Installation & User Guide

DuraFuse Frames® SDS2 Component

SDS2 2022

SDS2®

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1 Overview

The DuraFuse Frames ® (DFF) connection is system of plates, welds, and bolts. The DFF SDS2 component was developed to make detailing this connection easy. The component can be quickly applied to moment frame connections in an SDS2 model. Once the component is applied, the plates, welds and bolts are automatically updated for each connection using the XML Import Tool.

The flow chart below outlines steps required to apply the DFF SDS2 component in a model.

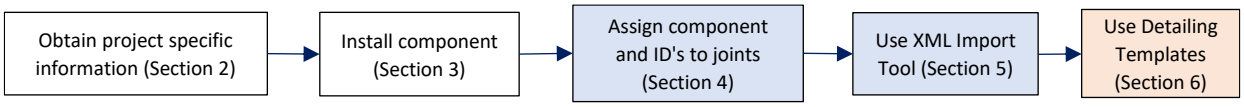

Figure 1. DuraFuse Frames SDS2 Component Application Flow Chart

The component has been expanded in 2022 to include several types of special connections such as one and two-sided beam connections, cap plates, steps and slopes. Examples of these connections can be found in section 8, *Specific Information for Included Configurations*.

2 Project Specific Information

Before the component can be applied in the model, project specific information will need to be obtained from DFF. Use one of the following resources:

- The DFF 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 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 more information in section 4.

