# Tekla Structures Basic Training

Tekla Structures 10.0

April 23, 2004

# Contents

# 7 Steel Detailing

**In this lesson**

In this chapter we will first create connections by using default AutoConnection / AutoDefault rules. We then investigate little the logic how certain connections are created to certain positions according the AutoConnection rules.

We will then create new AutoConnection rules for this project, remove the existing connections and replace them using new AutoConnection rules group.

We will also investigate how AutoConnections react to changes in the model.

## 7.1 AutoConnections

You can create connections either manually (as we did in Lesson 2) or by using AutoConnections.

**Help: Creating connections**

**Help: Using Autoconnections**

AutoConnections is recommendable way to create connections. Use AutoConnection to have Tekla Structures automatically create connections using a predefined set of rules, or rule group.

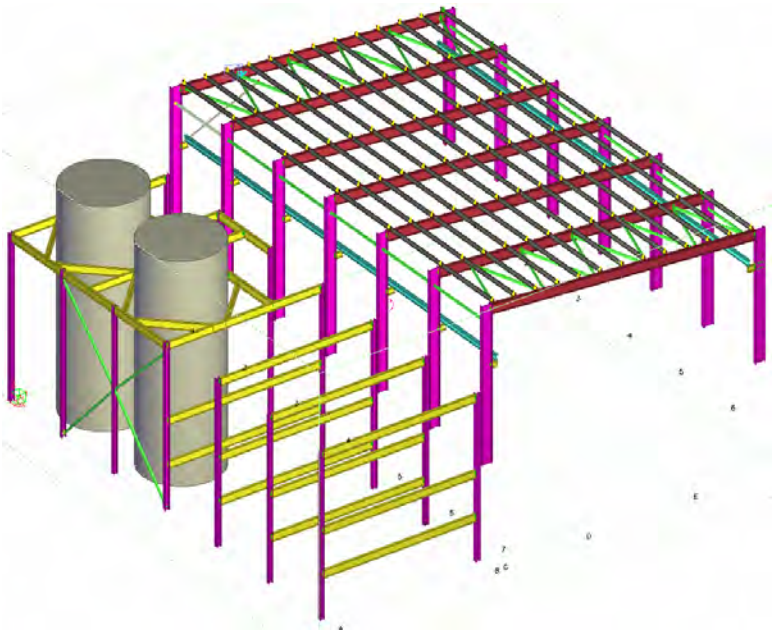
With AutoConnection, Tekla Structures automatically creates similar connections for similar framing conditions.

As creating AutoConnections you can also choose which connection properties you want to use (AutoDefaults).

### Run Default AutoConnections

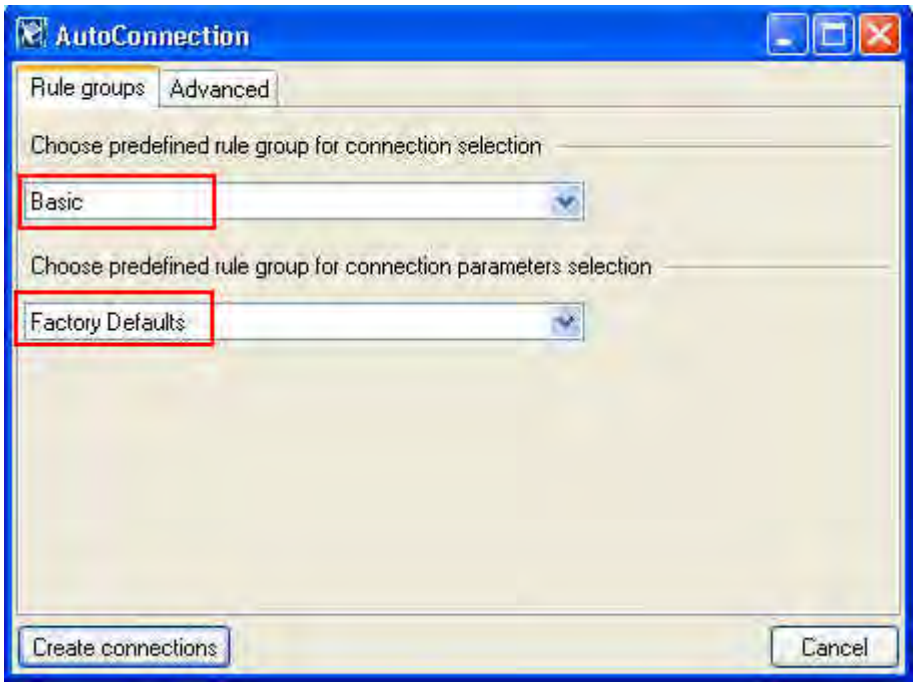
**Delete connections**

1. Create or open pre-defined view where only steel members are visible.
2. Select all the connections and delete them.



**Create auto-connections**

1. Select all the visible parts in the model.
2. Click **Detailing > AutoConnection...** to display the **AutoConnection** dialog box.
3. Select a default rule group **Basic** for AutoConnection.
4. Select a default rule group **Factory defaults** for AutoDefaults.
5. Click the **Create connections** button.




The connections are created.

# 7.2 General about the Criteria the Connections Are Created with

The AutoConnection setup is a tree structure containing rules.

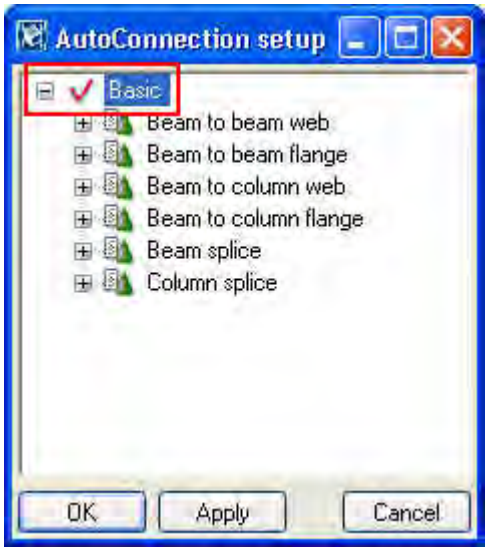
To apply a particular connection, the conditions within the model have to match all the rules in the branch containing the connection.

The order of the rules in the tree is important. Tekla Structures uses the first rule that matches the conditions within the model.

## Rule Group

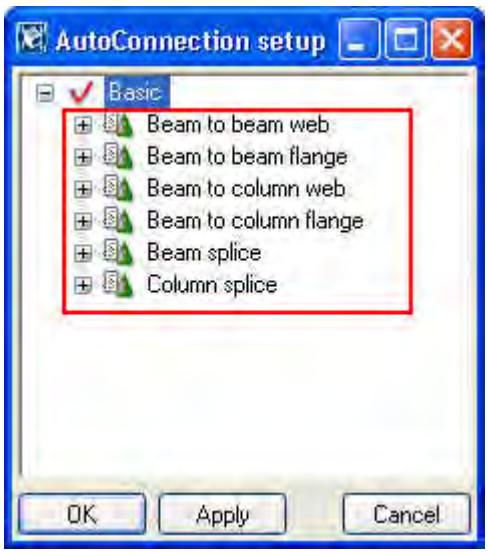
The 1st level in the tree is the rule group, a user defined group of rules for different standards, projects, manufacturers or models.

You can create connections using predefined rule group in **AutoConnection** dialog box (as we did above).



