



# Custom Components for Precast Concrete

Tekla Structures 12.0 Basic Training  
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# 4

# Custom Components for Precast Concrete

## In this lesson

Tekla Structures contains a set of tools for defining intelligent connections, parts, seams, and details, called custom components.

[Help: Detailing > Custom components](#)

In this lesson we will define few custom components (a custom part, two custom connections and one custom detail) then use the custom components in the model and finally edit the custom detail a little to make it parametric.

You will learn how to:

- Define custom components
- Use custom components
- Edit custom component to make them parametric

## 4.1 Define Custom Part of Fastener Plate

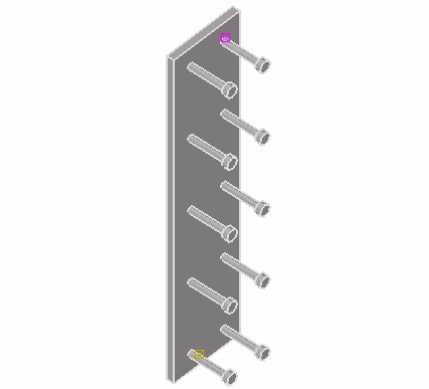
You can build custom components (connection, part, detail or seam) either by exploding and modifying an existing component, or by creating the component objects individually as we did in lesson 3.

You then define a custom component by picking the objects to include in the custom component, and specifying the information the user needs to input, for example, main part, secondary parts, or points they need to pick. You can then apply the custom component to similar framing conditions in the model.

We will now create a custom part from the fastener plate, which was interactively created in Lesson 3.

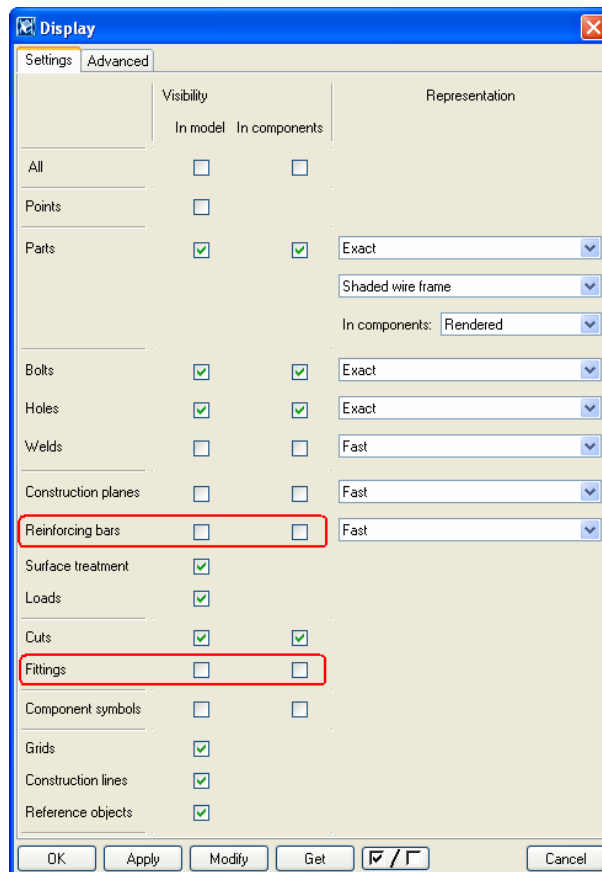
By changing the group of objects to a custom component we can use it in other places of the model inside other custom components and in other models. In next chapter we will use this custom part as a sub component in a custom connection

[Help: Detailing > Custom components > Defining custom components > Defining a custom component](#)



### Clean model view

1. Turn off Reinforcing bars and fittings in the 3D view and display the rest of the objects.



2. Zoom in close to the fastener plate that was interactively created between a column and bracing in lesson 3.



You can also create a part basic view when you need to see a specific part clearly. This places the part in the center of the view and fits the work area according to this part.

To further improve the view, use the **Hide** command to hide adjacent parts, such as the two braces on the other side of the column.

### Define Fastener plate custom part

1. Select **Detailing > Define custom component...** to open the **Custom component wizard** dialog box.
2. On the **Type/Notes** tab, set **Type** to Part, enter a name and description (description is not mandatory) for the custom component as shown. Click **Next>**.



Custom component wizard - 1/3

Type/Notes Position Advanced

Type: Part

Name: FastenerPlate 900\*200

Description:

plate 900\*200\*20  
5\*2 studs

Component identifier:

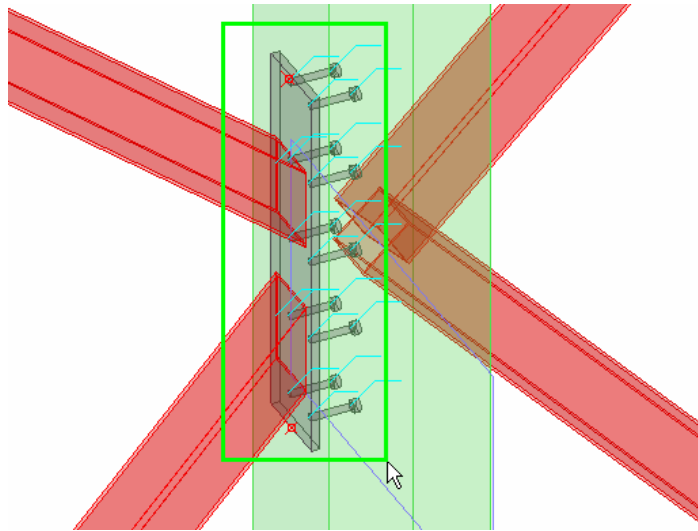
< Back Next > Finish Cancel



The Custom component types available:

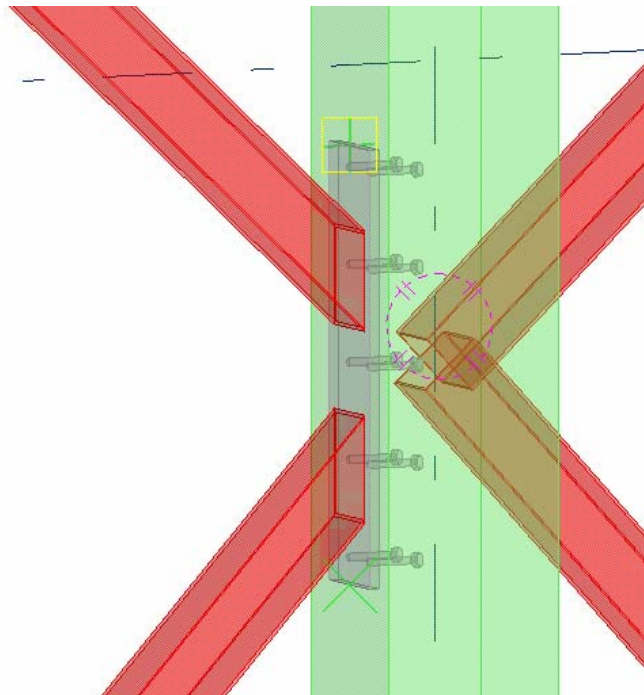
- **Connection:** A **connection** is 2 or more items connected together and is defined as having a main part and 1 or more secondary parts
- **Detail:** A **detail** connects one or more items at the end of, or along the length of, a main part
- **Part:** A **part** is a component in the model such as a ladder or cell form beam
- **Seam:** A **seam** creates seam objects along part or connects two parts along the parts' axial direction.

