TEKLA
A TRIMBLE COMPANY

Tekla Structures

Detailing Guide

Product version 21.0
March 2015

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1 Components

Once you have created a frame of parts in your Tekla Structures model, you will need to connect the parts to complete the model. To connect the parts, you can use components. Components are tools that automate tasks and group objects so that Tekla Structures treats them as a single unit.

Tekla Structures contains a wide range of predefined system components by default. The components are stored in the **Component Catalog**. To open the **Component Catalog**, click **Detailing** --> **Component** --> **Component Catalog** or press **Ctrl+F**.

The main benefits of using components are:

- Components adapt to changes in the model, which means that Tekla Structures automatically modifies a component if you modify the parts it connects.
- When you copy or move objects, Tekla Structures automatically copies or moves all the associated components with the objects.
- You can save the properties of a component and use them in other projects.

See also

Component concepts on page 5

Component Catalog on page 7

Component properties on page 9

Creating a component on page 11

Working with components on page 14

1.1 Component concepts

You can use components to connect parts in the model. Components automatically create the objects, for example, plates, welds, and bolts that are required to connect the parts.

System components

Tekla Structures contains a wide range of system components by default. There are three types of system components:

- **Connections** connect two or more parts, and create all the required objects such as cuts, fittings, parts, bolts, and welds.

  For example, end plates, clip angles, and bolted gusset are connections.

- **Details** add a detail or a reinforcement to the main part. A detail is only connected to one part.

  For example, stiffeners, base plates, and lifting hooks are steel details, and beam reinforcement and pad footing reinforcement are concrete details.

- **Modeling tools** automatically create and assemble the parts to build a structure, but do not connect the structure to existing parts. Modeling tools can include connections and details.

  For example, stairs, frames, and towers are modeling tools.

You can also create your own components, custom components, if you do not find a system component that suits your needs. You can use custom components in the same way as system components.

Component Catalog

Components are stored in the **Component Catalog**. To open the **Component Catalog**, click **Detailing** --> **Component** --> **Component Catalog** or press **Ctrl+F**.

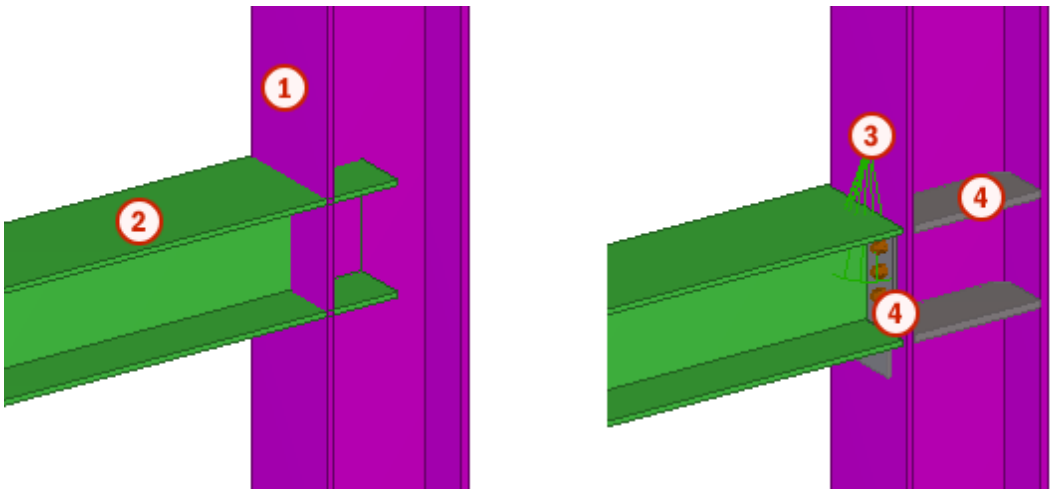
Component properties

Each component has a dialog box where you can define the properties of the component. You can open the dialog box by double-clicking the component in the **Component Catalog**.

Component main part and secondary part

To create a component you need to select existing parts or pick existing points. Components have a main part that you select first when creating a component, and a secondary part that you select after you have selected the main part. A component can have none, one or more secondary parts. Connections and details always have a main part but not all modeling tools have a main part and secondary parts.

The example image below shows the default selection order of a connection:



1. Select the main part.
2. Select the secondary part.
3. The connection is automatically created when you select the secondary part.

4. Double-click the connection symbol to see information about the connection. The connection symbol is green if the connection was created successfully.

   If the connection symbol is yellow, the component was created but there are some problems. If the connection symbol is red, the component was not created.

Up direction Up direction indicates how the connection is rotated around the secondary part, relative to the current work plane. The symbol on the **Picture** tab of the component dialog box indicates the correct up direction.

If there are no secondary parts, Tekla Structures rotates the connection around the main part. The options are: `+x, -x, +y, -y, +z, -z`.

You can change the default up direction on the **General** tab of the component dialog box. Try changing the positive directions first.

See also

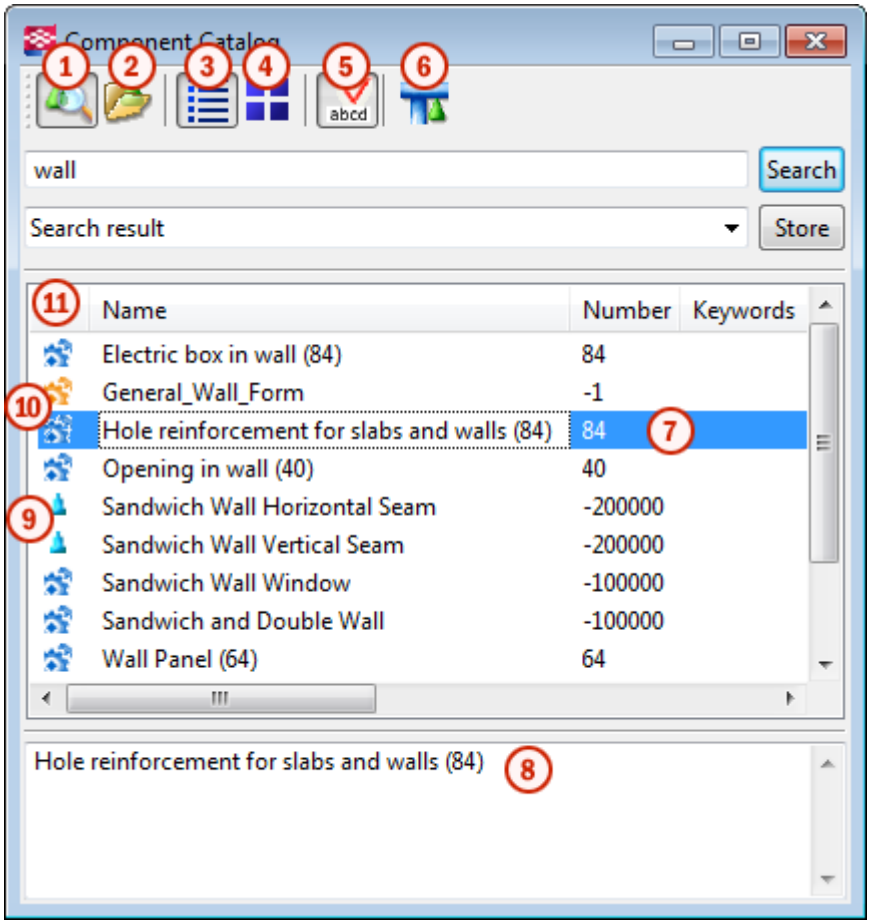
Component Catalog on page 7

Component properties on page 9

Creating a component on page 11

1.2 Component Catalog

Components are stored in the **Component Catalog**. To open the **Component Catalog**, click **Detailing** --> **Component** --> **Component Catalog** or press **Ctrl+F**.



1	Search for a component using the name or number of the component, or a keyword, for example `wall` as shown in the example image above. The default search view settings are stored in the `ComponentCatalog.txt` file that is located in the `..\ProgramData\Tekla Structures\<version>\environments\<environment>\system` folder. If you modify the file, the search view and the **Search results** folder in the folder view change.
2	View the folders in the **Component Catalog**. The default folder view settings are stored in the `ComponentCatalogTreeView.txt` file that is located in the `..\ProgramData\Tekla Structures\<version>\environments\<environment>\system` folder. If you modify the file, the folder view changes.
3	View the components as a list.
4	View the components as thumbnail images.
5	Show or hide the component descriptions.