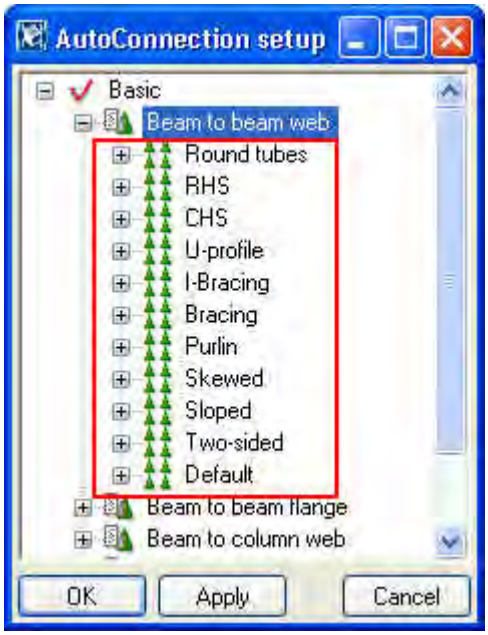

## Framing Conditions

The 2nd level shows the six different predefined framing conditions in AutoConnection setup which you cannot change.

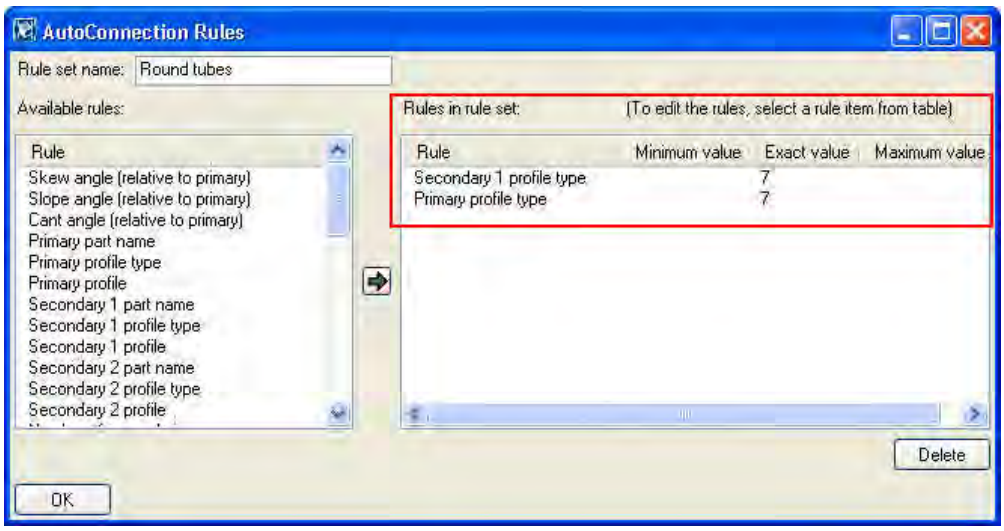



## Rule Sets

Under each framing condition you can create rule sets to specify which connection to use for specific conditions within the model.



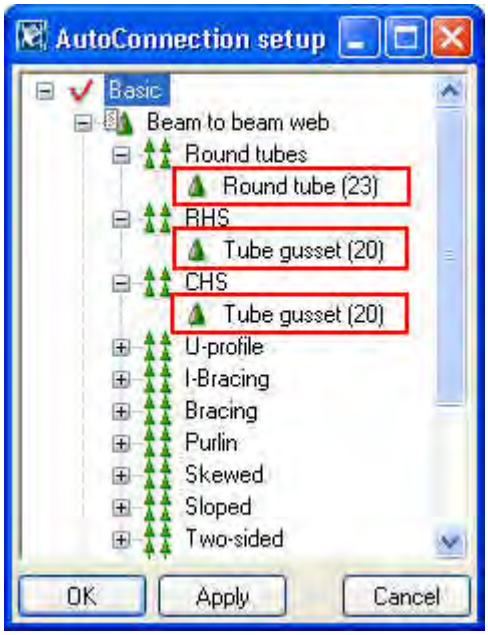

Each rule set can include several single rules to filter the cases.




The name of the rule set is just descriptive name that is displayed in the tree structure. The actual filtering is done according to criteria set in the rules.

## Connections

Under each rule set you can select the connection to apply if the rule set criteria is met. It is also possible to select that in this case no connection is created.




The order of the rules in the tree 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, lowest.

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

# 7.3 Study the Connections Created

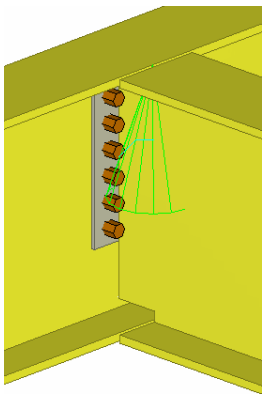
We will now study two beam to beam web connections created by default rule group **Basic**.

## End Plate

**Check rule set used**

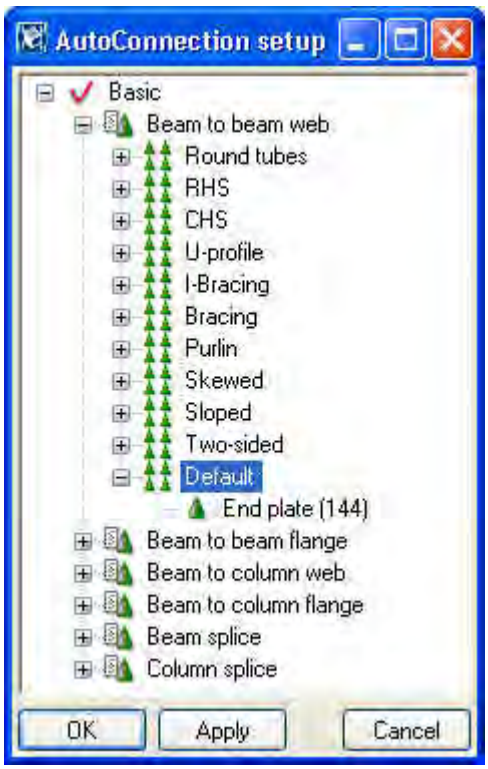
1. Double-click one of the straight beam to beam web connections around the silos.

   It appears to be **End plate (144)**.

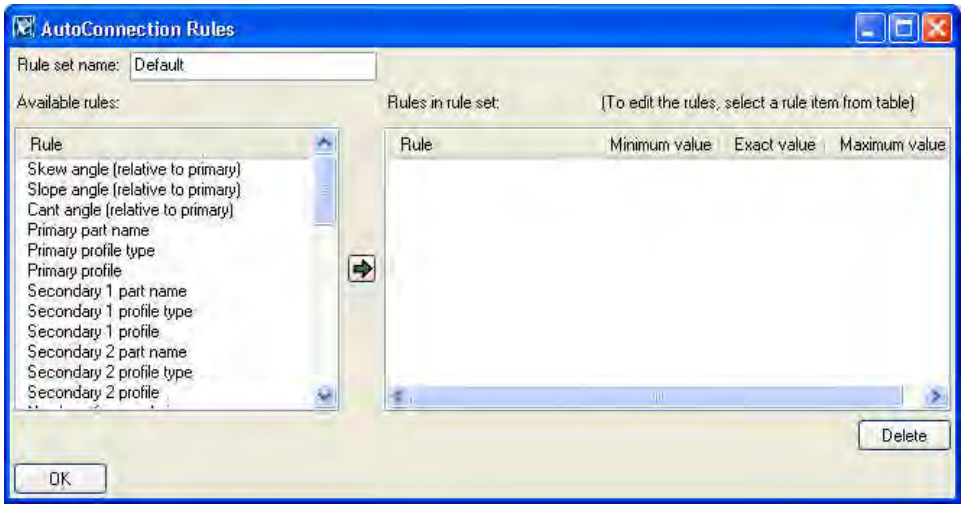


2. From the **Beam to beam web** framing condition in the **AutoConnection setup** check the names of the rule sets.

   No other rule set name (Round tube, RHS, CHS, Bracing) seems to match with the conditions in the model but the **Default**.