3. Drag the mouse from left to right as shown below to select the needed fastener plate objects (i.e. plate, studs and welds totally within that rectangular) click **Next>** on the wizard page 2/3.



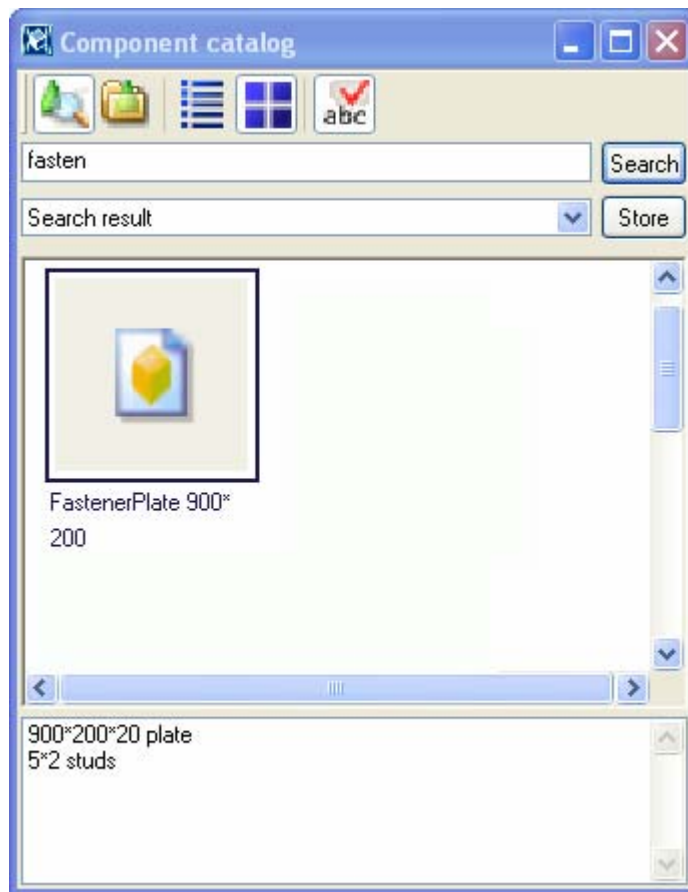
Be careful not to select objects (e.g. parts, fittings, or rebars) that do not belong to this component. Otherwise, when you use the custom component, those objects will also be created.

4. Select two positions: first the plate's lower definition point and then the upper. Click **Finish** on wizard page 3/3.



The new custom part that you have defined is added to the **Custom components** dialog box list. You are now able to create this custom part (instead of creating plate, studs and welds separately) in your model by selecting it in the component catalog and creating it by picking two definition points.





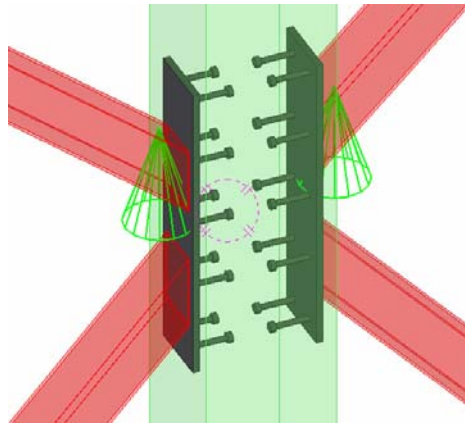
## 4.2 Define Brace Fastener Plate Custom Connections

We will now define the brace connection as a custom connection. We will include the custom part just created to this custom connection.



We could also have defined the custom connection straight away from the interactively created objects.

Defining a custom connection that includes a custom part enables us later, for example, to change the nested custom part to another one (a different size of fastener plate).



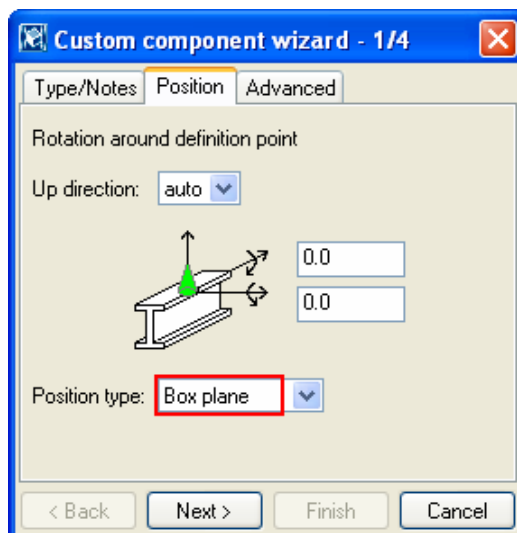
### Define Brace(2) custom component

1. Select **Detailing > Define custom component...** to open the **Custom component wizard** dialog box.
2. Set **Type** to Connection, enter a name and description



3. On the **Position** tab set the Position type to **Box plane** and click **Next>**.

**Help: Detailing > Custom components > Custom components reference > Position type**



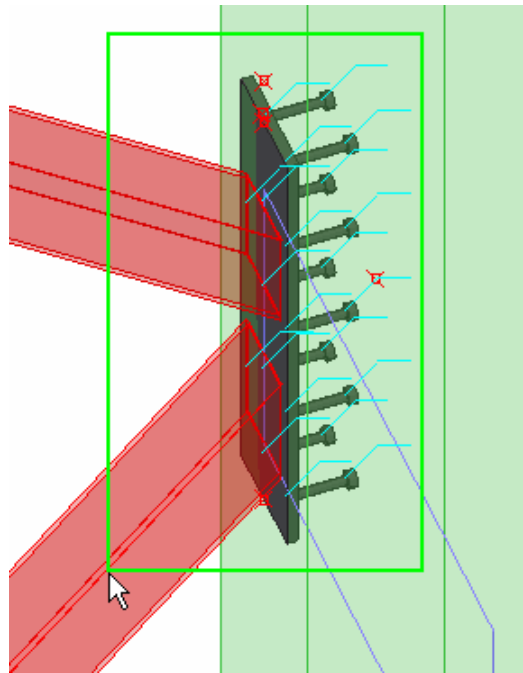
4. Make sure you have **Select component** select switch pressed down. This enables the selecting of a component (instead of just component objects).



5. Use area select from right to left to select all (and only) the objects belonging to the component (custom part, the fittings and the site welds), click **Next >** on the wizard page 2/4.



Site welds and fittings must be visible in the view in order for you to be able to select them. If you are not sure, check the view properties!