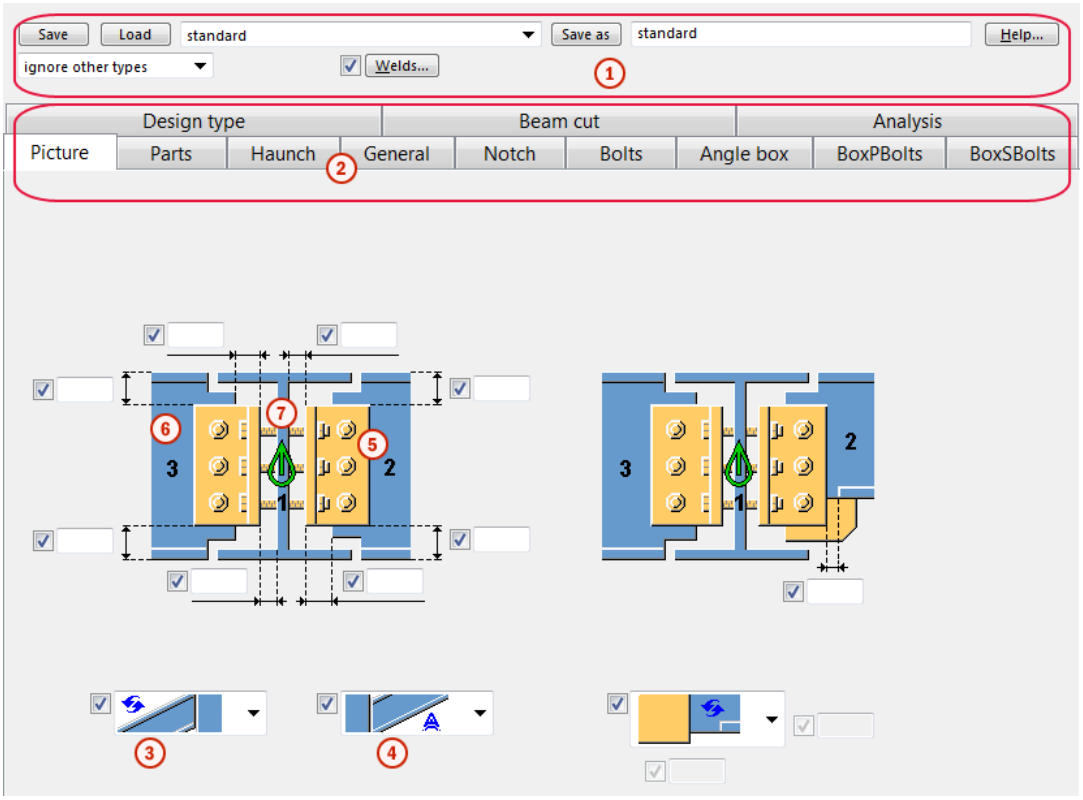
6	Create the component you last used with its current properties.
7	Double-click a component name to open its dialog box and to create the component. You can right-click the component to display more commands.
8	Component description
9	System components have blue symbols: • for connections • for details • for modeling tools
10	Custom components, sketched profiles and profiles with cross sections have yellow symbols: • for custom connections and seams • for custom details • for custom parts • for sketched profiles • for profiles with variable cross sections
11	Sort a column by clicking the header cell.

See also Component properties on page 9

1.3 Component properties

Each component has a dialog box where you can define the properties of the component. You can open the dialog box by double-clicking the component in the **Component Catalog**.

The image below shows a typical example of a steel connection, the **Two sided clip angle (143)** connection. Concrete and reinforcement component dialog boxes may have different options.



	Description
1	In the upper part of the dialog box, you can save and load predefined settings. In some components, there are buttons for accessing bolts, welds and DSTV properties.
2	On the tabs, you can define the properties of the parts and bolts that the component creates. You can enter values manually, use system default values, AutoDefaults values, automatic values, or for some steel connections, the values in the `joints.def` file. Manually entered values, AutoDefaults, automatic values and the properties defined in the `joints.def` file all override the system defaults. System default values are used if you do not manually enter a value or select any other type of property value. You cannot change the system default values.
3	If you select an AutoDefaults option, Tekla Structures uses the property defined in the AutoDefaults rules. The image in the AutoDefaults option is an example and does not necessarily match the outcome in the model. By default, each connection has a standard properties file that defines the standard properties, for example, `standard.j144`. You can save the connection properties that you want to use again in separate properties files and give them a distinctive name.

	Description
4	If you select an automatic option, Tekla Structures automatically determines which option to use for a property. For example, when you use the automatic option for the stiffener in **End plate (144)**, the connection automatically adds the stiffener to a beam-to-column connection, but does not add it to a beam-to-beam connection.
5	The component creates the parts that are shown in yellow in the component dialog box.
6	The parts that are blue in the component dialog box should already exist in the model before you create the component.
7	The green symbol indicates the correct up direction. See Component concepts on page 5 for more information.

See also Creating a component on page 11

AutoDefaults on page 32

AutoConnection on page 26

1.4 Creating a component

When creating a component you need to either select existing parts to which you attach a connection or pick positions to indicate the location or length of a detail or a modeling tool.

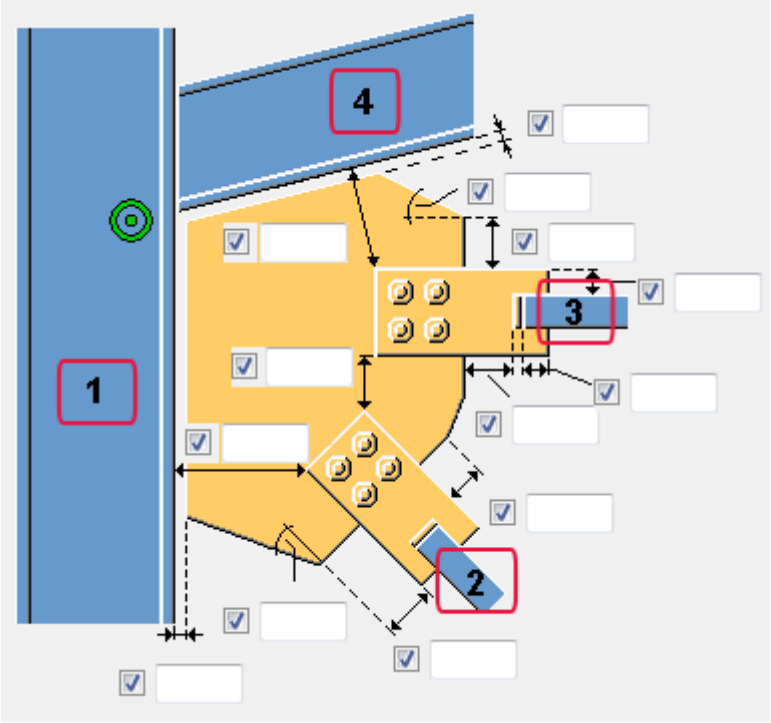
If you use a component you are unfamiliar with, use the default properties of the component. Then check what needs to be modified, and modify only few properties at a time to see how the modifications affect the component. This is quicker than trying to set all the component properties before seeing what the component actually creates.

Tekla Structures opens a command prompt when you add a component. Do not close the prompt window, because it displays information on the creation of the component. This information can be useful in problem situations.

To create a component:

1. Click **Detailing** --> **Component** --> **Component Catalog** .
2. Select a component in the catalog and do one of the following:

To	Do this
Add a connection	1. Select the main part. 2. Select the secondary part or parts. 3. If there is more than one secondary part, click the middle mouse button to finish selecting parts and to create the connection.

To	Do this
	The connection symbol in the model is . In the example image below, the numbers from 1 to 4 show the selection order of parts. The blue parts should already exist in the model before you create the component. 
Add a detail	1. Select the main part. 2. Pick a position in the main part to determine the location of the detail. The detail symbol in the model is .
Add a modeling tool	Pick one to three positions to determine the location of the objects that the modeling tool creates. The modeling tool symbol in the model is .

Component status

When you have added the component, Tekla Structures shows the component status using the following symbols:

Color	Status
	The green symbol shows that the component was created successfully.
	The yellow symbol shows that the component was created, but has problems. This often occurs when bolts or holes have an edge distance that is less than the default value.
	The red symbol shows that the component was not created. Common reasons are that the properties are incorrect or that the up direction is not appropriate.

See also

Component concepts on page 5

Working with components on page 14

Viewing a component on page 19

2 Working with components

This section contains examples of steel, concrete and reinforcement components. There are also instructions for viewing and modifying components, and tips on component use.

