



Installation & User Guide

DuraFuse Frames[®] Tekla

Component v1.5.1

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1 Overview

The DuraFuse Frames[®] (DFF) connection is a system of plates, welds, and bolts. The DFF Tekla component was developed to make detailing this connection easy. The component can be quickly applied to moment frame connections in a Tekla model and updated using the XML Import Tool.

The flow chart below outlines steps required to apply the DFF Tekla component in a model.

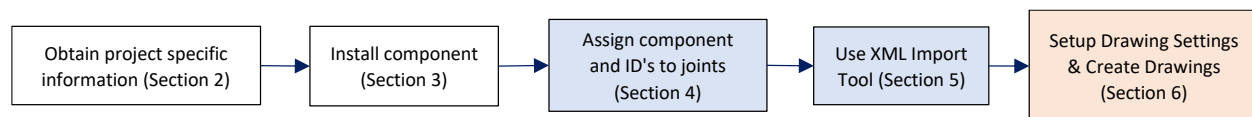


Figure 1-1. DuraFuse Frames Tekla Component Application Flow Chart

2 Project Specific Information

Obtain project information from DFF by using one of the following resources:

- The DuraFuse Frames engineer on the project you are working with
- General Phone: 801-727-4060
- General Email: contact@durafuseframes.com

The following items will be included in the project-specific information:

- Frame Elevations with connection ID's
- XML file
- Optional: connection schedules

Figure 2-1 is an example of a frame elevation, which indicates where the connection ID's apply. Use this to locate where to apply connection ID's in the model, see section 4 for more information.

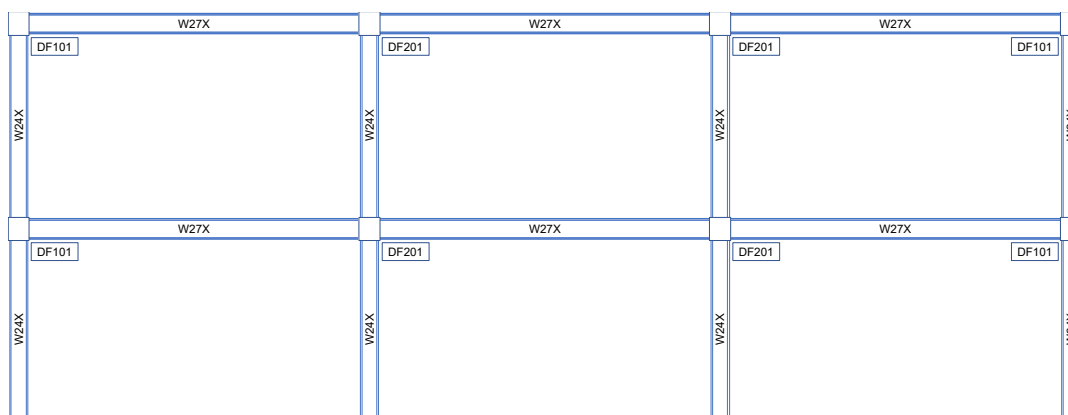



Figure 2-1. DuraFuse Frames Elevation Example

The XML file is a project specific file that contains all connection information for each ID from the DFF schedules. The files may look like the following, where the file name includes *DuraFuse Connection* followed by the date, time and the *.xml* extension:

 DuraFuse Connection_220106 14_46_31.xml

The file can be renamed as the user prefers and will still be compatible with Tekla and the component. Data within the XML file is organized by *Project Data*, *Global Data*, and each individual *DuraFuse Component* for each unique ID (see example in Figure 2-2). **Save** this file to a known location prior to using the component and assigning ID's.

```

<DuraFuseProject>
  <ProjectData>
    <Version>1.0.1</Version>
    <FileType>XMLExport</FileType>
    <Author>    </Author>
    <ProjectName>0</ProjectName>
    <ProjectNumber>XXXXXX-00</ProjectNumber>
    <ProjectEngineer>0</ProjectEngineer>
    <TimeStamp>01/06/2022 14:46:31</TimeStamp>
  </ProjectData>
  <GlobalData>
    <UnitsLength>Inches</UnitsLength>
    <UnitsAngle>Degrees</UnitsAngle>
    <NumberOfCnxns>15</NumberOfCnxns>
    <MemberMtlGrade>A572-50</MemberMtlGrade>
    <BoltGrade>F2280X</BoltGrade>
  </GlobalData>
  <DuraFuseComponent>
    <Members>
      <ID>DF101</ID>
      <ColumnSize>    </ColumnSize>
      <TotalNumOfBeams>1</TotalNumOfBeams>
      <WeldHBDefault>    </WeldHBDefault>
    </Members>
  </DuraFuseComponent>
</DuraFuseProject>

```

Figure 2-2. XML File Sample Data

Figure 2-3 shows blank connection schedules for parameters associated with each connection ID. DFF may provide drawings that include these schedules specific to each project. The parameters in the schedules are incorporated into the XML file. The XML Import tool (section 5) auto-populates the inputs in the *Component Dialog* (see section 7) for each of these parameters.

ID	MEMBER SIZES		PLATE THICKNESS			DIMENSIONS						WELDS				BOLTS PER CONNECTION (EACH SIDE)							
	BEAM	COLUMN	T1	T2	T3	C1	C2	C3	C4	C5	C6	W1	W2	W3	W4	DIA	SPACING	M	P	N	B		
DF101																							
DF102																							
DF103																							
DF104																							

ID	MEMBER SIZES		TOP PLATE DIMENSIONS					FUSE PLATE DIMENSIONS							SHEAR TAB			BEAM DIMENSIONS					
	BEAM	COLUMN	P1	P2	P3	P4	P5	F1	F2	F3	F4	F5	F6	F7	S1	S2	S3	B1	B2	B3			
DF101																							
DF102																							
DF103																							
DF104																							

Figure 2-3. DuraFuse Frames Schedules (Blank)

3 Installation

Prior to installation of the DuraFuse component, be sure that **Tekla 2022** or newer is installed on the working machine. For compatibility with versions 2019i-2021, contact DuraFuse Frames. Please note that older versions do not include the enhancements introduced in the latest release.

NOTE: OLDER VERSIONS OF THE COMPONENT WILL NOT INCLUDE UPDATES MADE TO THE COMPONENT.

3.1 OVERVIEW

The component can be downloaded and installed from the DFF or Tekla or websites. Section 3.2 outlines how to obtain the installation package and Section 3.3 outlines how to install the component.

3.2 OBTAIN THE INSTALLATION PACKAGE


Obtain the component installation package from one of 3 sources:

1. Download the package from <https://durafuseframes.com/software-plugins/>.
 - a. Click on the **Download** link under the **Tekla Component**.
 - b. Register and **log in** to receive updates.
 - c. Save the installation package to a known location.
2. Download the package from <https://warehouse.tekla.com/>
 - a. If downloading from Tekla.com, please use the **Trimble Notification Activation Guide** document for instructions on enabling notifications when updates are available.
 - b. In the search box, type **DuraFuse**
 - c. The DuraFuse component will display. Click on the image of the component or on **DuraFuse Component**
 - d. Select the **Download** button
 - e. Select **Insert into model** or **Just download** depending on your preference
 - f. If you select **Just download**, save the installation package to a known location and follow the installation instructions.
3. Contact DuraFuse Frames directly to receive the installation package.
Phone: 801-727-4060

Website: <https://durafuseframes.com/contact/>

Email: contact@durafuseframes.com

3.3 INSTALL THE COMPONENT

For a clean, first-time installation, refer to Section 3.3.1. For an installation update, refer to Section 3.3.2. The installation package includes this Installation & User Guide document and a Tekla Structures TSEP file,  **DuraFuseTools.tsep** . This file should be saved to a known location and will be used in the sections below.

3.3.1 Clean Installation

There are two options for a clean installation. The steps for the **first option** are below:

1. Locate the TSEP file on your computer.
2. Double click on the TSEP file.
3. The Tekla Structures **extension manager** will open (see Figure 3-1). From here, the compatible versions installed are listed.
4. Select the version to install to and continue to follow automatic prompts that pop up.

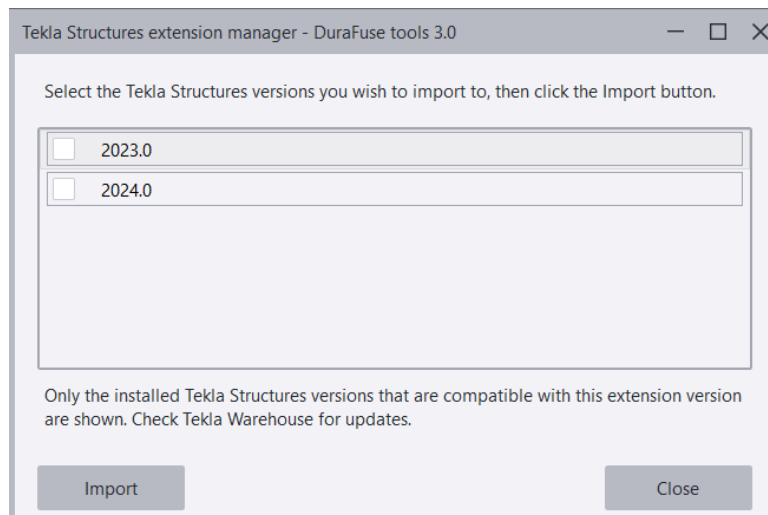


Figure 3-1. Extension Manager

Instructions for the **second option** for a clean installation are outlined below:

1. Start **Tekla Structures**.
2. Open a model.
3. Open the **Applications & components** catalog.

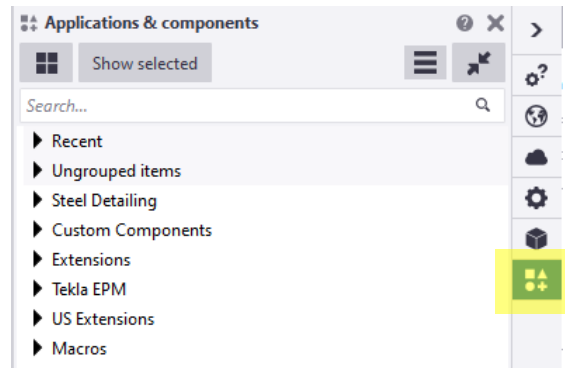


Figure 3-2. Applications & Components Catalog

- From the catalog menu select **Manage extensions** and select **Extension manager**. This will open the Extension manager.

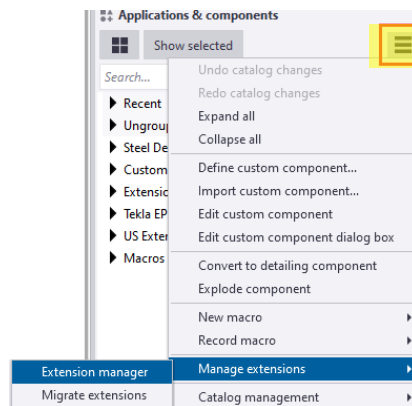


Figure 3-3. Manage Extensions Window

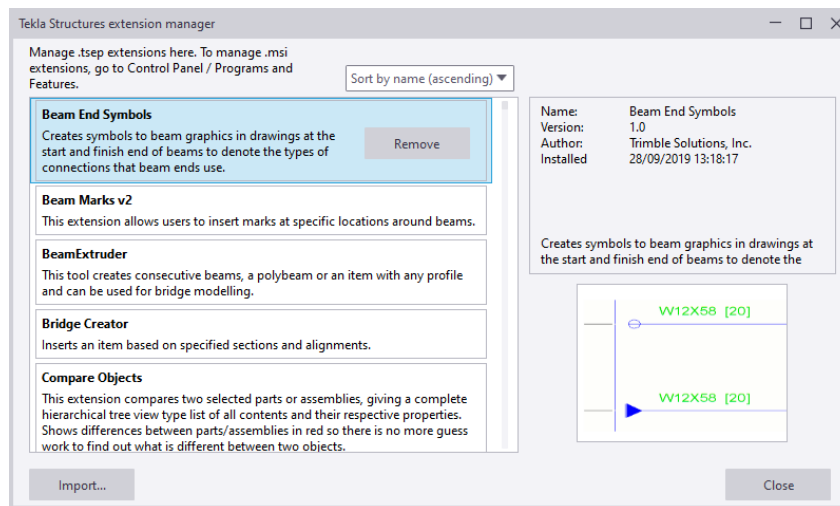


Figure 3-4. Extension Manager

- From the dialog select the **Import** and browse to where the TSEP file is saved. Select the file and **Open**.

NOTE: IF THE TSEP FILE IS BEING IMPORTED INTO A NONCOMPATIBLE VERSION OF TEKLA STRUCTURES, AN ERROR MESSAGE WILL APPEAR.

- Once the import is complete, the DuraFuse tools will be included in the list (see Figure 3-5).
- Restart** Tekla Structures.

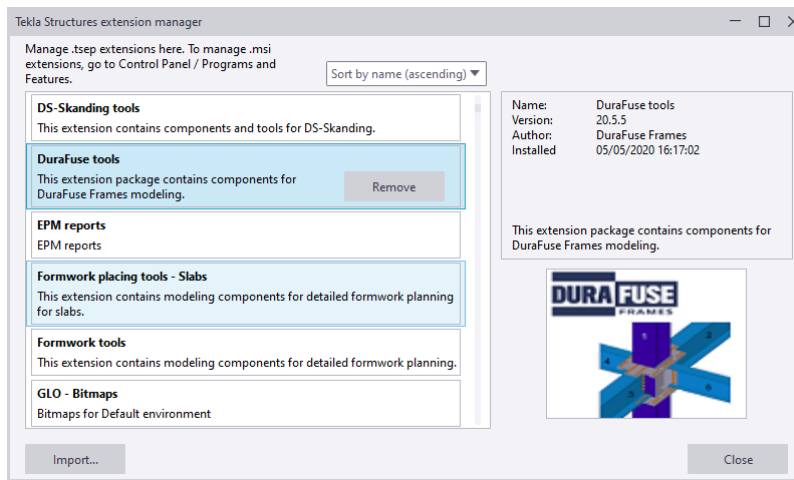


Figure 3-5. Extensions Manager Displaying DuraFuse Tools

3.3.2 Installing Updated Versions

To install an updated version of the component, first, uninstall the old version.

- Start Tekla Structures.
- Open a model.
- Open the **Applications & components** catalog (see Figure 3-6).

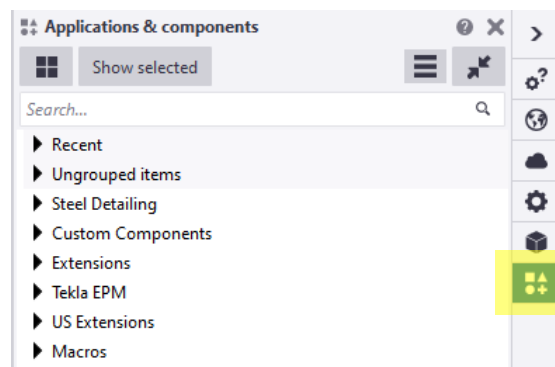


Figure 3-6. Applications & Components Catalog

- From the catalog menu, select **Manage extensions** and select **Extension manager**.

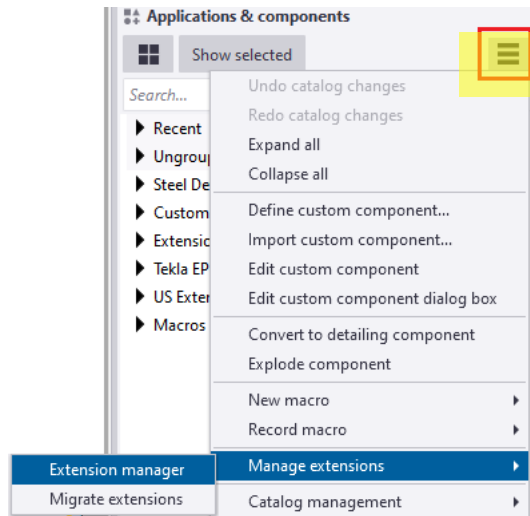


Figure 3-7. Manage Extensions Window

- This will open the **Extension manager**.

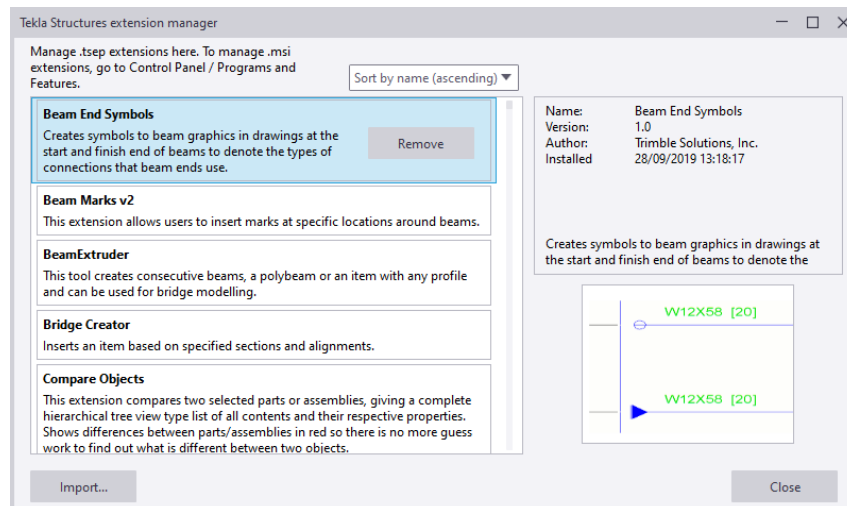


Figure 3-8. Extension Manager

- Scroll down and locate the **DuraFuse tools** in the list and click the **Remove** button (Figure 3-9). This will uninstall the DuraFuse Tools from the computer.

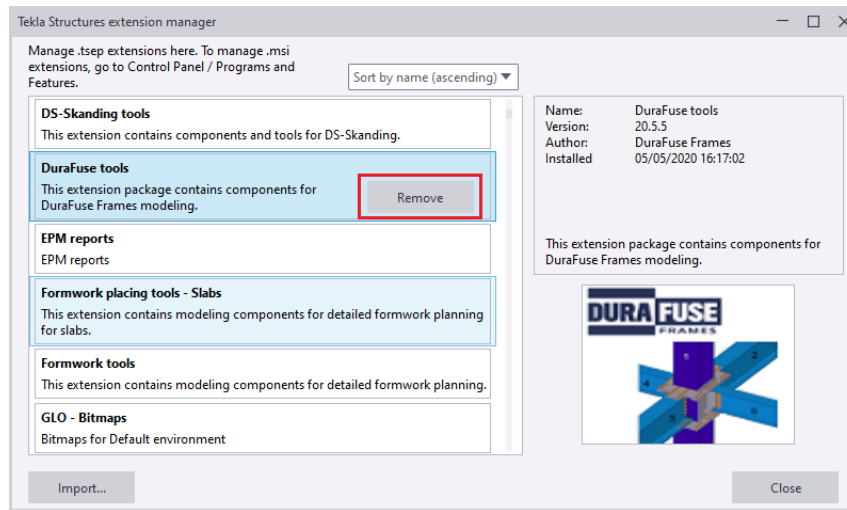


Figure 3-9. Remove the Old DuraFuse Tools

2. A prompt will appear, asking to restart Tekla Structures to finalize the uninstallation (Figure 3-10). Continue with the restart and uninstallation.

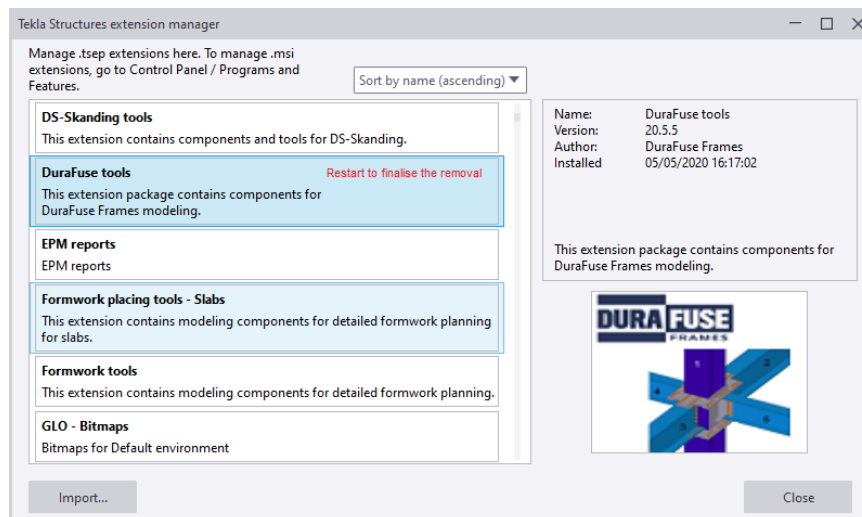


Figure 3-10. Restart Tekla Prompt

3. Once the computer restarts, follow the installation options for a Clean Installation (see Section 3.3.1).

4 The DuraFuse Frames Tekla Component

The DFF Tekla component creates all plates, welds, and bolts specific to each connection ID on a project. The connection ID's are numbered for unique beam-column moment frame combinations. Use the **DFF**

member tagging method to quickly apply the component to all applicable beam-column joints in the model. Or use the **manual** application for specific conditions.

4.1 DFF MEMBER TAGGING

The following steps outline the DFF member tagging method:

1. Consider the following when using the DFF tagging feature:
 - a. Beams shall be parallel to the web of the column (no skews).
 - b. Beam end points shall be modelled touching the column insertion line.
 - c. Connections will be treated as a single sided connection, unless beam end points share the same point intersecting the column line.
 - d. Column and beam sizes must match those in the XML file.
 - e. Gravity beams should not be included as part of the tagged members.
2. Make the appropriate Parameters settings visible by opening the **Parameters** window and select the **Properties** pane settings. Select the eye to make the Parameters visible (see Figure 4-1).