3. Right-click the **Default** rule set and select **Edit rule set...** to open the **AutoConnection Rules** dialog box.




You can see there are no rules defined in the right pane under **Rules in rule set**.

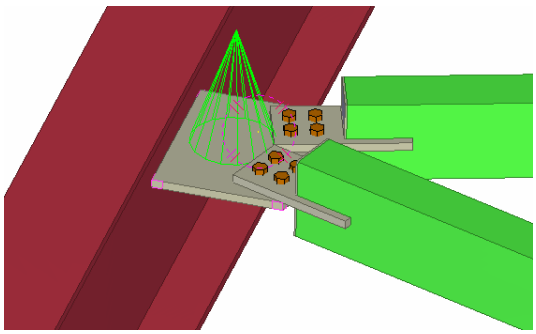
Since the **Default** rule set does not have any rules defined all the **Beam to beam web** framing conditions that don't match with any other rule sets will match with the **Default** rule set.

This is also the case with our example.

# Tube Gusset

**Check rule set used**

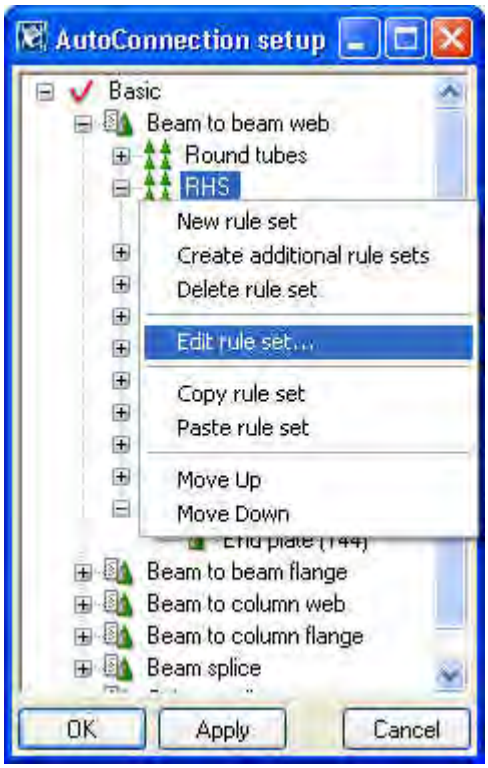
1. Double-click one of the horizontal brazing connections in the grid line 1.



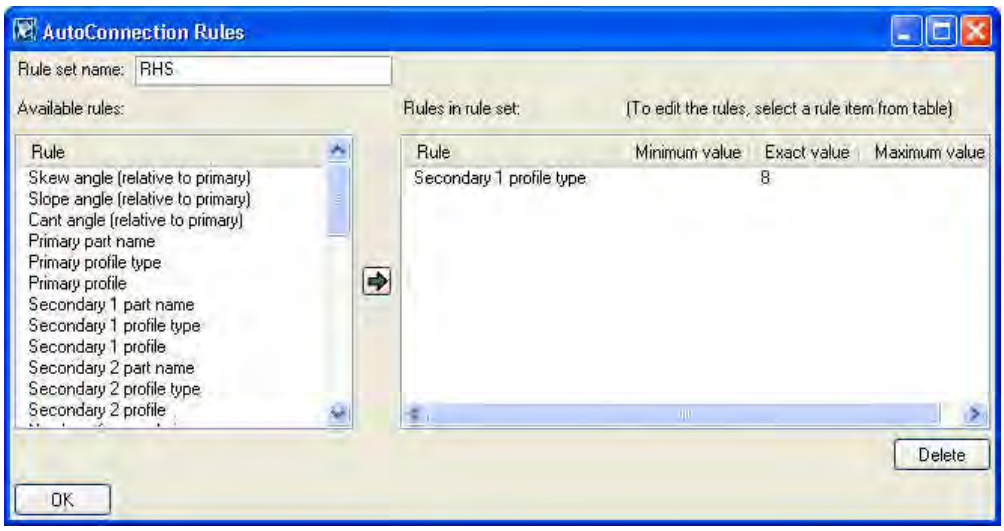
It appears to be **Tube gusset (20)** connection.

2. From the **Beam to beam web** framing condition in the **AutoConnection setup** check the names of the rule sets.

   From the tree we can see the first rule set name that could match with our example condition is **RHS**.




3. Right-click the **RHS** rule set and Select **Edit rule set...**



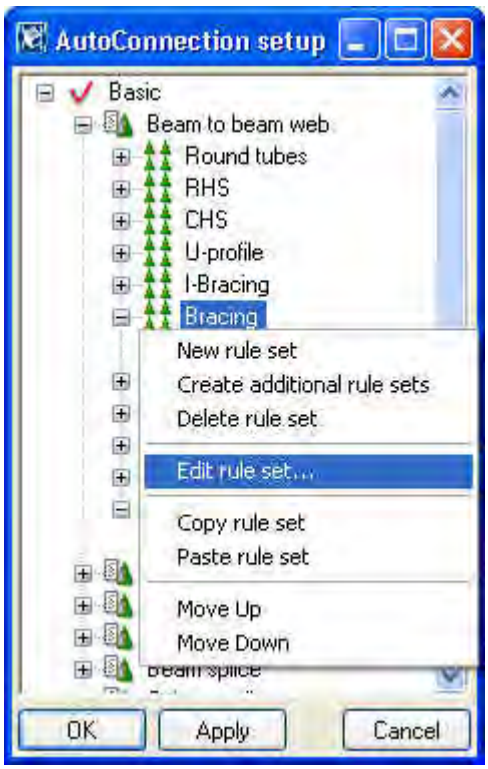

The only rule it includes is the Secondary 1 profile type = 8 (square pipe, see the table below). So the rules match and the connection **Tube gusset (20)** is created.

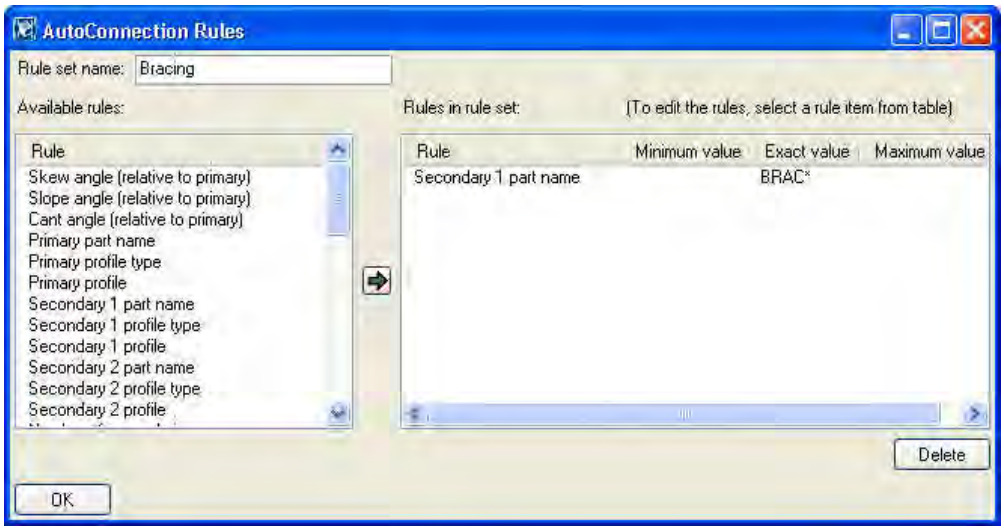
| Profile type | Number |
|---|---|
| I | 1 |
| L | 2 |
| Z | 3 |
| U | 4 |
| Plate | 5 |
| Round bar | 6 |
| Pipe | 7 |
| Square pipe | 8 |
| C | 9 |
| T | 10 |
| ZZ | 15 |
| CC | 16 |
| CW | 17 |
| Polygon plate | 51 |

4. Close the **AutoConnection Rules** dialog box.

   We will also study the next rule set that could have matched with the condition.