See also

Steel component example: Creating an end plate using the End plate (144) connection on page 14

Steel component example: Creating a base plate and anchor rods using the Base plate (1004) detail on page 15

Steel component example: Creating a beam to column connection using the Column with stiffeners (186) connection on page 16

Concrete component example: Creating a corbel connection using the Corbel connection (14) connection on page 17

Reinforcement component example: Creating a pad footing reinforcement using the Pad footing reinforcement (77) modeling tool on page 18

Viewing a component on page 19

Modifying a component on page 20

Converting a conceptual or a detailed component on page 23

Component tips on page 24

2.1 Steel component example: Creating an end plate using the End plate (144) connection

In this example, you will connect a beam to a column using an end plate connection.

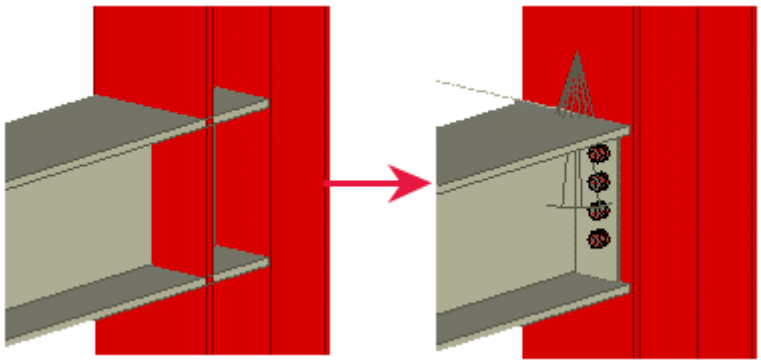
End plate (144) connects two beams, or a beam to a column, using a bolted end plate.

To create an end plate connection:

1. Press **Ctrl+F** to open the **Component Catalog**.
2. Enter `144` in the search box and click **Search**.
3. Select **End plate (144)**.

4. Click **Apply** to create the component using the default properties.
5. Select the main part (column).
6. Select the secondary part (beam).

   Tekla Structures automatically creates the connection when you select the beam.



2.2 Steel component example: Creating a base plate and anchor rods using the Base plate (1004) detail

In this example, you will add a base plate detail and anchor rods to a column.

To create a base plate and anchor rods:

1. Press **Ctrl+F** to open the **Component Catalog**.
2. Enter `base plate` in the search box and click **Search**.

   To view the thumbnail images of the components in the search results, click the **Thumbnails** button .
3. Select **Base plate (1004)**.
4. Select the column.
5. Pick a position at the base of the column.

   Tekla Structures automatically creates the base plate when you pick the position.
6. Next, modify the anchor rod dimensions.

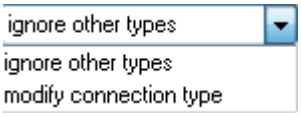
   a. Switch on the **Select components** switch to more easily select components.

   b. Double-click the component symbol in the model to open the **Base plate (1004)** component dialog box.

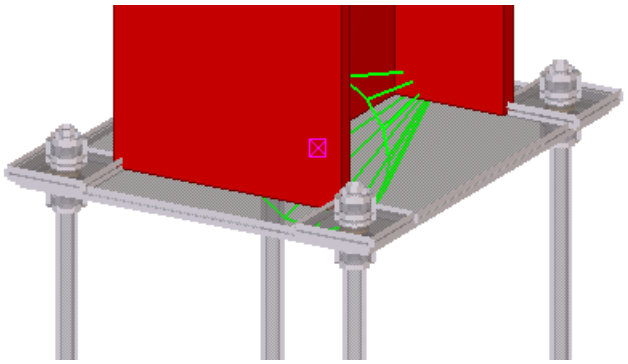
   c. Go to the **Anchor rods** tab.

   d. Change the dimensions of the anchor rods.

e. To change only this base plate, select **ignore other types** from the list in the top part of the dialog box.



f. Click **Modify**.



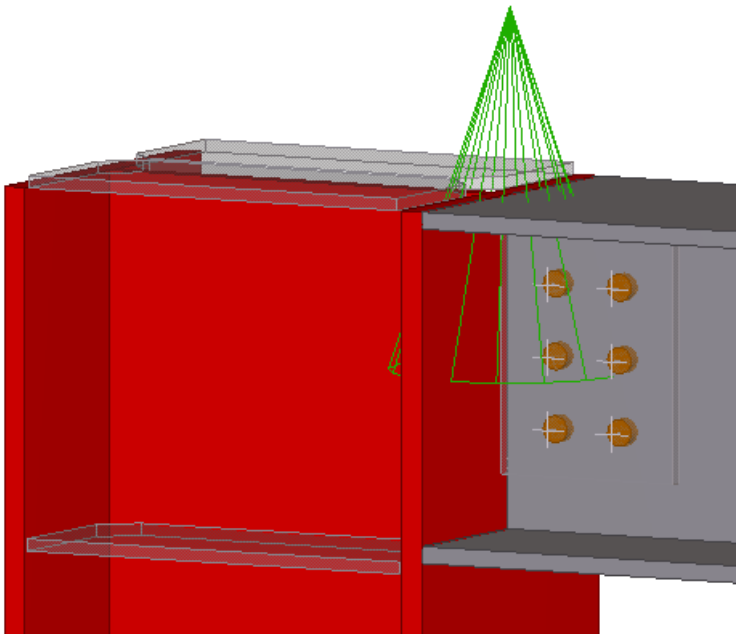
2.3 Steel component example: Creating a beam to column connection using the Column with stiffeners (186) connection

In this example, you will connect a beam to a column using a beam to column connection.

To create a beam to column type connection:

1. Press **Ctrl+F** to open the **Component Catalog**.
2. Enter `186` in the search box and click **Search**.
3. Select **Column with stiffeners (186)**.
4. Select the main part (column).
5. Select the secondary part (beam).

Tekla Structures automatically creates the connection when you select the beam.



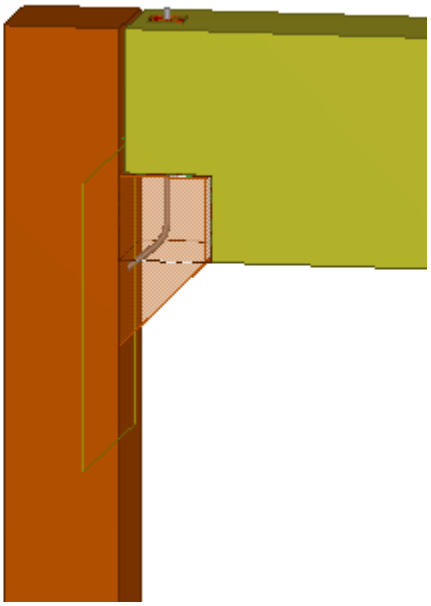
2.4 Concrete component example: Creating a corbel connection using the Corbel connection (14) connection

In this example, you will add a corbel connection between a column and a beam.

To create a corbel connection:

1. Press **Ctrl+F** to open the **Component Catalog**.
2. Enter `corbel` in the search box and click **Search**.
3. Select **Corbel connection (14)**.
4. Select the main part (column).
5. Select the secondary part (beam).

Tekla Structures automatically creates the corbel connection between the column and the beam when you select the beam.



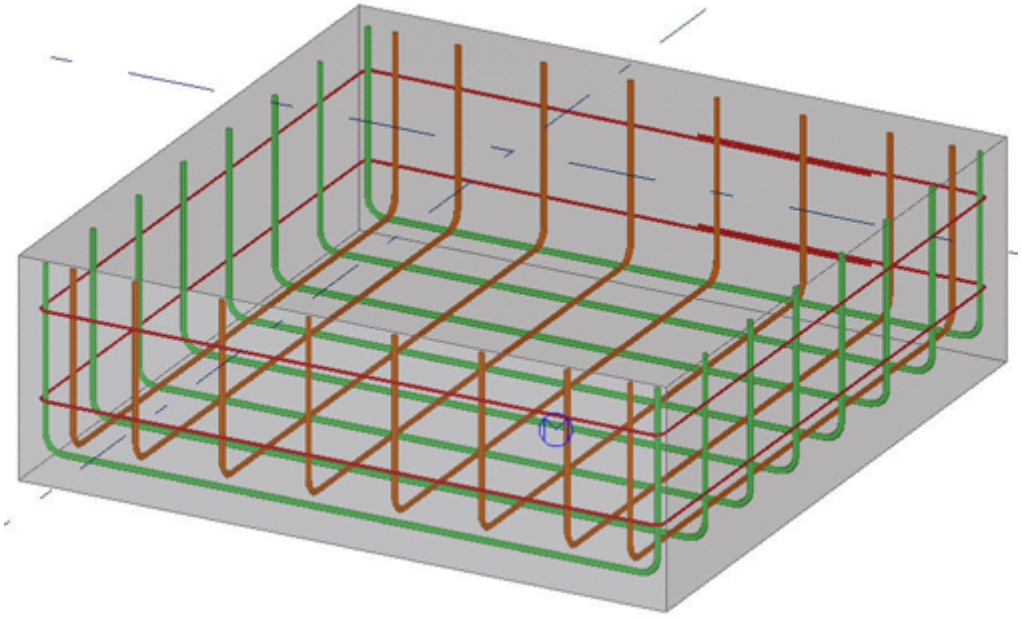
2.5 Reinforcement component example: Creating a pad footing reinforcement using the Pad footing reinforcement (77) modeling tool

In this example, you will reinforce a concrete pad footing.

