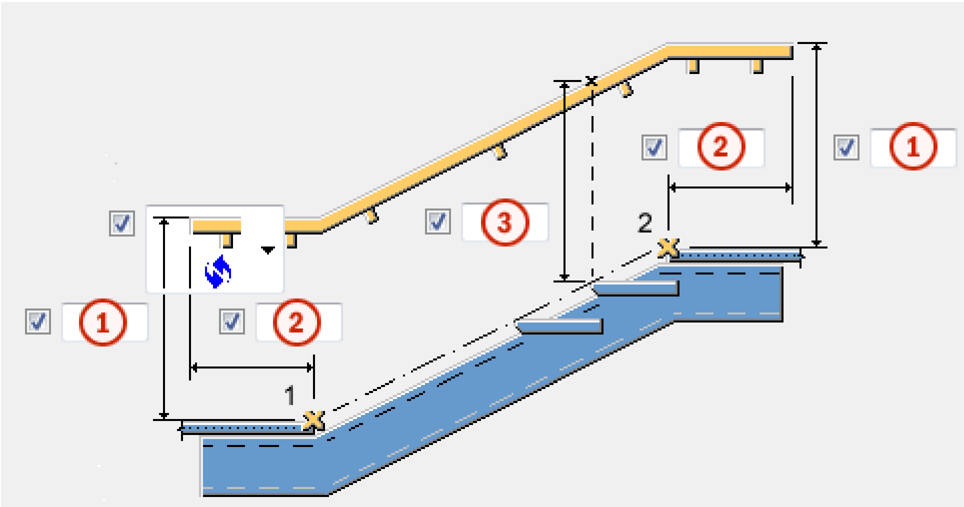
Wall Rails (1): General tab

Use the **General** tab to control the assembly creation, rail dimensions and the rail offset in the **Wall Rails (1)** modeling tool.

Assembly creation

Option	Description	Default
Create assembly	Define which parts form an assembly. The options are: • **All** All parts are included in an assembly, including brackets. Rail is the assembly main part. • **Rail** Rail and elbows form an assembly. The sloped part of the rail is the assembly main part. • **No** No assembly is created.	`All`

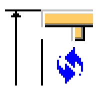
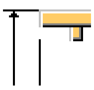
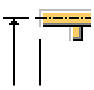
Rail dimensions



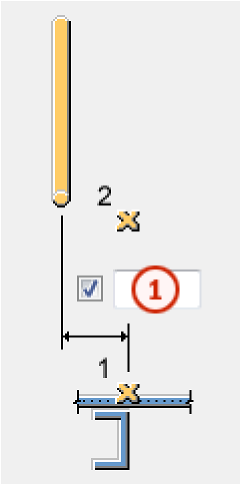
Option	Description	Default
1	Define the vertical distance between the rail and the start/end point.	0 mm
2	Define the horizontal distance from the rail's rightmost/ leftmost edge to the start/end point. If you have created endings, the distance is measured from the endings' outmost edge.	0 mm
3	Define the 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

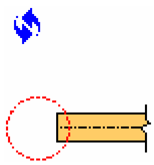
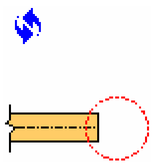
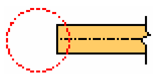
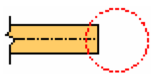
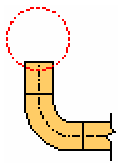
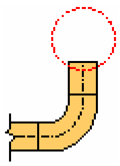
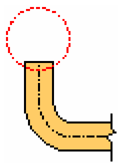
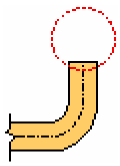


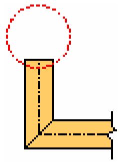
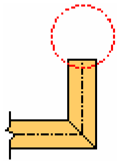
Option	Description	Default
1	Define the rail horizontal offset from the start/end point.	0 mm

Wall Rails (1): Endings tab

Use the **Endings** tab to control the rail ending types and dimensions in the **Wall Rails (1)** modeling tool.

Ending types

Option	Option	Description
		Default No ending AutoDefaults can change this option.
		No ending
		Separate bent elbow part between rails.
		Rail is bent.

Option	Option	Description
		Rail and ending are fitted.

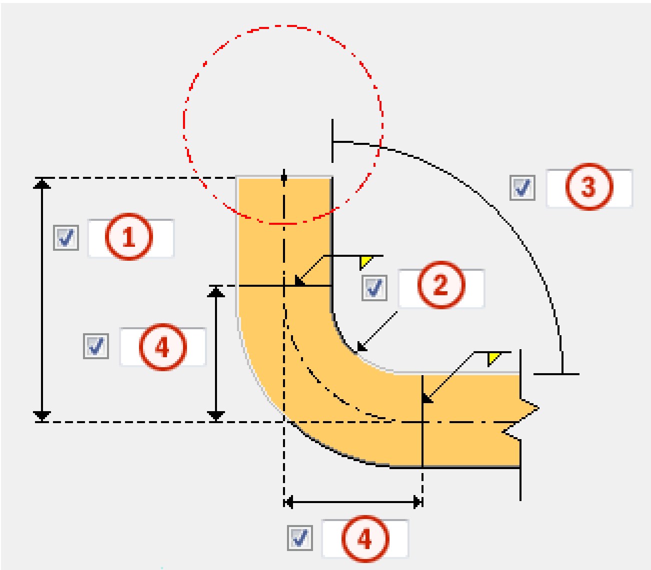
End detail

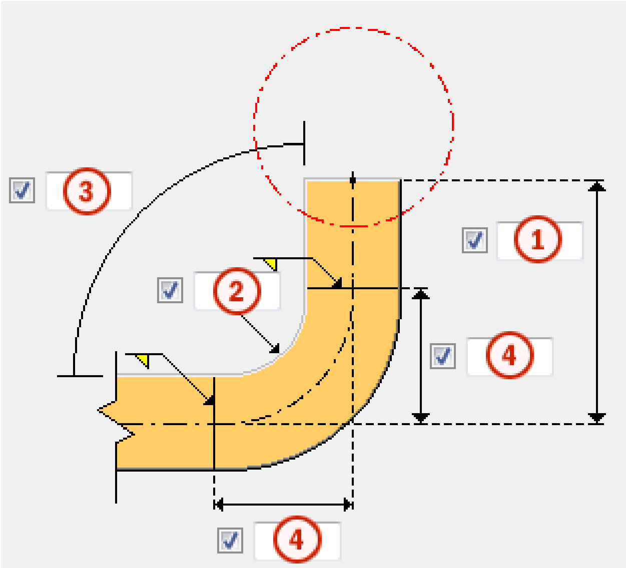
Option	Description	Default
End detail	Define a detail that is created to the ending by selecting it from the component catalog.	`None`
Attribute	Select an attribute file for the end detail.	`standard`

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

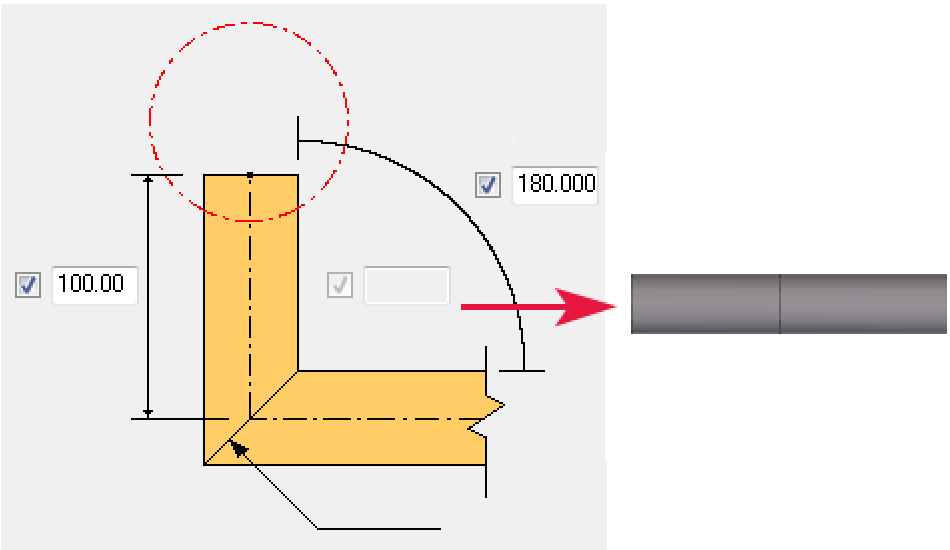


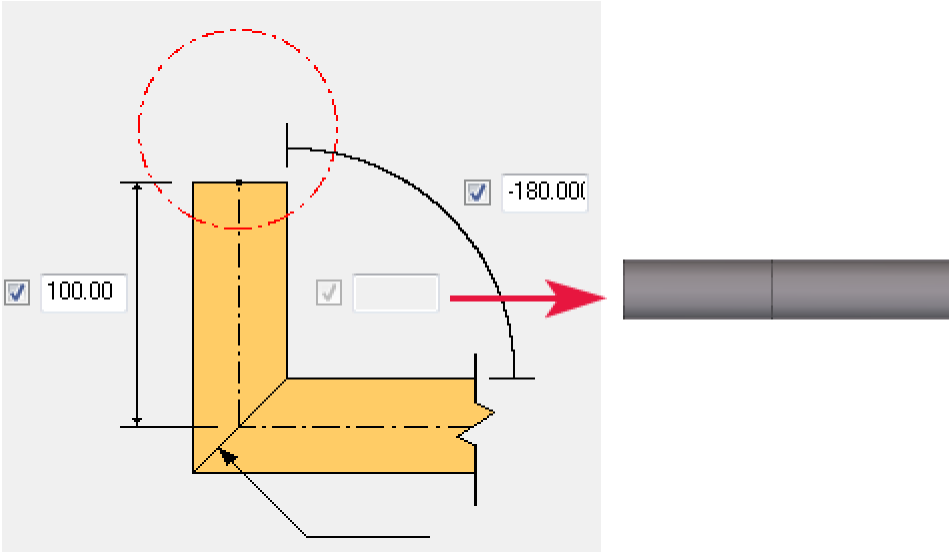


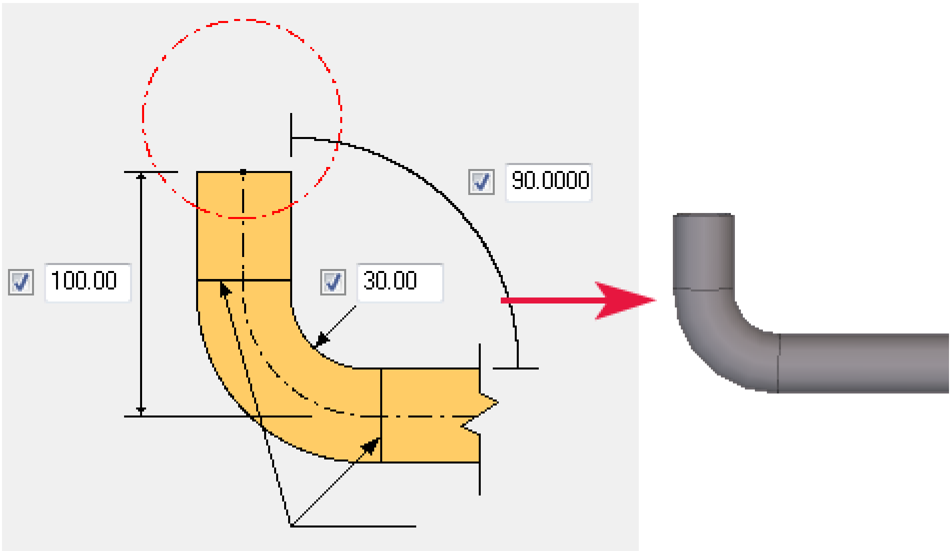
Option	Description	Default
1	Define the length of the straight part of the ending.	100 mm
2	Define the inner radius of the bent ending.	30 mm
3	Define the bent angle by entering a value between +90 and +180 degrees or -90 and -180 degrees.	90 degrees
4	Define the length of the bending.	

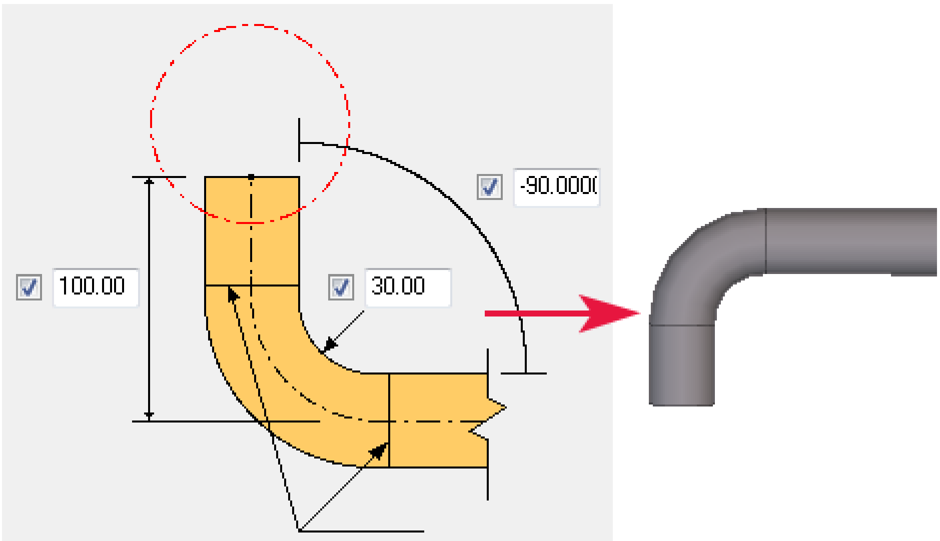
Rail orientation Define the orientation of the handrail.

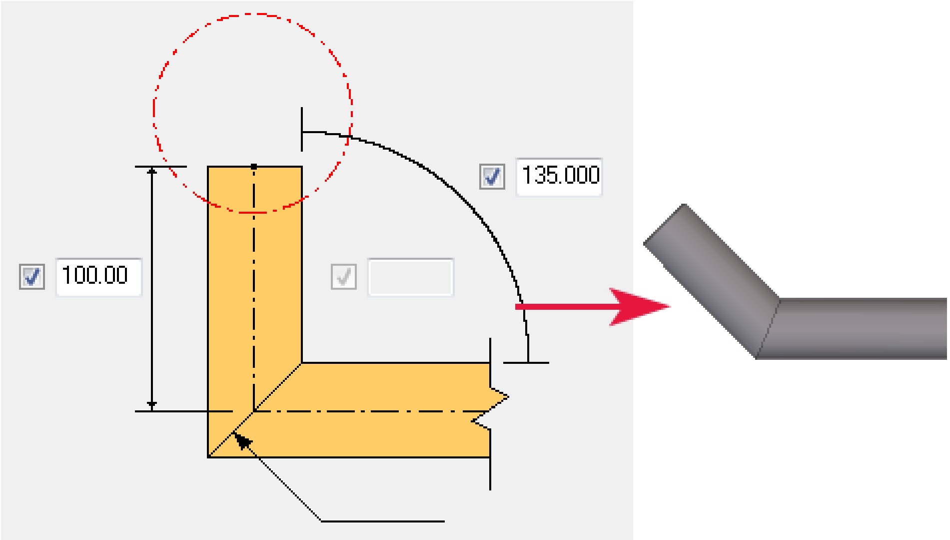
Bent angle examples




-180.000
100.00


90.0000
100.00
30.00

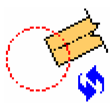
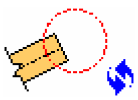
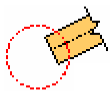
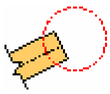
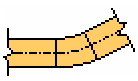
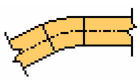
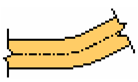
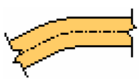
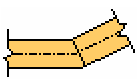
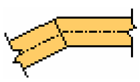
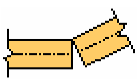
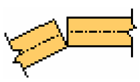

-90.0000
100.00
30.00



Wall Rails (1): Elbows tab

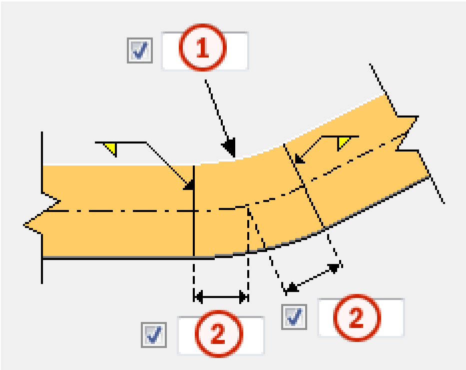
Use the **Elbows** tab to control the elbow types and dimensions in the **Wall Rails (1)** modeling tool.

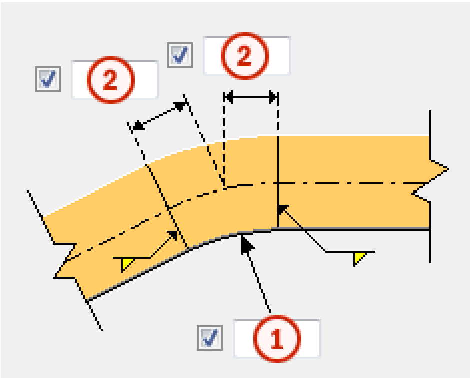
Elbow types

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.

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





Option	Description	Default
1	Define the inner radius of the bent elbow.	`30 mm`
2	Define the length of the bending.	

Wall Rails (1): Brackets tab

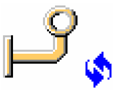
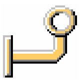
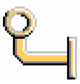
Use the **Brackets** tab to control the bracket types and dimensions created in the **Wall Rails (1)** modeling tool.

Bracket options

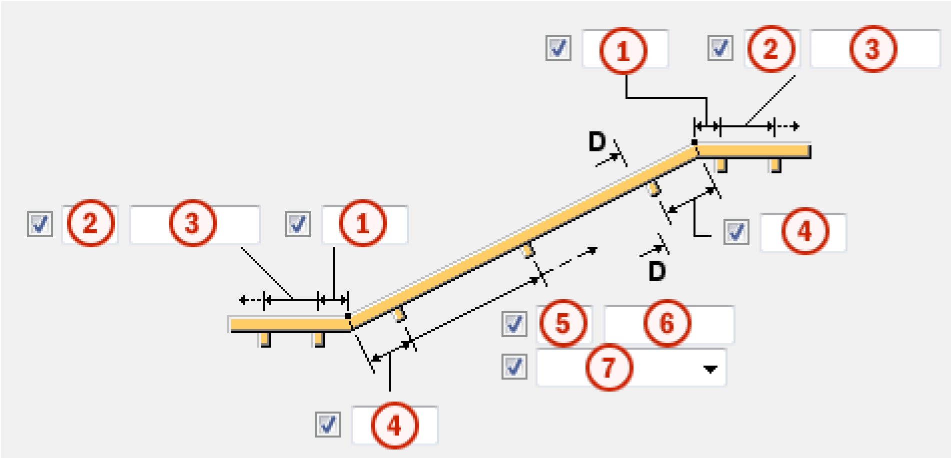
Option	Description	Default
Bracket type	Define how brackets are created. The options are:	`Internal`

Option	Description	Default
	• **Internal** Brackets are created according to the profile selected on the **Parts** tab. • **Detail** Brackets are created according to the selected bracket detail. • **No** No brackets are created.	
Bracket base	Define whether the bracket base is created or not.	`Yes`
Bracket detail	Define a system or a custom detail that is used as a bracket by selecting it from the component catalog. This field is active only if you have set the **Bracket type** to **Detail**.	
Attribute	Select an attribute file for the detail.	`standard`
Connect bracket detail to	Define the part to which the bracket detail is connected.	`Bracket arm`

Bracket direction

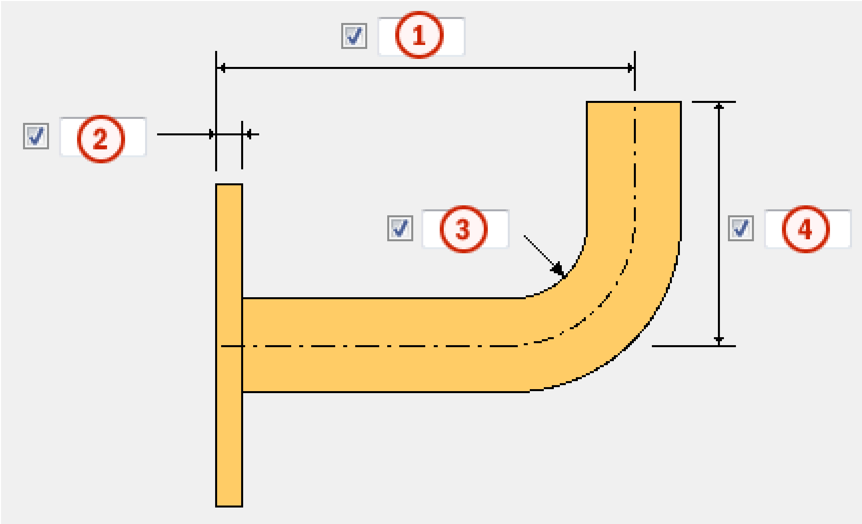
Option	Description
	Default Brackets on the left side AutoDefaults can change this option.
	Brackets on the left side
	Brackets on the right side

Bracket positioning



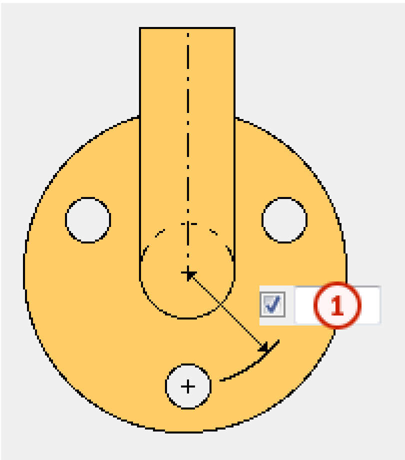
Optio n	Description	Default
1	Define the distance between the start/end point of the rail and the bracket.	100 mm
2	Define the number of brackets.	0
3	Define the bracket spacing. Use a space to separate bracket spacing values.	0 mm
4	Define the distance between the start/end point of the rail and the bracket.	100 mm
5	Define the number of brackets.	0
6	Define the bracket spacing. Spacing depends on the selected bracket spacing type.	0 mm
7	Define the spacing type. If you select **Maximum**, the component creates the mininum amount of brackets needed without exceeding the entered spacing value. The amount of brackets is then equally distributed along the rail.	Exact

Bracket dimensions



Option	Description	Default
1	Define the bracket arm width. The dimension is measured from the bracket base.	120 mm
2	Define the bracket base thickness.	50 mm
3	Define the bent inner radius of the bracket arm.	10 mm
4	Define the bracket arm vertical length. The dimension is measured from the bent radius.	5 mm

Hole placement in bracket base

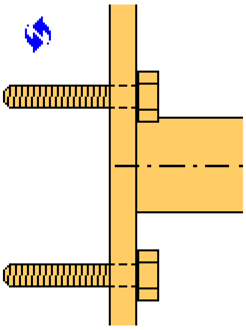
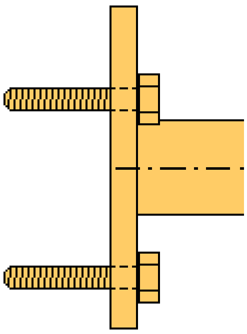
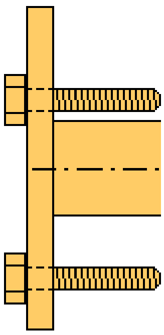


Option	Description	Default
①	Define the radius of the circle on which the bracket holes are placed.	17 mm

Wall Rails (1): Bolts tab

Use the **Bolts** tab to control the bolts that connect the bracket base to a wall in the **Wall Rails (1)** modeling tool.

Bolting direction

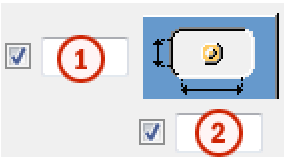
Option	Description
	Default From bracket to wall AutoDefaults can change this option.
	From bracket to wall
	From wall to bracket

Bolt basic properties

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

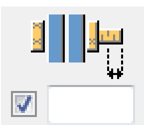
Option	Description	Default
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	Defines whether the thread may be within the bolted parts when bolts are used with a shaft.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

Slotted holes You can define slotted, oversized, or tapped holes.



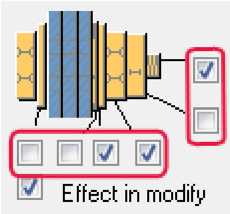
Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(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**.

Wall Rails (1): Parts tab

Use the **Parts** tab to control dimensions of the parts created in the **Wall Rails (1)** modeling tool.

Part guide Select a part from the list. The selected part is displayed.

Part dimensions

Option	Description	Default
Rail	Define a profile by selecting it from the profile catalog.	CHS40*3
Right elbow	Define a profile by selecting it from the profile catalog.	Not created
Left elbow	Define a profile by selecting it from the profile catalog.	Not created
Right ending	Define a profile by selecting it from the profile catalog.	Not created
Left ending	Define a profile by selecting it from the profile catalog.	Not created
Bracket arm	Define a profile by selecting it from the profile catalog.	D12
Bracket base	Define a profile by selecting it from the profile catalog.	D60

Field	Description	Default
Pos_No	Define a prefix and a starting number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.

Field	Description	Default
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

13 Base plates

This section introduces base plate components available in Tekla Structures.

Click the links below to find out more:

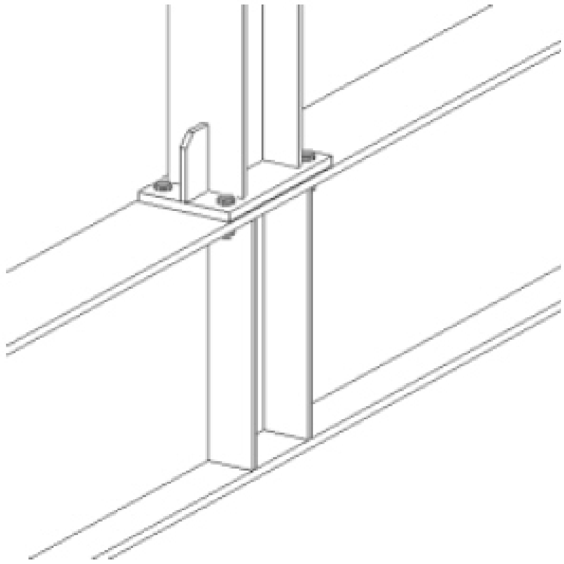
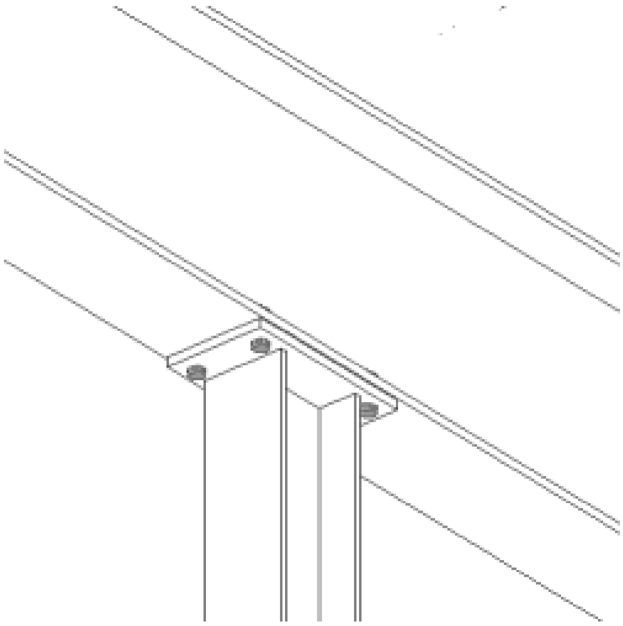
13.1 U.S. Base plate connection (71)

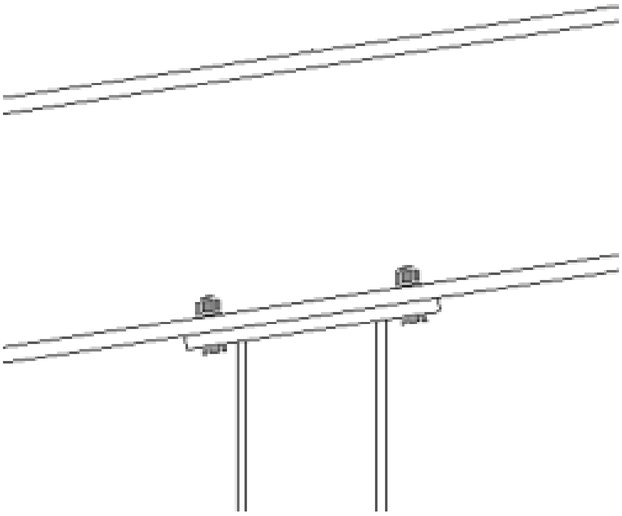
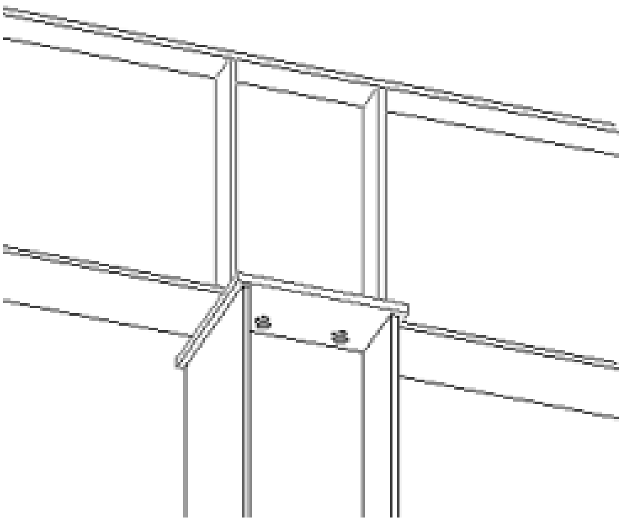
U.S. Base plate connection (71) creates a base plate that connects a column to a beam.

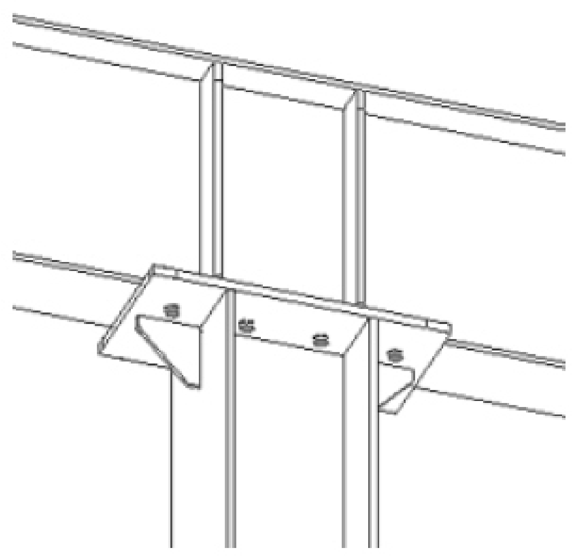
Objects created

- 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
	Base plate is connected to the beam. Beam and column stiffeners are used.
	Beam cantilever is connected to a column with a base plate.

Situation	Description
	Beam cantilever is connected to a sloped column with a base plate.
	Beam cantilever is connected to a column with a base plate. Beam stiffeners are used.

Situation	Description
	Beam cantilever is connected to the column with a base plate. Beam and column stiffener are used.

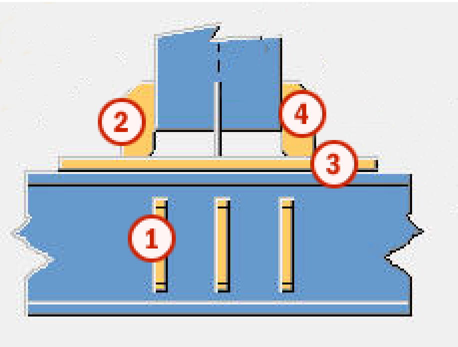
Before you start Create a beam and a column.

Selection order

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

   The connection is created automatically.

Part identification key



Number	Part
1	Beam stiffener
2	Stiffeners 1, 2, 4, 5
3	Base plate
4	Stiffeners 3, 6, 7, 8

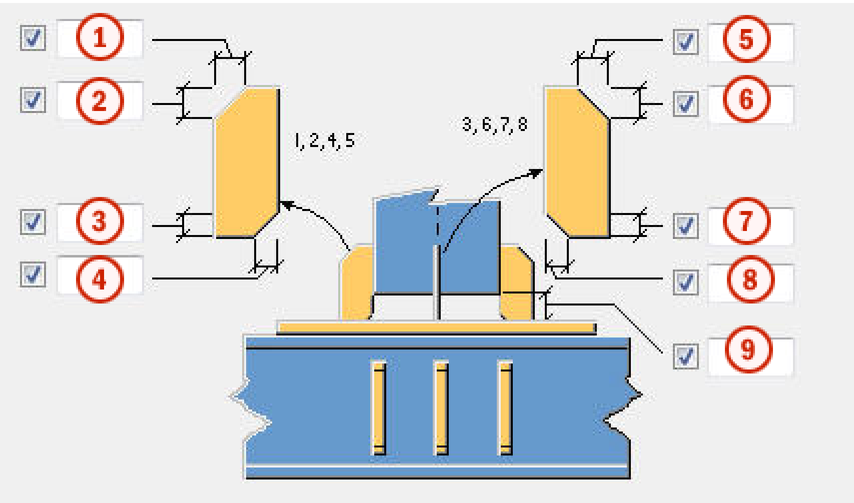
See also U.S. Base plate connection (71): Picture tab on page 1037

[U.S. Base plate connection (71): Parts tab on page 1038]
[U.S. Base plate connection (71): Parameters tab on page 1039]
[U.S. Base plate connection (71): Stiffeners tab on page 1042]
[U.S. Base plate connection (71): Beam stiff tab on page 1043]
[U.S Base plate connection (71): Bolts tab on page 1050]

U.S. Base plate connection (71): Picture tab

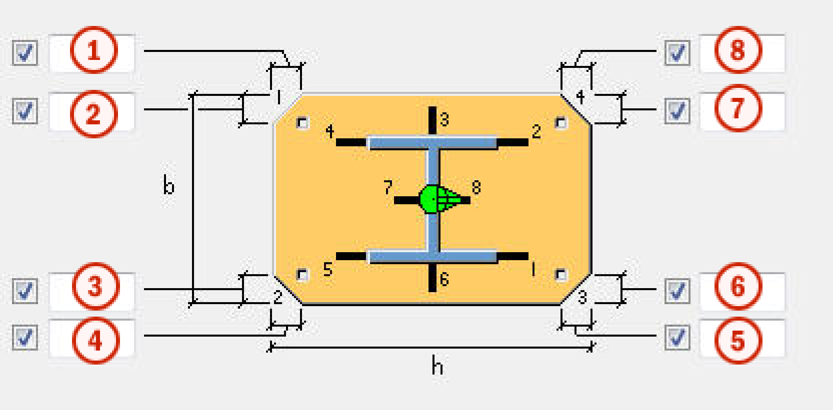
Use the **Picture** tab to control the stiffener chamfering and the base plate chamfers in the **U.S. Base plate connection (71)** connection.

Stiffener chamfering



Field	Description
1	Define the top chamfer width for stiffeners 1, 2, 4, 5.
2	Define the top chamfer height for stiffeners 1, 2, 4, 5.
3	Define the bottom chamfer height for stiffeners 1, 2, 4, 5.
4	Define the bottom chamfer width for stiffeners 1, 2, 4, 5.
5	Define the top chamfer width for stiffeners 3, 6, 7, 8.
6	Define the top chamfer height for stiffeners 3, 6, 7, 8.
7	Define the bottom chamfer height for stiffeners 3, 6, 7, 8.
8	Define the bottom chamfer width for stiffeners 3, 6, 7, 8.
9	Define the weld gap.

Base plate chamfering



Field	Description
1	Define the width of base plate chamfer 1.
2	Define the height of base plate chamfer 1.
3	Define the height of base plate chamfer 2.
4	Define the width of base plate chamfer 2.
5	Define the width of base plate chamfer 3.
6	Define the height of base plate chamfer 3.
7	Define the height of base plate chamfer 4.
8	Define the width of base plate chamfer 4.

U.S. Base plate connection (71): Parts tab

Use the **Parts** tab to control the dimensions of the base plate, stiffeners, and beam stiffener in the **U.S. Base plate connection (71)** connection.

Plate

Field	Description	Default
Plate	Define the base plate thickness, width and height.	Thickness = `20 mm` Width depends on the column profile. Height depends on the column profile.
Stiffeners 1, 2, 4, 5	Define the stiffener 1, 2, 4, 5 thickness, width and height.	

Field	Description	Default
Stiffeners 3, 6, 7, 8	Define the stiffener 3, 6, 7, 8 thickness, width and height.	
Beam stiff	Define the beam stiffener thickness, width and height.	

Field	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	`BASEPLATE`

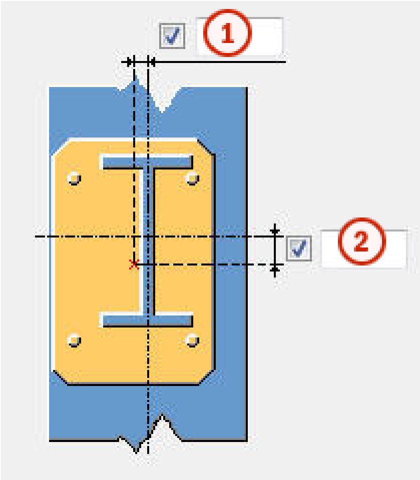
U.S. Base plate connection (71): Parameters tab

Use the **Parameters** tab to control the square cut corners, plate offset and bolt properties in the **U.S. Base plate connection (71)** connection.

Plate properties

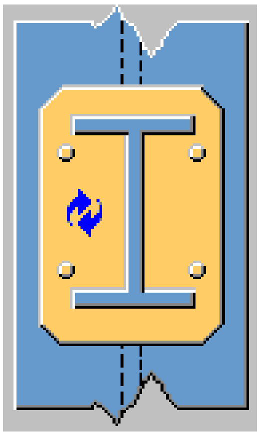
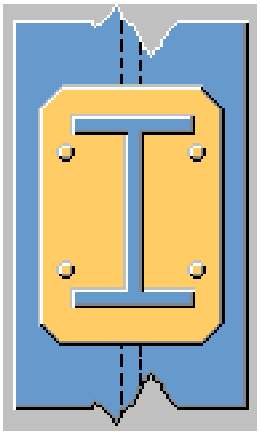
Field	Description
Square cut corners (1-4)	Define the cuts made on the corners of the base plate. If you enter a number corresponding to one of the corners of the base plate, the corner has a square cut instead of a diagonal chamfer. You can enter the numbers for one or all the corners.
Plate aligned with	Define whether the plate is aligned with the column or the connection symbol.

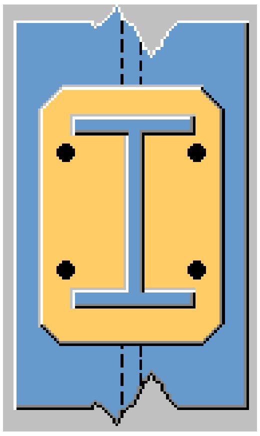
Base plate offset



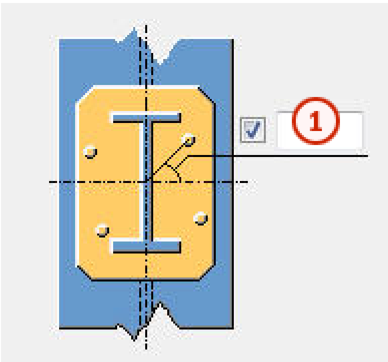
Field	Description
1	Define the base plate horizontal offset from the column center.
2	Define the base plate vertical offset from the column center.

Base plate with holes or bolts

Option	Description
	Default Bolts are created. AutoDefaults can change this option.
	Bolts are created.

Option	Description
	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.

Option	Description
1	Define the bolt group rotation angle.

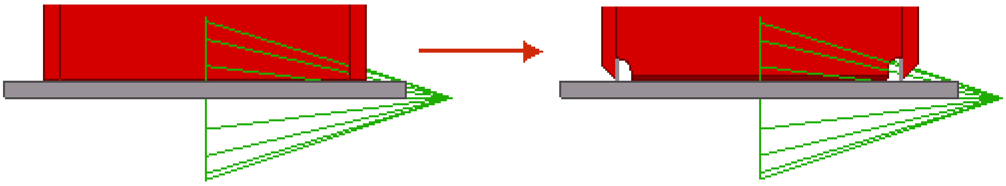
Bolt properties

Option	Description
Eliminate bolt number(s)	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.
Eliminate external bolt(s)	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.



Field	Description
Component	Define a system or a custom component by selecting it from the component catalog.
Attributes	Enter the name of the attribute file for the selected component.
Input	Define to which parts the selected component is applied. • **Default** is same as **Base + Column**. • **Column** sets the column as the main part. Use this option for details. • **Column + Base** sets the column as the main part and the base plate as the secondary part. • **Base + Column** sets the base plate as the main part and the column as the secondary part.

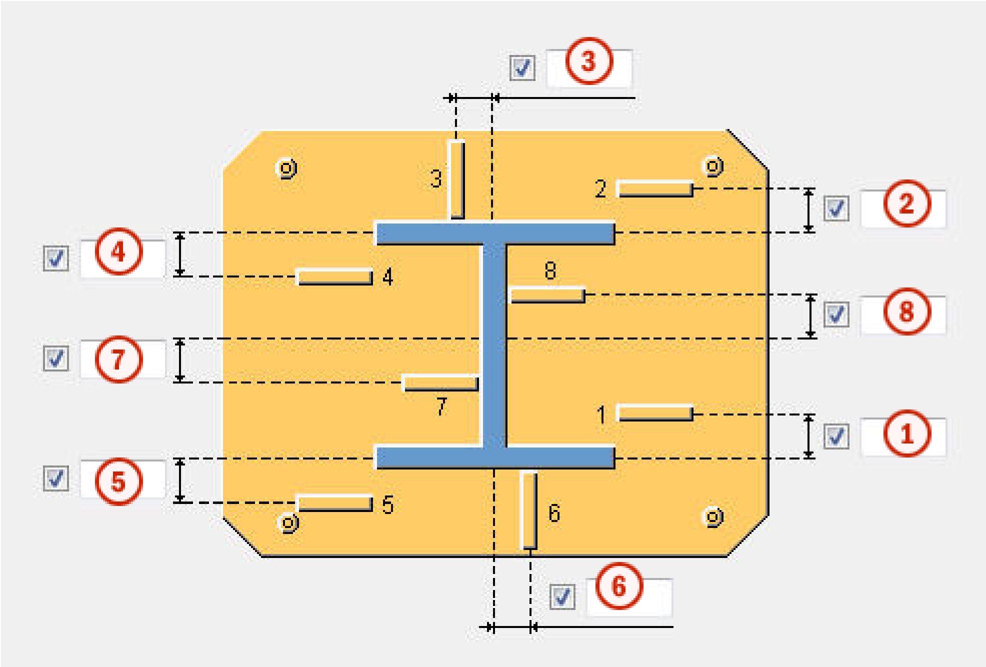
U.S. Base plate connection (71): Stiffeners tab

Use the **Stiffeners** tab to control stiffener positions and offsets in the **U.S. Base plate connection (71)** connection.

Stiffener positions (1-8)

Field	Description
Stiffener positions (1-8)	Define the 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.

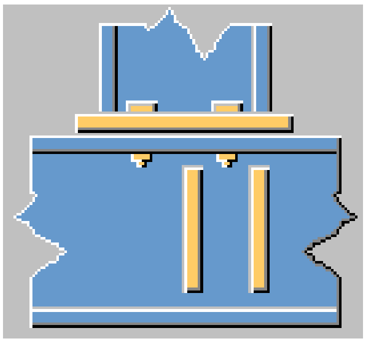


Field	Description
1	Define stiffener 1 offset.
2	Define stiffener 2 offset.
3	Define stiffener 3 offset.
4	Define stiffener 4 offset.
5	Define stiffener 5 offset.
6	Define stiffener 6 offset.
7	Define stiffener 7 offset.
8	Define stiffener 8 offset.

U.S. Base plate connection (71): Beam stiff tab

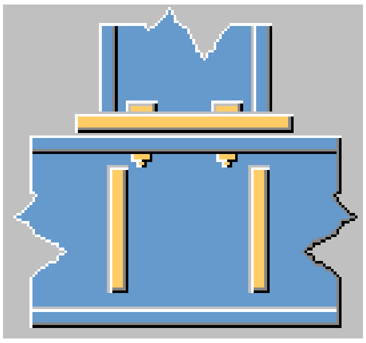
Use the **Beam stiff** tab to control the beam stiffener alignment, stiffener side, chamfer dimensions and types in the **U.S. Base plate connection (71)**.

Left stiffener

Option	Description
	Default Left stiffeners are created. AutoDefaults can change this option.
	Left stiffeners are created.
	Left stiffeners are not created.

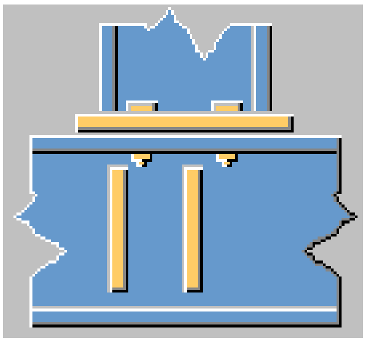
Center stiffener

Option	Description
	Default Center stiffeners are created. AutoDefaults can change this option.

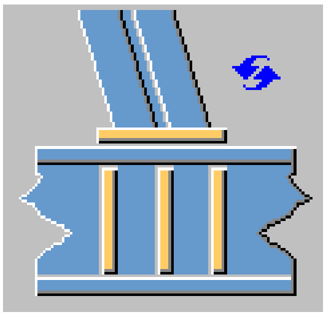
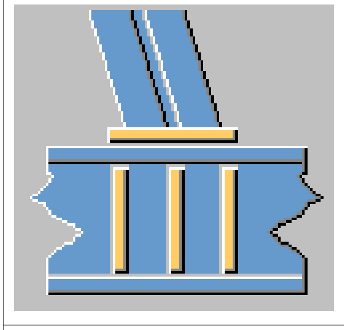
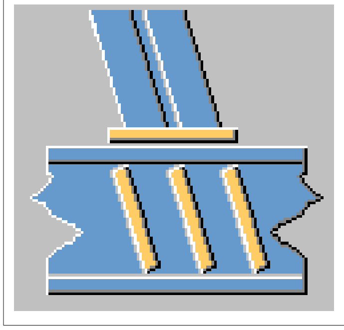
Option	Description
	Center stiffeners are created.
	Center stiffeners are not created.

Right stiffener

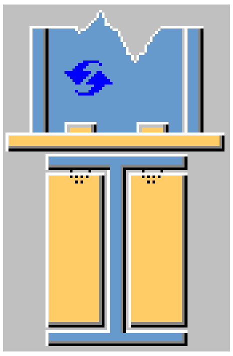
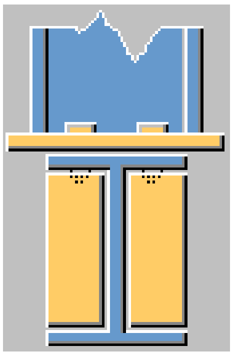
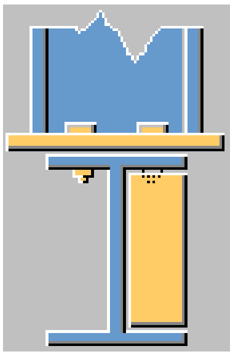
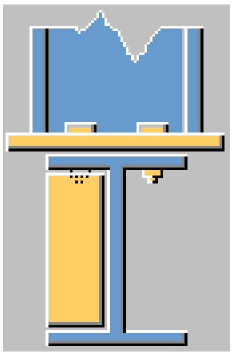
Option	Description
	Default Right stiffeners are created. AutoDefaults can change this option.
	Right stiffeners are created.

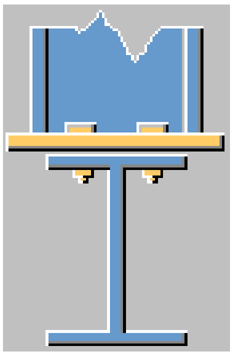
Option	Description
	Right stiffeners are not created.

Stiffener alignment

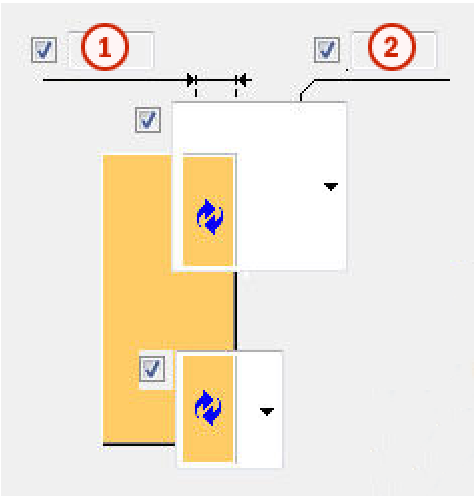
Options	Description
	Default Stiffeners are aligned with the beam. AutoDefaults can change this option.
	Stiffeners are aligned with the beam.
	Stiffeners are aligned with the column.

Stiffener creation

Option	Description
	Default Stiffeners are created on both sides. AutoDefaults can change this option.
	Stiffeners are created on both sides.
	Stiffeners are created on far side.
	Stiffeners are created on near side.

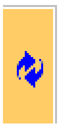
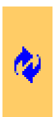
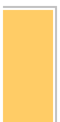
Option	Description
	Stiffeners are not created.

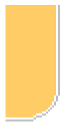
Chamfer dimensions



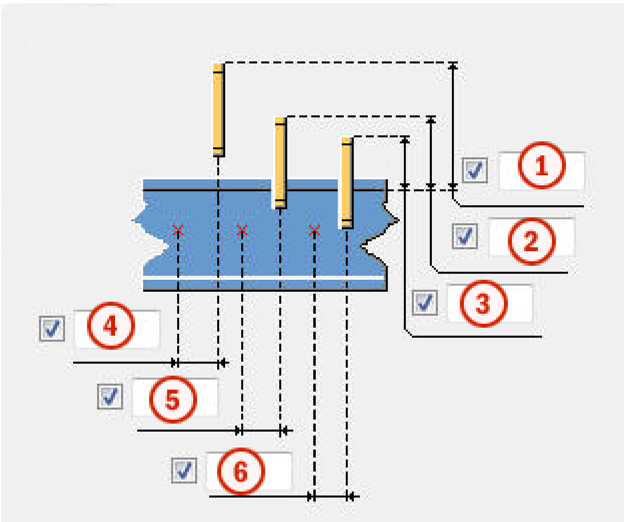
Field	Description
1	Define the horizontal dimension of the chamfer.
2	Define the vertical dimension of the chamfer.

Top and bottom chamfer type

Option for top chamfer	Option for bottom chamfer	Description
		Default No chamfer AutoDefaults can change this option.
		No chamfer

Option for top chamfer	Option for bottom chamfer	Description
		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.

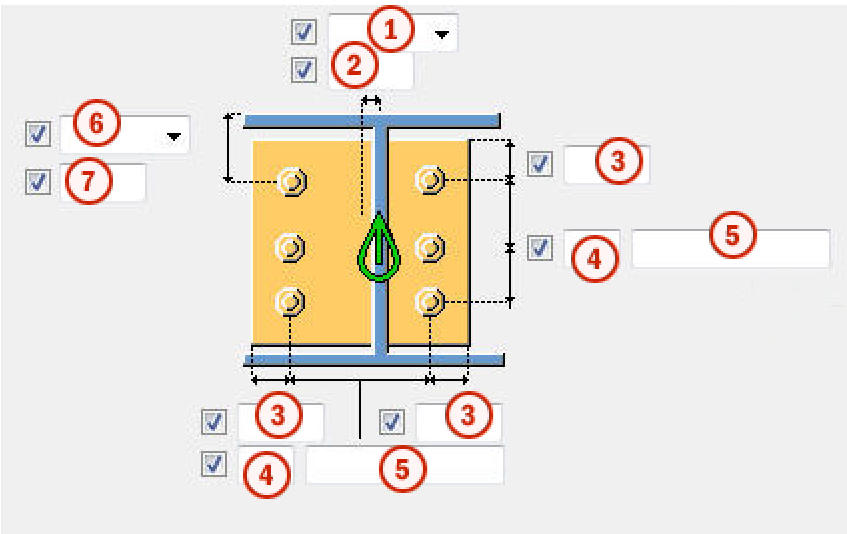


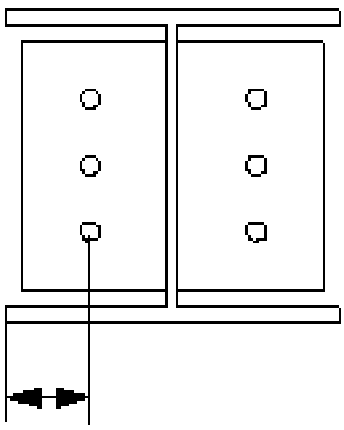
Field	Description
1	Define the left stiffener vertical offset.
2	Define the center stiffener vertical offset.
3	Define the right stiffener vertical offset.
4	Define the left stiffener horizontal offset.
5	Define the center stiffener horizontal offset.
6	Define the right stiffener horizontal offset.

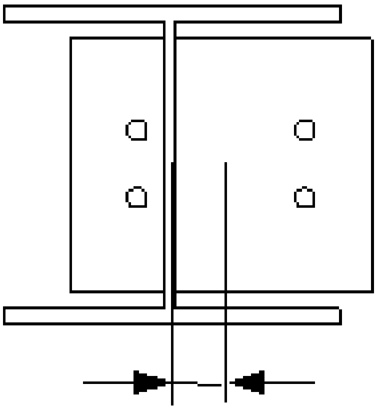
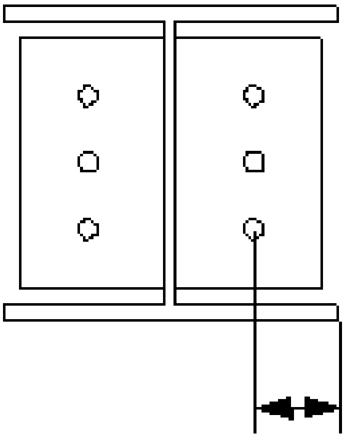
U.S Base plate connection (71): Bolts tab

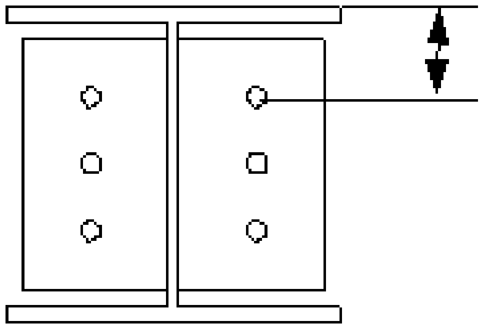
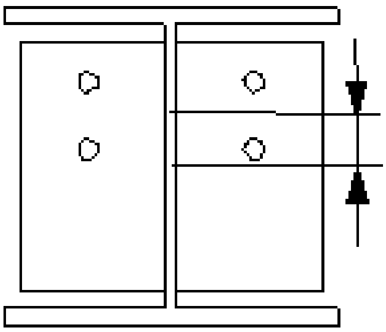
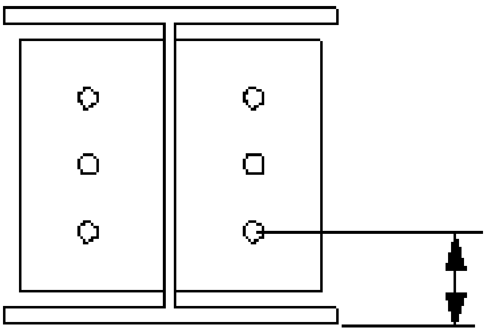
Use the **Bolts** tab to control the bolt properties in the **U.S Base plate connection (71)** connection.

Bolt group dimensions



Field	Description
①	Define how to measure the dimensions for horizontal bolt group position. • **Left**: From the left edge of the secondary part to the leftmost bolt. 

Field	Description
	• **Middle**: From the center line of the secondary part to the center line of the bolts.  • **Right**: From the right edge of the secondary part to the rightmost bolt. 
2	Define the dimension for horizontal bolt group position.
3	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
4	Define the number of bolts.
5	Define the 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.

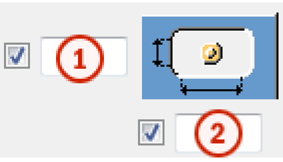
Field	Description
6	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt.  • **Middle**: From the center line of the bolts to the center line of the secondary part.  • **Below**: From the lower edge of the secondary part to the lowest bolt. 
7	Define the dimension for vertical bolt group position.

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

You can define slotted, oversized, or tapped holes.

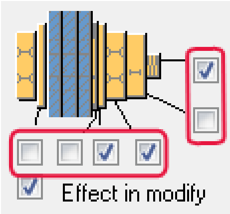


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(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.

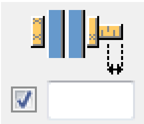
If you want to create a hole only, clear all the check boxes.



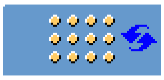
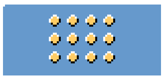
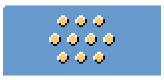
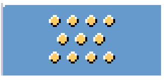
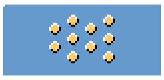
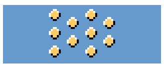
To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

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

13.2 Base plate (1004)

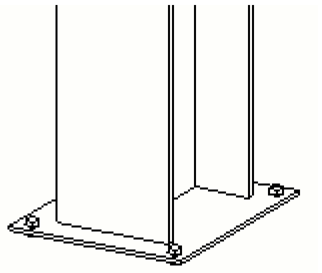
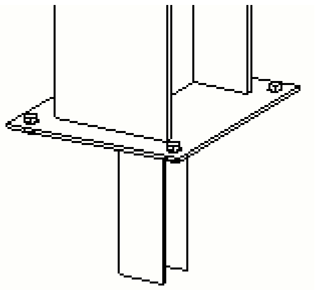
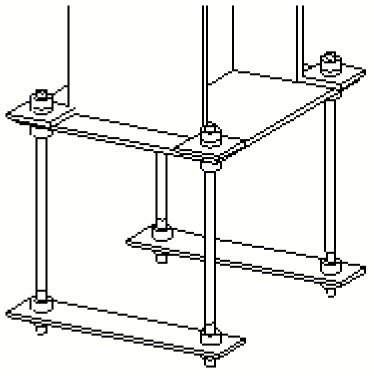
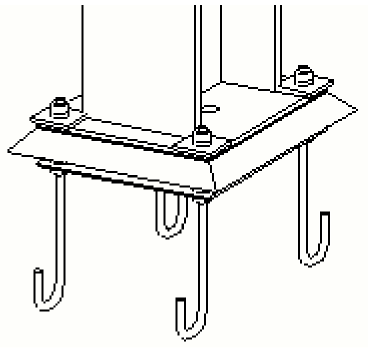
Base plate (1004) creates a base plate that is connected to a column end.

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)

Use for

Situation	Description
	Simple base plate detail
	Base plate detail with a shear key
	Base plate detail with • Straight anchor rods • Extra plates connecting the anchors
	Base plate detail with • Anchor rods with hooks • Leveling plate below the base plate • Grout and hole for grouting • Cast plate

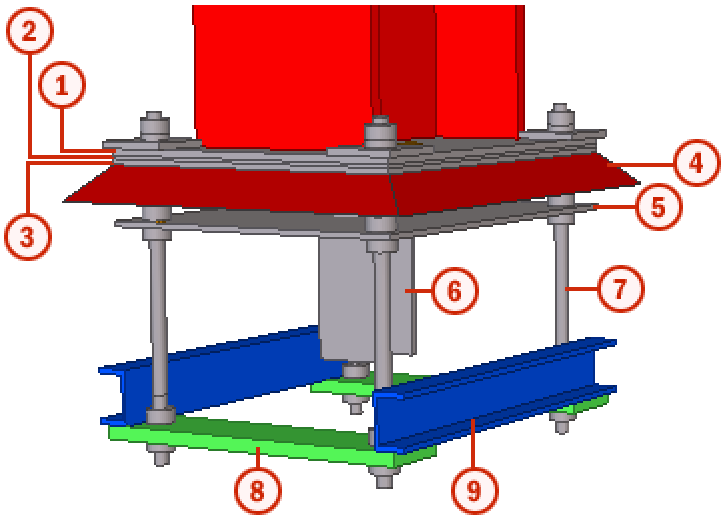
Before you start Create a column.

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
7	Anchor rod
8	Extra plate 1
9	Extra plate 2

See also Base plate (1004): Picture tab on page 1057

Base plate (1004): Parts tab on page 1058

Base plate (1004): Parameters tab on page 1060

Base plate (1004): Bolts tab on page 1062

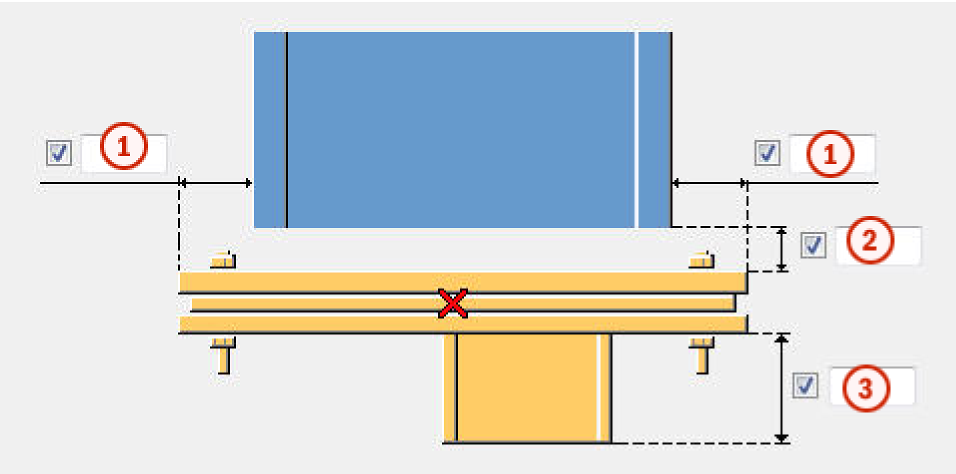
Base plate (1004): Anchor rods tab on page 1067

Base plate (1004): Extra plates tab on page 1071

Base plate (1004): Picture tab

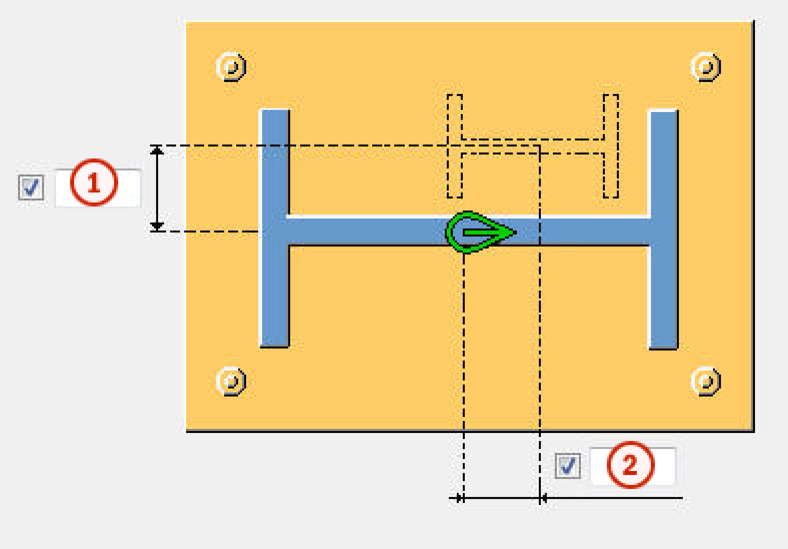
Use the **Picture** tab to control the position of the base plate and the length and position of the shear key in the **Base plate (1004)** detail.