5. Right-click the **Bracing rule set** and select **Edit rule set...**




We can see the only rule is Secondary 1 Part name = BRAC*. So also the Bracing rule set matches with the condition in our example. However since the RHS rule set is before Bracing rule set it is used and connection 20 created instead of connection 11.

**Study some connection more**

Study some more connections from the model.

**Delete the connections**

Finally delete all the connections from the model.

# 7.4 Create a New AutoConnection Rule Group

We will now create a new AutoConnection rule group for this project.

We will create a rule group that automatically creates the connections created manually in Lesson 2 added with some connections needed for the Model2.

In this exercise we will create following rules for framing conditions:

| Framing condition | Rule set name | Rules in rule set | Connection |
|---|---|---|---|
| Beam to beam web | Purlin | Secondary1 part name = PURLIN | Cold rolled overlap, page13 |
| | Bracing | Secondary1 profile type = 8 | Tube gusset (20), page 4 |
| | Default | No rule | Shear plate simple (146), page 1 |
| Beam to column web | Two sided | Number of secondaries = 2<br>Secondary1 part name = BEAM<br>Secondary2 part name = BEAM | Two sided end plate (142), page 1 |
| | Bracing | Secondary1 profile type = 8 | Tube gusset (20), page 4 |
| | Default | No rule | End plate (144), page 1 |
| Beam to column flange | Crane support | Secondary1 profile = IPE450 | Welded Column with stiffeners (128), page 3 |
| | Default | No rule | End plate (144), page 1 |

We will define rule sets for framing conditions

- Beam to beam flange
- Beam splices
- Column splices

since we do not have those connections in our model.

## Create Rule Group Industrial Building Connections

**Create new rule group**

1. Click **Setup >AutoConnection…** to open **AutoConnection setup** dialog box.
2. Right-click the **Basic** rule group and select **New rule group**.


A new rule group named **New** appears.

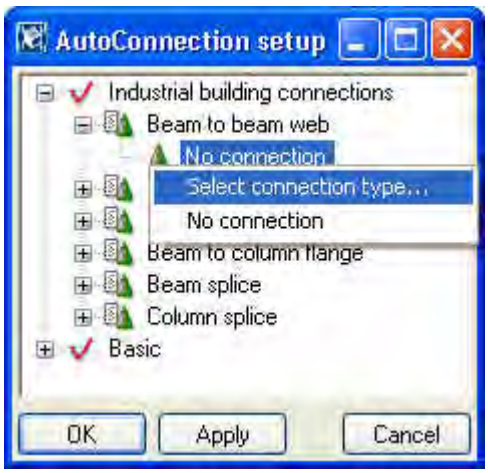
3. Select the **New** rule group, press **F2** key and edit the name to **Industrial building connections**.


# Beam to Beam Web

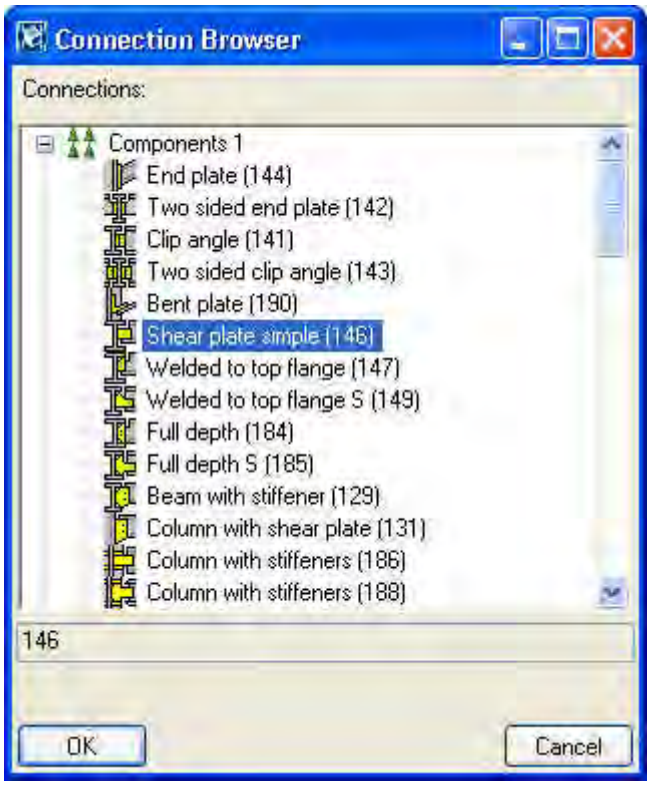
We will start creating rule sets for **Beam to beam web** framing condition. By default the framing conditions do not have any rule sets defined, only connection type **No connection**.

**Create Default connection**

1. Right-click a connection **No connection** in the **AutoConnection setup** tree.
2. **Select connection type...** to open the **Connection Browser** dialog box.




3. Select **Shear plate simple (146)** connection and click **OK** to update the tree.



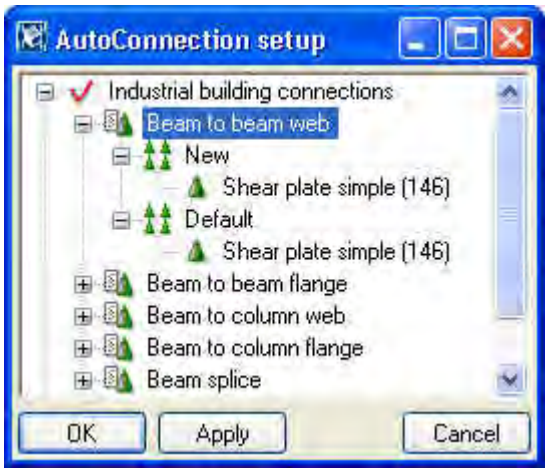

The tree is updated.


**Rule for purlin connections**

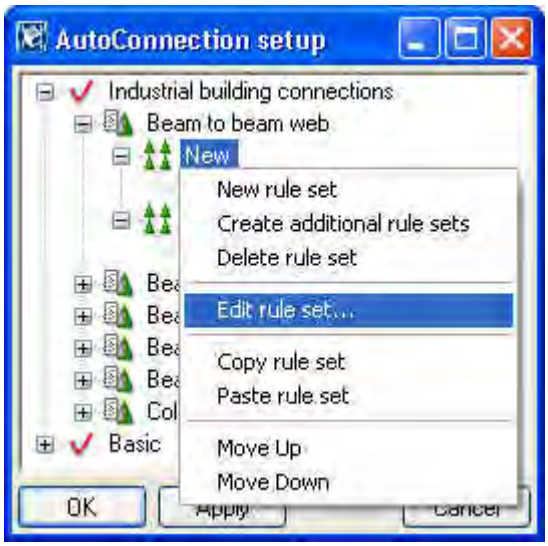
We will now create additional rule sets to **Beam to beam web** framing.