Tekla Structures ignores the main part, secondary parts, grids and component symbols when selecting objects to include in the custom component.

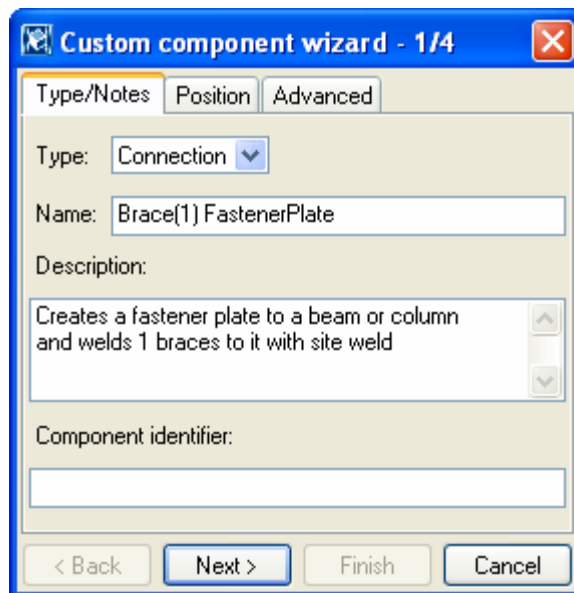
6. Select the column as the main part and click **Next>** on wizard page 3/4.
7. With the Ctrl button pressed down, select the upper brace and the lower brace as secondary parts, click **Finish** on wizard page 4/4.

Tekla Structures displays a connection symbol for the new Custom component.

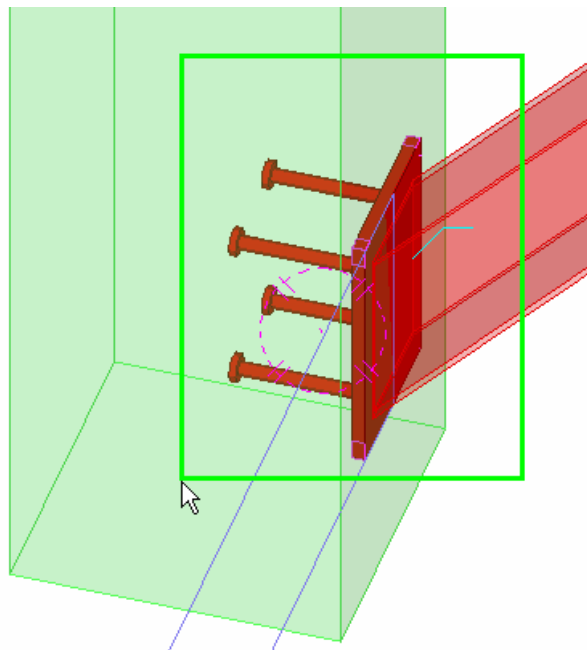
Following the procedure above, we will now define another custom connection at the bottom end of the brace on gridline 2. The only difference now is the name of the connection and that we define only one secondary for the connection.

#### Define Brace(1) custom connection

1. Select **Detailing > Define custom component...** to open the **Custom component wizard** dialog box.
2. Set **Type** to Connection, enter a name and description. Define the position type as **box plane**.



3. Use area select to select all the objects belonging to the component (, click **Next>** on the wizard page 2/4.



4. Select the column as the main part and click **Next>** on wizard page 3/4.
  5. Select the brace as the secondary part and click **Finish** on wizard page 4/4.
- Tekla Structures displays a connection symbol for the new Custom component.

## 4.3 Use Your New Custom Connections in the Model

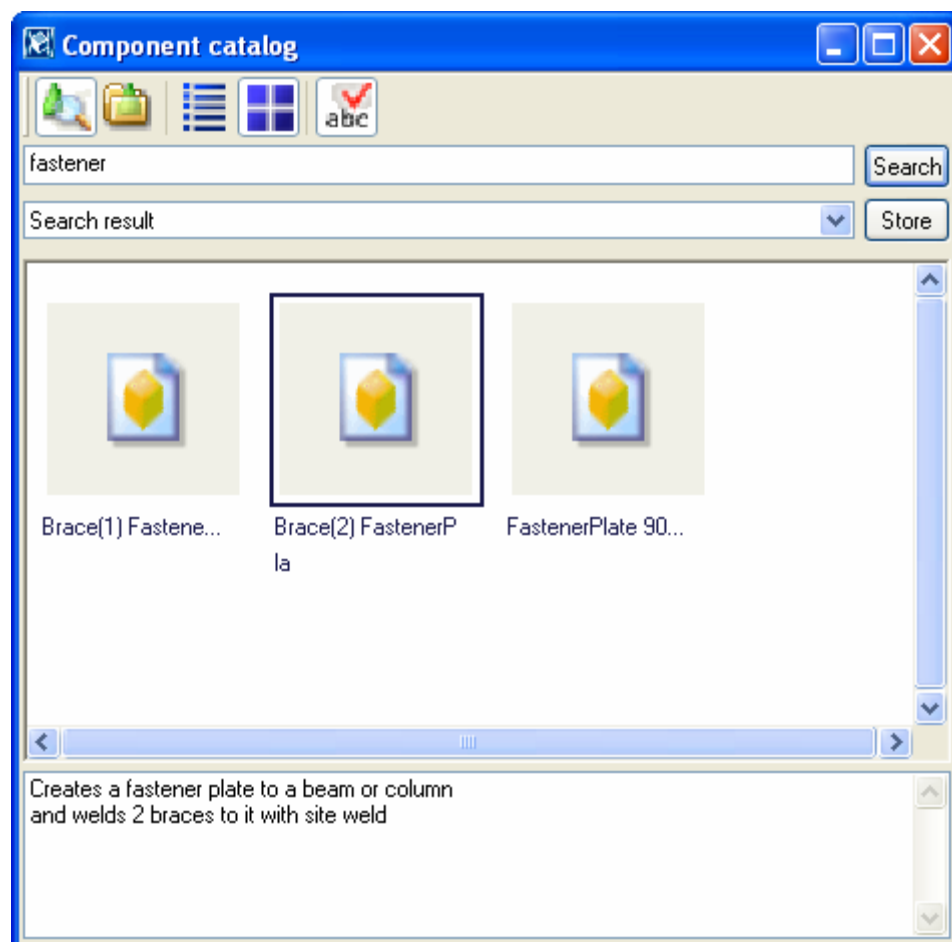
We will now use the custom components just defined to connect the rest of the braces in the model.