Dimensions



	Description
1	Define the distance from the flange to the edge of the base plate. Enter a negative value to make the base plate larger.
2	Define the weld gap.
3	Define the height of the shear key.

Shear key offset



	Description
1	Define the shear key vertical offset from the column center.
2	Define the shear key horizontal offset from the column center.

Base plate (1004): Parts tab

Use the **Parts** tab to control the dimensions of the base plate, shear key, leveling plate, and shim plate(s) in **Base plate (1004)** detail.

Plate

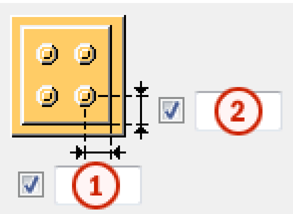
Part	Description	Default
Plate	Define the base plate thickness.	thickness = `0.5*bolt diameter rounded up to the next plate thickness`
Additional beam	Define the shear key profile by selecting it from the profile catalog.	`HEA 300` (in Default environment)
Leveling plate	Define the leveling plate thickness, width and height.	thickness = `1/4`
Fitting plate	Define the shim plate thickness, width and height. Define up to three different shim plates.	
Number of fitting pl.	Define the number of shim plates for each thickness.	`1`

Part	Description	Default
Leveling plate hole diameter	Define the leveling plate hole diameter.	
Key profile welded to	Define to which plate the shear key is welded.	

Field	Description	Default
Pos_No	Define a prefix and a starting number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	`BASEPLATE`

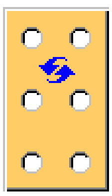
Bolt edge distances in shim plate

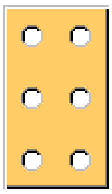
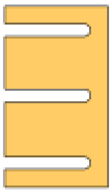
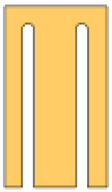
Define the bolt edge distances for shim plates. When these fields are empty, shim plates are of the same size as the base plate.



	Description	Default
1	Define the horizontal bolt edge distance in the shim plate.	30 mm
2	Define the 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 detail. AutoDefaults can change this option.

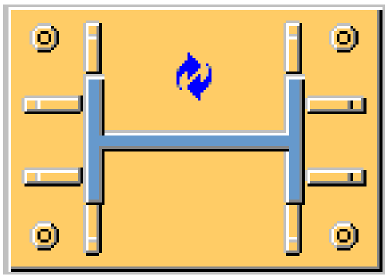
Option	Description
	Holes are based on the bolt group of the detail.
	Finger shim plate with horizontal slots. The plate can be installed from the right or left side of the detail.
	Finger shim plate with vertical slots. The plate can be installed from the top of the detail.

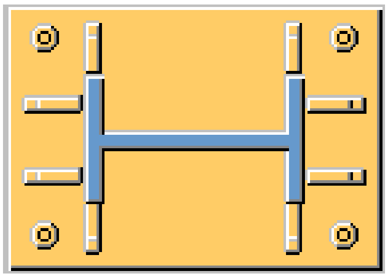
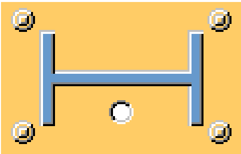
Tolerance Define the tolerance for the slots in finger shim plates. The width of the slot is the bolt diameter + the tolerance.

Base plate (1004): Parameters tab

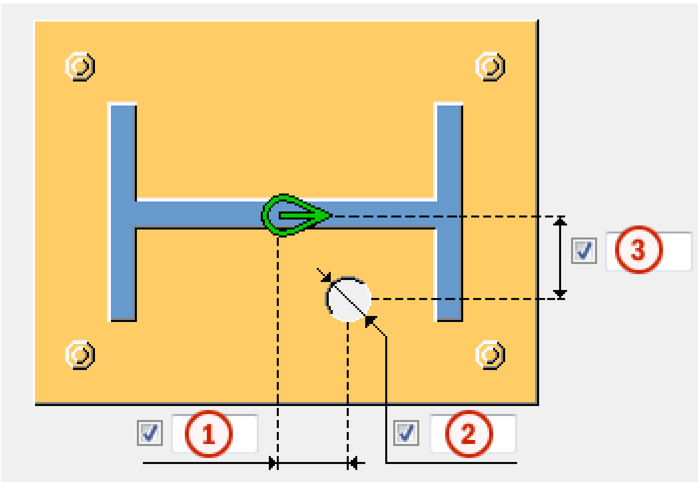
Use the **Parameters** tab to control the component and the grout hole in the **Base plate (1004)** detail.

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.

Grout hole dimensions

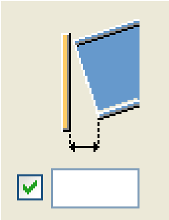


	Description
1	Define the location of the grout hole from the center of the column in the direction of the web.
2	Define the grout hole diameter.
3	Define the location of the grout hole from the center of the column in the direction of the flange.

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.

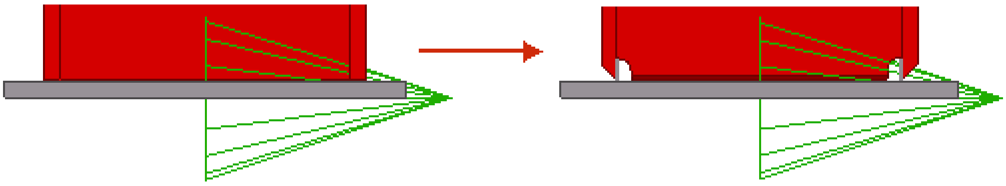
If the actual gap is larger than this value, the end of the column is fitted to the base plate.



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.

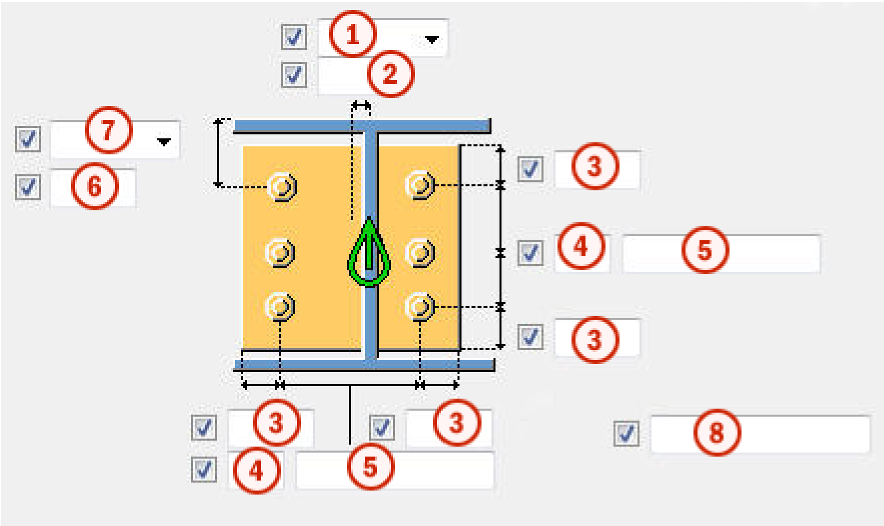


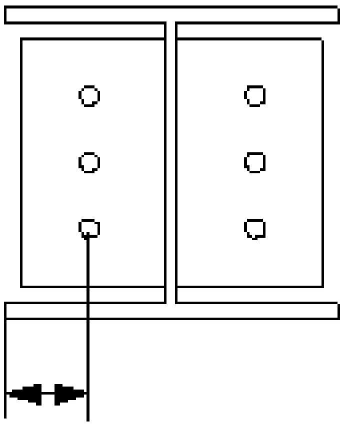
Field	Description
Component	Define a system or a custom component by selecting it from the component catalog.
Attributes	Enter the name of the attribute file for the selected component.
Input	Define to which parts the selected component is applied. • **Default** is same as **Base + Column**. • **Column** sets the column as the main part. Use this option for details. • **Column + Base** sets the column as the main part and the base plate as the secondary part. • **Base + Column** sets the base plate as the main part and the column as the secondary part.

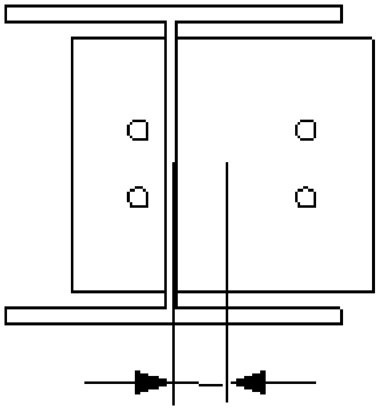
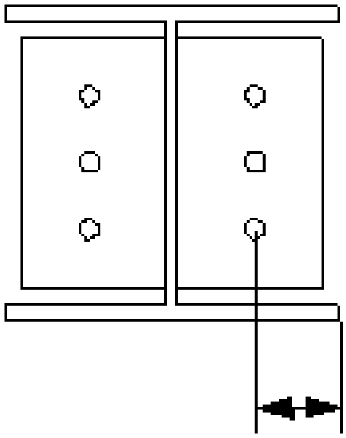
Base plate (1004): Bolts tab

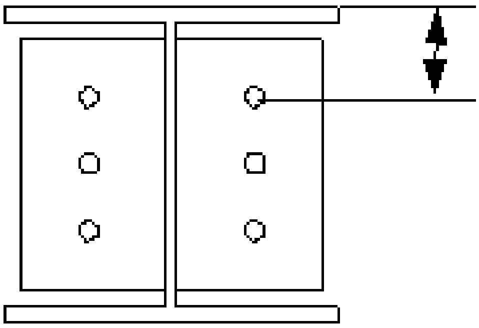
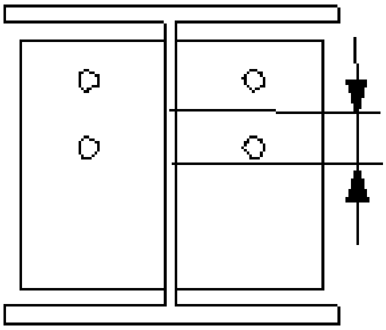
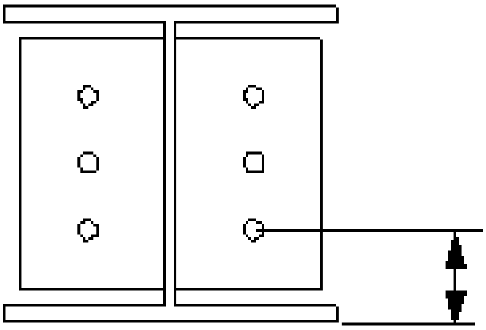
Use the **Bolts** tab to control the bolt properties in the **Base plate (1004)** detail.

Bolt group dimensions



	Description
1	Define how to measure the dimensions for horizontal bolt group position. • **Left**: From the left edge of the secondary part to the leftmost bolt. 

	Description
	• **Middle**: From the center line of the secondary part to the center line of the bolts.  • **Right**: From the right edge of the secondary part to the rightmost bolt. 
②	Define the dimension for horizontal bolt group position.
③	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
④	Define the number of bolts.
⑤	Define the 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 the dimension for vertical bolt group position.

	Description
7	Define 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. 

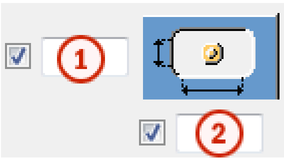
	Description
8	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

You can define slotted, oversized, or tapped holes.



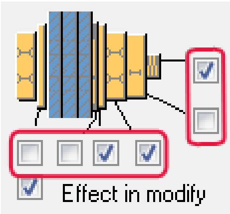
Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(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.

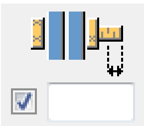
If you want to create a hole only, clear all the check boxes.



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.



Base plate (1004): Anchor rods tab

Use the **Anchor rods** tab to control the creation of different types of anchor rods in the **Base plate (1004)** detail.

Anchor rod dimensions

Option	Description
Anchor rod profile	Define the anchor rod profile.
Nut profile	Define the nut profile.
Washer profile	Define the washer thickness, width and height.
Plate washer	Define the plate washer thickness, width and height.
Castplate	Define the cast plate thickness, width and height.

Anchor rod part properties

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

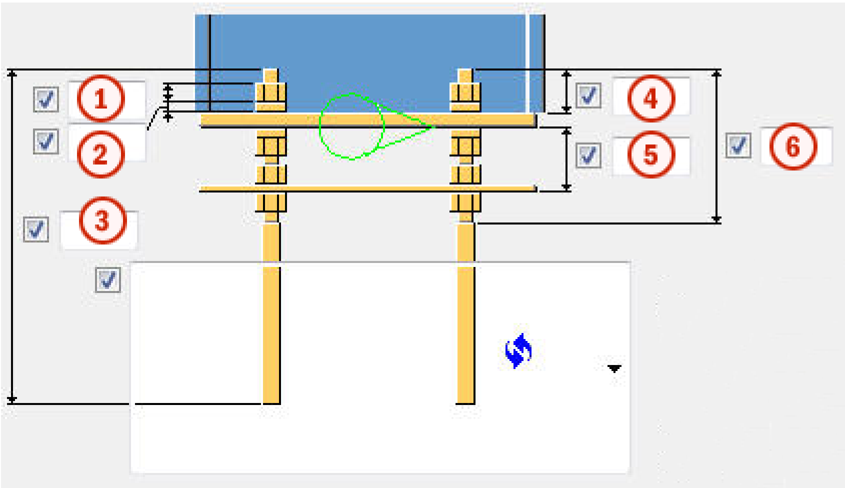
Option	Description	Default
	can enter the assembly position number.	
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Base plate with

Use this option to switch between the bolts and the anchor rods.

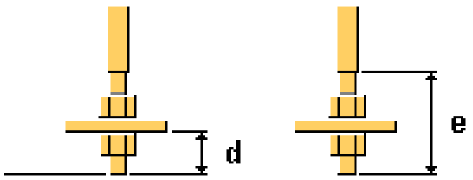
By default, the base plate is created with **Bolts**.

Anchor rod dimensions

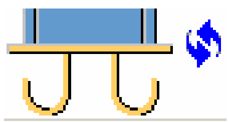
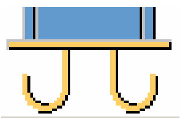


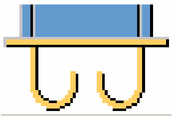
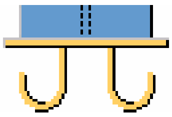
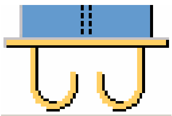
	Description	Default
1	Define the size or the length of the nut.	`anchor rod diameter`
2	Define the size or the thickness of the washer.	`half of nut size`
3	Define the length of the anchor rod.	`500 mm`
4	Define the length of the anchor rod above the base plate.	`50 mm`
5	Define the distance between the cast plate and the base plate.	`60 mm`
6	Define the length of the upper thread.	`0 mm`

Anchor rods types

Option	Description	
	Default Type 1 AutoDefaults can change this option.	
	Type 1	
	**a** Radius of the hook **b** Width of the hook	**a** = 2*anchor bar diameter **b** = 1/5 of anchor bar length
	**a** Radius of the hook **b** Width of the hook **c** Height of the hook	**c** = same as width of the hook
	**d** Length of the anchor rod below the extra plate **e** Length of the lower thread	**d** = 4*nut size plus thickness of extra plate **e** = 2*nut size

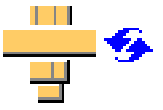
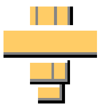
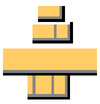
Hook direction

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1

Option	Description
	Type 2
	Type 3
	Type 4

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
Castplate holes tolerance	Define the tolerance of the cast plate holes.	`same as bolt tolerance`

Washer hole tolerance

Option	Description
Washer hole tolerance	Define the tolerance of the washer hole. By default, a hole is not created in the washer.

Grout thickness

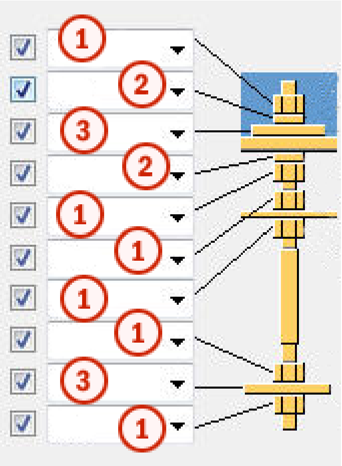
Grouting helps you to model columns to the top of concrete parts and place the base plate correctly. It also makes it easier to dimension the detail in GA drawings.

By default, no grouting is created.

In the first field, enter the grout thickness.

In the second field, define whether the grouting is created above or below the detail creation point. This also affects the shim plates.

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.

Base plate (1004): 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 in the **Base plate (1004)** detail.

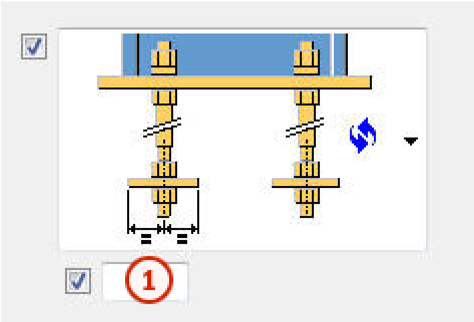
Part dimensions

Part	Description	Default
Extra profile 1	Define the first extra profile by selecting it from the profile catalog.	`PL10*100`
Extra profile 2	Define the second extra profile by selecting it from the profile catalog.	

Part properties

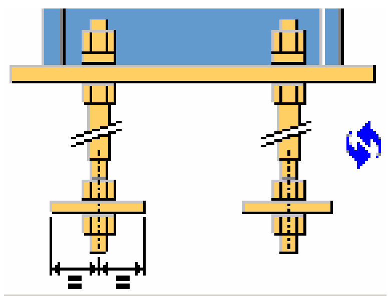
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

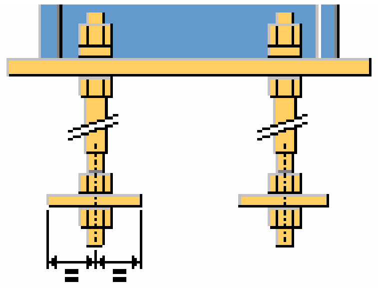
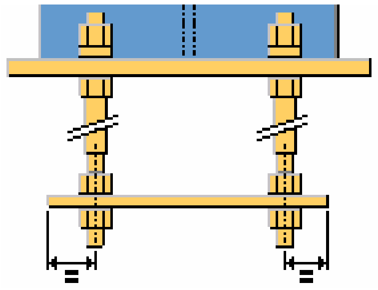
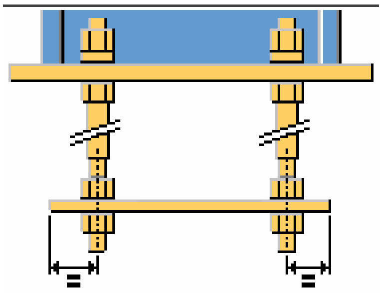
Edge distance of extra profile 1



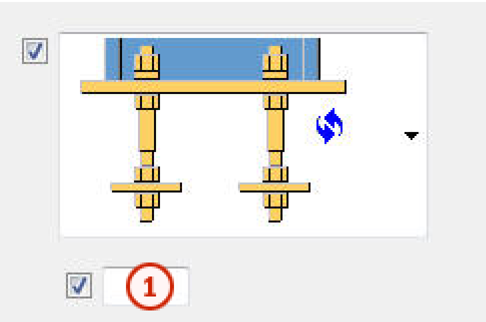
	Description	Default
1	Define the edge distance of extra profile 1.	`50 mm`

Type and direction of extra profile 1

Option	Description
	Default Type 1 AutoDefaults can change this option.

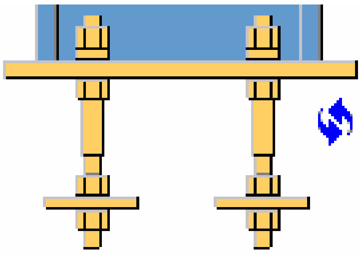
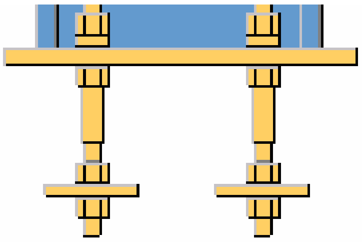
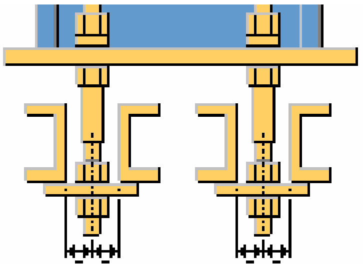
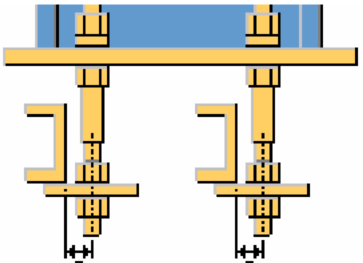
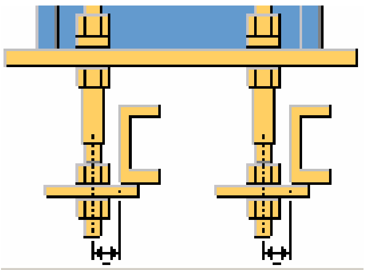
Option	Description
	Type 1
	Type 2
	Type 3

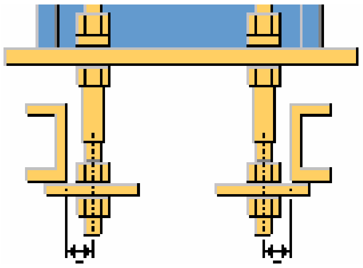
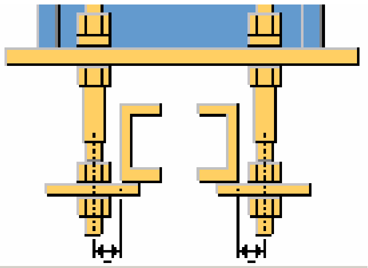
Edge distance of extra profile 2



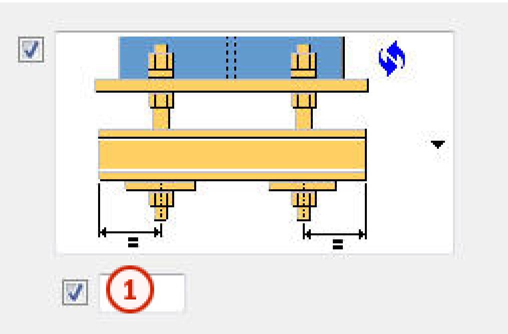
	Description	Default
1	Define the distance of extra profile 2 from the axis of the anchor bar.	`Half of the nut size or anchor bar diameter`

Extra profile 2 type

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2
	Type 3
	Type 4

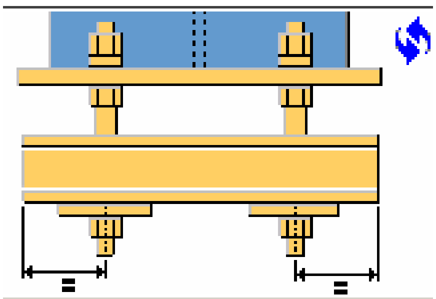
Option	Description
	Type 5
	Type 6

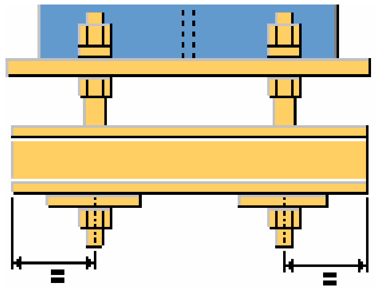
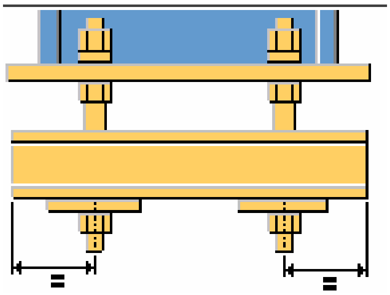
Length of extra profile 2



	Description	Default
1	Define the 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.

Option	Description
	Type 1
	Type 2

Extra profile 1 properties

Option	Description	Default
Hole tolerance	Define the hole tolerance of extra profile 1.	`Same as bolt tolerance`
Profile rotation	Define the profile rotation of extra profile 1.	`Front`

Extra profile 2 rotation

Option	Description	Default
Extra profile 2 rotation	Define the profile rotation of extra profile 2.	`Front`

13.3 Stiffened base plate (1014)

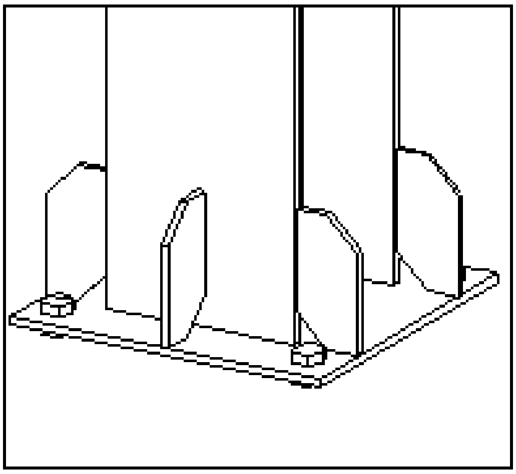
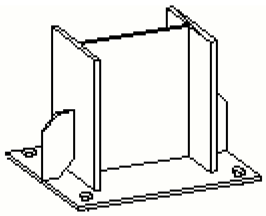
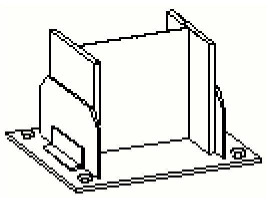
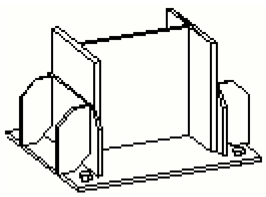
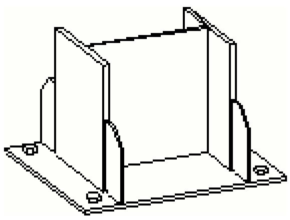
Stiffened base plate (1014) creates a base plate that is connected to a column end.

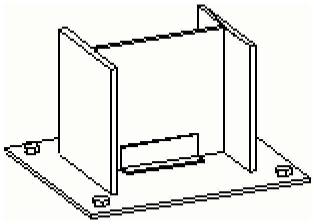
Objects created

- 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
	Base plate with stiffeners
	Base plate with stiffeners on the flange
	Base plate with stiffeners on the flange
	Base plate with stiffeners on the flange
	Base plate with stiffeners on the flange

Situation	Description
	Base plate with stiffeners on the web

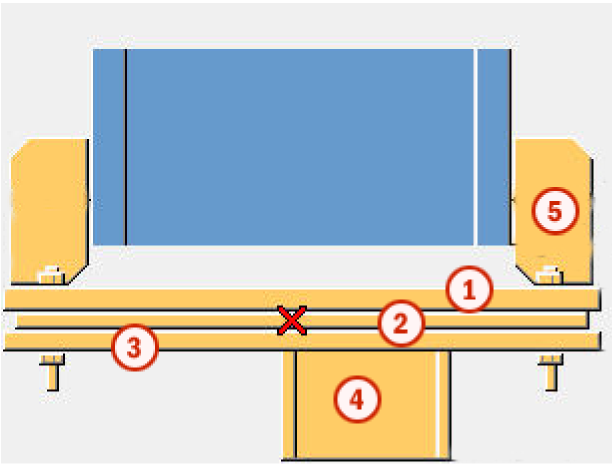
Before you start Create a column.

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

See also

Stiffened base plate (1014): Picture tab on page 1079

Stiffened base plate (1014): Parts tab on page 1080

Stiffened base plate (1014): Parameters tab on page 1082

Stiffened base plate (1014): Bolts tab on page 1084

Stiffened base plate (1014): Stiffeners tab on page 1089

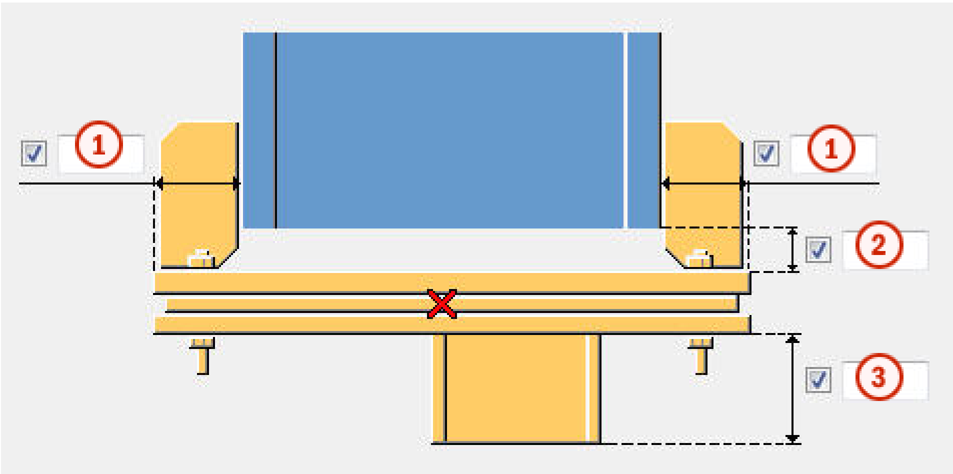
Stiffened base plate (1014): Anchor rods tab on page 1093

Stiffened base plate (1014): Extra plates tab on page 1097

Stiffened base plate (1014): Picture tab

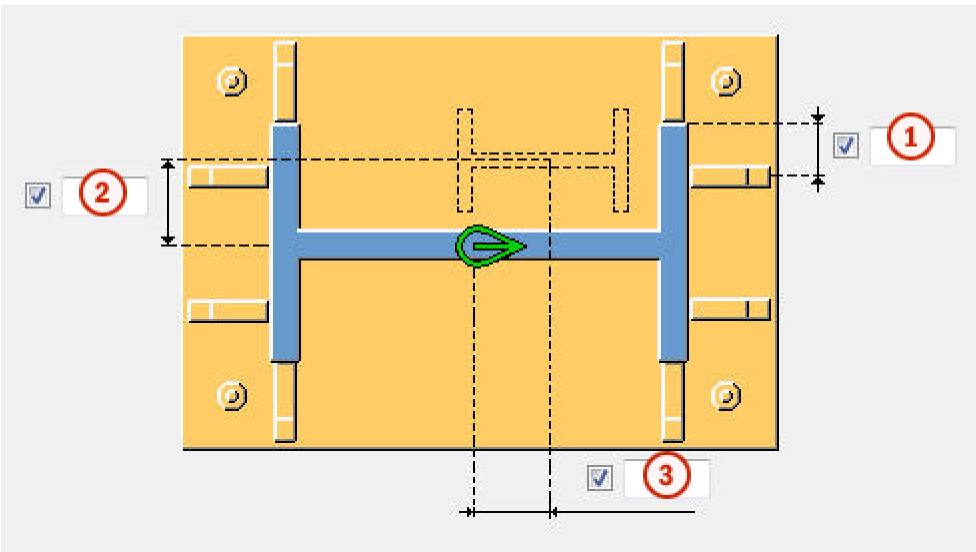
Use the **Picture** tab to control the position of the base plate and the length and position of the shear key in the **Stiffened base plate (1014)** detail.

Dimensions



	Description	Default
①	Define the distance from the flange to the edge of the base plate. Enter a negative value to make the base plate larger.	
②	Define the weld gap.	
③	Define the height of the shear key.	`Equal to the column width`

Shear key offset



	Description
1	Define the distance of the stiffener from the edge of the column flange.
2	Define the shear key vertical offset from the column center.
3	Define the shear key horizontal offset from the column center.

Stiffened base plate (1014): Parts tab

Use the **Parts** tab to control the dimensions of the base plate, web plates, flange plates, shear key, leveling plate, and shim plate(s) in the **Stiffened base plate (1014)** detail.

Plate

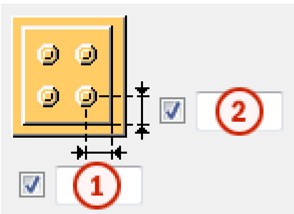
Part	Description	Default
Plate	Define the base plate thickness.	`BASEPLATE`
Web plate	Define the web plate thickness.	`10 mm`
Flange plate 4	Define the flange plate thickness.	`10 mm`
Additional beam	Define the shear key profile by selecting it from the profile catalog.	`HEA 300` (in Default environment)
Leveling plate	Define the leveling plate thickness, width and height.	
Fitting plate	Define the shim plate thickness, width and height. Define up to three different shim plates.	
Number of fitting pl.	Define the number of shim plates for each thickness.	`1`
Horizontal plates	Define the horizontal plate thickness.	
L profile, flange	Define the profile for L profile, flange by selecting it from the profile catalog.	
L profile, web	Define the profile for L profile, web by selecting it from the profile catalog.	
Leveling plate	Define the leveling plate hole diameter.	

Part	Description	Default
hole diameter		

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

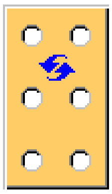
Bolt edge distances in shim plate

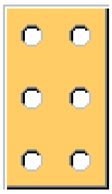
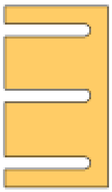
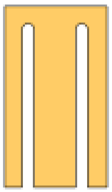
Define the bolt edge distances for shim plates. When these fields are empty, shim plates are of the same size as the base plate.



	Description	Default
1	Define the horizontal bolt edge distance in the shim plate.	30 mm
2	Define the 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 detail. AutoDefaults can change this option.

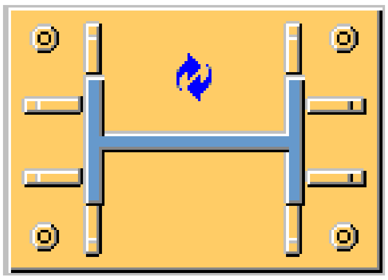
Option	Description
	Holes are based on the bolt group of the detail.
	Finger shim plate with horizontal slots. The plate can be installed from the right or left side of the detail.
	Finger shim plate with vertical slots. The plate can be installed from the top of the detail.

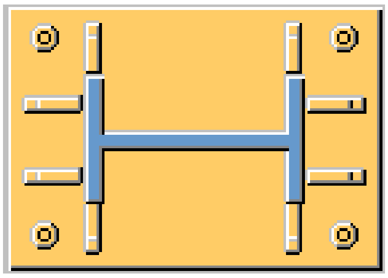
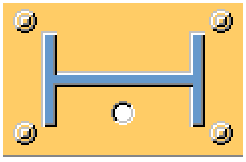
Tolerance Define the tolerance for the slots in finger shim plates. The width of the slot is the bolt diameter + the tolerance.

Stiffened base plate (1014): Parameters tab

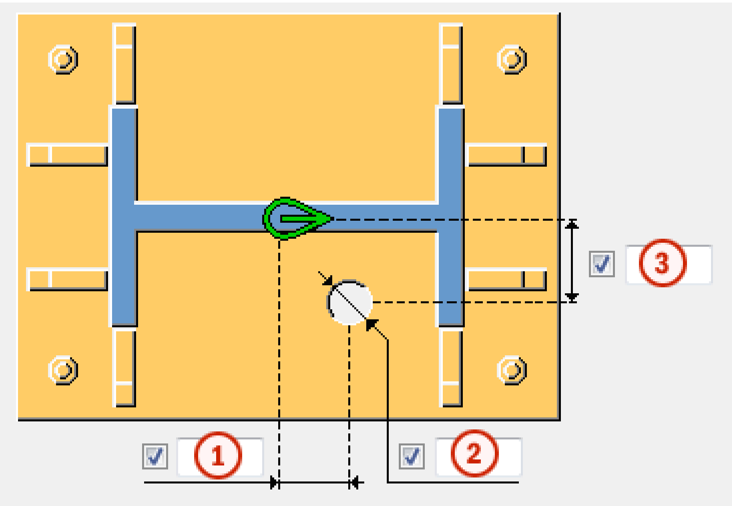
Use the **Parameters** tab to control the component and the grout hole in the **Stiffened base plate (1014)** detail.

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.

Grout hole dimensions

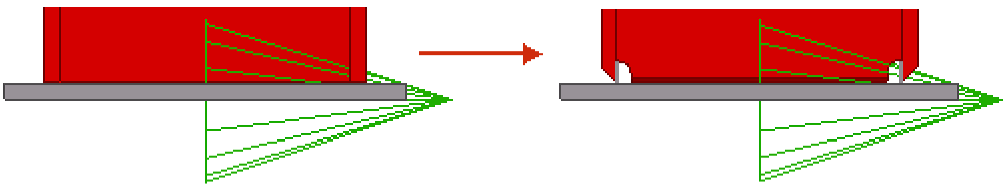


	Description
1	Define the location of the grout hole from the center of the column in the direction of the web.
2	Define the grout hole diameter.
3	Define the location of the grout hole from the center of the column in the direction of the flange.

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.

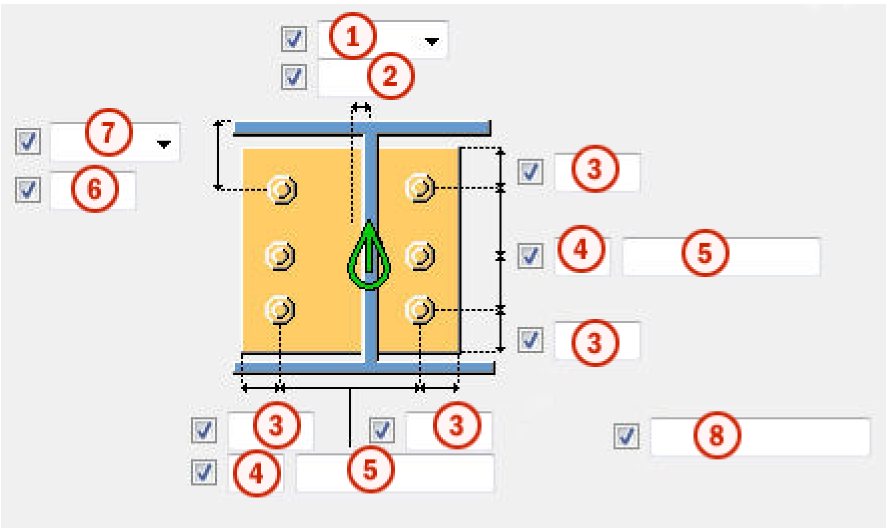


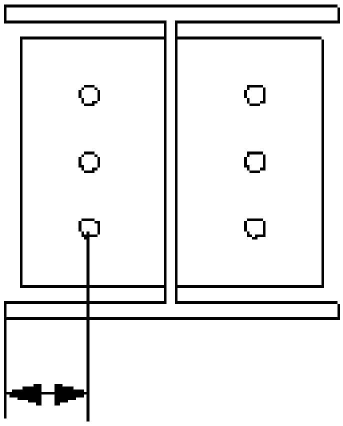
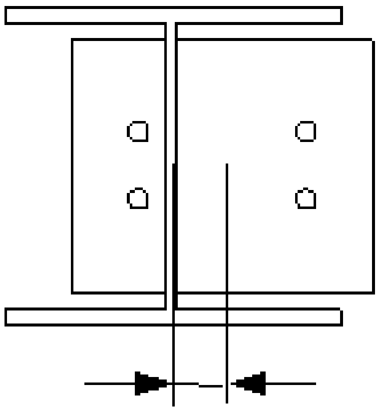
Field	Description
Component	Define a system or a custom component by selecting it from the component catalog.
Attributes	Enter the name of the attribute file for the selected component.
Input	Define to which parts the selected component is applied. • **Default** is same as **Base + Column**. • **Column** sets the column as the main part. Use this option for details. • **Column + Base** sets the column as the main part and the base plate as the secondary part. • **Base + Column** sets the base plate as the main part and the column as the secondary part.

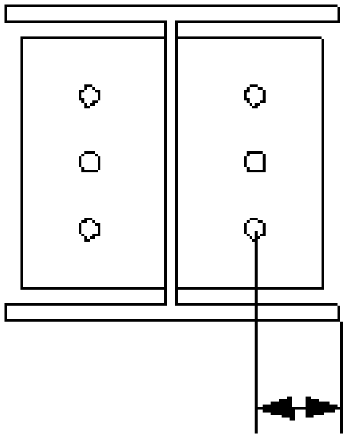
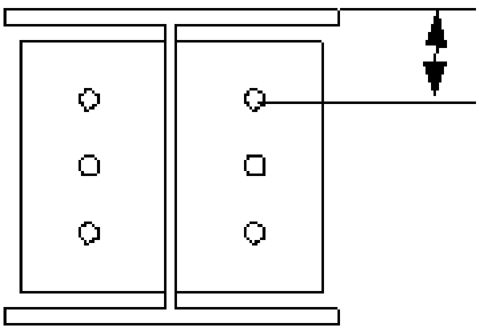
Stiffened base plate (1014): Bolts tab

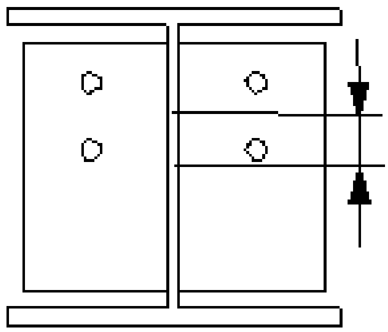
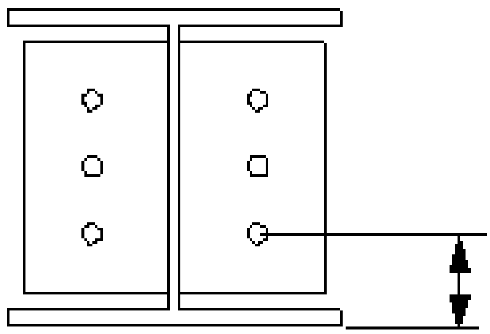
Use the **Bolts** tab to control the bolt properties in the **Stiffened base plate (1014)** detail.

Bolt group dimensions



	Description
1	Define 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. 

	Description
	• **Right**: From the right edge of the secondary part to the rightmost bolt. 
②	Define the dimension for horizontal bolt group position.
③	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
④	Define the number of bolts.
⑤	Define the 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 the dimension for vertical bolt group position.
7	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt. 

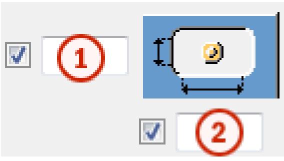
	Description
	• **Middle**: From the center line of the bolts to the center line of the secondary part.  • **Below**: From the lower edge of the secondary part to the lowest bolt. 
8	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to bottom.

Bolt basic properties

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

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

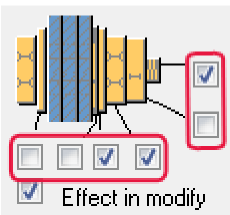
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

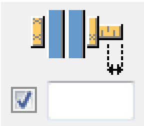
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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**.

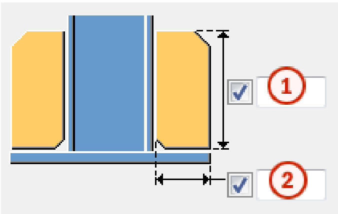
Bolt length increase Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



Stiffened base plate (1014): Stiffeners tab

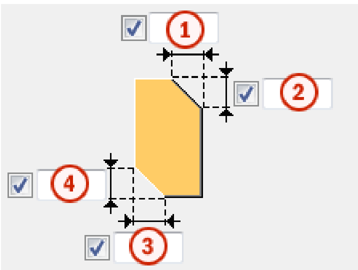
Use the **Stiffeners** tab to control the web plate stiffeners and the flange plate stiffeners in the **Stiffened base plate (1014)** detail.

Web plate stiffener dimensions



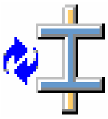
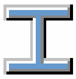
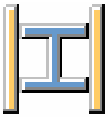
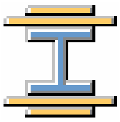
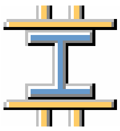
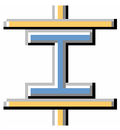
	Description	Default
1	Define the height of the web plate stiffener.	`200 mm`
2	Define the bottom width of the web plate stiffener.	`100 mm`

Web plate stiffener chamfer dimensions

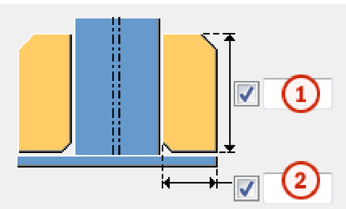


	Description
1	Define the top horizontal chamfer dimension.
2	Define the top vertical chamfer dimension.
3	Define the bottom horizontal chamfer dimension.
4	Define the bottom vertical chamfer dimension.

Web plate stiffener position You can create stiffeners to different positions using the web plate stiffener position options.

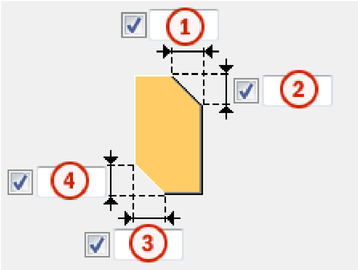
Option	Description
	Default Type 2 AutoDefaults can change this option.
	Type 1
	Type 2
	Type 3
	Type 4
	Type 5
	Type 6
	Type 7

Flange plate stiffener dimensions



	Description	Default
1	Define the height of the flange plate stiffener.	`200 mm`
2	Define the bottom width of the flange plate stiffener.	`100 mm`

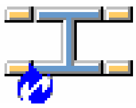
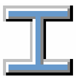
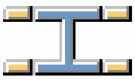
Flange plate stiffener chamfer dimensions



	Description
1	Define the top horizontal chamfer dimension.
2	Define the top vertical chamfer dimension.
3	Define the bottom horizontal chamfer dimension.
4	Define the bottom vertical chamfer dimension.

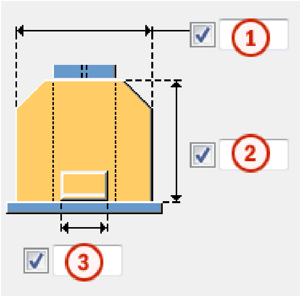
Flange plate stiffener position

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

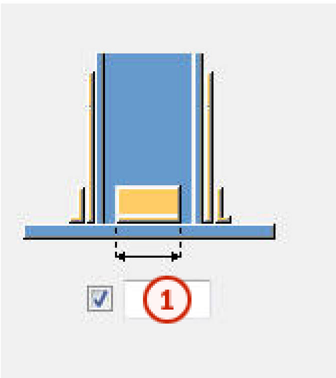
If you have created the stiffeners using other than the default stiffener position options, you can separately define the plate dimensions for different positions.



	Description
1	Define the width of the stiffener.
2	Define the height of the stiffener.
3	Define the width of the stiffener.

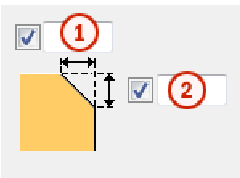
Stiffener plate width

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	Define the width of the stiffener.	200 mm

Stiffener chamfer dimensions



	Description
1	Define the horizontal chamfer dimension.
2	Define the vertical chamfer dimension.

Stiffened base plate (1014): Anchor rods tab

Use the **Anchor rods** tab to control the creation of different types of anchor rods in the **Stiffened base plate (1014)** detail.

Anchor rod dimensions

Option	Description
Anchor rod profile	Define the anchor rod profile.
Nut profile	Define the nut profile.
Washer profile	Define the washer thickness, width and height.
Plate washer	Define the plate washer thickness, width and height.
Castplate	Define the cast plate thickness, width and height.

Anchor rod part properties

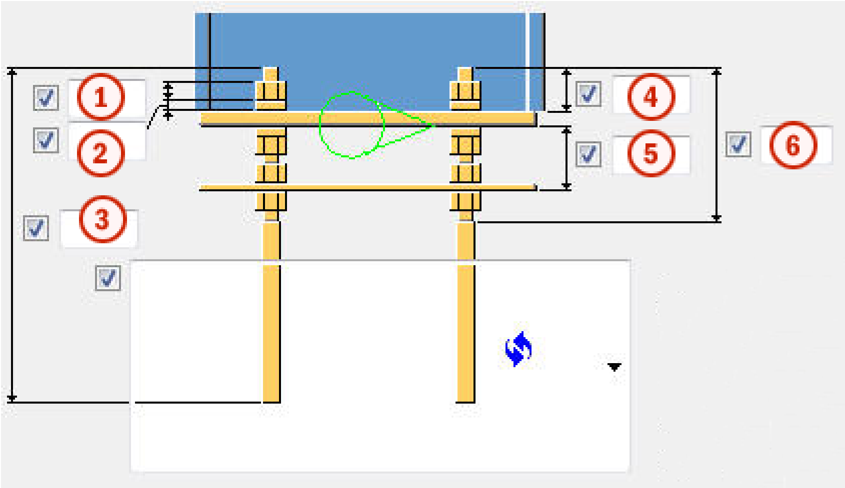
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Base plate with

Use this option to switch between the bolts and the anchor rods.

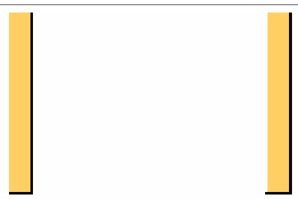
By default, the base plate is created with **Bolts**.

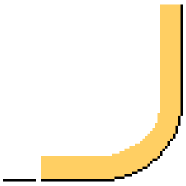
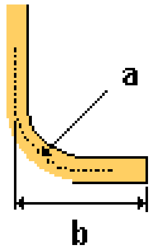
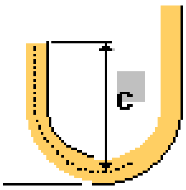
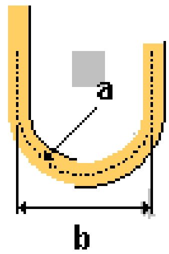
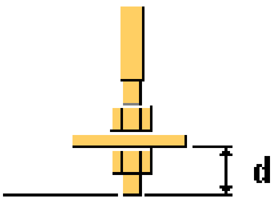
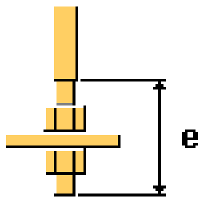
Anchor rod dimensions



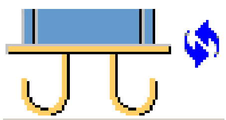
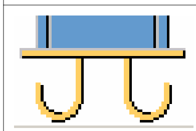
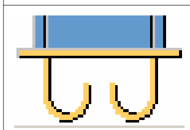
	Description	Default
1	Define the size or the length of the nut.	`anchor rod diameter`
2	Define the size or the thickness of the washer.	`half of nut size`
3	Define the length of the anchor rod.	`500 mm`
4	Define the length of the anchor rod above the base plate.	`50 mm`
5	Define the distance between the cast plate and the base plate.	`60 mm`
6	Define the length of the upper thread.	`0 mm`

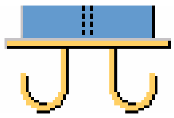
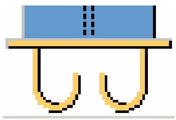
Anchor rods types

Option	Description	
	Default Type 1 AutoDefaults can change this option.	
	Type 1	

Option	Description	
 	**a** Radius of the hook **b** Width of the hook	**a** = 2*anchor bar diameter **b** = 1/5 of anchor bar length
 	**a** Radius of the hook **b** Width of the hook **c** Height of the hook	**c** = same as width of the hook
 	**d** Length of the anchor rod below the extra plate **e** Length of the lower thread	**d** = 4*nut size plus thicknes s of extra plate **e** = 2*nut size

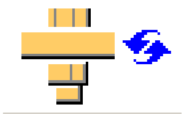
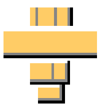
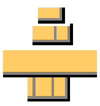
Hook direction

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2

Option	Description
	Type 3
	Type 4

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
Castplate holes tolerance	Define the tolerance of the cast plate holes.	`same as bolt tolerance`

Washer hole tolerance

Option	Description
Washer hole tolerance	Define the tolerance of the washer hole. By default, a hole is not created in the washer.

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.

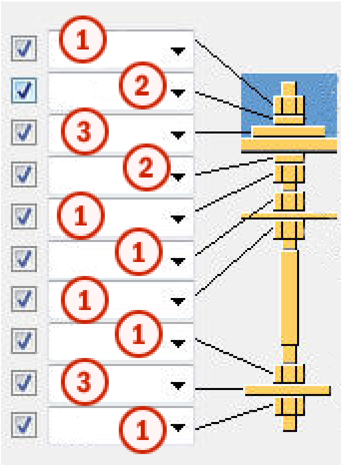
In the first field, enter the grout thickness.

In the second field, define whether the grouting is created above or below the detail creation point. This also affects the shim plates.

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.

Stiffened base plate (1014): 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 in the **Stiffened base plate (1014)** detail.

Part dimensions

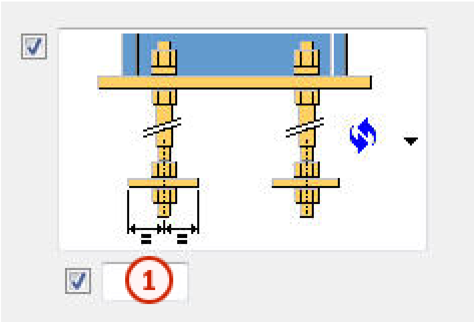
Part	Description	Default
Extra profile 1	Define the first extra profile by selecting it from the profile catalog.	PL10*100
Extra profile 2	Define the second extra profile by selecting it from the profile catalog.	

Part properties

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

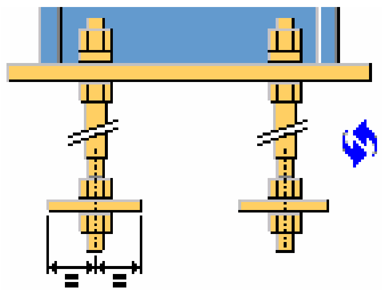
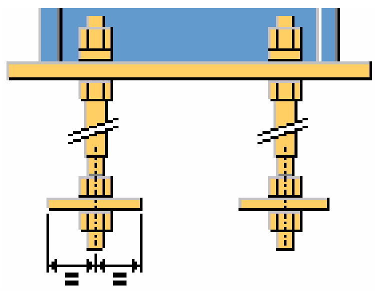
Option	Description	Default
	can enter the assembly position number.	
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

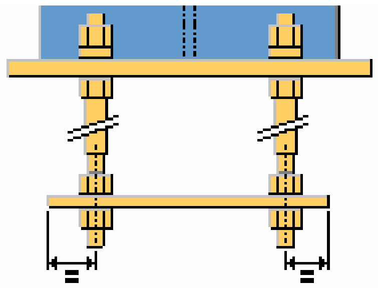
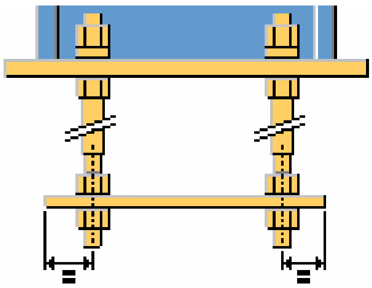
Edge distance of extra profile 1



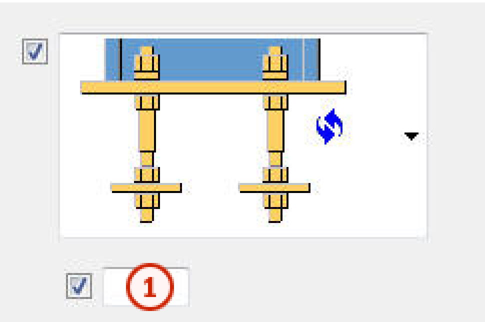
	Description	Default
1	Define the edge distance of extra profile 1.	50 mm

Type and direction of extra profile 1

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1

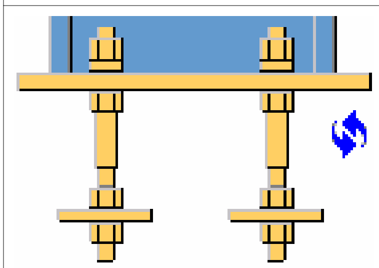
Option	Description
	Type 2
	Type 3

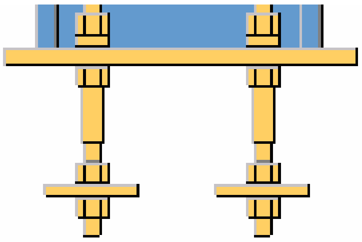
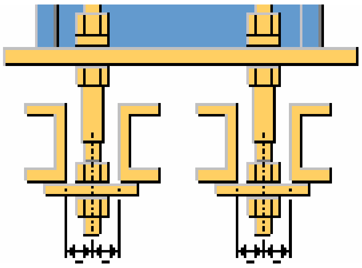
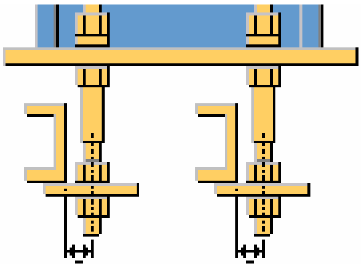
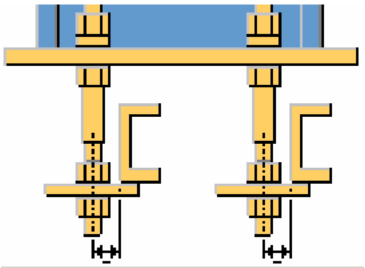
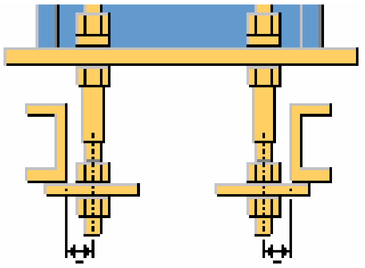
Edge distance of extra profile 2

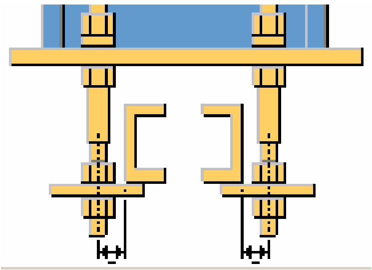


	Description	Default
1	Define the distance of extra profile 2 from the axis of the anchor bar.	Half of the nut size or anchor bar diameter

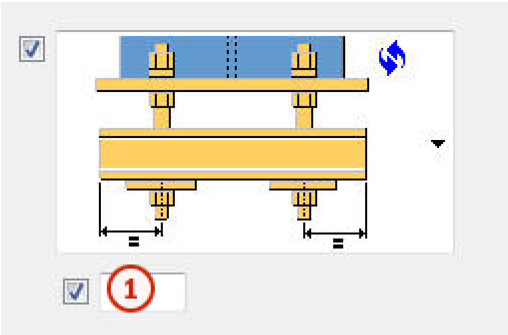
Extra profile 2 type

Option	Description
	Default Type 1 AutoDefaults can change this option.

Option	Description
	Type 1
	Type 2
	Type 3
	Type 4
	Type 5

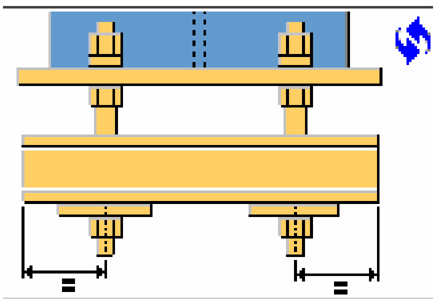
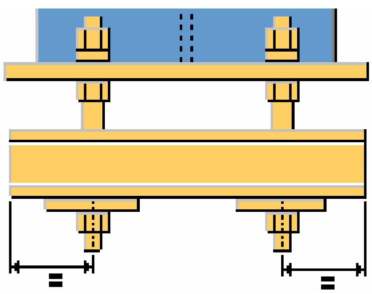
Option	Description
	Type 6

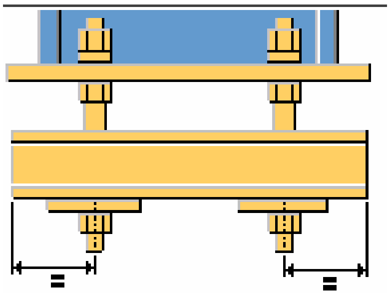
Length of extra profile 2



	Description	Default
1	Define the 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
Hole tolerance	Define the hole tolerance of extra profile 1.	`Same as bolt tolerance`
Profile rotation	Define the profile rotation of extra profile 1.	`Front`

Extra profile 2 rotation

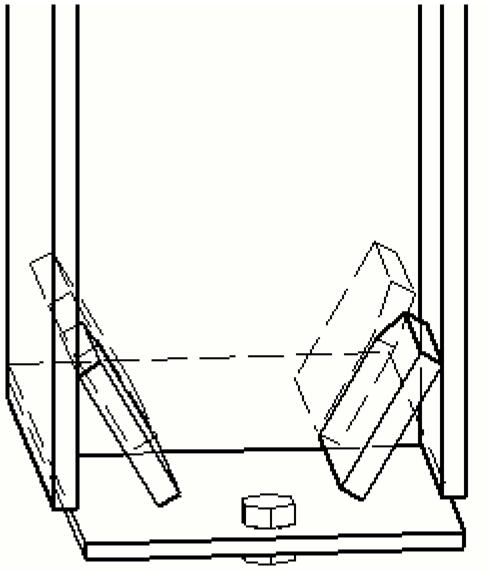
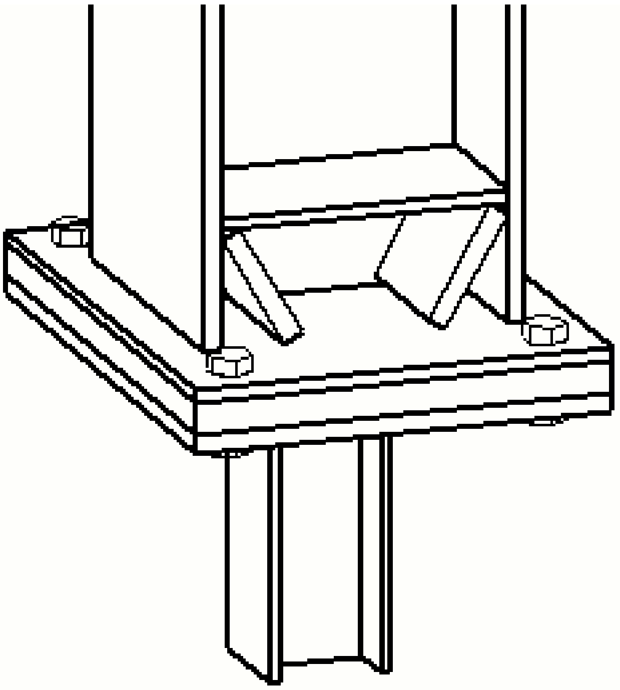
Option	Description	Default
Extra profile 2 rotation	Define the profile rotation of extra profile 2.	`Front`

13.4 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
		Web stiffened base plate with a leveling plate, a shim plate, horizontal stiffener and a shear key

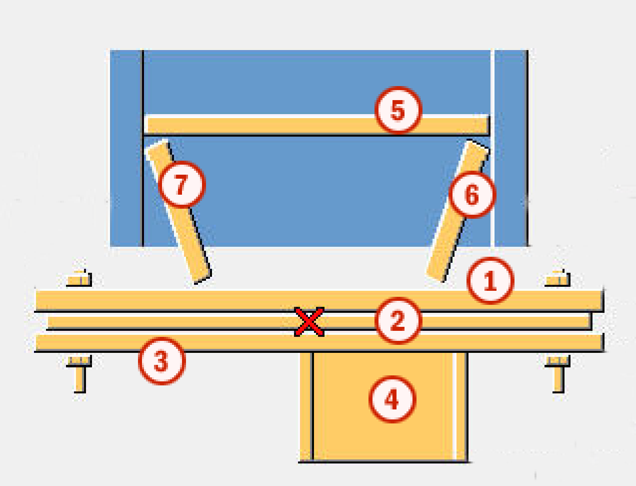
Before you start Create a column or a beam.

Selection order

1. Select the main part (column or beam).
2. Pick a position.

   The detail is created automatically.