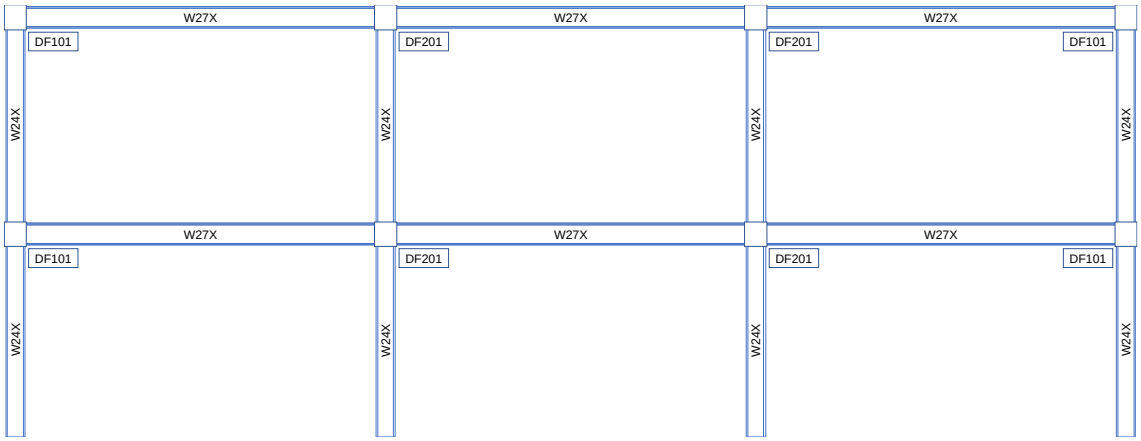

Figure 2. DuraFuse Frames Elevation Example

The XML file is a project specific file that contains all connection information for each ID from the DFF schedules. The files 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 anything the user prefers and will still be compatible with SDS2 and the component. Data within the XML file is organized by *Project Data*, *Global Data*, and each individual *DuraFuse Components* for each unique ID, see an example in Figure 3. **Save** this file to a known location prior to using the component tool 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>
```

Figure 3. XML File Sample Data

Figure 4 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 what make up the data included in the XML file, which are then auto populated for each connection in the *DuraFuse Component Dialog* (see section 7).

	MEMBER SIZES		PLATE THICKNESS			DIMENSIONS						WELDS				BOLTS PER CONNECTION (EACH SIDE)					
ID	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																					

	MEMBER SIZES		TOP PLATE DIMENSIONS					FUSE PLATE DIMENSIONS							SHEAR TAB			BEAM DIMENSIONS		
ID	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 4. DuraFuse Frames Schedules (Blank)

3 Installation

3.1 OVERVIEW

The component can easily be downloaded and installed from the DFF or SDS2 websites. The installer will automatically place the component into the plugins/Toolbox folder. It will also install the Detailing Templates into the SDS2 templates folder. Once installed, a toolbar can be added in SDS2 that will make it easy to apply the component in the model.

3.2 OBTAIN THE INSTALLATION PACKAGE