### Create Brace(2) custom component

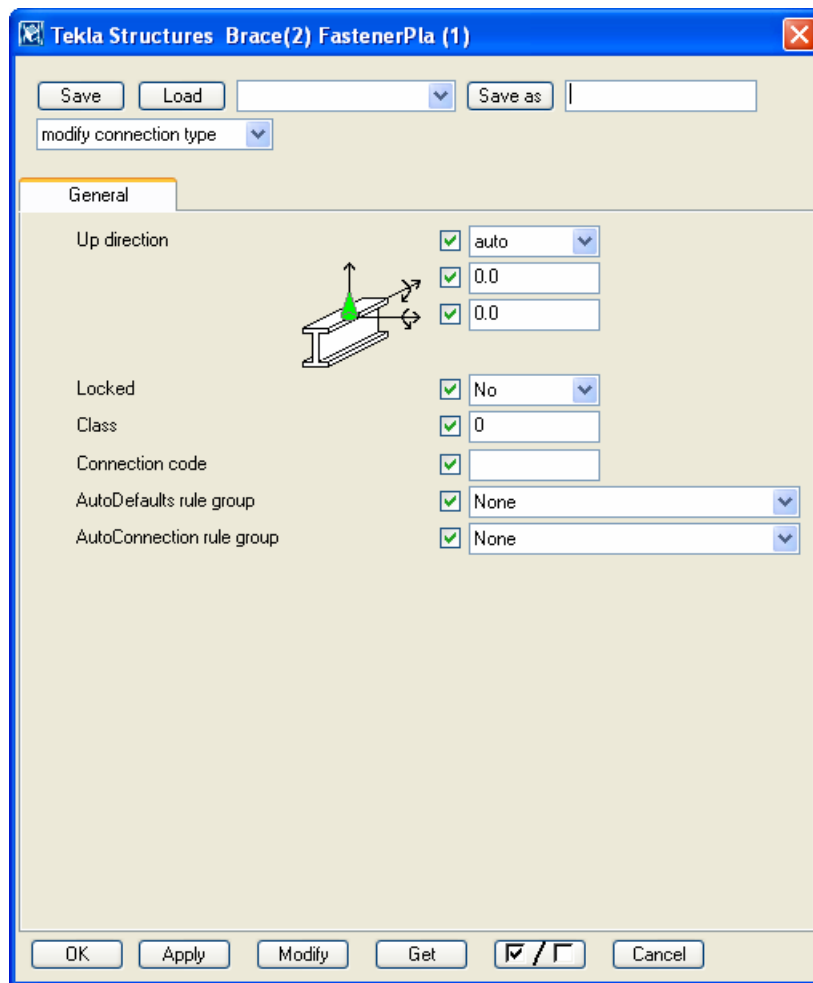
1. Open the component catalog.



2. Search with the word fastener.



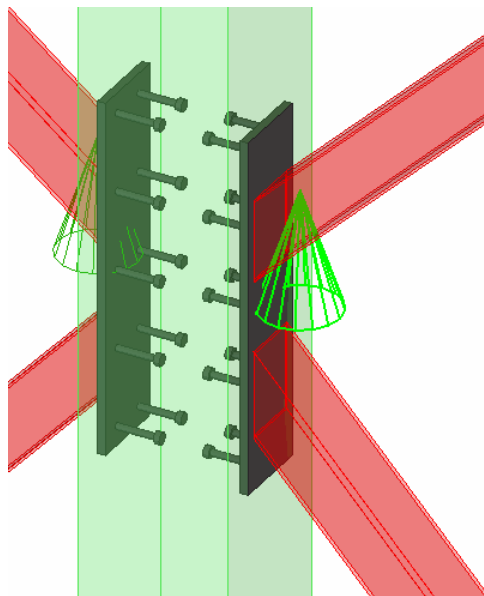
3. Double-click on the Brace(2) connection to display the properties.



4. Review the properties and click **Apply**.

**Help: Detailing > Custom components > Defining Custom components > Custom components basic properties**

5. Pick the column as the main part and the upper and lower brace as the secondary parts and click middle button to create the connection.



The custom component is created.

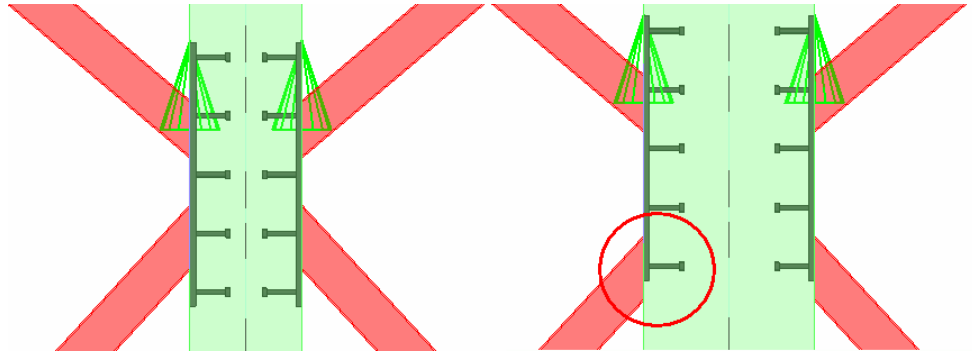


Once the custom component is created it has no intelligence or input values. In practice you can apply the custom component only in framing conditions similar to those for which it was originally created.

### Test the Change in the column size

We will now check how the Custom component reacts when the situation changes in the model.

1. Change the column size from 380\*380 to 600\*600, **Modify**.



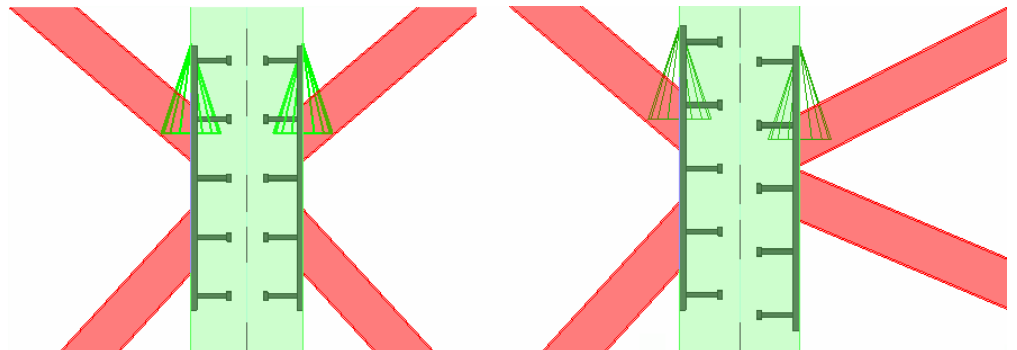
Since we selected **Box plane** as the position type (= where the main part cross section box and the center line of the secondary part intersect), the connection will automatically adjust to the change in the primary profile size.