Part identification key

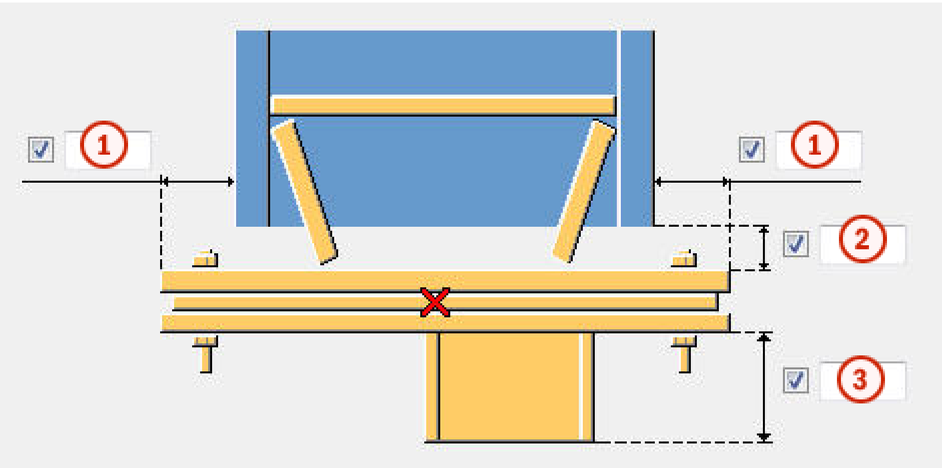


	Part
1	Base plate
2	Shim plate
3	Leveling plate
4	Shear key
5	Upper horizontal stiffener
6	Upper flange stiffener
7	Lower flange stiffener

Web stiffened base plate (1016): Picture tab

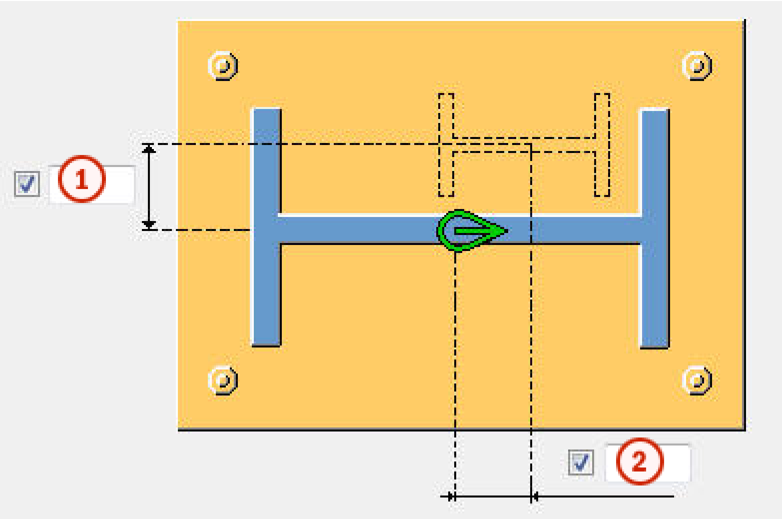
Use the **Picture** tab to control the position of the base plate and the shear key offset in the **Web stiffened base plate (1016)** detail.

Dimensions



	Description
①	Define the distance from the flange to the edge of the base plate.
②	Define the weld gap.
③	Define the height of the shear key.

Shear key offset



	Description
1	Define the shear key vertical offset from the column center.
2	Define the shear key horizontal offset from the column center.

Web stiffened base plate (1016): 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 plate(s) in the **Web stiffened base plate (1016)** detail.

Plate

	Description	Default
Plate	Define the base plate thickness. The dimensions on the **Picture** and **Bolts** tab determine the base plate width and length.	

	Description	Default
Upper fl. stiffener	Define the 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`
Lower fl. stiffener	Define the 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`
Additional beam	Define the shear key profile by selecting it from the profile catalog.	
Leveling plate	Define the leveling plate thickness, width and height.	
Upper hotizontal stiff	Define the upper horizontal stiffener thickness, width and height.	Thickness = `0 mm`
Fitting plate	Define the shim plate thickness, width and height. Define up to three different shim plates.	
Number of fitting pl.	Define the number of shim plates for each thickness.	`1`
Leveling plate hole diameter	Define the leveling plate hole diameter.	
Key profile welded to	Define to which plate the shear key is welded.	

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.

Option	Description	Default
	can enter the assembly position number.	
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

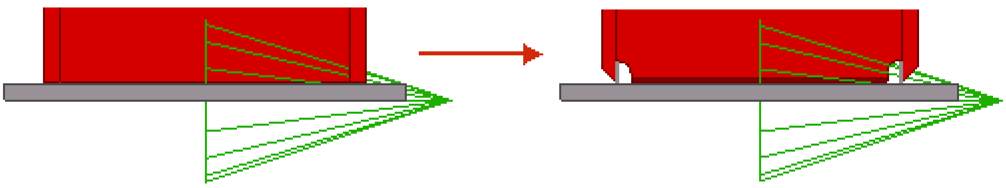
Web stiffened base plate (1016): Parameters tab

Use the **Parameters** tab to control the component used inside the **Web stiffened base plate (1016)** detail.

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.

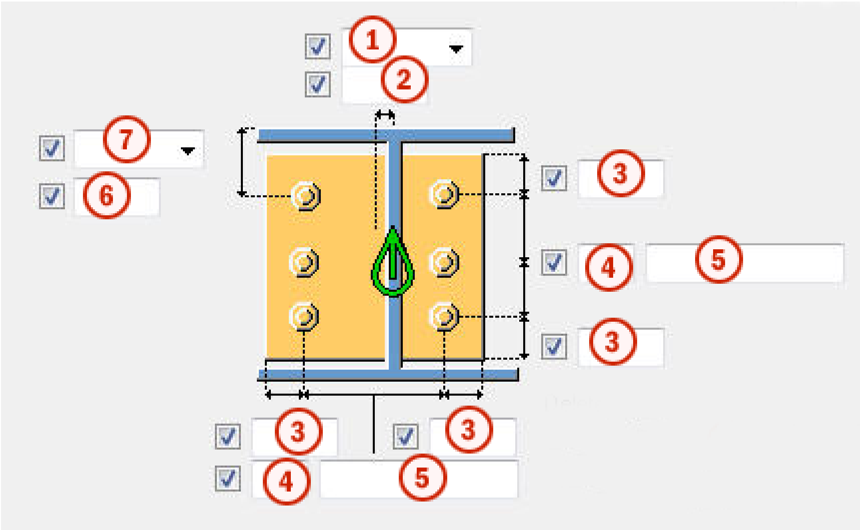


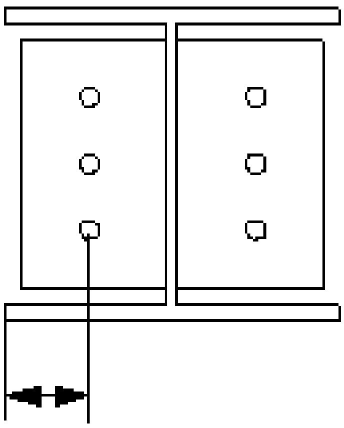
Field	Description
Component	Define a system or a custom component by selecting it from the component catalog.
Attributes	Enter the name of the attribute file for the selected component.
Input	Define to which parts the selected component is applied. • **Default** is same as **Base + Column**. • **Column** sets the column as the main part. Use this option for details. • **Column + Base** sets the column as the main part and the base plate as the secondary part. • **Base + Column** sets the base plate as the main part and the column as the secondary part.

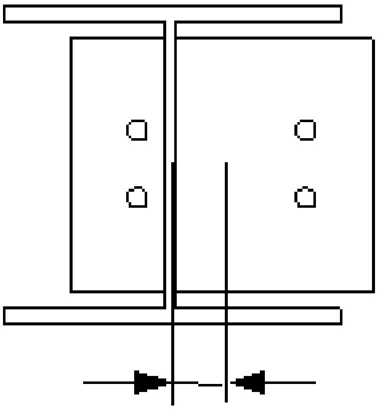
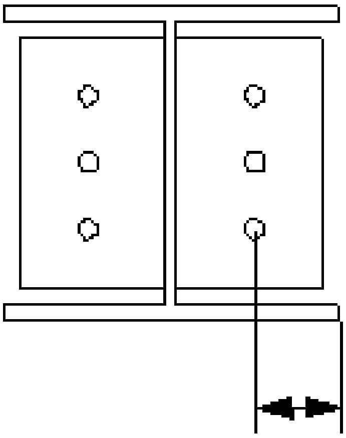
Web stiffened base plate (1016): Bolts tab

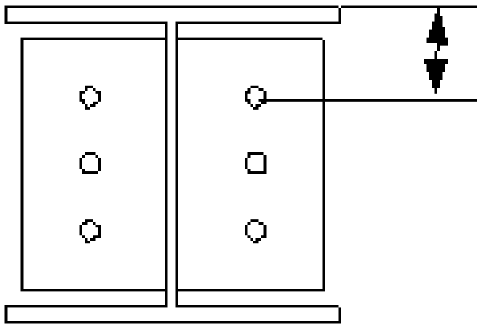
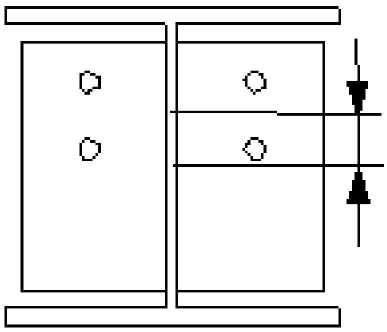
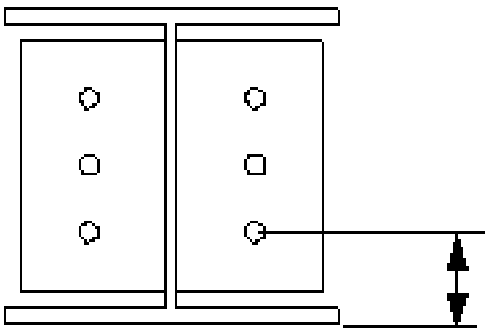
Use the **Bolts** tab to control the bolt properties in the **Web stiffened base plate (1016)** detail.

Bolt group dimensions



	Description
①	Define how to measure the dimensions for horizontal bolt group position. • **Left**: From the left edge of the secondary part to the leftmost bolt. 

	Description
	• **Middle**: From the center line of the secondary part to the center line of the bolts.  • **Right**: From the right edge of the secondary part to the rightmost bolt. 
②	Define the dimension for horizontal bolt group position.
③	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
④	Define the number of bolts.
⑤	Define the 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 the dimension for vertical bolt group position.

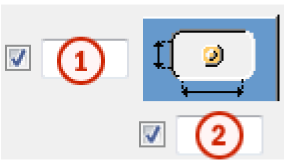
	Description
7	Define how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt.  • **Middle**: From the center line of the bolts to the center line of the secondary part.  • **Below**: From the lower edge of the secondary part to the lowest bolt. 

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

You can define slotted, oversized, or tapped holes.

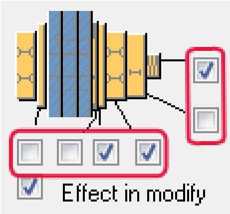


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(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.

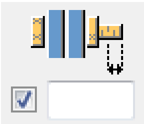
If you want to create a hole only, clear all the check boxes.



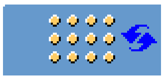
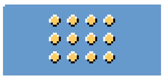
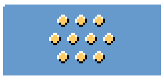
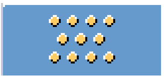
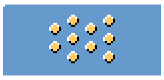
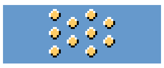
To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

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.



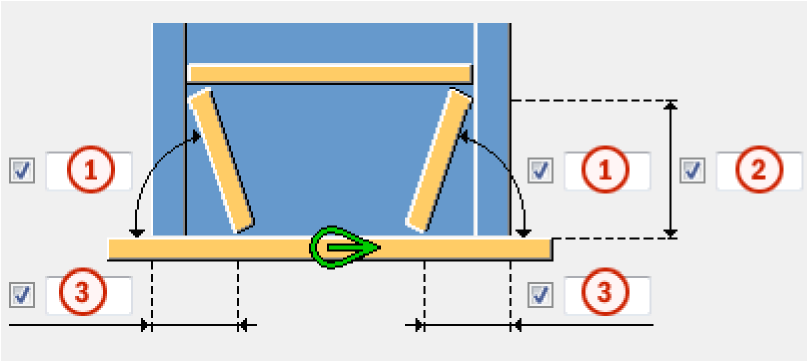
Staggering of bolts

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 stiffened base plate (1016): Stiffeners tab

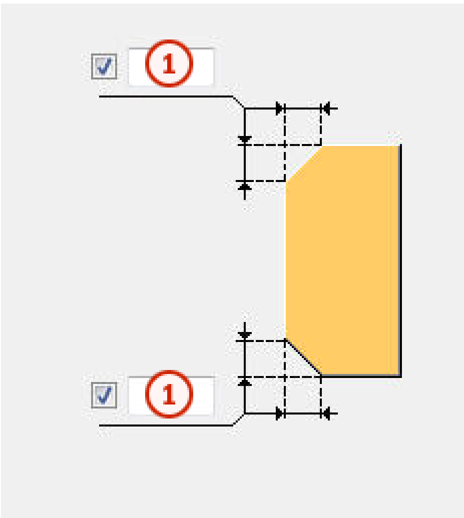
Use the **Stiffeners** tab to control the stiffener angle, position and selection in the **Web stiffened base plate (1016)** detail.

Stiffener angle and position



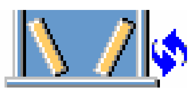
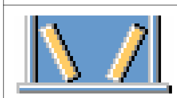
	Description	Default
1	Define the stiffener angle.	`60 degrees`
2	Define the height of the stiffener.	
3	Define the distance of the stiffener from the column edge.	

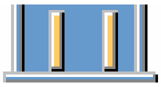
Stiffener plate dimension



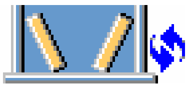
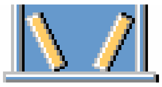
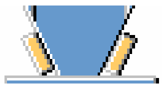
	Description
1	Define the size of the chamfer.

Stiffener selection 1

Option	Description
	Default Stiffeners are sloped. AutoDefaults can change this option.
	Stiffeners are sloped.

Option	Description
	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.

Web stiffened base plate (1016): Anchor rods tab

Use the **Anchor rods** tab to control the creation of different types of anchor rods in the **Web stiffened base plate (1016)** detail.

Anchor rod dimensions

Option	Description
Anchor rod profile	Define the anchor rod profile.
Nut profile	Define the nut profile.
Washer profile	Define the washer thickness, width and height.
Plate washer	Define the plate washer thickness, width and height.
Castplate	Define the cast plate thickness, width and height.

Anchor rod part properties

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** -->

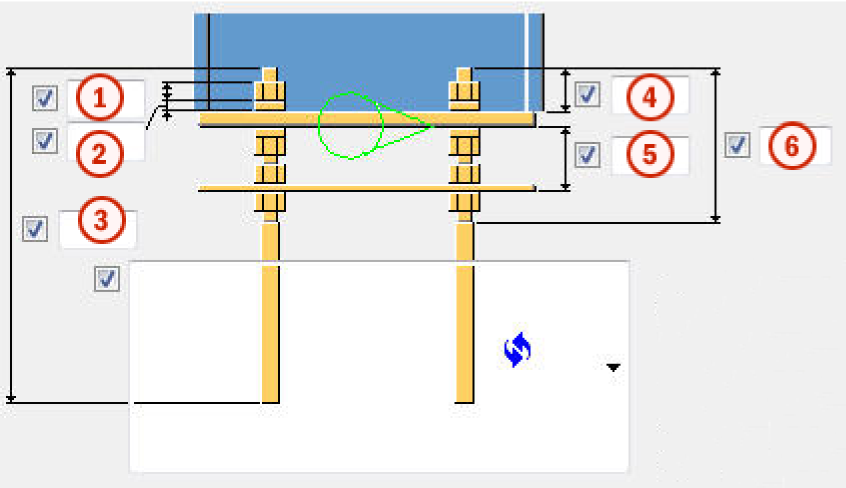
Option	Description	Default
		Options... --> Components tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Base plate with

Use this option to switch between the bolts and the anchor rods.

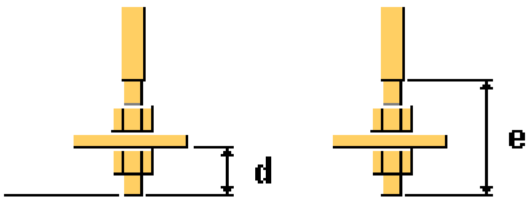
By default, the base plate is created with **Bolts**.

Anchor rod dimensions

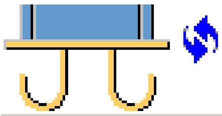
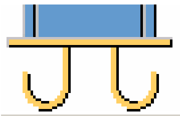
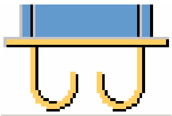
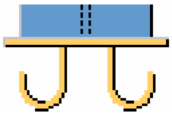
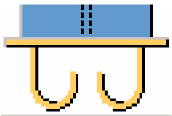


	Description	Default
1	Define the size or the length of the nut.	`anchor rod diameter`
2	Define the size or the thickness of the washer.	`half of nut size`
3	Define the length of the anchor rod.	`500 mm`
4	Define the length of the anchor rod above the base plate.	`50 mm`
5	Define the distance between the cast plate and the base plate.	`60 mm`
6	Define the length of the upper thread.	`0 mm`

Anchor rods types

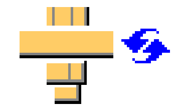
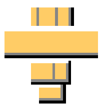
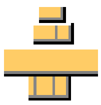
Option	Description	
	Default Type 1 AutoDefaults can change this option.	
	Type 1	
	**a** Radius of the hook **b** Width of the hook	**a** = 2*anchor bar diameter **b** = 1/5 of anchor bar length
	**a** Radius of the hook **b** Width of the hook **c** Height of the hook	**c** = same as width of the hook
	**d** Length of the anchor rod below the extra plate **e** Length of the lower thread	**d** = 4*nut size plus thickness of extra plate **e** = 2*nut size

Hook direction

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2
	Type 3
	Type 4

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
Castplate holes tolerance	Define the tolerance of the cast plate holes.	`same as bolt tolerance`

Washer hole tolerance

Option	Description
Washer hole tolerance	Define the tolerance of the washer hole. By default, a hole is not created in the washer.

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.

In the first field, enter the grout thickness.

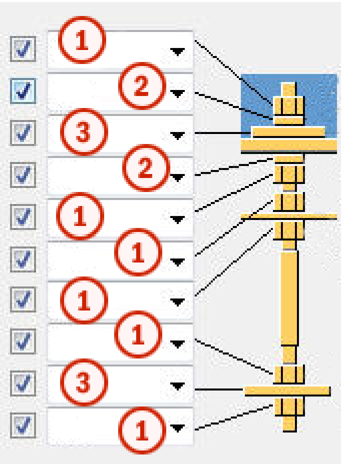
In the second field, define whether the grouting is created above or below the detail creation point. This also affects the shim plates.

Create assembly from all anchors Define whether anchors are included in an anchor rod assembly. You can also include leveling plates into the assembly.

Delete 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.

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.

Web stiffened base plate (1016): 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 in the **Web stiffened base plate (1016)** detail.

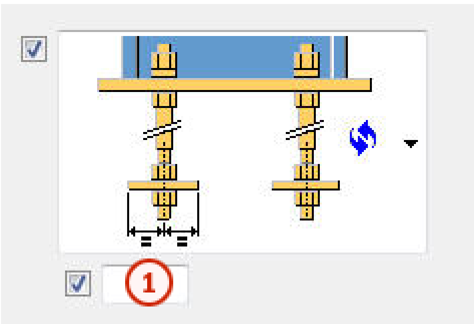
Part dimensions

Part	Description	Default
Extra profile 1	Define the first extra profile by selecting it from the profile catalog.	PL10*100
Extra profile 2	Define the second extra profile by selecting it from the profile catalog.	

Part properties

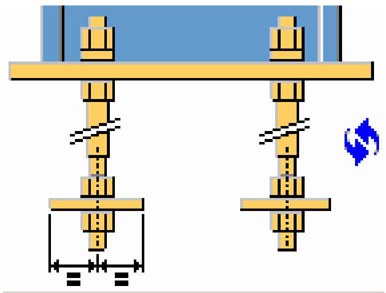
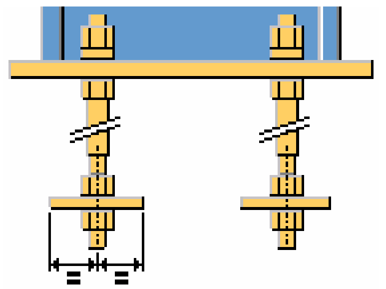
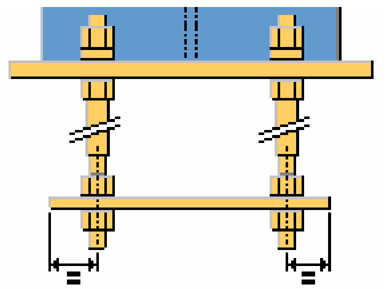
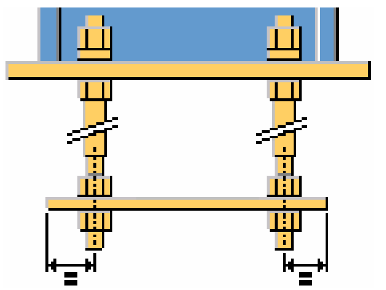
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Edge distance of extra profile 1

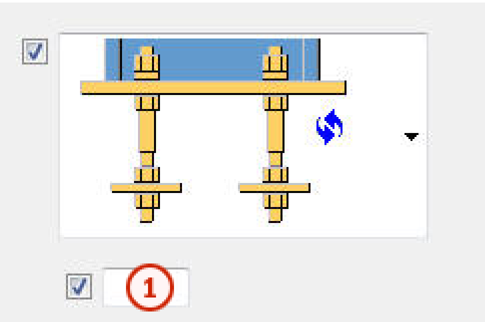


	Description	Default
1	Define the edge distance of extra profile 1.	50 mm

Type and direction of extra profile 1

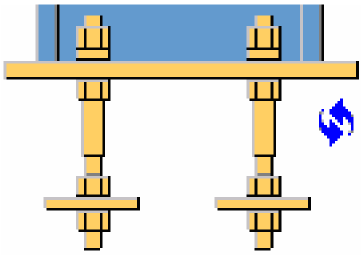
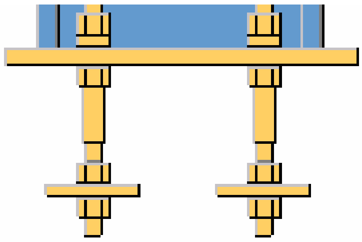
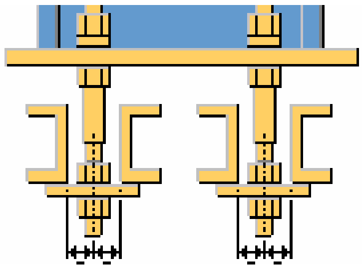
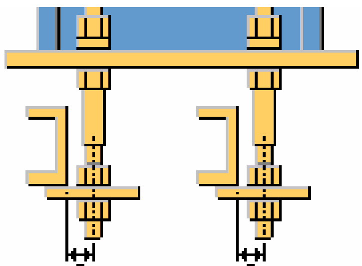
Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2
	Type 3

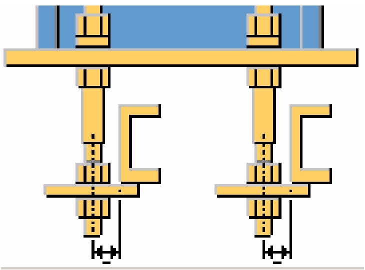
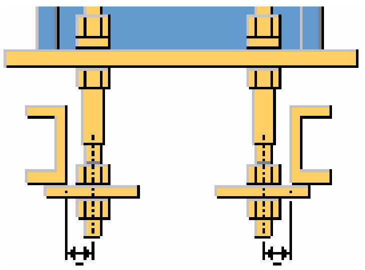
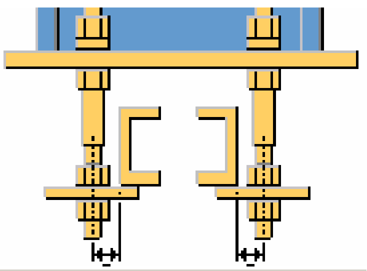
Edge distance of extra profile 2



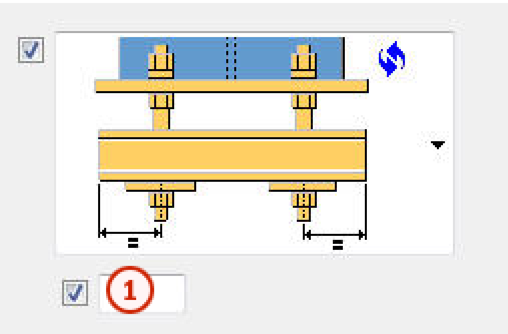
	Description	Default
1	Define the distance of extra profile 2 from the axis of the anchor bar.	Half of the nut size or anchor bar diameter

Extra profile 2 type

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2
	Type 3

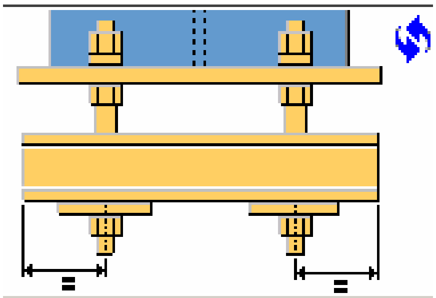
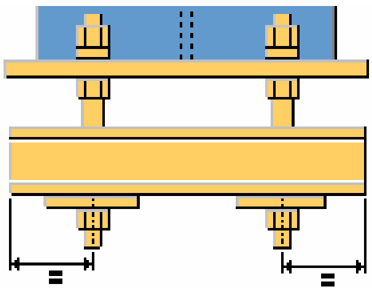
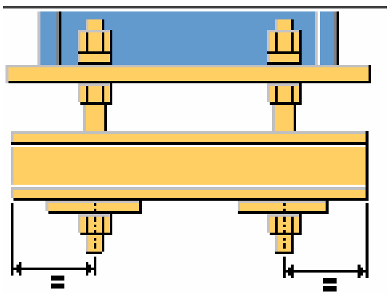
Option	Description
	Type 4
	Type 5
	Type 6

Length of extra profile 2



	Description	Default
1	Define the 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
Hole tolerance	Define the hole tolerance of extra profile 1.	`Same as bolt tolerance`
Profile rotation	Define the profile rotation of extra profile 1.	`Front`

Extra profile 2 rotation

Option	Description	Default
Extra profile 2 rotation	Define the profile rotation of extra profile 2.	`Front`

13.5 Base plate (1042)

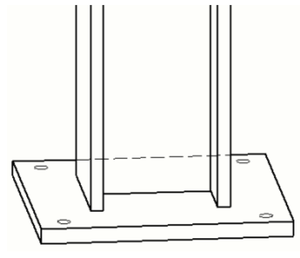
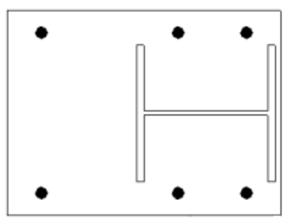
Base plate (1042) creates a base plate that is connected to a column end.

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

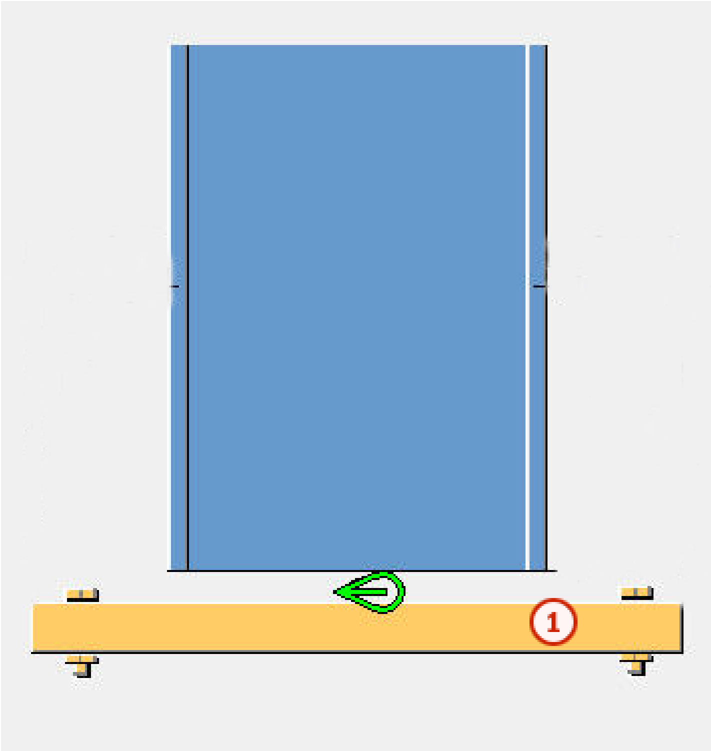
Before you start Create a column.

Selection order

1. Select the main part (column).
2. Pick a position.

   The detail is created automatically.

Part identification key



	Part
1	Base plate

See also

Base plate (1042): Picture tab on page 1125

Base plate (1042): Parts tab on page 1126

Base plate (1042): Parameters tab on page 1127

Base plate (1042): Anchor rods tab on page 1132

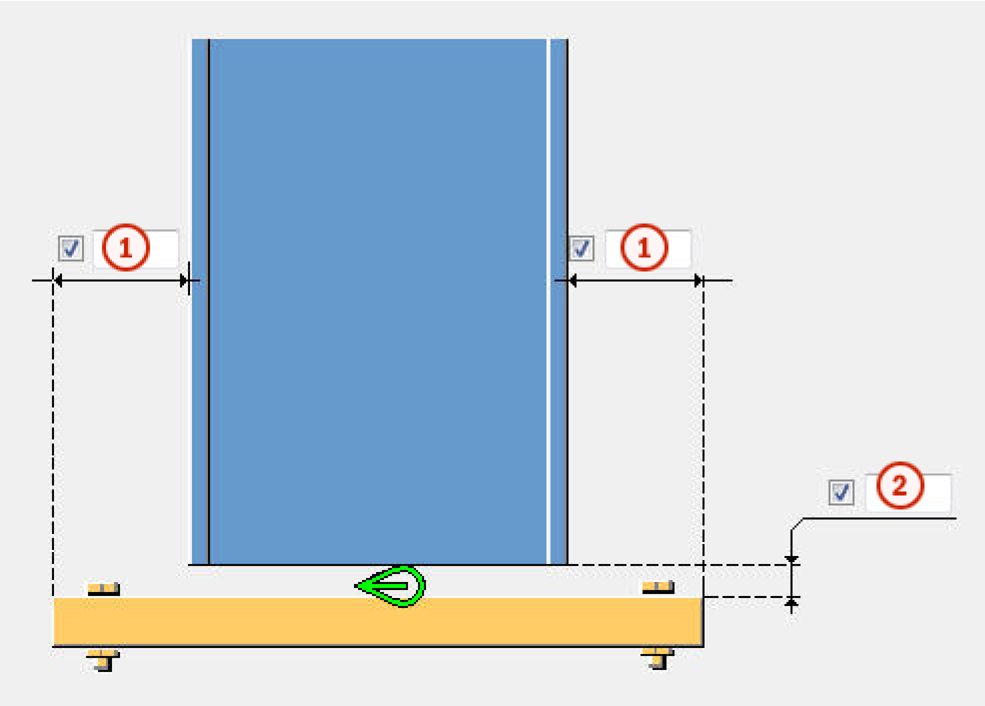
Base plate (1042): Extra plates tab on page 1136

Base plate (1042): Bolts tab on page 1141

Base plate (1042): Picture tab

Use the **Picture** tab to control the position of the base plate in the **Base plate (1042)** detail.

Dimensions



	Description
1	Define the distance from the flange of the main part to the edge of the base plate.
2	Define the weld gap.

Base plate (1042): Parts tab

Use the **Parts** tab to control the dimensions of the base plate in the **Base plate (1042)** detail.

Plate

Part	Description	Default
Plate	Define the thickness, width, and height of the base plate.	Thickness = 30 mm Width =500 mm Heigh t =500 mm

Field	Description	Default
Pos No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** -->

Field	Description	Default
		Options... --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

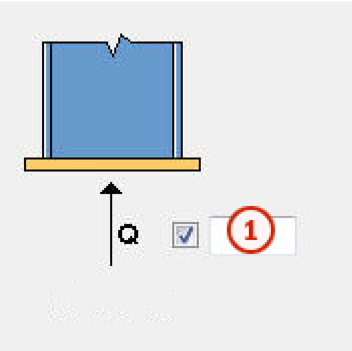
Base plate (1042): Parameters tab

Use the **Parameters** tab to control the weld dimensions, grout hole diameter and position, plate type, design check and shear force value in the **Base plate (1042)** detail.

Design check

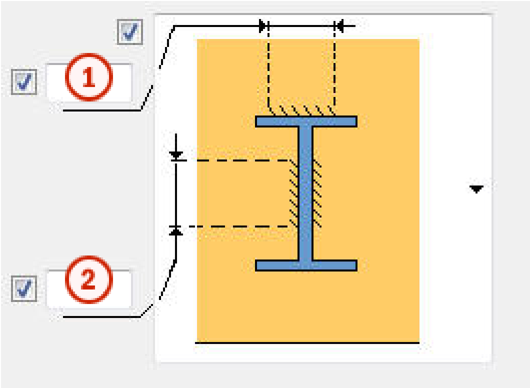
Option	Description
Design	Define whether design check is turned on or off.
Bearing	Define whether the detail and its components bear the entered shear force.
Factored Axial Dead Load	Define the factored axial dead load, if design check is turned on.
Minimum Fcu	Define the minimum Fcu, if design check is turned on.

Shear force



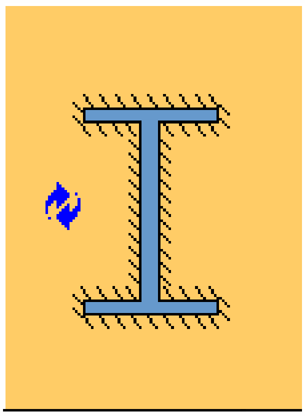
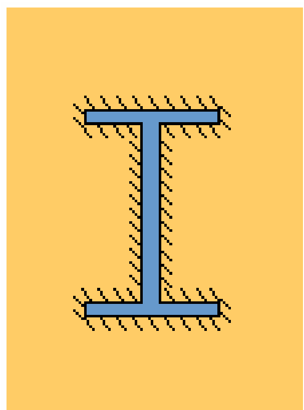
	Description
1	Define the shear force value. If the design check is turned on, enter a positive value. If there is no shear force, enter 0.

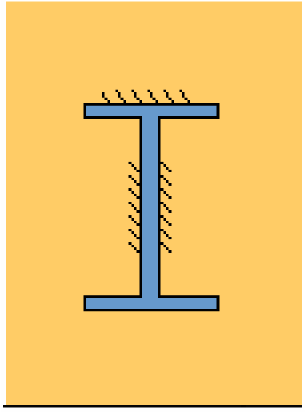
Weld dimensions



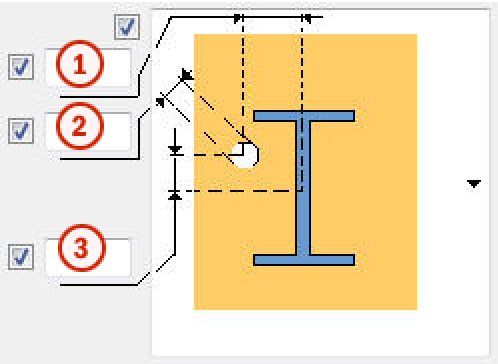
	Description
1	Define the weld dimension on the column flange.
2	Define the weld dimension on the column web.

Weld types

Option	Description
	Default Fully welded AutoDefaults can change this option.
	Fully welded

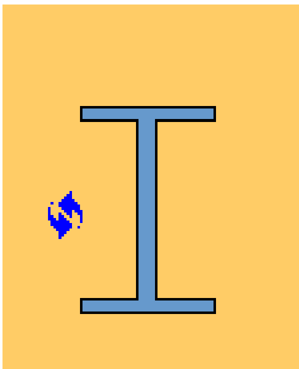
Option	Description
	Partially welded

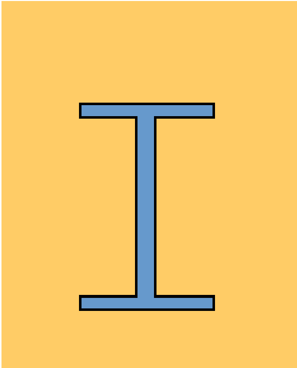
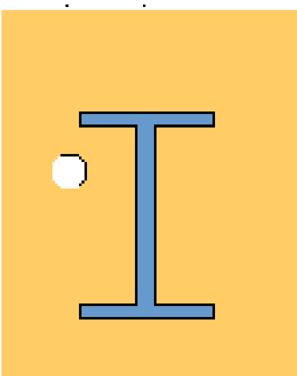
Grout hole diameter and offset



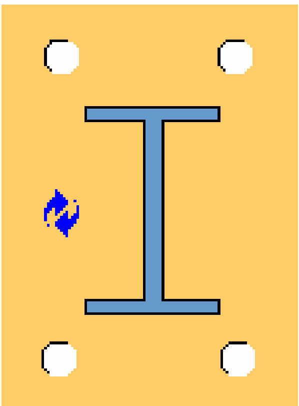
	Description
1	Define the grout hole horizontal offset from the column center.
2	Define the grout hole diameter.
3	Define the grout hole vertical offset from the column center.

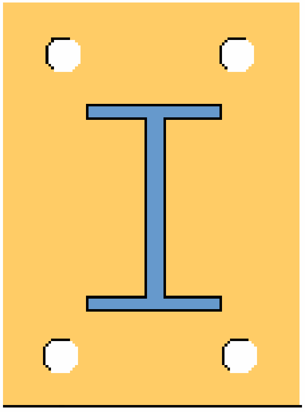
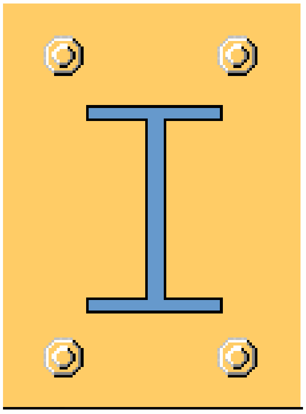
Base plate with grout hole

Option	Description
	Default Grout hole is not created. AutoDefaults can change this option.

Option	Description
	Grout hole is not created.
	Grout hole is created.

Base plate with holes or bolts

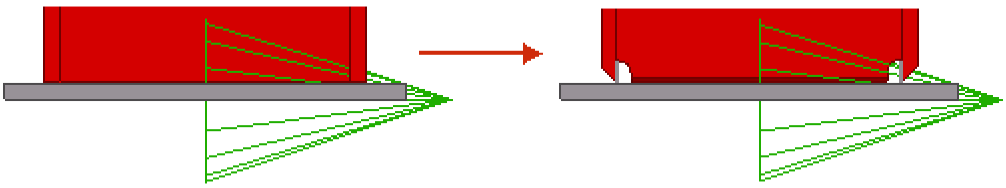
Option	Description
	Default Holes are created. AutoDefaults can change this option.

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.



Field	Description
Component	Define a system or a custom component by selecting it from the component catalog.
Attributes	Enter the name of the attribute file for the selected component.
Input	Define to which parts the selected component is applied. • **Default** is same as **Base + Column**.

Field	Description
	• **Column** sets the column as the main part. Use this option for details. • **Column + Base** sets the column as the main part and the base plate as the secondary part. • **Base + Column** sets the base plate as the main part and the column as the secondary part.

Base plate (1042): Anchor rods tab

Use the **Anchor rods** tab to control the creation of different types of anchor rods in the **Base plate (1042)** detail.

Anchor rod dimensions

Option	Description
Anchor rod profile	Define the anchor rod profile.
Nut profile	Define the nut profile.
Washer profile	Define the washer thickness, width and height.
Plate washer	Define the plate washer thickness, width and height.
Castplate	Define the cast plate thickness, width and height.

Anchor rod part properties

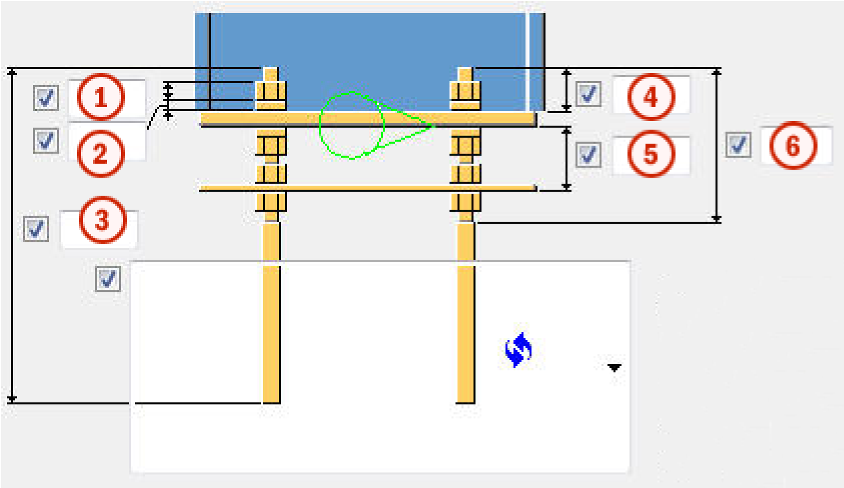
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Base plate with

Use this option to switch between the bolts and the anchor rods.

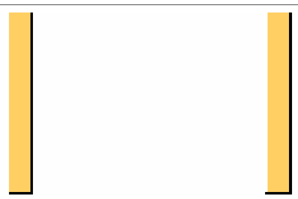
By default, the base plate is created with **Bolts**.

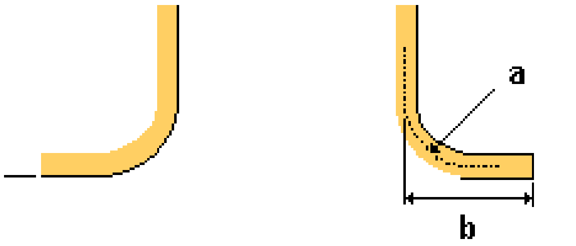
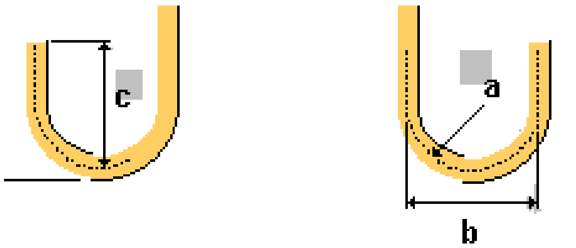
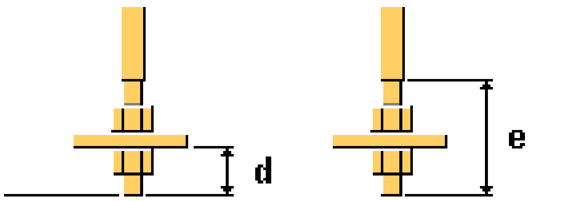
Anchor rod dimensions



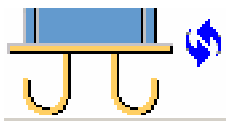
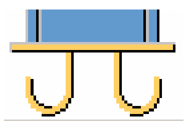
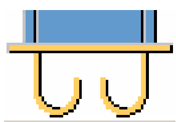
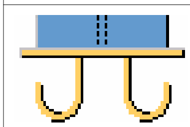
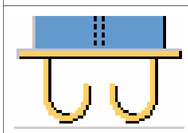
	Description	Default
1	Define the size or the length of the nut.	anchor rod diameter
2	Define the size or the thickness of the washer.	half of nut size
3	Define the length of the anchor rod.	500 mm
4	Define the length of the anchor rod above the base plate.	50 mm
5	Define the distance between the cast plate and the base plate.	60 mm
6	Define the length of the upper thread.	0 mm

Anchor rod types

Option	Description	
	Default Type 1 AutoDefaults can change this option.	
	Type 1	

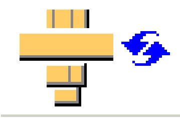
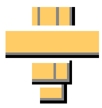
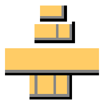
Option	Description	
	**a** Radius of the hook **b** Width of the hook	**a** = 2 x anchorbar diameter **b** = 1/5 of anchorbar length
	**a** Radius of the hook **b** Width of the hook **c** Height of the hook	**c** = same as width of the hook
	**d** Length of the anchor rod below the extra plate **e** Length of the lower thread	**d** = 4 x nut size plus thickness of extra plate **e** = 2 x nut size

Hook direction

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2
	Type 3
	Type 4

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 hole tolerance

Option	Description	Default
Castplate holes tolerance	Define the tolerance of the cast plate holes.	`same as bolt tolerance`

Washer hole tolerance

Option	Description
Washer hole tolerance	Define the tolerance of the washer hole. By default, a hole is not created in the washer.

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.

In the first field, enter the grout thickness.

In the second field, define whether the grouting is created above or below the detail creation point. This also affects the shim plates.

Delete

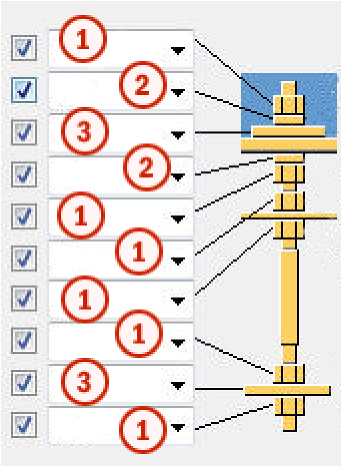
Define which bolts are deleted from the bolt group.

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.

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.

Base plate (1042): 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 in the **Base plate (1042)** detail.

Part dimensions

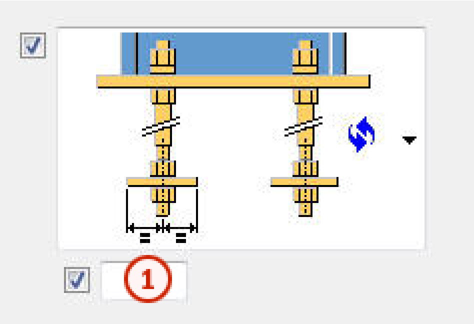
Part	Description	Default
Extra profile 1	Define the first extra profile by selecting it from the profile catalog.	`PL10 x 100`
Extra profile 2	Define the second extra profile by selecting it from the profile catalog.	

Part properties

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.

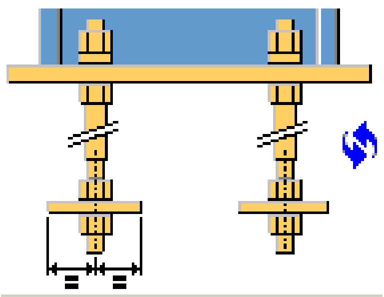
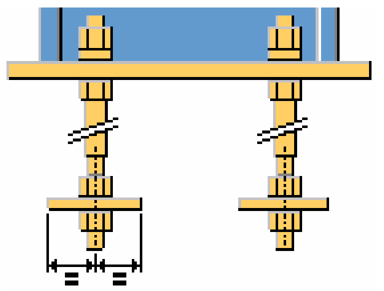
Option	Description	Default
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

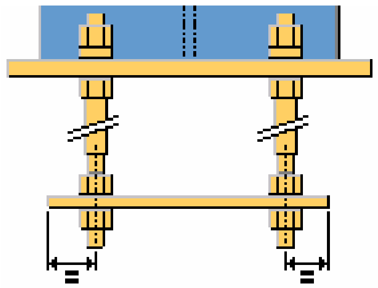
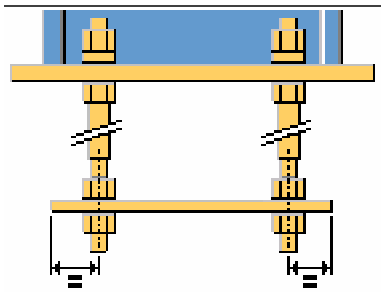
Edge distance of extra profile 1



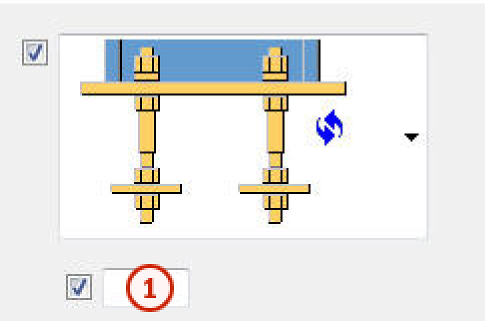
	Description	Default
1	Define the edge distance of extra profile 1.	`50 mm`

Type and direction of extra profile 1

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1

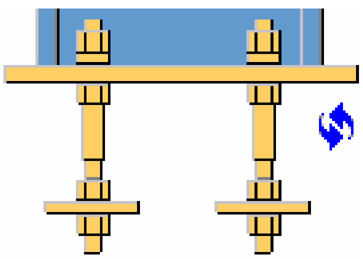
Option	Description
	Type 2
	Type 3

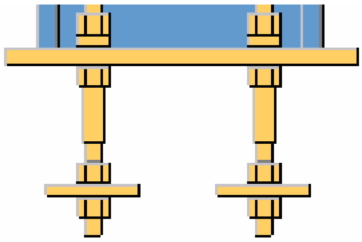
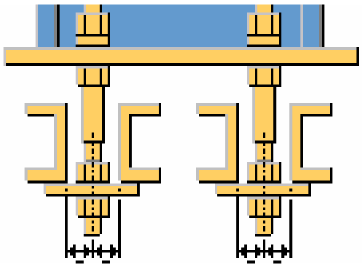
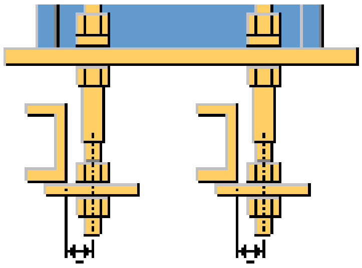
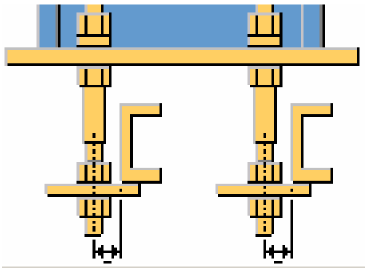
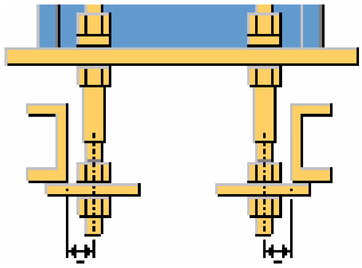
Edge distance of extra profile 2

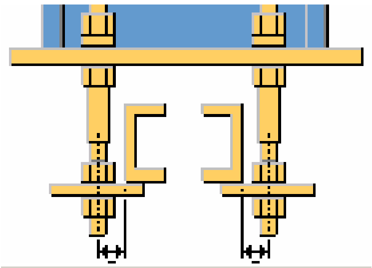


	Description	Default
1	Define the distance of extra profile 2 from the axis of the anchor bar.	`Half of the nut size or anchorbar diameter`

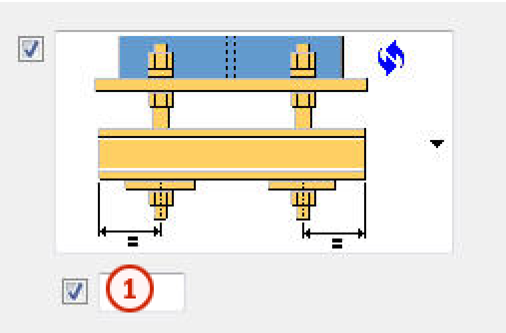
Extra profile 2 type

Option	Description
	Default Type 1 AutoDefaults can change this option.

Option	Description
	Type 1
	Type 2
	Type 3
	Type 4
	Type 5

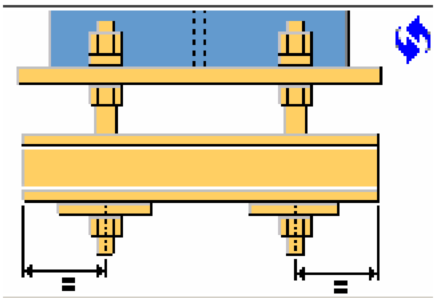
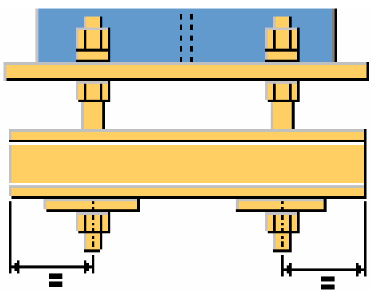
Option	Description
	Type 6

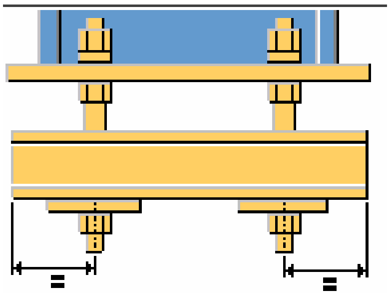
Length of extra profile 2



	Description	Default
1	Define the 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
Hole tolerance	Define the hole tolerance of extra profile 1.	`Same as bolt tolerance`
Profile rotation	Define the profile rotation of extra profile 1.	`Front`

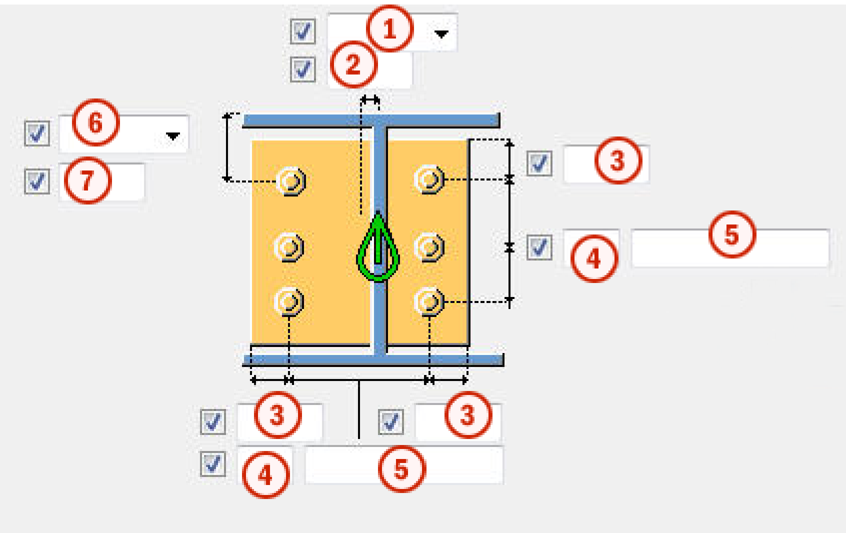
Extra profile 2 rotation

Option	Description	Default
Extra profile 2 rotation	Define the profile rotation of extra profile 2.	`Front`

Base plate (1042): Bolts tab

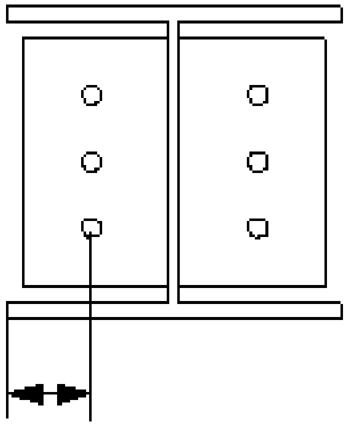
Use the **Bolts** tab to control the bolt properties in the **Base plate (1042)** detail.

Bolt group dimensions

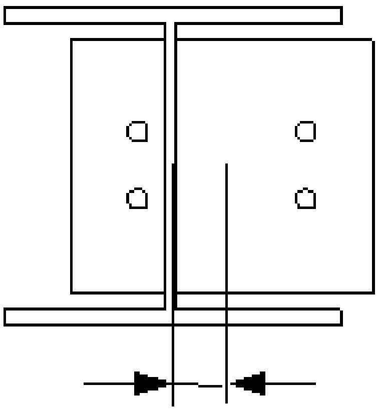


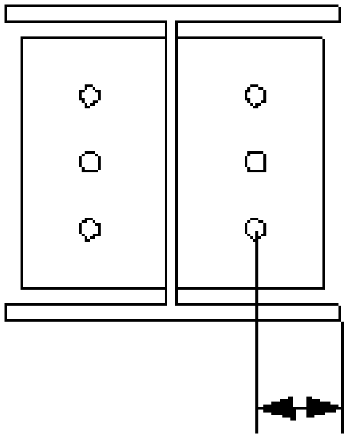
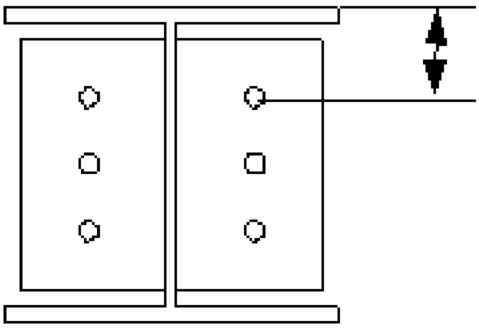
<table>
<tr><th></th><th>Description</th></tr>
<tr><td>1</td><td>Define how to measure the dimensions for horizontal bolt group position.

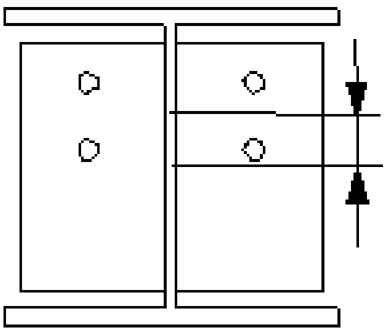
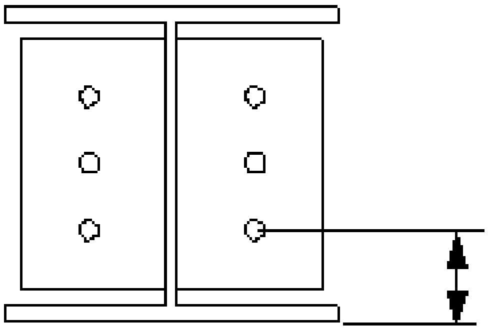
Left: From the left edge of the secondary part to the leftmost bolt.



Middle: From the center line of the secondary part to the center line of the bolts.


</td></tr>
</table>

	Description
	• **Right**: From the right edge of the secondary part to the rightmost bolt. 
②	Define the dimension for horizontal bolt group position.
③	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
④	Define the number of bolts.
⑤	Define the 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 how to measure the dimensions for vertical bolt group position. • **Top**: From the upper edge of the secondary part to the uppermost bolt. 

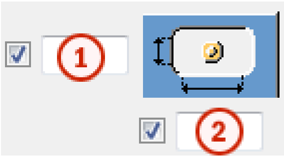
	Description
	• **Middle**: From the center line of the bolts to the center line of the secondary part.  • **Below**: From the lower edge of the secondary part to the lowest bolt. 
7	Define the dimension for vertical bolt group position.

Bolt basic properties

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

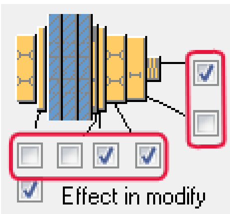
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

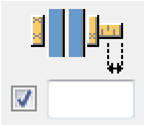
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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

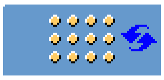
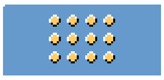
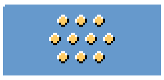
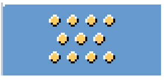
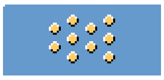
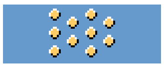


To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

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

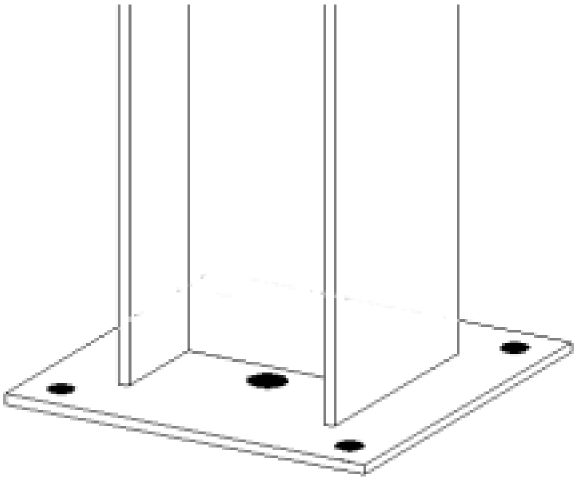
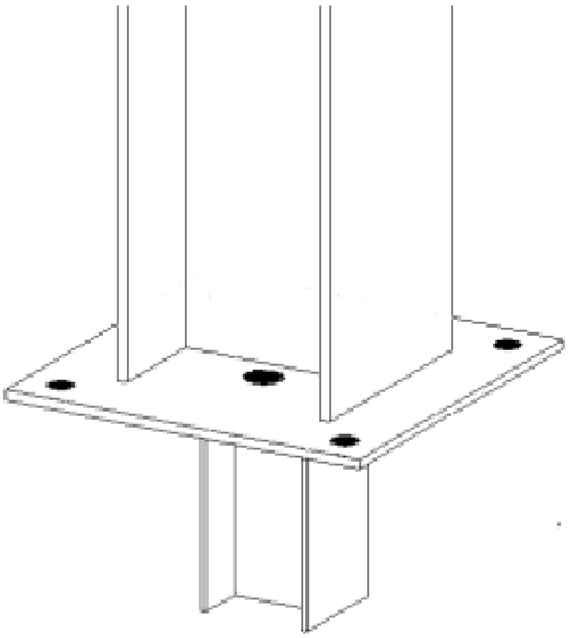
Option	Description
	Default Not staggered AutoDefaults can change this option.
	Not staggered
	Staggered type 1
	Staggered type 2
	Staggered type 3
	Staggered type 4

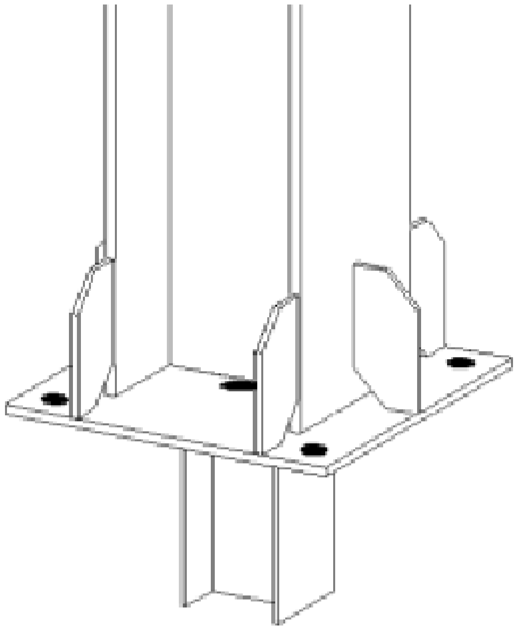
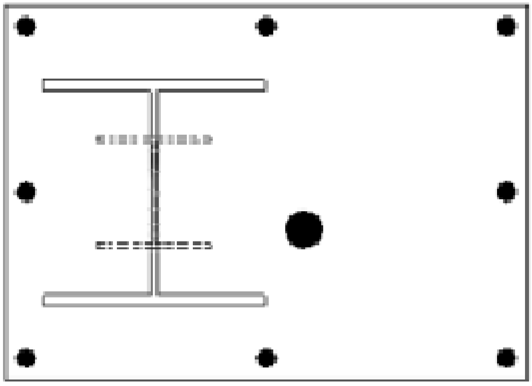
13.6 U.S. Base plate (1047)

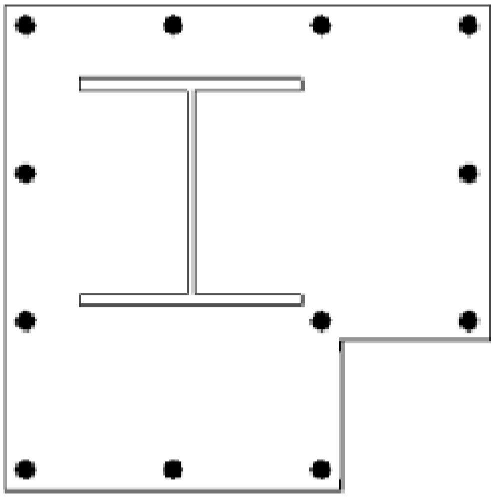
U.S. Base plate (1047) creates a base plate at the selected point on a column.