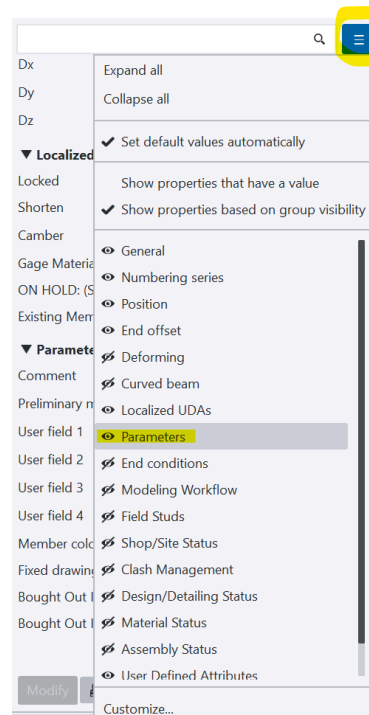
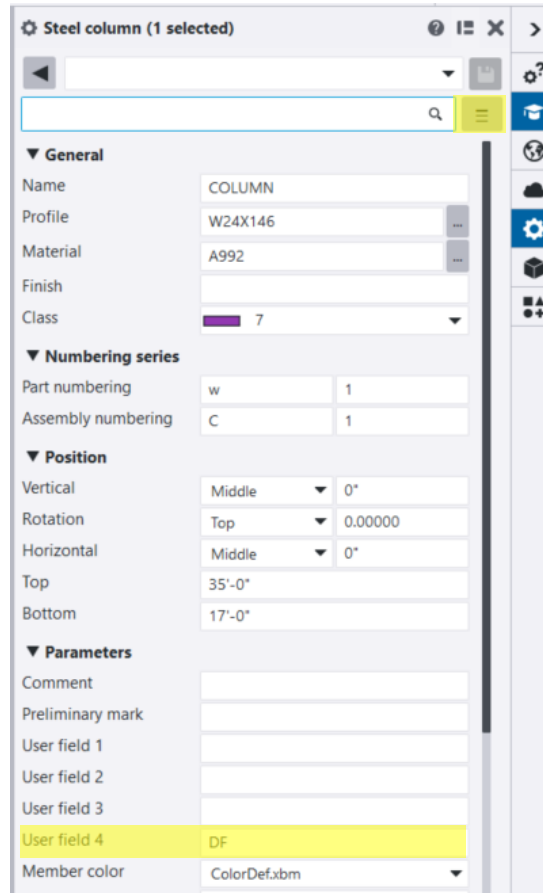


Figure 4-1. Parameters Option for the DFF Tagging Method

3. Identify all DuraFuse column and beams using the frame elevations provided for the project.
4. Select all applicable beams and columns on the project or select the beam(s) and column at each individual joint.
5. Open the **Properties** menu for the selected members.

6. Scroll down and locate **User field 4**. Enter **DF** as the “tag” in the User field 4. This tag is case sensitive. Both the DFF beam(s) and column need to have this tag applied in the parameters window (see Figure 4-2).



Steel column (1 selected)

▼ General

Name: COLUMN

Profile: W24X146

Material: A992

Finish:

Class: 7

▼ Numbering series

Part numbering: w 1

Assembly numbering: C 1

▼ Position

Vertical: Middle 0°

Rotation: Top 0.00000

Horizontal: Middle 0°

Top: 35'-0"

Bottom: 17'-0"

▼ Parameters

Comment:

Preliminary mark:

User field 1:

User field 2:

User field 3:

User field 4: DF

Member color: ColorDef.xbm

Figure 4-2. User Field 4 for DFF Tagging Method

7. Once all members have appropriately been labelled with the *DF* tag, use the XML import tool to import all of the connections to their appropriate locations. Refer to Section 5 for more instruction.

NOTE 1: WHEN CONNECTION ID'S HAVE THE SAME BEAM AND COLUMN COMBINATIONS, THE FIRST CONNECTION ID IN THE XML THAT MATCHES THE BEAM-COLUMN COMBINATION IN THE TEKLA MODEL WILL BE APPLIED. THE USER WILL NEED TO MANUALLY UPDATE THE ID IF IT IS NOT CORRECT. FOR EXAMPLE, IF CONNECTION ID DF101 AND DF102 ARE IDENTICAL IN BEAM AND COLUMN SIZE BUT ONE IS A ROOF CONDITION OR DRAG CONDITION, THE USER WILL NEED TO UPDATE TO ID DF102, WHERE APPROPRIATE.

NOTE 2: THE TAGGING FEATURE IS NOT APPLICABLE FOR STEPPED OR SKEWED CONDITIONS.

4.2 MANUAL APPLICATION

Specific connection conditions may require the manual application of the component (e.g., stepped conditions, connection ID's that have the same beam combination but differ in other parameters such as roof conditions, etc.). For these conditions, look up the beam-column combinations and corresponding ID's from the frame elevations provided by DFF. Then, apply the component manually using the following steps:

1. Open the **Applications & components** catalog.

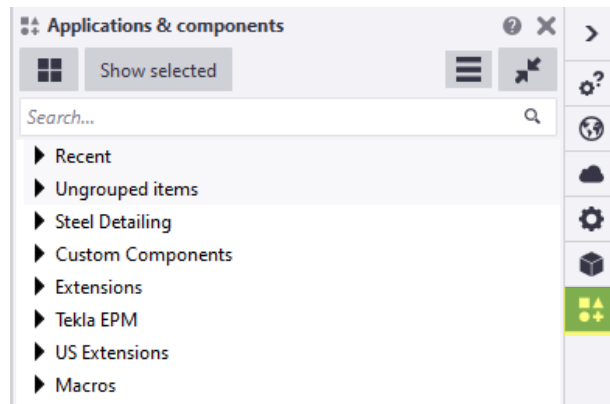


Figure 4-3. Applications and Components Search Catalog

2. Search for **Dura**. The component **DuraFuse_Conn** and XML Import tool, **DuraFuse_XML**, will both show up (Figure 4-4).

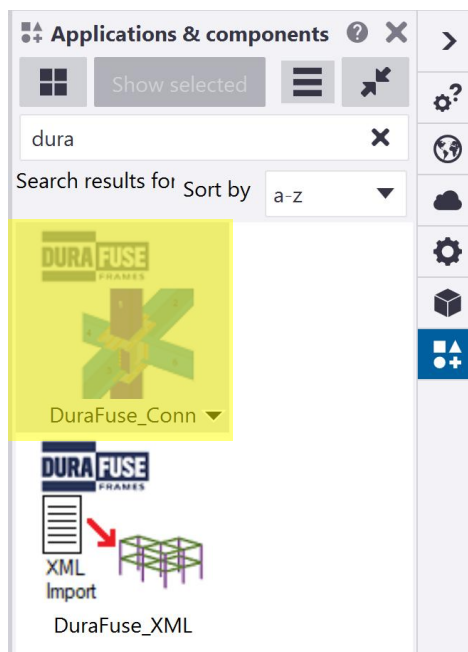


Figure 4-4. DuraFuse Frames Component in Applications & Components Catalog

3. Select the **DuraFuse_Conn** tool from the catalog to begin assigning connections and ID's to



beams and columns.

4. Select the **Main part** (The Column).
5. Select the **Secondary part** (The 1st Main Beam).
6. Select the 2nd **Secondary part** (The 2nd Main Beam or 1st gravity beam, if there is only one main beam).
7. Select the 3rd **Secondary part** (The 1st gravity beam).
8. Select the 4th **Secondary part** (The 2nd gravity beam).
9. To finish the selection process, press the **middle mouse button** (e.g. if it is a one-sided connection, press the middle mouse button after selecting the 1st Secondary part).
Note: This selection process is also summarized on the *Instructions* tab of the component dialog (see Figure 4-5).
10. The component dialog will pop up after the middle mouse button is pushed. Assign the connection ID by first, selecting the *General* tab.

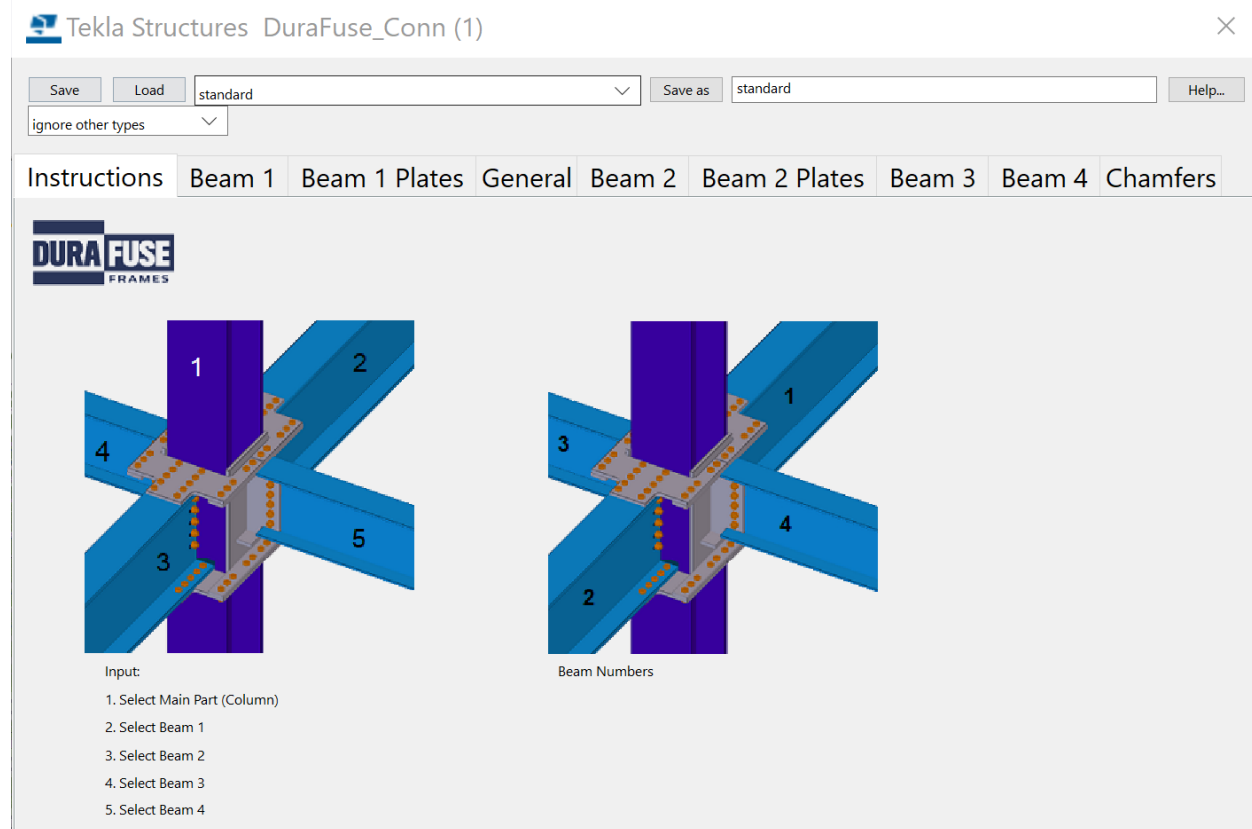


Figure 4-5. Component Dialog Instruction Tab

11. Next to **Connection code**, type the connection ID (Figure 4-6) for the specific location (refer to frame elevations, see Figure 2-1), e.g., DF101. Refer to Section 7.4 for instructions on making the connection ID's visible in the model.
12. At the bottom of the dialog, select **Modify** and **OK**. The connection ID will show up in the model (see Figure 4-7).

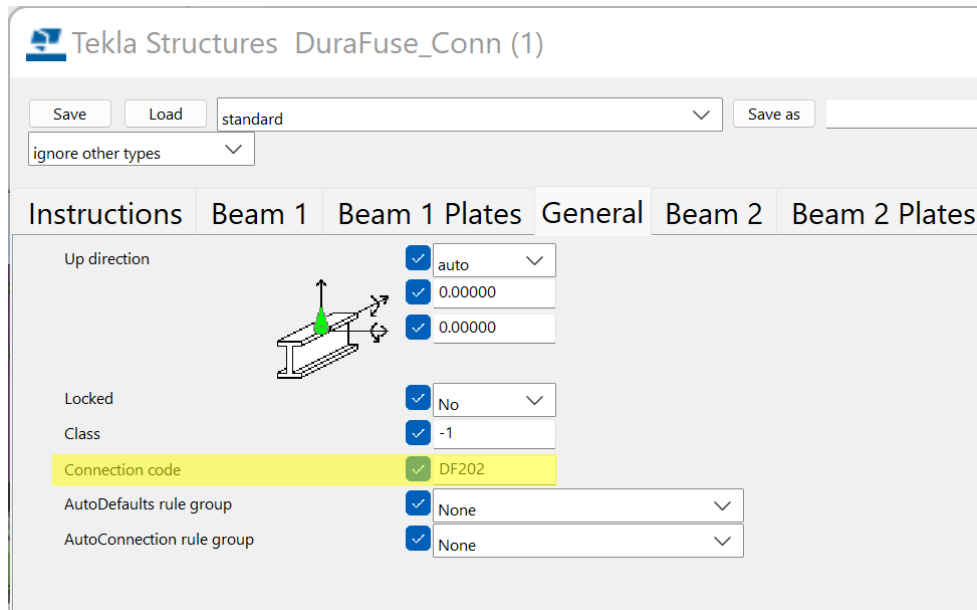


Figure 4-6. Component Dialog General Tab

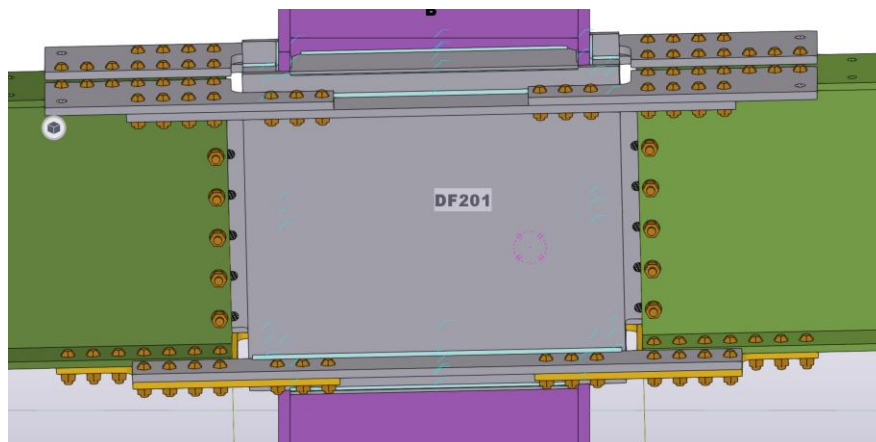


Figure 4-7. Connection ID Displayed in Tekla Model

13. Repeat steps 3-12 for all DFF connections in the model
14. Proceed to load the XML file. See Section 5, *XML Import Tool*, for more details.

15. If a **Connection ID** needs to be changed, double click on the component in the model and the component dialog will pop up. Change the ID the same way it was assigned originally in steps 11 and 12.

5 XML Import Tool

The XML Import Tool imports all information from the XML file to components assigned in a Tekla model. It also, auto-detects any members with the DF tag and applies a connection. Once connection ID's have been assigned in the model (see section 4), the information in the XML will be mapped to corresponding ID's. The plates, welds, and bolts in the component will be updated with the correct information. This is done by auto populating each of the input boxes in the component dialog for each ID with matching ID's and data from the XML. This eliminates manual entry of schedule information into the component. The following steps explain how to use the XML Import tool.

1. Once all members have been tagged (see Section 4) or the connections ID's have manually been assigned in the model, open the **Applications & components** catalog.

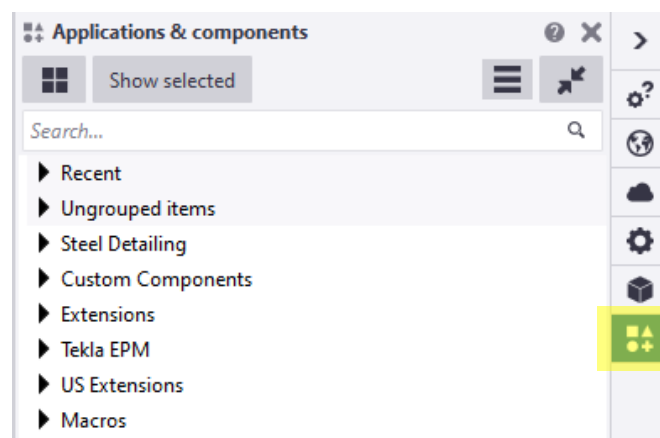


Figure 5-1. Applications and Components Search Catalog

2. Search for **Dura**. The component **DuraFuse_Conn** and XML Import tool, **DuraFuse_XML**, will both show up (Figure 4-4).

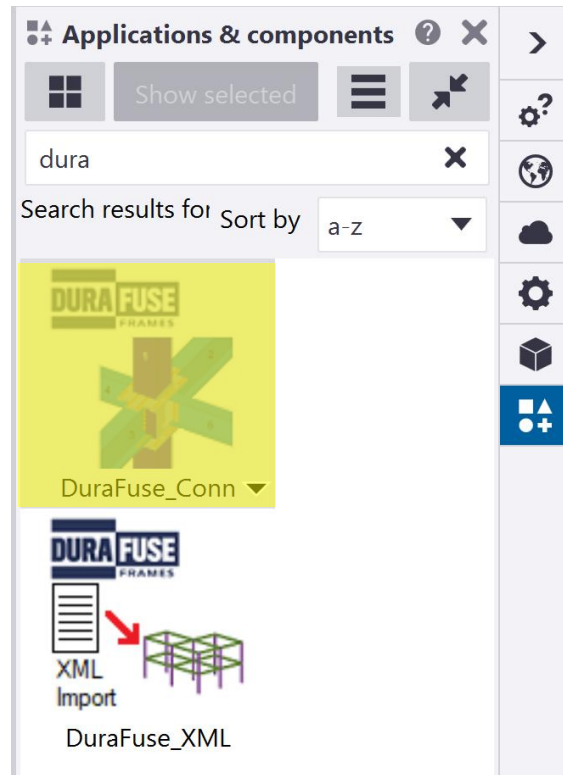



Figure 5-2. DuraFuse Frames Component in Applications & Components Catalog (Repeated)

3. Select the **DuraFuse_XML Import** tool from the catalog.



4. The dialog in Figure 5-3 will show up. Select the  button and navigate to where the project specific XML file is saved.

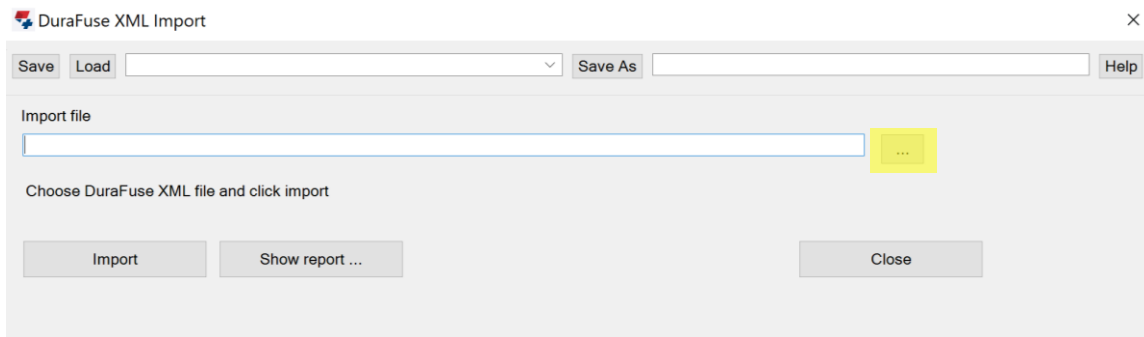


Figure 5-3. DuraFuse_XML Tool Dialog

5. Select **Import**.

- After the XML import is complete, the dialog will indicate whether there are any errors and details about the import (see Figure 5-4).

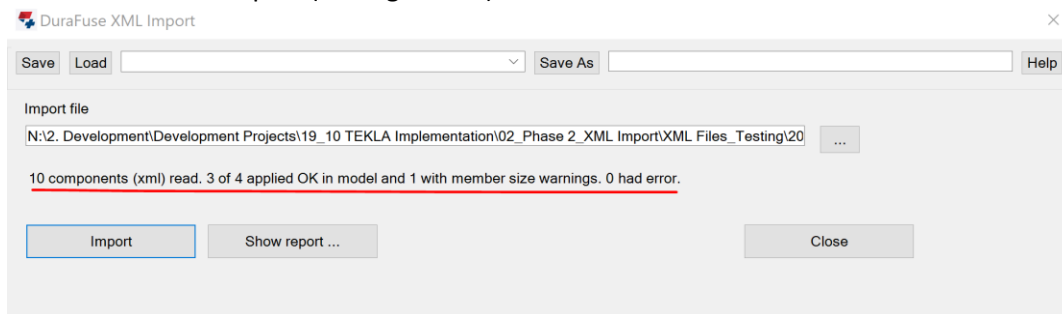


Figure 5-4. XML Import Dialog Message

- Select **Show Report** to view any errors. The report will indicate which connection ID's had errors and what the error was. The report will also indicate the following:
 - Number of components read from XML file
 - Number of components found from the model
 - Number of components applied correctly
 - Number of components that have member matching errors
 - Number of components not found in the XML file that were assigned in the model
 - Number of components in the model that did not have a connection ID assigned
 - Number of new components inserted into the model (for the DF tagging feature)
 - Number of components failed insertion into the model (for the DF tagging feature)
- Address any errors and make necessary changes to the model or assigned connection ID's.
- Once the parameters have been imported and all connections rendered, review each connection for accuracy.
- At this point, the application of the DFF connections is complete, and the user can move on to drawings, (refer to Section 6). For more information regarding the component dialog or included configurations, see sections 7 and 8, respectively.

6 Drawing Settings

The user can now create drawings for assemblies or single part drawings.

Specific settings apply for creating fuse plate drawings (R8 component only). Use the steps below to apply a hatch to the Fuse Plate, indicating a protected zone.

- From the Drawings menu select **Drawing Properties – Single part drawing** (see Figure 6-1).

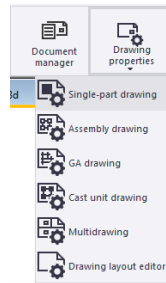


Figure 6-1. Single Part Drawings

- From the single part drawing properties dialog select **Fuse Plate** from the drop-down menu. Select **Load, Apply** and then **OK** (see Figure 6-2).

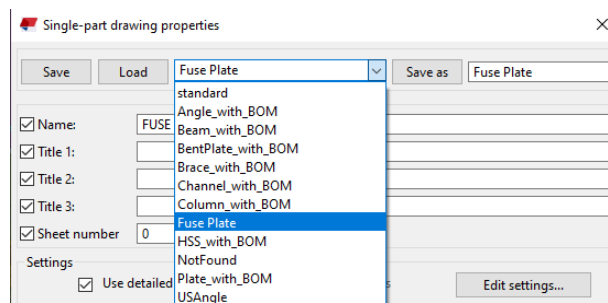


Figure 6-2. Fuse Plate Single Part Properties

- In the model select a fuse plate and create single part drawing.
- Open the **Document Manager** and the newly created fuse plate drawing. The hatch will show up, as shown in Figure 6-3.

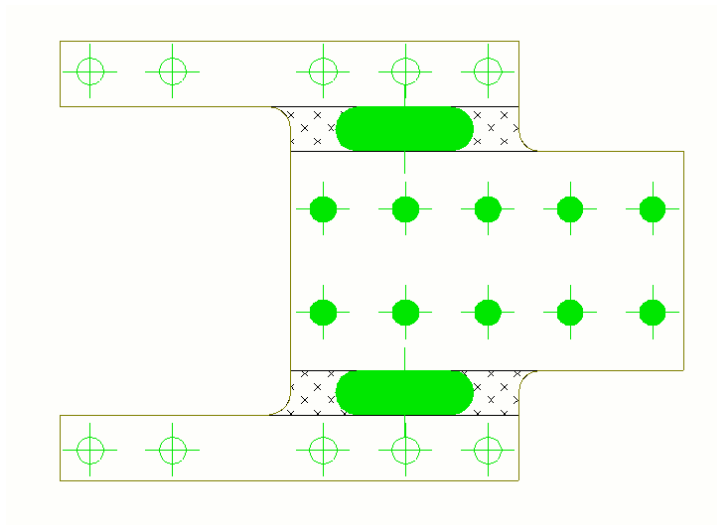


Figure 6-3. Fuse Plate Hatch

7 Component Dialog

The component dialog includes nine tabs with information about the DFF component (see Figure 7-1 below) and each will be discussed in detail in the sections to follow.