2. Click the **Undo** icon to change the beam back to 380\*380.



### Test the change in the brace sloping angle

3. Change the sloping angle of braces by moving the handles in the other end from the connection in z direction.



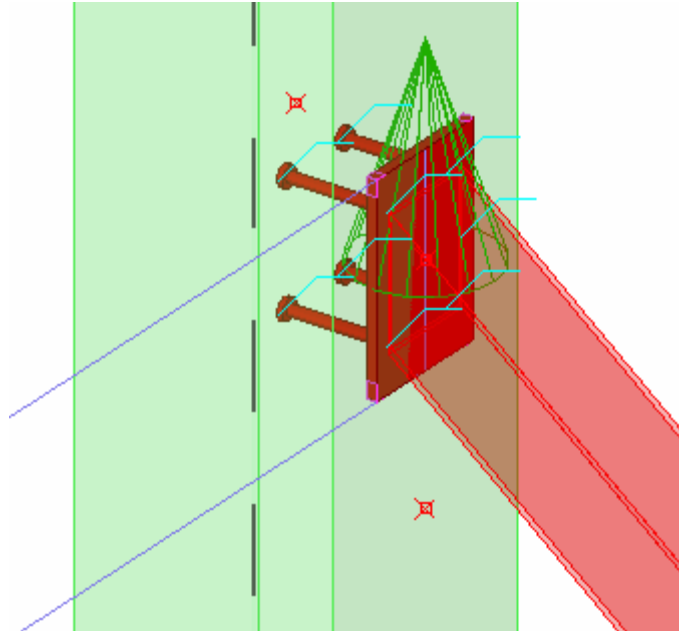
Since the fittings are created according to the main part, the cuts of the brace ends will be correct despite the change of the sloping angle.



4. Undo the changes of the brace sloping angles.

### Create Brace (1) custom components

1. Click **Brace(1)** connection in the component catalog.
2. Create connections to the remaining column brace situations in the model.



You can either create separate custom components for each different case needed in the model or you can parameterize the custom component (see the next section).

## 4.4 Define User\_Hole\_Creation Custom Detail

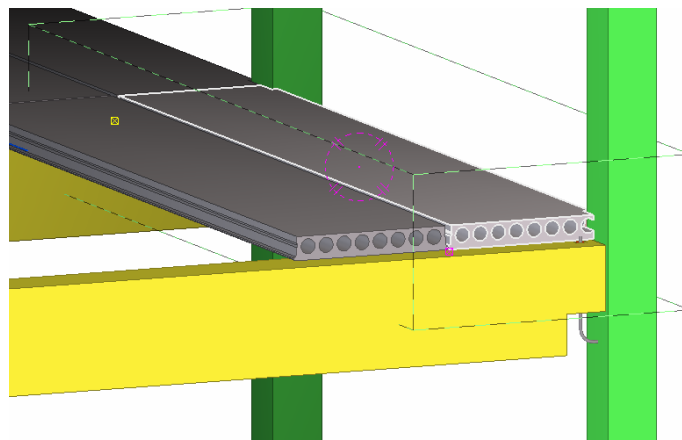
We will now create a custom detail that cuts a hole through a hollow-core slab.

### Create a part cut through a hollow-core slab

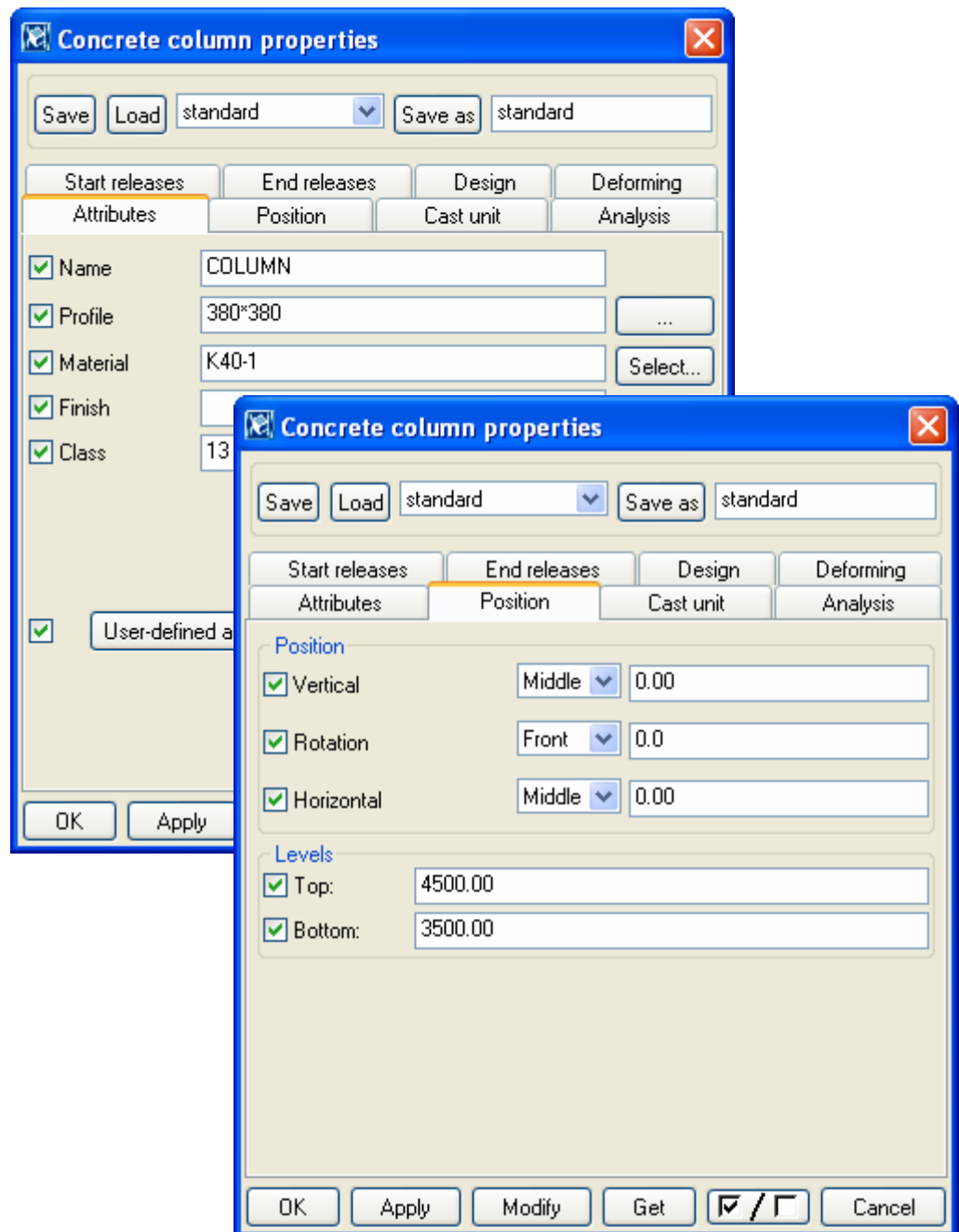
First we will create a part cut through a hollow-core slab by using a column to define the shape of the cut.