To create a pad footing reinforcement:

1. Create a pad footing.
2. Press **Ctrl+F** to open the **Component Catalog**.
3. Enter `pad footing` in the search box and click **Search**.
4. Select **Pad footing reinforcement (77)**.
5. Select the pad footing.

Tekla Structures inserts the lacer bar and bottom reinforcement in the pad footing.



2.6 Viewing a component

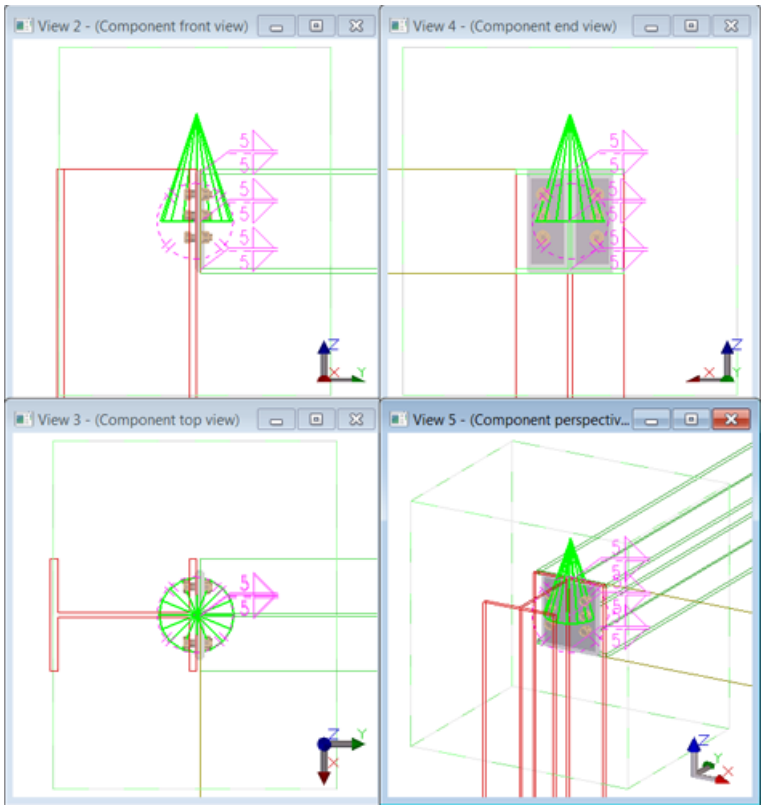
You can create several views of a component to view it from different viewpoints.

To create default views of a component:

1. Click the component symbol in the model to select the component.
2. Right-click and select **Create View** --> **Default Views of Component** .

   Tekla Structures creates four views: front, end, top, and perspective.

   The example image shows the default views of the **End plate (144)** connection.



You can check the dimensions, such as bolt locations and edge distances, using the **Measure** tool in the **Component front view**.

2.7 Modifying a component

You can modify the properties of a component after you have added the component in the model, for example, if you need to change the number of bolts or plate dimensions.

To modify a component:

1. Double-click the component symbol in the model to open the component dialog box.
2. Modify the properties.
3. If needed, define which connections and details are modified:
   - **Ignore other types**: Tekla Structures only modifies the connections and details that are of the same type as the connection or detail you are modifying.
   - **Modify connection type**: If you have selected several connections and details, click **Modify** to modify all the selected connections and details irrespective of their type. If the connection type of a selected connection is not the same as in the connection dialog box, Tekla Structures changes the connection type.

4. Click **Modify**.

See also Component properties on page 9

Grouping components in the Component Catalog

By default, components are grouped in folders in the **Component Catalog** based on their type and framing condition. You can create and remove folders, and copy components from one folder to another.

To group components, do any of the following:

To	Do this
Create a new folder	1. Click the folder button to show the folder view. 2. Right-click an existing folder and select **Create New Folder**.
Create a new sub-folder	1. Click the folder button to show the folder view. 2. Right-click an existing folder and select **Create New Sub-folder**.
Create a new folder based on search results	1. Click the search button to show the search box. 2. Enter your search criteria and click **Search**. 3. Click **Store** to group the search results in a new folder. 4. Enter a name for the new folder in the **Store Search Result** dialog box. 5. Click **OK**.
Copy a component from one folder to another	1. Click the folder button to show the folder view. 2. Go to the folder where the component to be copied is located. 3. Select the component, right-click and select **Copy**. 4. Go to the folder where you want to copy the component. 5. Right-click and select **Paste**.
Remove a folder	1. Right-click a component. 2. Do one of the following: a. If you are in the folder view , select **Remove**.

To	Do this
	b. If you are in the search view , select **Remove from search result**.

The information on the folders you create is stored in the `ComponentCatalogTreeView.txt` file that is located in the `..\TeklaStructuresModels\<model>\attributes\` folder.

See also Component Catalog on page 7

Adding descriptions and keywords for components in the Component Catalog

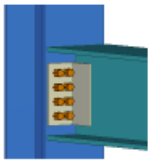
To add a description or a keyword for a component in the **Component Catalog**, do one of the following:

To	Do this
Add a description	1. Click the button to show the descriptions of components. 2. Enter the description in the description box at the bottom of the **Component Catalog** dialog box. You can also edit the existing description. Edited descriptions are model-specific. 3. Click another component in the **Component Catalog**. 4. Click **Yes** in the **Save description** dialog box. 5. Save the model. The default component descriptions are stored in the `xslib.db1` file that is located in the model folder.
Add a keyword	1. Right-click a component and select **Edit Keywords**. 2. Enter a new keyword in the **Keyword** box. 3. Click **Add**. 4. If you need to delete a current keyword, select it and click **Delete**. Keywords are saved in `ComponentCatalog.txt` file in the current model folder. You can combine `ComponentCatalog.txt` files and move them to the system folder `..\Tekla Structures\<version>\environments\<environment>\system`.

See also Component Catalog on page 7

Changing a thumbnail image in the Component Catalog

Most system components have a default thumbnail image in the **Component Catalog**. The image shows a typical situation where the component can be used. For example, the thumbnail image of **Clip angle (141)** is as follows:



To change a thumbnail image of a component:

1. Create an image and save it in the `.bmp` format in the `..\ProgramData\Tekla Structures\<version>\Bitmaps` folder.
2. Press **Ctrl+F** to open the **Component Catalog**.
3. Click to show the thumbnail images.
4. Right-click the component thumbnail image and select **Change Picture**.
5. Locate the image you created and select it.
6. Click **OK**.

See also Component Catalog on page 7

2.8 Converting a conceptual or a detailed component

Depending on the Tekla Structures configuration you are using, you can create either detailed or conceptual components.

- Detailed components include all the information needed for fabrication, such as assemblies, cast units, and reinforcing bars.

  Detailed components have a round symbol in the model: or .

- Conceptual components look similar to detailed components but do not include the option to change part numbering or assembly numbering settings. Conceptual components are meant to be used as reference information for further fabrication detailing.

  Conceptual components have a rectangular symbol in the model: or .

You can create conceptual components in the Engineering, Cast in Place, and Construction Modeling configurations.

You can edit conceptual components and convert them to detailed components in the Full, Primary, Steel Detailing, or Precast Concrete Detailing configurations.

Modifying part properties, such as the size of the component main part, does not automatically convert a detailed component to a conceptual component, or vice versa. For example, if you use the Engineering configuration and modify the model, detailed components are not converted to conceptual components. However, when you modify a detailed component in the Cast in Place configuration, the component changes to a conceptual component.