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
		Column base plate with a grout hole.
		Column base plate with a grout hole and a shear key.

Situation	Descriptio n
	Column base plate with a grout hole, a shear key and stiffeners.
	Offset column base plate with a shear key and a grout hole.

Situation	Description
	Column base plate with holes and chamfer.

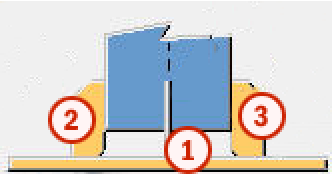
Before you start Create a column.

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

See also

U.S. Base plate (1047): Picture tab on page 1150

U.S. Base plate (1047): Parts tab on page 1151

U.S. Base plate (1047): Parameters tab on page 1153

U.S Base plate (1047): Bolts tab on page 1157

U.S. Base plate (1047): Stiffeners tab on page 1162

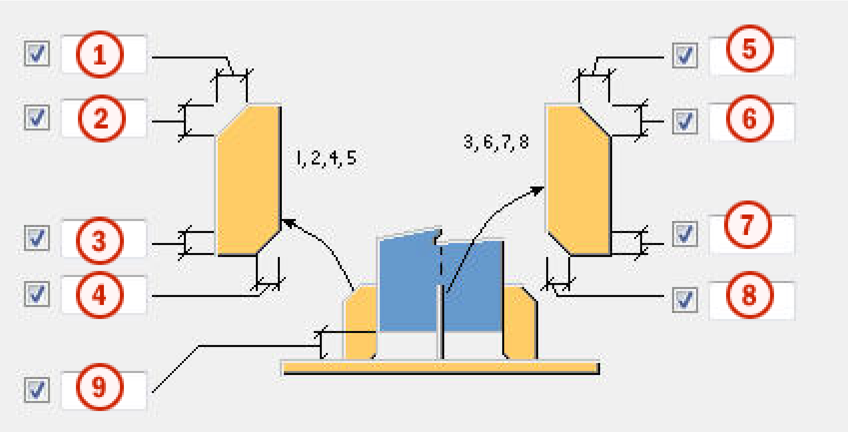
U.S. Base plate (1047): Anchor rods tab on page 1163

U.S. Base plate (1047): Extra plates tab on page 1168

U.S. Base plate (1047): Picture tab

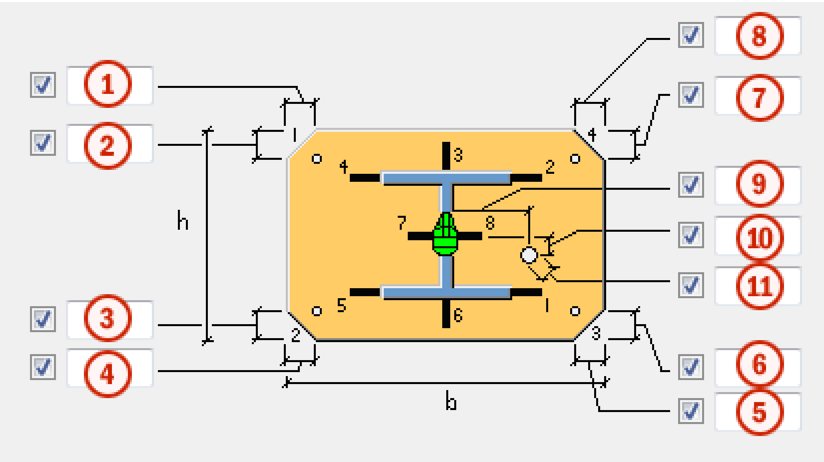
Use the **Picture** tab to control stiffener chamfering, base plate chamfers, and the location and size of the grout hole in the **U.S. Base plate (1047)** detail.

Stiffener chamfering



	Description
1	Define the top chamfer width for stiffeners 1, 2, 4, 5.
2	Define the top chamfer height for stiffeners 1, 2, 4, 5.
3	Define the bottom chamfer height for stiffeners 1, 2, 4, 5
4	Define the bottom chamfer width for stiffeners 1, 2, 4, 5.
5	Define the top chamfer width for stiffeners 3, 6, 7, 8.
6	Define the top chamfer height for stiffeners 3, 6, 7, 8.
7	Define the bottom chamfer height for stiffeners 3, 6, 7, 8.
8	Define the bottom chamfer width for stiffeners 3, 6, 7, 8,
9	Define the weld gap.

Base plate chamfering



	Description
1	Define the width of base plate chamfer 1.
2	Define the height of base plate chamfer 1.
3	Define the height of base plate chamfer 2.
4	Define the width of base plate chamfer 2.
5	Define the width of base plate chamfer 3.
6	Define the height of base plate chamfer 3.
7	Define the height of base plate chamfer 4.
8	Define the width of base plate chamfer 4.
9	Define the grout hole horizontal distance from the column center.
10	Define the grout hole vertical distance from the column center.
11	Define the diameter of the grout hole.

U.S. Base plate (1047): Parts tab

Use the **Parts** tab to control the dimensions of the base plate, stiffeners, leveling plate, and shim plate(s) in the **U.S. Base plate (1047)** detail.

Plate

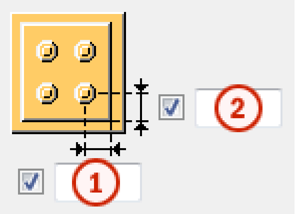
Part	Description	Default
Plate	Define the base plate thickness, width and height.	Thickness = `20 mm` Width depends on the largest cross-sectional dimension of the column. Height depends on the largest cross-sectional dimension of the column.
Stiffeners 1, 2, 4, 5	Define the stiffener 1, 2, 4, 5 thickness, 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`

Part	Description	Default
Stiffeners 3, 6, 7, 8	Define the stiffener 3, 6, 7, 8 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`
Key profile	Define the shear key profile by selecting it from the profile catalog.	
Leveling plate	Define the leveling plate thickness, width, and height.	
Fitting plate	Define the shim plate thickness, width and height. Define up to three different shim plates.	
Number of fitting pl.	Define the number of shim plates for each thickness.	`1`
Leveling plate hole diameter	Define the leveling plate hole diameter.	
Key profile welded to	Define to which plate the shear key is welded.	

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

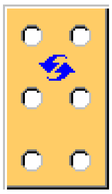
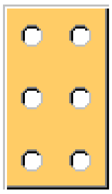
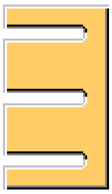
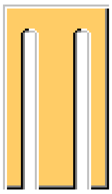
Bolt edge distances in shim plate

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	Define the horizontal bolt edge distance in the shim plate.	30 mm
2	Define the 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 detail. AutoDefaults can change this option.
	Holes are based on the bolt group of the detail.
	Finger shim plate with horizontal slots. The plate can be installed from the right or the left side of the detail.
	Finger shim plate with vertical slots. The plate can be installed from the top of the detail.

Tolerance Define the tolerance for the slots in finger shim plates. The width of the slot is the bolt diameter + the tolerance.

U.S. Base plate (1047): 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 in the **U.S. Base plate (1047)** detail.

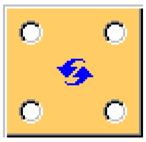
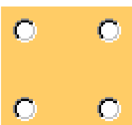
Plate properties

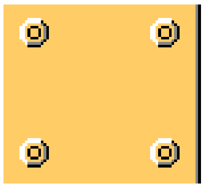
Option	Description
Square cut corners (1-4)	Define the cuts made on the corners of the base plate. If you enter a number corresponding to one of the corners of the base plate, the corner has a square cut instead of a diagonal chamfer. You can enter the numbers for one or all the corners.
Plate aligned with	Define whether the plate is aligned with the column or the connection symbol.

Bolt properties

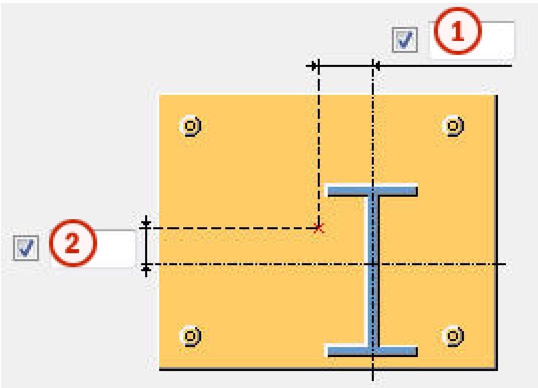
Option	Description
Eliminate bolt number(s)	Define which bolts are deleted from the bolt group. Enter the bolt numbers of the bolts to be deleted and separate the numbers with a space. Bolt numbers run from left to right and from top to down. If there are more than 10 bolts, enclose the bolt numbers in quotes (for example, to delete bolt numbers 13 and 15, enter `"13" "15"`).
Eliminate external bolt(s)	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.

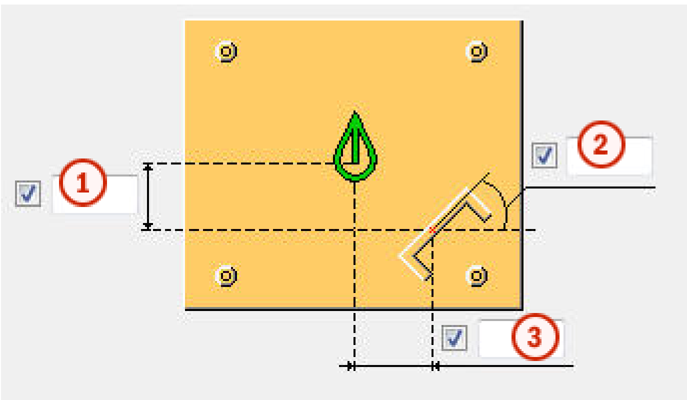
Option	Description
	Bolts are created.

Base plate offset



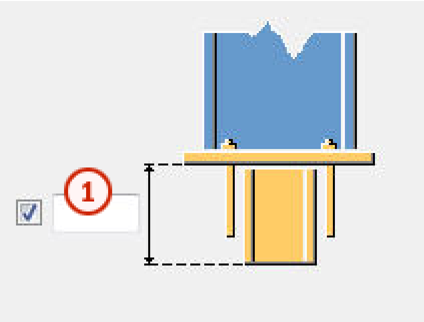
	Description
1	Define the base plate horizontal offset from the column center. Enter a negative value to move the base plate in the opposite direction
2	Define the base plate vertical offset from the column center. Enter a negative value to move the base plate in the opposite direction

Shear key offset and rotation



	Description
1	Define the shear key vertical offset. Enter a negative value to move the shear key in the opposite direction.
2	Define the 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	Define the shear key horizontal offset. Enter a negative value to move the shear key in the opposite direction.

Shear key length

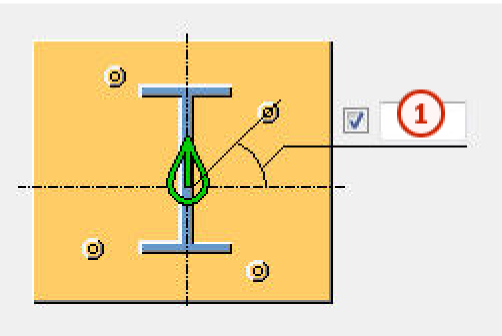


	Description
1	Define the shear key length to attach the shear key to the base plate. To attach a shear key to the base plate, define the shear key length and the key profile on the **Parts** tab.

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.

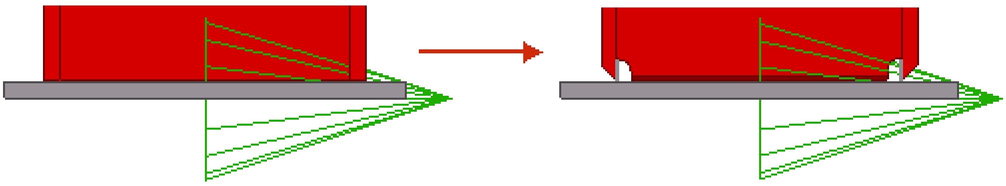


	Description
1	Define the bolt group rotation angle.

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.

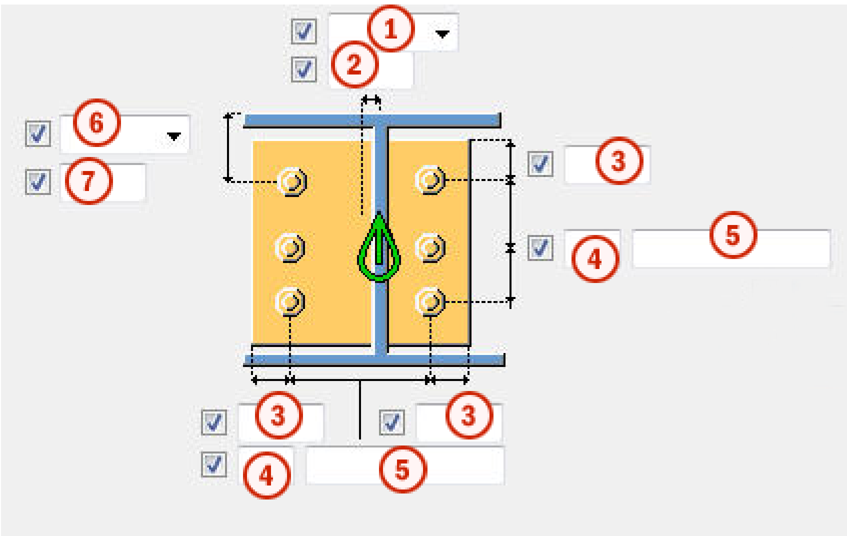


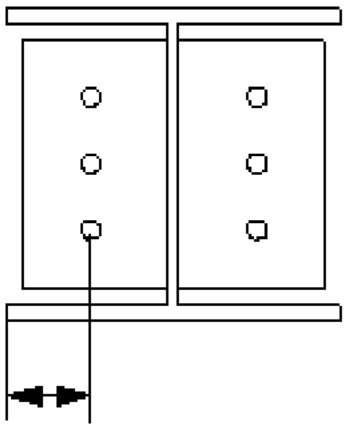
Field	Description
Component	Define a system or a custom component by selecting it from the component catalog.
Attributes	Enter the name of the attribute file for the selected component.
Input	Define to which parts the selected component is applied. • **Default** is same as **Base + Column**. • **Column** sets the column as the main part. Use this option for details. • **Column + Base** sets the column as the main part and the base plate as the secondary part. • **Base + Column** sets the base plate as the main part and the column as the secondary part.

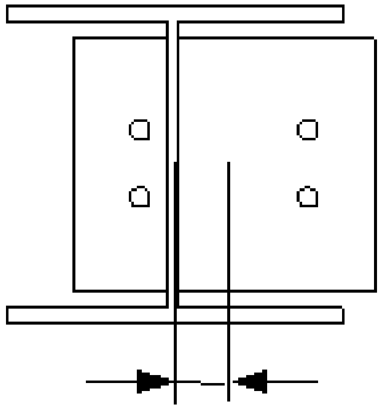
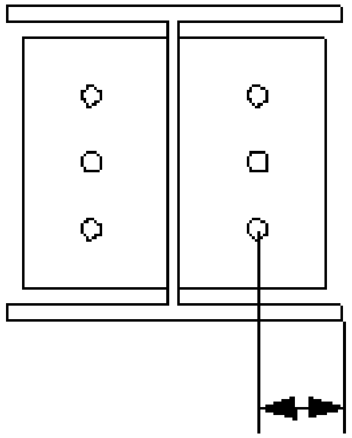
U.S Base plate (1047): Bolts tab

Use the **Bolts** tab to control the bolt properties in the **U.S Base plate (1047)** detail.

Bolt group dimensions

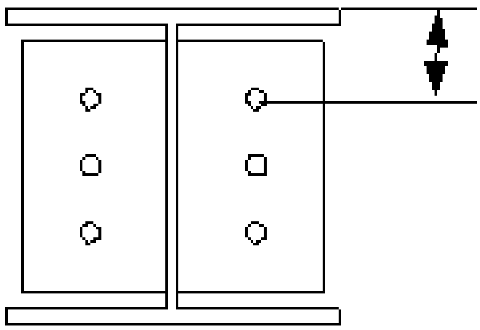


	Description
1	Define how to measure the dimensions for horizontal bolt group position. • **Left**: From the left edge of the secondary part to the leftmost bolt. 

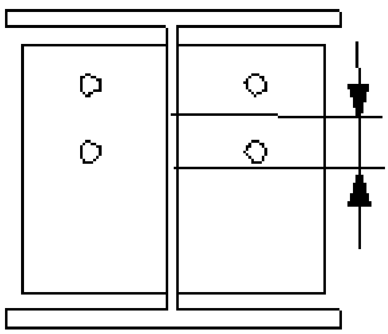
	Description
	• **Middle**: From the center line of the secondary part to the center line of the bolts.  • **Right**: From the right edge of the secondary part to the rightmost bolt. 
②	Define the dimension for horizontal bolt group position.
③	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
④	Define the number of bolts.
⑤	Define the 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.

<table>
<tr><th></th><th>Description</th></tr>
<tr><td>6</td><td>Define how to measure the dimensions for vertical bolt group position.

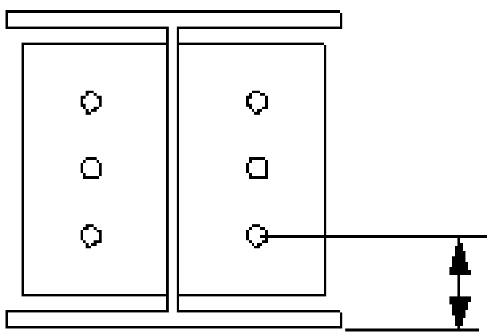
Top: From the upper edge of the secondary part to the uppermost bolt.



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.

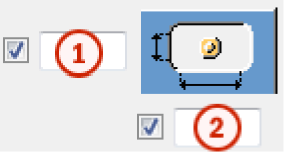

</td></tr>
<tr><td>7</td><td>Define the dimension for vertical bolt group position.</td></tr>
</table>

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

You can define slotted, oversized, or tapped holes.

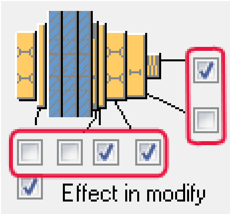


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(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.

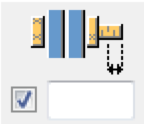
If you want to create a hole only, clear all the check boxes.



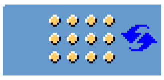
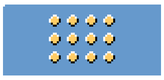
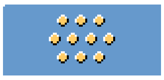
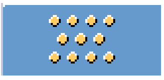
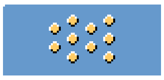
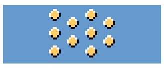
To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

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

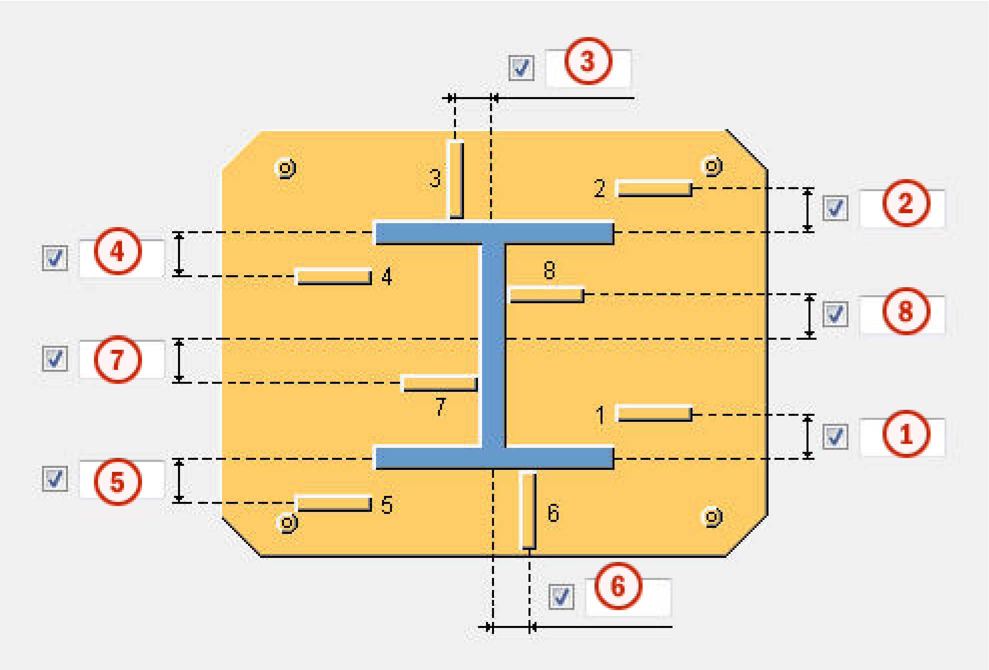
U.S. Base plate (1047): Stiffeners tab

Use the **Stiffeners** tab to control stiffener positions and offsets in the **U.S. Base plate (1047)** detail.

Stiffener positions (1-8)

Option	Description
Stiffener positions (1-8)	Define the 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
1	Define stiffener 1 offset.
2	Define stiffener 2 offset.
3	Define stiffener 3 offset.
4	Define stiffener 4 offset.
5	Define stiffener 5 offset.
6	Define stiffener 6 offset.
7	Define stiffener 7 offset.
8	Define stiffener 8 offset.

U.S. Base plate (1047): Anchor rods tab

Use the **Anchor rods** tab to control the creation of different types of anchor rods in the **U.S. Base plate (1047)** detail.

Anchor rod dimensions

Option	Description
Anchor rod profile	Define the anchor rod profile.
Nut profile	Define the nut profile.
Washer profile	Define the washer thickness, width and height.
Plate washer	Define the plate washer thickness, width and height.
Castplate	Define the cast plate thickness, width and height.

Anchor rod part properties

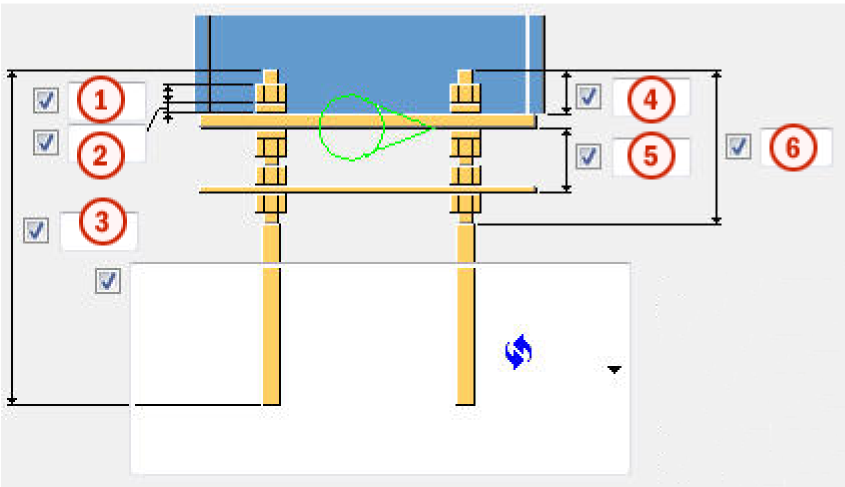
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Base plate with

Use this option to switch between the bolts and the anchor rods.

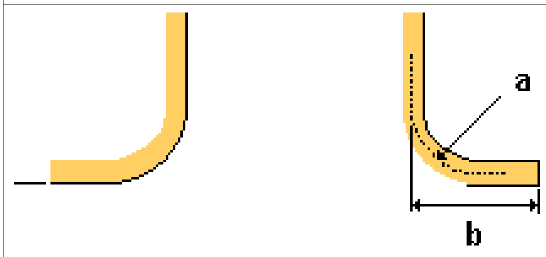
By default, the base plate is created with **Bolts**.

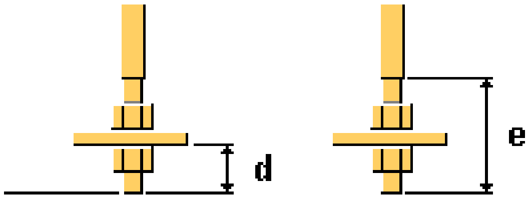
Anchor rod dimensions



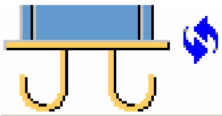
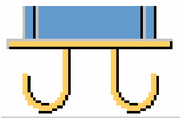
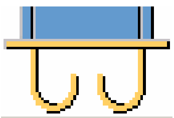
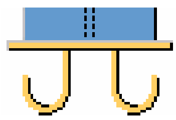
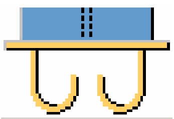
	Description	Default
1	Define the size or the length of the nut.	anchor rod diameter
2	Define the size or the thickness of the washer.	half of nut size
3	Define the length of the anchor rod.	500 mm
4	Define the length of the anchor rod above the base plate.	50 mm
5	Define the distance between the cast plate and the base plate.	60 mm
6	Define the length of the upper thread.	0 mm

Anchor rod types

Option	Description	
	Default Type 1 AutoDefaults can change this option.	
	Type 1	
	**a** Radius of the hook **b** Width of the hook	**a** = 2*anchor bar diameter **b** = 1/5 of anchor bar length
	**a** Radius of the hook **b** Width of the hook	**c** = same as width of the hook

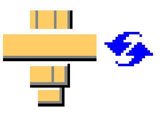
Option	Description	
	c Height of the hook	
	**d** Length of the anchor rod below the extra plate **e** Length of the lower thread	**d** = 4*nut size plus thickness of extra plate **e** = 2*nut size

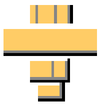
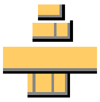
Hook direction

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2
	Type 3
	Type 4

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.

Option	Description
	Bolting direction 1
	Bolting direction 2

Cast plate hole tolerance

Option	Description	Default
Castplate holes tolerance	Define the tolerance of the cast plate holes.	`same as bolt tolerance`

Washer hole tolerance

Field	Description
Washer hole tolerance	Define the tolerance of the washer hole. By default, a hole is not created in the washer.

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.

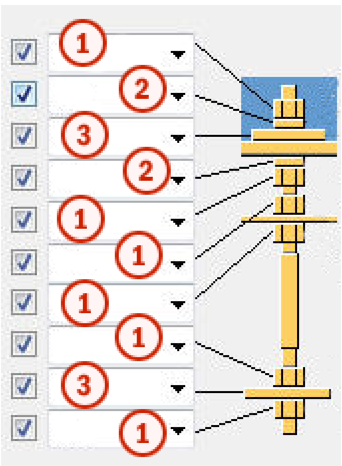
In the first field, enter the grout thickness.

In the second field, define whether the grouting is created above or below the detail creation point. This also affects the shim plates.

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.

U.S. Base plate (1047): 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 in the **U.S. Base plate (1047)** detail.

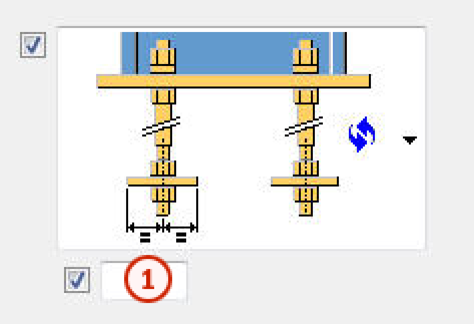
Part dimensions

Part	Description	Default
Extra profile 1	Define the first extra profile by selecting it from the profile catalog.	`PL10*100`
Extra profile 2	Define the second extra profile by selecting it from the profile catalog.	

Part properties

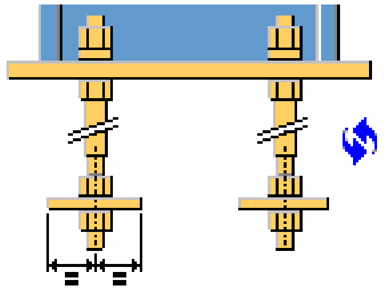
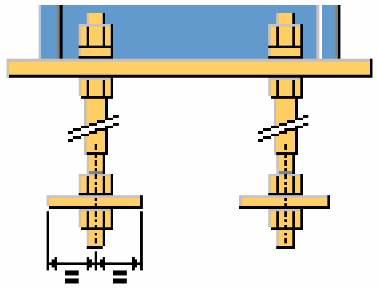
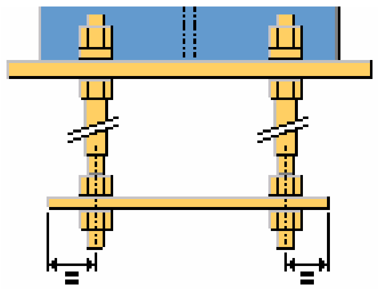
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

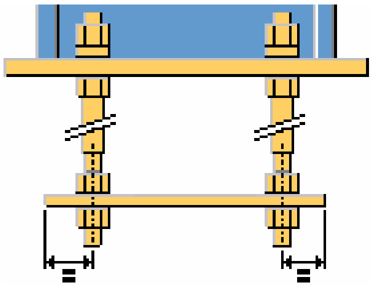
Edge distance of extra profile 1



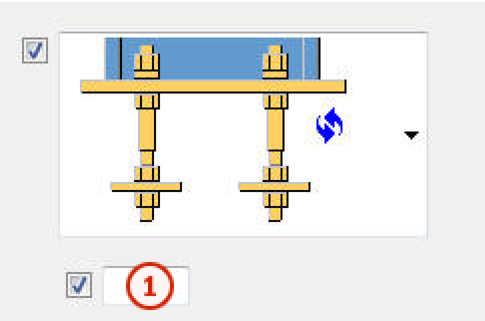
	Description	Default
1	Define the edge distance of extra profile 1.	`50 mm`

Type and direction of extra profile 1

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2

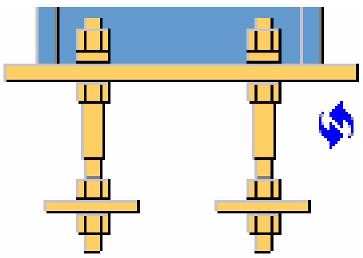
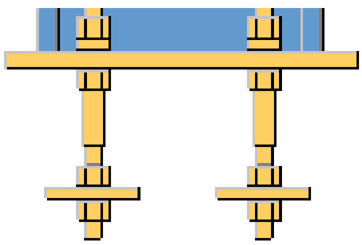
Option	Description
	Type 3

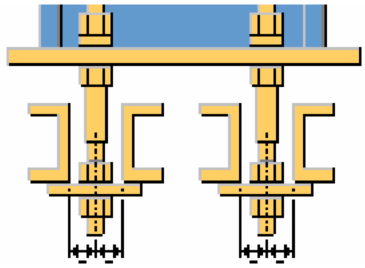
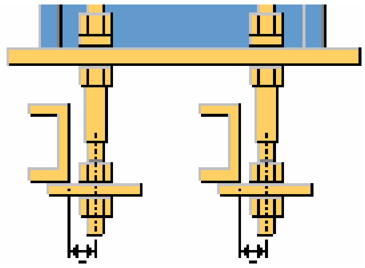
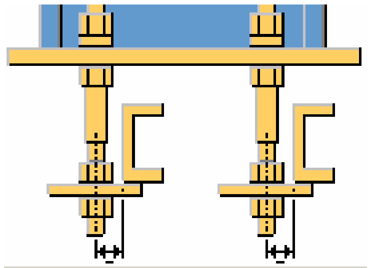
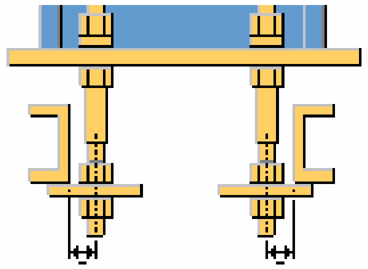
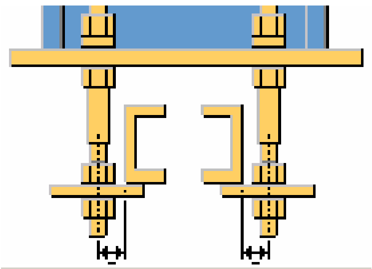
Edge distance of extra profile 2



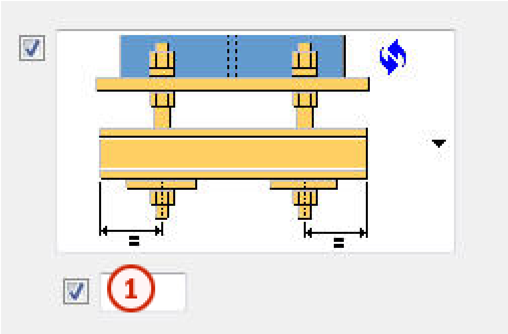
	Description	Default
1	Define the distance of extra profile 2 from the axis of the anchor bar.	`Half of the nut size or anchor bar diameter`

Extra profile 2 type

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1

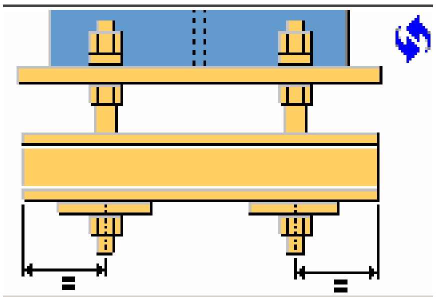
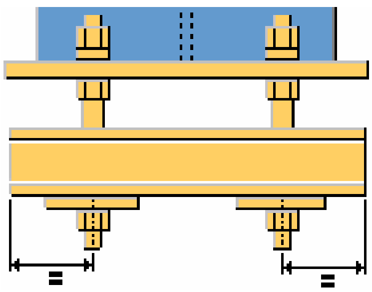
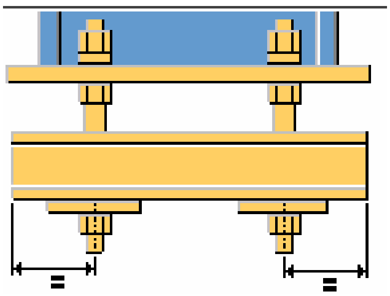
Option	Description
	Type 2
	Type 3
	Type 4
	Type 5
	Type 6

Length of extra profile 2



	Description	Default
1	Define the 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
Hole tolerance	Define the hole tolerance of extra profile 1.	`Same as bolt tolerance`

Option	Description	Default
Profile rotation	Define the profile rotation of extra profile 1.	`Front`

Extra profile 2 rotation

Option	Description	Default
Extra profile 2 rotation	Define the profile rotation of extra profile 2.	`Front`

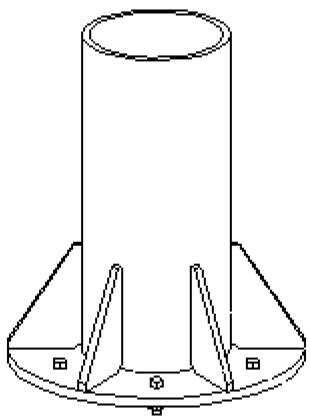
13.7 Circular base plates (1052)

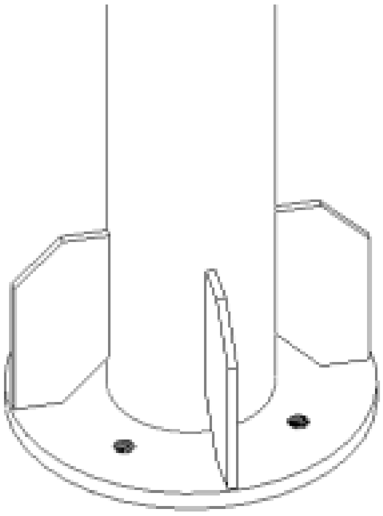
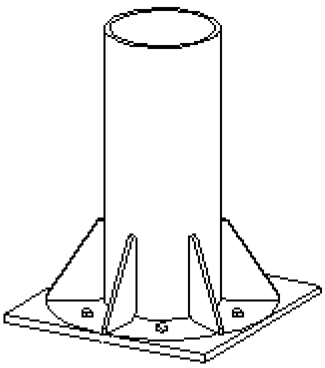
Circular base plates (1052) creates a base plate that is connected to a circular column.

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

Situation	Description
	Circular base plate
	Square base plate

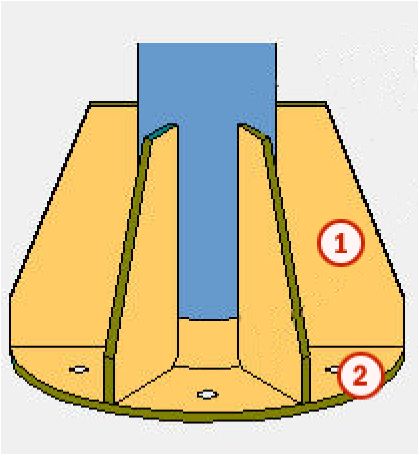
Before you start Create a circular column.

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

See also

Circular base plates (1052): Picture tab on page 1175

Circular base plates (1052): Parts tab on page 1176

Circular base plates (1052): Parameters tab on page 1176

Circular base plates (1052): Bolts tab on page 1180

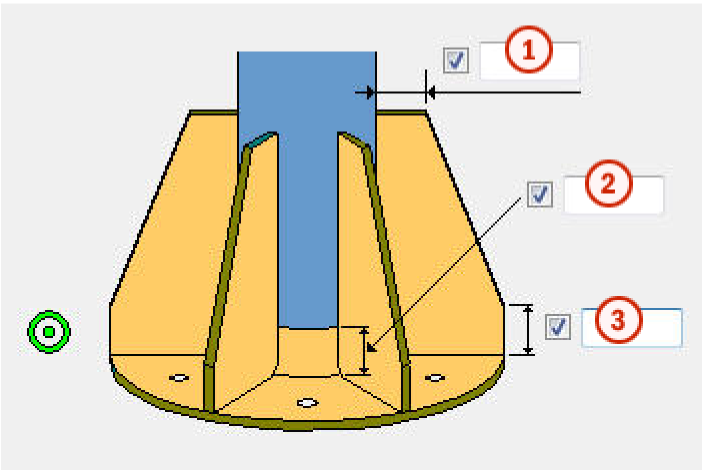
Circular base plates (1052): Anchor rods tab on page 1182

Circular base plates (1052): Extra plates tab on page 1186

Circular base plates (1052): Picture tab

Use the **Picture** tab to control the geometry of the **Circular base plates (1052)** detail.

Dimensions



	Description	Default
1	Define the width of top part of the tube stiffener.	20 mm
2	Define the weld gap.	0 mm
3	Define the height of the end part of the tube stiffener.	30 mm

Circular base plates (1052): Parts tab

Use the **Parts** tab to control the dimensions of the circular base plate and tube stiffeners in the **Circular base plates (1052)** detail.

Plate

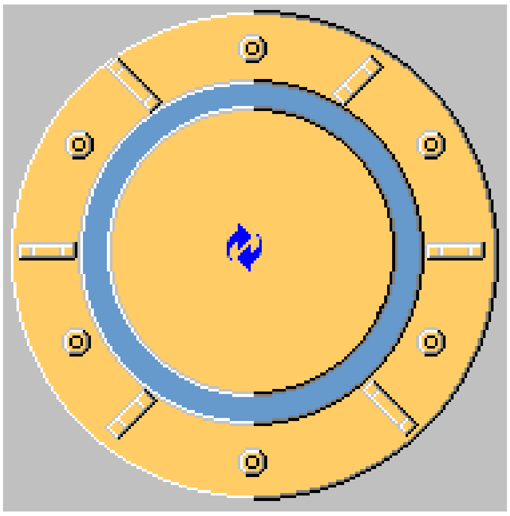
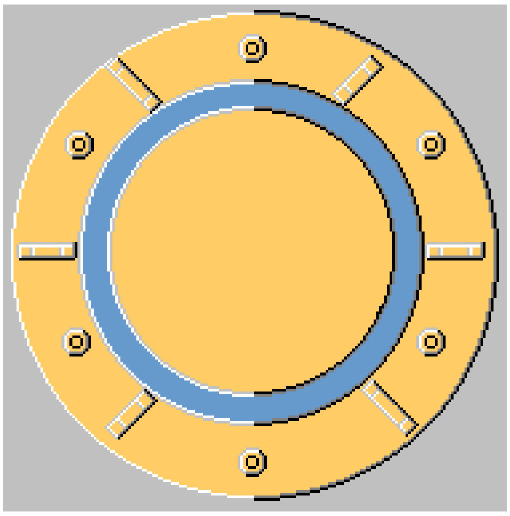
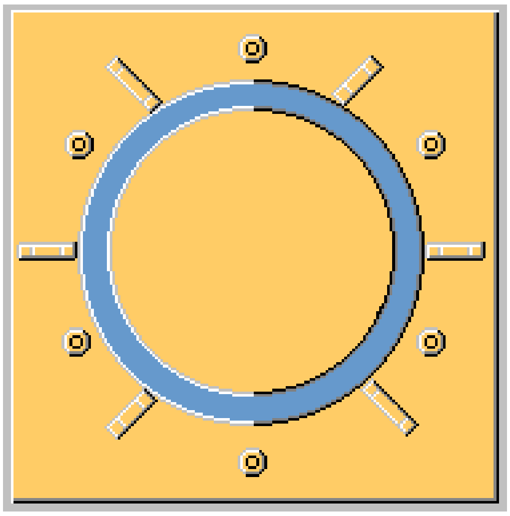
Part	Description	Default
Circular base plate	Define the circular base plate thickness and width.	Thickness = 30 mm Width depends on the tube diameter.
Tube stiffeners	Define the tube stiffener thickness, width and height.	Thickness = 10 mm Height = 200 mm

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

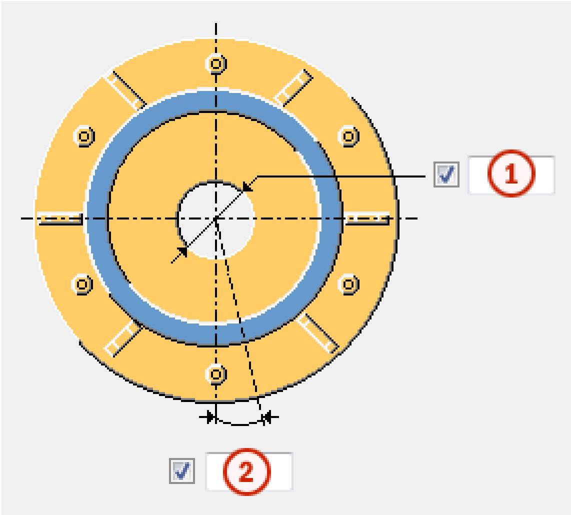
Circular base plates (1052): Parameters tab

Use the **Parameters** tab to control the shape of the base plate, diameter of the inner plate, bolt angle, the overlap, and chamfer dimension in the **Circular base plates (1052)** detail.

Base plate shape

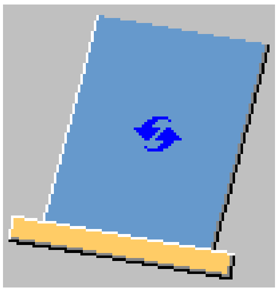
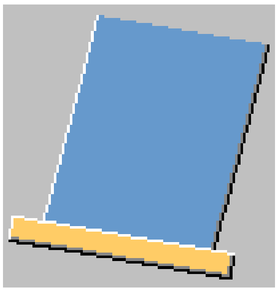
Option	Description
	Default Round base plate AutoDefaults can change this option.
	Round base plate
	Square base plate

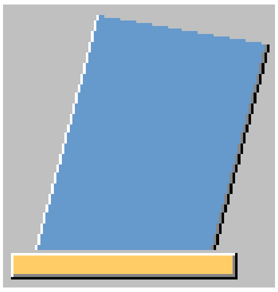
Inner plate diameter and bolt angle



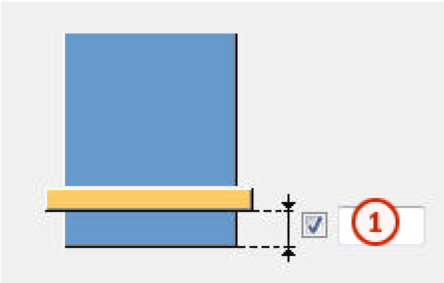
	Description
1	Define the base plate inner diameter.
2	Define the bolt angle (in degrees).

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.

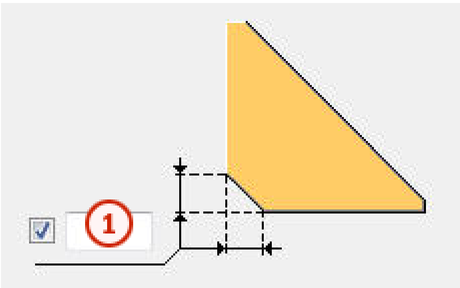
Option	Description
	Base plate is not perpendicular to the column.

Overlap



	Description	Default
1	Define the distance between the column flange and the plate flange.	0 mm

Chamfer dimension

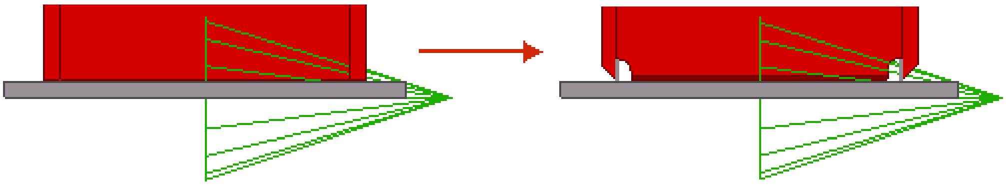


	Description	Default
1	Define the chamfer dimension.	10 mm

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.

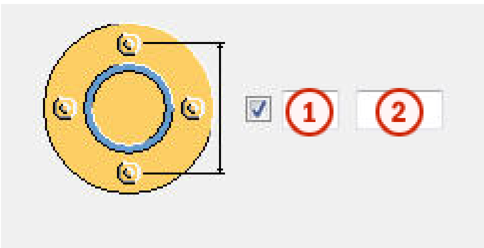


Field	Description
Component	Define a system or a custom component by selecting it from the component catalog.
Attributes	Enter the name of the attribute file for the selected component.
Input	Define to which parts the selected component is applied. • **Default** is same as **Base + Column**. • **Column** sets the column as the main part. Use this option for details. • **Column + Base** sets the column as the main part and the base plate as the secondary part. • **Base + Column** sets the base plate as the main part and the column as the secondary part.

Circular base plates (1052): Bolts tab

Use the **Bolts** tab to control the bolt properties in the **Circular base plates (1052)** detail.

Bolt positions



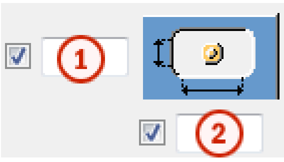
	Description
1	Define the number of bolts.
2	Define the spacing between bolts.

Bolt basic properties

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

Option	Description	Default
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

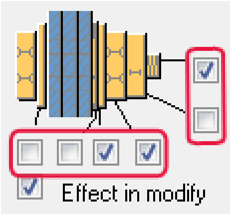
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(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.

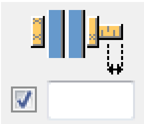
If you want to create a hole only, clear all the check boxes.



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.



Circular base plates (1052): Anchor rods tab

Use the **Anchor rods** tab to control the creation of different types of anchor rods in the **Circular base plates (1052)** detail.

Anchor rod dimensions

Option	Description
Anchor rod profile	Define the anchor rod profile.
Nut profile	Define the nut profile.
Washer profile	Define the washer thickness, width and height.
Plate washer	Define the plate washer thickness, width and height.
Castplate	Define the cast plate thickness, width and height.

Anchor rod part properties

Option	Description	Default
Pos_No	Define a prefix and a start number for the part position 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 **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.

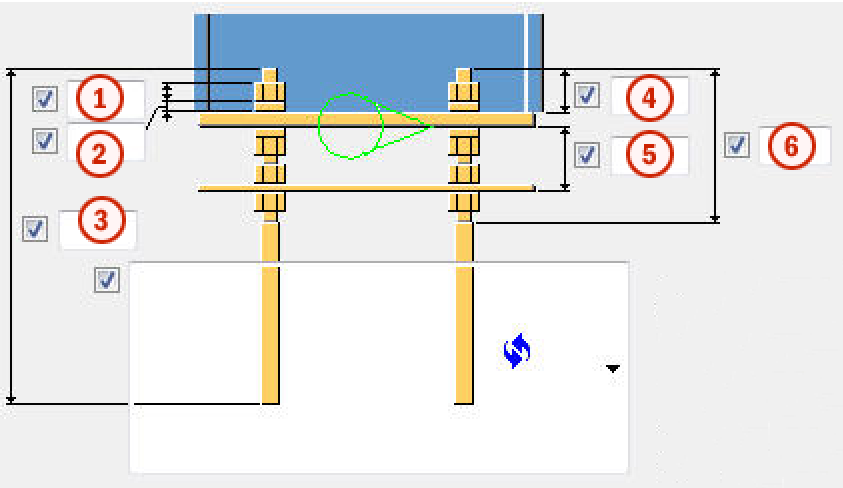
Option	Description	Default
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Base plate with

Use this option to switch between the bolts and the anchor rods.

By default, the base plate is created with **Bolts**.

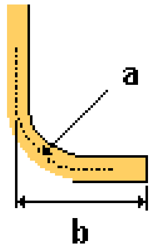
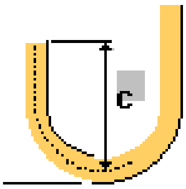
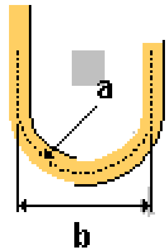
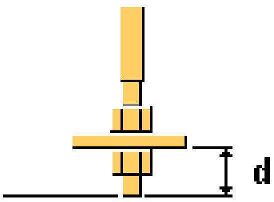
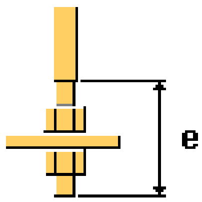
Anchor rod dimensions



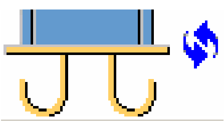
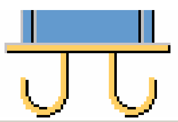
	Description	Default
1	Define the size or the length of the nut.	anchor rod diameter
2	Define the size or the thickness of the washer.	half of nut size
3	Define the length of the anchor rod.	500 mm
4	Define the length of the anchor rod above the base plate.	50 mm
5	Define the distance between the cast plate and the base plate.	60 mm
6	Define the length of the upper thread.	0 mm

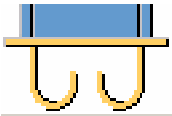
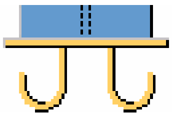
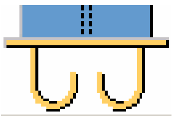
Anchor rod types

Option	Description	
	Default Type 1 AutoDefaults can change this option.	

Option		Description	
		Type 1	
		**a** Radius of the hook **b** Width of the hook	**a** = 2*anchor bar diameter **b** = 1/5 of anchor bar length
		**a** Radius of the hook **b** Width of the hook **c** Height of the hook	**c** = same as width of the hook
		**d** Length of the anchor rod below the extra plate **e** Length of the lower thread	**d** = 4*nut size plus thickness of extra plate **e** = 2*nut size

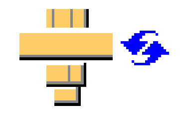
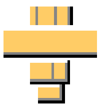
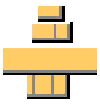
Hook direction

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1

Option	Description
	Type 2
	Type 3
	Type 4

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 hole tolerance

Option	Description	Default
Castplate holes tolerance	Define the tolerance of the cast plate holes.	`same as bolt tolerance`

Washer hole tolerance

Option	Description
Washer hole tolerance	Define the tolerance of the washer hole. By default, a hole is not created in the washer.

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.

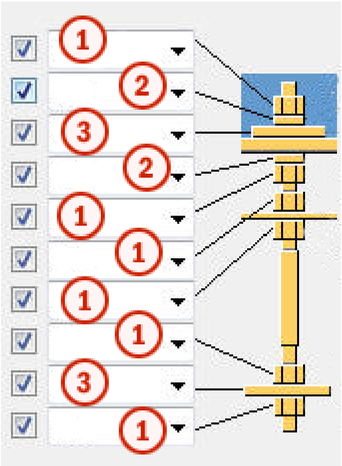
By default, no grouting is created.

In the first field, enter the grout thickness.

Delete 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.

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.

Circular base plates (1052): 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 in the **Circular base plates (1052)** detail.

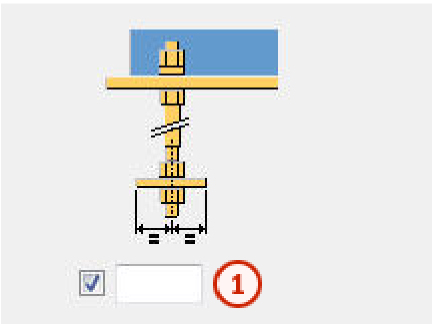
Part dimensions

Part	Description	Default
Extra profile 1	Define the first extra profile by selecting it from the profile catalog.	`PL10*100`
Extra profile 2	Define the second extra profile by selecting it from the profile catalog.	

Part properties

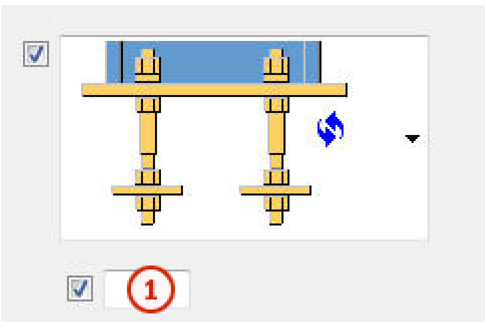
Option	Description	Default
Pos_No	Define a prefix and a start number for the part position number. Some components have a second row of fields where you can enter the assembly position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	
Class	Define the part class number.	

Edge distance of extra profile 1



	Description	Default
1	Define the edge distance of extra profile 1.	`50 mm`

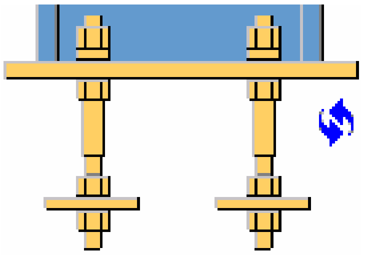
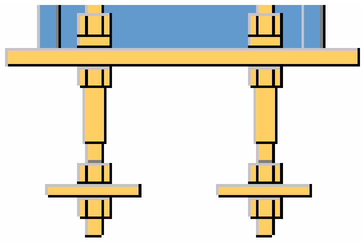
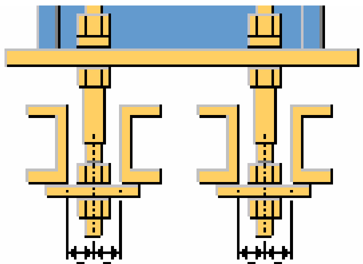
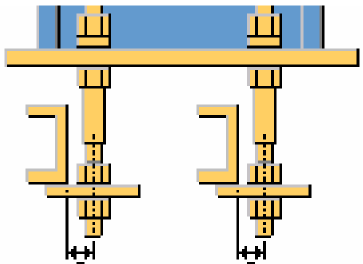
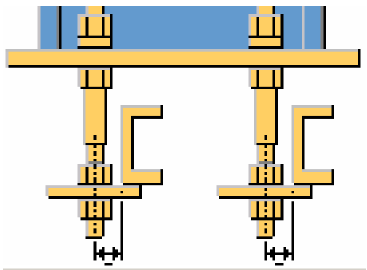
Edge distance of extra profile 2

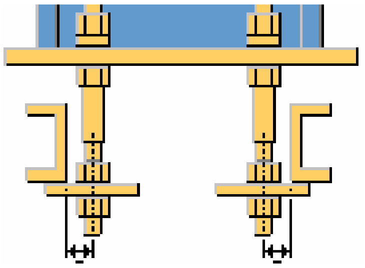
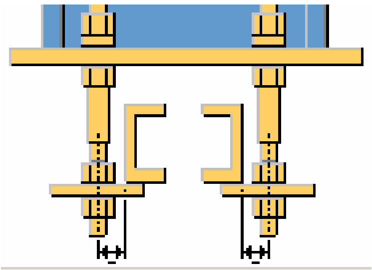


	Description	Default
1	Distance of extra profile 2 from the axis of the anchor bar.	`Half of nut size or anchor`

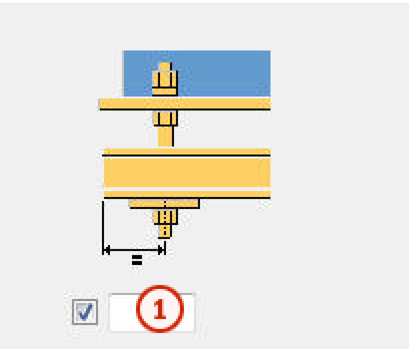
	Description	Default
		bar diameter

Extra profile 2 type

Option	Description
	Default Type 1 AutoDefaults can change this option.
	Type 1
	Type 2
	Type 3
	Type 4

Option	Description
	Type 5
	Type 6

Length of extra profile 2



	Description	Default
1	Define the length of extra profile 2 from the axis of the anchor bar.	`50 mm`

Extra profile 1 properties

Option	Description	Default
Hole tolerance	Define the hole tolerance of extra profile 1.	`Same as bolt tolerance`
Profile rotation	Define the profile rotation of extra profile 1.	`Front`

Extra profile 2 rotation

Option	Description	Default
Extra profile 2 rotation	Define the profile rotation of extra profile 2.	`Front`

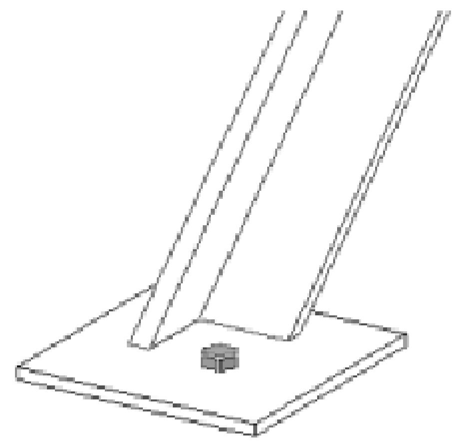
13.8 Base plate (1053)

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

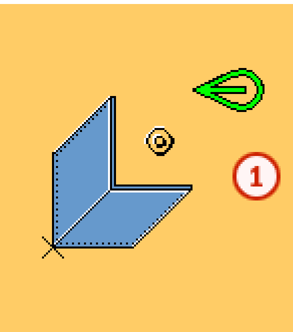
Before you start Create a column or a beam.

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

See also Base plate (1053): Picture tab on page 1191

Base plate (1053): Parts tab on page 1191

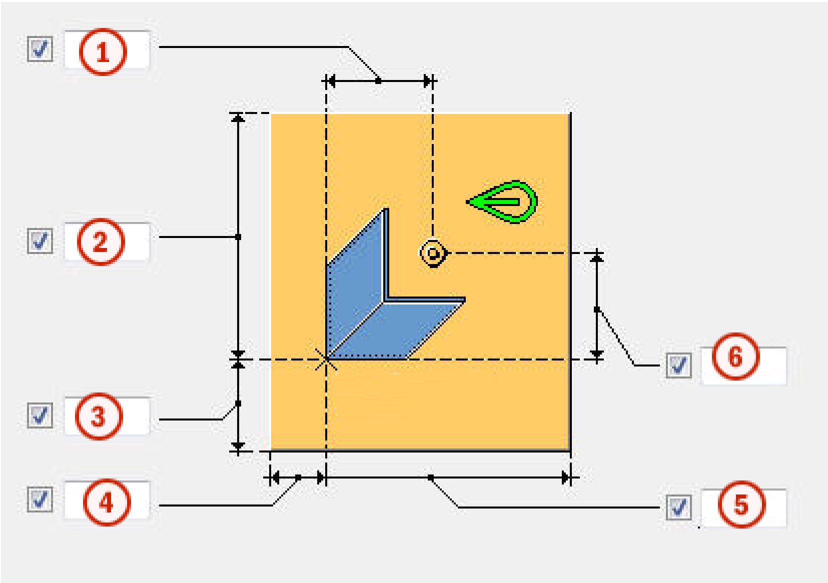
Base plate (1053): Parameters tab on page 1192

Base plate (1053): Bolts tab on page 1193

Base plate (1053): Picture tab

Use the **Picture** tab to control the position of the base plate in the **Base plate (1053)** detail.

Dimensions



Field	Description	Default
1	Define the horizontal distance between the reference point and the bolt.	150 mm
2	Define the vertical distance between the reference point and upper edge of the base plate.	300 mm
3	Define the vertical distance between the reference point and the lower edge of the base plate.	200 mm
4	Define the horizontal distance between the reference point and the left edge of the base plate.	200 mm
5	Define the horizontal distance between the reference point and the right edge of the base plate.	300 mm
6	Define the vertical distance between the reference point and the bolt.	150 mm

Base plate (1053): Parts tab

Use the **Parts** tab to control the dimensions of the base plate in the **Base plate (1053)** detail.

Plate

Field	Description	Default
Plate	Define the thickness, width, and height of the base plate.	Thickness = 10 mm Width = 250 mm Height =250 mm

Field	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	BASEPLATE

Base plate (1053): Parameters tab

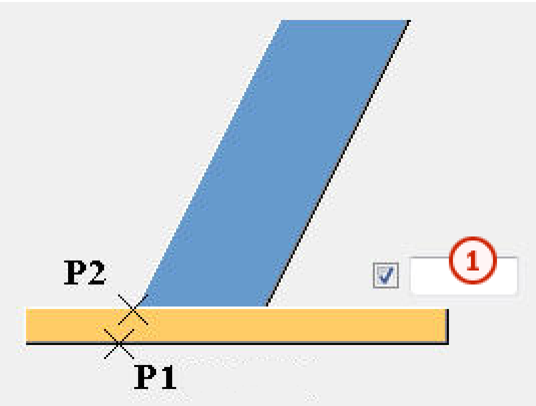
Use the **Parameters** tab to control the position of the reference point and the bolt locations in the **Base plate (1053)** detail.

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**).

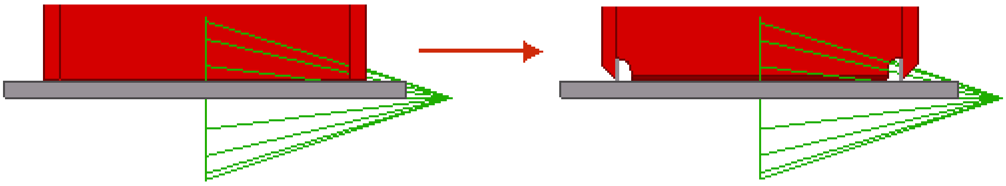
Weld gap



Field	Description
①	Define the 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.

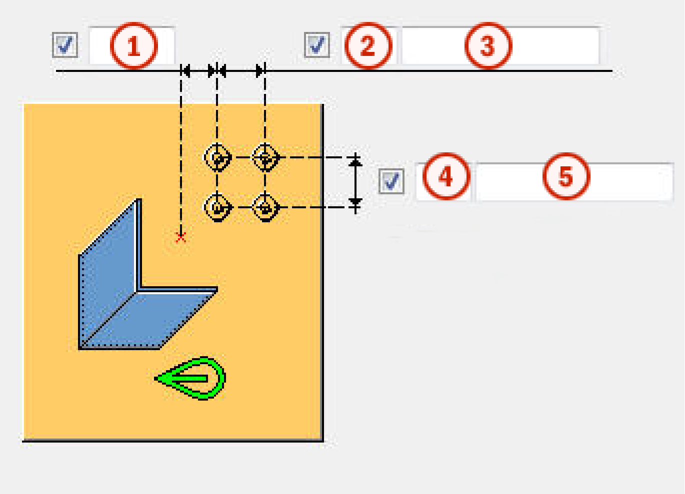


Field	Description
Component	Define a system or a custom component by selecting it from the component catalog.
Attributes	Enter the name of the attribute file for the selected component.
Input	Define to which parts the selected component is applied. • **Default** is same as **Base + Column**. • **Column** sets the column as the main part. Use this option for details. • **Column + Base** sets the column as the main part and the base plate as the secondary part. • **Base + Column** sets the base plate as the main part and the column as the secondary part.