#### Create cutting part

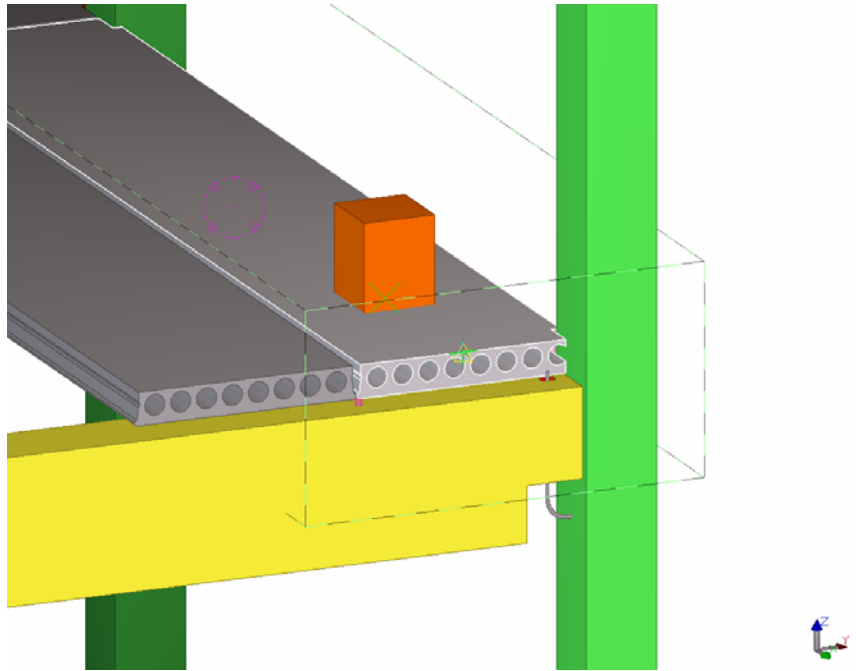
1. Select the hollow-core slab on level **+3850** closest to grid 7-B and create a part basic view of it: right-click and select **Create view > Part basic view**.



2. To create square part cut of size 380\*380 mm:
  - Double-click on the **Create concrete column** icon and define column size and position.
  - Close the dialog with **OK**.



- If necessary, restart the column command and then pick the middle point at the outer end of the hollow-core slab while holding **Ctrl** button down (this is a reference point for column position).
- Release the **Ctrl** button, and type -1000,0,0 press **Enter** to create the column 1000 mm from the edge.



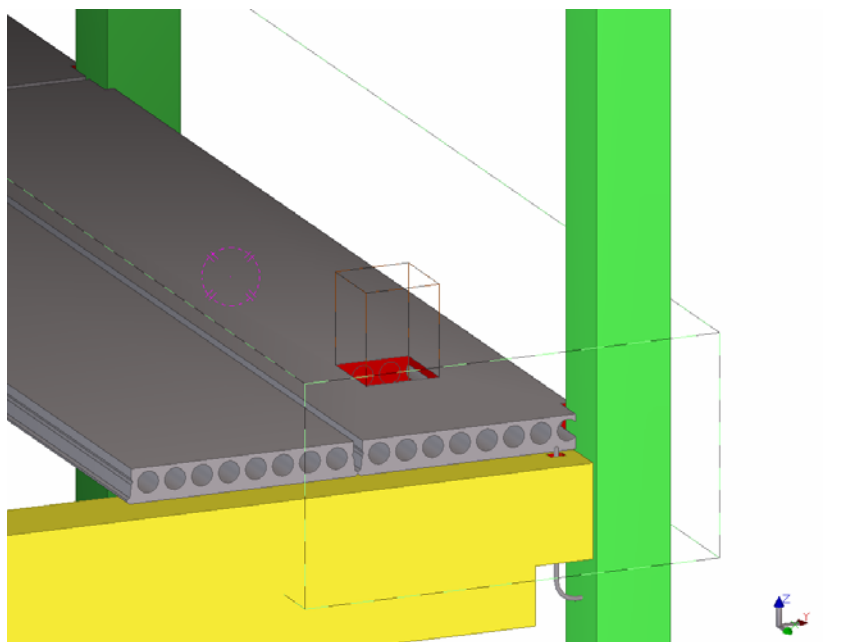
**Cut part**

Cut the hollow-core slab using part cut:

3. Pick the **Create part cut** icon.



4. Pick the hollow-core slab.
5. Pick the column.
6. To end the command right-click and select **Interrupt**.
7. Remove the cutting part.



## Define a custom detail

Next we will create a detail type custom component.

### Define custom component

1. Select **Detailing > Define custom component...** to open the **Custom component wizard** dialog box.
2. On the **Type/Notes** tab, set the **Type** to Detail, enter a **Name** and a **Description** (description is not mandatory) for the custom component as shown below.



3. Select the objects (cut + hollow-core slab using the **Ctrl** key) and press **Next >**.
4. Pick the main part (hollow-core slab) and press **Next >**.
5. Select middle point at the outer end of the hollow-core slab to set the position.
6. Click **Finish**.

## 4.5 Parameterize User\_Hole\_Creation Custom Detail

The User\_Hole\_Creation custom detail is defined as a custom component but as yet has no intelligence or input values. In order to add these capabilities we have to edit the custom component.

We will not create a complete parametric custom component here, but we will give you an idea how to build some simple dependencies between component objects and the model.

We will create the following variables to automatically adjust to suit a change in hole position, size and shape and we will also input them in the finished connection interface:

- The hole position in x direction
- The hole position in y direction
- The hole size and shape

### Open Custom Component Editor

#### Edit custom component

1. Select the User\_Hole\_Creation custom detail symbol.
2. Right-click and select **Edit custom component**. A new toolbar named **Custom component editor** opens along with the **Model browser** and four basic views of the custom component.