- Instructions
- Beam 1
- Beam 1 Plates
- General
- Beam 2
- Beam 2 Plates
- Beam 3
- Beam 4
- Chamfers

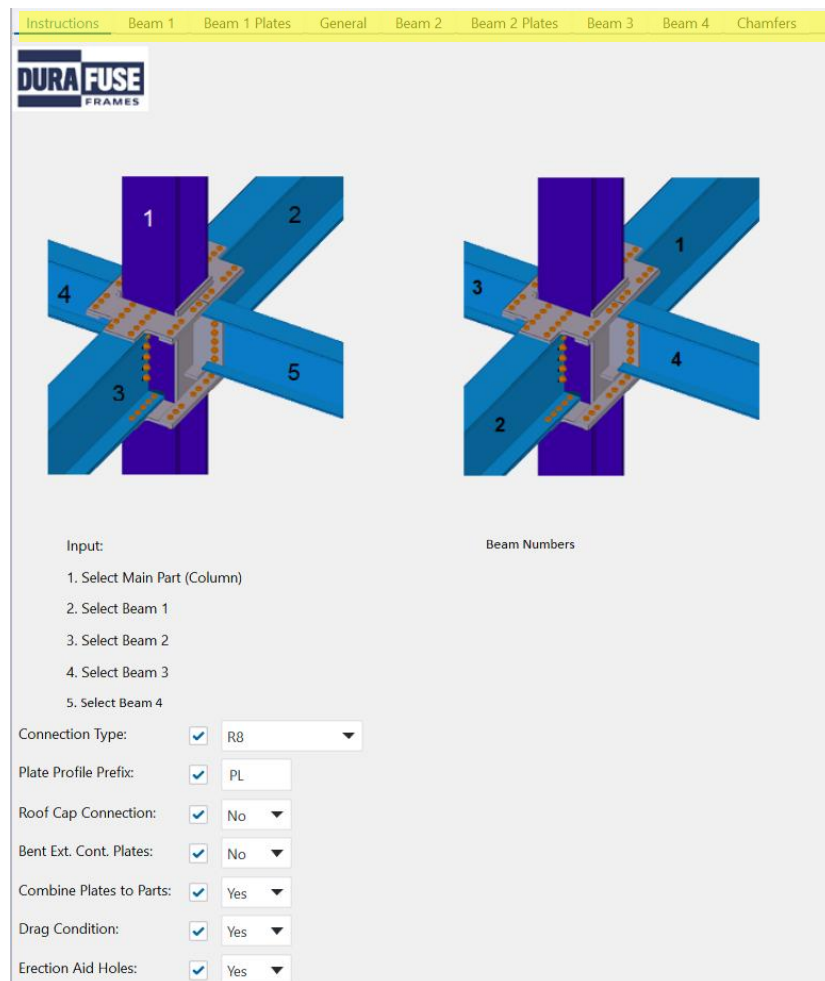
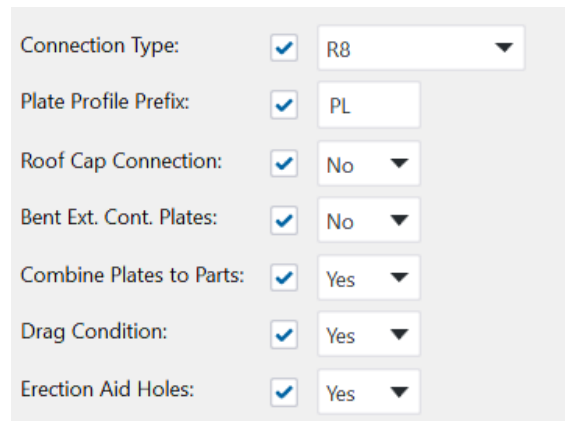


Figure 7-1. DFF Component Dialog Tabs

7.1 INSTRUCTIONS

The *Instructions* tab is the first screen to show up when double clicking on a connection and opening the dialog. Included on the *Instructions* tab are the following items (see Figure 7-2), which will be discussed in following sections:

1. Member Numbering Instructions
2. Connection Type
3. Plate Profile Prefix
4. Roof Cap Connection
5. Bent External Continuity Plates
6. Combine Plates to Parts
7. Drag Condition
8. Erection Aid Holes



Connection Type:	<input checked="" type="checkbox"/>	R8
Plate Profile Prefix:	<input checked="" type="checkbox"/>	PL
Roof Cap Connection:	<input checked="" type="checkbox"/>	No
Bent Ext. Cont. Plates:	<input checked="" type="checkbox"/>	No
Combine Plates to Parts:	<input checked="" type="checkbox"/>	Yes
Drag Condition:	<input checked="" type="checkbox"/>	Yes
Erection Aid Holes:	<input checked="" type="checkbox"/>	Yes

Figure 7-2. Instruction Tab Settings

7.1.1 Member Numbering

If the DFF tagging method is used (see Section 4.1), the member numbering shown on the *Instructions* tab is done automatically. If components are applied manually, the instructions provided help the user with member selection ordering.

Columns and applicable beams must be selected in a particular order for the component to work properly. The **Main Part**, indicated on the *Instructions* tab is the column at the joint in question. All other parts are **Secondary Parts**, which would be the beams at the joint. The beam numbers shown on the two images refer to the sequence of beam selection. These beam numbers correspond with the input tab names, *Beam 1*, *Beam 2*, *Beam 3* and *Beam 4*.

The component can currently accommodate in-plane lateral beams (one or two-sided) and in-plane gravity beams, and out-of-plane gravity beams. The component cannot accommodate biaxial configurations at this time. Therefore, the in-plane or lateral beams should be selected first, and then any gravity beams to follow.

The first in-plane (lateral beam) selected will use the parameters on the *Beam 1* tab.

The second in-plane (lateral beam) selected will use the parameters on the *Beam 2* tab. This can also be an in-plane cantilever beam.

The *Beam 3 & 4* tabs are for the beams to the right and left, respectively, of the 1st beam selected. These are gravity (non-lateral) beams.

The first gravity beam selected **must be** the beam to the right of the 1st beam selected. Parameters from the *Beam 3* tab apply to that beam.

The second gravity beam **must be** the beam to the left of the 1st beam selected. Parameters from the *Beam 4* tab apply to that beam.

NOTE 1: IF THE GRAVITY BEAM SELECTION IS OPPOSITE I.E. THE 1ST GRAVITY BEAM SELECTED IS TO THE LEFT OF THE 1ST BEAM, THEN THE "BEAM 4" TAB WILL APPLY, IF THE 2ND GRAVITY BEAM SELECTED IS TO THE RIGHT OF THE 1ST BEAM THEN "BEAM 3" WILL APPLY

Figure 7-3 shows an example of the correct gravity beam selection sequence to use. *Beam 3 & 4* tabs will apply to the 3rd and 4th beams selected.

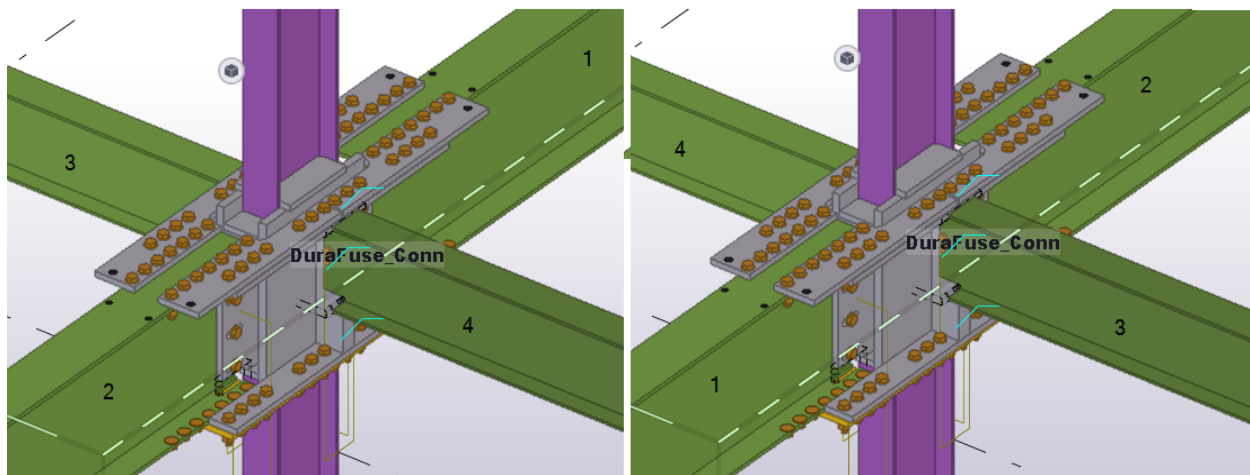


Figure 7-3. Correct Gravity Beam Selection

Figure 7-4 shows an example of incorrect gravity beam selection. This would make the 3rd beam selected use the *Beam 4* tab and the 4th beam selected use the *Beam 3* tab.

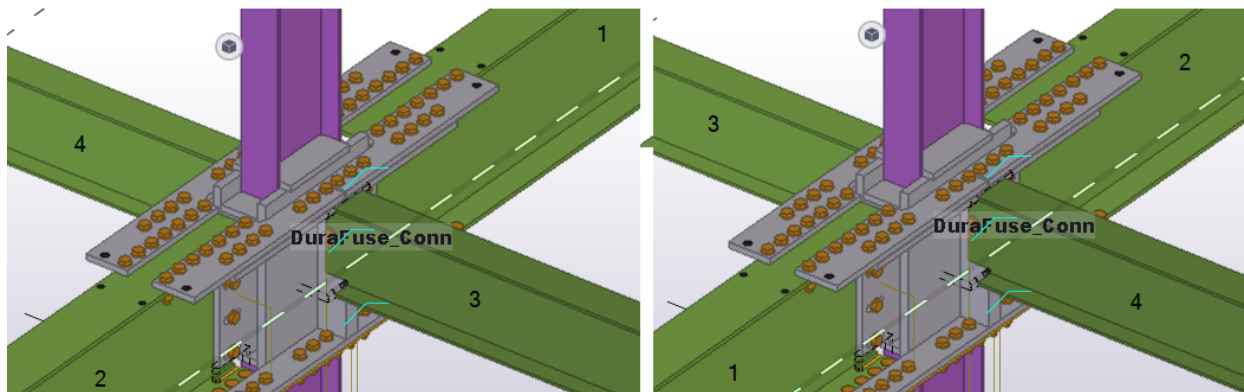
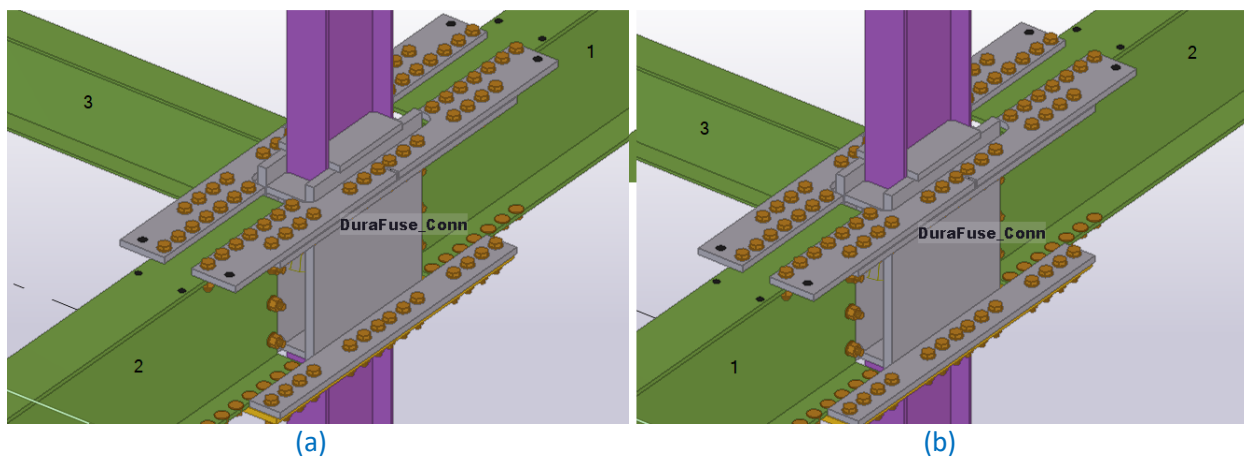


Figure 7-4. Incorrect Gravity Beam Selection

Figure 7-5(a) shows the correct lateral beam selection and Figure 7-5(b) shows the incorrect lateral beam selection in reference to the 3rd gravity beam.



(a) (b)
Figure 7-5. Examples of Correct and Incorrect Lateral Beam Selection

7.1.2 Connection Type

Three different DuraFuse components are available:

1. R8, high seismic
2. R3, high wind low seismic
3. R3 Narrow, high wind low seismic for narrow conditions

The XML file contains information about what connection type applies globally to the project (see Figure 7-6). If the project is R8, the Connection Type will be set to **R8**; if it is an R3 project, it will be set to **R3**, and similarly for **R3 Narrow**.

```

<GlobalData>
  <UnitsLength>Inches</UnitsLength>
  <UnitsAngle>Degrees</UnitsAngle>
  <NumberOfCnxns>19</NumberOfCnxns>
  <MemberMtlGrade>A572-50</MemberMtlGrade>
  <BoltGrade>F2280X</BoltGrade>
  <Washer1>0</Washer1>
  <Washer2>0</Washer2>
  <Washer3>1</Washer3>
  <CombinePlates>1</CombinePlates>
  <R8_R30pt>R8</R8_R30pt>
</GlobalData>

```

Figure 7-6. Connection Type XML Parameter

7.1.3 Plate Profile Prefix

The plate profile prefix is provided to detailers to help them name any group of plates or connections as they choose. The default is set to “PL”, but the user can change it if necessary.

7.1.4 Roof Cap Connection

At a top story, the user is provided the option to model a cap plate connection. The options are either **Yes**, to model the cap plate, or **No** to model a typical connection (no cap plate). Refer to Section 8.5 for examples of this connection.

The XML file contains information about whether the connection ID is at a top story condition. If it is a top story condition, the roof cap connection is set to **Yes** upon XML import. If the user prefers to use something other than what is read in from the XML, they can update it on the **Instruction tab** and click **Modify**.

NOTE: EACH TIME THE XML IS IMPORTED, THE ROOF CAP CONNECTION WILL BE RE-SET TO WHAT IS READ IN FROM THE XML FILE.

The user can manually override the roof cap setting in the XML for each connection ID if necessary. Do this by opening the XML file and under <DuraFuseComponent>, <Members> and <IsRoofCap>, change the number to 0 for no and 1 for yes (see Figure 7-7).

```

<DuraFuseComponent>
  <Members>
    <ID>DF101</ID>
    <ColumnSize>W24X94</ColumnSize>
    <TotalNumOfBeams>1</TotalNumOfBeams>
    <WeldHBDefault>0.4375</WeldHBDefault>
    <IsRoofCap>0</IsRoofCap>

```

Figure 7-7. Roof Cap XML Parameter

7.1.5 Bent External Continuity Plates

For a double sloped connection, it may be beneficial to use a bent external continuity plate, rather than the standard CJP weld for two separate plates. The options are either **Yes**, to model a bent plate, or **No** to model a typical connection (CJP weld). This parameter is read in from the XML but can be changed manually in the XML for each connection ID or in the component on the Instruction tab. Use 0 for no and 1 for yes (see Figure 7-8). Refer to Section 8.8 for examples of this connection.

```
<DuraFuseComponent>
  <Members>
    <ID>DF201</ID>
    <ColumnSize>W24X146</ColumnSize>
    <TotalNumOfBeams>2</TotalNumOfBeams>
    <WeldHBDefault>0.8125</WeldHBDefault>
    <Drag>1</Drag>
    <IsRoofCap>0</IsRoofCap>
    <IsBentExtPlate>0</IsBentExtPlate>
```

Figure 7-8. Bent External Continuity Plate XML Parameter

7.1.6 Combine Plates to Parts

A detailer may prefer to ship the fuse plate attached to the columns and the top plates attached to the beam (applicable to R8 component only). In this case, the user should select **Yes** for the **Combine Plates to Parts** option (see Figure 7-2). When the default **No** is selected, the bolts connecting the parts are all field bolts and the plates will be shipped separate from the columns and beams. When **Yes** is selected, the bolts connecting the plates are shop bolts. This is a global parameter read in from the XML, applicable to all connection ID's (see Figure 7-9). Refer to Section 8.9 for examples of this option.

```
<GlobalData>
  <UnitsLength>Inches</UnitsLength>
  <UnitsAngle>Degrees</UnitsAngle>
  <NumberOfCnxns>19</NumberOfCnxns>
  <MemberMt1Grade>A572-50</MemberMt1Grade>
  <BoltGrade>F2280X</BoltGrade>
  <Washer1>0</Washer1>
  <Washer2>0</Washer2>
  <Washer3>1</Washer3>
  <CombinePlates>1</CombinePlates>
```

Figure 7-9. Combine Plates to Parts XML Parameter

7.1.7 Drag Condition

When a drag (collector) condition applies to a connection, the top plates may have differing M, P and B bolt parameters than the bottom plates. When a drag condition applies, DuraFuse will provide the differing top plate M, P and B bolt parameters for each applicable connection ID. The XML will read in either **Yes** or **No** for **Drag Condition** (see Figure 7-2 and Figure 7-12). When the default **No** applies, the M, P and B bolt top plate parameters will be the same as the bottom plate. When **Yes** applies, the top plate parameters on the Beam 1 and Beam 2 tabs will show up and be populated (see Figure 7-10 for R8 and Figure 7-11 for R3). Refer to Section 8.10 for examples of this option.

TOP PLATE PARAMETERS FOR DRAG

Top Plate M 3

Top Plate P 4

Top Plate B 7

Figure 7-10. R8 Drag Bolt Parameters for Top Plates

TOP PLATE PARAMETERS FOR DRAG

Top Plate M 6

Figure 7-11. R3 Drag Bolt Parameters for Top Plates

```
<DuraFuseComponent>
  <Members>
    <ID>DF101</ID>
    <ColumnSize>W24X94</ColumnSize>
    <TotalNumOfBeams>1</TotalNumOfBeams>
    <WeldHBDefault>0.5625</WeldHBDefault>
    <Drag>1</Drag>
    <IsRoofCap>0</IsRoofCap>
  </Members>
```

Figure 7-12. Drag XML Parameter

NOTE: WHILE AVAILABLE, THE DRAG FEATURE FOR THE R3 AND R3 NARROW COMPONENTS IS NOT NECESSARY. CONTACT DURAFUSE FOR MORE INFORMATION.

7.1.8 Erection Aid Holes

Erectors may or may not choose to use the erection aid hole in construction. If not used, these holes can be unnecessary in the top plates and beam flange. An option is now included in the XML to include or not include these holes. The default is set to not include the holes in the top plates and beam flange.

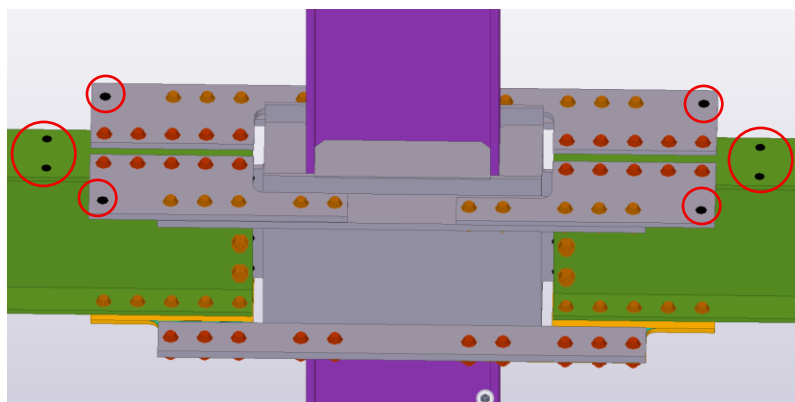


Figure 7-13. Erection Aid Holes

7.1.9 Save As and Load Connection Settings

After the connection information has been imported from the XML file, the user may need to manually adjust some of the connection settings (see previous sections). It may be more convenient to save these settings and then update other locations with the same saved settings. To do this, use the following steps:

1. Double click on a connection.
2. Make the appropriate changes to the connection.
3. Verify the correct connection ID is indicated on the General tab.
4. Enter the appropriate connection ID in the **input box** next to the Save as button (see Figure 7-14).
5. Click the **Save as** button.
6. Select the **drop-down menu** next to the Load button.
7. The new ID previously entered should be shown in the menu list.
8. Exit the dialog.
9. Double click on another connection that needs to be updated.
10. Once the dialog opens, use the **drop-down** menu and select the connection ID previously saved.
11. Select **Load**.
12. Select **Modify** at the bottom of the dialog.
13. Repeat steps 1-8 to save settings for other connection ID's.
14. Repeat steps 9-12 to update other connections to the saved settings.

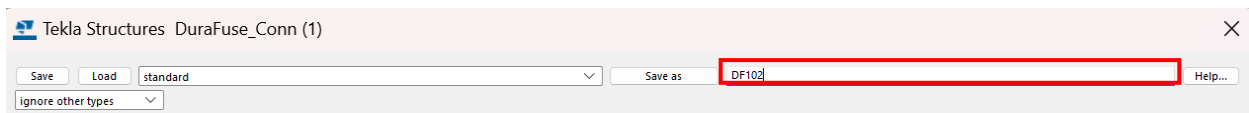


Figure 7-14. Loading Saved Connections

7.2 BEAM 1 TAB

The *Beam 1* tab dialog contains the input parameters that apply to the first main beam selected. Input parameters in the dialog are auto populated upon running the XML Import tool.

For one-sided connections, the beam parameters will always be populated on the *Beam 1* tab. For a two-sided connection with the same beams, the same properties for Beam 1 will apply to Beam 2. The *Beam 1* tab is, therefore, the primary tab for importing beam properties for two-sided same beam connections.