Obtain the component installation package from one of 3 sources:

1. Download the package from **durafuseframes.com/resources/** and scroll down to **Downloads**.
   a. After logging in, locate the SDS2 component and select **Download**.
   b. Register and **log in** to receive updates.
   c. Go to the **Resources** page.
   d. Locate the SDS2 Component and select **Download**.
   e. Save the installation package to a known location.
2. Download the package from **https://sds2.com/toolbox/durafuse-frames**.
   a. Select which version of the component to download (compatible with 2020 and newer).
   b. Fill out the contact information so DFF can send notifications for updates made to the component.
3. Contact DFF directly to receive the installation package.
   Phone: 801-727-4060
   Email: contact@durafuseframes.com

Once installed, the component includes three parts:

1) DuraFuse Frames Component: applies the component to selected column-beam joints. User assigns a connection ID to each applicable joint, and connection parameters are later updated by the XML import.

2) XML Import Tool: the user links and imports an XML file with connection parameters for all ID's (XML file provided by DFF). This populates any assigned connection ID's in the model with matching ID's from the XML file.

3) Detailing templates will be installed, which are customized for the DFF connection. Refer to section 6 for more information.

3.3 INSTALL THE COMPONENT

Prior to installing the component, please ensure that SDS2 202X (current version) is already installed. If SDS2 202X (current version) has not been installed, please visit http://www.sds2.com/support/releases to download the appropriate SDS2 release. SDS2 installation instructions will be displayed during the installation process.