Base plate (1053): Bolts tab

Use the **Bolts** tab to control the bolt properties in the **Base plate (1053)** detail.

Bolt group dimensions

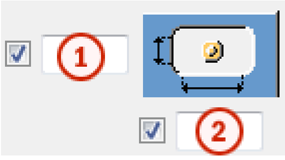


Field	Description
1	Define the dimension for horizontal bolt group position.
2	Define the number of bolts in the horizontal dimension.
3	Define the bolt spacing. Use a space to separate bolt spacing values. Enter a value for each space between bolts. For example, if there are 3 bolts, enter 2 values.
4	Define the number of bolts in the vertical dimension.
5	Define the 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
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

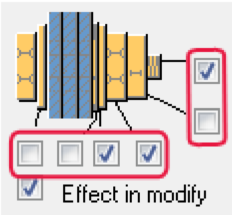
Slotted holes You can define slotted, oversized, or tapped holes.



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.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

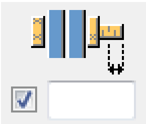
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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

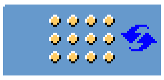
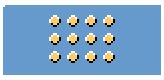
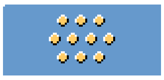
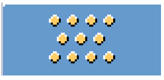
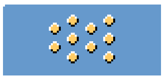
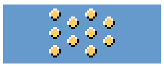


To modify the bolt assembly in an existing component, select the **Effect in modify** check box and click **Modify**.

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

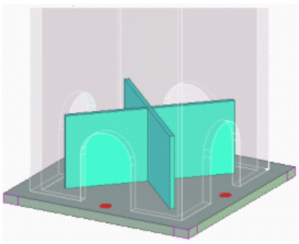
13.9 Box column base plate (1066)

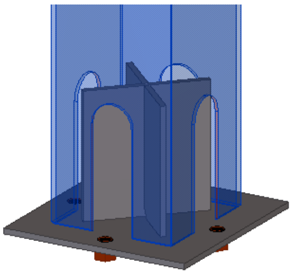
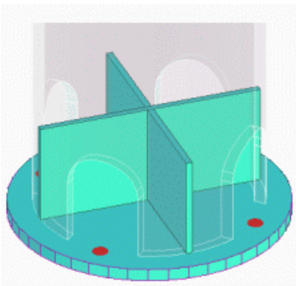
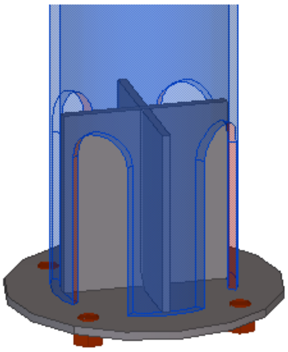
Box column base plate (1066) creates a base plate for a square or a circular column that is embedded in concrete.

Objects created

- Base plate
- Ribs
- Flow holes
- Bolts
- Welds

Use for

Situation	Description
	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

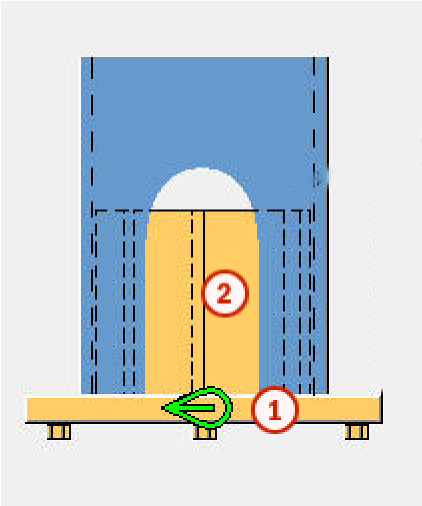
Before you start Create a column.

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

See also

Box column base plate (1066): Picture tab on page 1198

Box column base plate (1066): Parts tab on page 1199

Box column base plate (1066): Parameters tab on page 1200

Box column base plate (1066): Flow holes tab on page 1202

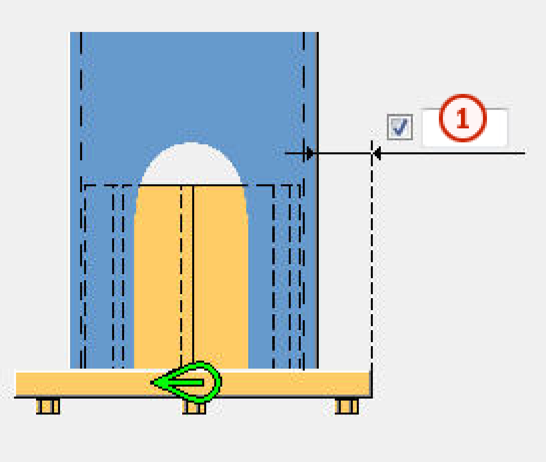
Box column base plate (1066): Bolts tab on page 1203

Box column base plate (1066): Height of ribs tab on page 1205

Box column base plate (1066): Picture tab

Use the **Picture** tab to control the position of the base plate in the **Box column base plate (1066)** detail.

Dimensions



Field	Description	Default
1	Define the distance from the edge of the column to the edge of the base plate.	50 mm

Box column base plate (1066): Parts tab

Use the **Parts** tab to control the dimensions of the base plate, long rib, and short rib in the **Box column base plate (1066)** detail.

Plate

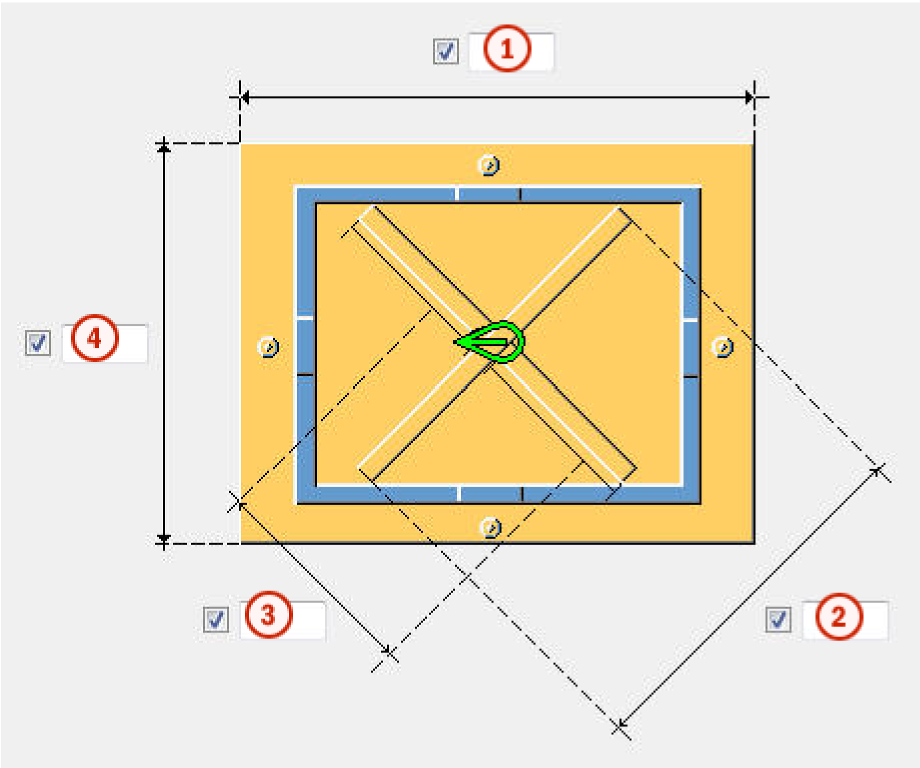
Field	Description	Default
Base plate	Define the base plate thickness.	
Long rib	Define the long rib thickness.	9 mm
Short rib	Define the short rib thickness.	9 mm

Field	Description	Default
Pos_No	Define a prefix and a starting number for the part position number.	The default part start number is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab.
Material	Define the material grade.	The default material is defined on the **Tools** --> **Options** --> **Options...** --> **Components** tab, in the **Part material** field.
Name	Define a name that is shown in drawings and reports.	

Box column base plate (1066): Parameters tab

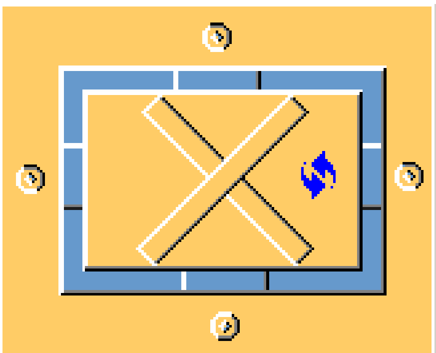
Use the **Parameters** tab to control the base plate and rib dimensions in the **Box column base plate (1066)** detail.

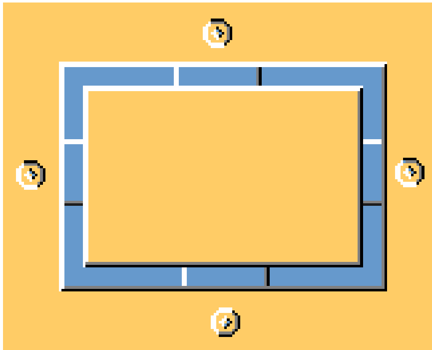
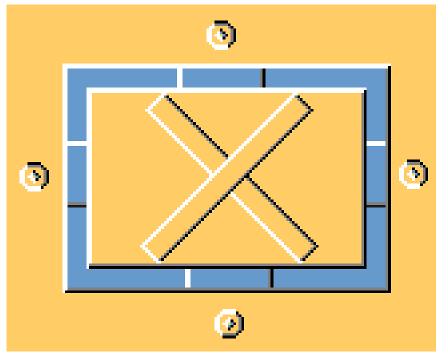
Base plate and rib dimensions



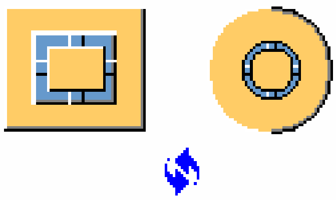
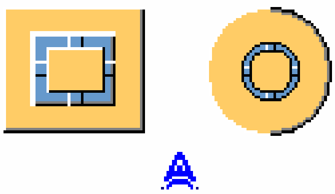
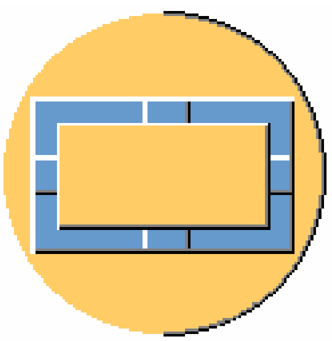
Field	Description
1	Define the width of base plate.
2	Define the length of long rib.
3	Define the length of short ribs.
4	Define the height of base plate.

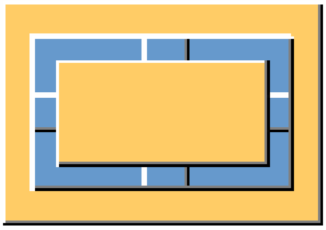
Rib creation

Option	Description
	Default No ribs are created. AutoDefaults can change this option.

Option	Description
	No ribs are created.
	Ribs are created.

Base plate creation

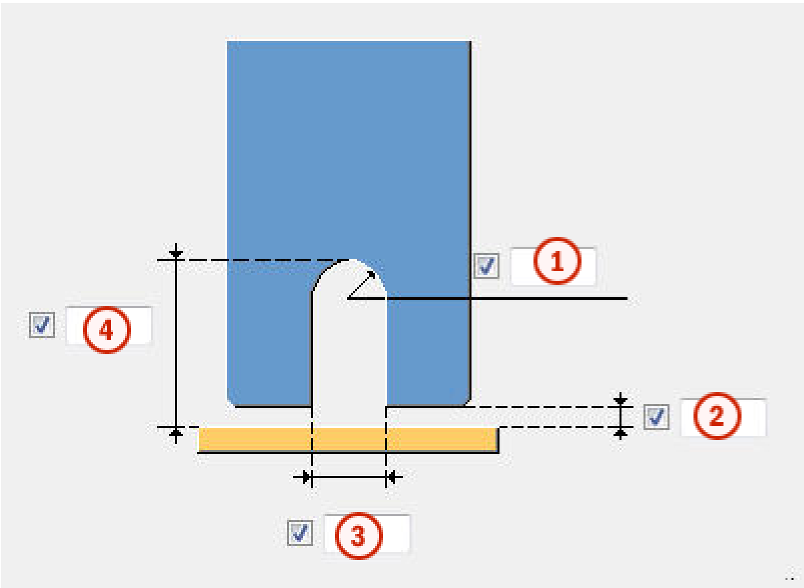
Option	Description
	Default Rectangular base plate AutoDefaults can change this option.
	Automatic
	Round base plate

Option	Description
	Rectangular base plate

Box column base plate (1066): Flow holes tab

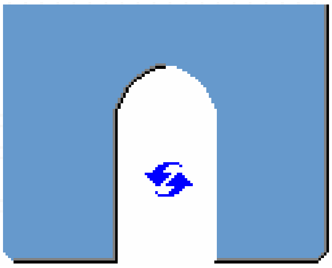
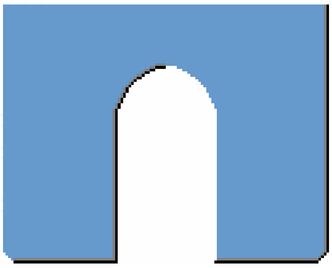
Use the **Flow holes** tab to control the distance between the base plate and the column in the **Box column base plate (1066)** detail.

Flow hole properties



Field	Description
1	Define the rounding of the column flow hole.
2	Define the weld gap.
3	Define the width of the column flow hole.
4	Define the height of the column flow hole.

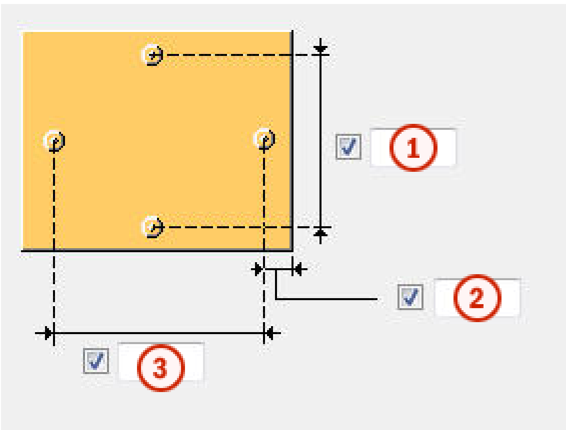
Flow hole creation

Option	Description
	Default Flow holes are created. AutoDefaults can change this option.
	Flow holes are not created.
	Flow holes are created.

Box column base plate (1066): Bolts tab

Use the **Bolts** tab to control the bolt properties in the in the **Box column base plate (1066)** detail.

Bolt positions



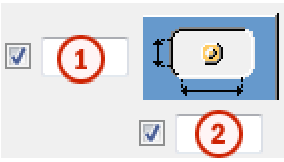
Field	Description
1	Define the vertical bolt spacing dimension.
2	Define the bolt edge distance. Edge distance is the distance from the center of a bolt to the edge of the part.
3	Define the horizontal bolt spacing dimension.

Bolt basic properties

Option	Description	Default
Bolt size	Bolt diameter.	Available sizes are defined in the bolt assembly catalog.
Bolt standard	Bolt standard to be used inside the component.	Available standards are defined in the bolt assembly catalog.
Tolerance	Gap between the bolt and the hole.	
Thread in mat	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`
Site/ Workshop	Location where the bolts should be attached.	`Site`

Slotted holes

You can define slotted, oversized, or tapped holes.

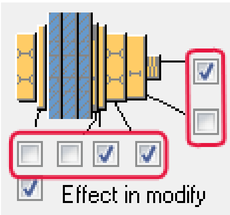


Option	Description	Default
1	Vertical dimension of slotted hole.	`0`, which results in a round hole.
2	Horizontal dimension of slotted hole, or allowance for oversized holes.	`0`, which results in a round hole.
Hole type	**Slotted** creates slotted holes. **Oversized** creates oversized or tapped holes.	
Rotate Slots	When the hole type is **Slotted**, this option rotates the slotted holes.	

Option	Description	Default
Slots in	Member(s) in which slotted holes are created. The options depend on the component in question.	

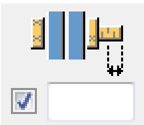
Bolt assembly The selected check boxes define which component objects (bolt, washers, and nuts) are used in the bolt assembly.

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**.

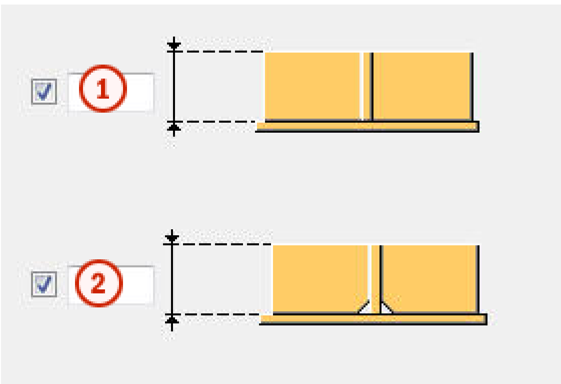
Bolt length increase Define how much the bolt length is increased. Use this option when, for example, painting requires the bolt length to be increased.



Box column base plate (1066): Height of ribs tab

Use the **Height of ribs** tab to control the height of the short and the long ribs in the **Box column base plate (1066)** detail.

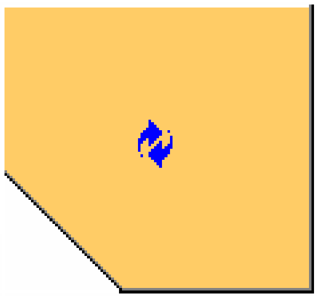
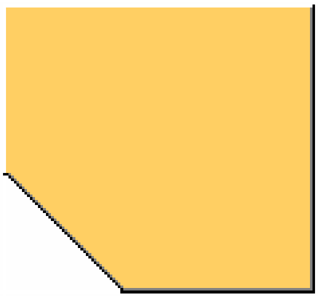
Height of ribs



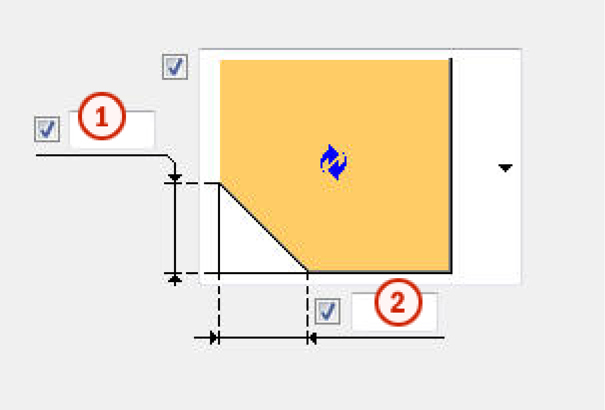
Field	Description	Default
1	Define the height of the long rib.	200 mm

Field	Description	Default
2	Define the height of the short ribs.	200 mm

Short rib chamfer

Option	Description
	Default Line chamfer is created. AutoDefaults can change this option.
	Chamfer is not created.
	Line chamfer is created.
	Arc chamfer is created.

Chamfer dimensions



Field	Description	Default
1	Define the chamfer height.	15 mm
2	Define the chamfer width.	15 mm

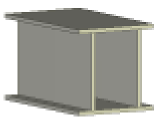
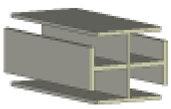
14 Built-up Components

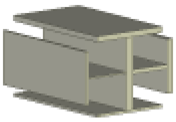
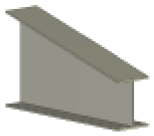
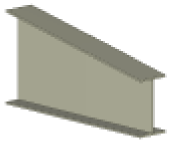
This section introduces built-up components available in Tekla Structures.

Click the links below to find out more:

14.1 Beams

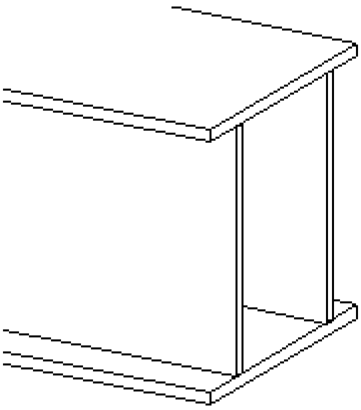
Use these componentss to automatically create built-up beams:

Component	Image	Description
Box girder (S13) on page 1209		Creates a built-up beam using four plates welded together.
Cross profile (S32) on page 1210		Creates a built-up beam using an I profile and two T profiles welded to the I profile web.

Component	Image	Description
Cross plate profile (S33) on page 1212		Creates a built-up beam from seven plates welded together.
Tapered beam (S98) on page 1212		Creates a tapered or straight built-up beam with I shape.
Tapered beam 2 (S45) on page 1215		Creates a tapered or straight built-up beam with I shape. Flange and web plates can be spliced.
PEB Tapered Section (S94) on page 1217		Creates a simple built-up beam or column between two picked points. The shape can be straight or tapered.

Box girder (S13)

Creates a built-up beam with box cross section.



Use for Straight built-up beams.

Do not use for Tapered built-up beams.

Before you start Ensure that you have two points to pick.

Defining properties

Use the following tabs in built-up beam dialog boxes to define the properties of the component:

Tab	Contents	See also
Picture	Dimensions of plates.	
Parts	Properties of plates.	Parts in steel connections
Parameters	Part names, classes and finishes. Beam location and length.	Built-up beam parameters on page 1210

Picking order

1. Starting point for the beam.
2. End point for the beam.

Built-up beam parameters

The **Parameters** tabs for the following built-up beams are the same:

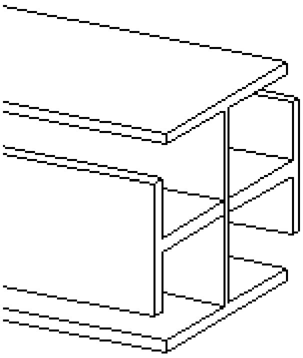
- **Box girder (S13)**
- **Cross profile (S32)**
- **Cross plate profile (S33)**

Use the following fields to change part properties and length and location of beams:

Field	Description
Name	See .
Class	
Finish	
Move end 1	Moves the end of the beam you pick first. Negative values shorten the beam, positive values lengthen it.
Move end 2	Moves the end of the beam you pick second. Negative values shorten the beam, positive values lengthen it.
Position in plane	See .
Position in plane offset	
Rotation	See .
Rotation offset	
Position in depth	See .
Position in depth offset	

Cross profile (S32)

Creates a built-up beam using an I profile and two T profiles welded to the I profile web.



Use for Straight built-up beams.

Do not use for Tapered built-up beams.

Before you start Check that you have two points to pick.

Defining properties Use the following tabs in built-up beam dialog boxes to define the properties of the parts the component creates:

Tab	Contents	See also
Picture	Dimensions of profiles.	Eccentricity on page 1211
Parts	Properties of plates.	Parts in steel connections
Parameters	Part names, classes and finishes. Beam location and length.	Built-up beam parameters on page 1210

Picking order

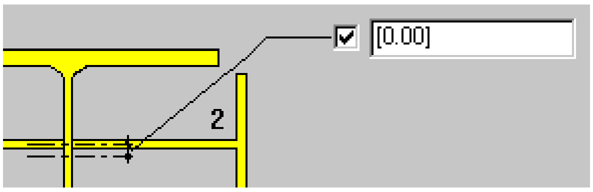
1. Starting point for the beam.
2. End point for the beam.

Eccentricity

Use eccentricity to adjust the location of horizontal parts relative to vertical parts in the following built-up beams:

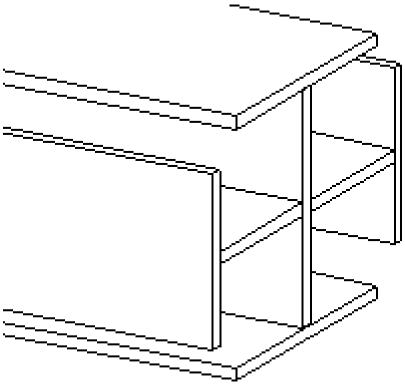
- **Cross profile (S32)**
- **Cross plate profile (S33)**

By default the eccentricity is zero. So T profiles or plates are connected to the middle of the I profile web or vertical plate.



Cross plate profile (S33)

Creates a built-up beam using seven plates welded together.



Use for Straight built-up beams.

Do not use for Tapered built-up beams.

Before you start Ensure that you have two points to pick.

Defining properties Use the following tabs in built-up beam dialog boxes to define the properties of the parts this component creates.

Tab	Contents	See also
Picture	Dimensions of plates.	Eccentricity on page 1211
Parts	Properties of plates.	Parts in steel connections
Parameters	Part names, classes and finishes. Location and length of beam.	Built-up beam parameters on page 1210

Picking order

1. Starting point for the beam.
2. End point for the beam.

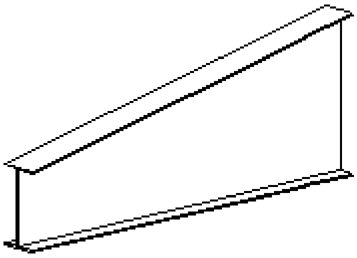
Tapered beam (S98)

Creates a tapered or straight built-up beam with I shape.

Parts created

- Web plate
- Top flange plate
- Bottom flange plate

Use for

Situation	More information
	Creates a simple built-up beam between two picked points.

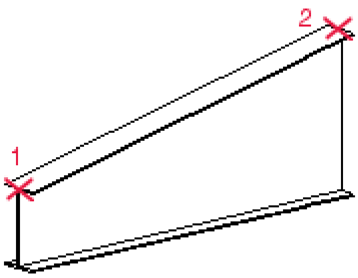
Before you start Ensure that you have two points to pick.

Defining properties Use the following tabs in the **Tapered beam (S98)** dialog box to define the properties of the component:

Tab	Contents	See also
Picture	Height of the web or the entire beam, depending on the option in the **Height type** field on the **Parameters** tab. Sloping rise and run values.	
Parts	Properties of plates.	Parts in steel connections
Parameters	Height type, type of reference point, type of cut, end plate thickness, position of web plate.	Tapered beam parameters on page 1213

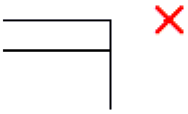
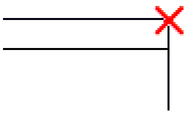
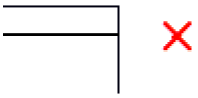
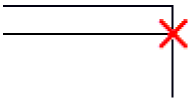
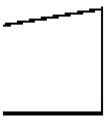
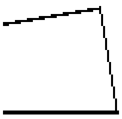
Picking order

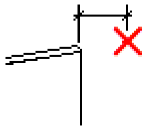
1. Pick a start and end point to indicate beam length:



Tapered beam parameters

The properties on the **Parameters** tab in the **Tapered beam (S98)** dialog box are:

Property	Description
Height type	Affects the height values entered in the **Picture** tab.
Type of reference point	Location of the end of the beam, relative to a point you pick: **Top profile, end of endpl**  **Top profile, end of webpl**  **Top webpl, end of endp**  **Top webpl, end of webpl** 
Type of cut	Shape of beam ends: • **Vertical in global system**  • **Perpend to top flange**  • **In Z of current plane**: depends on the position of the work plane

Property	Description
Position of web plate	Adjusts the location of web plate. See also .
Thickness of endplate	Set-back distance of beam ends. 

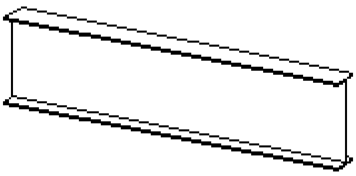
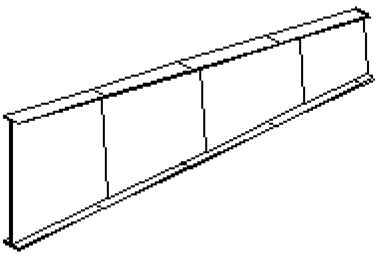
Tapered beam 2 (S45)

Creates a built-up beam with I shape. The beam can be tapered or straight. You can control the size of the spliced material.

Parts created

- Web plates
- Top flange plates
- Bottom flange plates

Use for

Situation	More information
	A simple, straight beam built up from two flange plates and a web plate.
	A tapered beam built-up from several spliced plates. The points you pick determine beam length. You can adjust the length on the **Picture** tab.

Before you start

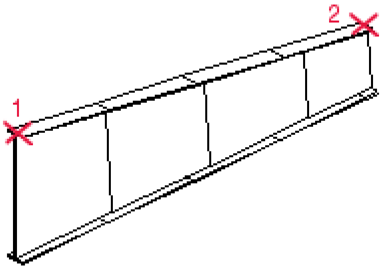
Ensure that you have two points to pick.

Defining properties

Use the following tabs in the **Tapered beam (S45)** dialog box to define the properties of the parts this component creates:

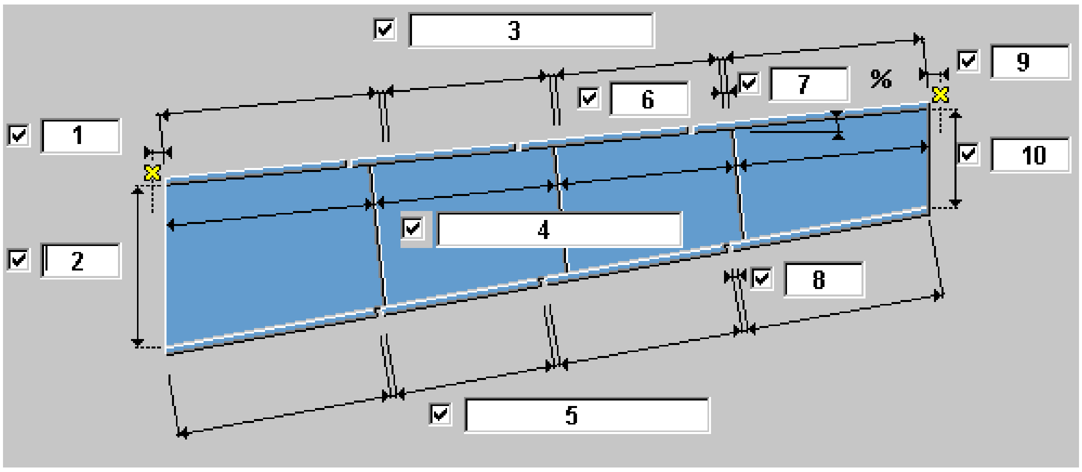
Tab	Contents	See also
Picture	Beam dimensions and location, relative to the points picked.	Picture (S45) on page 1216
Parts	Properties of plates.	Parts in steel connections

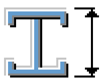
Picking order 1. Pick a start and end point to indicate beam length:

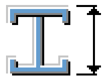


Picture (S45)

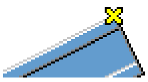
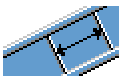
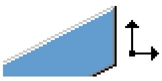
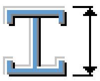
The **Picture** tab in the **Tapered column (S45)** dialog box contains the following dimensions:



Field	Description	More information
1	Distance from the first point picked to the end of the beam. Negative value lengthen the beam, positive values shorten it.	
2	Beam depth at the first end.	The height of the web or the entire beam, depending on the option Depth measure on page 1235. 

Field	Description	More information
3	Length of 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.
4	Length of web plates.	
5	Length of bottom flange.	
6	Gap between the top flange plates.	
7	How much the beam slopes from the horizontal.	Enter a percentage.
8	Gap between the bottom flange plates.	
9	Distance from the last point picked to the end of the beam. Negative value lengthen the beam, positive values shorten it.	
10	Beam depth at the second end.	The height of the web or the entire beam, depending on the option Depth measure on page 1235. 

See also Use the following options to define beam location and dimensions:

Option	See also
	Beam position to picked point on page 1234
	Web plate orientation on page 1235
	Beam end alignment on page 1235
	Depth measure on page 1235

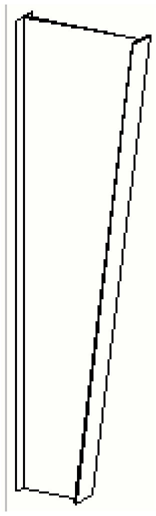
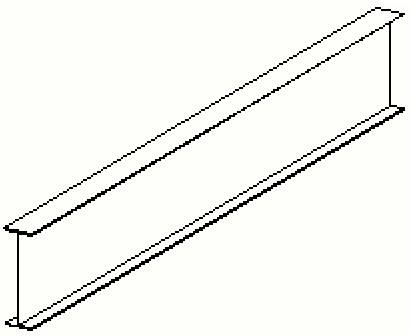
PEB Tapered Section (S94)

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.
	Straight built-up beam.

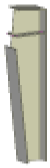
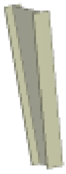
Selection order

1. Pick the starting point of the beam/column.
2. Pick the end point of the beam/colum.

Distance between the picked points is the beam or column lenght. You can modify the other dimensions in the component dialog box.

14.2 Columns

Use these components to automatically create built-up columns:

Component	Image	Description
Tapered column (S99) on page 1219		Creates a single built-up column, which can be straight or tapered.
Tapered column 2 (S44) on page 1222		Creates a built-up column, which can be straight or tapered. Flange and web plates can be spliced.
PEB Tapered Section (S94) on page 1217		Creates a simple built-up beam or column between two picked points. The shape can be straight or tapered.

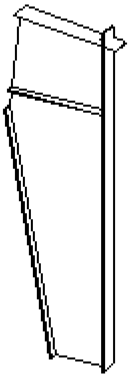
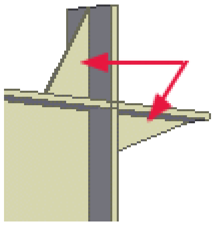
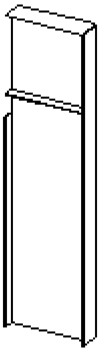
Tapered column (S99)

Creates a single built-up column, which can be straight or tapered.

Parts created

- Vertical web plate
- Vertical outside flange plate
- Inclined inside flange plate
- Top plate
- Flange stiffeners (2)
- Horizontal stiffeners (2)

Use for

Situation	More information
	A tapered built-up column with a stiffened corner. Flange stiffeners: 
	A straight built-up column.

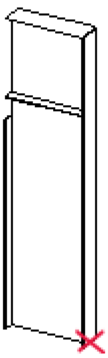
Before you start Ensure that you have a point to pick.

Defining properties Use the following tabs in the **Tapered column (S99)** dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Column dimensions.	Picture (S99) on page 1221
Parts	Properties of plates.	Parts in steel connections
Parameters	Plate sizes, distances and other properties.	Parameters (S99) on page 1221

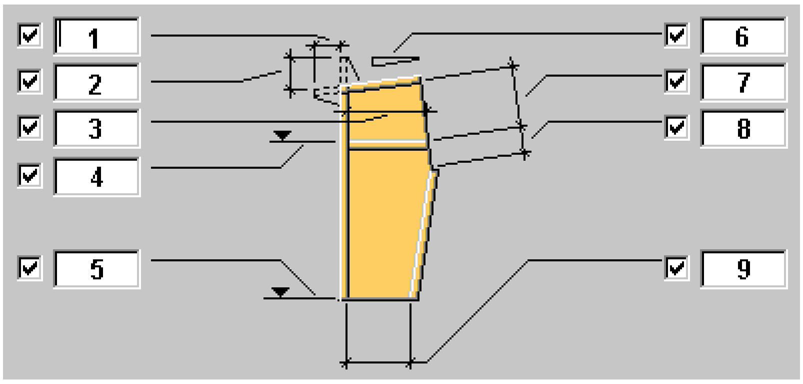
Picking order

1. Pick a point to indicate the location of column:



Picture (S99)

Use the following options on the **Picture** tab in the **Tapered column (S99)** dialog box to define the dimensions of the parts this component creates:



Field	Description
1	Extra length for top plate.
2	Extra length for outer flange.
3	Length of horizontal stiffener.
4	Top level of horizontal stiffener.
5	Bottom level of column.
6	Roof slope as a percentage, for example 10.
7	Distance from the top corner to the top of the stiffener.
8	Distance from the top of the stiffener to the inner corner of the web plate.
9	Web plate width at bottom.

Parameters (S99)

Use the **Parameters** tab in the **Tapered column (S99)** dialog box to define the following properties:

Field	Description
Outer flange profile	Profile size of plates. The file `std_flange_plates.dat` defines the available plate profiles.
Inner flange profile	
Top plate profile	
Horizontal stiffener profile	

Field	Description
Outer flange splice distance	If the plate is longer than the maximum plate length (defined in `std_flange_plates.dat`), Tekla Structures creates a splice.
Inner flange splice distance	
Horizontal stiffener chamfer	Dimension of internal chamfer in horizontal stiffener. (Default is 15.)
Orientation	Rotates the column web relative to the work plane.

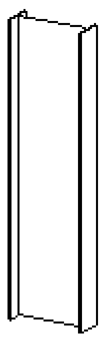
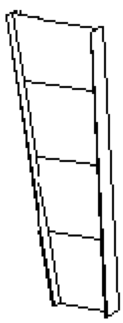
Tapered column 2 (S44)

Creates a welded built-up column, which can be tapered or straight. You can control the taper and the size of the spliced material.

Parts created

- Web plates
- Top flange plates
- Bottom flange plates

Use for

Situation	Example
	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, top, and bottom flanges.

Before you start Ensure that you have a point to pick.

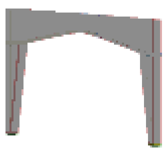
Defining properties Use the following tabs in the **Tapered column 2 (S44)** dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Column dimensions and location relative to points picked.	Similar to Tapered beam 2 (S45), see Picture (S45) on page 1216.
Parts	Properties of plates.	Parts in steel connections

Picking order 1. Pick the position of the column.

14.3 Frames

Use the following components to automatically create built-up frames, beams, and columns:

Component	Image	Description
Tapered frame comonor (S53) on page 1223		Creates a built-up frame or parts of it. You can control the taper and the size of the spliced material.
PEB Frame (S92) on page 1225		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.

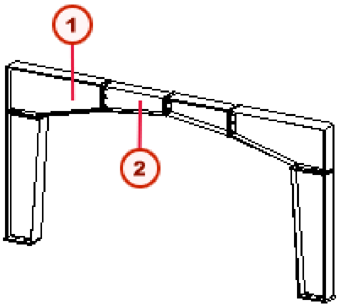
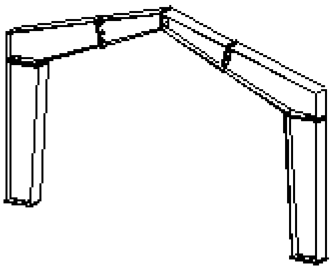
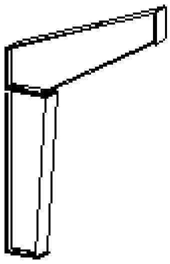
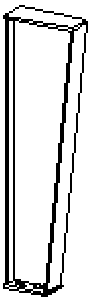
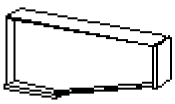
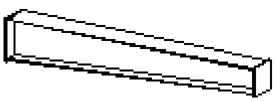
Tapered frame comonor (S53)

Creates a built-up frame or parts of it. You can control the taper and the size of the spliced material.

Parts created

- Built-up columns with base plate and end plate (2)
- Built-up beams with end plates (2)
- Built-up beams with end plates (2)

Use for

Situation	More information
	Built-up frame. **1** Beam 1 **2** Beam 2 Use the following options: • **Frame options** to **Column and beams** • **Symmetry** to **Yes**
	Sloped built-up frame. Use the following options: • **Frame options** to **Column and beams** • **Symmetry** to **Yes**
	Only half of the frame. Use the following options: • **Frame options** to **Column and first beam** • **Symmetry** to **No**
	Built-up column with base plate and end plate. Use the following options: • **Frame options** to **Column** • **Symmetry** to **No**
	Built-up beam (1) with end plates. Use the following options: • **Frame options** to **First beam** • **Symmetry** to **No**
	Built-up beam (2) with end plates. Use the following options: • **Frame options** to **Second beam** • **Symmetry** to **No**

Limitations Creates frame only in global x direction. Y direction is not possible.

Before you start Ensure that you have a point to pick.

Defining properties Use the following tabs in the **Tapered frame comonor (S53)** dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Column dimensions and location relative to points picked.	Works similar to Tapered beam 2 (S45), see Picture (S45) on page 1216.
Parts	Properties of plates.	Parts in steel connections
Column	Column dimensions.	
Column2	Base plate bolts.	
Column3	End plate bolts between column and beam 1.	
Beam1	Beam 1 dimensions.	
Beam1_2	End plate bolts between beam 1 and beam 2.	
Beam2	Beam 2 dimensions.	
Beam2_2	End plate bolts at the hip between beam 2 and beam 2.	

Picking order

1. Pick the position of the column.
2. Tekla Structures creates the frame.

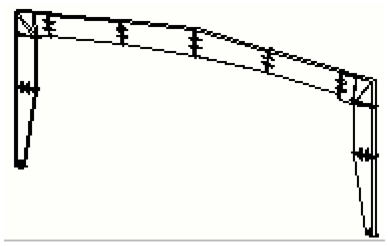
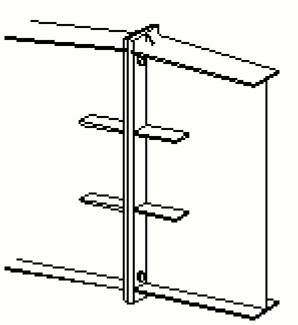
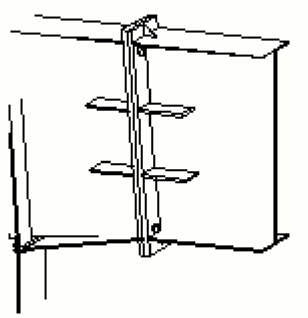
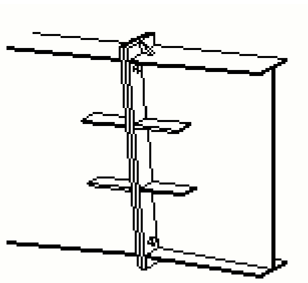
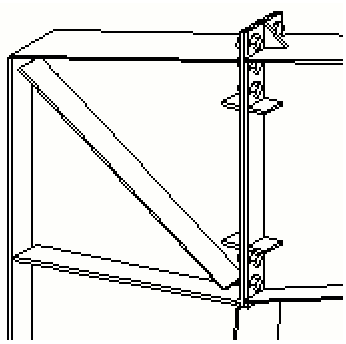
PEB Frame (S92)

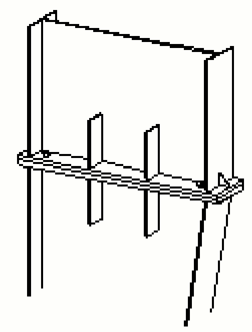
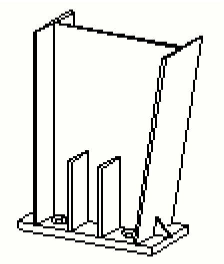
Creates a pre-engineered building frame to the selected point. This component uses existing components to create built-up columns and rafters, base plates, knee connection, splice connections, and apex connection.

Objects created

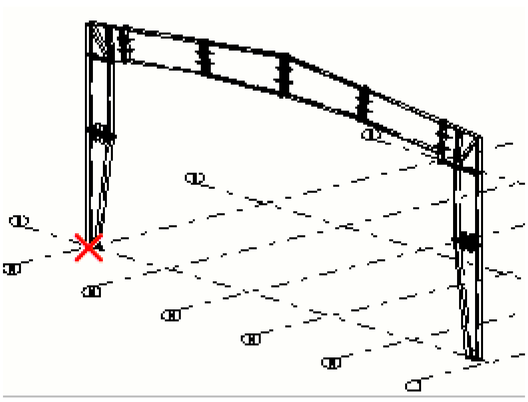
- Built-up rafter (1 to 4 segments)
- Apex connection
- Splice connections
- Knee connections (2)
- Built-up columns (1 to 4 segments)
- Base plate details (2)

Use for

Situation	Description
	Frame consisting of spliced columns and spliced rafters.
	Apex connection between two rafters at the apex of a portal frame.
	The first splice between the first segment and the second segment of rafter.
	The second splice between the second and the third segment of rafter.
	Knee connection between the second segment of column and the first segment of rafter.

Situation	Description
	Column splice between the first and the second segment of column.
	Column base plate detail.

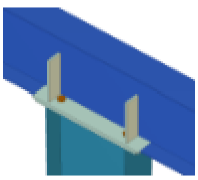
Selection order

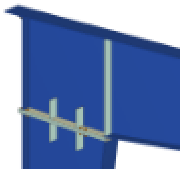
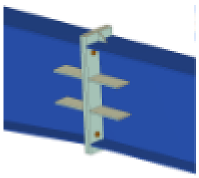
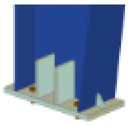


1. Pick the point in which to insert the frame.

14.4 Connections and details

Use the following components to automatically create connections and details for built-up beams and columns:

Component	Image	Description
Tapered beam to column (197) on page 1228		Creates a connection between a tapered beam and a tapered column.

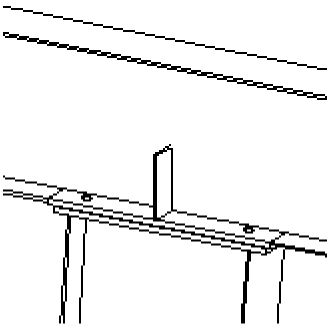
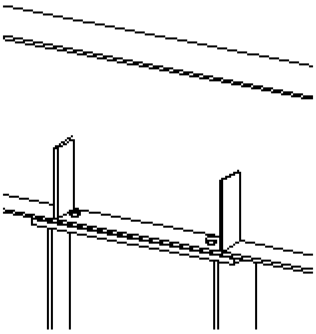
Component	Image	Description
Tapered column to beam (199) on page 1229		Creates a connection between a tapered beam and a tapered column.
Tapered beam to beam (200) on page 1231		Creates a connection between tapered beams.
Tapered column base plate (1068) on page 1232		Creates a base plate detail to a tapered column.
PEB Knee Joint (S93) on page 1233		Creates a knee connection between rafter and column. The end plate connection can be located horizontally, vertically, or perpendicular to the rafter.

Tapered beam to column (197)

Creates a connection between a tapered beam and a tapered column.

Parts created

- Plate to the top of the column
- Stiffeners (2 or 4)
- Plate to the beam flange (optional)

Use for	Situation	Example
		Connection created using two stiffeners and flange and column plates. Plates are connected with four bolts, but you can use any number.
		Connection created using four stiffeners and a column end plate. Does not create a separate plate for the beam flange.

Before you start

- Create the tapered beam.
- Create the tapered column.

Defining properties

Use the following tabs in the **Tapered beam to column (197)** dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions of end plates and stiffeners. Location of stiffeners. Options to fit column flange.	Column fitting option (197) on page 1236
Parts	Properties of column plate, beam plate and stiffeners.	Parts in steel connections
Bolts	Bolt properties, number of bolts, spacing. Option to create slotted holes.	Bolts

Selection order

1. Select the flange of the beam.
2. Select the web of the column.

Tapered column to beam (199)

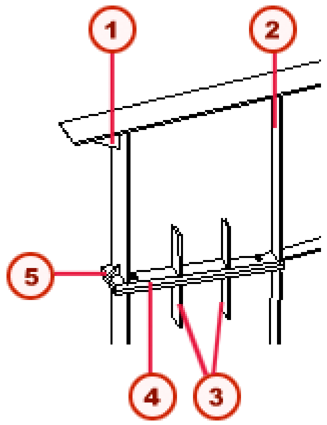
Creates connection between a tapered beam and a tapered column. All parts are optional.

To omit a part, set its thickness to 0 on the **Parts** tab.

Parts created

- End plates: to top of column and beam flange (optional)
- Web stiffeners (8) (optional)
- Triangular beam flange stiffener (optional)
- Triangular flange stiffeners (2) (optional)
- Beam web stiffeners (2) (optional)

Use for

Situation	Example
	Connection created using all possible parts. Plates are connected using four bolts, but you can use any number. **1** Beam flange stiffener **2** Beam web stiffeners **3** Web stiffeners **4** End plates **5** Flange stiffeners

Before you start

- Create the tapered beam.
- Create the tapered column.

Defining properties

Use the following tabs in the **Tapered column to beam (199)** dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions of end plates and stiffeners. Location of stiffeners. Option to fit column flange.	Column fitting option (199) on page 1236 Corner fitting option (199) on page 1237
Parts	Properties of column plate, beam plate and stiffeners.	Parts in steel connections
Bolts	Bolt properties, number of bolts, spacing. Option to create slotted holes.	Bolts

Selection order

1. Select the web of the beam.
2. Select the web of the column.

Tapered beam to beam (200)

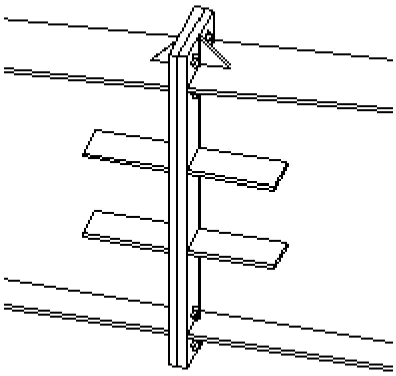
Creates a connection between tapered beams.

To omit a part, set its thickness to 0 on the **Parts** tab.

Parts created

- End plates (2)
- Flange stiffeners (4) (optional)
- Web stiffeners (8) (optional)

Use for

Situation	More information
	This example is created with all stiffeners and end plates. Plates are connected with eight bolts, but you can use any number.

Before you start

Create the following parts:

- Tapered beam
- Another tapered beam

Defining properties

Use the following tabs in the **Tapered beam to beam (200)** dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions of end plates and stiffeners. Location of stiffeners. Option to fit column flange.	Column fitting option (200) on page 1237
Parts	Properties of end plates, web stiffeners and flange stiffeners.	Parts in steel connections
Bolts	Bolt properties, number of bolts, spacing. Option to create slotted holes.	Bolts

Selection order

1. Select the web of the first beam.

2. Select the web of the second beam.

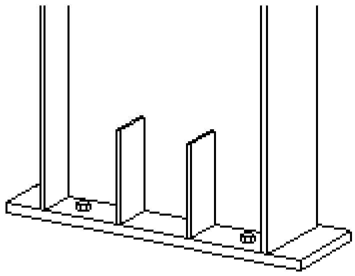
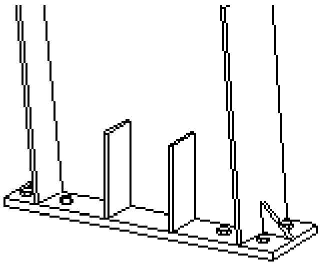
Tapered column base plate (1068)

Creates a base plate detail to a tapered column.

Parts created

- Base plate
- Web stiffeners (4)
- Flange stiffeners (2) (optional)

Use for

Situation	Example
	Detail uses four web stiffeners and without flange stiffeners. The end plate is connected using four bolts, but you can use any number.
	Detail uses four web stiffeners and two flange stiffeners.

Before you start Create a tapered column.

Defining properties Use the following tabs in the **Tapered column base plate (1068)** dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions of base plate and stiffeners. Location of web stiffeners. Option to fit column flange.	Column fitting option (1068) on page 1236
Parts	Properties of base plate, web and flange stiffeners.	Parts in steel connections
Bolts	Bolt properties, number of bolts, spacing. Option to create slotted holes.	Bolts

Selection order

1. Select the tapered column.
2. Pick a point to indicate the location of base plate.

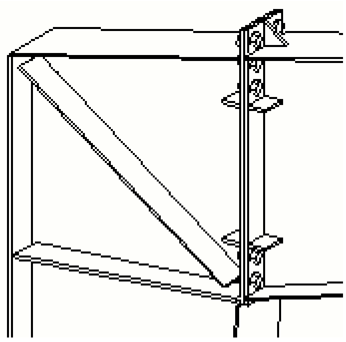
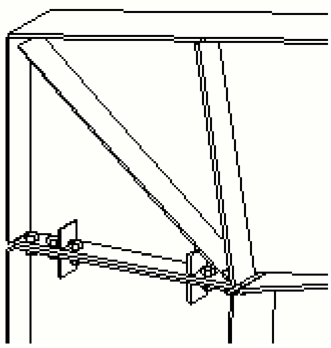
PEB Knee Joint (S93)

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
- Welds

Use for

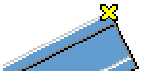
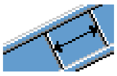
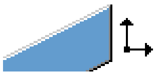
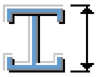
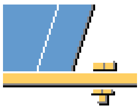
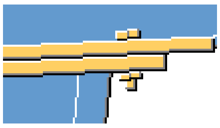
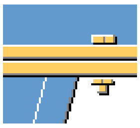
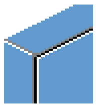
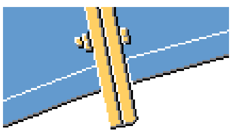
Situation	Description
	Vertical knee connection with triangular flange stiffeners and inner and outer stiffeners. Web strengthened with diagonal stiffeners.
	Horizontal knee connection with inner and outer stiffeners. Web strengthened with diagonal stiffeners.

Selection order

1. Pick the column.
2. Pick the rafter.
3. Click the middle mouse button to create the connection.

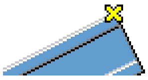
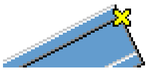
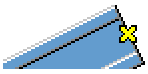
14.5 Tapered component properties

This section describes the options that appear in many of the tapered component dialog boxes. In the table below, the **Option** column shows the default option. To see all available options, click the link in the **See also** column.

Option	Description	See also
	Position of the beam, relative to the point picked.	Beam position to picked point on page 1234
	Orientation of the web plates.	Web plate orientation on page 1235
	Alignment of beam end cut.	Beam end alignment on page 1235
	How the depth of the beam is measured.	Depth measure on page 1235
	Option to fit the flanges of a tapered column (1068).	Column fitting option (1068) on page 1236
	Option to fit the flanges of a tapered column (197).	Column fitting option (197) on page 1236
	Option to fit the flanges of a tapered column (199).	Column fitting option (199) on page 1236
	Option to fit corner of tapered beam.	Corner fitting option (199) on page 1237
	Option to fit the flanges of tapered beams (200).	Column fitting option (200) on page 1237

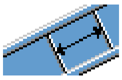
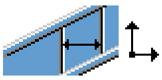
Beam position to picked point

Use the following options to move the beam relative to the point picked. Separate options may be available for both beam ends:

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 beam cross-section.

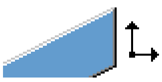
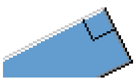
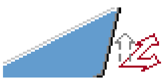
Web plate orientation

Use one of the following options to set the orientation of web plates for built-up sections:

Option	Description
	Web plates cut perpendicular to the top flange.
	Web plates cut vertically.

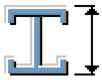
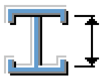
Beam end alignment

Use one of the following options to cut the beam end:

Option	Description
	Cut is vertical or horizontal.
	Cut is perpendicular to top flange.
	Cut is relative to the current position of the work plane.

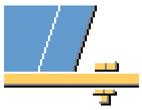
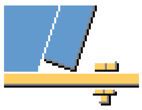
Depth measure

Use one of the following options to define beam depth:

Option	Description
	Depth calculated from outer surfaces of top and bottom flanges.
	Depth is the depth of the web.

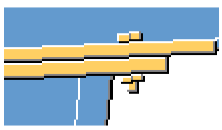
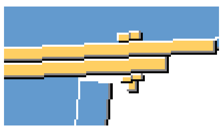
Column fitting option (1068)

Use one of the following options to define how the column flange is cut in the Tapered column base plate (1068) on page 1232 detail:

Option	Description
	Column flange fitted to be level with the base plate.
	Column flange is perpendicular to column axis.

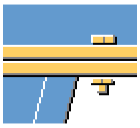
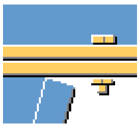
Column fitting option (197)

This option defines how the column flange is cut in the Tapered beam (S98) on page 1212 connection.

Option	Description
	Column flange fitted to be level with the end plate.
	Column flange perpendicular to column axis.

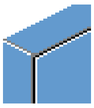
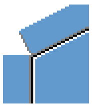
Column fitting option (199)

This option defines how the column flange is cut in the Tapered column to beam (199) on page 1229 connection.

Option	Description
	Column flange fitted to be level with the end plate.
	Column flange perpendicular to column axis.

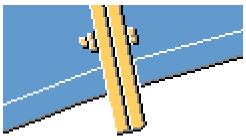
Corner fitting option (199)

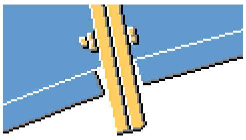
This option defines how the corner is cut in the Tapered column to beam (199) on page 1229 connection.

Option	Description
	Corner is fitted.
	Corner is not fitted.

Column fitting option (200)

This option defines how the column flange is cut in the Tapered beam to beam (200) on page 1231 connection.

Option	Description
	Beam flanges fitted to be level with the end plates.

Option	Description
	Beam flange perpendicular to beam axis.

15 Bracing Components

Introduction The Tekla Structures component catalog includes a variety of bracing components that automatically create complete bracing connections. It also includes bracing elements (such as gusset plates and stiffeners), that you can combine with other components to create your own bracing connections.

To open the component catalog, use the keyboard shortcut **Ctrl + F**. Bracing connections are located in the **Steel detailing** section of the component catalog:

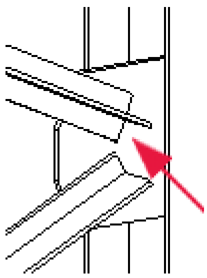
See also For general information about components and how to use them, see Components and Creating a component.

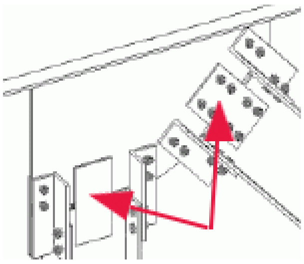
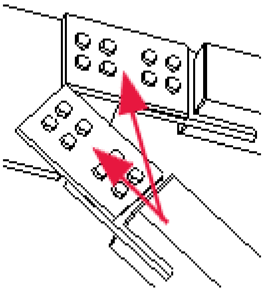
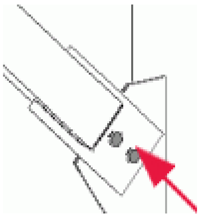
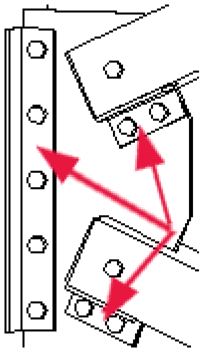
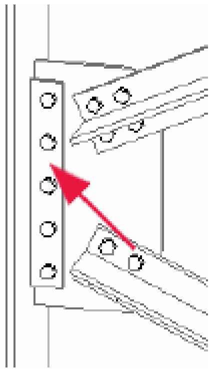
Component Catalog

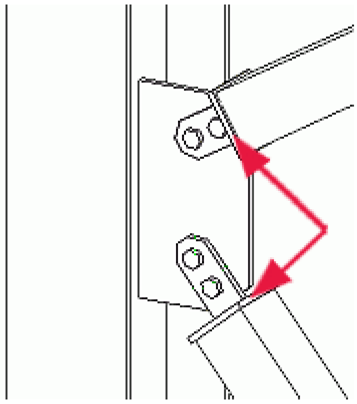
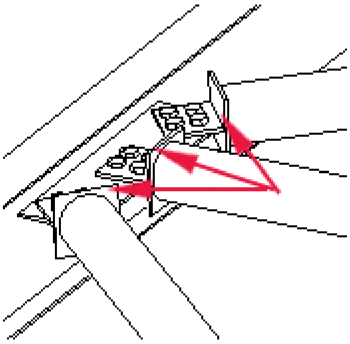
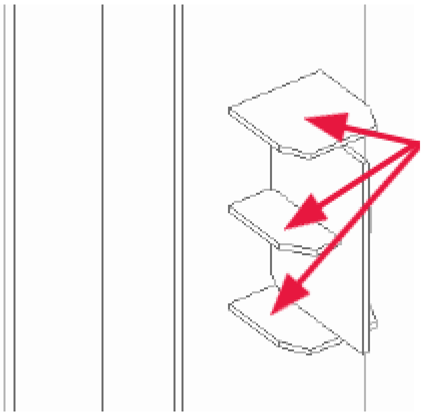
Creating custom components

15.1 Glossary of parts

Bracing components create some or all of the following parts:

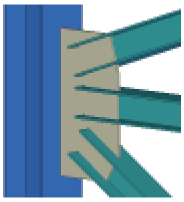
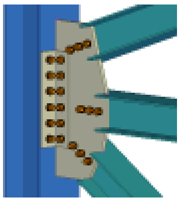
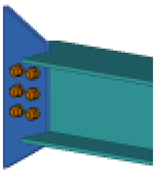
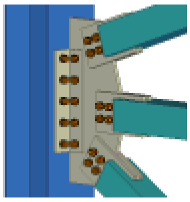
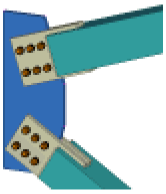
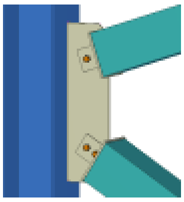
Part	Image
Gusset plate	

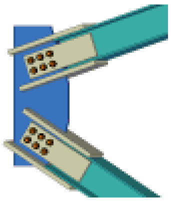
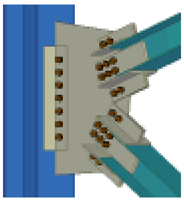
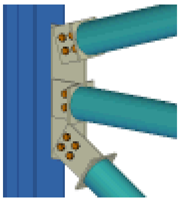
Part	Image
Connection plate	
Cover plate	
Tongue plate A *tongue plate* slots into a hollow profile brace.	
Clip angle	
Shear tab	

Part	Image
Seal plate *Seal plates* seal the ends of hollow braces. In this example they are used with chamfered connection plates.	
Tee *Tees* 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)	
Stiffener	

15.2 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
Welded gusset (10) on page 1243		Welds braces to a gusset plate.
Bolted gusset (11, 196) on page 1245		Bolts braces to a gusset plate. Optional clip angles or shear tabs.
Bracing cross (19) on page 1247		Bolts twin-profile braces to an existing gusset plate.
Tube gusset (20) on page 761		Bolts braces to a gusset plate using connection plates and optional tongue plates. Seals braces.
Tube crossing (22) on page 1249		Bolts braces to an existing gusset plate using connection plates and optional tongue plates. Seals braces.
Std bracing connection (67) on page 1250		Bolts 1 or 2 braces to a gusset plate using connection plates. Seals hollow braces.

Component	Image	Description
Wrapped cross (61) on page 1252		Bolts braces to an existing gusset plate, using connection plates and clip angles.
Gusseted cross (62) on page 1253		Bolts braces to a gusset plate using clip angles and connection plates. Welds or bolts the gusset plate to the beam or column.
Portal bracing (105) on page 1256		Connects up to three hollow braces to a beam, using a gusset plate and tees.