1. Right-click **Beam to beam web** framing condition and select **Create additional rule sets**.

   Two rule sets, **New** and **Default** appear. The connection we chose appears now under both rule sets **New** and **Default**.

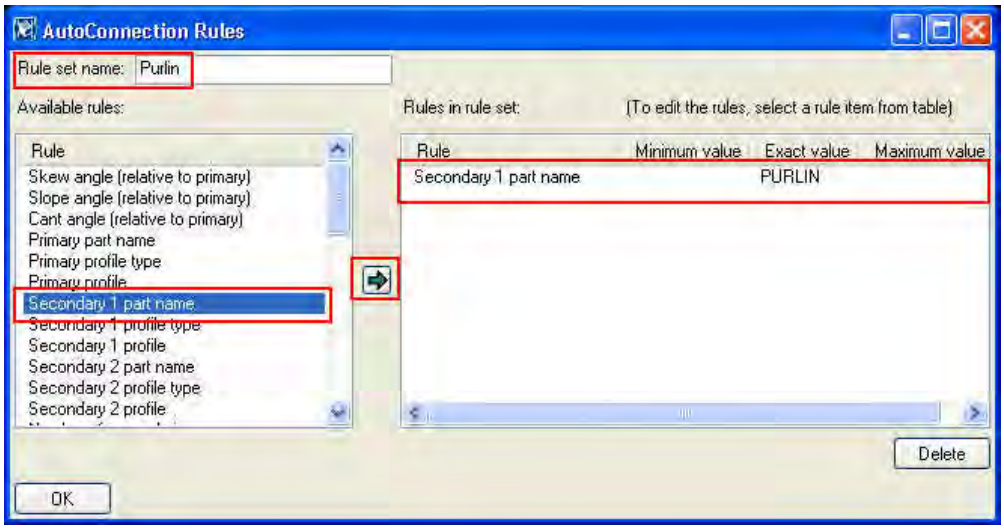



2. Right-click the rule set **New** and select **Edit rule set...**

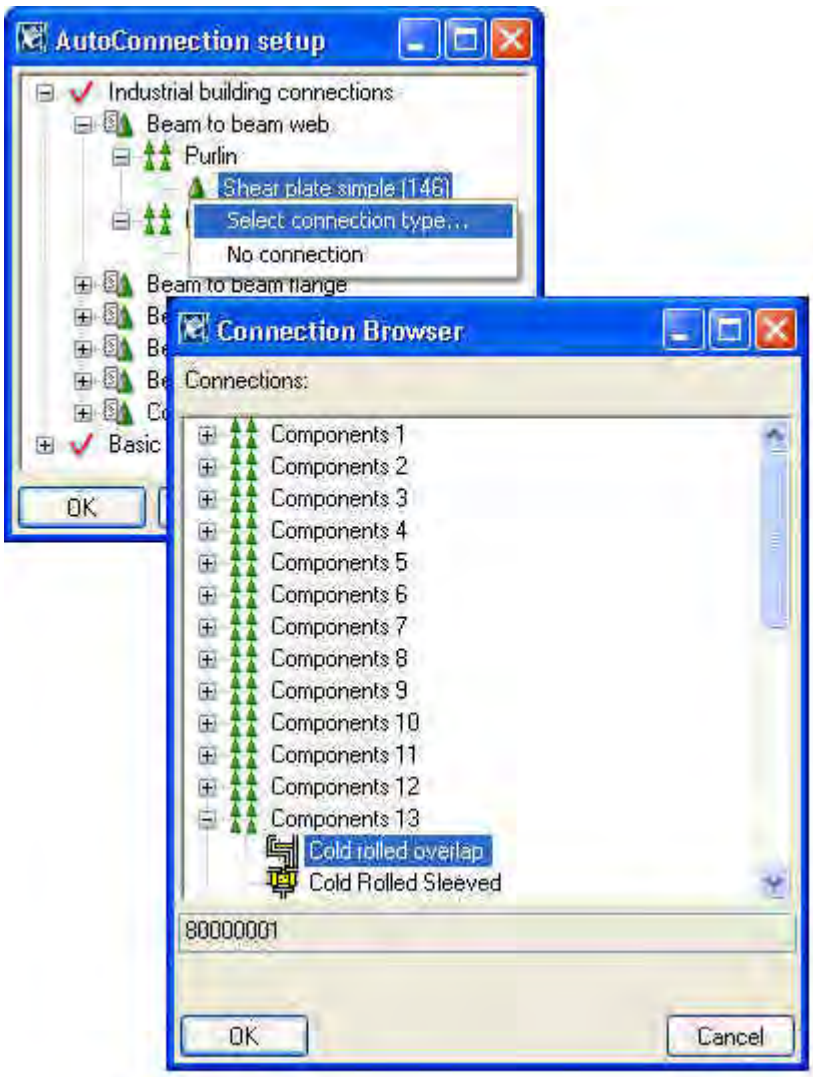


The **AutoConnection Rules** dialog box opens.

3. Select a rule **Secondary 1 part name** from the **Available rules** list.
4. Click the right arrow button to move the selected rule into the list of **Rules in rule set**.
5. Edit **PURLIN** as the **Exact** value for the rule.
6. Edit **Purlin** as the name for the rule set.
7. Click **OK** and the tree is updated.