To convert a component, do one of the following:

To	Do this	Configuration
Convert a conceptual component to a detailed component	1. Click **Detailing** --> **Component** --> **Convert to Detailing Component** . 2. Select the component symbol.	Full, Primary, Steel Detailing, Precast Concrete Detailing
Convert a detailed component to a conceptual component	1. Click **Detailing** --> **Component** --> **Convert to Conceptual Component** . 2. Select the component symbol.	Engineering, Construction Modeling, Cast In Place

2.9 Component tips

Default properties

If you use a component you are unfamiliar with, use the default properties of the component. Then check what needs to be modified, and modify only few properties at a time to see how the modifications affect the component. This is quicker than trying to set all the component properties before seeing what the component actually creates.

Valid profiles

Some components work with certain profiles only. If a component is not created successfully, try entering a valid profile.

Select components switch

You can switch on the **Select components** switch to be able to select any object that belongs to the component.

Component is not added to the model

If the component is not added to the model, check the status bar. For example, you may need to click the middle mouse button to stop selecting parts before Tekla Structures creates the component.

Using thickness to create needed parts

If a component does not by default create the parts that you need, look for options to create them. If there are no options, try entering a thickness value for the parts.

If a component creates parts that you do not need, look for options to remove them. If there are no options, enter a zero (0) as the thickness of the parts.

Many secondary parts are found

If you are using a connection that only allows one secondary part, you may see the message `Many parts found` on the status bar. This means that Tekla Structures cannot determine which parts to connect. You may have several parts in the same location, or the view may be set too deep.

3 AutoConnection

Use the AutoConnection tool to automatically select and apply connections with predefined properties to selected parts in a model. With AutoConnection, Tekla Structures automatically creates similar connections for similar framing conditions.

You can use AutoConnection to quickly add connections individually, in phases, or project-wide. This is a useful technique when you are working on a large project using many connections, modifying a model, or importing modified profiles.

Before using AutoConnection in a working model, we recommend that you create a test model, and create all the connection conditions in it that you need for a particular project. You can then use the test model to check the rules and properties of various connection types. The model also acts as a quick reference for connection information.

See also AutoConnection setup on page 26

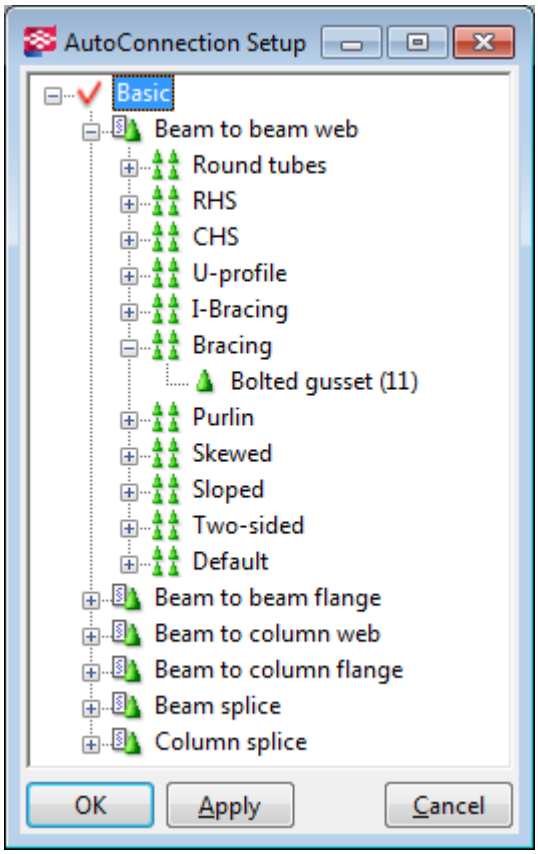
Using AutoConnection on page 30

AutoConnection and AutoDefaults rules on page 38

3.1 AutoConnection setup

With AutoConnection you can define groups of rules which Tekla Structures automatically applies when creating connections in a model. By using a rule group to select connections and connection properties you do not have to select each connection and define its properties separately. For example, you can create separate rules for different standards, projects, manufacturers, and even individual models.

To open the AutoConnection setup dialog box, click **Detailing** --> **AutoConnection** --> **AutoConnection Settings** .



Icon	Setup level	Description
	Rule group	You can use rule groups to organize connections and connection properties according to different standards, projects, manufacturers, and models. You can create, modify and delete rule groups.
	Framing condition	Framing conditions are predefined connection types that you cannot change. Tekla Structures creates the framing conditions automatically: • Beam to beam web • Beam to beam flange • Beam to column web • Beam to column flange • Beam splice • Column splice
	Rule set	You can use rule sets to define which connection to use in a certain situation. You can create additional rule sets.

Icon	Setup level	Description
	Connection	The connection to apply if the rule set criteria are met. To apply a particular connection, the conditions in the model have to match all the rules in the branch that contains the connection.

Rules.zxt file When you use AutoConnection, Tekla Structures saves the AutoConnection information in a zipped `rules.zxt` file in the `\attributes` folder under the current model folder.

You can copy the `rules.zxt` file to the project or firm folder to make it available in other models. Each time you modify the AutoConnection setup you need to recopy this file to the firm and project folders. To use the modified setup in other models, restart Tekla Structures.

See also
Creating a rule group for AutoConnection on page 28

Creating a rule set for AutoConnection on page 28

Changing a connection in an AutoConnection rule set on page 29

Creating a rule group for AutoConnection

You can define rule groups for AutoConnection to organize connections and connection properties according to different standards, projects, manufacturers, and models.

To create a rule group for AutoConnection:

1. Click **Detailing** --> **AutoConnection** --> **AutoConnection Settings** .
2. Select an existing rule group, right-click, and select **New Rule Group**.
3. Click the **New** group and enter a name.

   Give the rule group a name that reflects the group of connections that you want to create. For example, use the fabricator's name, the project name, or any name that clearly identifies the connection rules that you want to use for a specific model.

When you create a new rule group, Tekla Structures automatically adds the existing framing conditions in the group.

See also
Creating a rule set for AutoConnection on page 28

Using AutoConnection on page 30

Creating a rule set for AutoConnection

You can create rule sets under framing conditions to specify which connection properties to use when specific conditions in the model are met. You only need to create AutoConnection rule sets if you plan to use different connections to connect similar framing conditions. For

example, in the model, some beam-to-beam connections require clip angles, others need shear tabs. You need to define rule sets to determine where each connection type should be used.

To create a new rule set:

1. Click **Detailing** --> **AutoConnection** --> **AutoConnection Settings** .
2. Click the plus icon in front of the rule group to open the tree structure.
3. Select the relevant framing condition , right-click and select **Create Additional Rule Sets**.
4. Select the new rule set, right-click and select **Edit Rule Set**.
5. Enter a name for the rule set.
6. Select a rule from the **Available rules** list.
7. Click the right arrow button to move the selected rule into the list of **Rules in the rule set**.
8. Enter the values used in the rule: either an exact value, or minimum and maximum values.
9. Click **OK**.

The order of the rules in the tree structure is important. Tekla Structures uses the first rule that matches the conditions in the model so you should place the most limiting rule highest in the tree, and the most generic rule lowest.

You can change the priority of a rule set by right-clicking the rule set and selecting **Move Up** or **Move Down**.

See also Changing a connection in an AutoConnection rule set on page 29

Using AutoConnection on page 30

Changing a connection in an AutoConnection rule set

You can change the connection in a rule set by selecting a connection in the **Component Catalog**.

To change a connection in a rule set:

1. Click **Detailing** --> **AutoConnection** --> **AutoConnection Settings** .
2. Click the plus icon in front of the relevant framing condition and rule set to find the connection that you want to change.
3. Select the connection, right-click and select **Select Connection Type**.
4. Select a connection in the **Select component** dialog box.

5. Click **OK** in the **Select component** dialog box.
6. Click **OK** in the **AutoConnection Setup** dialog box.

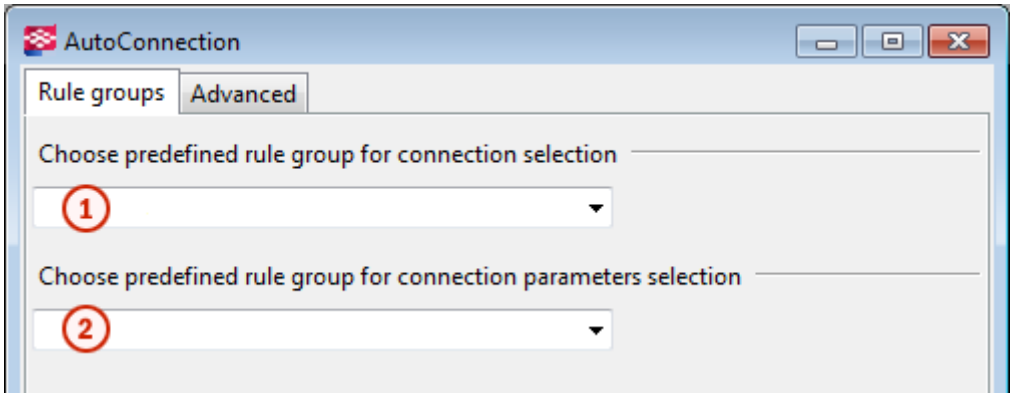
See also Using AutoConnection on page 30

3.2 Using AutoConnection

Use AutoConnection to have Tekla Structures automatically create connections using the properties of predefined rules. When you use AutoConnection, Tekla Structures ignores the properties in the connection dialog boxes. Tekla Structures does not modify the existing connections.