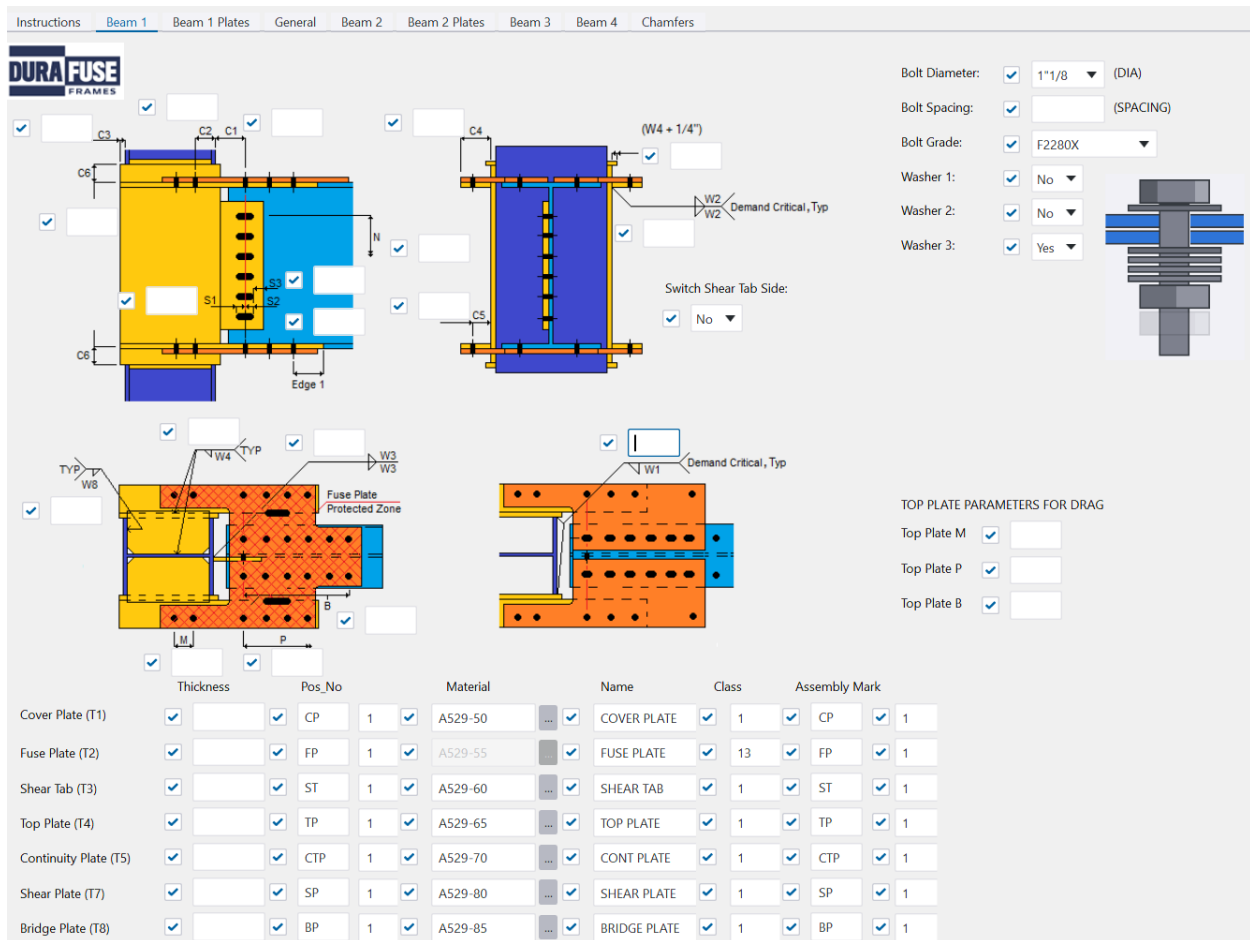


Figure 7-15. R8 Beam 1 Tab Input Dialog

The Beam 1 tabs for the R3 and R3 Narrow connections are show in Figure 7-16and Figure 7-17, respectively.

Instructions | Beam 1 | General | Beam 2 | Chamfers

1-SIDED ELEVATION

TOP VIEW

2-SIDED ELEVATION

TOP VIEW

GAP NOT TO EXCEED 1/8" ON EACH SIDE OF COLUMN

Bolt Diameter: 1 1/8 (DIA)

Bolt Spacing: (SPACING)

Bolt Grade: F2280X

Washer 1: No

Washer 2: No

Washer 3: Yes

C1:

C2:

C3:

C4:

C5:

S1:

S2:

S3:

N:

M:

W1:

W2:

W3:

W4:

W5:

Radius:

Switch Shear Tab Side: No

Edge 1:

Edge 2:

Edge 4:

ST_Spac:

Gap: 0" 1/8

Plate Tolerance: 0"

Plate Shift: Both

S3 is calculated based on the following formula: If beam_bf >= col_bf then S3 >= C3+Radius+Edge1 Else S3 >= 0.5 * Edge1. Leave blank to use Calculated value or override by entering a value within these limits.

ST_Depth = Beam T - 1"

Shear tab spacing (ST_Spac) is calculated based on the following equation: (ST_Depth - 2*Edge 4)/(N-1). Leave blank to use Calculated value or override by entering a value.

Edge 1, Edge 2, & Edge 4 are calculated based on tables provided by AISC 360. Leave blank to use calculated values or override by entering a value.

	Thickness	Pos_No	Material	Name	Class	Assembly Mark
Cover Plate (T1)	<input checked="" type="checkbox"/>	CP	1	A529-50	COVER PLATE	1 CP 1
Top & Bottom Plate (T2)	<input checked="" type="checkbox"/>	TP/FP	1	A529-55	TOP/BOTTOM PLATE	1 TP/FP 1
Shear Tab (T3)	<input checked="" type="checkbox"/>	ST	1	A529-60	SHEAR TAB	1 ST 1
Shear Plate (T4)	<input checked="" type="checkbox"/>	SP	1	A529-65	SHEAR PLATE	1 SP 1

TOP PLATE EXTENSION

Extension Length, LExt (left) 0"

Extension Width, WExt (left) 0"

Extension Length, LExt (right) 0"

Extension Width, WExt (right) 0"

Figure 7-16. R3 Beam 1 Tab Input Dialog

There are also auto populated typical Tekla Structures assembly parameters such as **Position No., Start Material, Name, Class** etc., see Figure 7-19. This is where the plate thicknesses, and materials are defined. Plate thicknesses are importing using the XML tool.

	Thickness	Pos_No	Material	Name	Class	Assembly Mark
Cover Plate (T1)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CP 1	A529-50	COVER PLATE	1 CP 1
Fuse Plate (T2)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	FP 1	A529-55	FUSE PLATE	13 FP 1
Shear Tab (T3)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ST 1	A529-60	SHEAR TAB	1 ST 1
Top Plate (T4)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	TP 1	A529-65	TOP PLATE	1 TP 1
Continuity Plate (T5)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CTP 1	A529-70	CONT PLATE	1 CTP 1
Shear Plate (T7)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	SP 1	A529-80	SHEAR PLATE	1 SP 1
Bridge Plate (T8)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	BP 1	A529-85	BRIDGE PLATE	1 BP 1

Figure 7-19. Tekla Structures Assembly Parameters

Also included on the Beam 1 (and Beam 2) tabs is bolt and washer information. The bolt diameter, spacing, grade and washer options are read in from the XML file and are specific to each DuraFuse connection ID (see Figure 7-20). The component default is to include Washer 3 only. The user can modify these washer settings by selecting **Yes** or **No** to include or not include Washers 1, 2 or 3, depending on preference (see Figure 7-21) or change the XML.

NOTE: WHEN THE XML IS IMPORTED, MANUAL MODIFICATIONS MADE TO ANY PARAMETERS WILL BE OVERRIDDEN WITH PARAMETERS FROM THE XML (MANUAL CHANGES WILL BE OVERRIDEN).

```

<GlobalData>
  <UnitsLength>Inches</UnitsLength>
  <UnitsAngle>Degrees</UnitsAngle>
  <NumberOfCnxns>19</NumberOfCnxns>
  <T1MtlGrade>A529-50</T1MtlGrade>
  <T2MtlGrade>A529-50</T2MtlGrade>
  <T3MtlGrade>A529-50</T3MtlGrade>
  <T4MtlGrade>A529-50</T4MtlGrade>
  <T5MtlGrade>A529-50</T5MtlGrade>
  <T6MtlGrade>A529-50</T6MtlGrade>
  <T7MtlGrade>A529-50</T7MtlGrade>
  <T8MtlGrade>A529-50</T8MtlGrade>
  <BoltGrade>F2280X</BoltGrade>
  <Washer1>0</Washer1>
  <Washer2>0</Washer2>
  <Washer3>1</Washer3>
  <CombinePlates>1</CombinePlates>
  <R8_R30pt>R8</R8_R30pt>
  <ErectionAid>1</ErectionAid>
</GlobalData>

```

Figure 7-20 Bolt and Washer XML Parameters

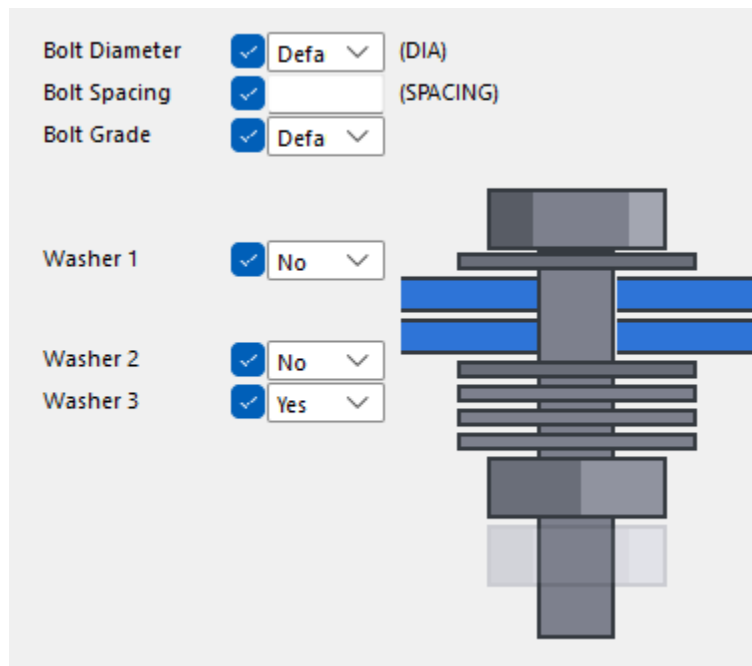
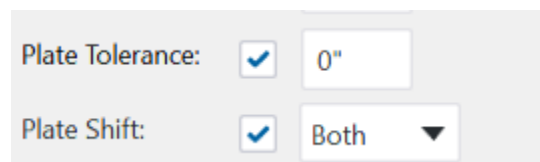


Figure 7-21 Bolt Settings

7.2.1 R3 Beam Gap

For beam fitup between the top and bottom plates, a plate gap has been provided. This is imported with the XML but can also be adjusted for more or less clearance as preferred. The top plate, and/or the bottom plates can also be adjusted up or down accordingly. This is indicated by the “plate shift”.



7.3 BEAM 1 PLATES TAB

The *Beam 1 Plates* tab (R8 connection only) contains the input parameters for the connection plates for the first lateral beam. These parameters will be auto populated upon XML import.

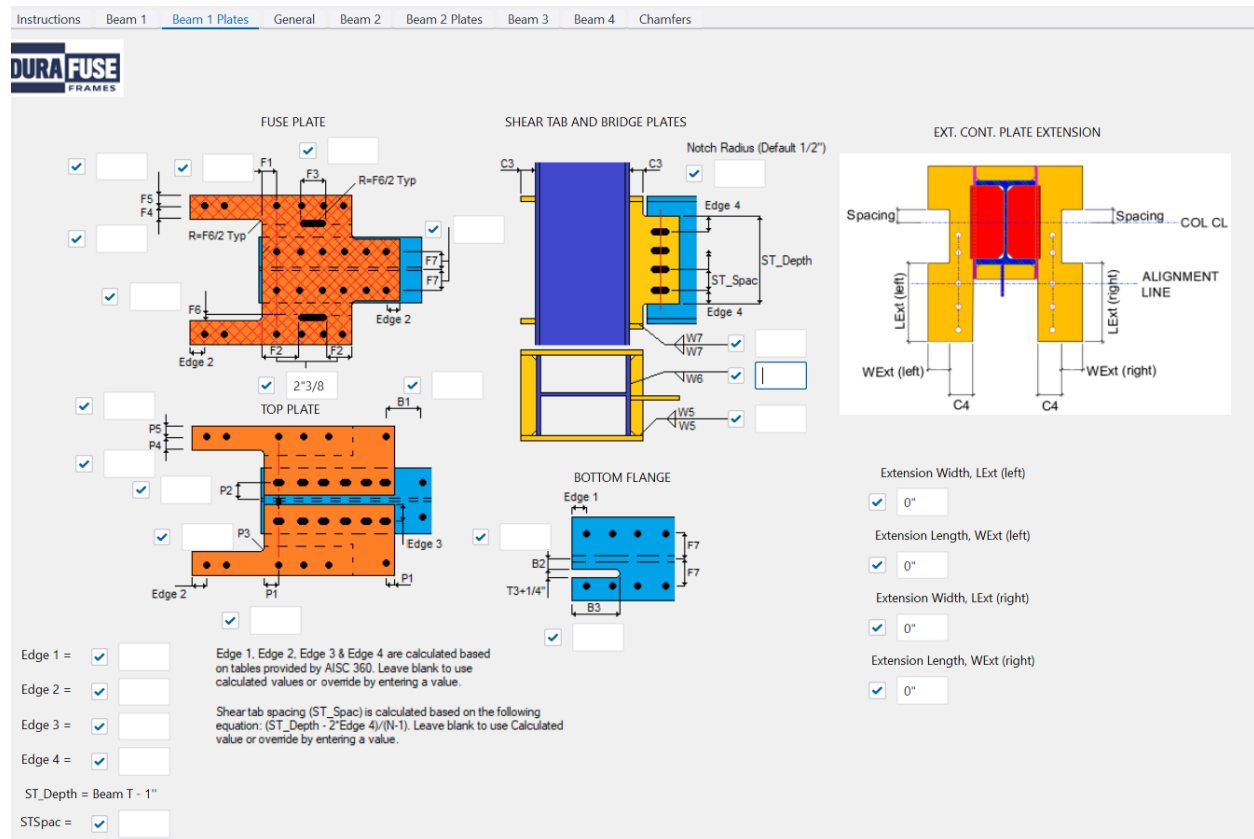
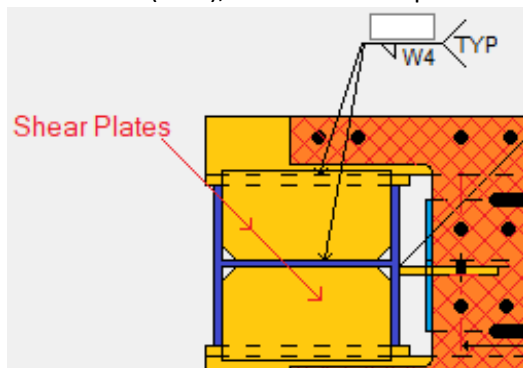


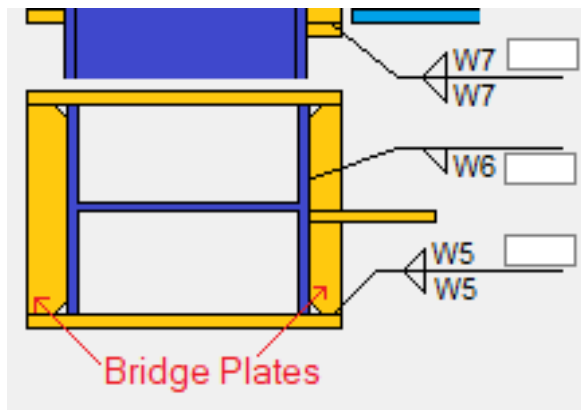
Figure 7-22. Beam 1 Plate Input Dialog

Some of the plates and welds may or may not apply to a connection depending on the input values. Rules for interpreting when these plates and welds apply are shown below.

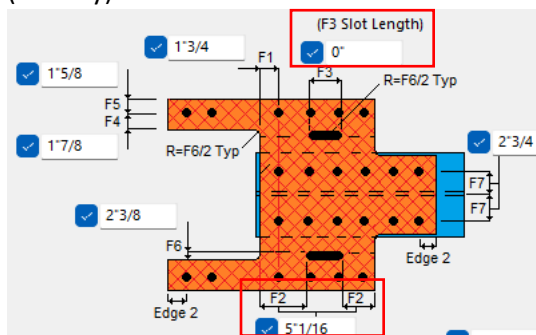
1. If **W4** is "0" (zero), then the shear plates are not created (R8, R3 and R3 Narrow applicable).



2. If **W5, W6 OR W7** are "0" (zero), then the bridge plates are not created (R8 only)

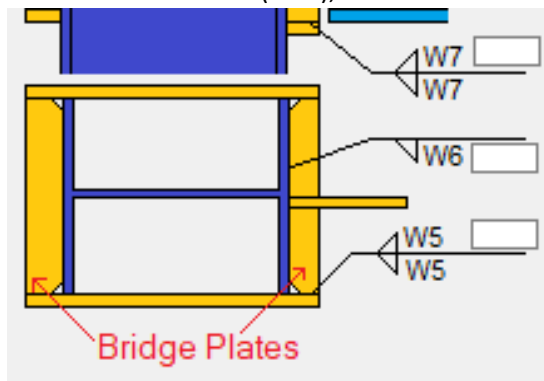


- If **F3** is "0" (zero), then the fuse hole disappears. **F2** has been recalculated in the XML file and auto imported in the dialog ($F2 = F2 + F3/2$). This case applies when *Beam 2* is an in-plane cantilever beam. Be sure to select the beams in such a way that *Beam 2* is the cantilever beam (R8 only).



NOTE: CANTILEVER BEAMS CAN ONLY BE APPLIED TO BEAM 2. BEAM 1 MUST BE A TYPICAL MOMENT FRAME CONNECTION.

- If **B2 AND B3** are "0" (zero), then the beam slot(s) disappear (R8 only).



7.3.1 Extended External Continuity Plate Option

The fields on the right of the *Beam 1 Plates* Tab (see *Beam 1 or 2* tabs for the R3 connection) are not auto-populated with the XML file. These fields are a user option to extend the external continuity plates (ECP). This option may be used if the detailer needs extra plate to attach deck or other elements to. Follow the instructions below to use this feature:

1. To extend the left ECP the full length of the plate, enter a length greater than half of the length of the ECP in **LExt (left)**. This will automatically extend the plate the full length of the plate.
2. Enter a desired width of the left side of the plate in **WExt (left)**.
3. To extend the left ECP only part of the length of the plate (see length indicated in Figure 7-23), enter that length in the **LExt (left)**. This will only extend the plate indicated in Figure 7-23.
4. Repeat steps 1-3 for the right ECP, if desired.
5. Follow steps 1-4 for the beam 2 on the *Beam 2 Plates* Tab.

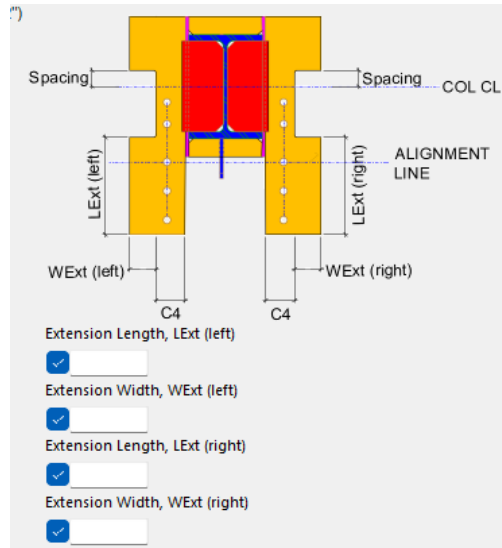


Figure 7-23. R8 Extended External Continuity Plate Option

The extended plate option also applies to the top plates on the R3 and R3 Narrow components (see Figure 7-24 and Figure 7-25).

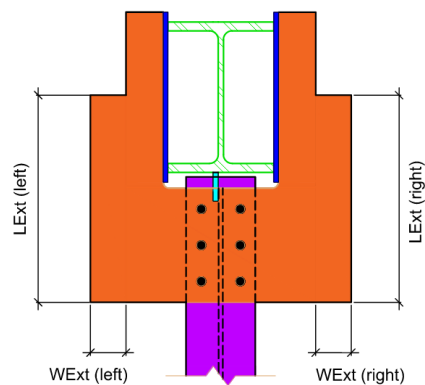


Figure 7-24. R3 Extended Top Plate Option

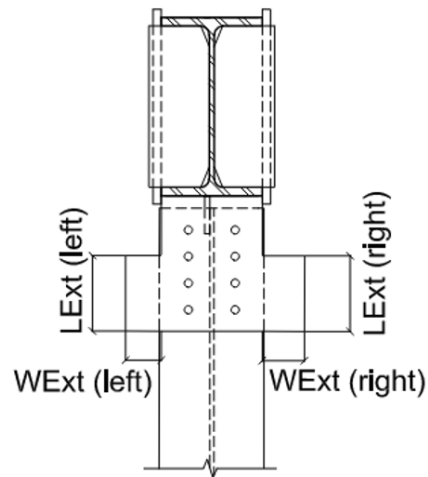


Figure 7-25. R3 Narrow Extended Top Plate Option

NOTE: THE EXTENDED EXTERNAL CONTINUITY PLATE DOES NOT WORK IN CONJUNCTION WITH THE BENT EXTERNAL CONTINUITY PLATE (DOUBLE SLOPED) CONDITION (R8, R3, R3 NARROW).

NOTE: FOR TWO-SIDED CONNECTIONS, IF THE LENGTH EXTENSIONS ON THE SAME SIDE (LEXT LEFT OR RIGHT) OF BEAMS 1 AND 2 OVERLAP EACH OTHER, THERE WILL BE DETAILING ISSUES WITH THE PLATE. IT IS UP TO THE USER TO SPECIFY LENGTHS APPROPRIATE FOR THE EXTENSION SO THAT THEY DON'T OVERLAP BETWEEN BEAMS 1 & 2.

7.4 GENERAL TAB

The *General* tab is where the user will update the **Connection code** for the connection ID. When adding components in the model, the connection ID is defined in the Connection code input box by the user. Refer to Section 4 for more information on adding components and their corresponding connection ID's.

The user will need to modify some settings for the connection ID's to show up in the model. Use the following steps to make the connection ID's visible in the model:

1. Open the view properties by double clicking in the blue background of the model.
2. Open the **Display** option next to **Visibility of object types** (see Figure 7-26).