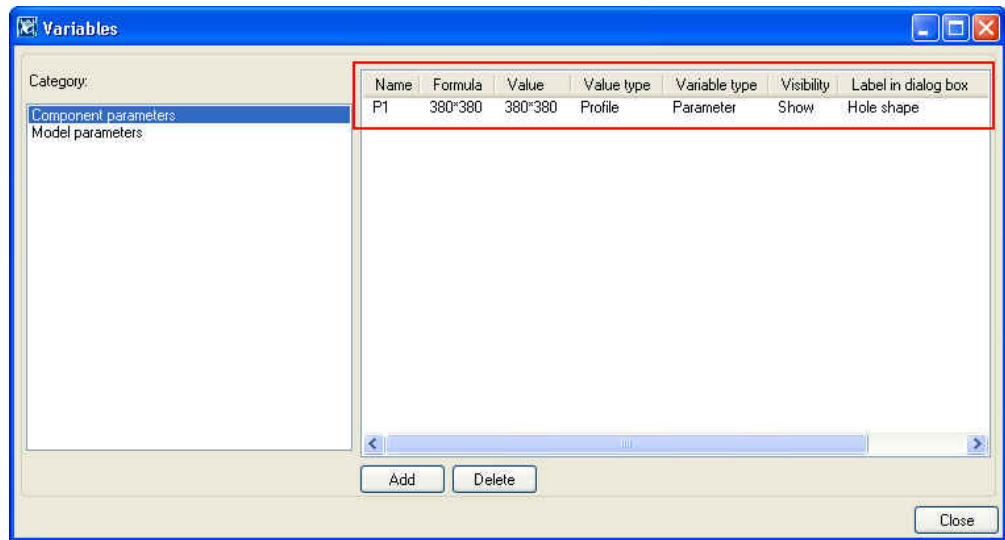
### Define parameters

#### Hole size and shape

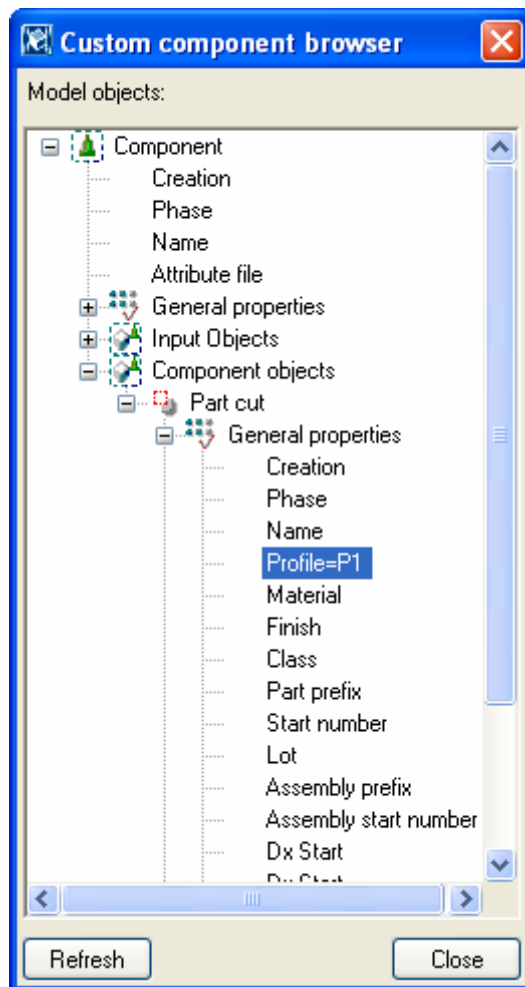
1. Open variables dialog by clicking on the **Display variables** icon.



2. Add a new variable by pressing the **Add** button.
3. Define the **Value type** as Profile.
4. Set the **Formula** to 380\*380.
5. In the **Label in dialog box** field, enter Hole shape.



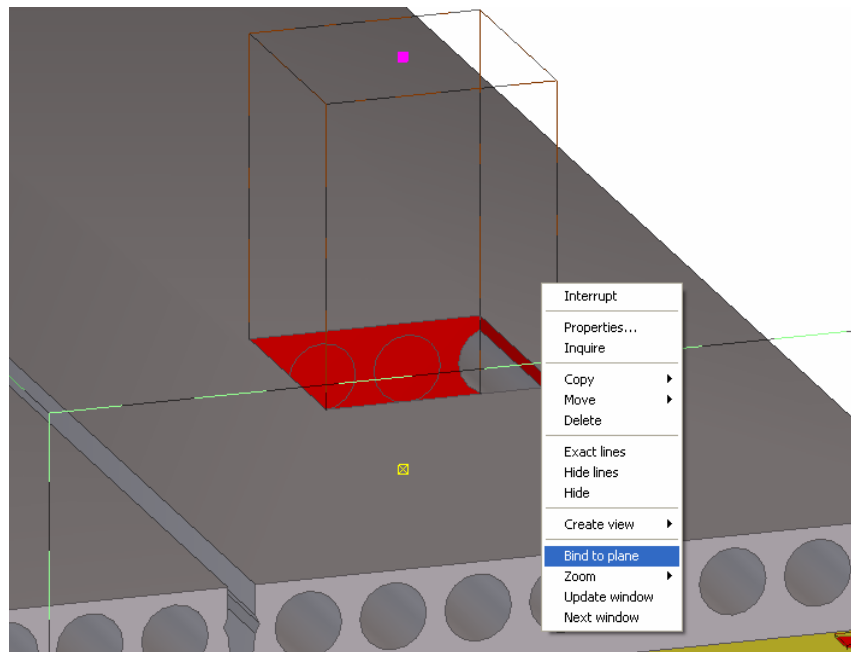
6. Select **Part cut** from the **Custom component browser**.
7. Under **General properties**, select **Profile** of the part cut.
8. Right-click **Profile** and select **Add equation** to edit the name.
9. Type Profile=P1 (variable name).



## Bind hole definition points

We will define the hole position by binding the part cut's reference points.

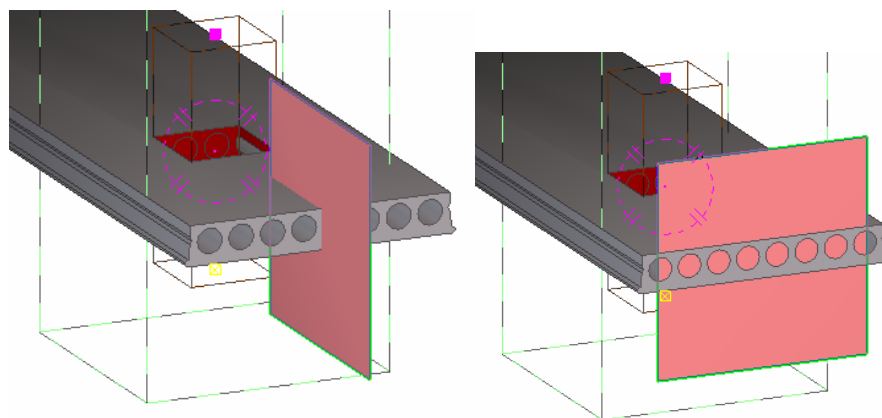
1. Select the part cut in any of the views.
2. Select the upper reference point.
3. Right-click and select **Bind to plane** command.



4. Select **Component planes** from **Custom component editor** toolbar's drop down menu.



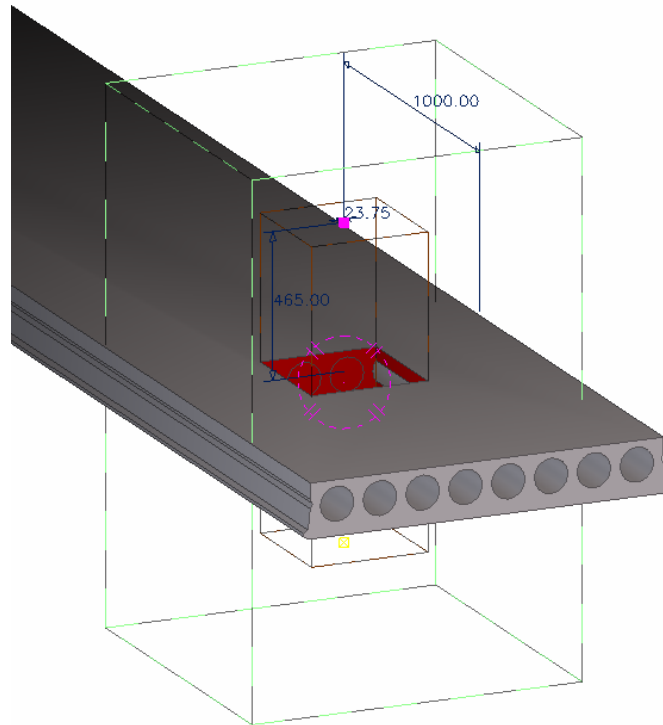
5. Zoom in to the detail symbol.
6. Rotate to highlight the XY plane.
7. Pick the detail's XY plane.