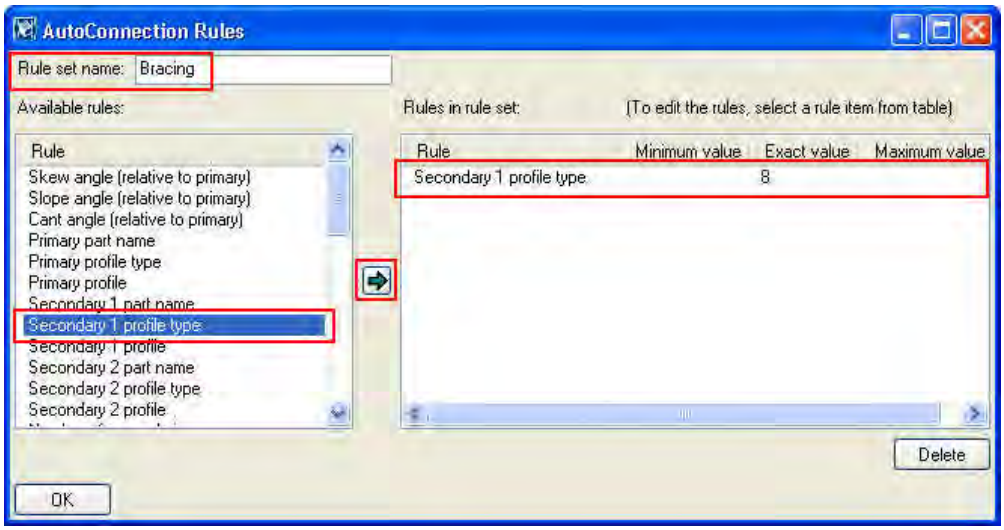



8. Select **Cold rolled overlap** connection for the **Purlin** rule set.

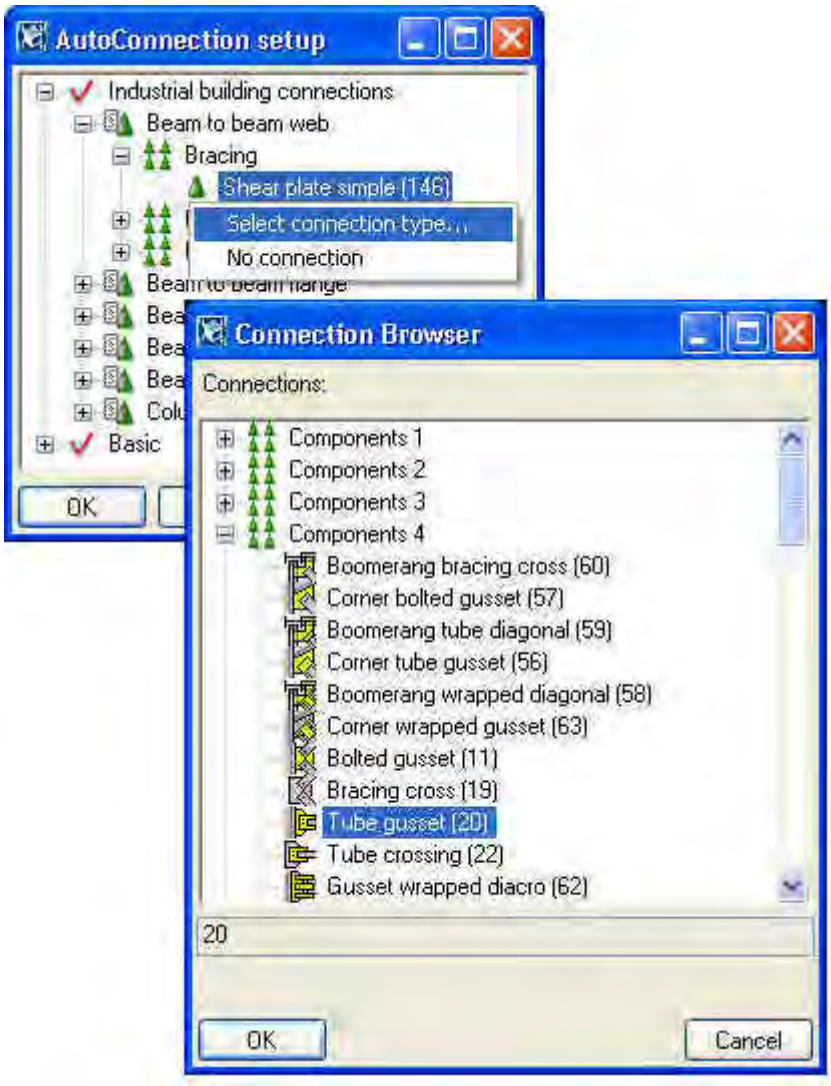



**Rule for Bracing connections**

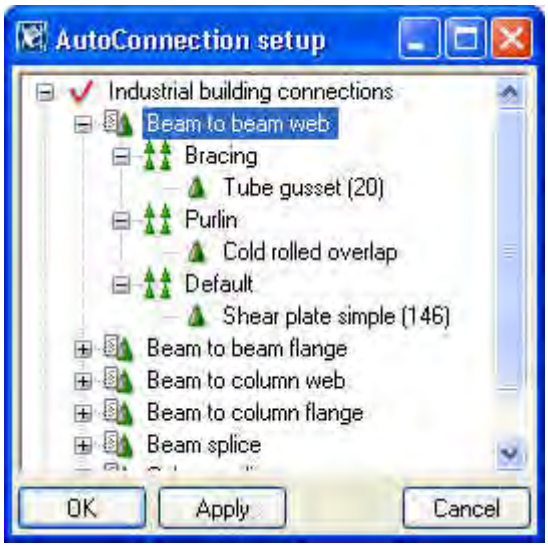
1. Create an additional rule set to **Beam to beam web** framing.
2. Right-click the **New** rule set created and select **Edit rule set...**
3. Add the rule for **Secondary 1 profile type** to be 8 and name the rule as **Bracing**, click **OK**.



4. Select connection **Tube gusset (20)** for **Bracing** rule.



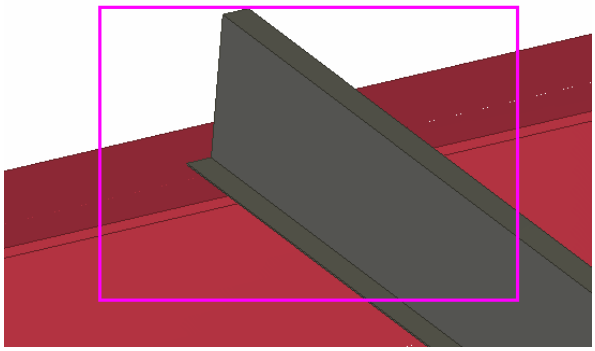

5. Click **Apply** in the **AutoConnection setup** dialog box to save the editing so far.

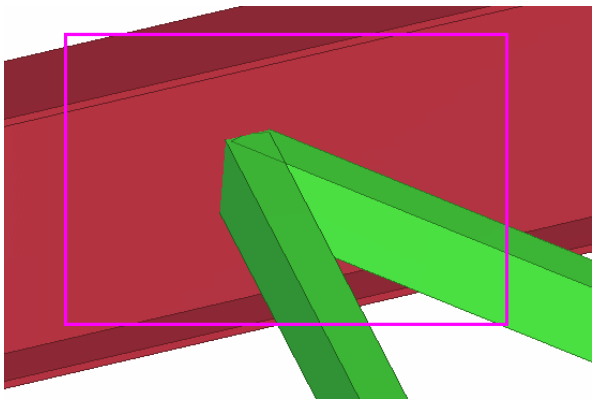


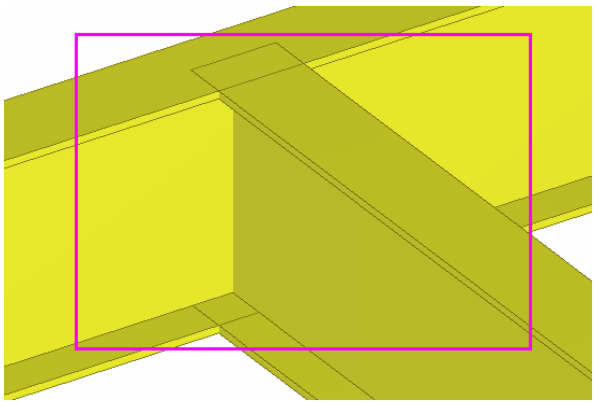

**Test the rules**

We will now do a simple test to make sure our new rule group works.