To create connections using AutoConnection:

1. Select the parts to connect.
2. Click **Detailing** --> **AutoConnection** --> **Create connections** .
3. Select the rule groups from the lists on the **Rule groups** tab.



1 Rule group for AutoConnection

2 Rule group for AutoDefaults

4. If needed, go to the **Advanced** tab to change the rules groups used for each framing condition. You can use a rule group for all framing types other than beam to column flange, and indicate a particular connection to use for that framing type.
   a. Select the connection in the **Connection selection** option:
      - **AutoConnection** applies the connection defined in the rule group you have selected in the first list on the **Rule groups** tab.
      - **None** does not create a connection.
      - Click **Select** to select a connection in the **Select component** dialog box and click **OK**. Tekla Structures creates the connection using the default properties.
   b. Select the connection properties in the **Parameters selection** option:

- **AutoDefaults** applies the properties of the rule group you have selected in the first list on the **Rule groups** tab.
- **No autodefaults** applies the default connection properties.

5. Click **Create connections**.

See also AutoConnection setup on page 26

4 AutoDefaults

Use AutoDefaults to set up the correct properties for existing connections. When you use AutoDefaults, Tekla Structures automatically creates the connections with the predefined AutoDefaults properties. AutoDefaults allows you to modify the default connection properties and save them for use in specific circumstances. You can also use AutoDefaults for a single connection.

For example, you can use AutoDefaults to automatically adjust the thickness of each base plate you create, according to the main part profile. If the main part profile changes, Tekla Structures automatically adjusts the thickness of the base plate.

Before using AutoDefaults in a working model, we recommend that you create a test model, and create all the connection conditions in it that you need for a particular project. You can then use this test model to check the rules and properties of various connection types. It also acts as a quick reference for connection information.

See also

AutoDefaults setup on page 32

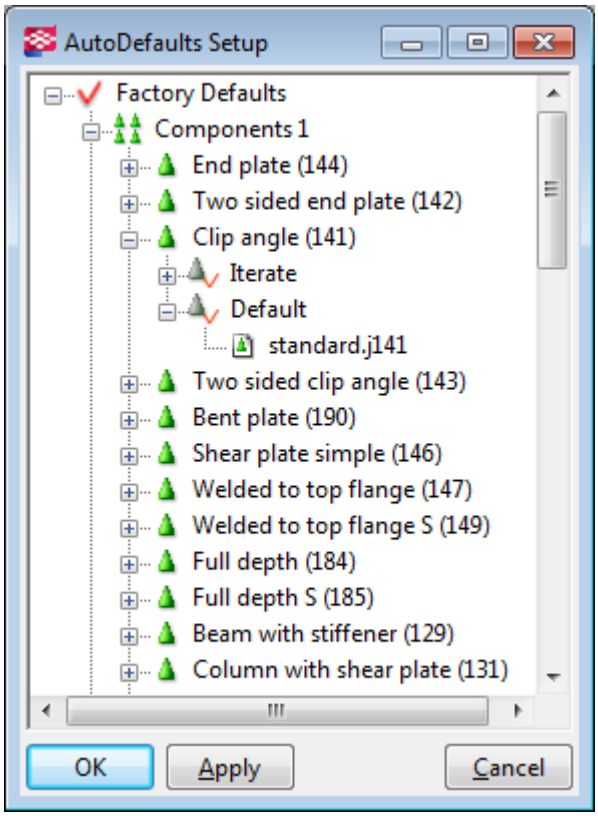
Using AutoDefaults on page 37

AutoConnection and AutoDefaults rules on page 38

4.1 AutoDefaults setup

Use AutoDefaults to set up properties for existing connections. With AutoDefaults you can create rules that define the situations where the predefined properties are used.

To open the AutoDefaults rules setup dialog box, click **Detailing** --> **AutoConnection** --> **AutoDefaults Settings** .



Icon	Setup level	Description
	Rule group	You can use rule groups to organize settings according to different standards, projects, manufacturers, and models. You can create, modify and delete rule groups.
	Components	The component tree structure shows the connections that are available on component toolbars in Tekla Structures.
	Rule set	Rule sets control which properties to use in certain situations. You can create additional rule sets. Tekla Structures processes AutoDefaults rule sets in the order in which they are in the tree, so you can control the selection of properties.
	Properties file	The properties files are under the rule sets. By default, each connection has a standard properties file that defines the standard properties, for example, `standard.j144` or `standard.j1042`. You can create additional properties files for the properties that you want to use again and give the files distinctive names.

Defaults.zxt file When you use AutoDefaults, Tekla Structures saves the AutoDefaults rules in a zipped `defaults.zxt` text file in the `\attributes` folder under the current model folder.

You can copy the `defaults.zxt` file to the project or firm folder to make it available in other models. Each time you modify the AutoDefaults setup, you need to recopy this file to the firm or project folder. To use the modified setup in other models, restart Tekla Structures.

We do not recommend that you edit the `defaults.zxt` file using a text editor, but if you do, ensure that you are using the right syntax. The easiest way to unzip the `.zxt` file is to change the file extension `.zxt` to `txt.gz` and unzip the file. Change the extension back to `.zxt` when you have finished. You do not need to zip the file after editing it, Tekla Structures can also read the unzipped file.

See also Creating a rule group for AutoDefaults on page 34

Creating a rule set for AutoDefaults on page 34

Modifying connection properties for AutoDefaults on page 36

Creating a rule group for AutoDefaults

You can define rule groups for AutoDefaults to group the rules according to different standards, projects, manufacturers, for example.

To create a rule group for AutoDefaults:

1. Click **Detailing** --> **AutoConnection** --> **AutoDefaults Settings** .
2. Select an existing rule group, right-click, and select **New Rule Group**.
3. Click the **New** group to rename it.

   Give the rule group a name that reflects the contents of the group. For example, use the fabricator's name, the project name, or any name that clearly identifies the rules that you want to use for a specific model.

When you create a new rule group, Tekla Structures automatically adds the existing components to the group.

See also Creating a rule set for AutoDefaults on page 34

Using AutoDefaults on page 37

Creating a rule set for AutoDefaults

You can create rule sets to define which connection properties are used when specific conditions in the model are met.

To create a rule set:

1. Click **Detailing** --> **AutoConnection** --> **AutoDefaults Settings** .

2. Click the plus icon in front of the rule group to open the tree structure.
3. Click the plus icon in front of the relevant group of components and connection .
4. Select an existing rule set, right-click and select **New Rule Set**.
5. Select the new rule set, right-click and select **Edit Rule Set**.
6. Enter a name for the rule set.
7. Select a rule from the **Available rules** list.
8. Click the right arrow button to move the selected rule into the list of **Rules in the rule set**.
9. Enter the values used in the rule: either an exact value, or minimum and maximum values.
10. Select from the **Parameter file(s) selection in the rule set** list how the properties are selected in the rule set.

Option	Description
Use combination of first parameters	Tekla Structures uses the properties files it finds in the first matching sub-rule set and does not check other rule sets.
Iterate until connection symbol is green	Tekla Structures checks sub-rule sets until it finds matching properties.
Iterate until connection symbol is yellow	Tekla Structures checks sub-rule sets until it finds matching properties.
Use combination of all parameters	Tekla Structures checks all rule sets and uses the properties files in all matching rule sets. The order of the properties files is important. When Tekla Structures combines the properties files, the most recent files (the lowest in the tree) override previous ones. If you do not enter any values for the properties, Tekla Structures does not override the previous property values.

11. Click **OK**.

The order of the rules in the tree structure is important. Tekla Structures uses the first rule that matches the conditions within the model so you should place the most limiting rule highest in the tree, and the most generic rule lowest.

You can change the priority of a rule set by right-clicking the rule set and selecting **Move Up** or **Move Down**.