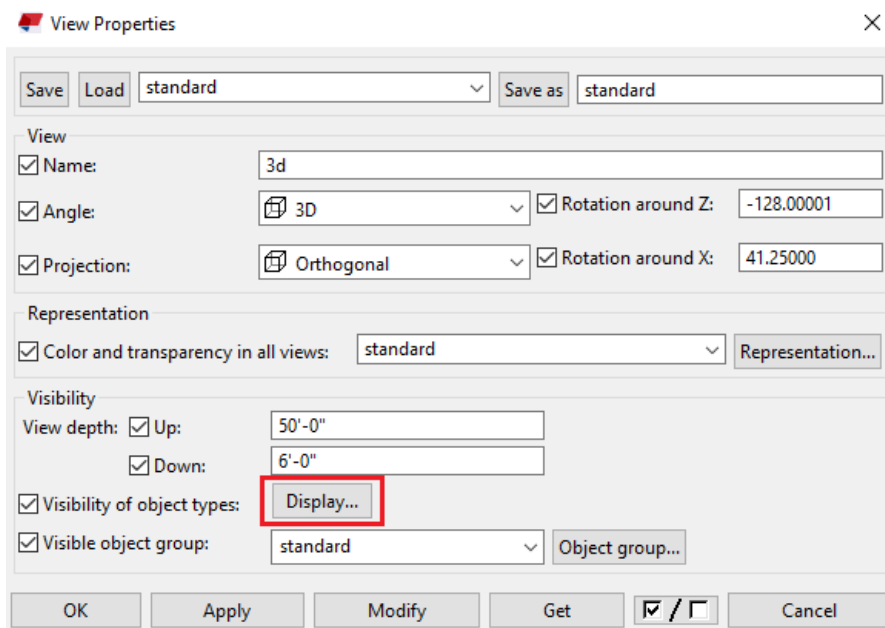


Figure 7-26. View Properties for Displaying Connection ID's

3. Go to the *Advanced* tab.

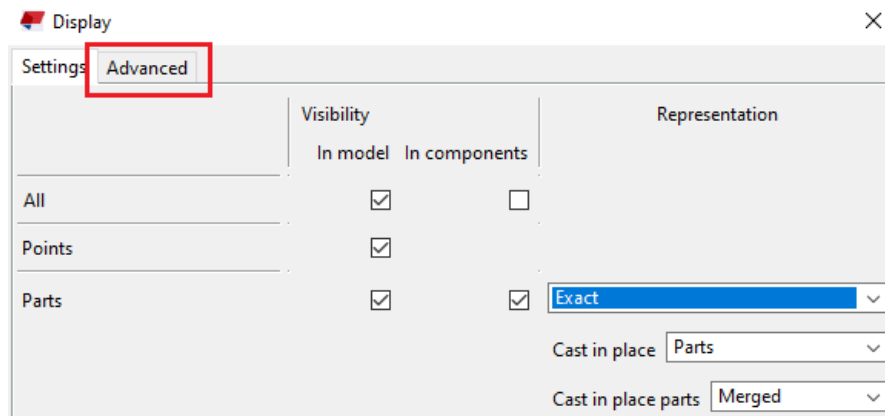


Figure 7-27. Advanced Settings for Displaying Connection ID's

4. Check the **Connection text** box and **Modify** to apply the changes to the view.

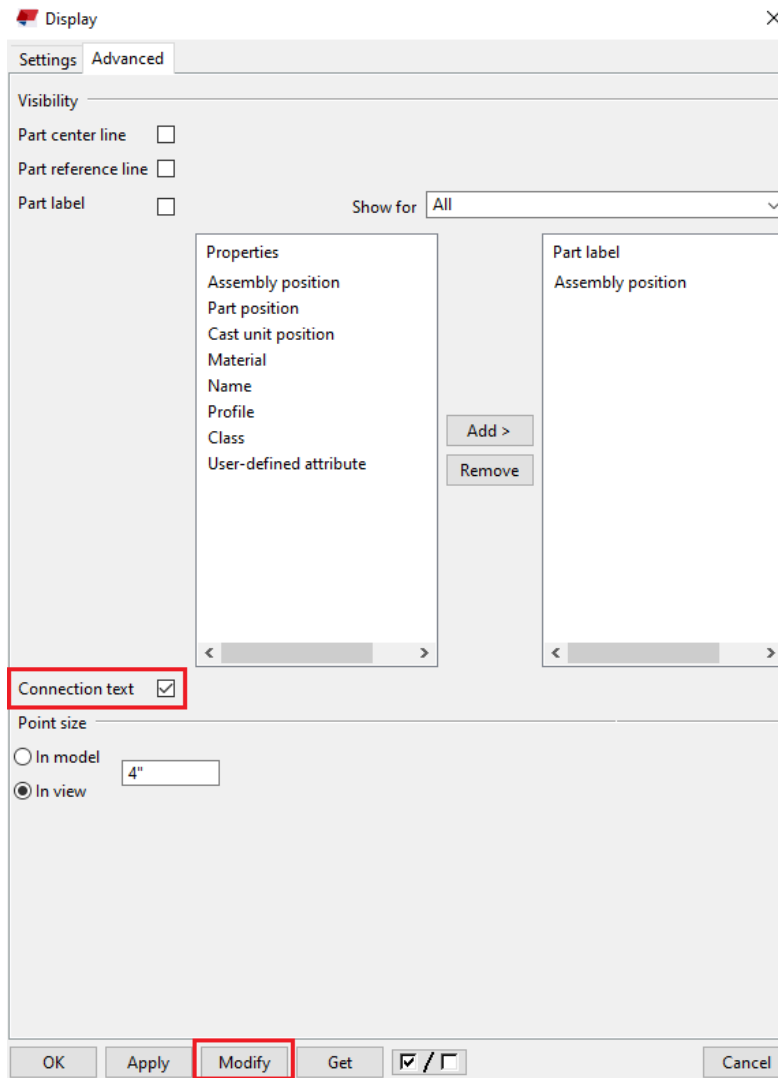


Figure 7-28. Apply Connection Text for Displaying Connection ID's

5. The connection ID will then be shown in the model (see Figure 7-29).

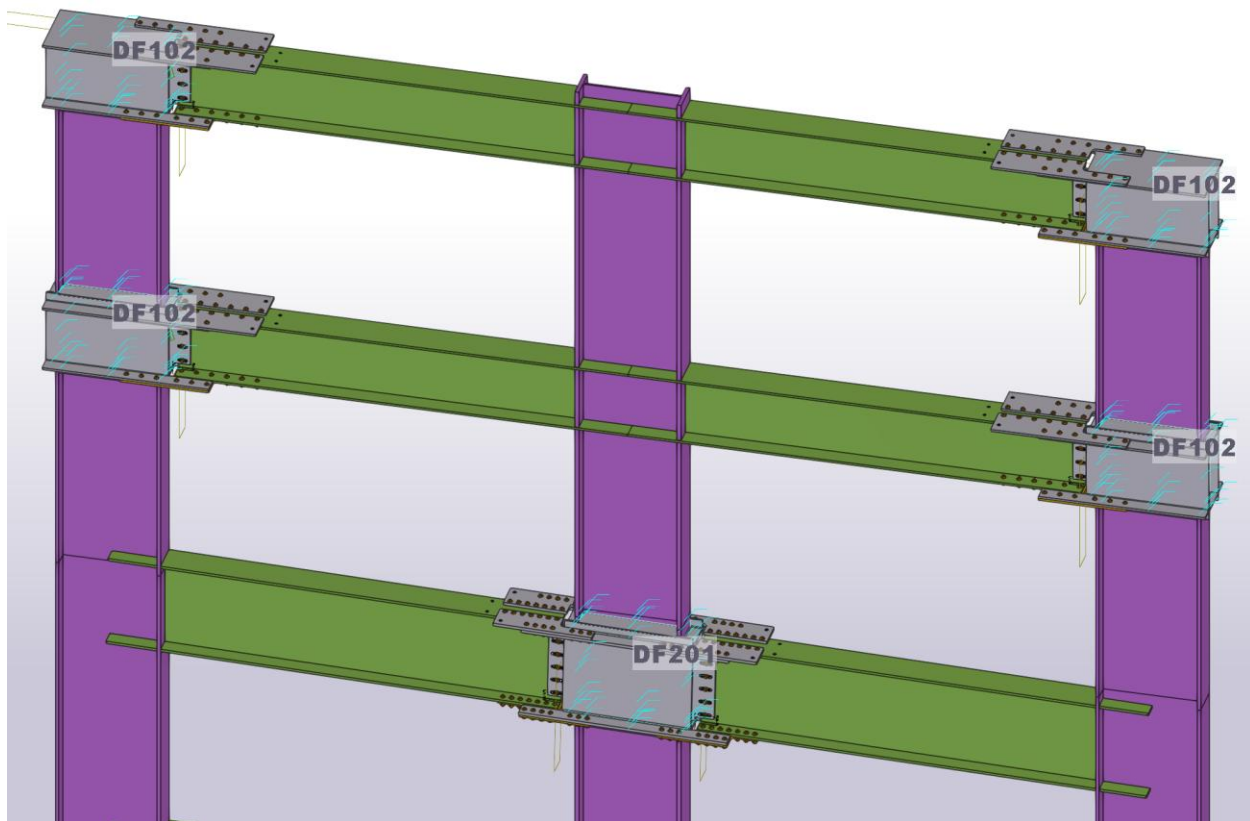


Figure 7-29. Displayed Connection ID's in Model

7.5 BEAM 2 TAB

If a two-sided, same beam connection applies at a joint, the parameters for the first lateral beam will apply to the second lateral beam. Therefore, the inputs on the *Beam 2* tab will match those from the *Beam 1* tab.

If a two-sided different beam connection applies at a joint, only a few of the parameters will differ between the two beams. The parameters that are different between beam 1 and beam 2 are those displayed on the *Beam 2* tab (see Figure 7-30). For example, the shear tab inputs are included on the *Beam 2* tab and these can be different from the *Beam 1* tab inputs.

A two-sided, cantilever condition may also apply. Beam 2 must be selected as the cantilever beam. Parameters applicable to a cantilever connection will be auto imported from the XML and applied appropriately (see Section 7.3 for more information).

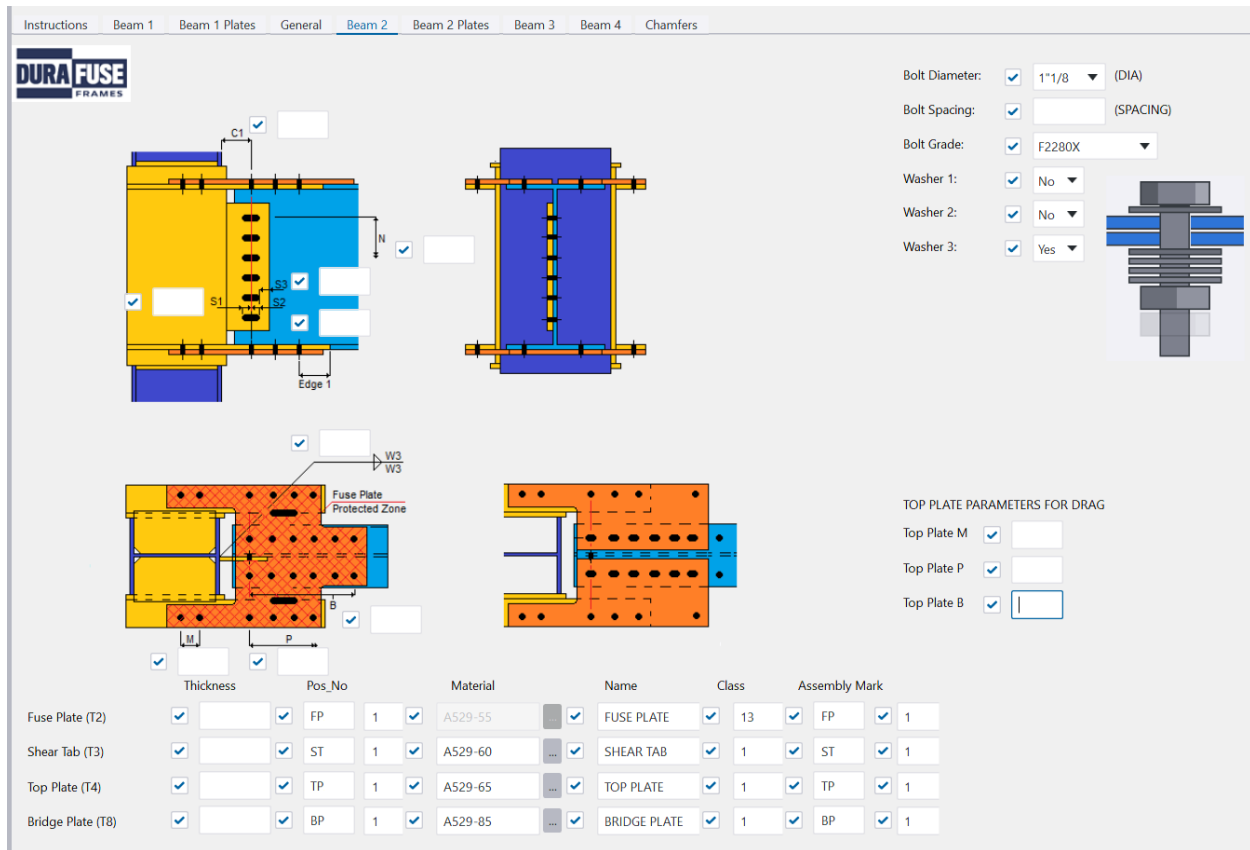


Figure 7-30. Beam 2 Tab Input Dialog

7.6 BEAM 2 PLATES TAB

Similar to the *Beam 2* tab (R8 connection only), if a two-sided, same beam connection applies at a joint, parameters for the first lateral beam plates will apply to the second lateral beam plates. Therefore, inputs on the *Beam 2 Plates* tab will match those from the *Beam 1 Plates* tab.

For a two-sided, different beam connection, inputs on the *Beam 2 Plates* tab are those that differ from the *Beam 1 Plates* tab (see Figure 7-31).

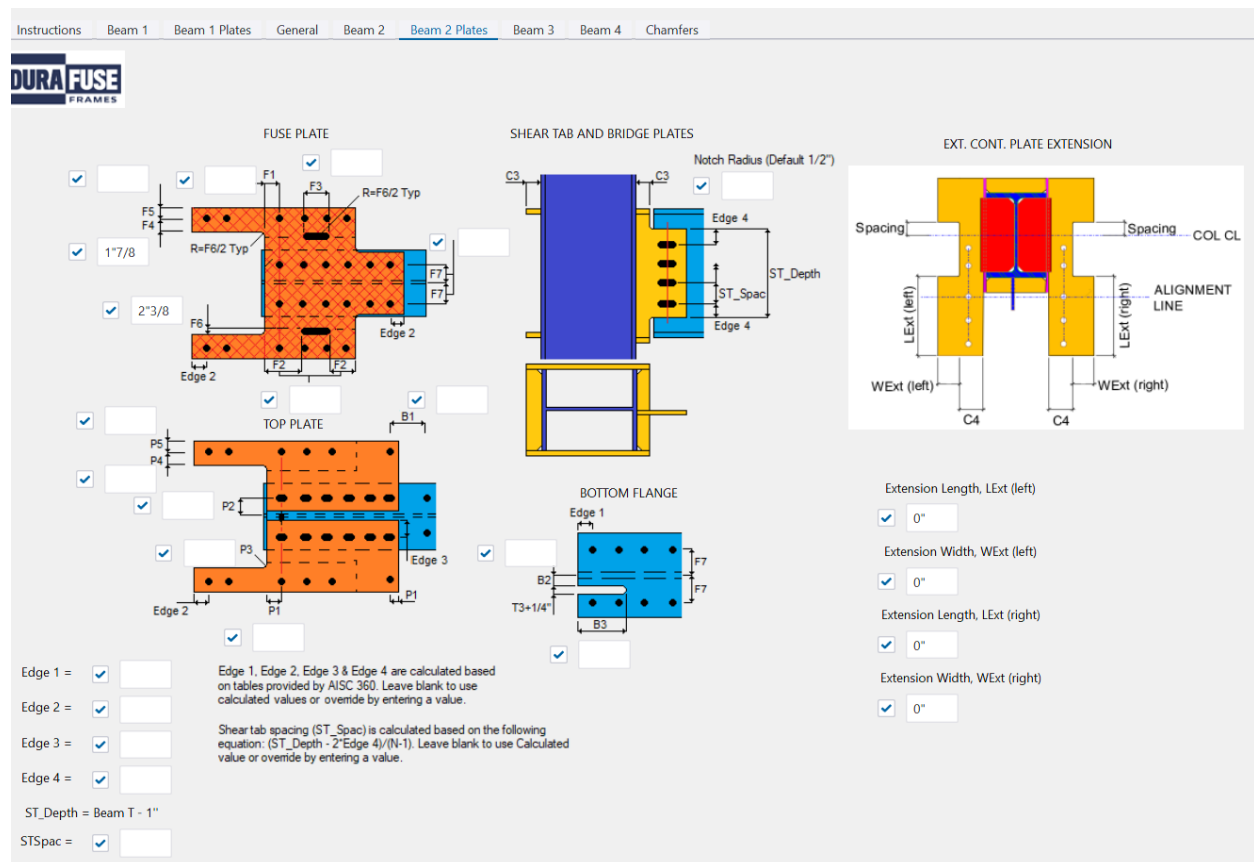


Figure 7-31. Beam 2 Plates Tab Dialog

7.6.1 Extended External Continuity Plate Option

Refer to section 7.3.1 for instruction on extending the external continuity plate for Beam 2.

7.7 BEAM 3 & 4 TABS

The *Beam 3 & 4* tabs contain the input parameters for the first & second gravity beams selected. These parameters must be entered by hand; they are not auto imported when using the XML Import tool.

NOTE: BEAMS 3 AND 4 ARE APPLICABLE FOR THE R8 COMPONENT. THEY CAN STILL BE APPLIED TO THE R3 AND R3 NARROW COMPONENTS BUT ARE NOT ACCURATE IN THE BEAM CUTS AND DETAILING AT THIS TIME.

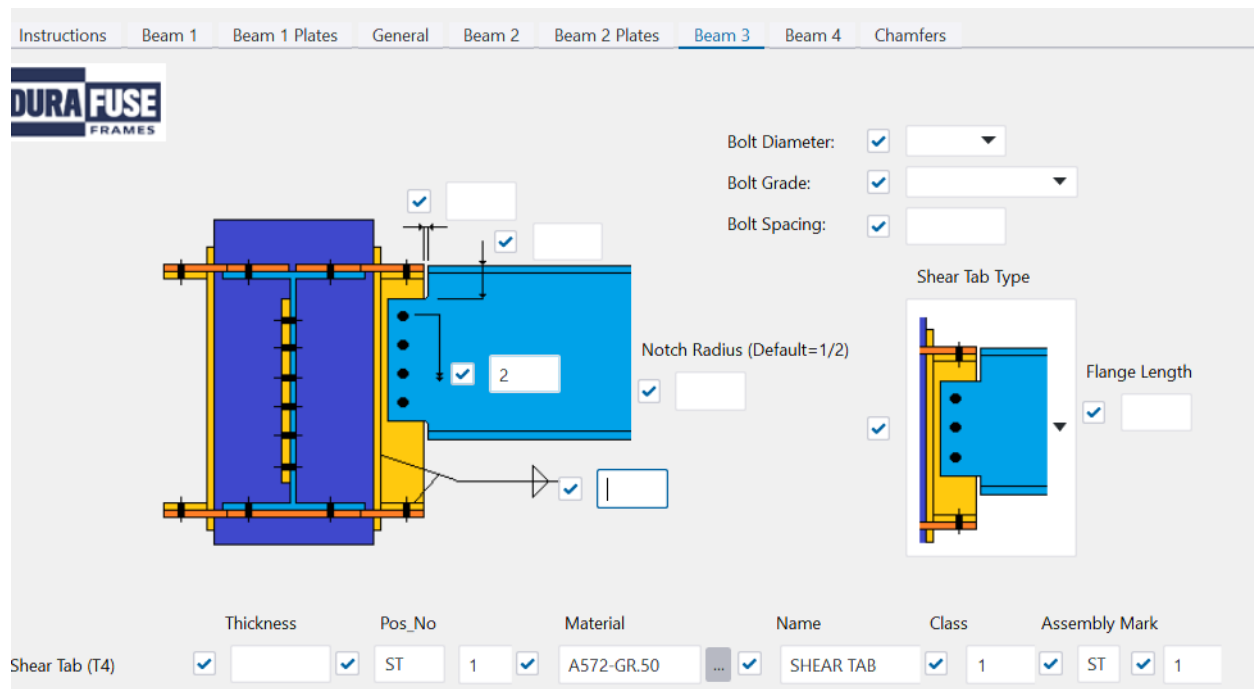


Figure 7-32. Beam 3 and 4 Tab Input Dialog

7.8 CHAMFERS TAB

The *Chamfers* tab contains the parameters to control the chamfers on the shear and bridge plates. These parameters are not auto imported with the XML Import tool. However, if they are left blank, the column K and K1 values will be assumed.

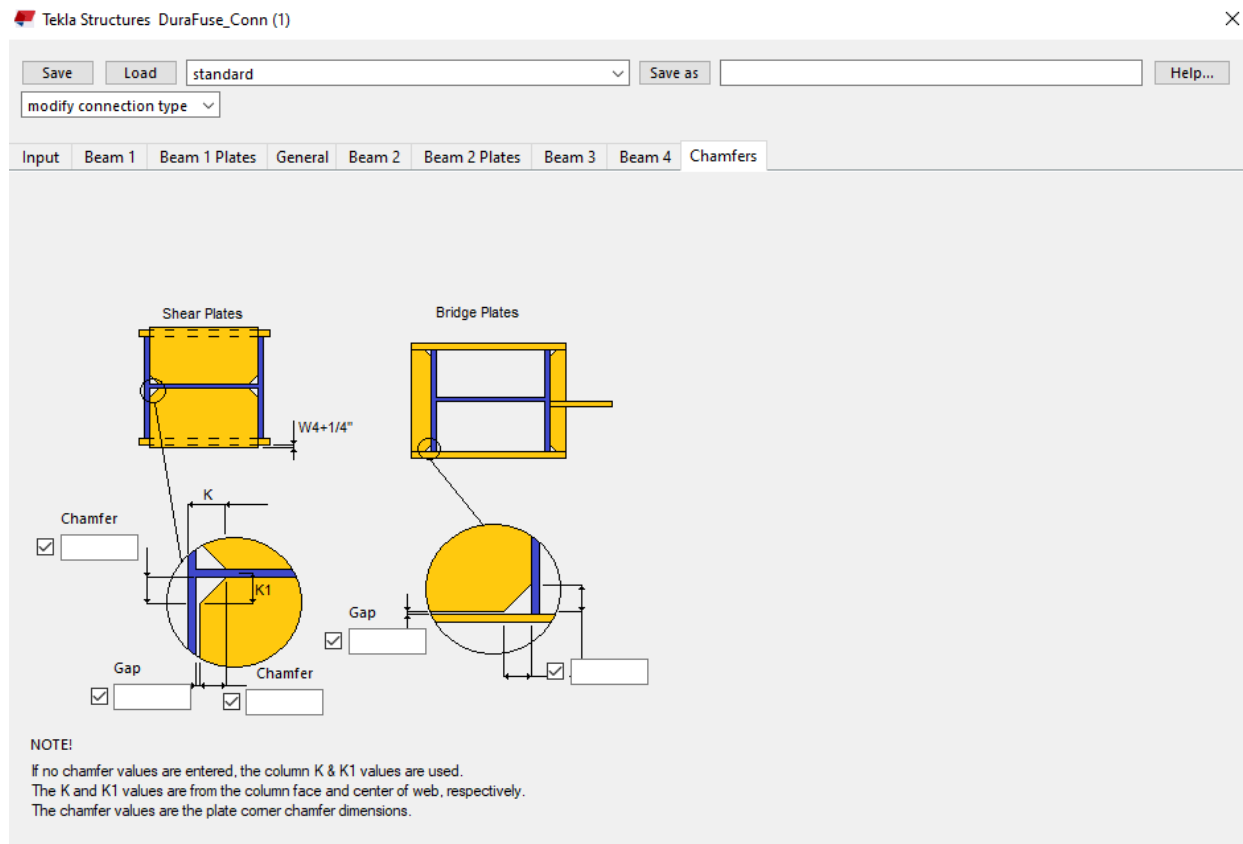


Figure 7-33. Chamfer Tab Input Dialog

The following chamfer rules apply for the shear plates used on the lateral beams 1 and 2 (see Figure 7-34):

- If no chamfer values are entered, then the column K & K1 values are used.
- The K & K1 values are measured from the column face and center of web, respectively.
- The chamfer values are the plate corner chamfer dimensions.