Welded gusset (10)

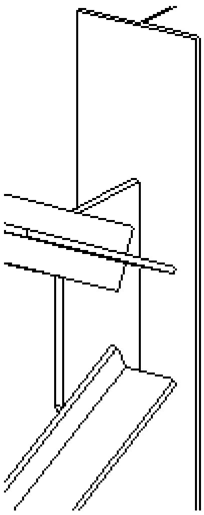
Connects 1 to 10 braces to a beam or column using a gusset plate welded to the web or flange of the beam or column. Welds the braces to the gusset plate.

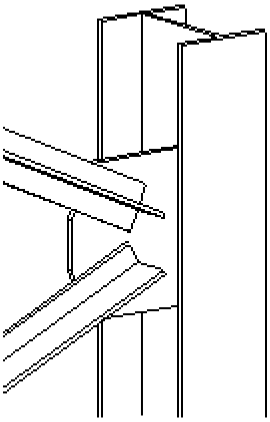
Profiles Braces:

Parts created

- Gusset plate to connect braces to the column or beam web
- Seal plates (hollow braces)

Use for

Situation	Description
	**Brace profile**: T **Connection method**: • Gusset plate welded to column flange • Braces welded to gusset plate

Situation	Description
	**Brace profile**: T **Connection method**: • Gusset plate welded to column web • Braces welded to gusset plate

Before you start Create a beam or column and 1 to 10 braces.

Defining properties Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions that define the position and shape of the gusset plate.	Modifying gusset plate shape on page 1289
Gusset	Gusset plate properties.	Parts in steel connections Defining gusset plate type on page 1290 Fine-tuning position on page 1292 Defining gusset plate position on the brace on page 1292
Brace conn	Seal plate, brace notch and slot properties.	Parts in steel connections
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Analysis	Information used in structural analysis	Analysis tab

Tekla Structures uses values in the `joints.def` file to create this component. For more information, see About the joints.def file.

Selection order

1. Beam or column

2. First brace
3. Second and subsequent braces
4. Click the middle mouse button to create the component

Bolted gusset (11, 196)

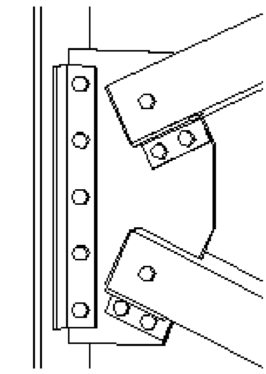
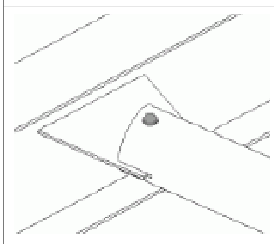
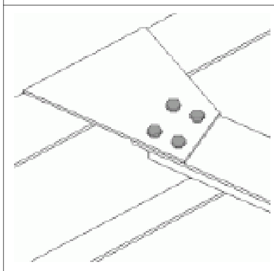
Connects 1 to 10 braces to a beam or column using a gusset plate, which is bolted or welded to the beam or column. Bolts the braces to the gusset plate. Creates optional clip angles, either at the ends of the braces, or on each side.

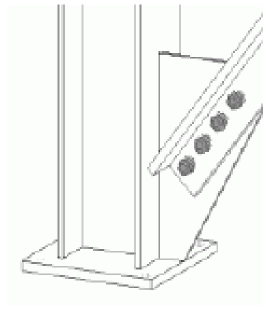
Profiles

Parts created

- Gusset plate
- Clip angles or shear tabs (optional) connecting the gusset plate to the beam or column
- Clip angles (optional) connecting the brace to the gusset plate
- Connection plates
- Seal plates (hollow braces)

Use for

Situation	Description
	**Brace profile**: RHS **Connection method**: • Gusset plate bolted to beam flange using a clip angle • Braces slotted around the gusset plate and attached to it using bolts and clip angles
	**Brace profile**: Tube **Connection method**: • Gusset plate welded to beam web • Brace notched around gusset plate and pinned to it
	**Brace profile**: T **Connection method**: • Gusset plate welded to beam flange • Brace bolted to gusset plate

Situation	Description
	**Brace profile**: L **Connection method**: • Gusset plate welded to column flange • Brace bolted to gusset plate

Before you start Create a beam or column and 1 to 10 braces.

Defining properties Use the following tabs in the dialog box to define the properties of the part this component creates:

Tab	Contents	See also
Picture	Dimensions that define the position, shape, and chamfer of the gusset plate.	Modifying gusset plate shape on page 1289
Gusset	Gusset, connection plates, and clip angle properties; clip angle limit for parallel bracing.	Parts in steel connections Defining gusset plate type on page 1290 Defining gusset plate position on the beam or column (11) on page 1293 Selecting gusset plate connection material (11) on page 1291
Brace conn	Seal plate properties, brace notch and slot properties.	Parts in steel connections Creating tongue plates (20, 22, 56) on page 1295
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Gussetbolt	Option to weld or bolt clip angles to gusset plate and brace, option to weld or bolt gusset plate to beam or column, bolt group properties for gusset plate bolts.	Bolts Position of gusset bolts (11) on page 1305
Bracebolts1	Bolt group properties for the bolts that connect the first brace picked to the gusset plate.	

Tab	Contents	See also
Bracebolts2 **Bracebolts3**	Bolt group properties for the bolts that connect the second and subsequent braces picked to the gusset plate.	
Angle bolts	Option to use clip angles or shear tabs to connect the brace to the gusset, bolt group properties for bolts that connect optional clip angles.	Parts in steel connections Bolts Using clip angles to connect braces (11, 57) on page 1298
Analysis	Information used in structural analysis	Analysis tab

Tekla Structures uses values in the `joints.def` file to create this component. For more information, see About the joints.def file.

Bolted gusset (196)

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 connection Tube crossing (22) on page 1249 between the gusset plate and the hollow secondary part.

To define which property file **Tube crossing (22)** uses, go to **Brace bolts 2** tab, and enter the property file name in the field **Attributes for Tube crossing (22)**.

Selection order

1. The beam or column
2. First brace
3. Second and subsequent braces
4. Click the middle mouse button to create the component

Bracing cross (19)

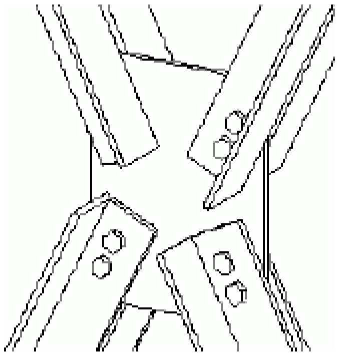
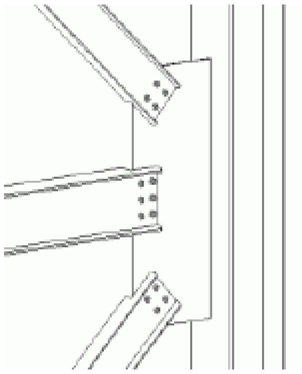
Bolts one or more twin-profile braces to an existing gusset plate.

Profiles Braces: Twin profiles

To create a gusset plate, use the Standard gusset (1065) on page 1282 component, or the **Contour Plate** command.

Parts created –

Use for

Situation	Description
	**Brace profile**: L **Connection method**: • Braces bolted directly to gusset plate
	**Brace profile**: W **Connection method**: • Braces notched around gusset plate and bolted to it

Before you start Create a gusset plate and 1 to 10 braces.

Defining properties Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Parameters	Option to notch brace flange, notch properties.	
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Bolts	Bolt group properties for the bolts that connect the braces to the gusset plate.	Bolts
Analysis	Information used in structural analysis	Analysis tab

Tekla Structures uses values in the `joints.def` file to create this component. For more information, see About the joints.def file.

Selection order

1. Gusset plate
2. First brace
3. Second and subsequent braces
4. Click the middle mouse button to create the component

Tube crossing (22)

Bolts one or more braces to an existing gusset plate, directly, or using connection plates. Seals braces.

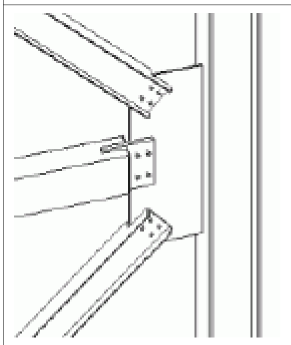
Profiles Braces: W, RHS, tube

To create a gusset plate, use the Standard gusset (1065) on page 1282 component or the **Contour Plate** command.

Parts created

- Connection plates
- End plates
- Tongue plates
- Cover plates

Use for

Situation	Description
	**Brace profile**: RHS, W **Connection method**: • RHS brace bolted to gusset plate using a tongue plate • W-profile braces bolted directly to gusset plate

Before you start Create a gusset plate and 1 to 10 braces.

Defining properties Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions that define connection plate width, brace notch, and clearance	

Tab	Contents	See also
	between the gusset plate and brace.	
Brace conn	Properties of connection, end, tongue, and cover plates. Options defining the brace connection.	Parts in steel connections Defining the brace connection on page 1294 Creating tongue plates (20, 22, 56) on page 1295
Brace bolts	Bolt group properties for the bolts that connect the braces to the gusset plate.	Bolts
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Rib plates	Cover plate and cross plate properties.	
Analysis	Information used in structural analysis	Analysis tab

Tekla Structuresuses values in the `joints.def` file to create this component. For more information, see About the joints.def file.

Selection order

1. Gusset plate
2. First brace
3. Second and subsequent braces
4. Click the middle mouse button to create the component

Std bracing connection (67)

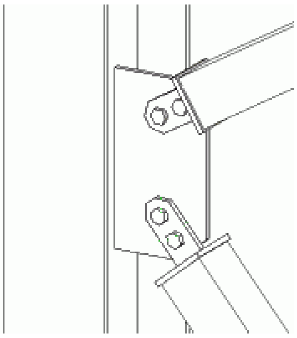
Connects 1 or 2 braces to a beam or column, using a gusset plate and connection plates. Seals hollow and tube profile braces. You can define different properties for the upper and lower brace connections.

Profiles Braces: RHS, tube

Parts created

- Gusset plate
- Connection plates
- Seal plates

Use for

Situation	Description
	**Brace profile**: RHS **Connection method**: • Gusset plate welded to column web • Brace bolted to gusset plate using chamfered connection plates.

Before you start Create a beam or column and 1 or 2 braces.

Defining properties Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions that define the location of the braces on the gusset plate, connection plate chamfer, end plate clearance.	Parts in steel connections
Parts	Properties of all plates.	Parts in steel connections
Gusset	Gusset plate properties and location.	Parts in steel connections Modifying gusset plate shape on page 1289
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Bracebolts1	Bolt group properties of the bolts connecting the connection plate to the gusset plate for the first brace picked.	Bolts
Bracebolts2	Bolt group properties of the bolts connecting the connection plate to the gusset plate for the second and subsequent braces picked.	
Analysis	Information used in structural analysis	Analysis tab

Selection order

1. Beam or column
2. First brace

3. Second and subsequent braces
4. Click the middle mouse button to create the component

Wrapped cross (61)

Bolts one or more braces to an existing gusset plate, using connection plates and clip angles.

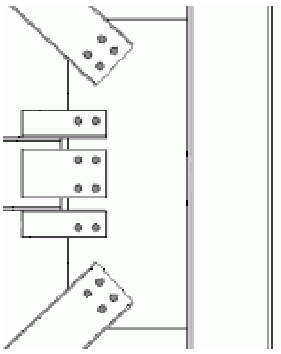
Profiles

To create a gusset plate, use the Standard gusset (1065) on page 1282 component or the **Contour Plate** command.

Parts created

- Clip angles
- Connection plates

Use for

Situation	Description
	**Brace profile**: W **Connection method**: • Braces bolted to gusset plate using clip angles and connection plates

Before you start

Create a gusset plate and 1 to 10 braces.

Defining properties

Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Gap between the gusset plate and brace.	
Brace conn	Properties of connection, filler, and shim plates, and shear tabs; options to create clip angles or shear tabs, filler and shim plates.	Parts in steel connections Creating filler plates (58, 61, 62, 63) on page 1300 Creating shim plates (58, 61, 62, 63) on page 1300
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab

Tab	Contents	See also
Brace bolts	Bolt group properties of the bolts connecting the connection plate to the gusset plate and brace.	Bolts
Angle bolts	Bolt group properties of the bolts that connect the clip angles to the braces.	
Analysis	Information used in structural analysis	Analysis tab

Tekla Structures uses values in the `joints.def` file to create this component. For more information, see About the joints.def file.

Selection order

1. Gusset plate
2. First brace
3. Second and subsequent braces
4. Click the middle mouse button to create the component

Gusseted cross (62)

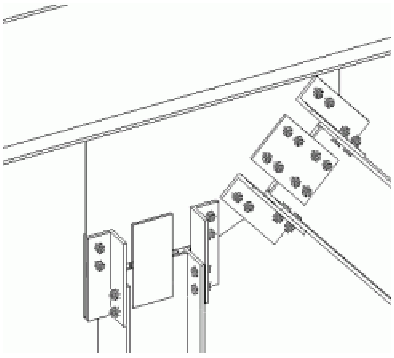
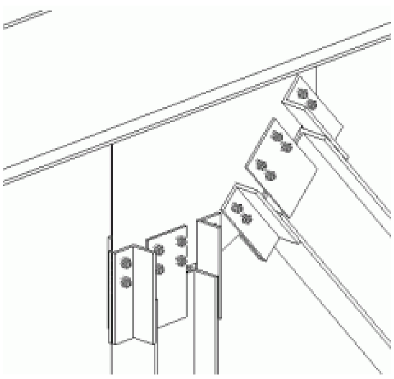
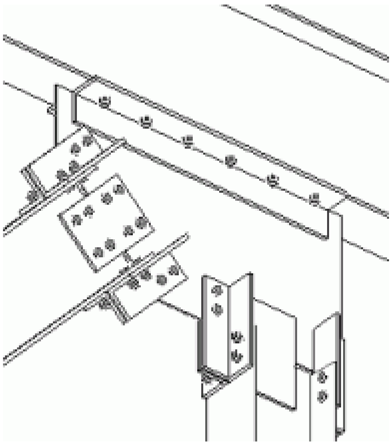
Bolts 1 to 10 braces to a beam or column using a gusset plate. Welds or bolts the gusset plate to the beam or column. Bolts braces to the gusset plate using clip angles and connection plates.

Profiles Braces: U, W

Parts created

- Gusset plate
- Clip angles
- Connection plates
- Filler plates
- Shim plates

Use for

Situation	Description
	**Brace profile**: W **Connection method**: • Gusset plate welded to beam • Different connection materials used for each brace
	**Brace profile**: W **Connection method**: • Gusset plate welded to beam • Braces bolted to gusset plate using connection plates and clip angles.
	**Brace profile**: W **Connection method**: • Gusset plate welded to beam • Different connection materials used for each brace

Before you start Create a beam or column and 1 to 10 braces

Defining properties Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions that define the position and shape of the gusset plate, brace notch properties.	Modifying gusset plate shape on page 1289

Tab	Contents	See also
Gusset	Properties of gusset and connection plates, and angle profiles.	Parts in steel connections Modifying gusset plate shape on page 1289 Defining gusset plate position on the brace on page 1292 Defining gusset plate type on page 1290 Defining chamfer dimensions on page 1292 Specifying gusset plate connection material (11, 20, 62) on page 1293
Brace conn	Properties of connection, filler, shim, and shear tabs; options to create clip angles or shear tabs, filler and shim plates.	Parts in steel connections Creating filler plates (58, 61, 62, 63) on page 1300 Creating shim plates (58, 61, 62, 63) on page 1300
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Gusset conn	Options to weld or bolt clip angles to gusset plate and braces, options to bolt or weld gusset plate to beam or column, bolt group properties for gusset plate bolts.	Bolts
Bracebolts1	Bolt group properties for the bolts in the upper, or only connection plate.	
Bracebolts2	Bolt group properties for the bolts in the middle connection plate.	
Bracebolts3	Bolt group properties for the bolts in the lower connection plate.	
Analysis	Information used in structural analysis	Analysis tab

Tekla Structures uses values in the `joints.def` file to create this component. For more information, see About the joints.def file.

Selectin order

1. Beam or column
2. First brace
3. Second and subsequent braces
4. Click the middle mouse button to create the component

The order in which you pick the braces is important. It can affect the position of braces on the gusset plate. See Picking order affects brace position on page 1290.

Portal bracing (105)

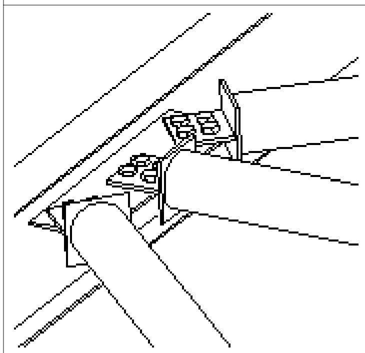
Connects up to 3 hollow braces to a beam or column, using a gusset plate and Tees.

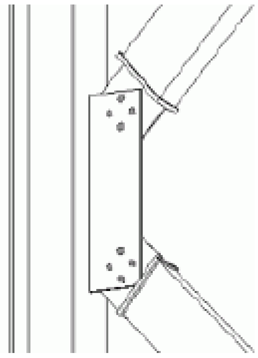
Profiles RHS, tube

Parts created

- Gusset plate
- Tees

Use for

Situation	Description
	**Brace profile**: Tube **Connection method**: • Gusset plate welded to beam • Braces bolted to gusset plate using tees

Situation	Description
	**Brace profile**: RHS **Connection method**: • Gusset plate welded to column • Braces bolted to gusset plate using tees

Do not use for Braces that are not in the same plane.

Before you start Create up to three braces all in the same plane, and a beam.

Defining properties Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Parts	Properties of the gusset plate and the Tees at the ends of the braces.	Defining Tees (105) on page 1306
Parameters	Tee dimensions, clearances, option to chamfer gusset plate, position of gusset plate.	
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Bolts	Bolt group properties of the bolts use to connect the first brace picked to the gusset plate.	Bolts
Bolts 2 **Bolts 3**	Bolt group properties of the bolts use to connect the second and third brace picked to the gusset plate.	
Analysis	Information used in structural analysis	Analysis tab

Selection order

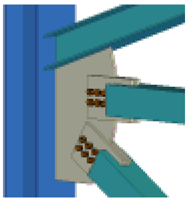
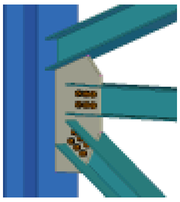
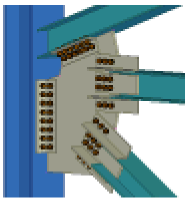
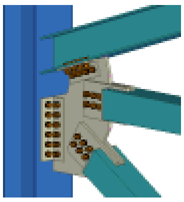
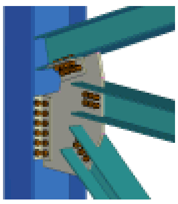
1. Beam or column
2. First brace
3. Second and third braces
4. Click the middle mouse button to create the component

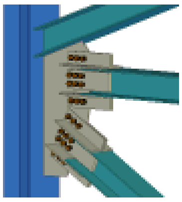
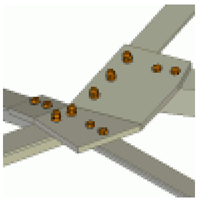
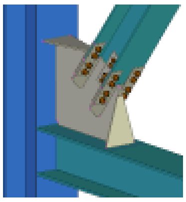
15.3 Corner bracing connections

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
Corner tube gusset (56) on page 1259		Bolts braces to a gusset plate using connection plates and optional tongue plates. Seals hollow braces.
Corner bolted gusset (57) on page 1261		Bolts braces to a gusset plate. Welds the gusset plate to one or both of the parts that form the corner. Seals hollow braces.
Wraparound gusset (58) on page 1263		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.
Hollow brace wraparound gusset (59) on page 1265		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 connect the gusset plate to the main parts.
Wraparound gusset cross (60) on page 1268		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

Component	Image	Description
		the gusset plate to the main parts.
Corner wrapped gusset (63) on page 1271		Bolts braces to a gusset plate using clip angles and connection plates. Welds the gusset plate to one of the main parts.
Bent gusset (140) on page 1274		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.
Heavy brace (165) on page 1275		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)

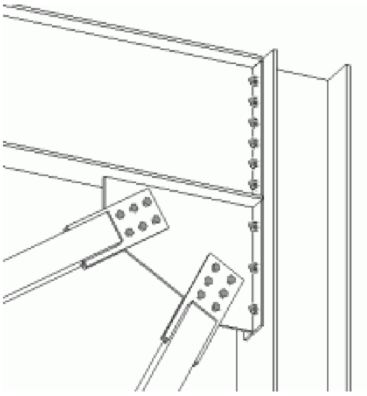
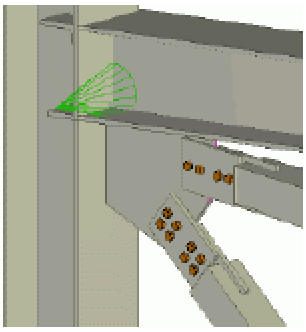
Connects 1 to 10 hollow braces to the corner where two parts meet, using a gusset plate. Bolts braces to the gusset plate using a connection plate or tongue plate slotted into the brace. Option to create extra connection plates. Seals braces.

Profiles Braces: RHS, tube

Parts created

- Gusset plate
- Connection plates
- Tongue plates (optional)
- Cover plates (optional)
- Seal plates

Use for

Situation	Description
	**Brace profile**: RHS **Framing type**: Column and extended end plate **Connection method**: • Gusset plate welded to extended end plate • Braces bolted to gusset plate using tongue plates
	**Brace profile**: RHS **Framing type**: Column and beam **Connection method**: • Gusset plate welded to column flange • Braces bolted to gusset plate using tongue plates, connection and cover plates

Before you start Create two parts that form a corner, and 1 to 10 braces.

Defining properties Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions that define the position, shape, and chamfer of the gusset plate.	Modifying gusset plate shape on page 1289
Gusset	Gusset plate properties, properties of brace notches.	Defining gusset plate type on page 1290 Defining gusset plate position on the brace on page 1292
Brace conn	Connection, seal, tongue, and cover plate properties.	Parts in steel connections Defining the brace connection on page 1294 Creating tongue plates (20, 22, 56) on page 1295
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab

Tab	Contents	See also
Tubebolts1	Bolt group properties for the bolts that connect the first brace picked to the gusset plate.	Bolts
Tubebolts2	Bolt group properties for the bolts that connect the second and subsequent braces picked to the gusset plate.	
Analysis	Information used in structural analysis	Analysis tab

Tekla Structures uses values in the `joints.def` file to create this component. For more information, see About the joints.def file.

Selection order

1. The first part that forms the corner
2. First brace
3. Second and subsequent braces
4. The second part that forms the corner (Tekla Structures connects the gusset plate to this part)
5. Click the middle mouse button to create the component

Corner bolted gusset (57)

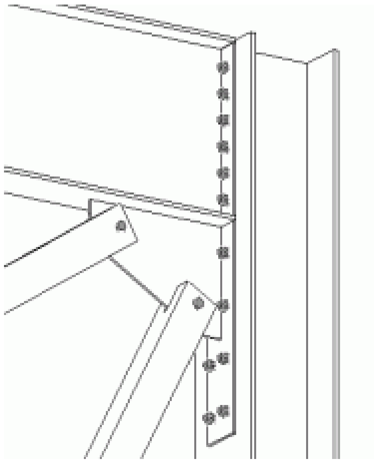
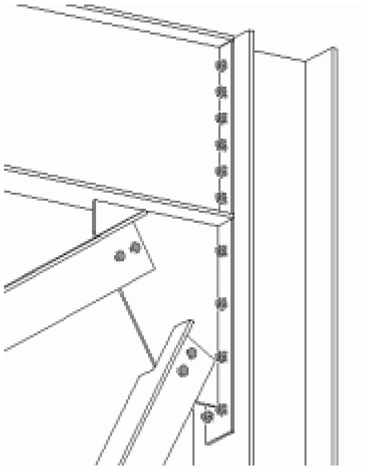
Connects 1 to 10 braces to the corner where two parts meet, using a gusset plate. Welds the gusset plate to one or both of the parts that form the corner. Creates optional clip angles, either at the ends of the braces, or on each side. Seals RHS or tube braces.

Profiles T, L, RHS, tube, twin

Parts created

- Gusset plate
- Clip angles (optional)
- Seal plates

Use for

Situation	Description
	**Brace profile**: RHS **Framing type**: Column and extended end plate **Connection method**: • Gusset plate welded to extended end plate • Braces pinned to the gusset plate
	**Brace profile**: T, L **Framing type**: Column and extended end plate **Connection method**: • Gusset plate welded to extended end plate • Braces bolted to gusset plate

Before you start Create 2 parts to form a corner, and 1 to 10 braces.

Defining properties Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions that define the position and shape of the gusset plate.	Modifying gusset plate shape on page 1289
Gusset	Gusset plate properties, brace notch properties, weld options.	Defining gusset plate properties on page 1289 Defining gusset plate position on the brace on page 1292
Bracebolts1	Bolt group properties for the bolts that connect the first brace picked to the gusset plate.	Bolts

Tab	Contents	See also
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Bracebolts2	Bolt group properties for the bolts that connect the second and subsequent braces picked to the gusset plate.	Bolts
Angle bolts	Option to create clip angles, location of clip angles, bolt group properties for the bolts that connect the clip angles to the gusset plate.	
Analysis	Information used in structural analysis.	Analysis tab

Tekla Structures uses values in the `joints.def` file to create this component. For more information, see About the joints.def file.

Selection order

1. The first part that forms the corner (Tekla Structures connects the gusset plate to this part)
2. First brace
3. Second and subsequent braces
4. The second part that forms the corner
5. Click the middle mouse button to create the component

Wraparound gusset (58)

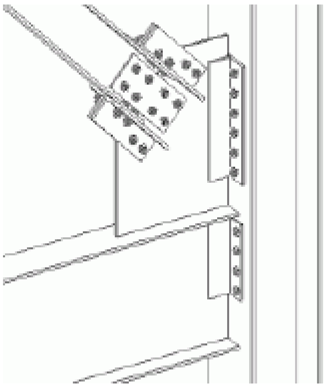
Connects 1 to 10 braces to the corner where two or three parts meet, usually two beams and a column, using a gusset plate. Option to wrap the gusset plate around the third part, usually a column. Bolts or welds the brace web to the gusset plate using connection plates, and bolts or welds the brace flange 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.

Profiles Braces: W, C

Parts created

- Gusset plate
- Clip angles or shear tabs
- Connection plates

Use for

Situation	Description
	**Brace profile**: W **Framing type**: Beam and column **Connection method**: • Gusset plate bolted to column flange using a clip angle • Braces bolted to 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.

Defining properties Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Description	See also
Picture	Dimensions that define the shape of the gusset plate, location of braces and clip angles; clearances; work point location.	Modifying gusset plate shape on page 1289 Specifying work point location (58, 59, 60) on page 1306
Gusset	Properties of gusset and fastener plates, and clip angles.	Parts in steel connections Defining gusset plate type on page 1290 Defining wraparound gusset plates (58, 59, 60) on page 1291 Defining chamfer dimensions on page 1292
Brace conn	Properties of connection, filler, shim, and shear tabs; options to create clip angles or shear tabs plates, filler and shim plates; brace connection properties.	Parts in steel connections Creating filler plates (58, 61, 62, 63) on page 1300 Creating clip angles or shear tabs (58, 61, 62, 63) on page 1298 Creating shim plates (58, 61, 62, 63) on page 1300 Defining the brace connection on page 1294

Tab	Description	See also
Gusset bolts 1	Connection options and bolt group properties for the first brace picked.	Bolts
Gusset bolts 2	Connection options and bolt group properties for the second and subsequent braces picked.	
Bracebolts1	Bolt group properties for the bolts that connect the first brace picked to the gusset plate.	
Bracebolts2	Bolt group properties for the bolts that connect the second and subsequent braces picked to the gusset plate.	
Beam cut	Properties of end preparations, rat holes, and cuts to beam flange.	Beam cut
Analysis	Information used in structural analysis.	Analysis tab

Tekla Structures uses values in the `joints.def` file to create this component. For more information, see About the joints.def file.

Selection order

1. The first part that forms the corner
2. First brace
3. Second and subsequent braces
4. The second part that forms the corner
5. To wrap the gusset plate around the column where two beams and a column meet, pick the column (optional)
6. Click the middle mouse button to create the component

Hollow brace wraparound gusset (59)

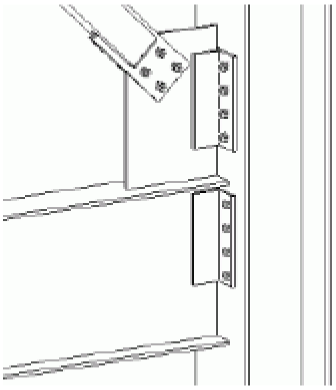
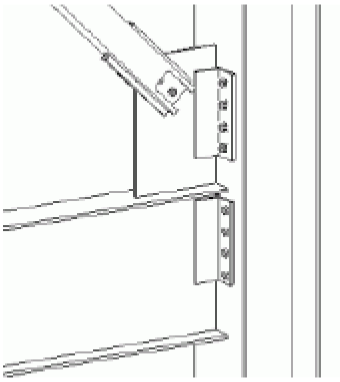
Connects 1 to 10 braces to the corner where 2 or 3 parts meet, using a gusset plate. Option to wrap the gusset plate around the third part, usually a column. Bolts or welds the brace web to the gusset plate using connection plates, and bolts or welds the brace flange to the gusset plate using clip angles. Either connects the gusset plate directly to the existing parts, or uses clip angles or connection plates. Seals braces.

Profiles Braces: RHS, tube

Parts created

- Gusset plate
- Connection plates (optional)
- Clip angles (optional)
- End plates

Use for

Situation	Description
	**Brace profile**: RHS **Framing type**: Beam and column **Connection method**: • Gusset plate bolted to column flange using a clip angle • Brace bolted to gusset plate using a tongue plate
	**Brace profile**: RHS **Framing type**: Beam and column **Connection method**: • Gusset plate bolted to column flange using a clip angle • Brace 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.

Before you start Create 2 or 3 parts that form a corner, and 1 to 10 braces.

Defining properties Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions that define the shape of the gusset plate, the width of the connection plate, and location of clip angles; clearances; brace	Parts in steel connections Defining gusset plate type on page 1290

Tab	Contents	See also
	notch properties; work point location.	Defining wraparound gusset plates (58, 59, 60) on page 1291 Notching the brace (22, 59) on page 1297 Specifying work point location (58, 59, 60) on page 1306
Gusset	Properties of gusset and connection plates, and clip angles; option to create clip angles or shear tabs.	Parts in steel connections Modifying gusset plate shape on page 1289 Defining gusset plate type on page 1290 Defining chamfer dimensions on page 1292
Brace conn	Properties of connection, end, tongue, and cover plates. Options defining the brace connection.	Parts in steel connections Defining the brace connection on page 1294 Notching the brace (22, 59) on page 1297
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Gusset conn 1	Options for the first part picked: options to weld or bolt clip angle to gusset plate and first part picked, bolt group properties for clip angle bolts.	Bolts
Gusset conn 2	Options for the second part picked. Same as Gusset conn 1.	
Bracebolts1	Bolt group properties for the bolts that connect the first brace picked to the gusset plate.	
Bracebolts2	Bolt group properties for the bolts that connect the second and subsequent braces picked to the gusset plate.	
Analysis	Information used in structural analysis.	Analysis tab

Tekla Structures uses values in the `joints.def` file to create this component. For more information, see About the joints.def file.

Selection order

1. The first part that forms the corner
2. First brace
3. Second and subsequent braces
4. The second part that forms the corner
5. To wrap the gusset plate around the column where two beams and a column meet, pick the column (optional)
6. Click the middle mouse button to create the component

Wraparound gusset cross (60)

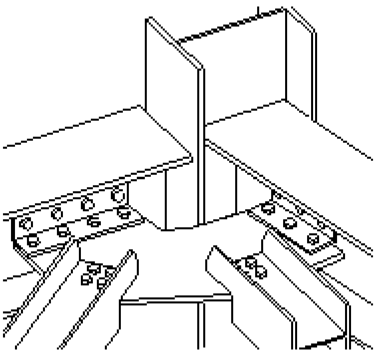
Connects 1 to 10 braces to a gusset plate where 2 or 3 parts meet to form a corner, using clip angles and connection plates. Option to wrap the gusset plate around the third part, usually a column. Connects the gusset plate to the parts using clip angles or connection plates, or welds it directly to the first part picked. Creates optional clip angles, either at the ends of the braces, or on each side. Seals hollow braces.

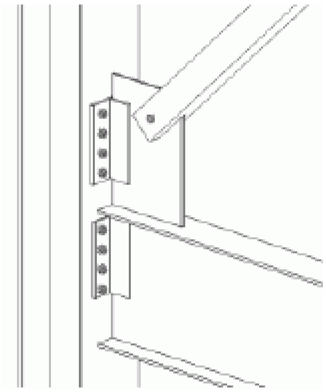
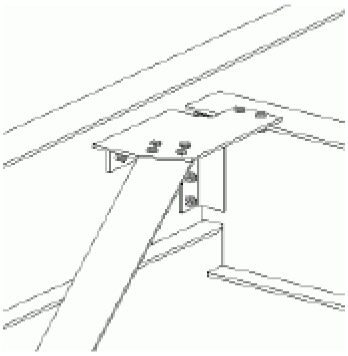
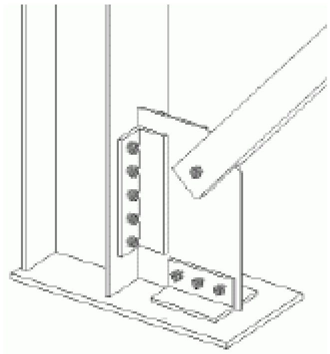
Profiles Braces: L, W, WT, RHS, tube

Parts created

- Gusset plate
- Connection plates
- Clip angles (optional)
- Seal plates (hollow braces)

Use for

Situation	Description
	**Brace profile**: W **Framing type**: Column and 2 beams **Connection method**: • Gusset plate bolted to beams using clip angles • Braces notched and bolted to gusset plate

Situation	Description
	**Brace profile**: RHS **Framing type**: Column and beam **Connection method**: • Gusset plate bolted to column using a clip angle • Brace pinned to gusset plate
	**Brace profile**: L **Framing type**: Two beams with different elevations **Connection method**: • Gusset plate notched and bolted to both beams using clip angles • Brace bolted to gusset plate
	**Brace profile**: RHS **Framing type**: Column and column base plate **Connection method**: • Gusset plate bolted to column and base plate using clip angles • Brace pinned to gusset plate

In the above examples, we loaded the **Default** connection properties and set **Rule group** to **Default**.

Before you start Create 2 or 3 parts that meet to form a corner, and 1 to 10 braces

Defining properties Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions that define the position and shape of the gusset plate; workpoint location.	Modifying gusset plate shape on page 1289 Specifying work point location (58, 59, 60) on page 1306
Gusset	Properties of gusset and connection plates, and angle profiles.	Parts in steel connections Defining gusset plate type on page 1290 Modifying gusset plate shape on page 1289 Defining wraparound gusset plates (58, 59, 60) on page 1291 Defining chamfer dimensions on page 1292
Brace conn	Options to notch and cut braces, seal plate properties.	Notching brace flange (60) on page 1296 Cutting braces (60) on page 1297
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Gussetbolt1	Options for the first part picked: weld or bolt clip angle to gusset plate and first part picked, bolt group properties for clip angle bolts.	Bolts
Gussetbolt2	Options for the second part picked: weld or bolt clip angle to gusset plate and second part picked, bolt group properties for clip angle bolts.	
Bracebolts1	Bolt group properties for the bolts that connect the first brace picked to the gusset plate.	
Bracebolts2	Bolt group properties for the bolts that connect the second and subsequent braces picked to the gusset plate.	

Tab	Contents	See also
Anglebolts	Option to create and bolt clip angle to the ends, or on either side of the braces; bolt group properties.	
Analysis	Information used in structural analysis.	Analysis tab

Tekla Structures uses values in the `joints.def` file to create this component. For more information, see Using the joints.def file.

Selection order

1. The first part that forms the corner
2. First brace
3. Second and subsequent braces
4. The second part that forms the corner
5. To wrap the gusset plate around the column where two beams and a column meet, pick the column. (optional)
6. Click the middle mouse button to create the component

Corner wrapped gusset (63)

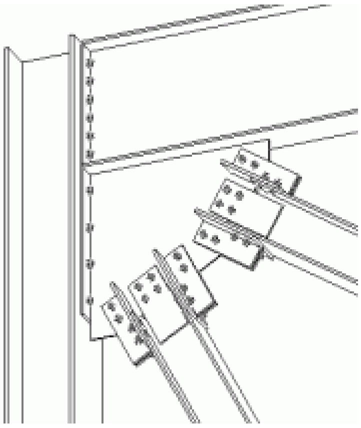
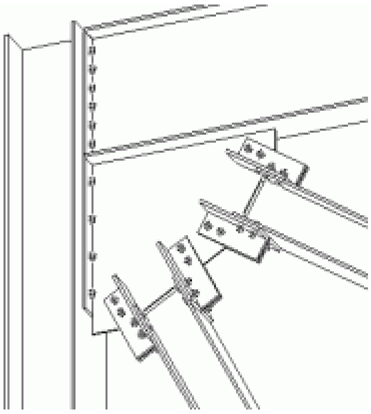
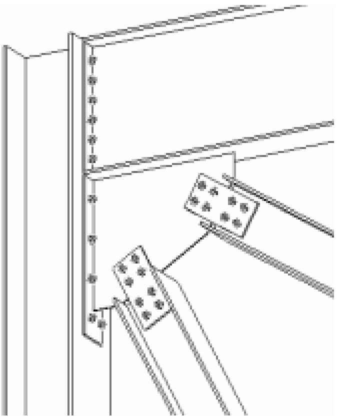
Bolts 1 to 10 braces to a gusset plate where 2 parts meet to form a corner, using clip angles and connection plates. Welds the gusset plate to one of the parts that form the corner.

Profiles W, U, C

Parts created

- Gusset plate
- Connection plate between the gusset plate and the brace web
- Shear tab between the gusset plate and the brace flange
- Filler plate between the connection plate and the brace web (optional)
- Shim plates (optional)
- Clip angles

Use for

Situation	Description
	**Brace profile**: W **Framing type**: Column and extended end plate **Connection method**: • Gusset plate welded to extended end plate • Braces bolted to gusset using clip angles on flanges and connection plates on webs
	**Brace profile**: W **Framing type**: Column and extended end plate **Connection method**: • Gusset plate welded to extended end plate • Braces bolted to gusset using clip angles on flanges
	**Brace profile**: W **Framing type**: Column and extended end plate **Connection method**: • Gusset plate welded to extended end plate • Braces bolted to gusset using connection plates on webs

Before you start Create 2 parts that form a corner, and 1 to 10 braces.

Defining properties Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions that define gusset plate shape.	Modifying gusset plate shape on page 1289

Tab	Contents	See also
Gusset	Gusset plate properties, brace notch properties, weld options.	Parts in steel connections Defining gusset plate type on page 1290 Defining gusset plate position on the brace on page 1292
Brace conn	Properties of connection, filler and shim plates; options to create clip angles or shear tabs, filler and shim plates.	Parts in steel connections Creating filler plates (58, 61, 62, 63) on page 1300 Creating clip angles or shear tabs (58, 61, 62, 63) on page 1298 Creating shim plates (58, 61, 62, 63) on page 1300
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Bracebolts1	Bolt group properties for the bolts in the connection plate that connects the first brace picked to the gusset plate.	Bolts
Bracebolts2	Bolt group properties for the bolts in the connection plates that connect the second and subsequent braces picked to the gusset plate.	
Angle bolts 1	Bolt group properties for the bolts connecting clip angles to the first brace picked.	
Angle bolts 2	Bolt group properties for the bolts connecting clip angles to the second and subsequent braces picked.	
Analysis	Information used in structural analysis.	Analysis tab

Tekla Structures uses values in the `joints.def` file to create this component. For more information, see Using the joints.def file.

Selection order

1. The first part that forms the corner
2. First brace

3. Second and subsequent braces
4. The second part that forms the corner
5. Click the middle mouse button to create the component

Bent gusset (140)

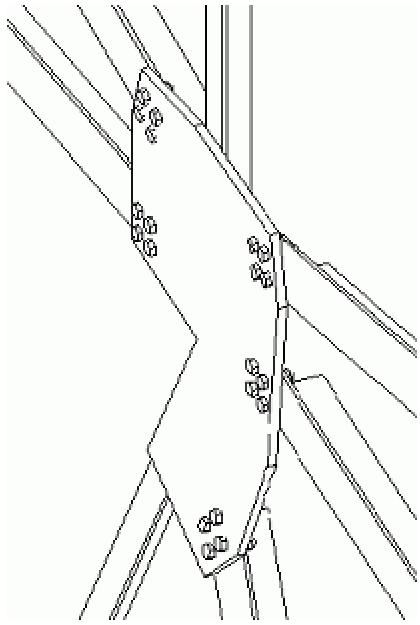
Connects braces in different planes to one or more beams or columns that are in different planes. Creates a gusset plate that is bent along two bending lines. Seals tube or hollow profile braces.

Profiles Braces: L

Parts created

- Gusset plate
- Seal plates

Use for

Situation	Description
	

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.

Defining properties Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions that define gusset plate shape, clearance	Modifying gusset plate shape on page 1289

Tab	Contents	See also
	between braces, cut options for ends of braces.	
Gusset	Gusset plate properties, brace notch properties, weld options. Option to cut corner of gusset plate for single brace connections.	Defining gusset plate properties on page 1289 Defining the bend line in skewed connections (140) on page 1293
Brace conn	Bolt group properties of the bolts connecting the gusset plate to the first beam or column picked.	Bolts
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Bracebolts1	Bolt group properties for the bolts that connect the first brace picked to the gusset plate.	Bolts
Bracebolts2 **Bracebolts3**	Bolt group properties for the bolts that connect the second and subsequent braces picked to the gusset plate.	
Plates	Options to create filler plates and to bolt braces to both gusset plate and the first or second beam or column picked.	
Analysis	Information used in structural analysis.	Analysis tab

Selection order

1. Beam or column in the first plane
2. First brace
3. Second and subsequent braces in the first plane
4. Braces in planes 2 and 3
5. The beam or column in the second plane
6. Click the middle mouse button to create the component

Heavy brace (165)

Connects a single brace to a gusset plate where 2 parts meet to form a corner.

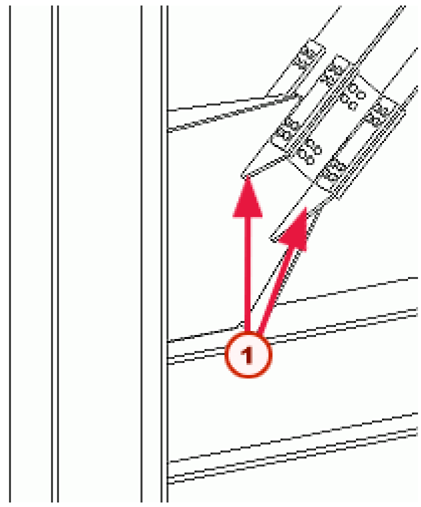
Profiles Columns and beams: H, RHS, tube

Braces: W

Parts created

- Gusset plate
- Connection plates
- Rib plates
- Filler plates
- Stiffeners

Use for

Situation	Description
	**Column or beam profile: RHS, tube, I** **Brace profile**: H **Framing type**: Column and beam **Connection method**: • Gusset plate welded column • Brace web bolted to gusset using connection plate. **1** Rib plates

Do not use for Sloped or skewed beams

Before you start Create 2 parts that meet to form a corner, and one 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
Picture	Dimensions of gusset and rib plate, clearance between plate and brace.	Parts in steel connections
Parts	Properties of stiffeners and gusset, flange, web, rib, flange filler and web filler plates.	Parts in steel connections Defining plate sizes in marketsizes.dat (165, Japan) on page 1301

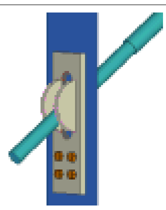
Tab	Contents	See also
Gusset	Gusset plate chamfers, gap between gusset and brace.	
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Ribs	Dimensions that define the size and location of rib plates, option to create ribs of equal length.	Defining rib plate dimensions (165) on page 1302
Stiffeners	Dimensions of stiffener plates.	
Web bolts	Bolt group properties for the bolts fastening the web connection plate to the gusset plate.	Bolts
Flange bolts	Bolt group properties for the bolts fastening the flange connection plate to the gusset plate.	
Analysis	Information used in structural analysis.	Analysis tab

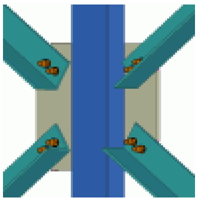
Selection order

1. First part that forms the corner
2. First brace
3. Second and subsequent braces
4. Second part that forms the corner
5. Click the middle mouse button to create the component

15.4 Windbracing connections

Use the following components to automatically create windbracing:

Component	Image	Description
Windbracing (1) on page 1278		Connects a single brace to a beam or column, using a connection plate, round plates, a threaded rod, and nuts.

Component	Image	Description
Windbrace connection (110) on page 1279		Bolts braces to a gusset plate. Welds or bolts the gusset plate to the main part. Braces can be: • Located in the same work plane as the beam or column, or skewed • On the same side of the beam or column, or on each side

Windbracing (1)

Connects a single hollow brace to a beam or column, using a connection plate, threaded rod, and nuts. Welds round plates to the connection plate and bolts it to the beam or column.

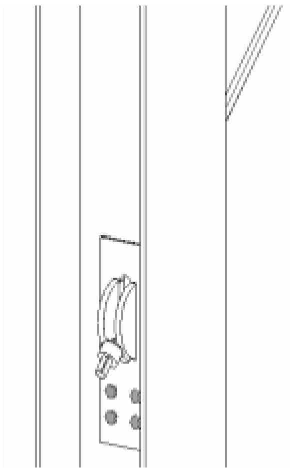
Tekla Structures creates the threaded rod using the **Detailing** --> **Attach Part** command. This means that the rod and brace are treated as a single part when you use commands like **Delete**, **Move** or **Copy**.

Profiles Brace: RHS, tube

Parts created

- Connection plate
- Round plates (2)
- Filler plate
- Threaded rod
- Nuts on rod (2)

Use for

Situation	Description
	**Column or beam profile: H** **Brace profile**: RHS

Before you start Create a beam or column and one 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
Picture	Dimensions that define the size and position of the connection and round plates.	
Parts	Properties of all plates, nuts, and washers.	Parts in steel connections Defining part thickness (1) on page 1304
Brace conn	Properties of the hole in the beam or column and the slot in the connection plate, position of round plates, rod dimensions.	Defining hole type (1) on page 1304
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Bolts	Bolt group properties for the bolts that fasten the connection plate to the beam or column.	Bolts
Analysis	Information used in structural analysis.	Analysis tab

Selection order

1. Beam or column
2. Brace

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 skewed
- On the same side of the beam or column, or on each side

Profiles Braces: L

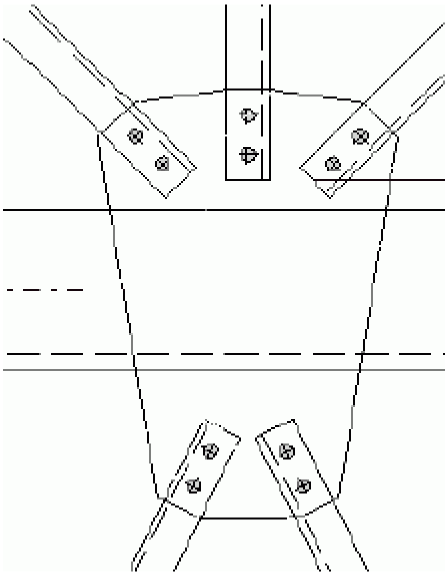
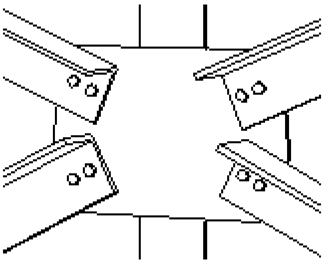
Parts created

- One gusset plate, if the braces are located on the same side of the beam or column

OR

- 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.

Use for

Situation	Description
	Two gusset plates (welded in the shop to form a folded plate) **Brace profile**: L **Connection method**: Braces bolted directly to gusset plate
	**Column or beam profile: L** **Brace profile**: L **Connection method**: • Gusset plate welded column • Braces web bolted to gusset plate. No stiffeners.

Before you start Create a beam or column and 1 to 10 braces.

Defining properties Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions that define gusset plate shape; brace clearances and cut options for ends of braces.	Modifying gusset plate shape on page 1289
Gusset	Gusset plate properties, brace notch properties, weld options.	Parts in steel connections Modifying gusset plate shape on page 1289 Defining gusset plate type on page 1290

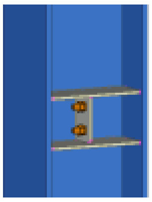
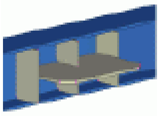
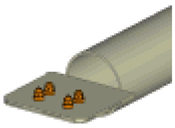
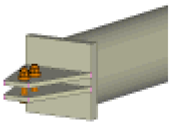
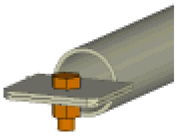
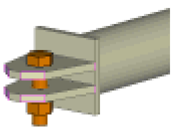
Tab	Contents	See also
		Defining gusset plate position on the brace on page 1292 Creating tongue plates (20, 22, 56) on page 1295 Creating an orientation hole in the gusset plate (110) on page 1293 Dimensioning holes in drawings (110, 140) on page 1305
Gusset conn	Bolt group properties of the bolts connecting the gusset plate to the beam or column.	Bolts
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Bracebolts1	Bolt group properties for the bolts that connect the braces to the upper, or only gusset plate.	Bolts
Bracebolts2	Bolt group properties for the bolts that connect the braces to the lower gusset plate.	
Brace conn	Option to create filler plates between the braces and the gusset plate; option to bolt the braces to the beam or column, as well as the gusset plate.	Double-bolting braces (110) on page 1297
Analysis	Information used in structural analysis.	Analysis tab

Selection order

1. Beam or column
2. First brace
3. Second and subsequent braces
4. Click the middle mouse button to create the component

15.5 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
Standard gusset (1065) on page 1282		Creates a gusset plate and welds it to the beam or column web. Automatically creates a stiffener on each end of the gusset plate.
Gusset stiffeners (171) on page 1284		Creates stiffener plates and welds them to an existing gusset plate and a beam or column. Options to chamfer the gusset plate and stiffeners.
Crushed tube in points (S46) on page 1285		Creates a tube brace between two points using a tube crushed between bolts.
Gusset tube in points (S47) on page 1286		Creates a tube brace between two points that you pick, using a circular hollow section with 2 Tees at each end.
Crushed tube in bolts (S48) on page 1287		Creates a tube brace using a tube crushed between two existing bolts.
Gusset tube in bolts (S49) on page 1288		Creates a tube brace between two bolts, with tees at both ends.

See also

Standard gusset (1065)

Creates a gusset plate and welds it to the beam or column web. Automatically creates a stiffener on each end of the gusset plate.

Profiles Beam or column: H, W, C

This component creates the gusset plate using the dimensions you specify on the **Parts** tab, not the geometry of the plate.

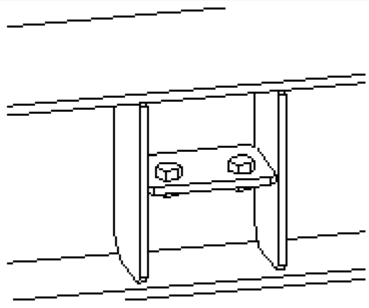
Parts created

- Gusset plate
- Stiffener plates (2)

To create braces and connect them to the gusset plate, use Gusset tube in points (S47) on page 1286, Crushed tube in bolts (S48) on page 1287, or Gusset tube in bolts (S49) on page 1288.

Before you start Create a beam, and a point on the beam to indicate the position of the gusset plate.

Use for

Situation	Description
	**Connection method**: • Gusset plate welded to the beam web

Defining properties Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Gusset and stiffener plate dimensions, clearance between plate and beam, number of bolts, bolt spacing.	
Parts	Gusset and stiffener plate properties.	Parts in steel connections Omitting stiffener plates (1065) on page 1302
Parameters	Position, offset, and rotation of the component.	General tab

Tab	Contents	See also
General	Connection properties, AutoDefaults and AutoConnection rule groups.	
Bolts	Bolt properties of the bolts in the gusset plate, option to create single or multiple bolt groups.	Bolts
Analysis	Information used in structural analysis.	Analysis tab

Selection order

1. Beam
2. Pick a point on the beam to indicate the location of the connection

Gusset stiffeners (171)

Creates 2 or 3 (default) stiffener plates and welds them to an existing gusset plate and a beam or column. Options to chamfer the gusset plate and stiffeners.

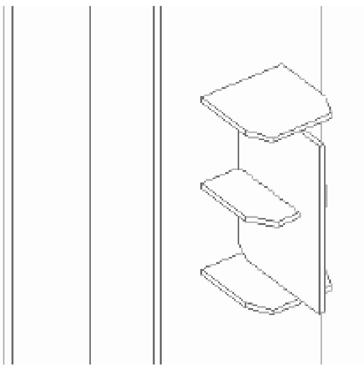
Profiles Beam or column: I, C, tube, RHS

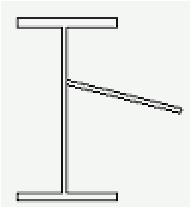
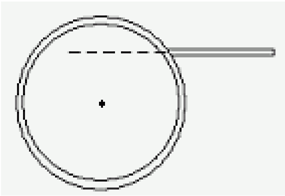
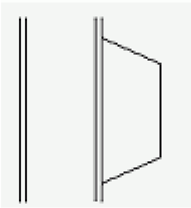
Parts created Stiffener plates

Before you start Create a gusset plate and a beam or column

To create a gusset plate, use the Standard gusset (1065) on page 1282 component or the **Contour Plate** command.

Use for

Situation	Description
Situation	**Description**
	3 stiffeners welded to column flange and gusset plate.

Situation	Description
	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.

Defining properties Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions that indicate the location of the stiffener plates.	
Parts	Properties and shape of stiffeners, number of stiffeners.	Parts in steel connections Defining the number of stiffeners (171) on page 1302
Parameters	Shape and dimensions of stiffener chamfers.	
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Analysis	Information used in structural analysis.	Analysis tab

Selection order

1. Gusset plate
2. Beam or column

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.

You cannot modify the individual objects that this component creates.

Parts created Tube brace

Before you start Create 2 points.

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	See also
Picture	Dimensions that define the location of the bolts.	
Parts	Properties of the tube brace.	Parts in steel connections
Tube pos.	Options that affect the position, plane and class of the tube.	
Bolts	Bolt group properties.	Bolts

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.

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 Points.

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	See also
Picture		
Parts	Properties of the tube, end plate, and tees	Parts in steel connections
Tube pos.	Options that affect the position, plane and class of the tube.	
Bolts	Bolt group properties.	Bolts

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.

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) on page 1282).

Defining properties Use the following tabs in the dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions that define the crushed end of the tube.	
Parts	Properties of the tube.	Parts in steel connections
Parameters	Options that affect the position, plane and class of the tube.	
Bolts		Bolts

Selection order

1. Work plane
2. First bolt
3. Second bolt
4. 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.

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
Picture	Dimensions that define the end of the tube and the tees.	
Parts	Properties of the tube, end plate and Tees.	Parts in steel connections
Parameters	General connection properties.	General tab
Bolts	Properties of bolts.	Bolts

Selection order

1. First bolt

2. Second bolt
3. Click the middle mouse button to create the component

15.6 Defining gusset plate properties

This section explains how to define gusset plate properties for various bracing components.

Click the links below to find out more:

Not all component dialog boxes contain all the properties listed in this section.

Modifying gusset plate shape

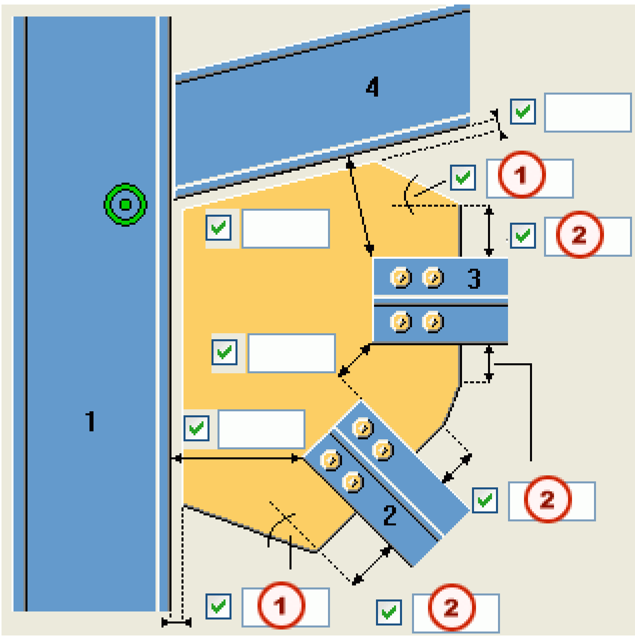
To change shape of a gusset plate, you need to change its dimensions. Bracing components automatically create gusset plates based on the dimensions in the `joints.def` file.

- To only modify the dimensions of the gusset plate for the connections you have selected, enter the new dimensions on the **Picture** tab.
- To modify the dimensions of the gusset plate for all connections that this component creates, edit the dimensions in the `joints.def` file. Tekla Structures uses values in the `joints.def` file to create this component. See Using the joints.def file.

Using the dialog box

To modify the shape of the gusset plate using the dialog box:

1. Go to the **Picture** tab and enter values in any of the following fields (this image is from **Corner bolted gusset (57)**):

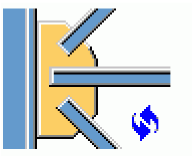


1	Enter angles here.
2	Enter dimensions here.

2. Click the **Apply** button to change any connections you have open.

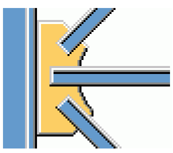
Defining gusset plate type

To define the type of gusset plate to use, go to the **Gusset** tab. The default option is:



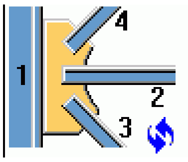
Optimizing plate weight

To optimize plate weight, select this option:

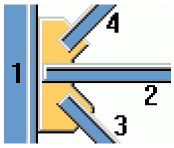


Picking order affects brace position

Optional. When you select the option to optimize plate weight, you can also choose to have the picking order affect the position of the braces. The default option is 'No':

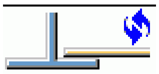


To place the first brace picked closest to the first beam or column picked, select this option:



Selecting gusset plate connection material (11)

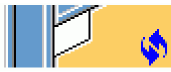
To select the connection material to use to connect the gusset plate to the beam or column, go to the **Gusset** tab. The default option is to weld the gusset plate directly to the beam or column:



There are also options to use clip angles or shear tabs.

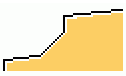
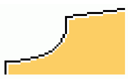
Defining wraparound gusset plates (58, 59, 60)

If the gusset plate clashes with the column, Tekla Structures notches the gusset plate to wrap around the column. To specify the angle of the notch, go to the **Gusset** tab. The default is:



Notch chamfer type

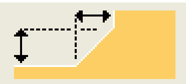
To specify the chamfer type to use for the notch, go to the **Gusset** tab. The options are:

Option	Description
	No chamfer. Notch edges parallel to the edges of the gusset plate.
	Default.
	Creates a rounded chamfer calculated as a quarter of a circle. Enter the diameter of the circle as the horizontal dimension of the chamfer. See Defining chamfer dimensions on page 1292.

Option	Description
	Creates a rounded chamfer calculated as a three-quarters of a circle. Enter the diameter of the circle as the horizontal dimension of the chamfer. See Defining chamfer dimensions on page 1292. The center point of the circle is the corner of the notch.
	Bevels the corner of the gusset plate.
	Does not notch or chamfer the corner of the gusset plate.

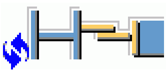
Defining chamfer dimensions

To define the size of the notch chamfer, or the diameter of the circle used to calculate rounded chamfers, go to the **Gusset** tab and enter these dimensions:



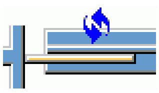
Defining gusset plate location (67)

To specify the location of the gusset plate relative to the beam or column web, go to the **Gusset** tab. The default location is above the beam or column web:



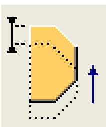
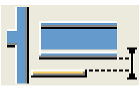
Defining gusset plate position on the brace

To indicate where to locate the gusset plate on the brace, go to the **Gusset** tab. The default option is 'Middle':



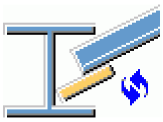
Fine-tuning position

To fine-tune the position of a gusset plate, enter values for the following properties:

Property	Description
	Moves the gusset plate in the y direction.
	Moves the gusset plate towards the connection.

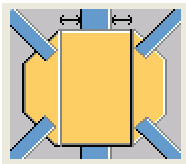
Defining gusset plate position on the beam or column (11)

To indicate where to locate the gusset plate on the beam or column, go to the **Gusset** tab. The default option is parallel to the brace:



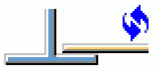
Defining the bend line in skewed connections (140)

To define the bend line in skewed connections, enter the following dimensions on the **Gusset** tab.



Specifying gusset plate connection material (11, 20, 62)

To specify what type of connection material to use to connect the gusset plate to the beam or column, go to the **Gusset** tab. The default option is to connect the gusset plate to directly to the flange of the beam or column:

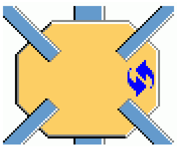


You can also choose to use clip angles or fastener plates in various configurations.

Creating an orientation hole in the gusset plate (110)

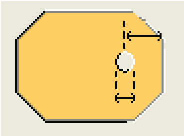
You may need to create an orientation hole in the gusset plate to indicate the position of the plate when the connection is assembled in the shop, or during erection. To create an orientation hole in the gusset plate, go to the **Gusset** tab:

The default option is no orientation hole:



To create the hole in the left or right of the gusset plate:

- Select one of the options in the listbox
- Enter the dimensions of the hole:



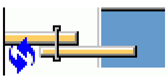
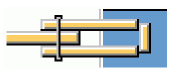
15.7 Defining brace connection properties

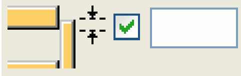
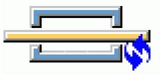
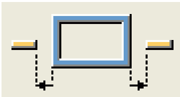
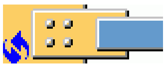
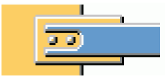
Click the links below to find out more:

- Defining the brace connection on page 1294
- Creating tongue plates (20, 22, 56) on page 1295
- Notching brace flange (11, 57) on page 1295
- Notching brace flange (60) on page 1296
- Notching the brace (22, 59) on page 1297
- Cutting braces (60) on page 1297
- Double-bolting braces (110) on page 1297
- Using clip angles to connect braces (11, 57) on page 1298
- Creating clip angles or shear tabs (58, 61, 62, 63) on page 1298

Defining the brace connection

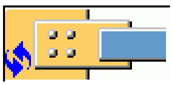
Several component dialog boxes contain a **Brace conn** tab, where you can specify the options to use to connect the brace to the gusset plate. Some of the options are:

Option	Description
How many connection plates to use.	You can use one or two connection plates to connect the brace to the gusset plate. The default option is 1 plate:  If there are two connection plates, Tekla Structures creates an end plate to the ends of the connection plates.  You can specify the width of the end plate.

Option	Description
	
Notch the brace or cut the connection plate?	The default option is to notch the brace:  If you choose to cut the plate, you can specify the gap between the brace and the plate: 
How to connect the brace to the connection plate.	The default option is to weld the brace:  You can also bolt the brace, or weld it and notch it around the nuts connecting it to the gusset plate: 

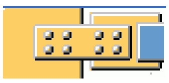
Creating tongue plates (20, 22, 56)

To connect the brace to the gusset plate using a tongue plate and cover plate, go the **Brace conn** tab. By default, this component does not create a tongue plate:



With the default option, the **Tongue plate** and **Cover plate** fields are not available. They are grayed out.