To install the component and templates, log in as an Administrator. After component has been downloaded from any of the sources provided in section 3.2, double-click on the executable file to launch the installation wizard. Any users who would like to use the component will need to install it individually.

NOTE: WHEN PROMPTED, SELECT 'YES' TO ALLOW INSTALLATION TO CONTINUE AND MAKE CHANGES TO THE SYSTEM.

The installation will start with a Welcome screen, as shown in Figure 5, with a wizard to help with the installation process. Click **Next**.

Figure 5. Welcome Screen

After selecting Next, the installer should automatically find the path for the *Data Files* folder, as shown in Figure 6. If the path is incorrect, select the button to the right ... and browse to the SDS2 202X

(current version) data directory. If the path is correct, click **Next** and then **Install**. The installer will then copy the files to the appropriate location. Once the installer is finished, click **Next** and then **Finish**.

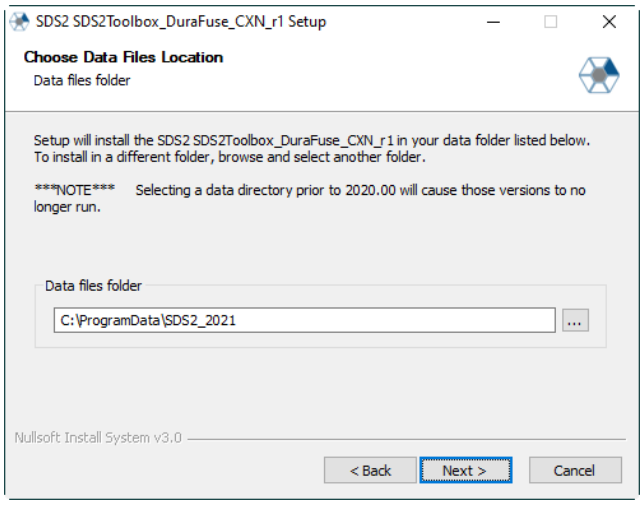

Figure 6. Choose Data File Location

3.4 ADD DURAFUSE COMPONENT TOOLBAR

Use the following steps to add the main component and XML Import tool to a customized toolbar:

1) On the main SDS2 screen select **Utilities – Plugins Manager** (Figure 7).
2) Scroll down in the *Plugins Manager* window for "DuraFuse". The DuraFuse_CXN and Update XML tool will be in the list.
3) Select them both and click the right **arrow** button  to move them over to the *Job plugin* section.
4) Select **Close**.