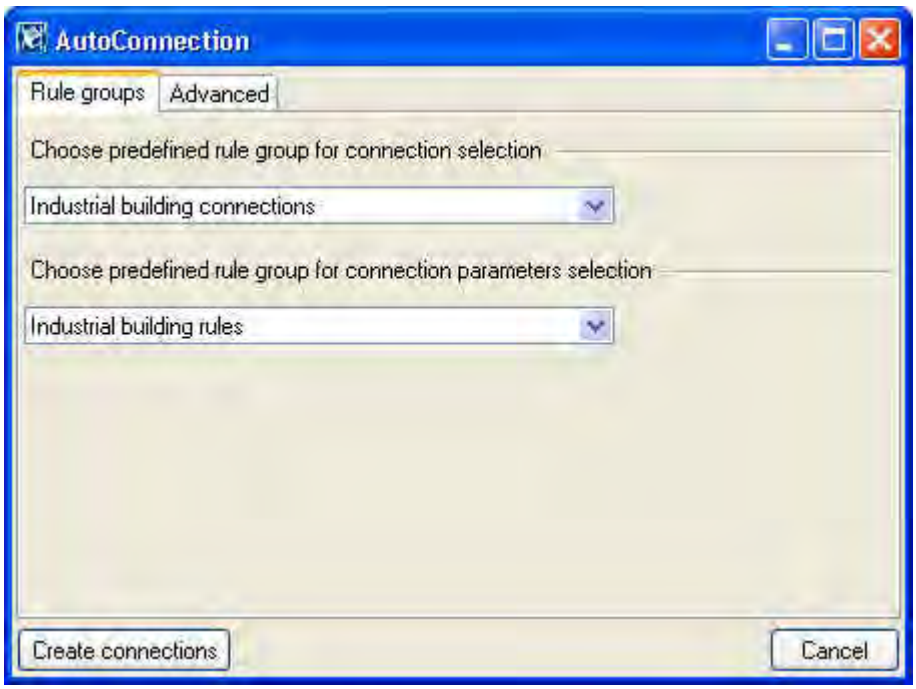
1. Select the parts of each conditions we have defined rules for (by using **Ctrl**).







2. Click **Detailing > AutoConnection…**
3. Select the **Industrial building connections** rule group.
4. Select **Industrial building rules** for connection parameters (the AutoDefaults file we created in lesson 2).
5. Click **Create connections**.

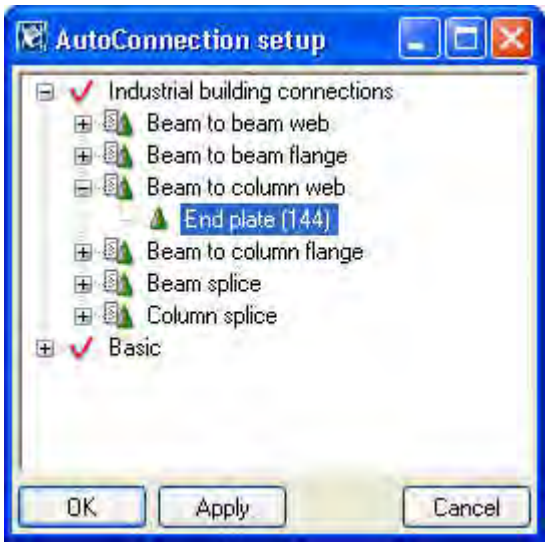



6. Check that a correct connection was created to each condition.

## Beam to Column Web

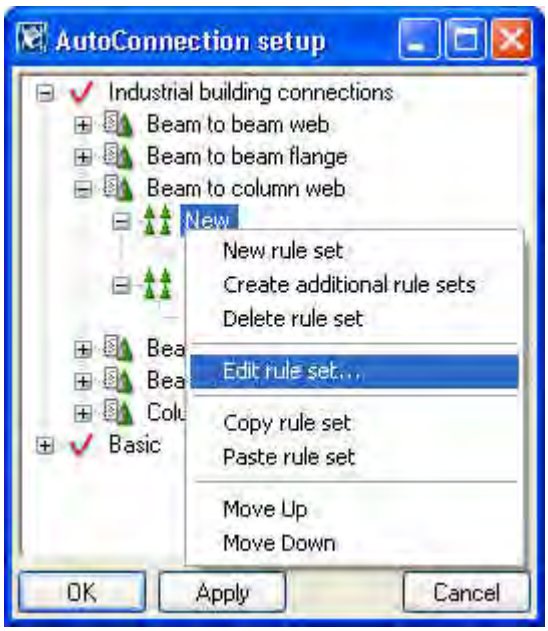
**Default connection**

Set **End plate (144)** as the default connection for **Beam to column web** framing condition.

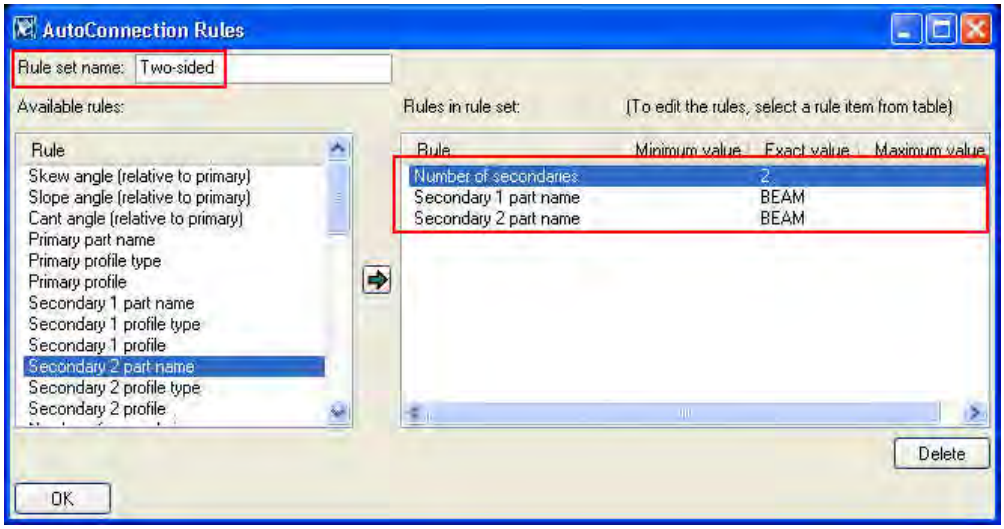



**Two sided End plate**

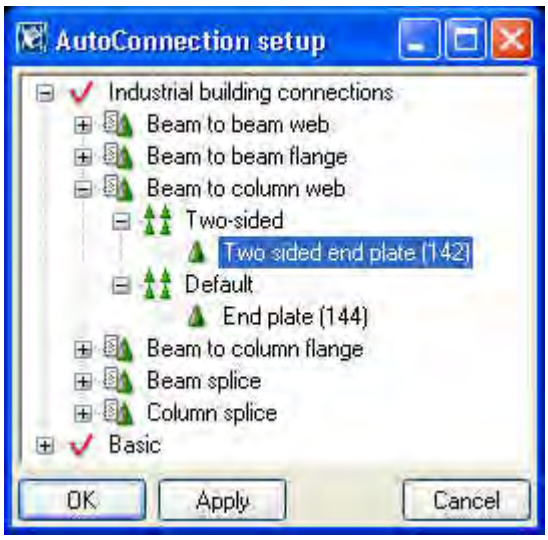
1. Right-click **Beam to column web** framing condition and select **Create additional rule sets**.
2. Right-click the **New Rule set** and select **Edit rule set...**




3. Edit the rule set to have the following rules:
4. Number of secondaries: 2
5. Secondary 1 part name: BEAM
6. Secondary 2 part name: BEAM
7. Name the rule set to **Two-sided** and click **OK**.