See also AutoDefaults setup on page 32

Modifying connection properties for AutoDefaults on page 36

Combining and iterating properties for AutoDefaults on page 40

Modifying connection properties for AutoDefaults

Each connection has a default standard property file that defines the properties for the connection, for example, `standard.j144`.

You can modify the properties that the file uses by saving certain properties to a file and selecting this file for use in the AutoDefaults setup.

To modify connection properties for AutoDefaults:

1. Click **Detailing** --> **AutoConnection** --> **AutoDefaults Settings** .
2. Select the `standard.j` connection file that you want to modify, for example, `standard.j144`.
3. Right-click the file and select **Edit connection parameters**.
4. In the connection dialog box, set the properties that you want to save.

   Such properties could be, for example, bolt properties, profiles, and materials.
5. Enter a descriptive name for the properties in the box next to the **Save as** button.
6. Enter the same name in the **Connection code** option on the **General** tab.

   When you save the connection properties for AutoDefaults, you can enter the same name in the **Connection code** option and in the box next to **Save as**. Using the same name allows you to check which properties Tekla Structures used in specific situations. Tekla Structures does not automatically show the AutoDefaults values in the connection dialog box.
7. Click **Save as**.

   Tekla Structures saves the properties file in the `\attributes` folder under the current model folder. The filename consists of the name you entered in **Save as** and the file extension `.jXXX`, where `XXX` is the connection number, for example, `sec_0-190.j144`.
8. Click **Cancel** to close the dialog box and return to the **AutoDefaults Setup** dialog box.

   If you click **OK** to close the dialog box, you need to load the default properties the next time you use the connection. Using the default properties ensures that AutoDefaults can modify the properties.
9. Right-click the `standard.j` file again and select **Select connection parameters**.

   The **Attribute File List** dialog box that opens contains the properties that have been set and saved in the connection dialog box.
10. Select a file in the **Attribute File List** dialog box.
11. Click **OK**.

See also Using AutoDefaults on page 37

4.2 Using AutoDefaults

When you use a component that you are unfamiliar with, first use the default properties. Then use AutoDefaults to modify the properties.

To use AutoDefaults:

1. Open the connection dialog box.
2. On the **General** tab, select a rule group from the **AutoDefaults rule group** list.
3. On all tabs, select the AutoDefaults options marked with the arrow symbol for the properties in which you want to use AutoDefaults.
4. Click **Apply** to create the connection using AutoDefaults.

If you manually modify the properties after using AutoDefaults, Tekla Structures uses the manually modified properties.

For example, you have manually set the base plate thickness of a connection to 20 mm. AutoDefaults is active and sets the plate thickness according to the main part profile. If you modify the main part profile, Tekla Structures does not update the base plate thickness. It remains at 20 mm.

You can view which AutoDefault rules and properties are used:

- To view AutoDefaults rules, select the connection symbol in the model, right-click and select **Inquire**.

  Tekla Structures shows the rule group, rule sets and properties files used.
- To view the AutoDefaults properties, double-click the connection symbol in the model, select `<AutoDefaults>` in the list box next to the **Load** button and click **Load**.

See also AutoDefaults setup on page 32

5 AutoConnection and AutoDefaults rules

You can create your own AutoConnection and AutoDefaults rules for project and company defaults. By defining rules you can accurately select connections and connection properties when using AutoConnection and AutoDefaults.

General rules

- **Profile name** is the name in the **Profile Catalog**.
- **Profile type**

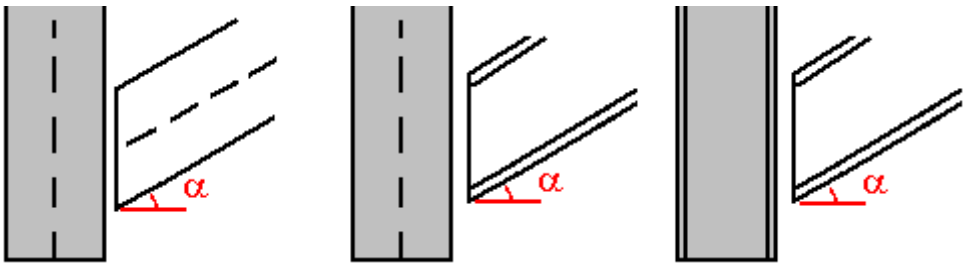
Profile type	Number
I	1
L	2
Z	3
U	4
Plate	5
Round bar	6
Pipe	7
Square pipe	8
C	9
T	10
ZZ	15
CC	16
CW	17
Polygon plate	51

- Number of secondary parts
- Number of main parts
- Material name

Orientation rules Depending on the relative angle of a beam, the connections can be classified as sloped, skewed, or cant. The angle value can be between - 90 and 90 degrees.

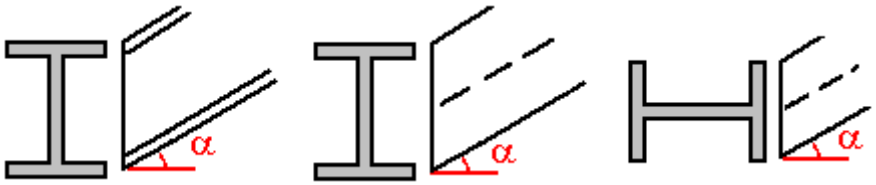
- **Sloped** angle (relative to main part cross section)

  The longitudinal axis of the secondary part follows the slope of the longitudinal axis of the main part.



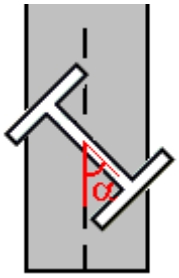
- **Skewed** angle (relative to main part longitudinal axis)

  The longitudinal axis of the secondary part is skewed according to the main part cross section. The angle is the smaller of the angles between the longitudinal axis of the secondary part and the main part Z or Y axis.



- **Cant** angle

  For rotated secondary parts



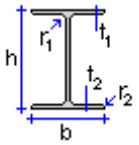
Dimension rules

- **Profile depth**
- **Web depth**

  For profiles with an upper and lower flange, the web depth is: `h-t1-t2-2*r1`

  Or, if t2 is zero: `h-2*t-2*r1`

  For profiles with one flange, the web depth is `h-t-r1-r2`.



- **Web thickness**
- **Flange thickness**

Forces and strengths

- Shear force
- Axial force
- Bending moment

See also

Combining and iterating properties for AutoDefaults on page 40

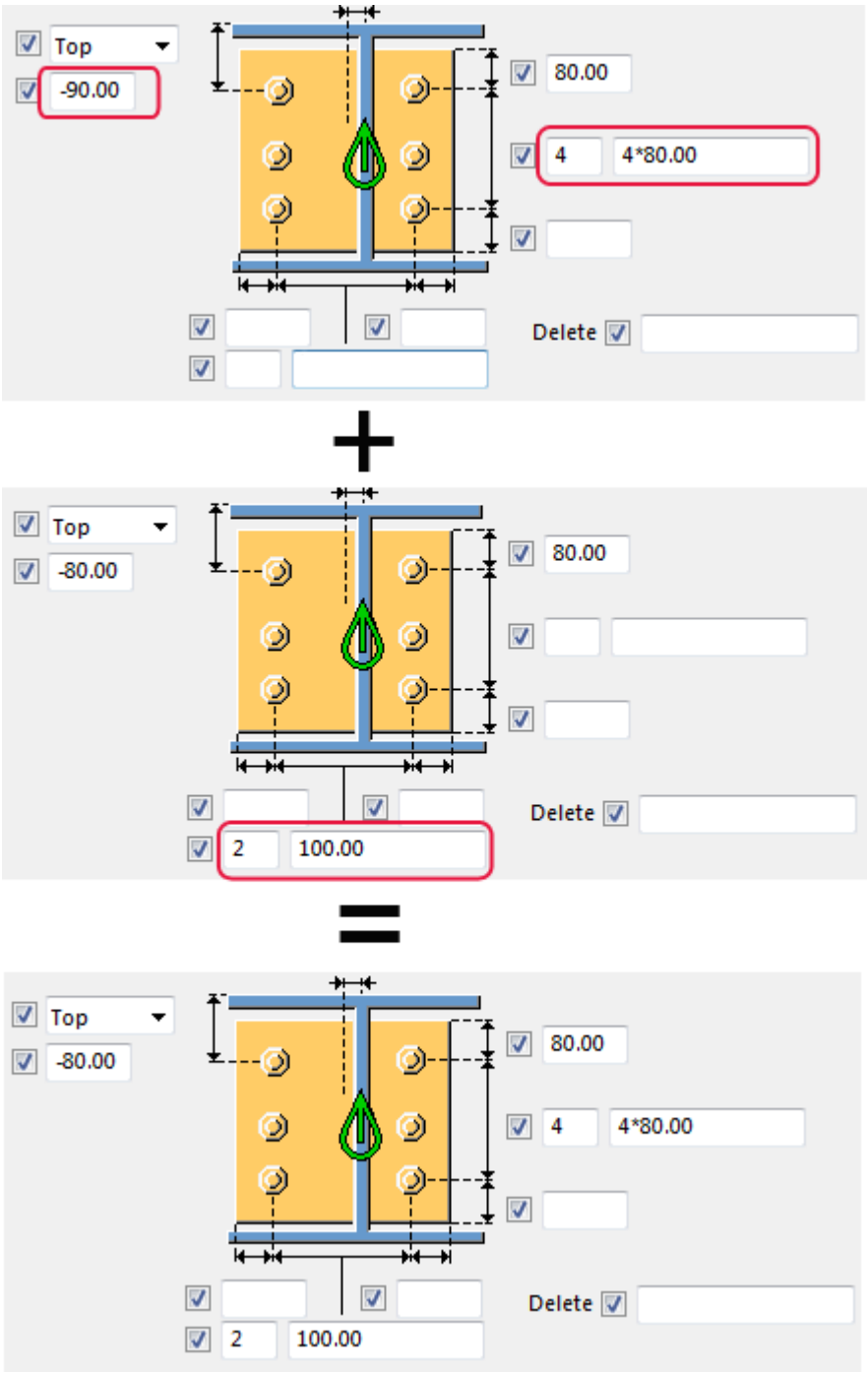
AutoDefaults example: Using iteration with connection check on page 42