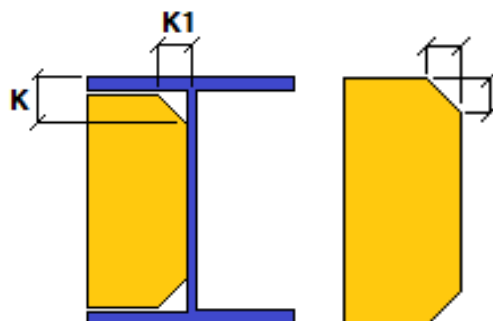


Figure 7-34. Chamfer Details

The following chamfer rule applies for the bridge plates used on the lateral beams 1 and 2 (see Figure 7-34):

- For the Bridge Plates, chamfer values are equal for both chamfer dimensions.

7.9 USER OVERRIDES

The user has control over a few overrides in the component, which include bolt edge distance, and shear tab bolt spacing. Other input parameters are specific to the design of the connection and should not be adjusted.

7.9.1 Bolt Edge Distance override

Bolt edge distances apply to several locations in the DFF connection. These edge distances are calculated from tables provided in AISC 360, based on the hole type and bolt diameter. The XML file includes this parameter, which will be auto populated in the edge distance input boxes in the dialog.

The user can choose to override the edge distance on the *Beam 1* and *Beam 2 Plates* tabs by entering in a value in the **Edge** input boxes (see Figure 7-35). Overridden values should be close to the value provided in the XML file and calculated based on AISC 360.

NOTE: IF AN XML FILE IS IMPORTED, ANY USER OVERRIDES WILL REVERT BACK TO VALUES PROVIDED IN THE XML.

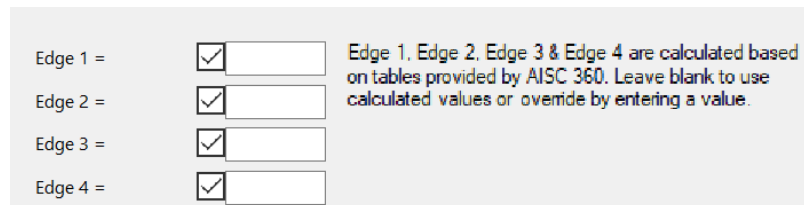


Figure 7-35. Edge Distance Input Boxes

7.9.2 Shear Tab Bolt Spacing Override

Shear tab bolt spacing is calculated based on the following equation:

$$ST_Spac = (ST_Depth - 2 * Edge 4) / (N - 1)$$

Where, $ST_Depth = Beam T - 1"$, Edge 4 is the shear tab edge distance, and N is the number of shear tab bolts

The XML file will auto populate the shear tab spacing on the *Beam 1* and *Beam 2 Plates* tabs, with this calculated value if the box is left blank (see Figure 7-36).

If the user chooses to use something different than what is provided, it should be close to what is recommended by AISC 360 for bolt spacing.

NOTE: IF AN XML FILE IS IMPORTED, ANY USER OVERRIDES WILL REVERT BACK TO VALUES PROVIDED IN THE XML.

ST_Depth = Beam T - 1"

ST_Spac = Shear tab spacing (ST_Spac) is calculated based on the following equation: $(ST_Depth - 2 * Edge 4) / (N - 1)$. Leave blank to use Calculated value or override by entering a value.

Figure 7-36. Shear Tab Bolt Spacing Input Box

8 Specific Information for Included Configurations

The component can accommodate several different types of connections:

- R8 (high seismic) connection
- R3 (high wind) connection
- R3 Narrow (high wind) connection

For each of these three types of connections, the component can accommodate several different configurations:

- One-Sided
- Two-Sided Same Beams
- Two-Sided Different Beams
- Cap Plates
- Steps
- Slopes
- Double Slopes
 - Bent Plate Option (R8 only)
 - CJP Option (R8 only)
- Cantilever Beam (R8 only)
- Combined Plates to Parts (R8 only)

See the following sections for details on modelling these specific connections. Not currently included are biaxial connections, combinations of cap plates with steps, or combination of slopes with steps.

8.1 ONE-SIDED

A one-sided connection includes a single moment frame beam connecting to a column. A typical detail for a one-sided connection modelled in Tekla is shown below.

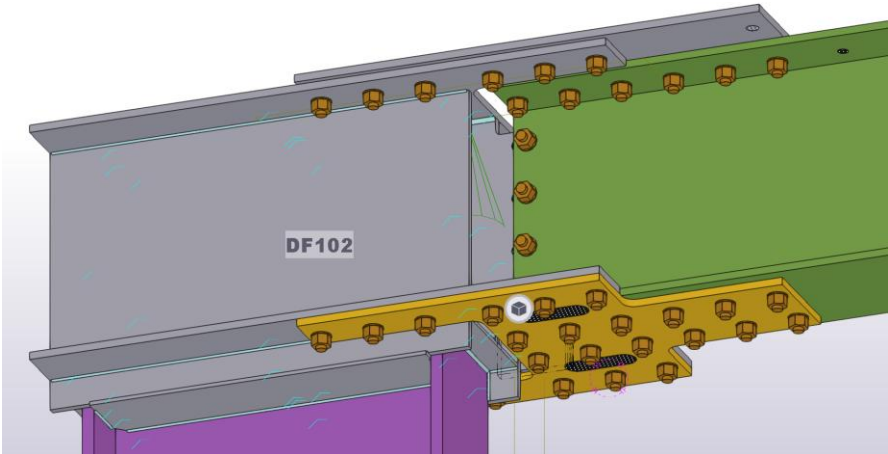


Figure 8-1. R8 One-Sided Connection

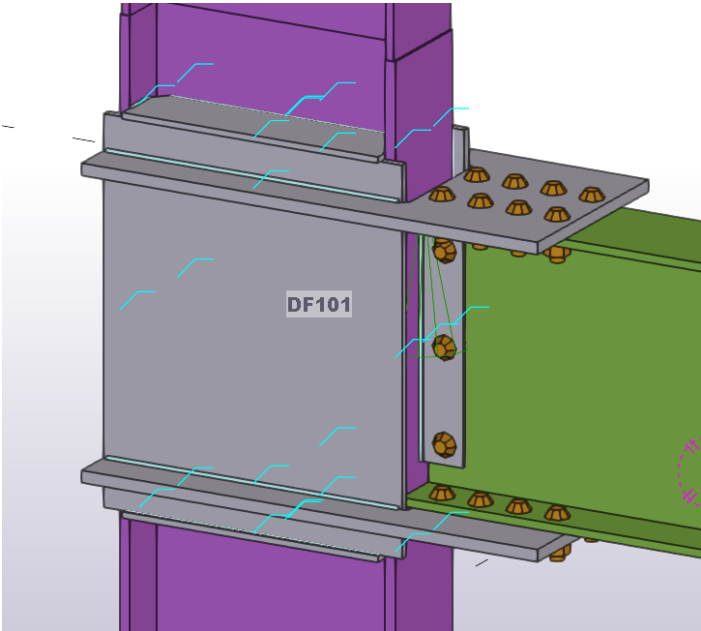


Figure 8-2. R3 One-Sided Connection

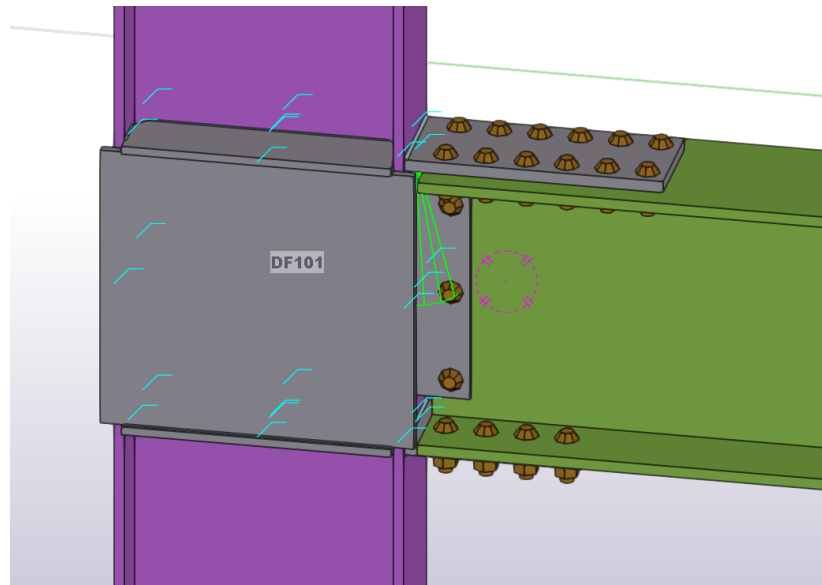


Figure 8-3. R3 Narrow One-Sided Connection

8.2 TWO-SIDED SAME BEAMS

A two-sided connection includes two moment frame beams of the same size. The same parameters are used for both beams. A typical detail of a two-sided same beam connection is shown below.

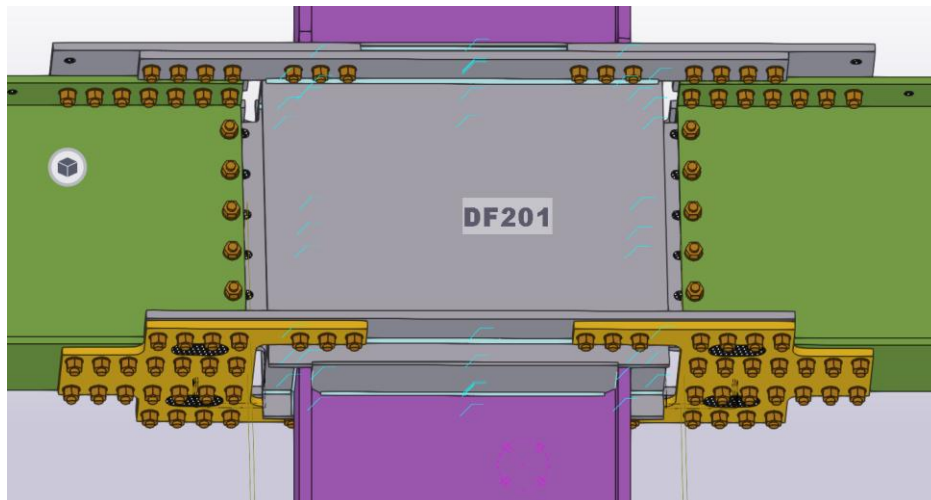


Figure 8-4. R8 Two-Sided Same Beam Connection

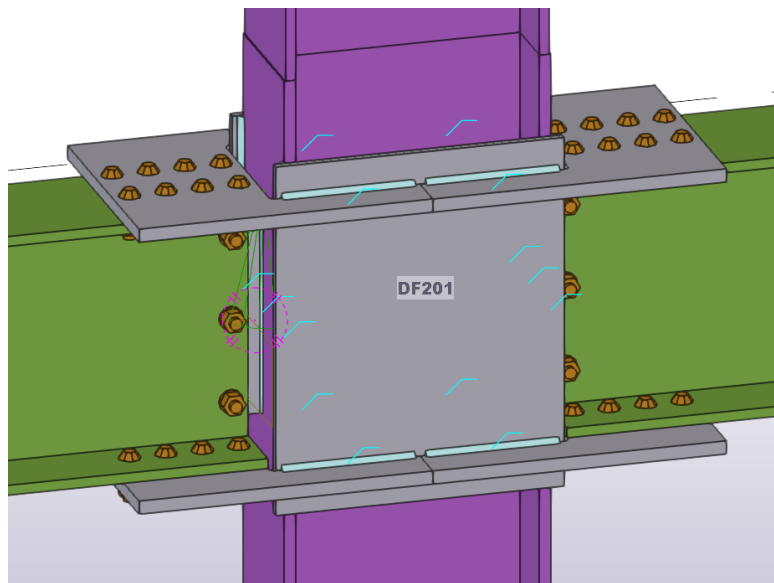


Figure 8-5. R3 Two-Sided Same Beam Connection

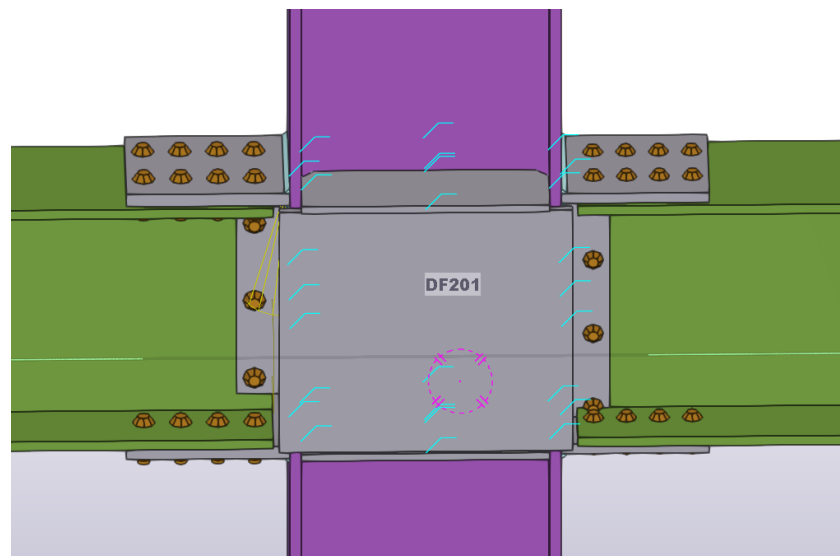


Figure 8-6. R3 Narrow Two-Sided Same Beam Connection

For the two-sided connection with same beams, all parameters are the same for Beam 1 and Beam 2, based on the schedules provided by DuraFuse (these parameters are auto-populated using the XML Tool). The parameters that are the same between Beam 1 and 2 and that do not need to be entered for Beam 2 are as follows (these parameters are taken from Beam 1):

- T1 (Cover Plate and Shear Plate Thickness)
- T2 (Top, Fuse, Continuity, and Bridge Plate Thickness)
- C2 Dimension

- C3 Dimension
- C4 Dimension
- C5 Dimension
- C6 Dimension
- W1 (Weld from cover plate to column flange)
- W2 (Weld from continuity plate to cover plate)
- W4 (Weld from shear plate to column web and to cover plate)
- W5 (Weld from bridge plate to cover plate)
- W6 (Weld from bridge plate to column flange)
- W7 (Weld from shear tab to bridge plate)

8.3 TWO-SIDED DIFFERENT BEAMS

A two-sided connection with beams of different size, will have different parameters for the two beams. The connection schedule for this type includes two rows for each beam under the same connection ID, see table below. Each row under the ID will correspond to each beam and will be populated in the *Beam 1* and *Beam 2* tabs.

This type of connection is only valid when the difference in beam depths is greater than or equal to 6”.

A typical detail of a two-sided different beam connection is shown below.

NOTE: BEAM DEPTH DIFFERENCES MUST BE GREATER THAN OR EQUAL TO 6” TO BE APPLIED CORRECTLY IN THE MODEL.

ID	MEMBER SIZES		PLATE THICKNESS			DIMENSIONS						WELDS							BOLTS PER CONNECTION (EACH SIDE)					
	COLUMN	BEAM	T1	T2	T3	C1	C2	C3	C4	C5	C6	W1	W2	W3	W4	W5	W6	W7	DIA	SPACING	M	P	N	B
DF206																								
DF207																								
DF208																								
DF209																								
DF210																								

ID	MEMBER SIZES		TOP PLATE DIMENSIONS					FUSE PLATE DIMENSIONS							SHEAR TAB			BEAM DIMENSIONS		
	COLUMN	BEAM	P1	P2	P3	P4	P5	F1	F2	F3	F4	F5	F6	F7	S1	S2	S3	B1	B2	B3
DF206																				
DF207																				
DF208																				
DF209																				
DF210																				

Figure 8-7. Two-Sided Different Beam Connection Schedules (Blank)

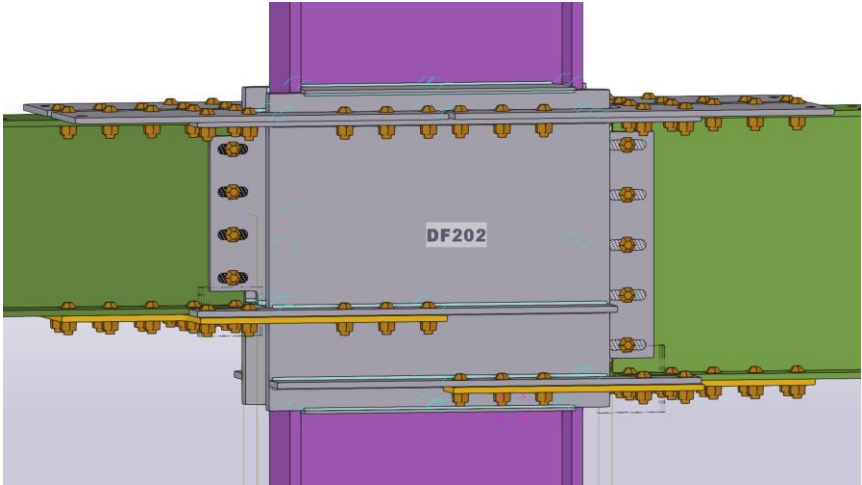


Figure 8-8. R8 Two-Sided Different Beam Connection

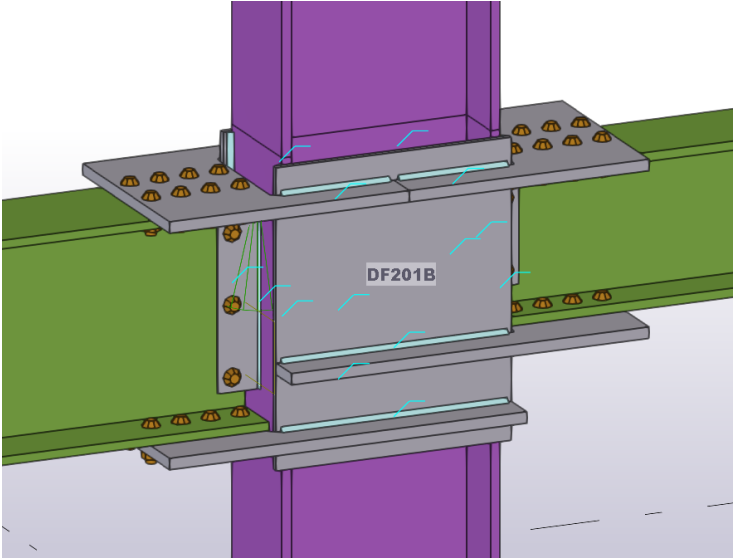


Figure 8-9. R3 Two-Sided Different Beam Connection

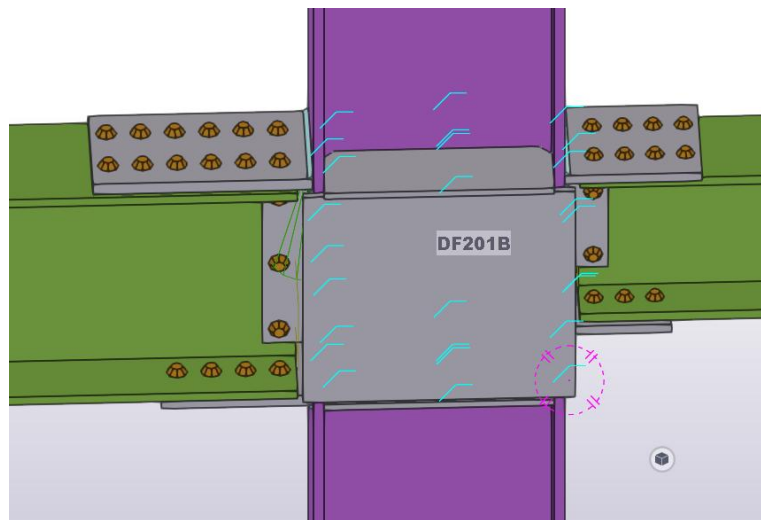


Figure 8-10. R3 Narrow Two-Sided Different Beam Connection

For the two-sided connection with different beams, most parameters may vary for Beam 1 and Beam 2, based on the schedules provided by DFF. The only parameters that are the same for both beams are as follows (these parameters are taken from Beam 1):

- T1 (Cover Plate and Shear Plate Thickness)
- T2 (Top, Fuse, Continuity, and Bridge Plate Thickness)
- C2 Dimension
- C3 Dimension
- C4 Dimension
- C5 Dimension
- C6 Dimension
- W1 (Weld from cover plate to column flange)
- W2 (Weld from continuity plate to cover plate)
- W4 (Weld from shear plate to column web and to cover plate)
- W5 (Weld from bridge plate to cover plate)
- W6 (Weld from bridge plate to column flange)
- W7 (Weld from shear tab to bridge plate)

8.4 TWO-SIDED CANTILEVER

A two-sided connection where one beam is a cantilever beam (*Beam 2*), will have different parameters for F3 and F2 between the two beams (R8 connection only). The connection schedule for this type will include an asterisk, indicating a cantilever connection (see image below).

DF201
DF202*
DF203
DF204
DF205
DF206*

Figure 8-11. Schedule with * Indicating a Cantilever Connection

The asterisk correlates with the note in the schedule, giving instruction for the cantilever beam (*Beam 2*):

*** THERE ARE NO FUSE HOLES ON THE FUSE PLATE FOR THE CANTILEVER SIDE OF THE CONNECTION. STANDARD BOLT HOLES MUST BE USED ON TOP PLATES AND FUSE PLATES ON THE CANTILEVER SIDE.**

A typical detail of a two-sided cantilever connection is shown below. Note that one side of the connection has the fuse holes (*Beam 1*) and the other does not. The side without the fuse holes is the cantilever side (*Beam 2*). $F3 = 0$ in the component and is auto-populated from the XML file if the cantilever beam is known in advance. Refer to Section 7.3 for more details on input parameters. If the user manually needs to create a cantilever beam, only *Beam 2* can be the cantilever beam so be sure to indicate *Beam 1* and *Beam 2* correctly when applying the connection. The component will also update the bolt holes for the cantilever beam to use standard holes instead of the typical oversized holes.