8. Select **Two sided end plate (142)** as the connection for rule two sided.

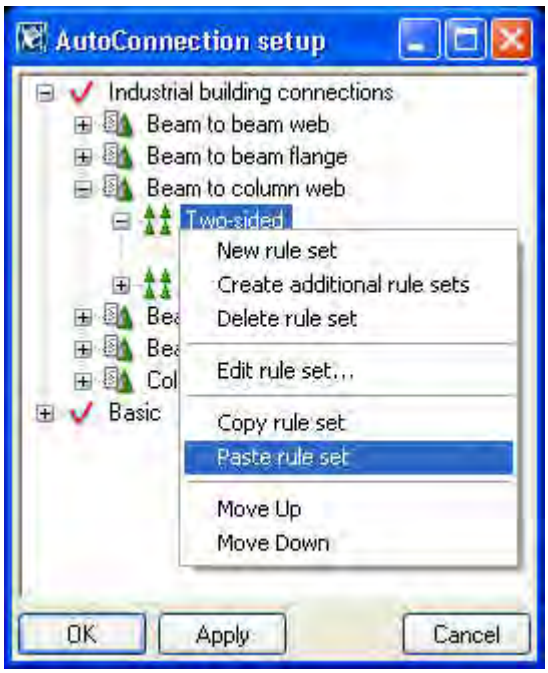



**Bracing**

Instead of creating a new rule for Bracing we will now copy the existing Bracing rule from Beam to beam web framing condition.

1. Copy the rule **Bracing** from **Beam to beam web** framing.

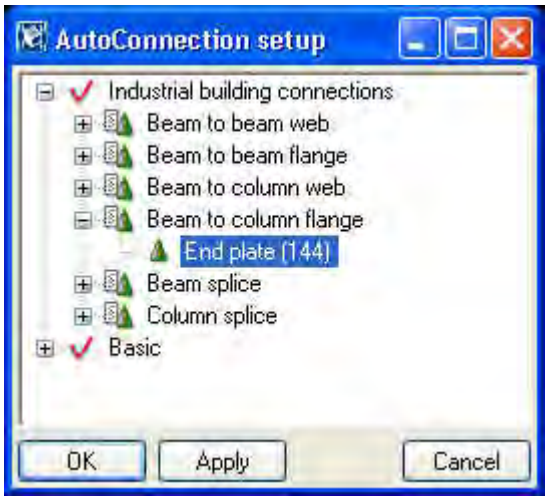

2. Right-click the first rule (**Two sided**) in **Beam to column web** framing condition and select **Paste rule set**.




## Beam to Column Flange

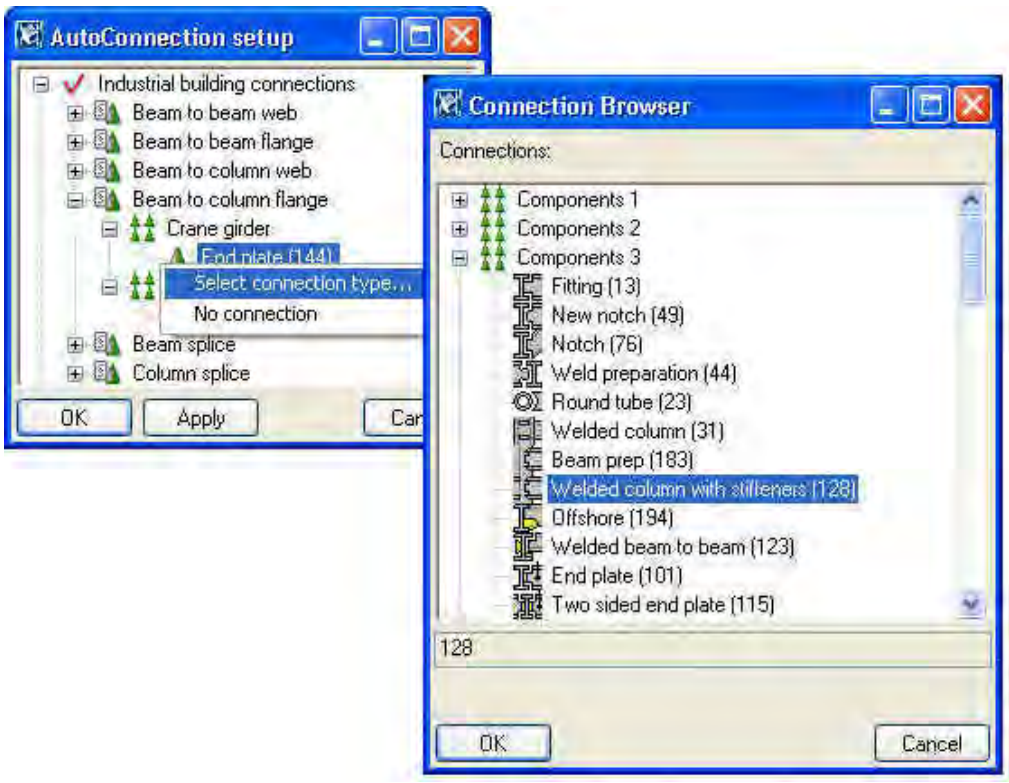
**Default connection**

Set **End plate (144)** as the default connection for **Beam to column flange** framing condition.




**Crane support**

1. Create additional rule sets.
2. Right-click the **New** rule set and select **Edit rule set**.
3. Edit the rule set to have the rules **Secondary 1 profile** = IPE450.
4. Select **Welded column with stiffener (128)** from as the connection for rule **Crane girder**.

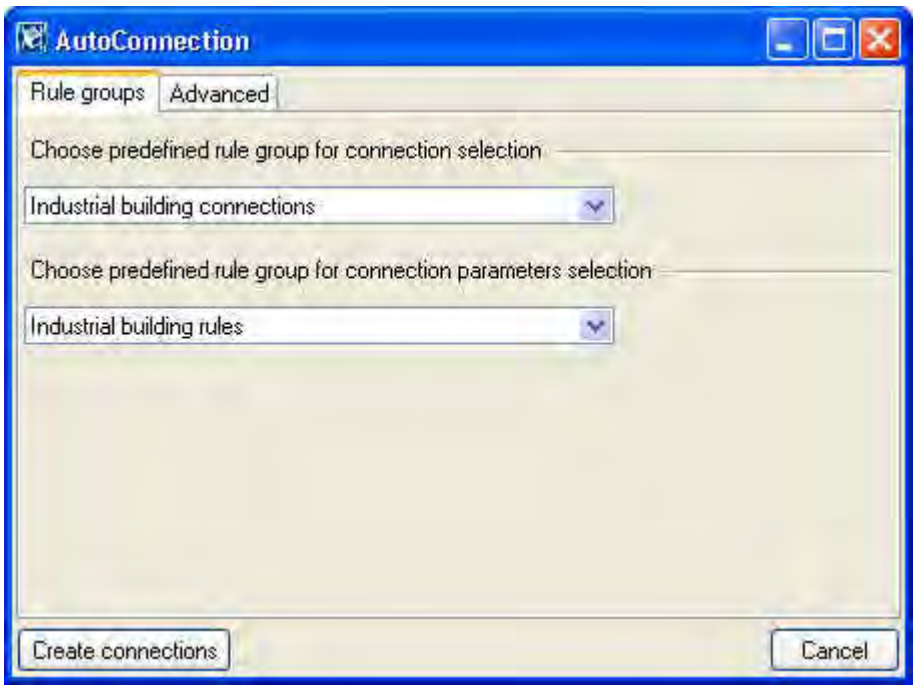



5. Click **OK** in the **AutoConnection setup** dialog box.

# 7.5 Run AutoConnection

**Create connections**

1. Select the whole model.
2. Click **Detailing > AutoConnection...**
3. Select the **Industrial building connections** rule group.
4. Select **Industrial building rules** for connection parameters (the AutoDefaults file we created in lesson 2).
5. Click **Create connections**.




6. Check that a correct connection was created to each condition.