Select this option to create a tongue plate:



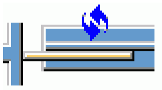
Notice that the **Tongue plate** and **Cover plate** fields are now available (they are not grayed out). Enter the properties of the plates.

Notching brace flange (11, 57)

Some components give you the option to notch the brace flange. You may want to do this:

- if the gusset plate collides with the brace flange
- to create slots in hollow braces. See Creating slots in hollow braces (11, 57) on page 1296
- to connect hollow braces using clip angles. See Using clip angles to connect braces (11, 57) on page 1298

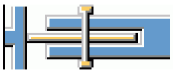
To notch the flange or create a slot, go to the **Gusset** tab. The default option is not to notch:



Creating slots in hollow braces (11, 57)

To create a slot in a hollow brace, go to the **Gusset** tab:

1. Define the position of the gusset plate as 'Middle'. This is the default option. See Defining gusset plate position on the brace on page 1292.
2. Select this option to create a slot in the brace and fasten the gusset plate to it using a bolt:

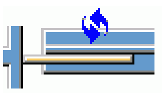


Notching brace flange (60)

Some components give you the option to notch the brace flange. You may want to do this:

- if the gusset plate collides with the brace flange
- to create slots in hollow braces

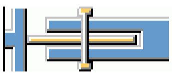
To notch the flange or create a slot, go to the **Brace conn** tab. The default option is not to notch:



Creating slots in hollow braces (60)

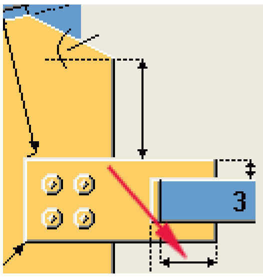
To create a slot in a hollow brace, go to the **Brace conn** tab:

1. Define the position of the gusset plate as 'Middle'. This is the default option. See Defining gusset plate position on the brace on page 1292.
2. Select this option to create a slot in the brace and fasten the gusset plate to it using a bolt:



Notching the brace (22, 59)

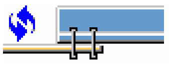
To define the depth of the notch in the brace, go to the **Picture** tab:

Depth of the notch in the brace	

To prevent the connection plate from penetrating the hollow brace, enter a negative value for the depth of the notch.

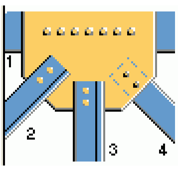
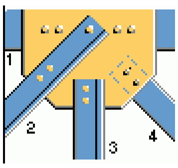
Cutting braces (60)

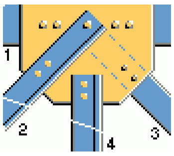
To indicate whether to cut the braces, go to the **Brace conn** tab. The default is to cut the braces:



Double-bolting braces (110)

By default braces are bolted to the gusset plate. To also bolt braces to the first or second beam or column picked, go to the **Brace conn** tab. The options are:

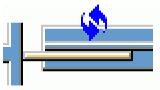
Option	Description
	Only bolts braces to the gusset plate.
	Bolts the first brace picked to both the gusset plate and the first beam or column picked.

Option	Description
	Bolts the first and subsequent braces picked to both the gusset plate and the first beam or column picked.

Using clip angles to connect braces (11, 57)

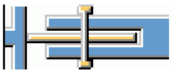
To attach the braces to the gusset plate using clip angles:

1. First, create a slot in the brace. To do this, go to the **Gusset** tab. The default option is:



To create a slot in the brace:

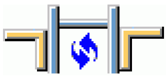
- Define the position of the gusset plate as 'Middle'. See Defining chamfer dimensions on page 1292.
- Select this option to create the slot and fasten the gusset plate to the brace using a bolt:



- Go to the **Angle bolts** tab. The default option is not to create clip angles:

Creating clip angles or shear tabs (58, 61, 62, 63)

To attach the braces to the gusset plate using clip angles or shear tabs, and specify the number of clip angles to create, go to the **Brace conn** tab. The default option is to create two clip angles below the brace web:



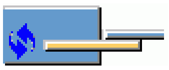
15.8 Defining minor plate properties

As well as gusset plates, many bracing components create *minor plates*, including connection, filler, and shim plates. This section explains how to define the properties of some of these minor plates.

Click the links below to find out more:

Defining the number of connection plates (58, 61, 62, 63)

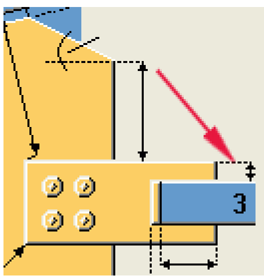
To define the position and number of connection plates to create between the brace web and the gusset plate, go to the **Brace conn** tab. The default option is one plate:



Defining connection plate width (59)

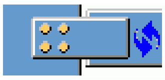
To define the width of the connection plate go to the **Picture** tab and indicate the distance from the edge of the brace to the edge of the connection plate:

This dimension defines the width of the connection plate.

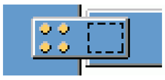


Creating filler plates (58, 61, 62, 63)

To create a filler plate between the connection plate and the brace web, go to the **Brace conn** tab. The default option is no filler plate:



To create a filler plate, select this option:



Creating filler plates (165)

If required, **Heavy brace (165)** automatically creates filler plates between the connection plate and the:

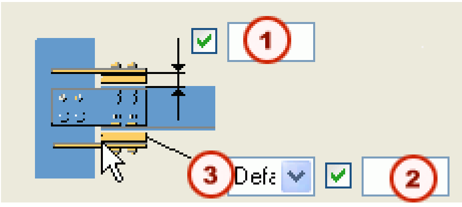
- brace flange
- brace web

The thickness of the filler plates depends on the gap between the connection plate and the brace flange or web, as follows:

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

Creating shim plates (58, 61, 62, 63)

To create and define shim plates, go to the **Brace conn** tab. The options are:



1. Clearance. Enter 1 mm or more to create shim plates.
2. Enter number of shim plates to create.
3. Select **No** to omit shim plates.

Defining plate sizes in marketsizes.dat (165, Japan)

In the Japanese environment, **Heavy brace gusset (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 using any standard text editor, such as Notepad.

Enter a value in the **t** field 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.

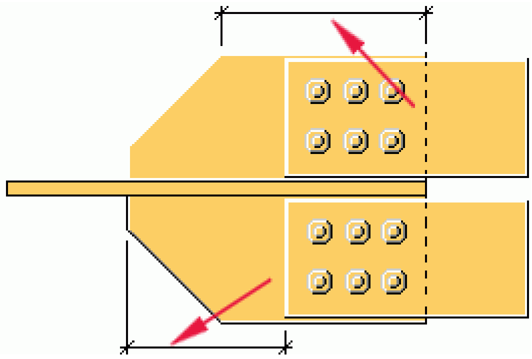
```
# Market size (thickness) table
# Specify the material as given in Tekla Structures material database
# and after that the market sizes separated by commas
SS400,1.6,2.3,3.2,4.5,6,9,12,16,19,22,25,28,32,38
DEFAULT,6,9,12,16,19,22,25,28,32,38
```

`marketsizes.dat file`

Defining rib plate dimensions (165)

Tekla Structures automatically calculates the following dimensions from the length of the rib plate and bolt group properties.

These dimensions are automatically calculated from the length of the rib plate and the bolt group properties:



To define the remaining dimensions, go to the **Ribs** tab.

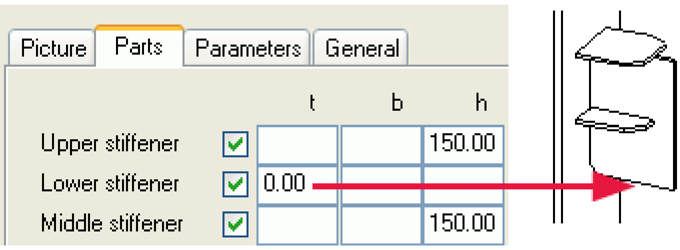
Omitting stiffener plates (1065)

This component automatically creates stiffener plates at each end of the gusset plate. To omit one or both stiffener plates, go to the **Parts** tab and delete the values in the **Front stiffener** or **Back stiffener** fields.

Defining the number of stiffeners (171)

By default, this component creates 3 stiffeners. To omit a stiffener, go to the **Parts** tab, and enter 0 for in the **t** field for that stiffener.

To remove a stiffener, enter 0 in the **t** field.

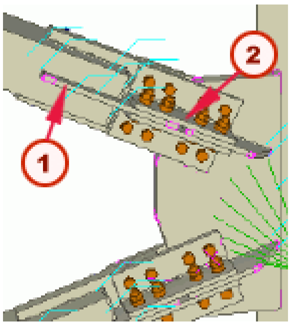


Flipping stiffener plates

To flip stiffener plates, go to the **Picture** tab and set **Flip stiffener directions** to **Yes**.

Creating rib plates (22, Japan)

To create this type of connection:



1 Cross plate

2 Cover plate

Go to the **Rib plates** tab and enter properties in the **Cross plate** and **Cover plate** fields.

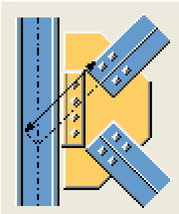
15.9 Defining bolt and hole properties

Click the links below to find out more:

- Brace bolt properties (11, 57) on page 1303
- Defining part thickness (1) on page 1304
- Defining hole type (1) on page 1304
- Dimensioning holes in drawings (110, 140) on page 1305
- Position of gusset bolts (11) on page 1305

Brace bolt properties (11, 57)

To define the minimum distance from the connection plate bolts to the intersection point of the column and brace centerlines, go to the **Bracebolts** tabs:

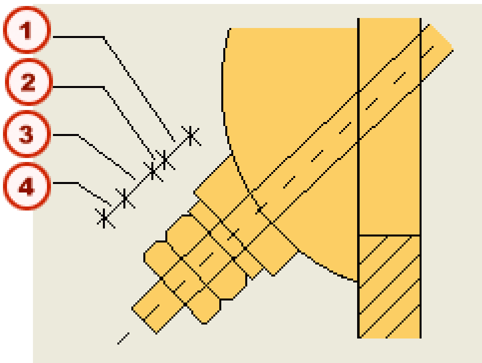


The gap is measured parallel to each brace. If a brace is perpendicular to the column, the gap is measured from the column centerline to the nearest bolts:

Defining part thickness (1)

To define the thickness of the filler plate, washer, and nuts that this component creates, go to the **Parts** tab and enter the following dimensions:

Enter the thickness of the following parts:



1 Filler plate

2 Washer

3 Nut

4 Extra nut

Defining hole type (1)

To define the type of hole to create in the beam or column for the rod, go to the **Brace conn** tab and select one of the options in the **Create hole in primary** field:

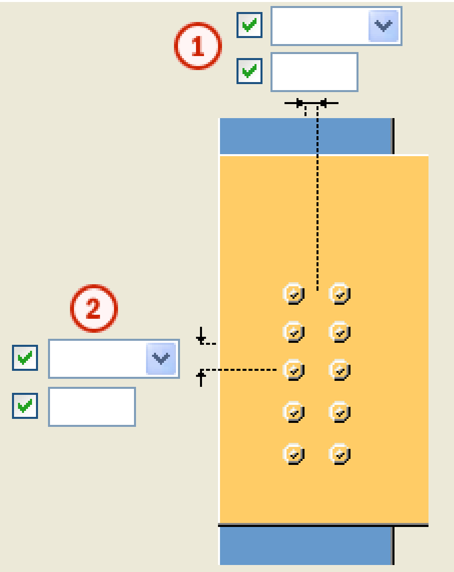
- **Partcut** cuts a hole for the rod
- **Bolt** creates a bolt hole
- **Partcut+bolthole** cuts a hole for the rod and creates a bolt hole

Dimensioning holes in drawings (110, 140)

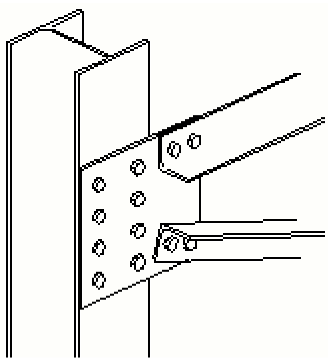
If a component creates a gusset plate that is skewed so that the gusset hole is not perpendicular to the gusset plate, hole dimensions in drawings may be wrong. To fix this, go to the **Gusset** tab and set the **Create extra bolt holes to the gusset** field to **Yes**. This creates an extra bolt hole that is perpendicular to the gusset plate.

Position of gusset bolts (11)

To find the right position for the gusset bolt group, go to the **Gusset bolts** tab. The position options are for the horizontal (1) and vertical (2) direction:



Horizontal position Gusset horizontal position and offset options (1) 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.



Vertical position Gusset vertical position and offset options (2) 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.

15.10 Defining other properties

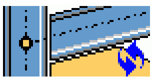
Click the links below to find out more:

- Specifying work point location (58, 59, 60) on page 1306
- Defining Tees (105) on page 1306

Specifying work point location (58, 59, 60)

Tekla Structures uses the *work point* of a component to calculate check dimensions and part position dimensions in drawings.

To change the position of the work point, go to the **Picture** tab. The default position is the point where the two main parts intersect:



Defining Tees (105)

There are several ways to create the tees at the end of the braces:

- On the **Parts** tab, specify a T profile to use.
- On the **Parts** tab, specify an I profile to use. The component creates the tee by cutting the I profile. You must specify where to cut the I profile, using the **Tee depth** field on the **Parameters** tab.
- To have Tekla Structures use two plates to create the tee, leave the **Tee profile** field on the **Parts** tab blank. You must enter **t,b**, and **h** dimensions for the tee flange and web.

You can define the Tees for each brace separately.

16 Tower Components

Introduction The Tekla Structures component catalog contains a variety of tower components which you can use to automatically create:

- Complete towers, and tower elements such as legs and bracing
- Brace to tower leg connections
- Brace to brace connections

It also includes several editing tools to modify tower bracing.

To open the **Component catalog**, use the keyboard shortcut **Ctrl + F**, or click the **Search component** button on the component toolbar .

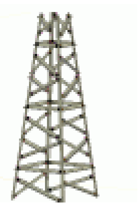
See also For general information about components and how to use them, see Components and Creating a component.

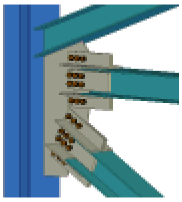
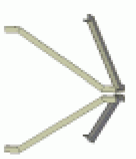
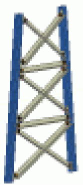
Component Catalog

Creating custom components

16.1 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
Tower generation (S43) on page 1309		Creates a complete tower.

Component	Icon	Description
Tower member (S63) on page 1311		Creates tower legs.
Transmission tower cross arm (S65) on page 1312		Creates cross arms using bent, angle-profile cleats.
Tower diagonal (S66) on page 1313		Creates bracing panels.

Tower generation (S43)

Creates a complete tower, with a square or rectangular base.

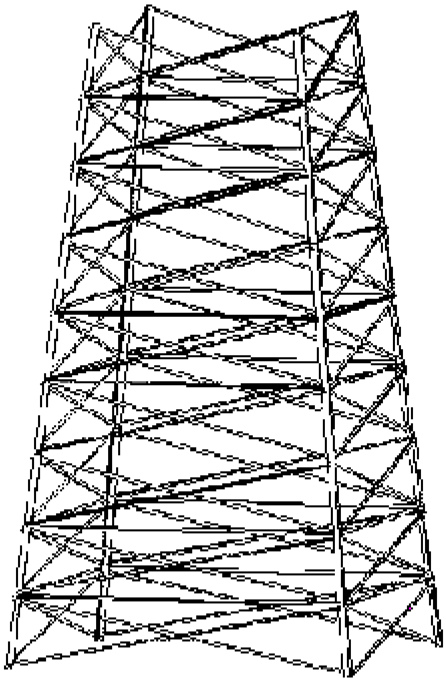
Profiles **Tower legs**: L

Bracing: L, flat, U, twin

Parts created

- Tower legs (4)
- Bracing panels (you define the quantity)

Use for

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) on page 1330

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
Picture	Quantity of bracing panels, dimensions that define the location of cross braces on the tower legs.	Defining bracing panels (S43, S66) on page 1336
Parts	Part properties, profiles for legs and bracing.	
Leg Parameters	Quantity of profiles in each leg, lift length, option to tile profiles	Defining tower legs (S63) on page 1333
Tower Parameters	Options that define the type of bracing to create, class numbers of bracing.	Defining bracing panels (S43, S66) on page 1336
Twin Profiles	Options to use twin profiles for bracing.	
Model Points		Creating construction points (S43, S66) on page 1330

Tab	Contents	See also
Joints	Components that connect braces to tower legs.	Defining bracing connections (S43, S66) on page 1336

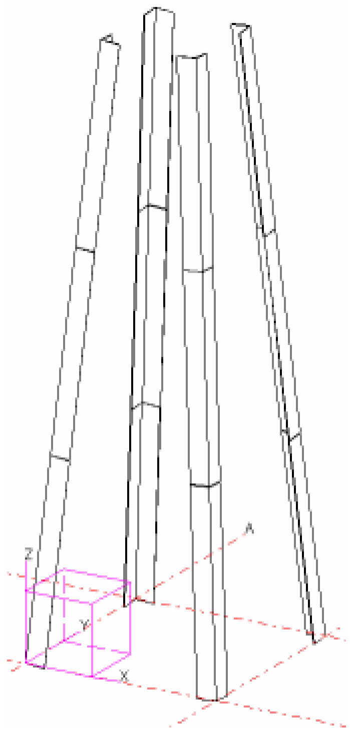
Picking order Pick a point to indicate the position of the tower leg at the bottom left corner of the base of the tower.

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) on page 1330

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
Picture	Properties of angle profiles, quantity of profiles in each leg, lift length, option to tile profiles.	Defining tower legs (S63) on page 1333 Creating sloping legs (S63) on page 1334
Parts		
Parameters	Gaps between angle profiles	Pattern of angle profiles (S63) on page 1335

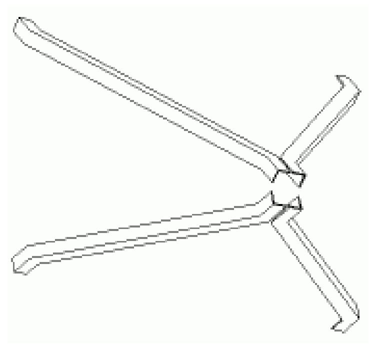
Picking order Pick a point to indicate the lower left corner of the tower.

Transmission tower cross arm (S65)

Creates cross arms using bent, angle-profile cleats.

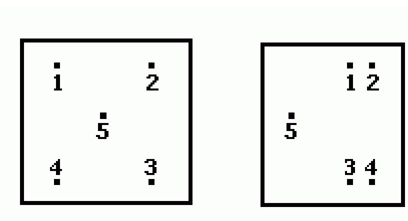
Parts created Bent, angle-profile cleats

Use for

Situation	Description
	

Do not use for Twin-profile cross arms.

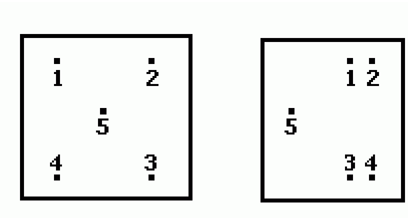
Before you start Create 5 points. The 5th point must be in the center of the pattern, vertically:



Defining properties Use the following tabs in the component dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions that define the shape and size of the upper and lower cross arms.	
Parts	Part properties of the cross arms.	
Parameters	Layout of profiles	Layout of profiles (S65) on page 1335

Picking order The picking order depends on the location of the 5th point:



Tower diagonal (S66)

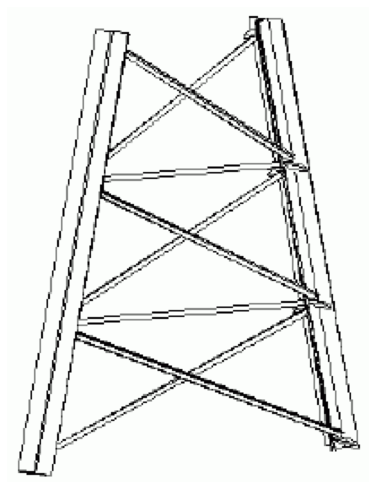
Creates bracing panels between 2 or 4 existing columns.

Profiles Bracing: L, flat, U, twin

Parts created

- Horizontal braces
- Diagonal braces

Use for

Situation	Description
	

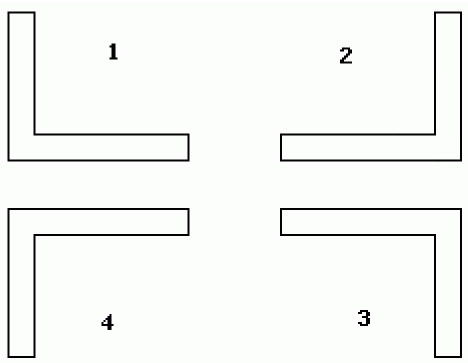
Before you start Create 2 or 4 tower legs.

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
Picture	Dimensions that define the location of diagonal braces, quantity of bracing panels.	Defining bracing panels (S43, S66) on page 1336
Parts	Part properties of the horizontal and diagonal braces.	
Parameters	Options that define the type of bracing to create.	Defining bracing panels (S43, S66) on page 1336
Twin Profiles	Option to create twin-profile braces, position of twin profiles.	
Model Points	Option to create construction points, construction point properties.	Creating construction points (S43, S66) on page 1330
Joints	Components to use to connect braces to tower legs.	Defining bracing connections (S43, S66) on page 1336

Picking order

1. Pick the tower legs clockwise, starting with the top left leg:

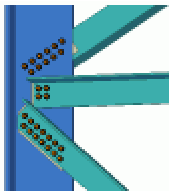
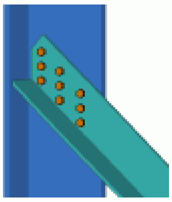


2. Click the middle mouse button to create the component

16.2 Brace to tower leg connections

Tekla Structures includes the following components to connect one or more braces to tower legs:

Component	Icon	Description
Tower 1 diagonal (87) on page 1315		Bolts 1 diagonal brace to a tower leg.

Component	Icon	Description
Tower 2 diagonal (89) on page 1316		Bolts 2 diagonal braces to a tower leg.
Leg - 2 and 3 diagonals (177) on page 1317		Bolts 2 diagonal braces and 1 horizontal brace (optional) to a tower leg. No gusset plate.
Leg - 1 diagonal (178) on page 1319		Bolts 1 diagonal brace directly to the outside or inside face of a tower leg. No gusset plate.

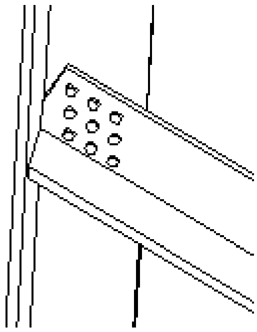
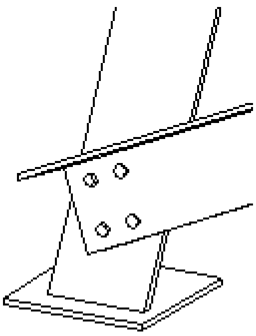
Tower 1 diagonal (87)

Bolts 1 diagonal brace to a tower leg.

Profiles **Brace and tower leg:** L

Parts created -

Use for

Situation	More information
	
	

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
Picture	Option to create bolts, Location of bolts.	About bolt gage lines on page 1343 Creating bolts (89) on page 1346
Parts	Option to cut vertical leg of brace, dimensions of cut.	Cutting braces (87, 89) on page 1337
Bolts	Bolt properties	Bolts
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Extra cuts	Option to cut horizontal leg of brace, dimensions of cut.	
Check		
Analysis	Information used in structural analysis	Analysis tab

Selection order

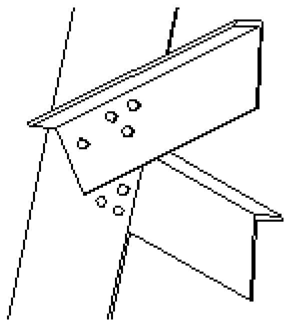
1. Tower leg
2. Brace

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:

Tab	Contents	See also
Picture	Bolt gages that define the location of bolts that connect all parts.	About bolt gage lines on page 1343 Creating bolts (89) on page 1346
Picture2	Bolt gages that define the location of bolts in the bolt groups that connect: • 1st brace to the tower leg • 2nd brace to the tower leg	
Parts	Dimensions that define the cuts in the vertical legs of the diagonal braces.	Cutting braces (87, 89) on page 1337
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Cuts d.1	Dimensions that define the cuts in the horizontal leg of the first brace picked.	Cutting braces (87, 89) on page 1337
Cuts d.2	Dimensions that define the cuts in the horizontal leg of the second brace picked.	
Bolts	Bolt properties.	Bolts
Check		
Analysis	Information used in structural analysis	Analysis tab

Selection order

1. Tower leg
2. First brace
3. Second brace
4. Click the middle mouse button to create the component

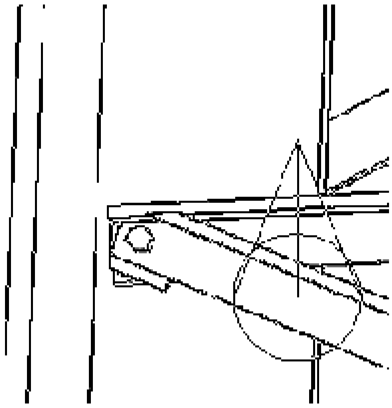
Leg – 2 and 3 diagonals (177)

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

Situation	More information
	

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:

Tab	Contents	See also
Picture	Edge distances, dimensions that define the cut in the diagonal brace on the inside of the tower leg and the horizontal brace.	Creating your own defaults (177) on page 1339
Parameters	Edge distances that define the location of bolt groups.	Creating your own defaults (177) on page 1339
Bolts	Bolt properties, dimensions that define the location of bolts, and bolt pattern of bolt groups.	Bolts

Tab	Contents	See also
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Plates	Option to create filler plates, filler plate properties.	Defining filler plates (177) on page 1349
Design	Option to use UDL with AutoDefaults, reaction forces.	Using reaction forces and UDLs in AutoDefaults and AutoConnection
Analysis	Information used in structural analysis	Analysis tab

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

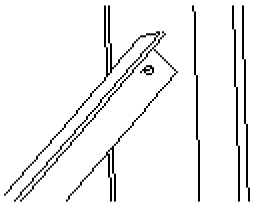
Leg – 1 diagonal (178)

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
Picture	Dimensions that define how the brace is cut.	

Tab	Contents	See also
Parameters	Bolt gage lines that define the positions of bolts.	About bolt gage lines on page 1343
Bolts	Quantity of bolts, bolt properties.	Bolts
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Design	Option to use UDL with AutoDefaults, reaction forces.	Using reaction forces and UDLs in AutoDefaults and AutoConnection
Analysis	Information used in structural analysis	Analysis tab

Selection order

1. Tower leg
2. Diagonal brace

16.3 Brace to brace connections

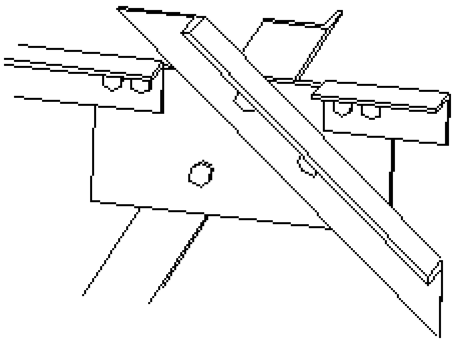
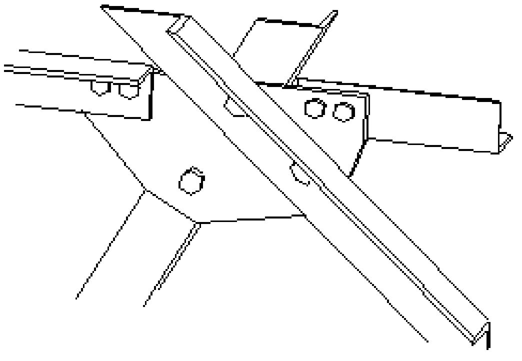
Component	Icon	Description
Bolted gusset brace (167) on page 1320		Bolts 2 diagonal braces to 2 horizontal braces, using a gusset plate.
Bolted bridge brace (169) on page 1322		Bolts 2 horizontal braces and 1 diagonal brace to a bridge plate or angle profile.
Bolted Brace (181) on page 1323		Bolts 1 diagonal brace to 1 or 2 horizontal braces.
Bolted Plate Brace (182) on page 1325		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.
	Braces connect to different faces of chamfered gusset plate.

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
Picture	Dimensions that define bolt locations.	About bolt gage lines on page 1343
Parts	Properties of gusset plate.	Parts in steel connections
Parameters	Properties of bolts in horizontal braces, option to chamfer gusset plate.	
General	Connection properties, AutoDefaults and AutoConnection rule groups.	General tab
Analysis	Information used in structural analysis	Analysis tab

Selection order

1. First diagonal brace
2. Second diagonal brace
3. First horizontal brace
4. Second horizontal brace

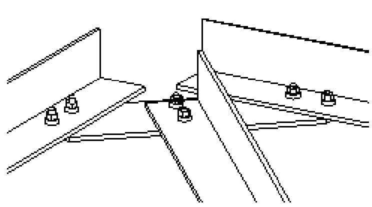
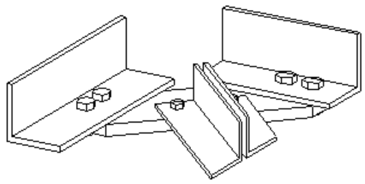
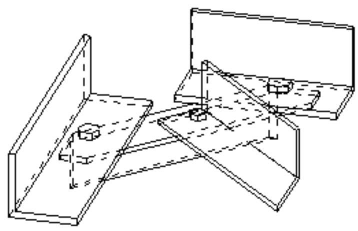
5. Click the middle mouse button to create the component

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.

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).

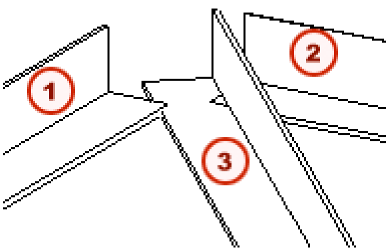
Defining properties Use the following tabs in the component dialog box to define the properties of the component:

Tab	Contents	See also
Picture	Dimensions that define bolt locations and the clearance	

Tab	Contents	See also
	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.



1 First horizontal brace

2 Second horizontal brace

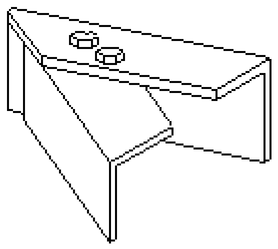
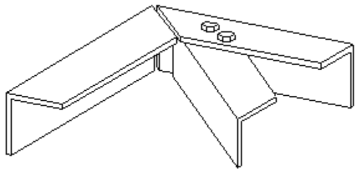
3 Diagonal brace

Bolted Brace (181)

Bolts 1 diagonal brace to 1 or 2 horizontal braces.

Parts created -

Use for

Situation	More information
	
	

Do not use for Braces that are not in the same plane.

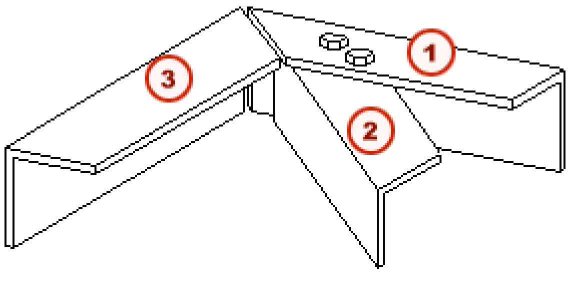
Before you start Create 1 diagonal brace and 1 or 2 horizontal braces. The braces can be built-up beams.

Defining properties Use the following tabs in the component dialog box to define the properties of this component:

Tab	Contents	See also
Picture	Dimensions that define the position of bolts. Clearance between braces.	Defining bolt gage lines (87) on page 1344
Parameters	Bolt and cut options for horizontal braces.	Cutting braces (181, 182) on page 1339

Picking order

1. First horizontal brace
2. Diagonal brace
3. Second horizontal brace (optional)



 First horizontal brace

 Diagonal brace

3 Second horizontal brace (optional)

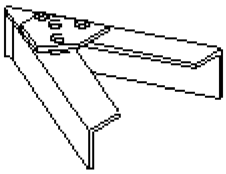
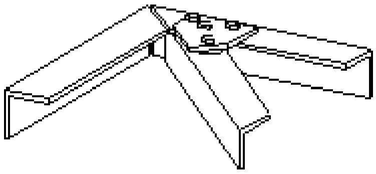
Bolted Plate Brace (182)

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	More information
	
	

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.

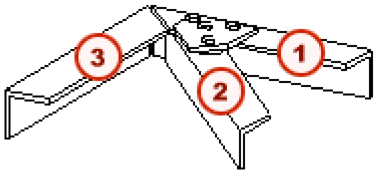
Defining properties Use the following tabs in the component dialog box to define the properties of the parts this component creates:

Tab	Contents	See also
Picture	Dimensions that define the location of bolts, clearance between horizontal braces.	About bolt gage lines on page 1343 Cutting braces (181, 182) on page 1339
Parts	The properties of the plate and optional filler plate.	
Parameters	Shape of cut in braces, bolt options, plate options.	Defining filler plates (182) on page 1350 Creating bolts (182) on page 1347

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



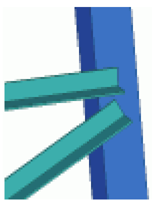
1 Horizontal brace to which to bolt the diagonal brace

2 Diagonal brace

3 Second horizontal brace (optional)

16.4 Editing tools

Use the following components to modify tower bracing:

Component	Icon	Description
Open/Close angle ends (1050) on page 1326		Simulates the opening or closing of one end of an angle profile.
Open/Close angle (1051) on page 1328		Simulates the opening or closing of an inner portion of an angle profile.
Autoposition (S67) on page 1329		Adjusts the position of braces connected to a tower leg. Cuts braces.

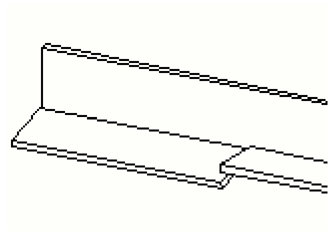
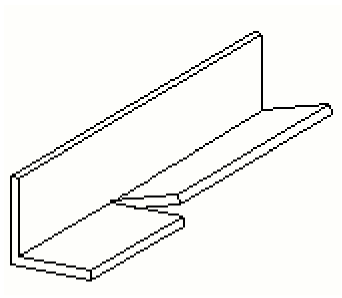
Open/Close angle ends (1050)

Simulates the opening or closing of one end of an angle profile by cutting and bending the profile.

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 -

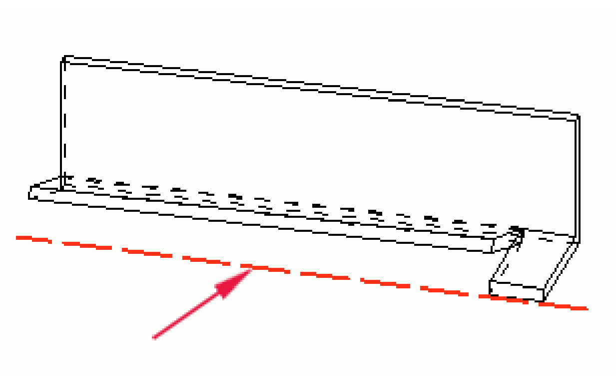
Use for

Situation	More information
	
	

Do not use for To open or close the inner portion of an angle profile, use Open/Close angle (1051) on page 1328.

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
Parameters	Which leg to open or close, location of cut, bend angle.	Adjusting length of leg to open or close (1050, 1051) on page 1331

Picking order

1. Angle profile
2. A point on the angle profile

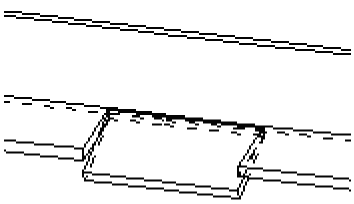
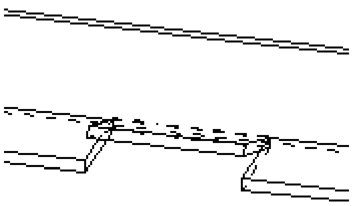
Open/Close angle (1051)

Simulates the opening or closing of an inner portion of an angle profile by cutting and bending the profile.

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

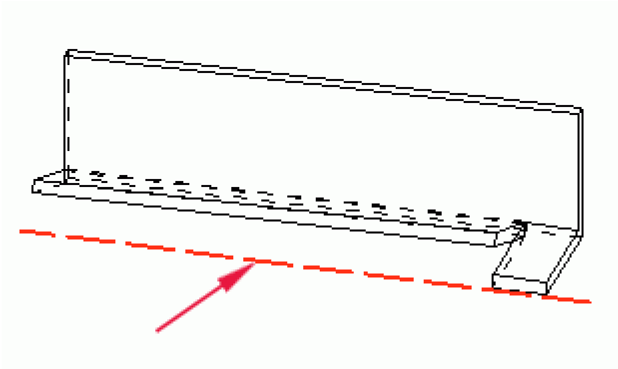
Situation	More information
	
	

Do not use for To open or close one end of an angle profile, use Open/Close angle ends (1050) on page 1326.

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
Parameters	Which leg to open or close, location of cut, bend angle.	Adjusting length of leg to open or close (1050, 1051) on page 1331

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.

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
Picture		Moving and cutting braces (S67) on page 1341

Picking order

1. Tower leg

2. First brace
3. Second brace (optional)
4. Click the middle mouse button

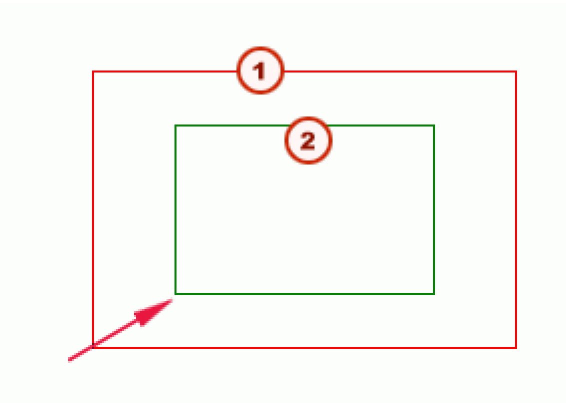
16.5 Defining general properties

Click the links below to find out more:

- Position of the tower (S43, S63) on page 1330
- Creating construction points (S43, S66) on page 1330
- Adjusting length of leg to open or close (1050, 1051) on page 1331

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:



1 Base of tower

2 Top of tower

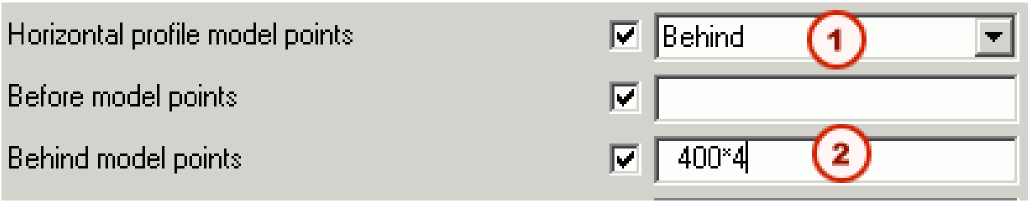
See also

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.



See also

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:

Field	Description
External length of the portion to be opened/closed	Measured from the point you pick to create the component towards the start of the part reference line
Internal length of the portion to be opened/closed	Measured from the point you pick to create the component towards the end of the part reference line

16.6 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) on page 1332
- Defining tower legs (S63) on page 1333
- Layout of profiles (S65) on page 1335

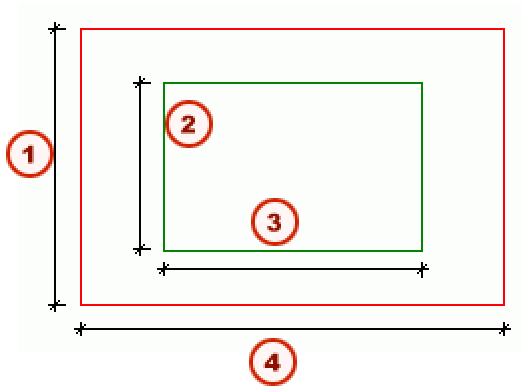
Defining tower legs (S43)

Tower legs are constructed using angle profiles.

- Creating sloping legs (S43) on page 1332
- Type and quantity of angle profiles (S43) on page 1332

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:



1 Base y

2 Top y

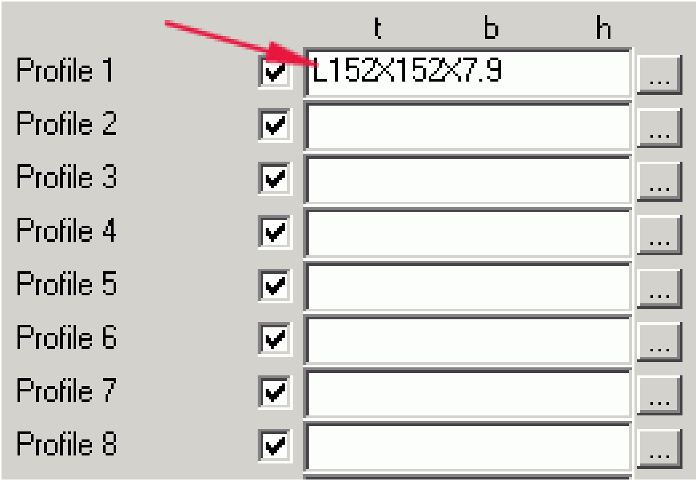
3 Top x

4 Base x

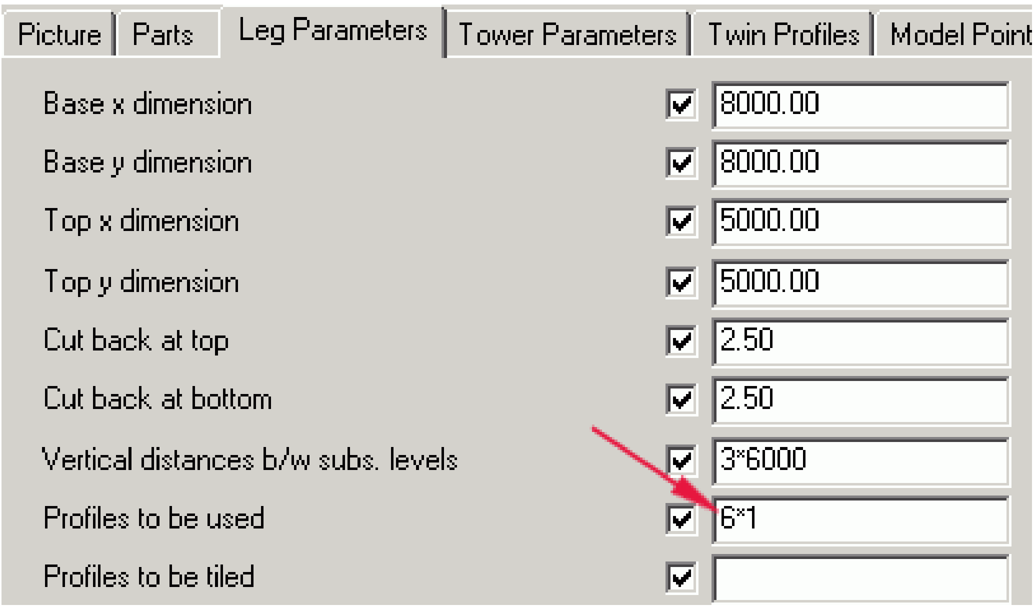
Type and quantity of angle profiles (S43)

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.



2. 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:



Defining tower legs (S63)

Tower legs are constructed using angle profiles.

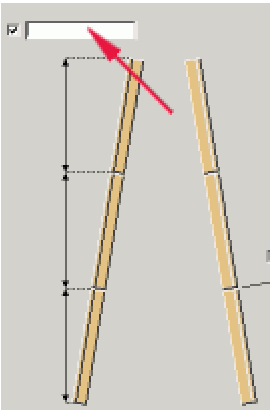
- Type and quantity of angle profiles (S63) on page 1334

- Creating sloping legs (S63) on page 1334
- Pattern of angle profiles (S63) on page 1335
- Splicing legs (S63) on page 1335

Type and quantity of angle profiles (S63)

To define the type and quantity of angle profiles to use:

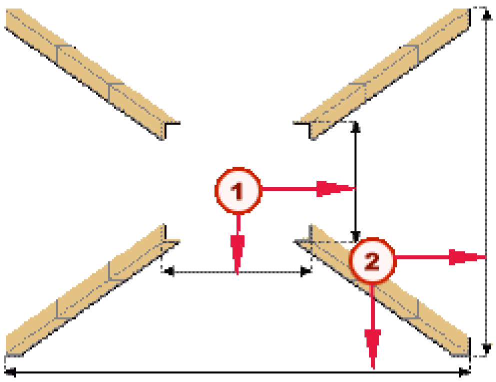
1. Go to the **Picture** tab. Use fields **1** to **8** to define the angle profiles you want to use.
2. In the **Profiles for part** field, enter the quantity of each profile type to use for each leg. For example, enter 6*1 to create tower legs each made up of 6 lifts with the profile type you defined in field **1**.
3. 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:



4. 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:

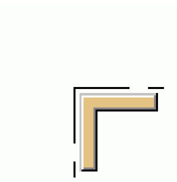


1 Dimensions of top of tower

2 Dimensions of base of tower

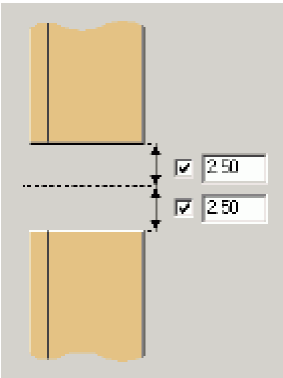
Pattern of angle profiles (S63)

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:



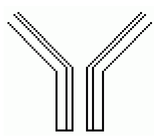
Splicing legs (S63)

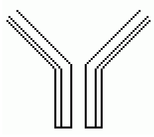
To enable the erector to splice tower legs, go to the **Parameters** tab and set the cut back distance between the angle profiles:



Layout of profiles (S65)

The options are:

Option	Layout
Inside	

Option	Layout
Outside	

16.7 Defining tower bracing properties

This section explains how to define the properties of tower bracing.

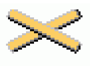
Click the links below to find out more:

- Defining bracing panels (S43, S66) on page 1336
- Defining bracing connections (S43, S66) on page 1336
- Cutting braces (87, 89) on page 1337
- Cutting braces (177) on page 1339
- Cutting braces (181, 182) on page 1339
- Creating your own defaults (177) on page 1339
- Moving and cutting braces (S67) on page 1341

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.

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:

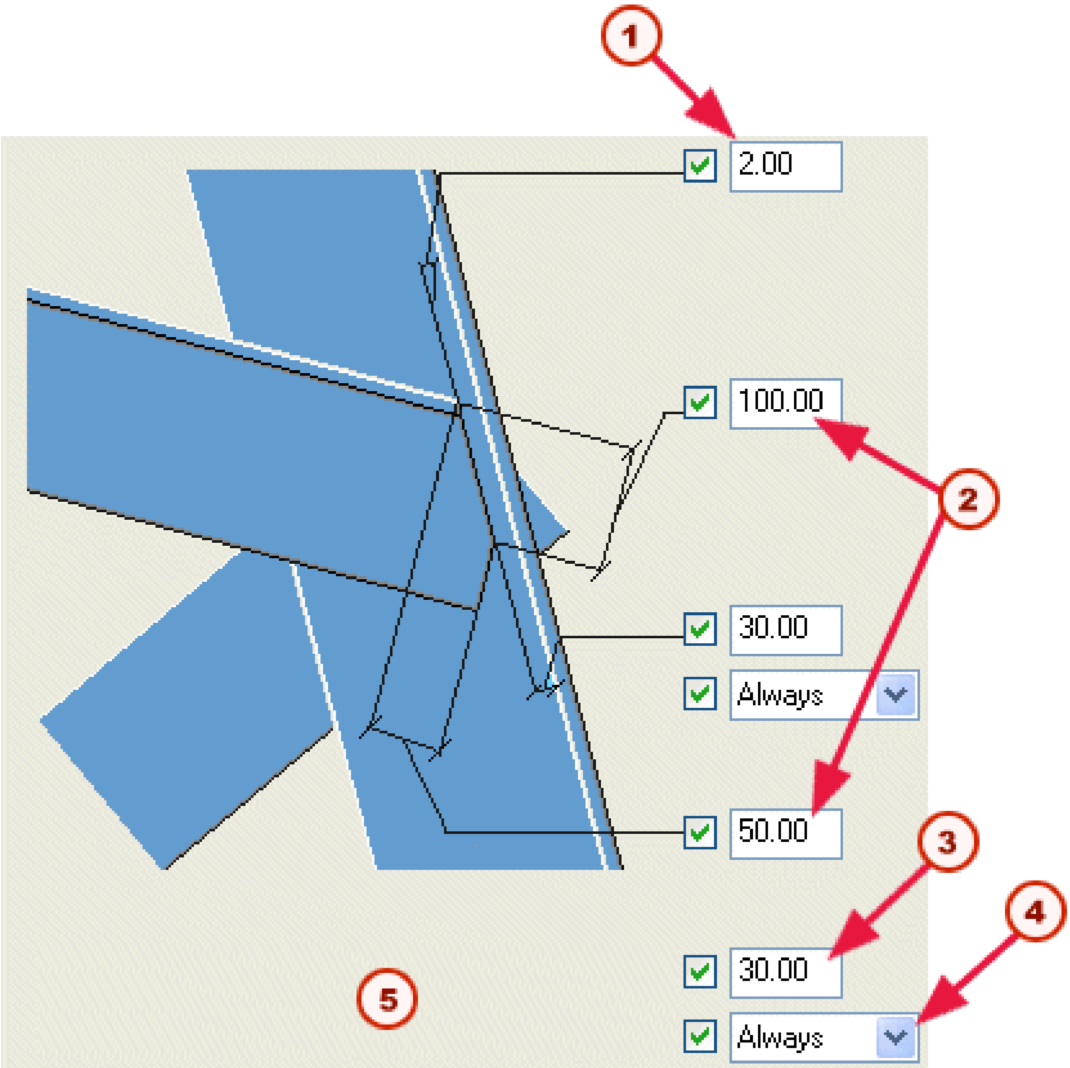
1. Enter the number of the component to use (1). Here we are using **Fitting (13)**.
2. Indicate the predefined set of properties to use (2).

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:



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

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)

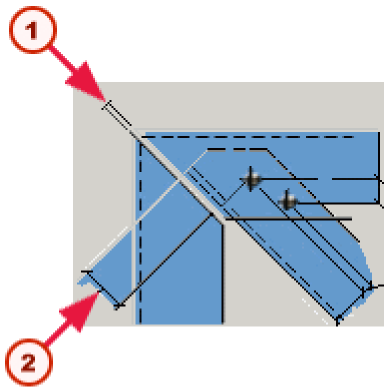
Leg - 2 & 3 diagonals (177) automatically cuts the braces according to the bolt edge distances specified for each brace on the **Picture** tab.

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:



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 directory or the system directory (eg. \countries \uk\system\).

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

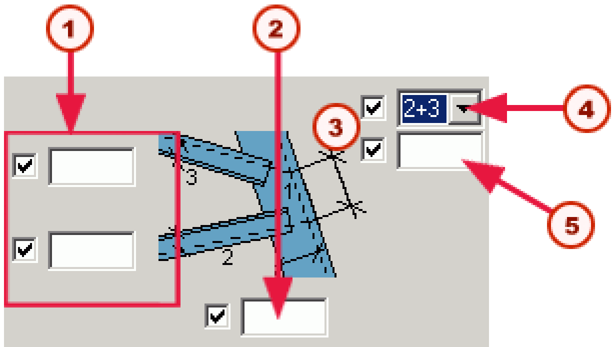
- Lines starting with a ';' or ' ' are skipped.
- <L-profile> must start on the first position of the line.
- There must be at least one blank space between <L-profile> and the first value.
- The component finds only the first occurrence of the specified L-profile.