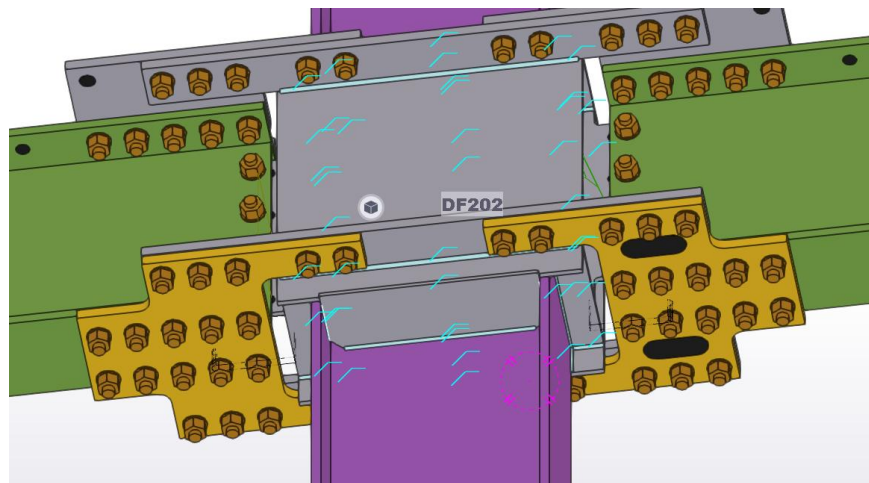


Figure 8-12. R8 Two-Sided Cantilever Connection

8.5 CAP PLATES

A cap plate option is available for connections at the top of a frame. The **Roof Cap Connection** option can be selected on the *Instructions* tab of the component dialog (see Section 7.1). Instead of having separate shear and external continuity plates, the cap plate replaces those with a single plate, see Figure 8-13 for typical cap plate connection.

NOTE 1: IF THE ROOF CAP CONNECTION OPTION IS APPLIED TO A CONNECTION THAT IS NOT AT THE TOP OF COLUMN, THE COLUMN BELOW WILL DISAPPEAR. MAKE SURE TO APPLY CAP PLATES ONLY AT THE TOP LEVEL OF A COLUMN TO AVOID THIS ISSUE.

NOTE 2: THE CAP PLATE OPTION DOES NOT APPLY TO A DOUBLE SLOPED CONNECTIONS. THEREFORE, THE BENT EXTERNAL CONTINUITY PLATE OPTION (ONLY APPLICABLE TO DOUBLED SLOPED CONNECTIONS) MAY BE IGNORED OR NOT DRAWN CORRECTLY IF A CAP PLATE CONDITION APPLIES.

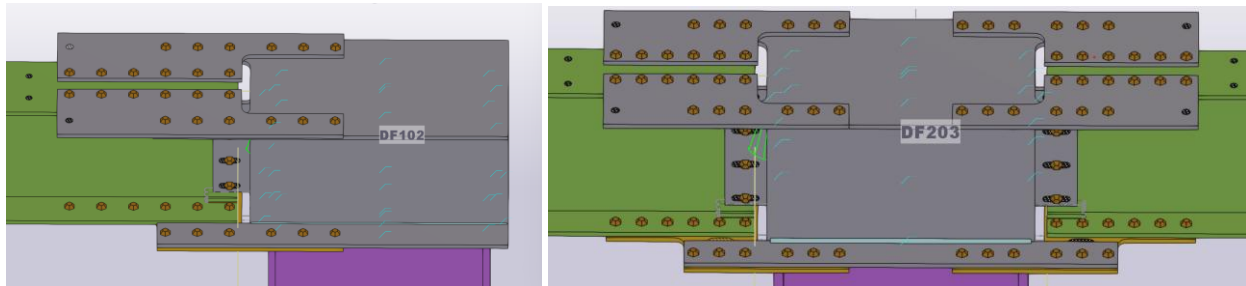


Figure 8-13. R8 Cap Plate Connection

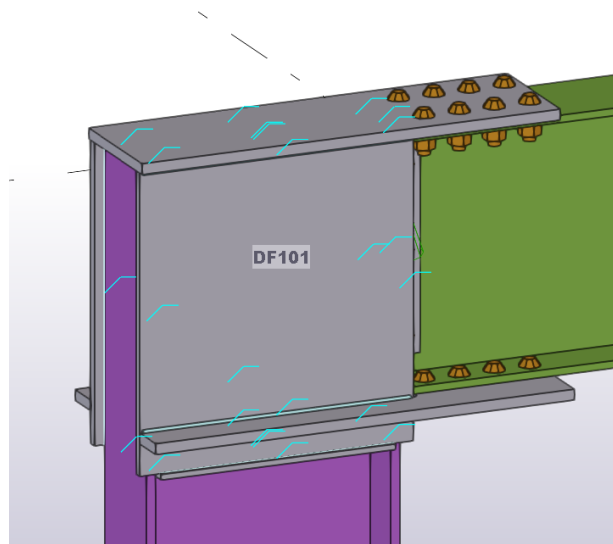


Figure 8-14. R3 Cap Plate Connection

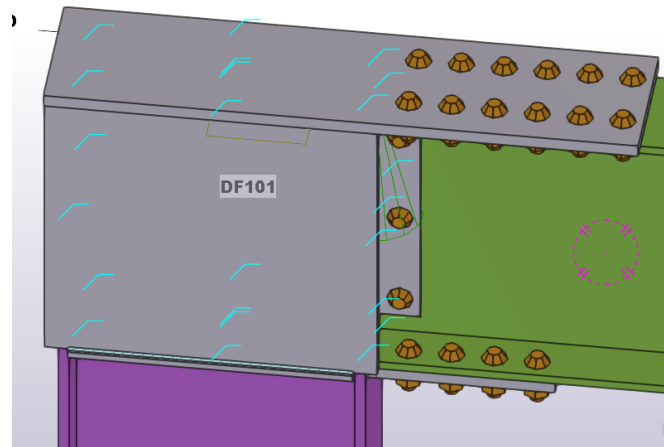


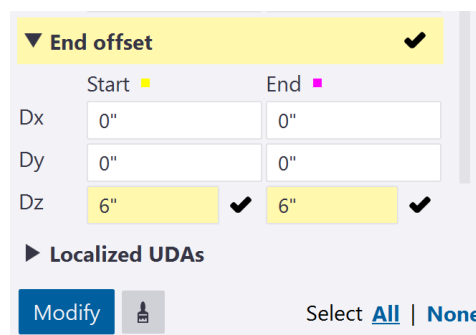
Figure 8-15. R3 Narrow Cap Plate Connection

8.6 STEPS

Beams may be offset from each other by a minimum of 6". See Figure 8-17 for a typical stepped connection. Since the selection process defines which beams to consider in the connection, the component automatically detects what the step dimension is, based on the elevations of the beams. The beam offsets can be adjusted by double clicking on the beam. The properties dialog will show up and the start and end offsets of the beam can be adjusted (see Figure 8-16).

NOTE 1: ANY STEP LESS THAN 6" COULD CAUSE BOLT CONFLICT. IF STEPS ARE LESS THAN 6", THE EXTERNAL CONTINUITY PLATES WILL NOT BE SPLIT AND THE CONNECTION MAY HAVE ERRORS.

NOTE 2: STEPPED CONDITIONS WILL NOT BE DETECTED AND APPLIED BY THE DFF TAGGING TOOL (SEE SECTION 4.1). THESE TYPES OF CONDITIONS WILL NEED TO BE APPLIED MANUALLY USING PROCEDURES OUTLINED IN SECTION 4.2.



▼ End offset		✓
	Start	End
Dx	0"	0"
Dy	0"	0"
Dz	6" ✓	6" ✓

▶ Localized UDAs


Modify  Select [All](#) | [None](#)

Figure 8-16. Beam End Offsets

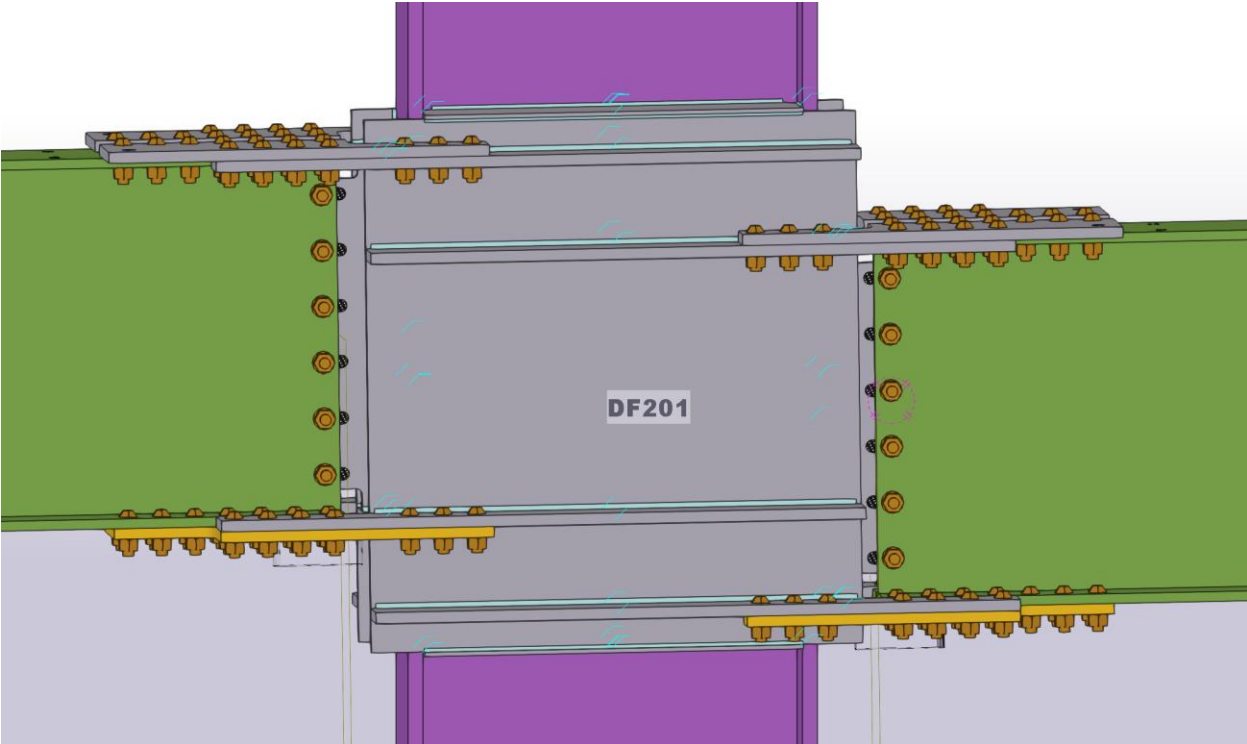


Figure 8-17. R8 Beam Step Connection

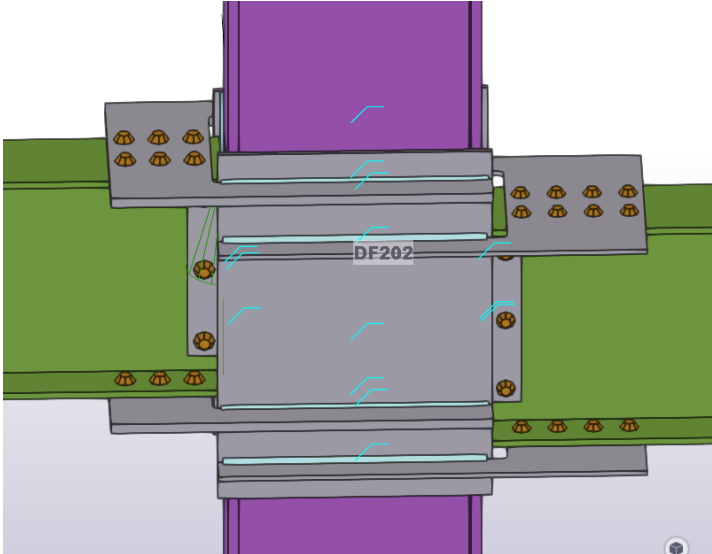


Figure 8-18. R3 Beam Step Connection

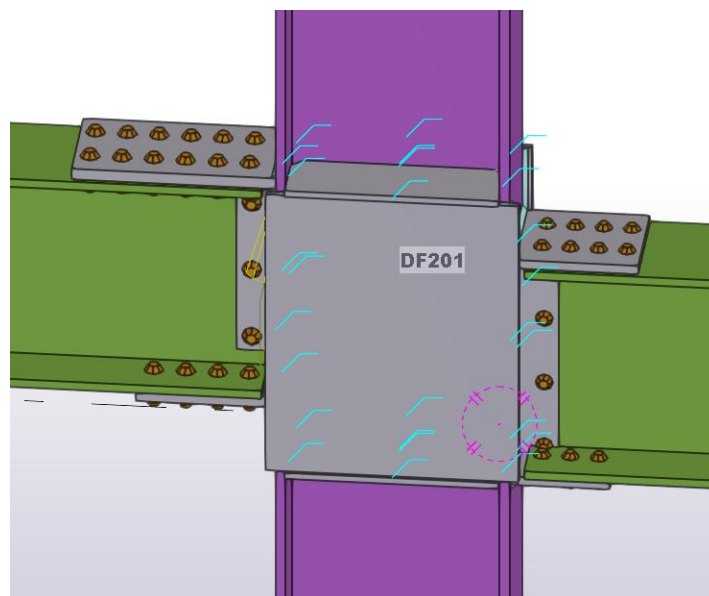


Figure 8-19. R3 Narrow Beam Step Connection

8.7 SLOPES

Slopes apply to one-sided, two-sided same beams, two-sided different beams, and capped connections. See the figures below for typical sloped connections.

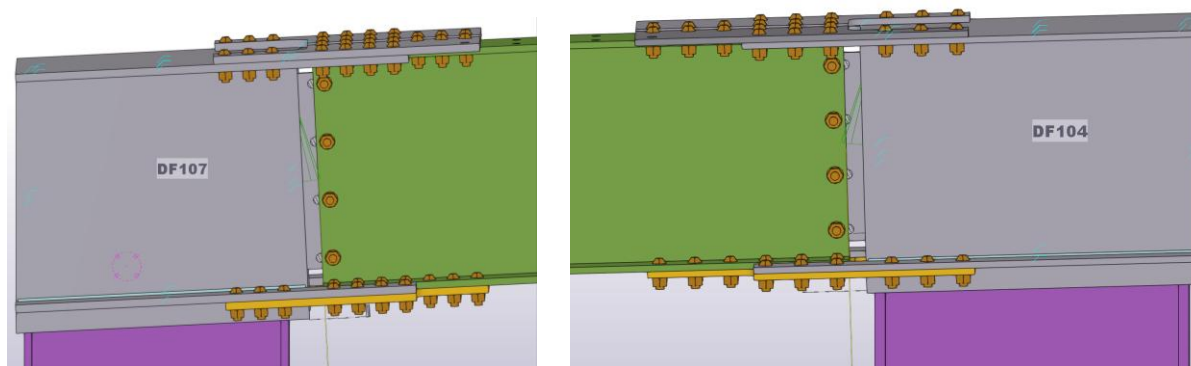


Figure 8-20. R8 Sloped One-Sided Connection

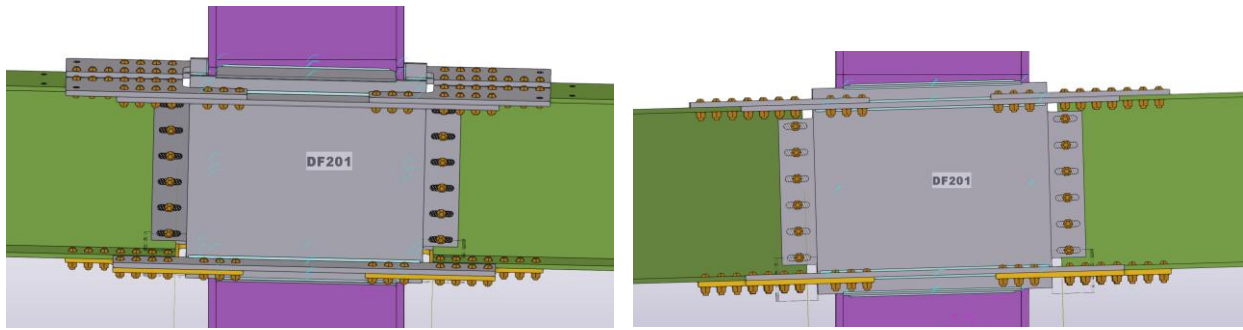


Figure 8-21. R8 Sloped Two-Sided Connection

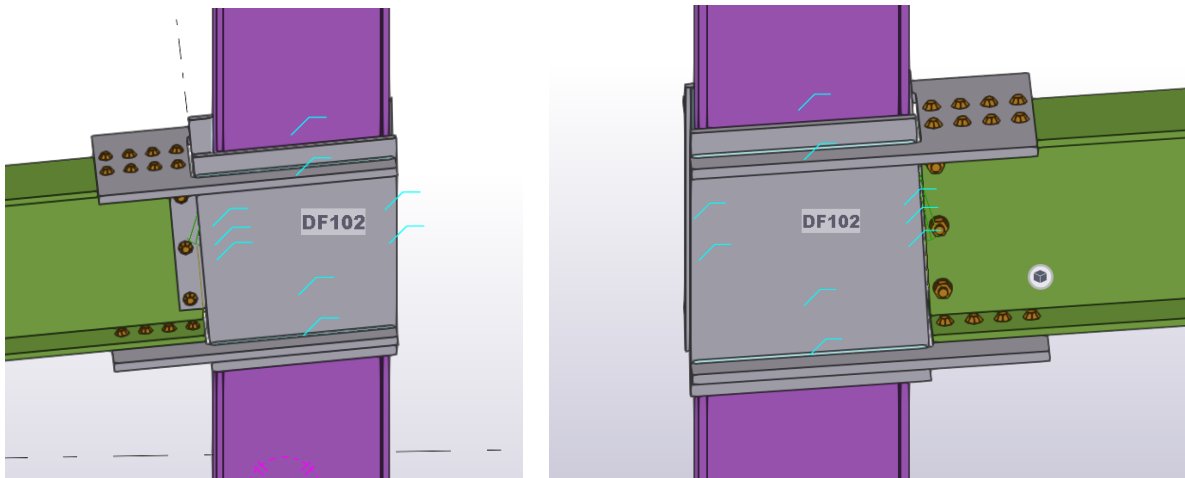


Figure 8-22. R3 Sloped One-Sided Connection

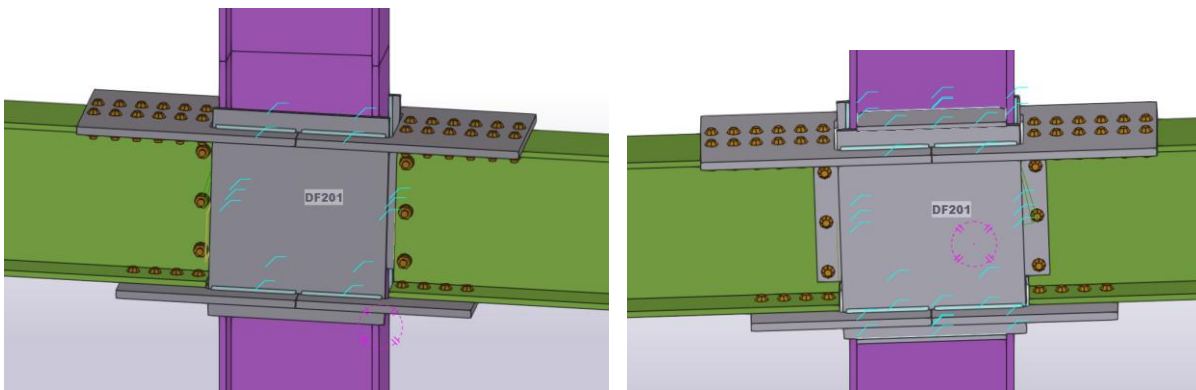


Figure 8-23. R3 Sloped Two-Sided Connection

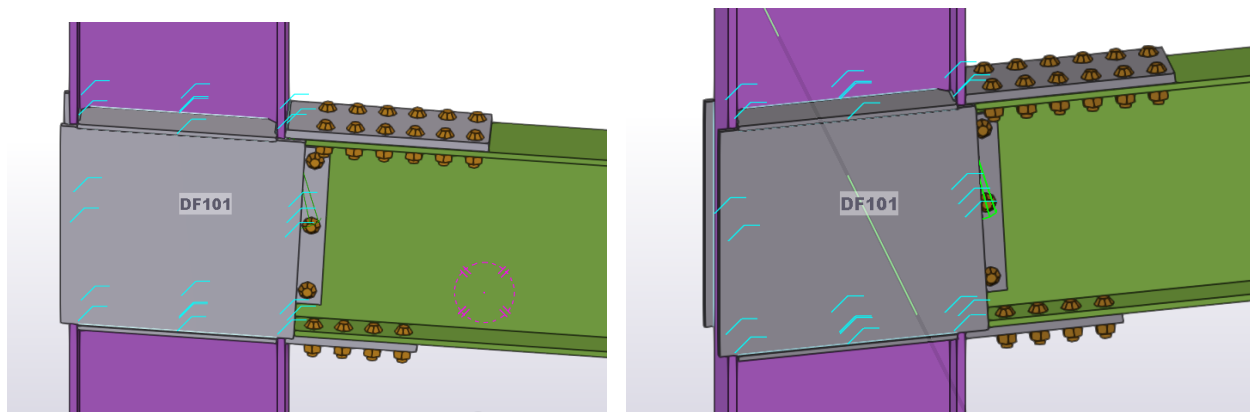


Figure 8-24. R3 Narrow One-Sided Connection

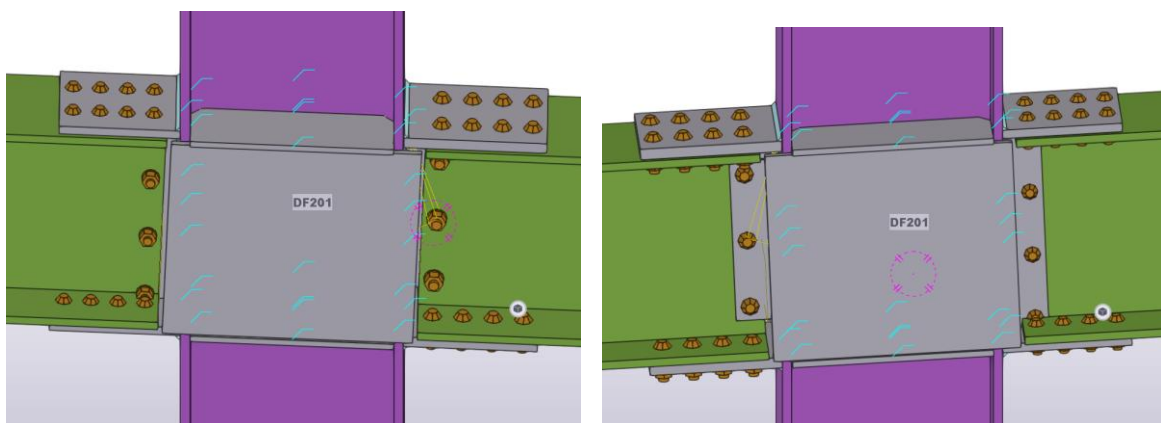


Figure 8-25. R3 Narrow Two-Sided Connection

8.8 DOUBLE SLOPES

Double sloped connections apply to two-sided connections. Two options for the external continuity plates are available for double slopes: 1) bent plate and 2) CJP weld. These options can be specified with the **Bent External Continuity Plate** option on the *Instructions* tab of the component dialog (see Section 7.1.5). Figure 8-26 and Figure 8-27 below show examples of sloped connections with bent plates and CJP options.