8. Rotate to highlight the YZ plane.
9. Pick the YZ plane.



10. Select **Boundary planes** from **Custom component editor** toolbar's drop down menu.
11. Zoom out and rotate to highlight the top boundary plane of the slab.
12. Pick the **top** plane.



You have now bound the upper reference point in three directions. The distances are now visible in the **Variables** dialog.

Repeat steps 3 - 12 to the part cut's lower reference point by binding it to XY and YZ directions in the Component plane and to slab bottom plane using **Boundary** plane.

### Edit hole definition variables

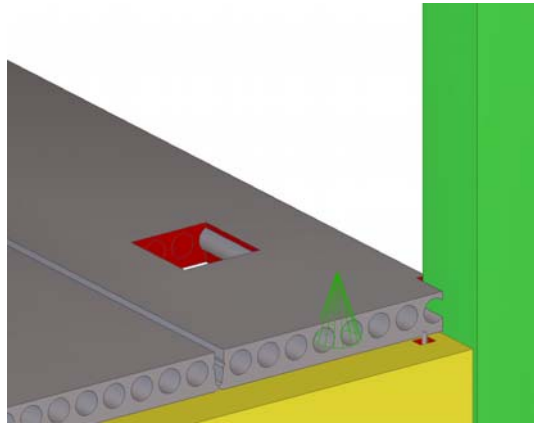
We will next edit the hole position variables and define their visibility on the detail's dialog.

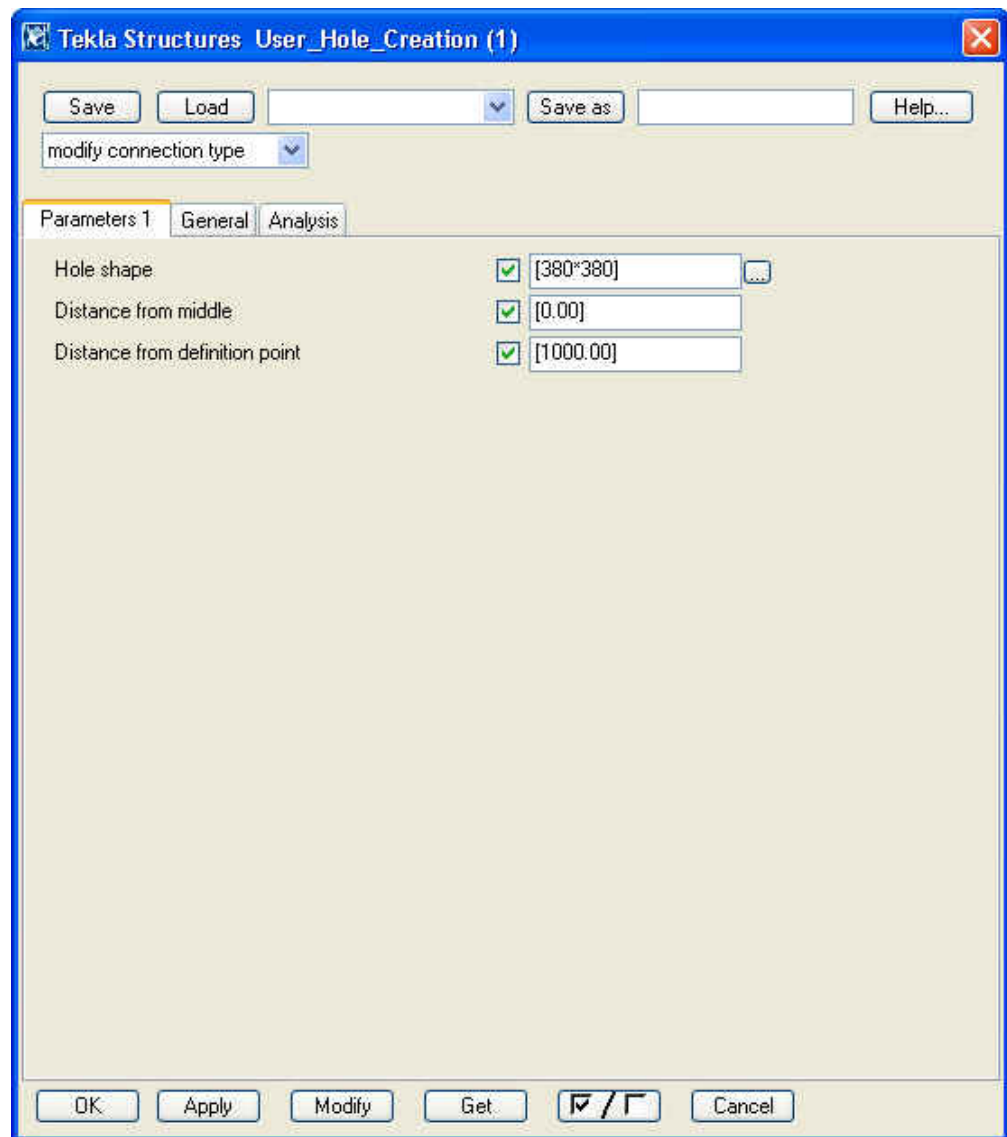
1. Open the **Variables** dialog.

Name	Formula	Value	Value type	Variable type	Visibility	Label in dialog box
P1	380°380	380°380	Profile	Parameter	Show	Hole shape
D1	0.00	0.00	Length	Distance	Show	Distance from middle
D2	1000.00	1000.00	Length	Distance	Show	Distance from definition point
D3	100.00	100.00	Length	Distance	Hide	D3.COLUMN.Extrema behind plane
D4	=D1	0.00	Length	Distance	Hide	D4.COLUMN.XY plane
D5	=D2	1000.00	Length	Distance	Hide	D5.COLUMN.YZ plane
D6	100.00	100.00	Length	Distance	Hide	D6.COLUMN.Extrema front plane

2. Edit D1 variable: Label: Distance from middle.
3. Edit D2 variable: Label: Distance from definition point.
4. Edit D3 variable: Formula: 100, Visibility: Hide.
5. Edit D4 variable: Formula: =D1, Visibility: Hide.
6. Edit D5 variable: Formula: =D2, Visibility: Hide.

7. Edit D6 variable: Formula: 100, Visibility: Hide.
8. Close editor, save changes.





## Check the results

We will now check that the dialog custom detail dialog has the fields that we needed and that they function correctly.

### Modify custom detail

1. Double-click on the User\_Hole\_Creation custom detail symbol. A dialog opens.
2. Change cut size and location, press **Modify**.