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
```

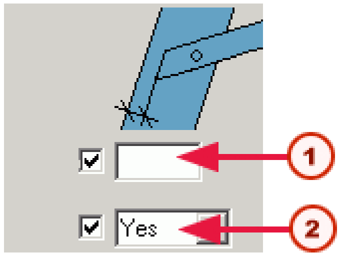
Moving and cutting braces (S67)

To move the ends of braces:



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

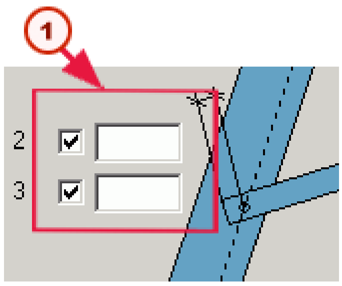
To cut the braces:



1 Enter the distance from the end of the brace(s) to the edge of the tower leg

2 Select **Yes** to cut the brace(s)

To move bolt groups:



1 Enter the distance from the first bolt in the group to the end of the brace

16.8 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 on page 1343
- Editing default gage lines on page 1346
- Creating bolts (87) on page 1346
- Creating bolts (89) on page 1346
- Creating bolts (178) on page 1347
- Creating bolts (181) on page 1347
- Creating bolts (182) on page 1347
- Bolt location (87, 89) on page 1348

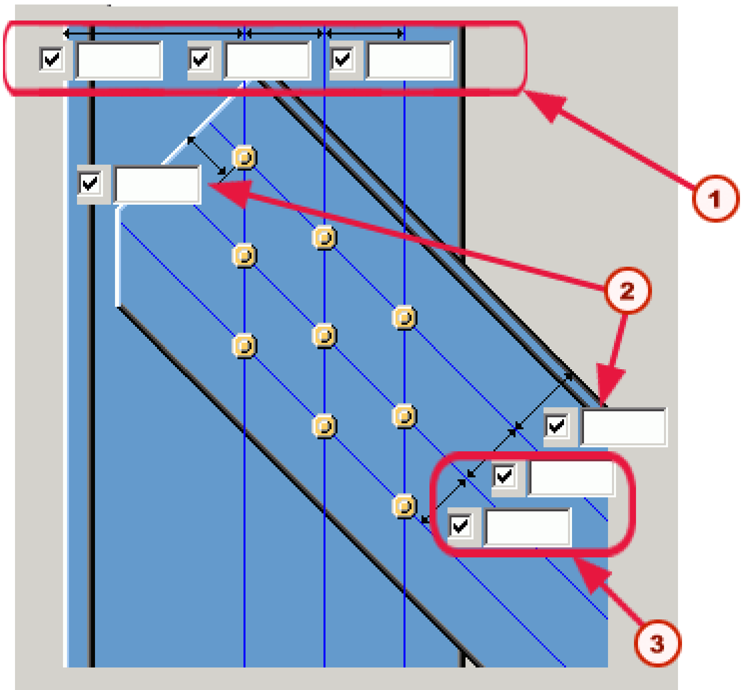
About bolt gage lines

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:



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 `gauge_lines.dat` file is in the profile folder of the environment your are using,
- Leave all the fields blank on the **Parameters** tab.

To learn how to change the default gage lines, see Editing default gage lines on page 1346.

Components using gauge_lines.dat

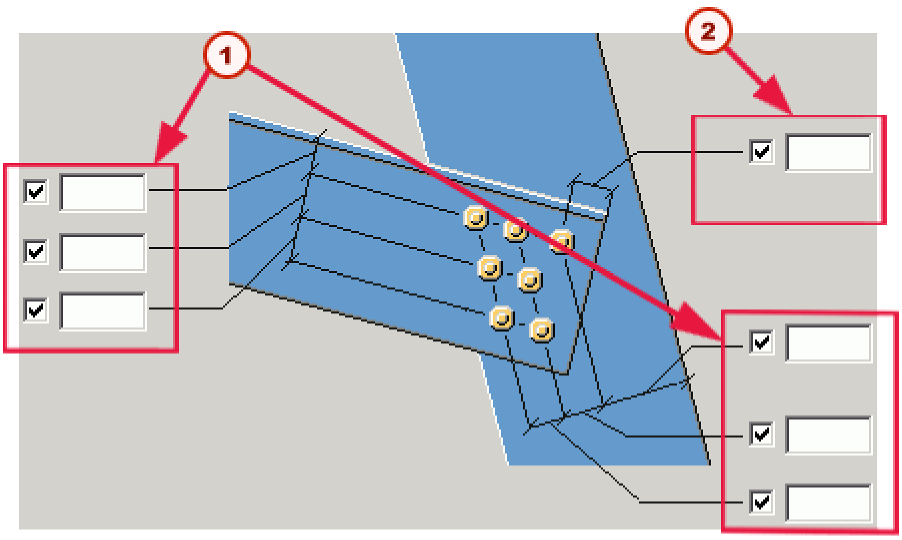
The following components use the `gauge_lines.dat` file:

- **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) on page 1348

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:



1 Location of gage lines

2 Bolt edge distance

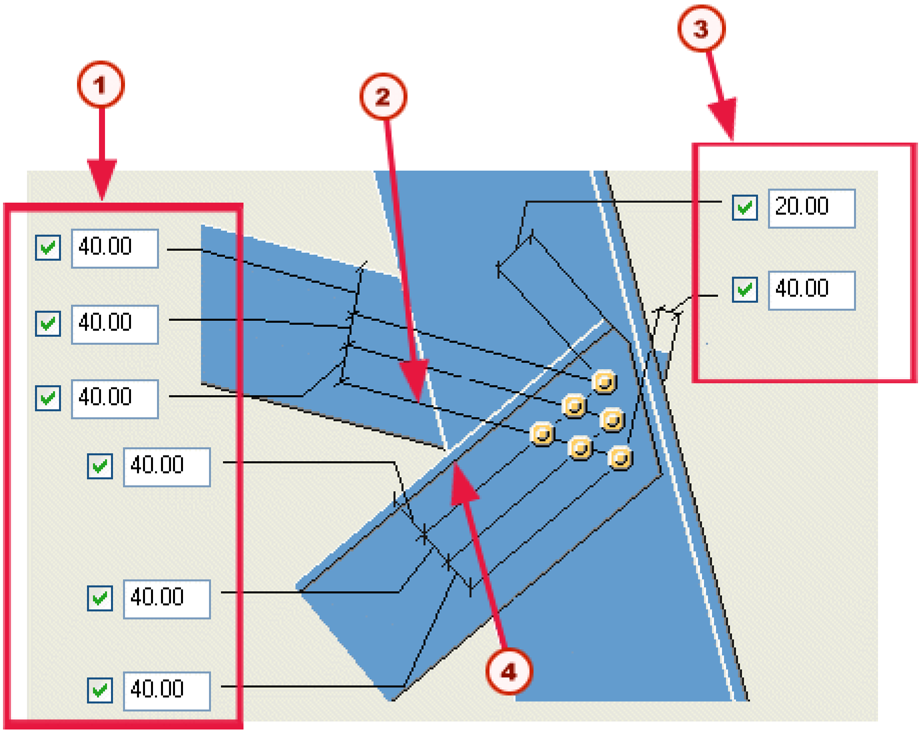
To learn how to create bolts, see Bolt location (87, 89) on page 1348.

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	**Picture**
Connects first and second brace picked to the tower leg	**Picture 2**

For example, on the **Picture** tab, enter the following dimensions:



1 Location of gage lines

2 Gage line 1(second brace picked)

3 Bolt edge distances

4 Gage line 1 (first brace picked)

To learn how to create bolts, see Bolt location (87, 89) on page 1348.

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)

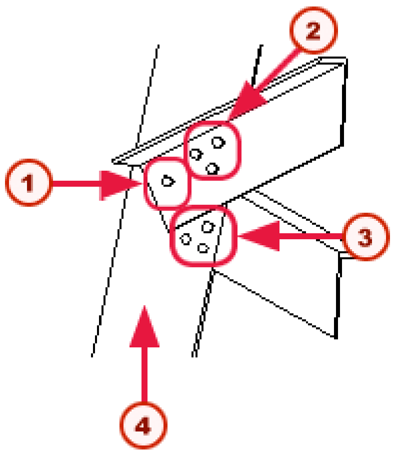
This component creates a single bolt group that connects the brace to the tower leg. To create bolts, you need to:

- Define the bolt gage lines and edge distances. See About bolt gage lines on page 1343
- Create bolts, and specify the location of individual bolts. See Bolt location (87, 89) on page 1348

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:



1 Bolt group that connects all parts

2 Bolt group that connects the first brace picked to the tower leg

3 Bolt group that connects the second brace picked to the tower leg. (component 89 only)

4 Tower leg

For each bolt group, you need to:

- Define the bolt gage lines and edge distances. See About bolt gage lines on page 1343
- Create bolts, and specify the location of individual bolts. See Bolt location (87, 89) on page 1348

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 on page 1343.

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**.

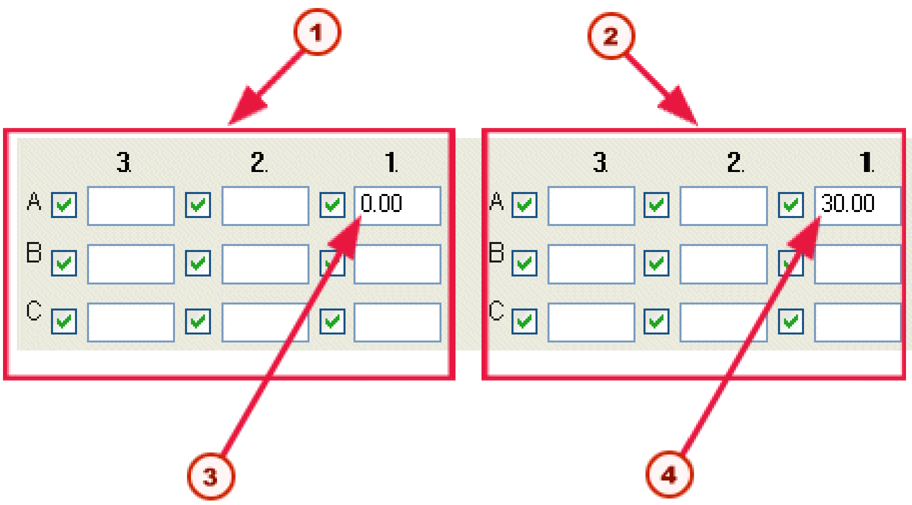
- A bolt on the main bolt gage line of each brace, which connects the brace to the plate.

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	**Picture**
Connects first and second brace picked to the tower leg	**Picture 2**

- 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:



1 First brace picked

2 Second brace picked (component 89 only)

3 Creates bolt at intersection of gage lines

4 Moves bolt 30 mm along the gage line, away from the end of the brace

---

To move a bolt towards the edge of the brace, enter a negative number, e.g. -10.

16.9 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) on page 1349
- Defining filler plates (182) on page 1350

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.

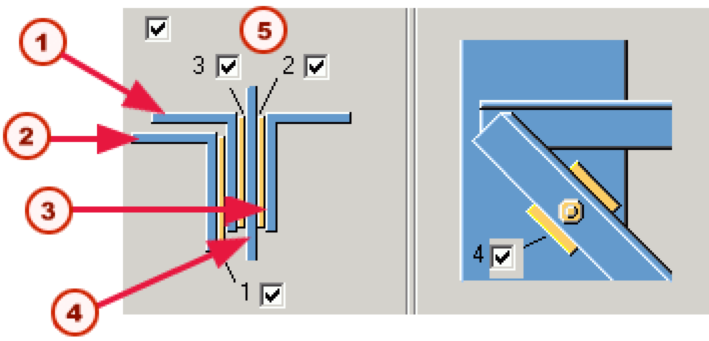


Plate 1: Between the first diagonal brace picked and the horizontal brace

Plate 2: Between the second diagonal brace picked and the tower leg

Plate 3: Between the horizontal brace and the tower leg

Plate 4: Between the first horizontal brace picked and the tower leg

1 Horizontal brace

2 First diagonal brace picked

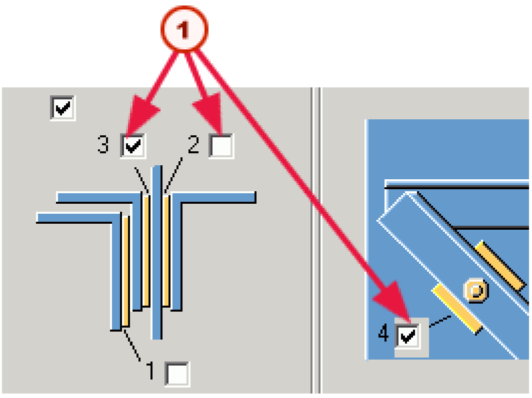
3 Second diagonal brace picked

4 Tower leg

5 Effect in modify

To specify the properties of each filler plate, use the fields on the **Plates** tab.

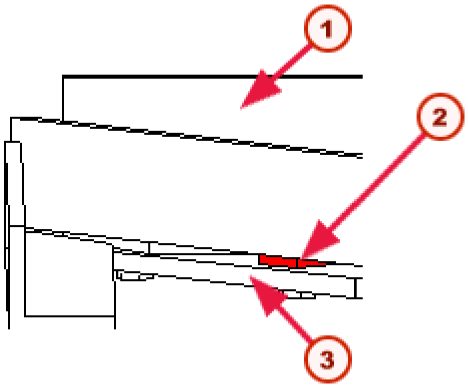
To remove a filler plate, go to the illustration and clear the checkbox against it:



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:



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.

17 Connection Map

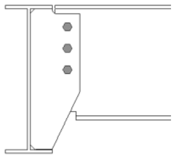
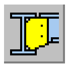
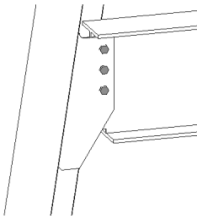
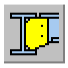
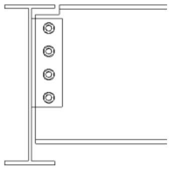
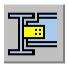
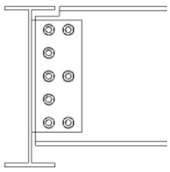
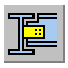
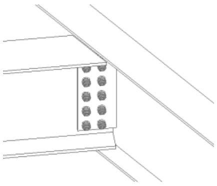
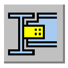
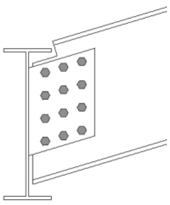
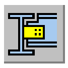
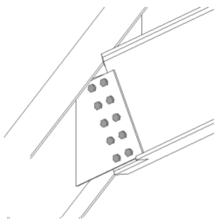
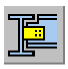
This section introduces example illustrations of different connections, grouped according to their usage.

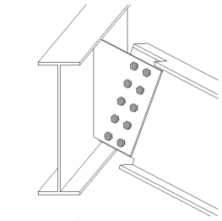
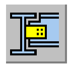
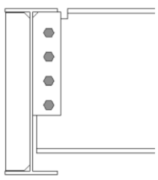
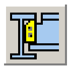
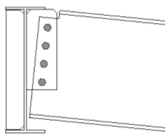
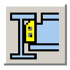
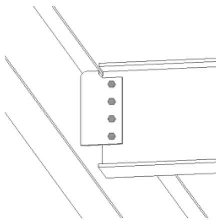
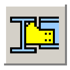
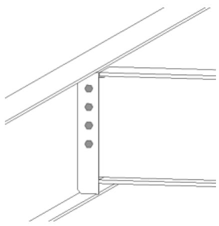
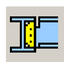
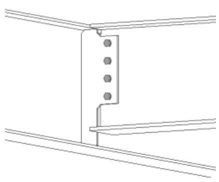
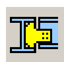
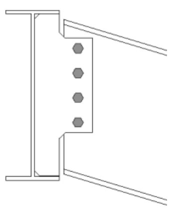
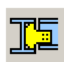
Click the links below to find out more:

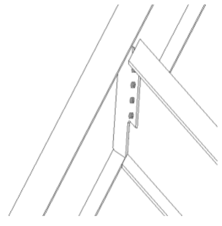
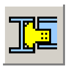
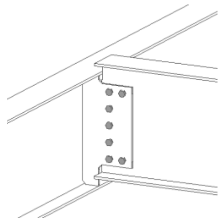
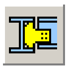
17.1 Beam to beam framing

Click the links below to find out more:

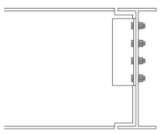
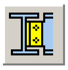
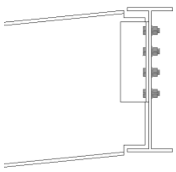
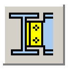
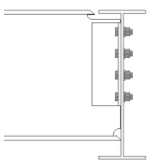
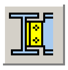
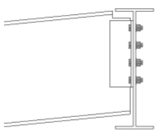
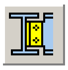
Shear tabs

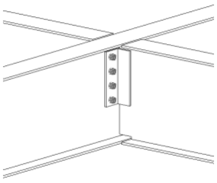
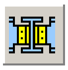
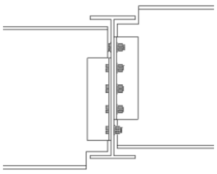
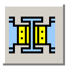
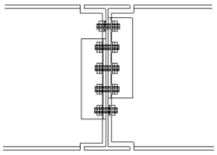
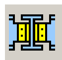
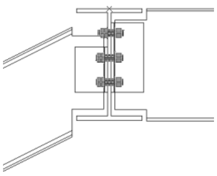
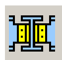
	Full depth shear plate - secondary beam cut short of primary member. Use connection **Beam with stiffener (129)** on toolbar 1.	
	Full depth shear plate -secondary member sloped and/or skewed. Use connection **Beam with stiffener (129)** on toolbar 1.	
	Simple shear tab to beam. Use connection **Shear plate simple (146)** on toolbar 1.	
	Simple shear tab to beam - bolt elimination option. Use connection **Shear plate simple (146)** on toolbar 1.	
	Simple shear tab to beam - skewed secondary member. Use connection **Shear plate simple (146)** on toolbar 1.	
	Simple shear tab to beam - sloped (and skewed) secondary member. Bolts and plate oriented with secondary member. Use connection **Shear plate simple (146)** on toolbar 1.	
	Simple shear tab to beam - sloped and skewed secondary member. Valley condition. Use connection **Shear plate simple (146)** on toolbar 1.	

	Simple shear tab to beam - sloped and skewed secondary member. Valley condition. Use connection **Shear plate simple (146)** on toolbar 1.	
	Partial depth shear tab to top flange of beam - square or skewed, stiffener option. Use connection **Welded to top flange (147)** on toolbar 1.	
	Partial depth shear tab to top flange of beam. Sloped/ square or skewed. Use connection **Welded to top flange (147)** on toolbar 1.	
	Partial depth shear tab to top flange of beam, secondary beam cut short of primary member. Square, sloped, skewed. Use connection **Welded to top flange S (149)** on toolbar 1.	
	Full depth shear tab. Square, sloped, skewed. Use connection **Full depth (184)** on toolbar 1.	
	Full depth shear tab. Secondary beam cut short of primary member. Use connection **Full depth S (185)** on toolbar 1.	
	Full depth shear tab. Secondary beam cut short of primary member. Sloped secondary. Use connection **Full depth S (185)** on toolbar 1.	

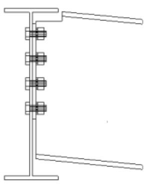
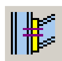
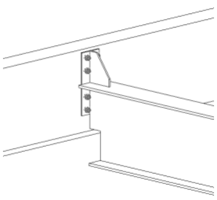
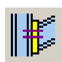
	Full depth shear tab. Secondary beam cut short of primary member. Sloped and skewed secondary (hip &valley). Use connection **Full depth S (185)** on toolbar 1.	
	Full depth shear tab. Secondary beam cut short of primary member. Secondary offset. Bolt elimination option. Use connection **Full depth S (185)** on toolbar 1.	

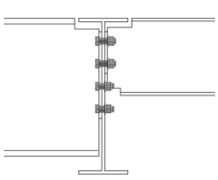
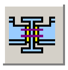
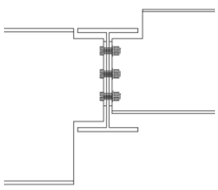
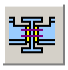
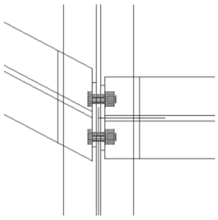
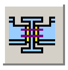
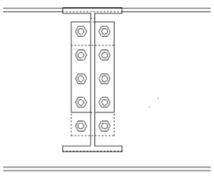
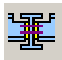
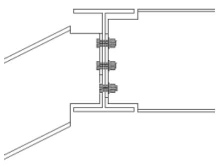
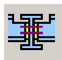
Clip angles

	Clip angle connection – single sided clip/double sided clip. Use connection **Clip angle (141)** on toolbar 1.	
	Clip angle connection – single sided clip/double sided clip. Sloped secondary member. Various notching options. Use connection **Clip angle (141)** on toolbar 1.	
	Clip angle connection – single sided clip/double sided clip. Weld prep option. Use connection **Clip angle (141)** on toolbar 1.	
	Clip angle connection – single sided clip/double sided clip. Sloped secondary member. Use connection **Clip angle (141)** on toolbar 1.	

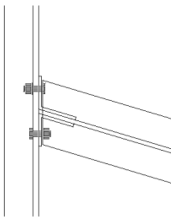
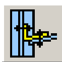
	Clip angle connection – single sided clip/double sided clip. Two secondary members. Bolted/bolted, welded/ bolted, welded/welded options. Use connection **Two sided clip angle (143)** on toolbar 1.	
	Clip angle connection – single sided clip/double sided clip. Two secondary members at differing heights. Use connection **Two sided clip angle (143)** on toolbar 1.	
	Clip angle connection – single sided clip/double sided clip. Two secondary members. Safety connection. Use connection **Two sided clip angle (143)** on toolbar 1.	
	Clip angle connection – single sided clip/double sided clip. Two secondary members. One sloped. Use connection **Two sided clip angle (143)** on toolbar 1.	

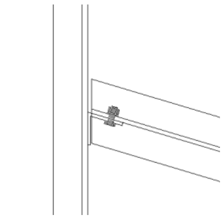
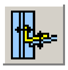
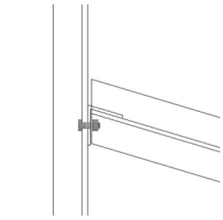
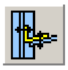
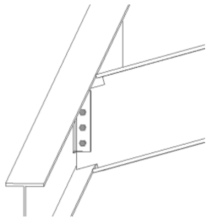
End plates

	End plate connection - level or sloped, square or skewed secondary member. Various notching options. Use connection **End plate (144)** on toolbar 1.	
	End plate connection – extended plate with or without haunches. Use connection **End plate (144)** on toolbar 1.	

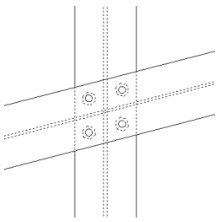
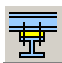
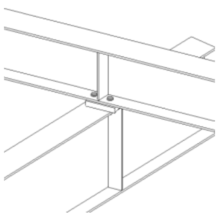
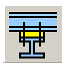
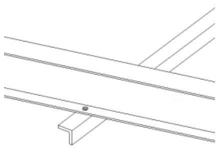
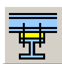
	End plate connection – two secondaries. Automatic notch for bolt clearance. Use connection **Two sided end plate (142)** on toolbar 1.	
	End plate connection – two secondaries at differing heights. Use connection **Two sided end plate (142)** on toolbar 1.	
	End plate connection – two secondaries. Square and /or skewed. Use connection **Two sided end plate (142)** on toolbar 1.	
	End plate connection – two secondaries. Safety connection. Use connection **Two sided end plate (142)** on toolbar 1.	
	End plate connection – two secondaries. Level and/or sloped. Use connection **Two sided end plate (142)** on toolbar 1.	

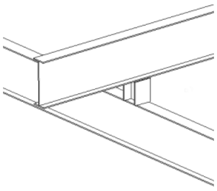
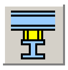
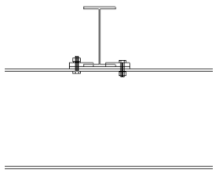
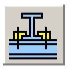
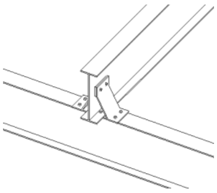
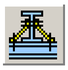
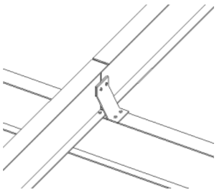
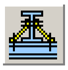
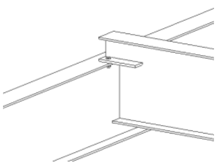
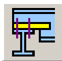
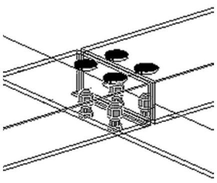
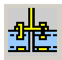
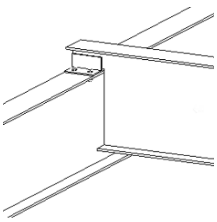
Bent plate

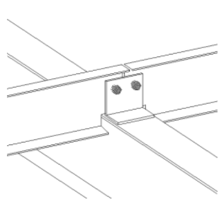
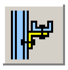
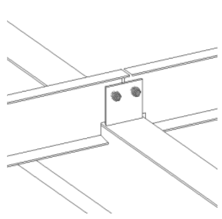
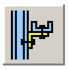
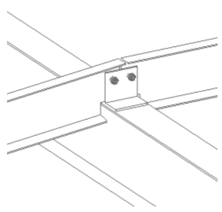
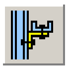
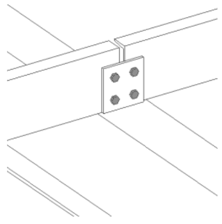
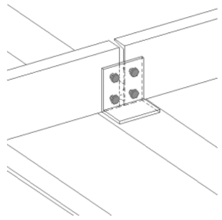
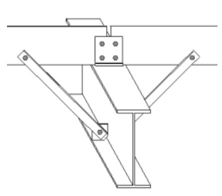
	Bent plate connection – skewed or square secondary, plate near side and far side. Use connection **Bent plate (190)** on toolbar 1.	

	Bent plate connection – skewed or square secondary, plate one side. Use connection **Bent plate (190)** on toolbar 1.	
	Bent plate connection – skewed or square secondary, plate one side. Various plate placing options. Use connection **Bent plate (190)** on toolbar 1.	
	Bent plate connection – skewed and sloped (Hip & Valley). Use connection **Bent plate (190)** on toolbar 1.	

Bearing type

	Beam to beam bearing connection. Options for 1,2,3, or 4 bolts. Use connection **Seating (30)** on toolbar 7.	
	Beam to beam bearing connection. Spacer option. Use connection **Seating (30)** on toolbar 7.	
	Beam to beam bearing connection. Brace support. Use connection **Seating (30)** on toolbar 7.	

	Beam to beam bearing connection with stub column. Square, sloped and skewed conditions. Use connection **Cross (4)** on toolbar 7.	
	Beam to beam bearing clamp type connection. Use connection **Seating with nail (36)** on toolbar 7.	
	Beam to beam bearing purlin connection to single purlin. Use connection **Purlin connections (93)** on toolbar 7.	
	Beam to beam bearing purlin connection to two purlins. Use connection **Purlin connections (93)** on toolbar 7.	
	Beam to beam bearing notched seating connection. Square and skewed conditions. Use connection **Notched seating (9)** on toolbar 7.	
	Beam to beam bearing tube steel rails to primary member. Cope or hole bolt access options. Use connection **Tube rail (113)** on toolbar 7.	
	Beam to beam bearing notched seat with angle. Use connection **Rail joint (70)** on toolbar 12.	

	Beam to beam bearing rafter connection to two secondary members. Notching required. Use connection **Rail joint (70)** on toolbar 12.	
	Beam to beam bearing rafter connection to two secondary members. Plate. Notching required. Use connection **Rail joint (70)** on toolbar 12.	
	Beam to beam bearing rafter connection to two secondary members. Sloped/level notching required. Use connection **Rail joint (70)** on toolbar 12.	
	Beam to beam full bearing rafter connection to two secondary members. Plate. Use connection **Cold rolled overlap (1)** on toolbar 13.	
	Beam to beam full bearing rafter connection to two secondary members. Angle. Use connection **Cold rolled overlap (1)** on toolbar 13.	
	Beam to beam full bearing rafter connection to two secondary members. Knee brace option. Use connection **Cold rolled overlap (1)** on toolbar 13.	

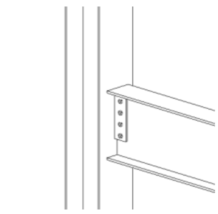
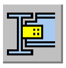
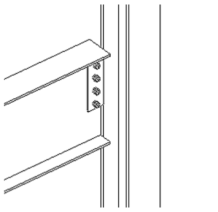
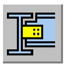
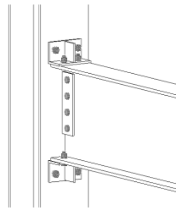
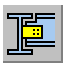
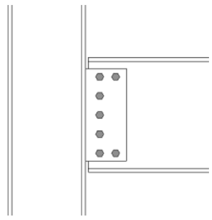
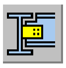
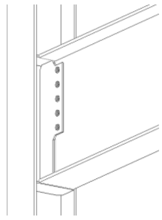
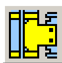
17.2 Beam to column framing

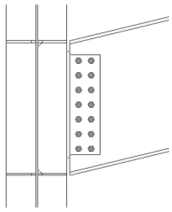
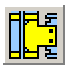
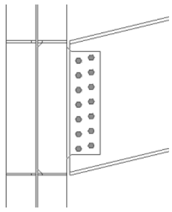
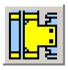
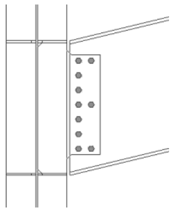
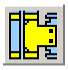
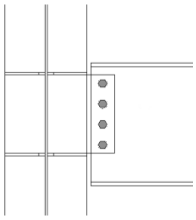
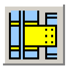
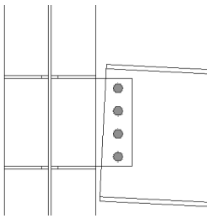
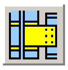
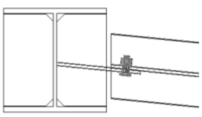
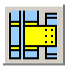
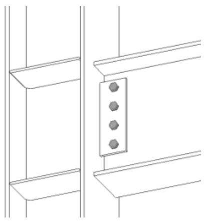
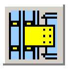
Click the links below to find out more:

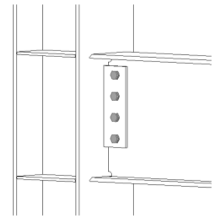
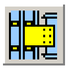
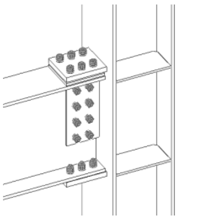
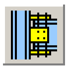
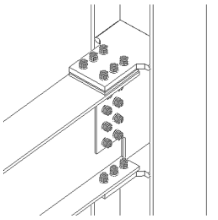
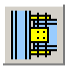
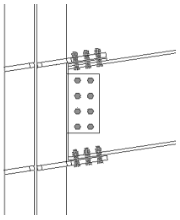
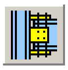
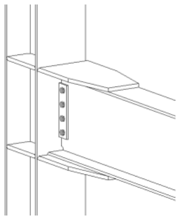
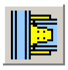
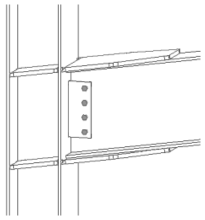
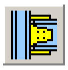
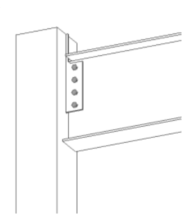
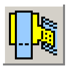
- Shear tabs on page 1361
- Clip angles on page 1364

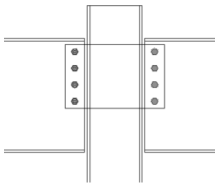
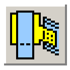
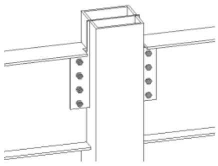
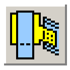
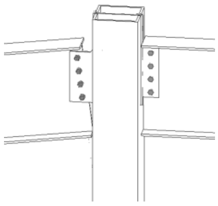
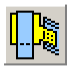
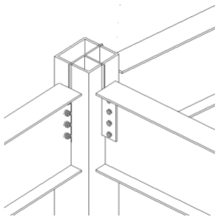
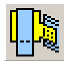
- End plates on page 1366
- Bent plate on page 1367
- Welded tee on page 1367
- Seated connection on page 1368
- Bearing type cap plate on page 1368
- Girt to column on page 1370

Shear tabs

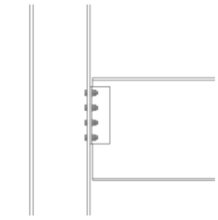
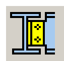
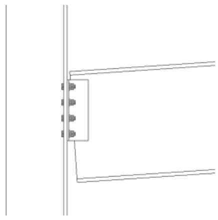
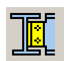
	Simple shear tab to column flange. Use connection **Shear plate simple (146)** on toolbar 1.	
	Simple shear tab to edge/column flange. Use connection **Shear plate simple (146)** on toolbar 1.	
	Simple shear tab to column flange with seat angle options. Use connection **Shear plate simple (146)** on toolbar 1.	
	Simple shear tab to column flange. Bolt elimination options. Use connection **Shear plate simple (146)** on toolbar 1.	
	Shaped shear plate with column stiffeners. Use connection **Column with stiffeners W (182)** on toolbar 1.	

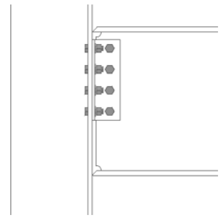
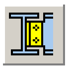
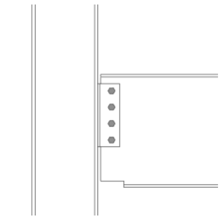
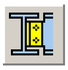
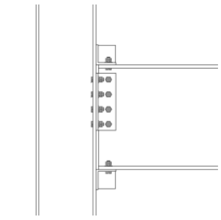
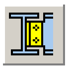
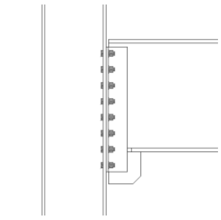
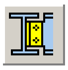
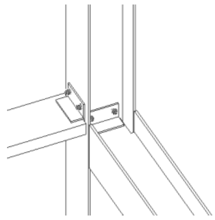
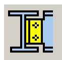
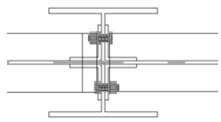
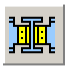
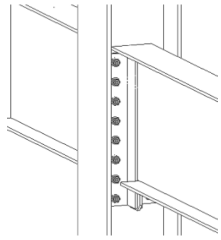
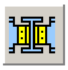
	Shaped shear plate with column stiffeners. Sloped secondary. Use connection **Column with stiffeners W (182)** on toolbar 1.	
	Shaped shear plate with column stiffeners. Bolts aligned with secondary member. Use connection **Column with stiffeners W (182)** on toolbar 1.	
	Shaped shear plate with column stiffeners. Bolt elimination option. Use connection **Column with stiffeners W (182)** on toolbar 1.	
	Shear plate with column stiffeners. Use connection **Column with stiffeners (186)** on toolbar 1.	
	Shear plate with column stiffeners. Sloped secondary. Use connection **Column with stiffeners (186)** on toolbar 1.	
	Shear plate with column stiffeners. Skewed secondary. Use connection **Column with stiffeners (186)** on toolbar 1.	
	Shear plate to column flange with column stiffeners. Use connection **Column with stiffeners (188)** on toolbar 1.	

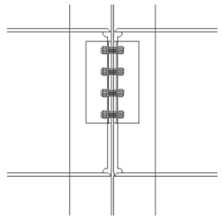
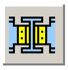
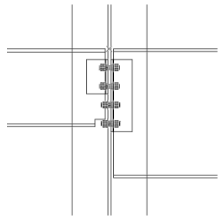
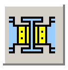
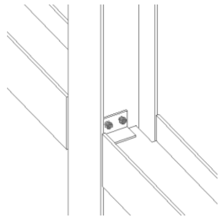
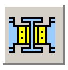
	Shear plate to column flange with column stiffeners. Weld prep and rat holes for moment connection option. Use connection **Column with stiffeners (188)** on toolbar 1.	
	Bolted moment connection to column flange with column stiffeners. Use connection **Bolted moment connection (134)** on toolbar 1.	
	Bolted moment connection to column web. Use connection **Bolted moment connection (134)** on toolbar 1.	
	Bolted moment connection to column web. Sloped secondary member. Use connection **Bolted moment connection (134)** on toolbar 1.	
	Welded moment connection to column flange. Beam weld prep and rat hole options. Use connection **Moment connection (181)** on toolbar 1.	
	Welded moment connection to column flange. Sloped. Use connection **Moment connection (181)** on toolbar 1.	
	Shear plate through tube column. Use connection **Shear plate tube column (189)** on toolbar 1.	

	Shear plate through tube column. Two secondaries. Use connection **Shear plate tube column (189)** on toolbar 1.	
	Shear plate through tube column. Two secondaries. Plate extended to top of column option. Use connection **Shear plate tube column (189)** on toolbar 1.	
	Shear plate through tube column. Two secondaries, level and/or sloped. Bolt alignment options. Use connection **Shear plate tube column (189)** on toolbar 1.	
	Shear plate through tube column. Third secondary member after connection applied to original two secondaries. Use connection **Shear plate tube column (189)** on toolbar 1.	

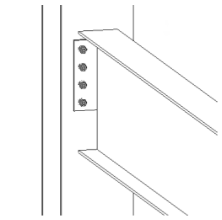
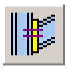
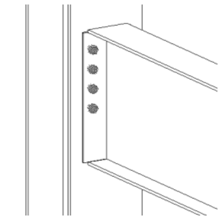
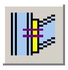
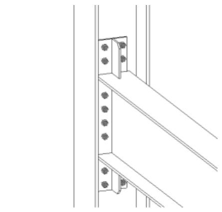
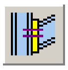
Clip angles

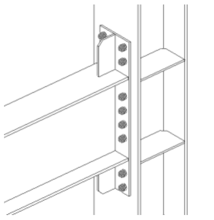
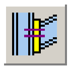
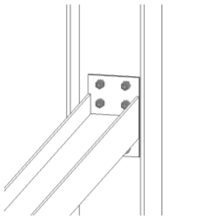
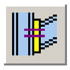
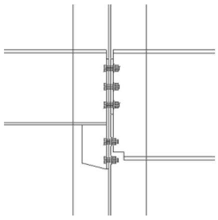
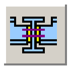
	Clip angle connection to column flange or web. Single sided /double sided clip. Welded/bolted, bolted/ bolted, welded/welded options. Use connection **Clip angle (141)** on toolbar 1.	
	Clip angle connection to column flange or web. Single sided /double sided clip. Sloped secondary. Square or bevel cut secondary options. Use connection **Clip angle (141)** on toolbar 1.	

	Clip angle connection to column flange or web. Single sided /double sided clip. Weld prep and rat holes for moment connection. Use connection **Clip angle (141)** on toolbar 1.	
	Clip angle connection to column knife connection. Bottom flange blocked or stripped for erection. Use connection **Clip angle (141)** on toolbar 1.	
	Clip angle connection to column. Seat angle option. Top/Bottom/Both. Use connection **Clip angle (141)** on toolbar 1.	
	Clip angle connection to column flange or web. Single sided /double sided clip. Haunch extension option. Top/Bottom/Both. Use connection **Clip angle (141)** on toolbar 1.	
	Clip angle connection to column flange or web. Single sided /double sided clip. Rotated secondary Use connection **Clip angle (141)** on toolbar 1.	
	Clip angle connection. Single sided / double sided clip. Two secondary members. Bolted/bolted, welded/ bolted, welded/welded options. Use connection **Two sided clip angle (143)** on toolbar 1.	
	Clip angle connection. Single sided / double sided clip. Two secondary members. Haunch extension option. Top/Bottom/Both. Use connection **Two sided clip angle (143)** on toolbar 1.	

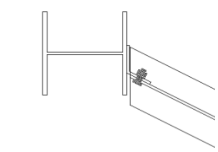
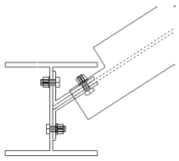
	Clip angle connection. Single sided / double sided clip. Two secondary members. Weld prep and rat holes for moment connection. Use connection **Two sided clip angle (143)** on toolbar 1.	
	Clip angle connection. Automatic notching of secondary member to provide bolt clearance. Use connection **Two sided clip angle (143)** on toolbar 1.	
	Clip angle connection. Single sided / double sided clip. Two secondary members rotated. Use connection **Two sided clip angle (143)** on toolbar 1.	

End plates

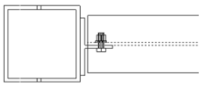
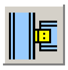
	End plate connection to column flange or web. Level or sloped, square or skewed secondary member Use connection **End plate (144)** on toolbar 1.	
	Full depth end plate connection to column flange or web. Level or sloped, square or skewed secondary member. Use connection **End plate (144)** on toolbar 1.	
	End plate connection to column web. Extended plate with haunches option. Use connection **End plate (144)** on toolbar 1.	

	End plate connection to column flange. Column stiffener option. Use connection **End plate (144)** on toolbar 1.	
	End plate connection to column. Secondary member rotated. Use connection **End plate (144)** on toolbar 1.	
	End plate connection. Two secondaries. Automatic notching for bolt clearance. Haunch option. Use connection **Two sided end palte (142)** on toolbar 1.	

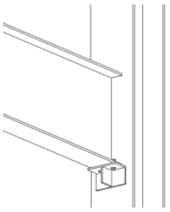
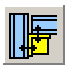
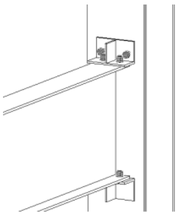
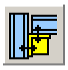
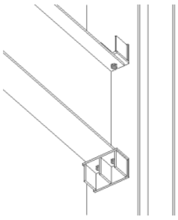
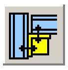
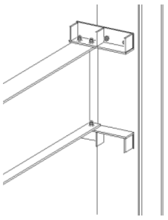
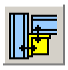
Bent plate

	Bent plate connection to column flange. Skewed or square secondary. Plate Near side\Far side\Both sides. Use connection **Bent plate (190)** on toolbar 1.	
	Bent plate connection to column web. Skewed or square secondary. Plate Near side\Far side\Both sides. Use connection **Bent plate (190)** on toolbar 1.	

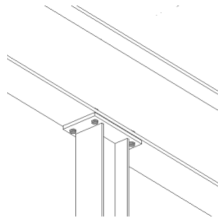
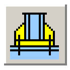
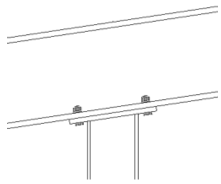
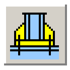
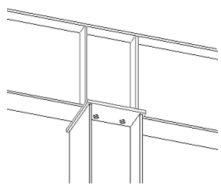
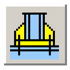
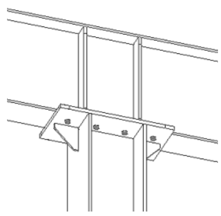
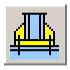
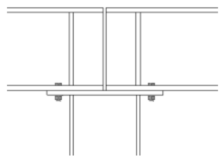
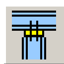
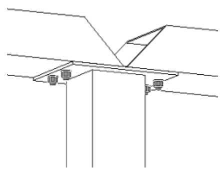
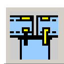
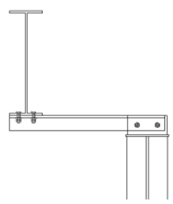
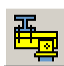
Welded tee

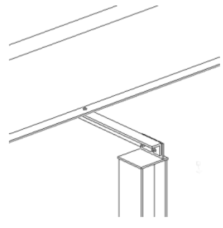
	Welded tee to column. Use connection **Welded tee (32)** on toolbar 2.	

Seated connection

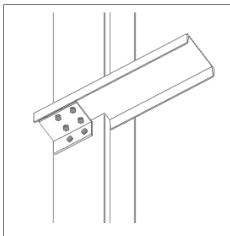
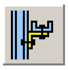
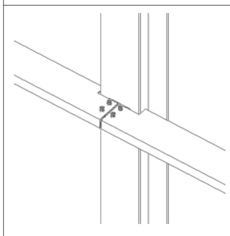
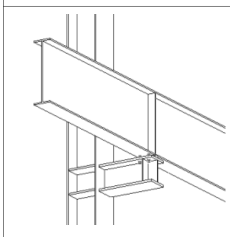
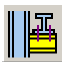
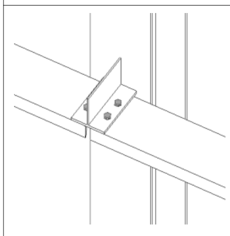
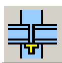
	Beam seat with stiffeners. Use connection **Rail joint (170)** on toolbar 12.	
	Beam seat top and bottom with stiffeners. Various bolting options. Use connection **Rail joint (170)** on toolbar 12.	
	Beam seat. Multiple stiffener options. Use connection **Rail joint (170)** on toolbar 12.	
	Beam seat. Offset secondary member. Use connection **Rail joint (170)** on toolbar 12.	

Bearing type cap plate

	Beam cantilever over column with cap plate. Use connection **U.S. Base plate joint (71)** on toolbar 5.	
	Beam cantilever over column with cap plate. Sloped secondary. Use connection **U.S. Base plate joint (71)** on toolbar 5.	
	Beam cantilever over column with cap plate. Beam stiffener option. Use connection **U.S. Base plate joint (71)** on toolbar 5.	
	Beam cantilever over column with cap plate. Column stiffener option. Use connection **U.S. Base plate joint (71)** on toolbar 5.	
	Two beams to column cap plate. Beam stiffener options. Use connection **Seating (39)** on toolbar 7.	
	Beam column cap plate. Tube steel rails to primary member. Cope or hole bolt access options. Use connection **Column tube seating (100)** on toolbar 7.	
	Wind column to beam connection. Use connection **Wind column (5)** on toolbar 12.	

	Wind column to beam connection. Plate offset option Use connection **Wind column (5)** on toolbar 12.	

Girt to column

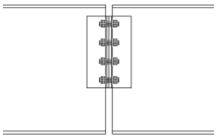
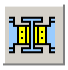
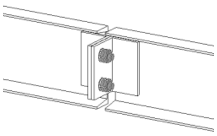
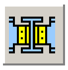
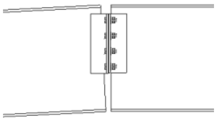
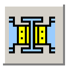
	Single girt to column. Angle connection. Use connection **Rail joint (70)** on toolbar 12.	
	Two girts to column. Angle connection. Use connection **Rail joint (70)** on toolbar 12.	
	Beam to column outrigger connection. Primary and secondary member stiffener options. Use connection **Stub (28)** on toolbar 12.	
	Two girts to column. WT connection. Use connection **U.S. seat joint 3 (74)** on toolbar 12.	

17.3 Splice connections

Click the links below to find out more:

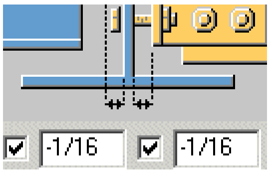
- Beam to beam on page 1371
- Column splice on page 1373

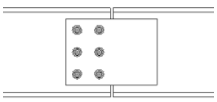
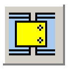
Beam to beam

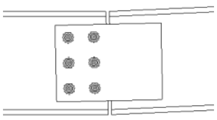
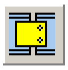
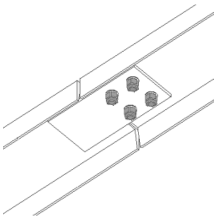
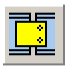
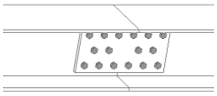
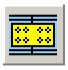
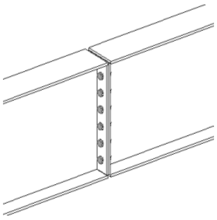
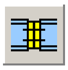
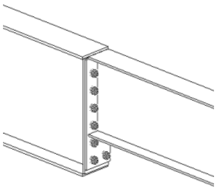
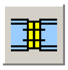
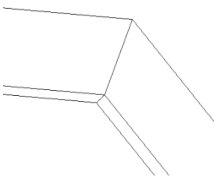
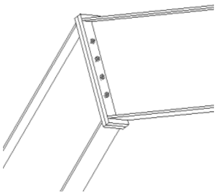
	Clip angle splice connection. Bolted/ bolted, welded/bolted, welded/welded options. Use connection **Two sided clip angle (143)** on toolbar 1.	
	Clip angle splice connection. One sided. Bolted/bolted, welded/bolted, welded/welded options. Use connection **Two sided clip angle (143)** on toolbar 1.	
	Clip angle splice connection. Beams in differing planes. Use connection **Two sided clip angle (143)** on toolbar 1.	

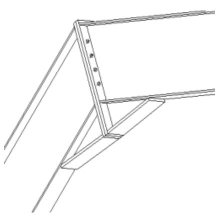
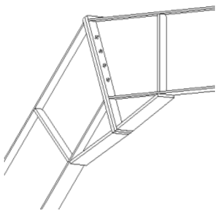
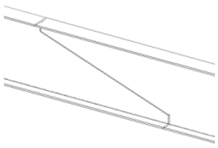
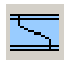
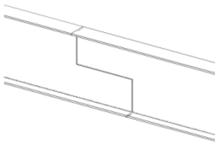
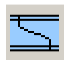
To make a clip angle type splice connection it is necessary to create a "dummy" primary part to bolt through. The beams to be spliced will be the secondary members.

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.

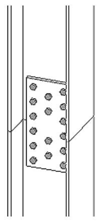
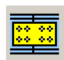
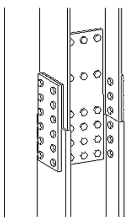
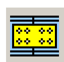


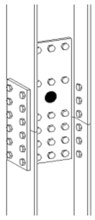
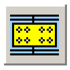
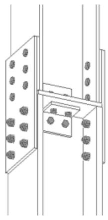
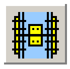
	Beam to beam web splice plate welded to primary/ bolted to secondary. Use connection **Tab plate (33)** on toolbar 8.	

	Beam to beam web splice plate welded to primary/ bolted to secondary. Beams in differing planes. Use connection **Tab plate (33)** on toolbar 8.	
	Beam to beam web splice plate welded to primary/ bolted to secondary. Members rotated. Use connection **Tab plate (33)** on toolbar 8.	
	Beam to beam web splice plate bolted to both members. Both members in same plane. Use connection **Column splice (42)** on toolbar 8.	
	Beam to beam end plate splice. Use connection **Joining plates (14)** on toolbar 8.	
	Beam to beam end plate splice. Members of different depths. Use connection **Joining plates (14)** on toolbar 8.	
	Beam to beam welded splice. Stair stringer to landing. Use connection **Cranked beam (41)** on toolbar 7. **Note**: Does not work on very shallow slopes, or beams in same plane.	
	Beam to beam bolted end plate splice. Use connection **Cranked beam (41)** on toolbar 7. **Note**: Does not work on very shallow slopes, or beams in same plane.	

	Beam to beam bolted end plate splice with haunch. Use connection **Cranked beam (41)** on toolbar 7. **Note**: Does not work on very shallow slopes, or beams in same plane.	
	Beam to beam bolted end plate splice with haunch stiffener plate option. Use connection **Cranked beam (41)** on toolbar 7. **Note**: Does not work on very shallow slopes, or beams in same plane.	
	Beam to beam welded splice, "Z" cut. Use connection **Offshore Z (192)** on toolbar 8.	
	Beam to beam welded splice, "Z" square cut. Use connection **Offshore Z (192)** on toolbar 8.	

Column splice

	Column splice. Bolted to both members. Both members in same plane. Use connection **Column splice (42)** on toolbar 8.	
	Column splice. Bolted to both members. Shim plates for differing profiles. Use connection **Column splice (42)** on toolbar 8.	

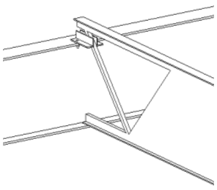
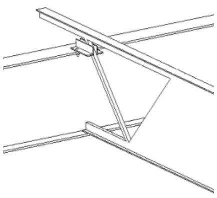
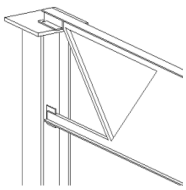
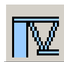
	Column splice. Bolted to both members. Lifting hole option. Use connection **Column splice (42)** on toolbar 8.	
	Column splice with division plate and connection angles. Use connection **Column splice (132)** on toolbar 8.	

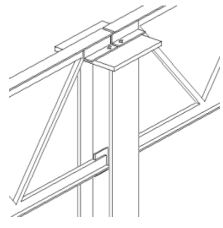
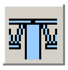
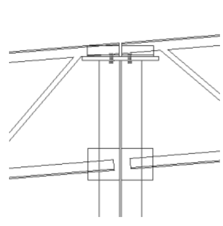
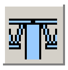
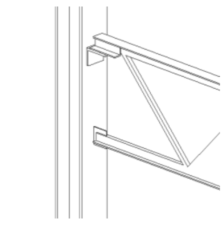
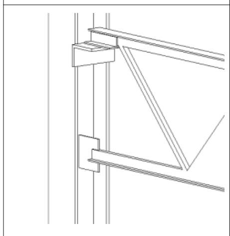
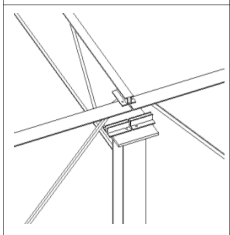
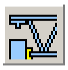
17.4 Joist connections

Click the links below to find out more:

- Joist to beam/ Joist to column on page 1374

Joist to beam/ Joist to column

	Joist bearing on beam. Use connection **Joist to beam, type 1 (160)** on toolbar 12.	
	Joist bearing on beam. Top chord extension option. Use connection **Joist to beam, type 1 (160)** on toolbar 12.	
	Joist bearing to column. Cap plate, stabilizer bar or angle option. Top chord extension option also available. Use connection **Joist to column, type 1 (161)** on toolbar 12.	

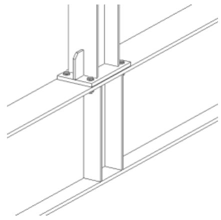
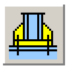
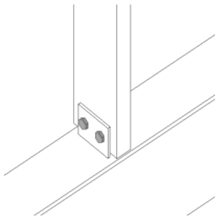
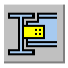
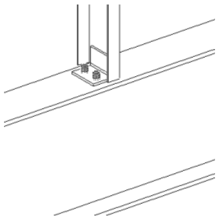
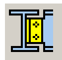
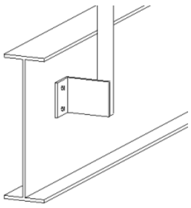
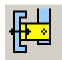
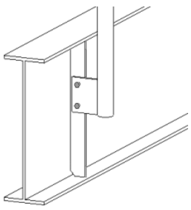
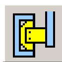
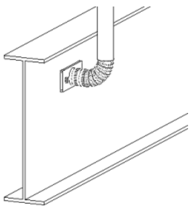
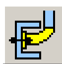
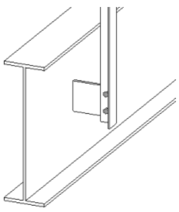
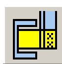
	Two joists bearing to column. Cap plate, stabilizer bar or angle option. Use connection **2 sided joist to column (162)** on toolbar 12.	
	Two joists bearing to column. Cap plate, cap plate level or on slope of joists. Use connection **2 sided joist to column (162)** on toolbar 12.	
	Joist framing to side of column. Stabilizer bar or angle option. Use connection **Joist to column, type 2 (163)** on toolbar 12.	
	Joist framing to side of column. Seat angle across toes of flanges. Use connection **Joist to column, type 2 (163)** on toolbar 12.	
	Joist framing to joist girders at column. Use connection **Joist to beam and column (164)** on toolbar 12.	

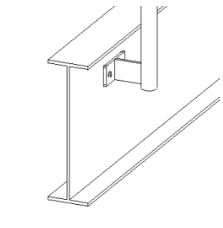
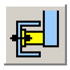
17.5 Vertical member to beam

Click the links below to find out more:

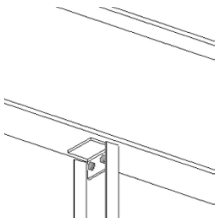
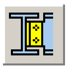
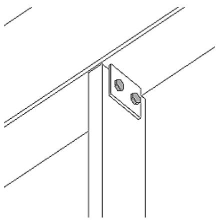
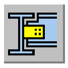
- Post and door jamb to top of beam on page 1375
- Hangers from underside of beam on page 1377

Post and door jamb to top of beam

	Post base plate to top of beam. Primary and secondary stiffener options. Use connection **U.S. base plate joint (71)** on toolbar 5.	
	Simple shear tab to post or channel jamb. Use connection **Shear plate simple (146)** on toolbar 1.	
	Clip angle to channel jamb. Use connection **Clip angle (141)** on toolbar 1.	
	Clip angle to railing post. Use connection **Stringer stanchion L profile (68)** on toolbar 11.	
	Railing post connection plate to beam stiffener. Use connection **Stringer stanchion st (69)** on toolbar 11	
	Railing post elbow to connection plate. Use connection **Stanchion curved (84)** on toolbar 11.	
	Shear tab to railing post. Use connection **Stanchion side profile (86)** on toolbar 11.	

	Built–up plate railing post connection. Use connection **Stanchion double plate (87)** on toolbar 11.	

Hangers from underside of beam

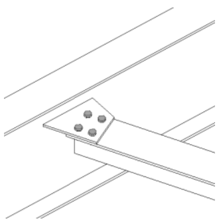
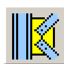
	Clip angle hanger connection. Use connection **Clip angle (141)** on toolbar 1.	
	Simple shear tab hanger connection. Use connection **Shear plate simple (146)** on toolbar 1.	

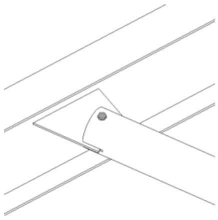
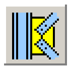
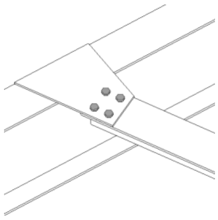
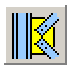
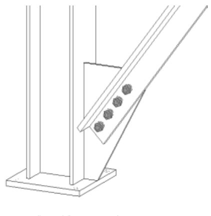
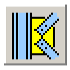
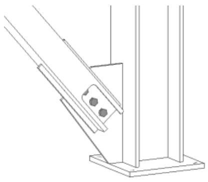
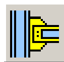
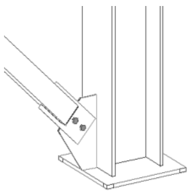
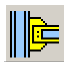
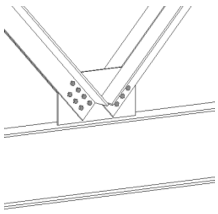
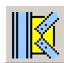
17.6 Bracing connections

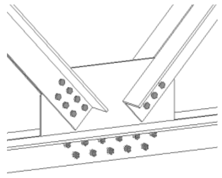
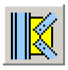
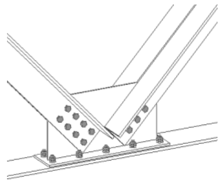
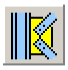
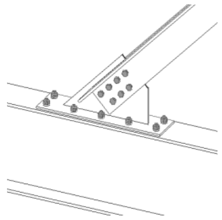
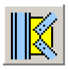
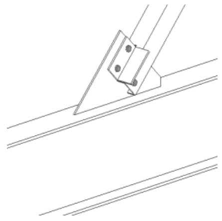
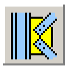
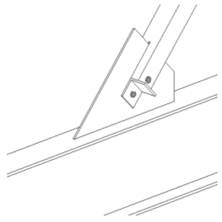
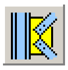
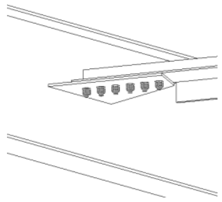
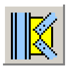
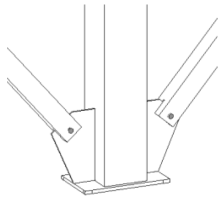
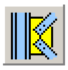
Click the links below to find out more:

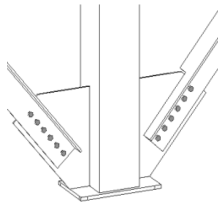
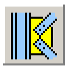
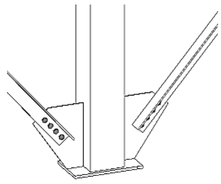
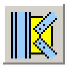
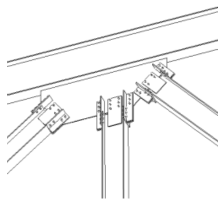
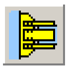
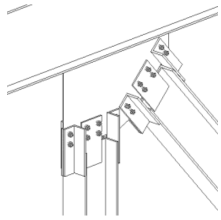
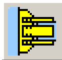
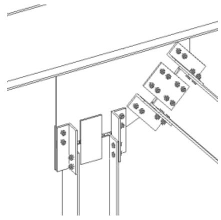
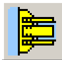
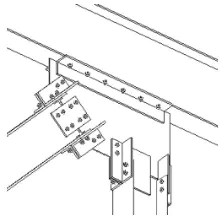
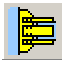
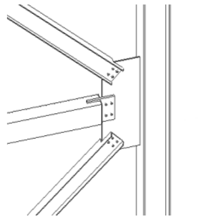
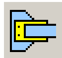
- Simple gusset plate connections on page 1377

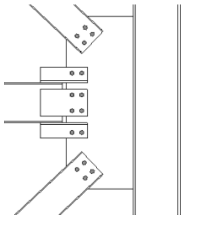
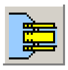
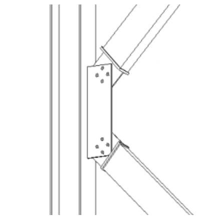
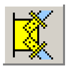
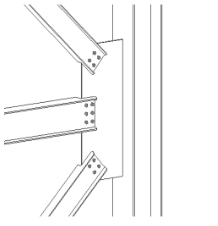
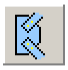
Simple gusset plate connections

	Gusset plate to single brace. Horizontal and vertical bracing. Various bracing profiles. Use connection **Bolted gusset (11)** on toolbar 4. Load connection attribute < **Defaults** > and select **Defaults** for **Rule Group** for best results.	

	Gusset plate to single brace. Horizontal and vertical bracing. Hollow round brace with pin bolt option. Use connection **Bolted gusset (11)** on toolbar 4. Load connection attribute **< Defaults >** and select **Defaults** for **Rule Group** for best results.	
	Gusset plate to single brace. Brace and primary member at same elevation Use connection **Bolted gusset (11)** on toolbar 4.	
	Gusset plate to single brace at base plate of column. Use connection **Bolted gusset (11)** on toolbar 4.	
	Gusset plate hollow section "Birds mouth" connection to secondary members. Use connection **Tube gusset (20)** on toolbar 4.	
	Gusset plate hollow section tongue plate connection to secondary members. Use connection **Tube gusset (20)** on toolbar 4.	
	Gusset plate to twin profile brace. Vertical or horizontal brace. Multiple bracing members. Use connection **Bolted gusset (11)** on toolbar 4.	

	Gusset plate to twin profile brace. Twin profile primary member. Weld or bolt to primary. Use connection **Bolted gusset (11)** on toolbar 4.	
	Gusset plate with connection plate. Bolted to primary option. Use connection **Bolted gusset (11)** on toolbar 4.	
	Gusset plate with connection plate. Bolted to primary option. Various gusset plate shaping options. Use connection **Bolted gusset (11)** on toolbar 4.	
	Gusset plate to hollow section brace. Pin bolt and tension angle option. Use connection **Bolted gusset (11)** on toolbar 4.	
	Gusset plate to hollow section brace. Pin bolt and tension angle option. Use connection **Bolted gusset (11)** on toolbar 4.	
	Gusset plate to WT section brace. Notching option. Use connection **Bolted gusset (11)** on toolbar 4. Load connection attribute **< Defaults >** and select **Defaults** for **Rule Group** for best results.	
	Gusset plate through hollow section column to hollow section bracing at base plate. Use connection **Bolted gusset (11)** on toolbar 4. Select column, then brace and brace.	

	Gusset plate through hollow section column to WT bracing at base plate. Use connection **Bolted gusset (11)** on toolbar 4. Select column, then brace and brace.	
	Gusset plate through hollow section column to angle bracing at base plate. Single or twin profile. Use connection **Bolted gusset (11)** on toolbar 4. Select column, then brace and brace.	
	Wrapped gusset plate W section bracing. Various bracing connection options. Welded/bolted, bolted/bolted. Use connection **Gusset wrapped cross (62)** on toolbar 4.	
	Wrapped gusset plate W section bracing. Various bracing connection options. Welded/bolted, bolted/bolted. Use connection **Gusset wrapped cross (62)** on toolbar 4.	
	Wrapped gusset plate W section bracing. Various bracing connection options for each brace. Use connection **Gusset wrapped cross (62)** on toolbar 4.	
	Wrapped gusset plate W section bracing. Various gusset plate connection options. Use connection **Gusset wrapped cross (62)** on toolbar 4.	
	Hollow section bracing tongue plate connection to existing gusset plate. Use connection **Tube crossing (22)** on toolbar 4.	

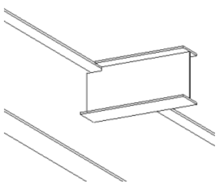
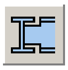
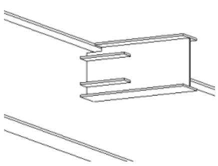
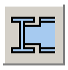
	Wrapped gusset W section bracing connection to existing gusset plate. Use connection **Wrapped cross (61)** on toolbar 4.	
	Hollow section bracing WT end connection to existing gusset plate. Use connection **Portal bracing (105)** on toolbar 4.	
	Bolted brace connection to existing gusset plate. Use connection **Bracing cross (19)** on toolbar 4.	

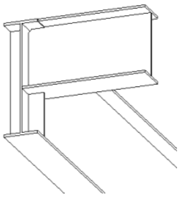
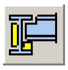
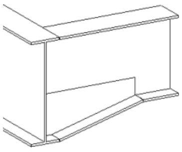
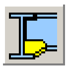
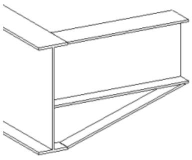
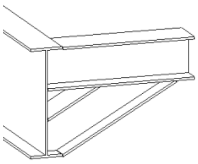
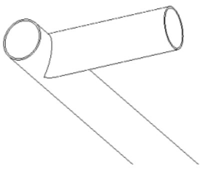
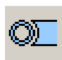
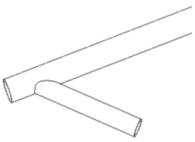
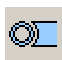
17.7 Welded connections

Click the links below to find out more:

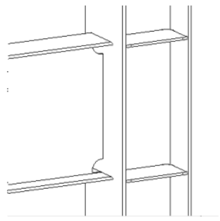
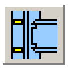
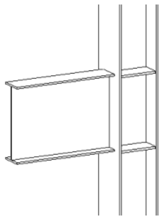
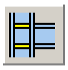
- Beam to beam on page 1381
- Beam to column on page 1382

Beam to beam

	Welded beam to beam. Use connection **Fitting (13)** on toolbar 3.	
	Welded beam to beam with horizontal stiffeners. Use connection **Fitting (13)** on toolbar 3.	

	Welded beam to beam with primary. Vertical stiffeners. Use connection **Welded beam to beam (123)** on toolbar 3.	
	Welded beam to beam with haunch. Use connection **Offshore (194)** on toolbar 3.	
	Welded beam to beam with haunch. Various haunch options. Use connection **Offshore (194)** on toolbar 3.	
	Welded beam to beam with haunch. Various haunch options. Use connection **Offshore (194)** on toolbar 3.	
	Welded round profile to round profile. Use connection **Round tube (23)** on toolbar 3.	
	Welded round profile to round profile Differing profile size and skewed secondary. Use connection **Round tube (23)** on toolbar 3.	

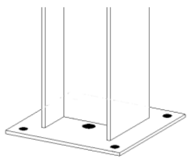
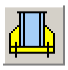
Beam to column

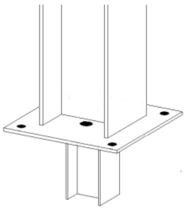
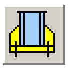
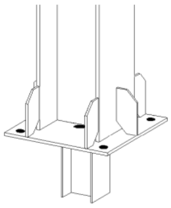
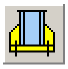
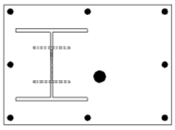
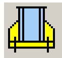
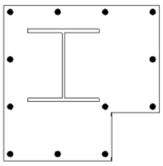
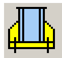
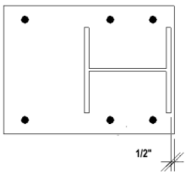
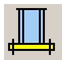
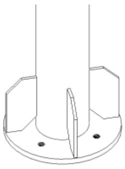
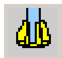
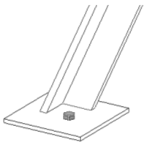
	Welded to column with weld prep and stiffener options. Use connection **Welded column with stiffeners (128)** on toolbar 3.	
	Welded to column. Use connection **Welded column (31)** on toolbar 3.	

17.8 Details

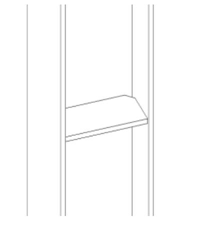
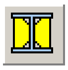
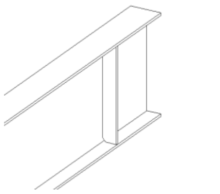
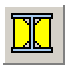
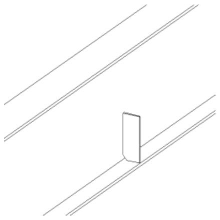
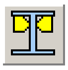
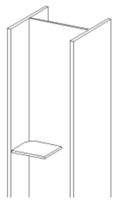
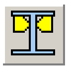
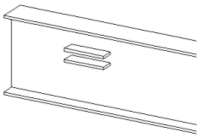
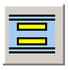
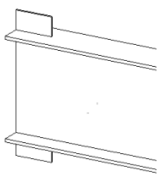
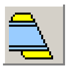
Click the links below to find out more:

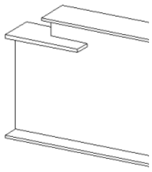
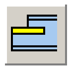
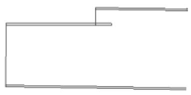
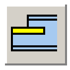
Base plates

	Column base plate with grout hole option. Use connection **U.S. base plate (1047)** on toolbar 5.	

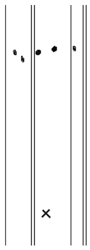
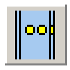
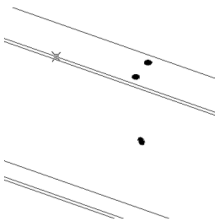
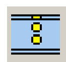
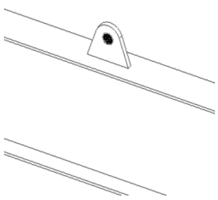
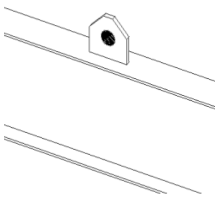
	Column base plate with shear key option. Use connection **U.S. base plate (1047)** on toolbar 5.	
	Column base plate with stiffener option. Use connection **U.S. base plate (1047)** on toolbar 5.	
	Offset column base plate (shear key and grout hole optional). Use connection **U.S. base plate (1047)** on toolbar 5.	
	Column base plate bolt elimination and interior corner chamfer option. Use connection **U.S. base plate (1047)** on toolbar 5.	
	Column base plate located from face of flange. Use connection **Base plate (1042)** on toolbar 5.	
	Circular column base plate with stiffener option. Use connection **Circular base plates (1052)** on toolbar 5.	
	Horizontal base plate to sloped post. Use connection **Base plate (1053)** on toolbar 5.	

Stiffeners

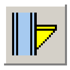
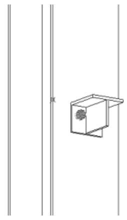
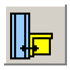
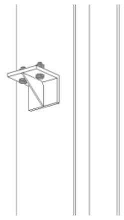
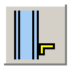
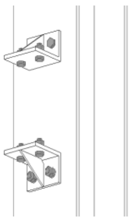
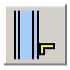
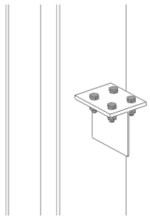
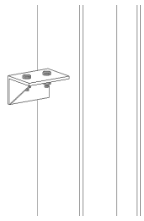
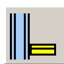
	Stiffener plate detail to column. Use connection **Stiffeners (1003)** on toolbar 5.	
	Stiffener plate detail to beam. Use connection **Stiffeners (1003)** on toolbar 5.	
	Partial depth stiffener plate detail to beam. Use connection **Stiffeners (1041)** on toolbar 5.	
	Partial depth stiffener plate detail to column. Use connection **Stiffeners (1041)** on toolbar 5.	
	Parallel stiffener plates. Use connection **Horizontal stiffener (1017)** on toolbar 5.	
	Flange stiffener plates. Use connection **Stiffeners (1030)** on toolbar 5.	

	Stiffened notch. Use connection **Stiffened notch (1006)** on toolbar 5.	
	Stiffened notch. Notch cut on bevel to member. Use connection **Stiffened notch (1006)** on toolbar 5.	

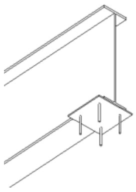
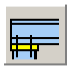
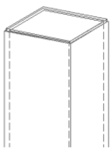
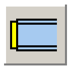
Manlock holes and lifting lugs

	Manlock holes in column. Use connection **Manlock column (1032)** on toolbar 6.	
	Manlock holes in beam. Use connection **Manlock beam (1033)** on toolbar 6.	
	Lifting lug to beam. Use connection **Lifting/alignment pieces (1031)** on toolbar 6.	
	Lifting lug to beam chamfered plate. Use connection **Lifting/alignment pieces (1031)** on toolbar 6.	

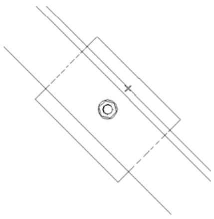
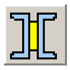
Seat details

	Plate seat with stiffeners. Use connection **Stub plate (1013)** on toolbar 12.	
	Angle seat with stiffener. Use connection **Angle profile box (1040)** on toolbar 12.	
	Angle seat with stiffener. Bolt to primary and through seat options. Use connection **U.S. seat detail (1048)** on toolbar 12.	
	Angle seat with stiffener. Bolt to primary placed at a given distance apart. Use connection **U.S. seat detail (1048)** on toolbar 12.	
	WT seat detail. Use connection **U.S. seat detail 2 (1049)** on toolbar 12.	
	Rotated angle seat. Stiffener plate option available. Use connection **U.S. seat detail 2 (1049)** on toolbar 12.	

Cap plate and bearing plate

	Bearing plate at end of beam. Use connection **U.S. bearing plate (1044)** on toolbar 7.	
	Cap plate. Use connection **End plate detail (1002)** on toolbar 5.	

Miscellaneous

	Spacer plate between twin profiles. Welded or bolted. Use connection **Twin profile connection plate (1046)** on toolbar 6.	

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