For double sloped connections, Weld 2 is shown in the model as two separate welds, with a break where the external continuity plates meet. While Weld 2 is shown with a break, it shall be detailed as a continuous weld in the drawings. A note has been added for this case and can be displayed when the column assembly drawings are created (see Figure 8-28). The note is also visible in the model or by clicking on Weld 2 and viewing the **Tail Information** in the Properties menu (see Figure 8-29). The note reads “See Holdback Detail. Weld shall be continuous between sloped segments.”

The CJP weld may not consistently show up in the model. However, it is consistently called out in the drawings (see Figure 8-28).

NOTE: THE CAP PLATE OPTION DOES NOT APPLY TO DOUBLE SLOPED CONNECTIONS. IF A CAP PLATE CONNECTION IS APPLIED TO A DOUBLE SLOPED CONNECTION, THE CAP PLATE WILL MAY BE IGNORED AND MAY BE DRAWN INCORRECTLY.

COMBINATION DOUBLE SLOPED, EXTENDED EXTERNAL CONTINUITY PLATES, AND STEPPED CONDITIONS ARE NOT AVAILABLE IN THE DFF COMPONENT. THEY WILL NEED TO BE DRAWN MANUALLY.

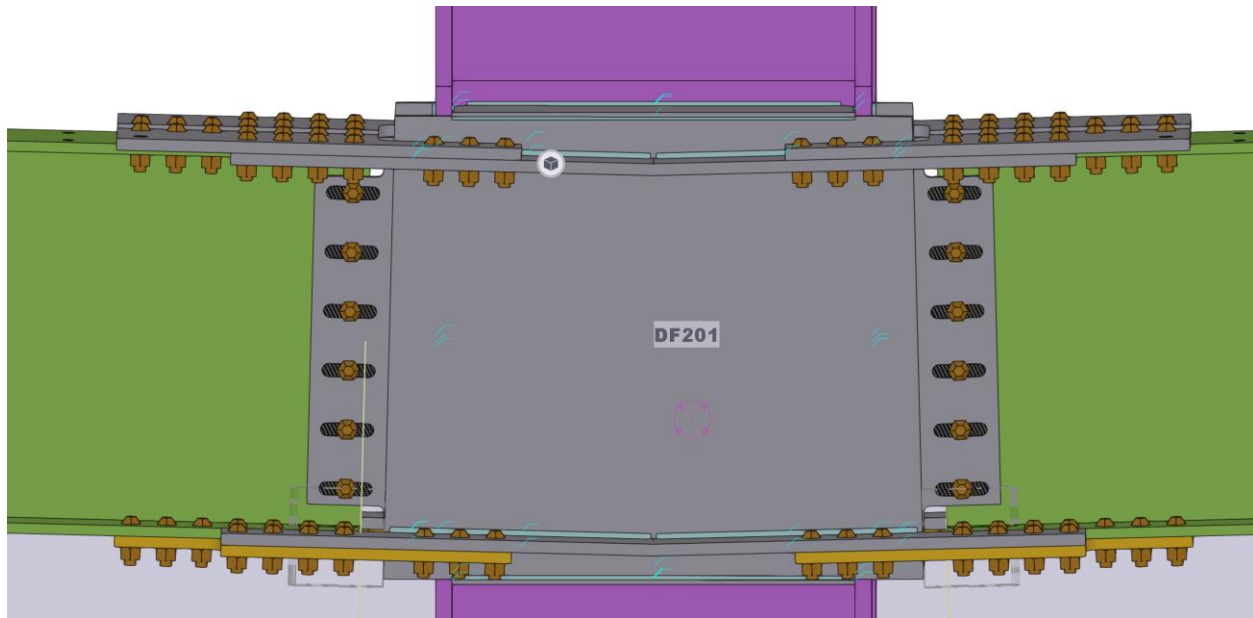


Figure 8-26. R8 Double Sloped Bent Plate Connection

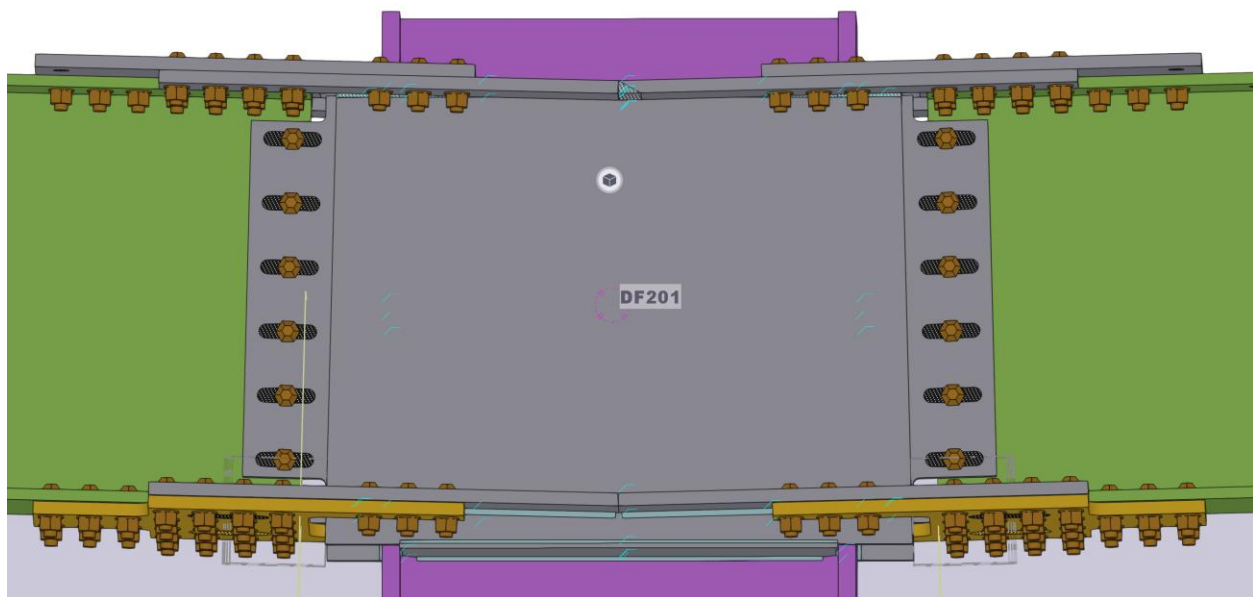


Figure 8-27. R8 Double Sloped CJP Connection

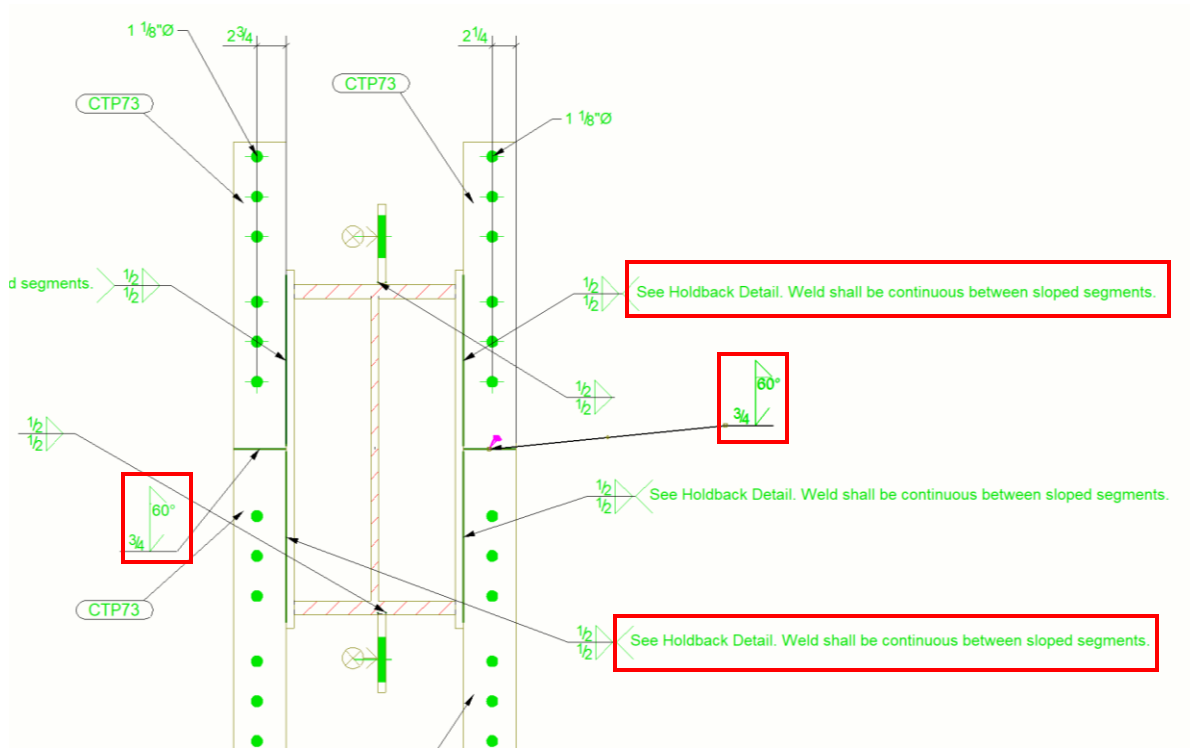


Figure 8-28. Weld 2 Note and CJP Callout in Drawings

▼ Tail information

NDT inspection	None
Electrode classificat	
Electrode strength	0
Electrode coefficient	0
Process type	
Reference text	See Holdback Detail. Weld shall be continuous between sloped segments.

Figure 8-29. Continuous Weld 2 Note for Double Sloped Connections

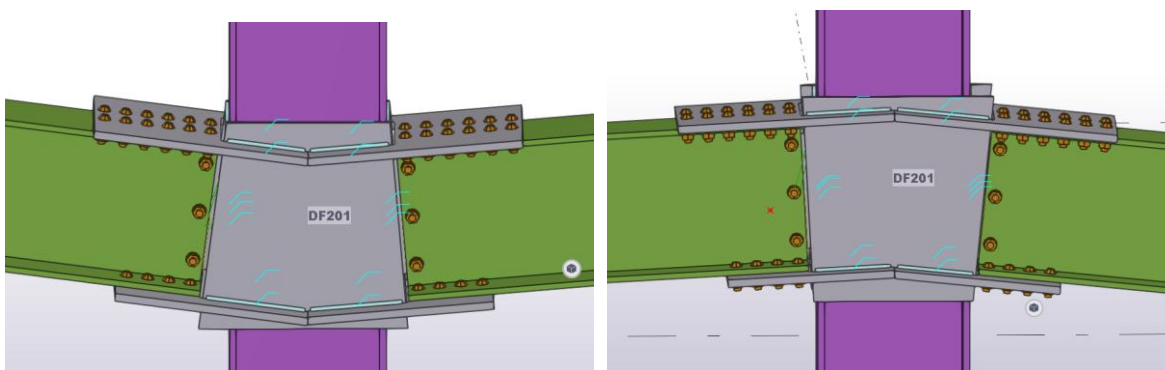


Figure 8-30. R3 Double Sloped Connection

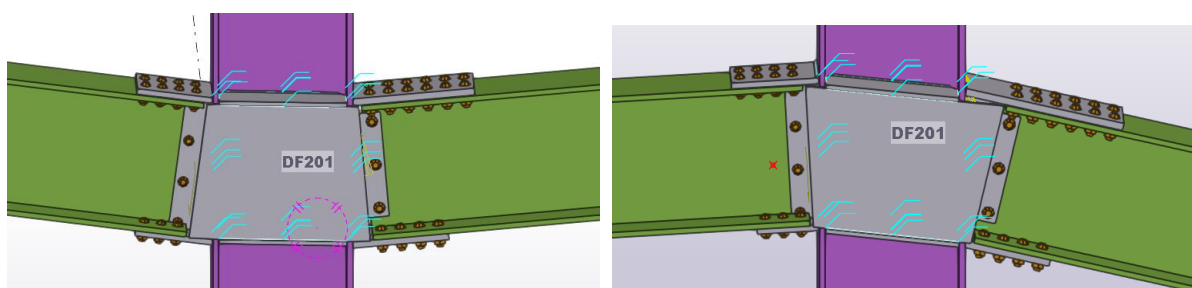


Figure 8-31. R3 Narrow Double Sloped Connection

8.9 COMBINED PLATES TO PARTS

When the user selects **Yes** to combine plates to parts (see Section 7.1.6), the two different types of bolts, shop (orange) and field (yellow), will be shown in the Tekla model (see Figure 8-32). Otherwise, all of the bolts will be shown as field (yellow) bolts. This feature applies to the R8 connection **ONLY**.

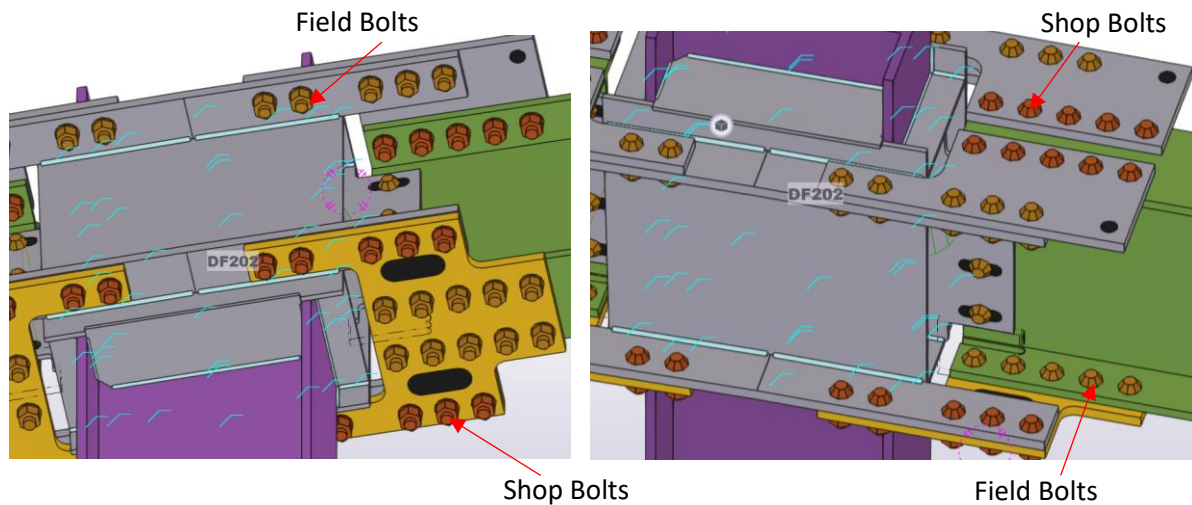


Figure 8-32. R8 Field (yellow) and Shop (orange) Bolts for Combined Plates Option

8.10 DRAG CONDITION

When the user selects Yes to include a Drag Condition, (see Section 7.1.7), the number of M, P and B bolts on the top plates can differ from those on the bottom plates. The user enters in the appropriate M, P and B bolts for the top plates. For example, 3 M bolts, 4 P bolts and 7 B bolts have been specified for the top plates in the connection shown in Figure 8-33. The bottom plates still have the original 2 M, 3 P and 5 B bolts.

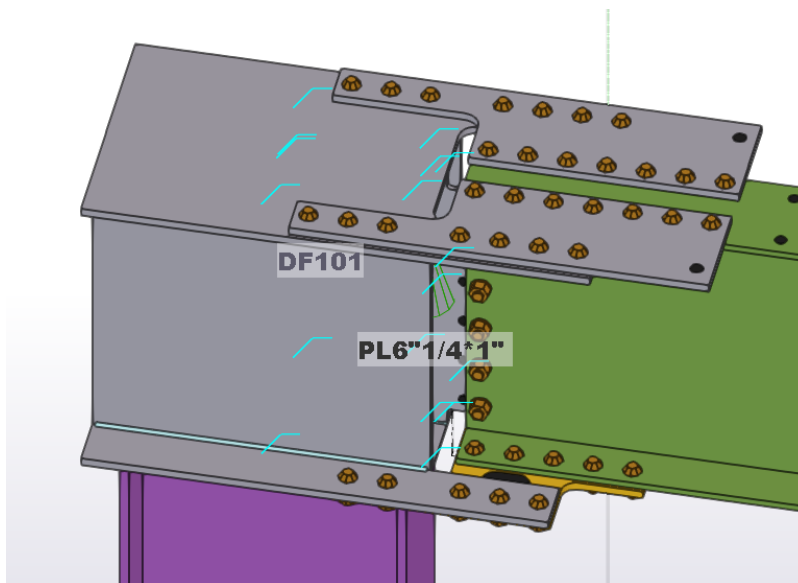


Figure 8-33. R8 Drag Condition with Differing Bolt Counts for Top Versus Bottom Plates

8.11 EXTENDED EXTERNAL CONTINUITY PLATES

The user is permitted to add extensions to either the external continuity plates (for R8) or the top plates (for R3 and R3 Narrow), see Section 7.3.1. Examples of these extensions for the different components are shown in the following three figures. This feature may be applied in conjunction with slopes and drag conditions.

NOTE 1: THE EXTENDED EXTERNAL CONTINUITY PLATE DOES NOT WORK IN CONJUNCTION WITH THE BENT EXTERNAL CONTINUITY PLATE (DOUBLE SLOPED) CONDITION (R8, R3, R3 NARROW).

NOTE 2: FOR TWO-SIDED CONNECTIONS, IF THE LENGTH EXTENSIONS ON THE SAME SIDE (LEFT OR RIGHT) OF BEAMS 1 AND 2 OVERLAP EACH OTHER, THERE WILL BE DETAILING ISSUES WITH THE PLATE. IT IS UP TO THE USER TO SPECIFY LENGTHS APPROPRIATE FOR THE EXTENSION SO THAT THEY DON'T OVERLAP BETWEEN BEAMS 1 & 2.

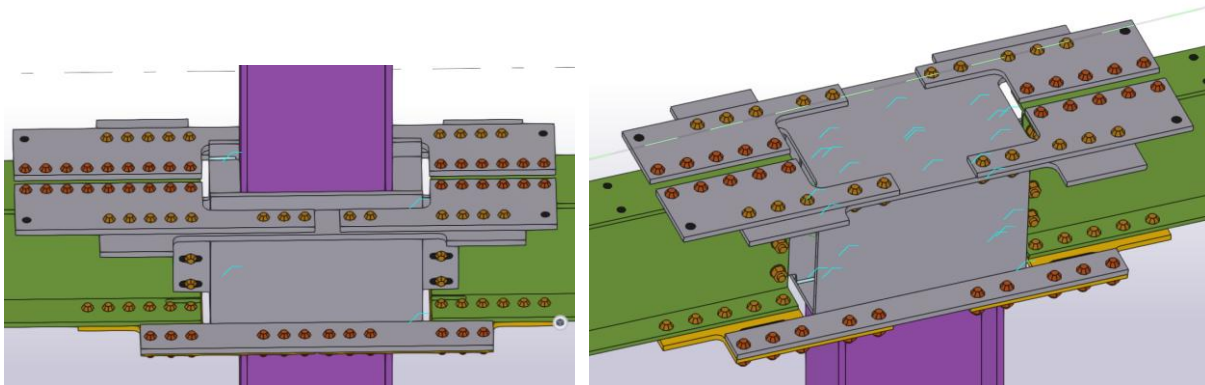


Figure 8-34. R8 Extended Top External Continuity Plates (lower and roof conditions)

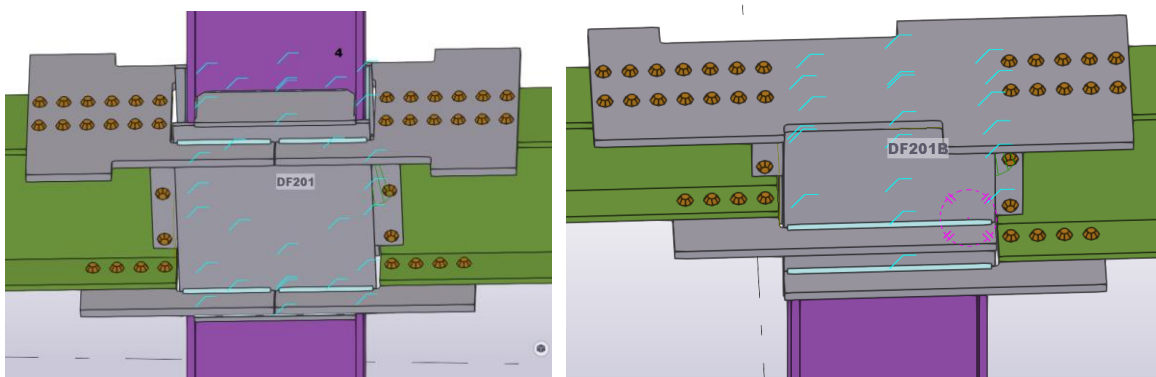


Figure 8-35. R3 Extended Top Plates (lower and roof conditions)

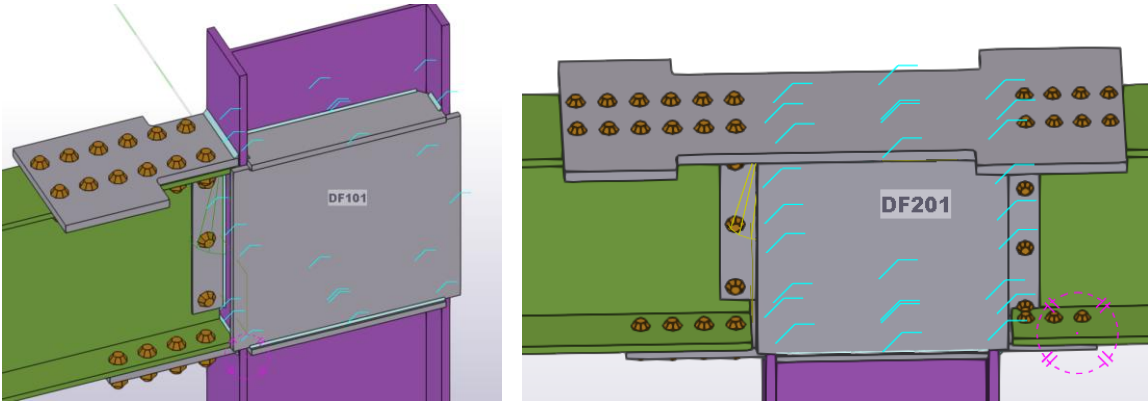


Figure 8-36. R3 Narrow Extended Top Plates (lower and roof conditions)