Using reaction forces and UDLs in AutoDefaults and AutoConnection on page 44

5.1 Combining and iterating properties for AutoDefaults

Combining properties

You can save properties files that cover different groups of properties and use these files to define many rules. For example, you can have one file for bolt properties and another for profile properties. AutoDefaults combines the separate files into one file. This means that you can define fewer files because you can use one file for several rules. If the files contain different values for the same property, Tekla Structures uses the last property it finds, see the example image below.



Iterating properties

Tekla Structures tests the properties until the connection symbol is yellow or green. Iteration changes the properties automatically if the connection is not created successfully, even if the rules match. If connection check is active, the iteration results in properties that have passed the check.

Limitations

- Tekla Structures cannot iterate property files directly. Use a single iteration rule set with sub-rule sets.

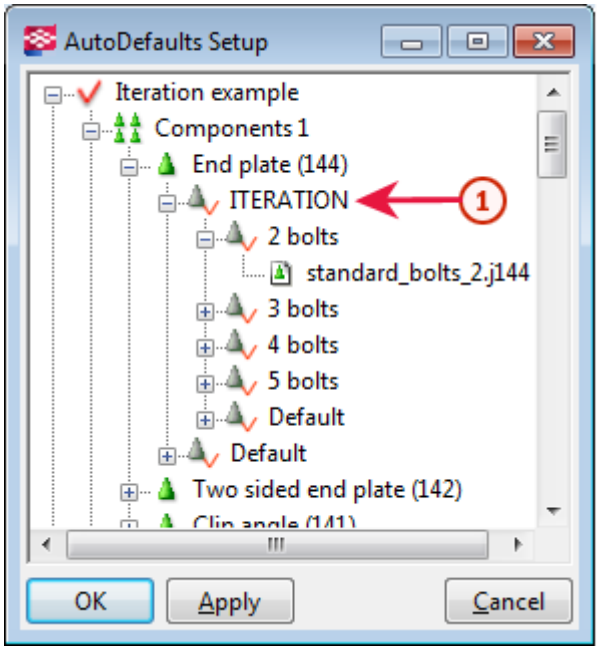
- You cannot have many parallel iteration rule sets. Use a single iteration rule set and place it just before the default rule set.
- Place the combination rule sets above the iteration rule set in the AutoDefaults tree structure.
- Combination rule sets can only be one level deep.
- Tekla Structures disregards empty rule sets, so include at least one rule in each rule set.

See also Creating a rule set for AutoDefaults on page 34

5.2 AutoDefaults example: Using iteration with connection check

You can use the connection check result when using AutoDefaults with iteration. If an iteration rule matches, but the connection does not pass the connection check and the connection symbol remains red, AutoDefaults continues testing other rules and properties until the connection symbol is green.

In this example, you will create iteration rules to set the number of bolts according to the result of the connection check. After this, you will use the rules group and connection check together for a connection. The example image below shows the rules in the **AutoDefaults Setup** dialog box.



To create iteration rules for use with connection check:

1. Click **Detailing** --> **AutoConnection** --> **AutoDefaults Settings** .
2. Right-click the tree and select **New Rule Group**.
3. Click the new rule group and rename it to `Iteration example`.

4. Browse the `Iteration example` tree to find **End plate (144)**, right-click it, and select **Create Additional Rule Sets**.
5. Right-click the **New** rule set and select **Edit Rule Set**.
6. Change the rule set name to `ITERATION`.
7. Set the **Parameter file(s) selection in rule set** option to **Iterate until connection symbol is green**.
8. Click **OK**.
9. Right-click the `ITERATION` rule set and select **Create Additional Rule Sets**.
10. Right-click the **New** rule set and select **Edit Rule Set**.
11. Change the rule set name to `2 bolts`.
12. Select the rule **Secondary 1 depth** and set the minimum and maximum depth values for two bolts.
13. Set the **Parameter file(s) selection in rule set** option to **Use combination of first parameters**.
14. Click **OK**.
15. Right-click the connection properties file `standard.j144` under `2 bolts` and select **Select Connection Parameters**.
16. Select the properties file for two bolts in the **Attribute File List** and click **OK**.

If there is no suitable properties file, you can define suitable properties. Right-click the `standard.j144` file and select **Edit Connection Parameters**. Save the needed properties and click **Cancel** to close the dialog box. The saved properties are now available in the **Attribute File List**.

17. Click **Apply** to have the changes available in the connection dialog box.
18. Repeat steps 9 to 16 for other rule sets.
19. Open the **End plate (144)** dialog box.
20. Select `<Defaults>` from the list next to the **Load** button and click **Load**.
21. On the **General** tab, set the **AutoDefaults rule group** option to the `Iteration example` you created.
22. On the **Design type** tab, set the **Check connection** option to **Yes**.
23. Enter the load from secondary members in the **Shear**, **Tension**, and **Moment** options.
24. Click **OK**.

See also AutoDefaults setup on page 32

Combining and iterating properties for AutoDefaults on page 40

5.3 Using reaction forces and UDLs in AutoDefaults and AutoConnection

You can set reaction forces for AutoConnection and AutoDefaults:

- In the user-defined attributes of a part (for AutoConnection and AutoDefaults)
- On the **Design** tab in the connection dialog box (for AutoDefaults)

Reaction forces

When you use reaction forces in a rule and AutoDefaults is activated, Tekla Structures first searches for reaction forces in the corresponding connection's properties. If the properties do not contain reaction forces, Tekla Structures searches the user-defined attributes of the secondary part of the connection. If Tekla Structures does not find forces there, you cannot use reaction force rules.

Shear force calculation

If you have not given any reaction force values, shear force is calculated using the UDL (uniformly distributed load) shear force routine. The UDL calculation is mainly intended for use with imperial units. It uses the yield stress value, profile dimensions, and UDL percentage to calculate the maximum shear force allowed.

- Yield stress is defined in the **Material Catalog**.
- Profile dimensions come from the **Profile Catalog**.
- UDL percentage is taken either from the connection dialog box or from an advanced option.

Tekla Structures compares the result with the shear force rule in AutoDefaults.

To use UDLs for AutoConnection and AutoDefaults:

To	Do this
Use UDL for AutoConnection	1. On the **Design** tab in the connection dialog box, set the UDL option to **Yes**. 2. Enter the UDL percentage in the **UDL%** box. If you do not enter any value, Tekla Structures uses a default percentage set with the `XS_AUTODEFAULT_UDL_PERCENT` advanced option.
Use UDL for AutoDefaults	1. On the **Design** tab in the connection dialog box, set the **Use UDL** option to **Yes**. 2. Enter the UDL percentage in the **UDL %** box. If you do not enter any value, Tekla Structures uses a default percentage set using the `XS_AUTODEFAULT_UDL_PERCENT` advanced option.

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