5) Back on the *Home* screen, select **Utilities – Customize Interface** (Figure 8).
6) Select the *Default* and select OK.
7) When the *Customize Interface* window comes up, Select **Detailer (Modeling)** (Figure 9).
8) Over to the right, on the same line as *Ribbon configuration*, select **Edit**.
9) When the *Modeling Ribbon Editor* shows up, search for "DuraFuse" in the *Menu item search box.*
10) Create a new "Page" by using the "**+**" button next to *Page*. Give it a title (Figure 10).
11) Once the new page has been created, use the "**+**" button next to the DuraFuse components to move them to the right and add them to the new page (Figure 10).
12) Click the "X" to close and save the toolbar.
13) A new DuraFuse toolbar will show up in the SDS2 ribbon with quick buttons for the main component and XML import tool (Figure 11).

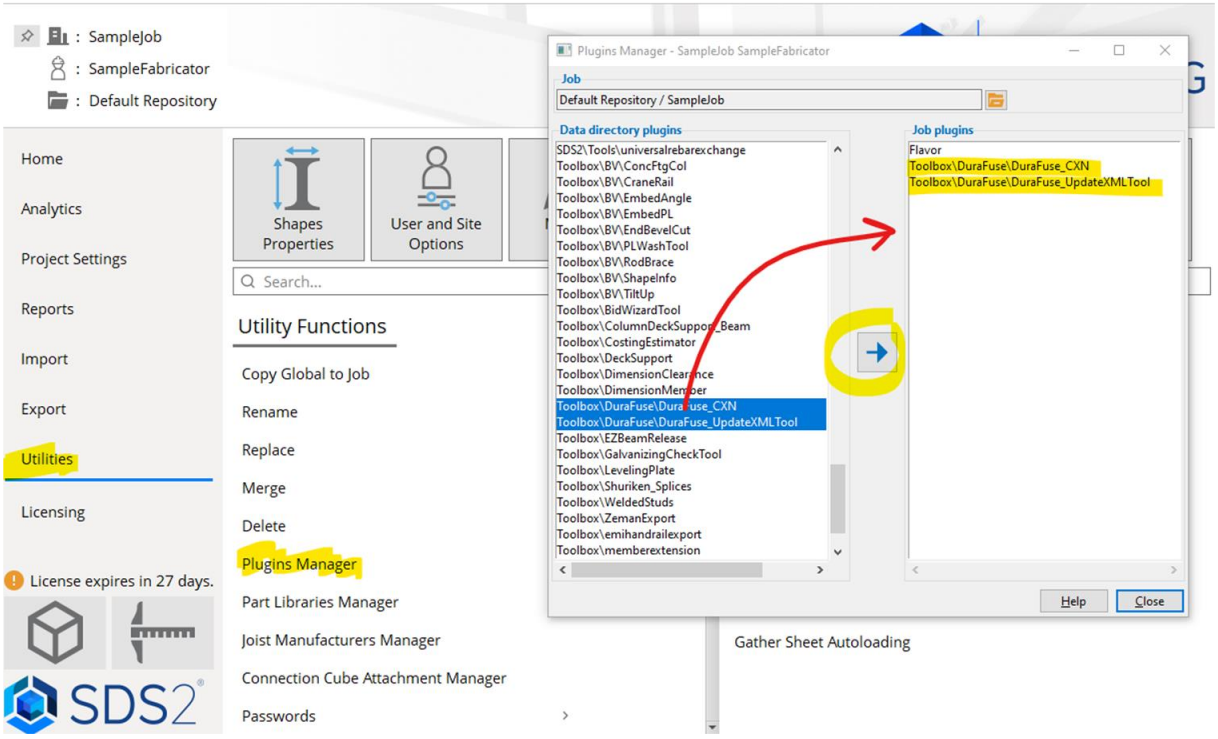

Figure 7. Plugins Manager

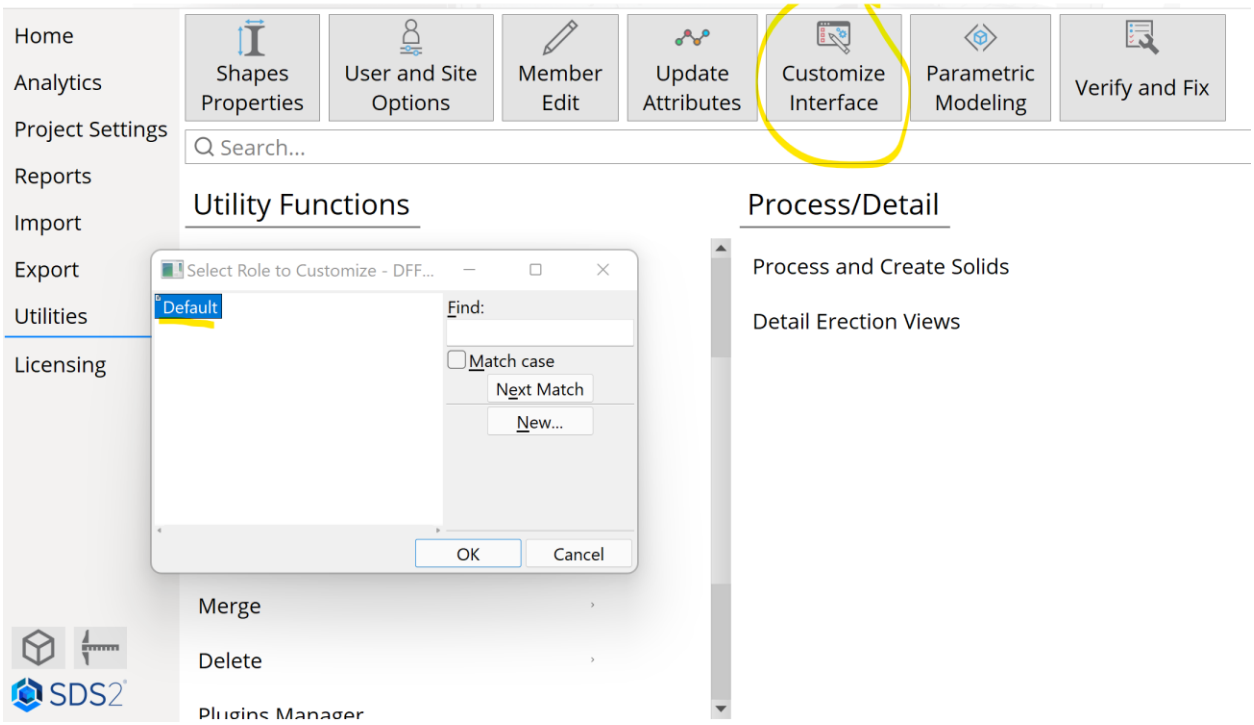

Figure 8. Customize Interface

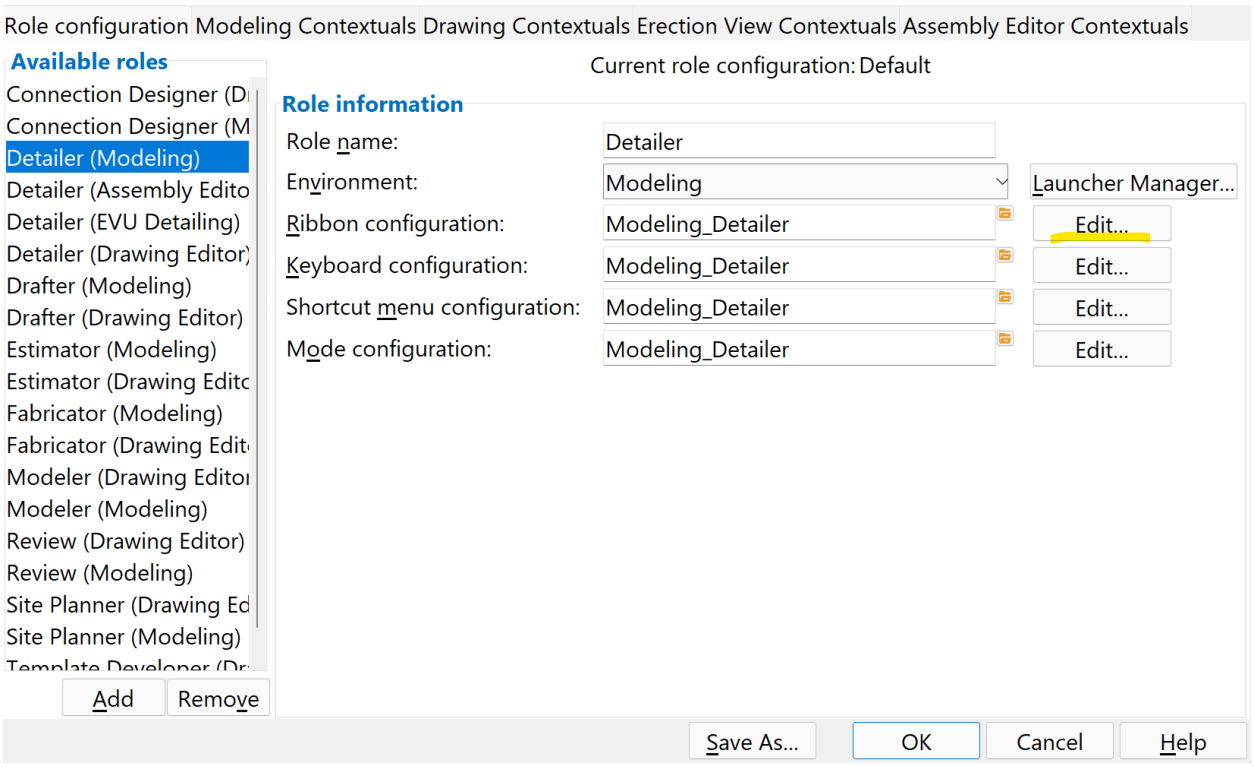

Figure 9. Customize Interface Window

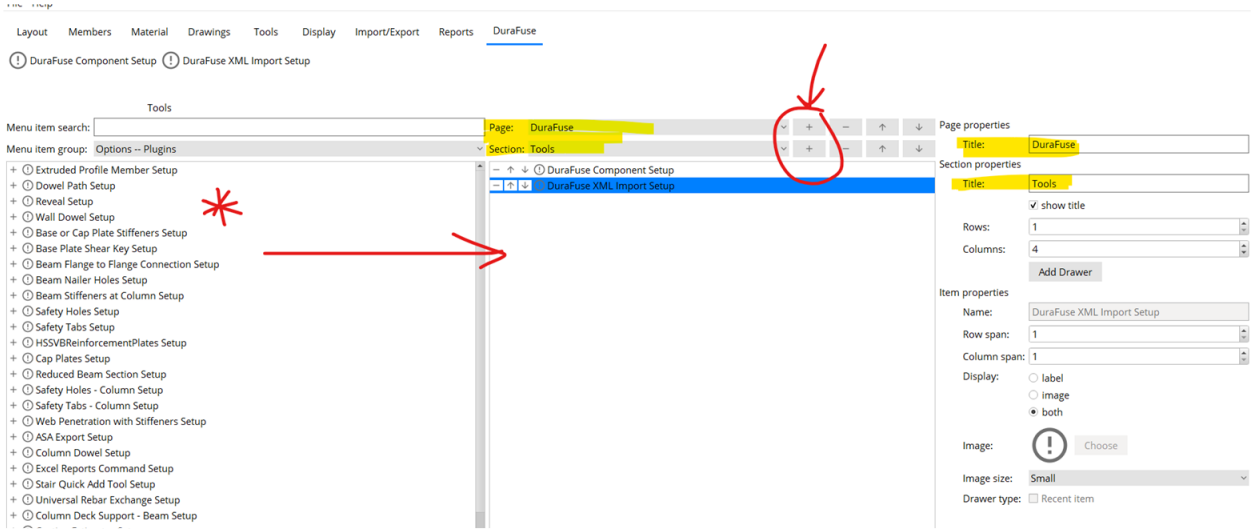

Figure 10. Add New Page with DuraFuse Frames Components

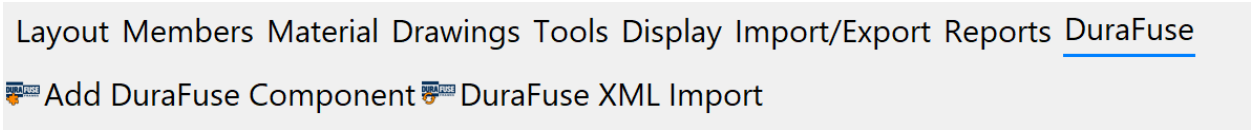

Figure 11. DuraFuse Frames Custom Toolbar

4 The DuraFuse Frames SDS2 Component

The DFF SDS2 component is what creates all plates, welds, and bolts specific to each connection ID. The connection ID's are numbered for unique column-beam moment frame combinations. Look up the column-beam combinations and corresponding ID's from the frame elevations provided by DFF. Apply the component and provide the applicable ID for each column-beam joint. The following steps go through this process:

1. Select the component button (puzzle icon) 
2. Select the column first
3. Holding the shift key, select the main beam
4. If there is a second beam, select it while still holding the shift key. Column and beam(s) should all be selected, see Figure 12.
5. Right click and select **OK** and the *DuraFuse Component Dialog* will pop up.
6. Under *General Settings*, indicate the **Connection ID** (see Figure 24) and select **OK** to close the *DuraFuse Component Dialog*. The component will be applied to the joint.
7. Repeat steps 1-6 for all DFF connections in the model.
8. Proceed to load the XML file. See section 5, *XML Import Tool* for more details.
9. If a **Connection ID** needs to be changed, double click on the component and the *DuraFuse Component Dialog* will pop up. Here the ID can be changed. See section 7 for more information on the *DuraFuse Component Dialog*.

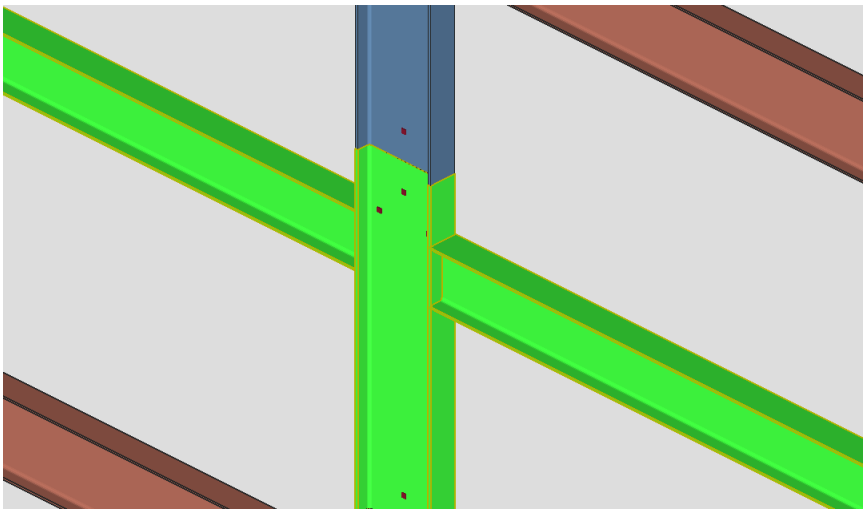

Figure 12. Select Members

5 XML Import Tool

The XML Import Tool imports all information from the XML file to components assigned in an SDS2 model. 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 *DuraFuse 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 the connection ID's have been assigned in the model, select the **DuraFuse XML tool** (sync icon) 
2. After selecting the XML tool, the main dialog will pop up. **Browse** to the saved XML file as shown in Figure 13.
3. Select the button **Import XML Data to DuraFuse Components** (see Figure 14). This will import all the connection information for each connection ID assigned in the model

NOTE: IF AN XML FILE IS IMPORTED, DATA IN THE DURAFUSE COMPONENT DIALOG WILL BE OVERWRITTEN.

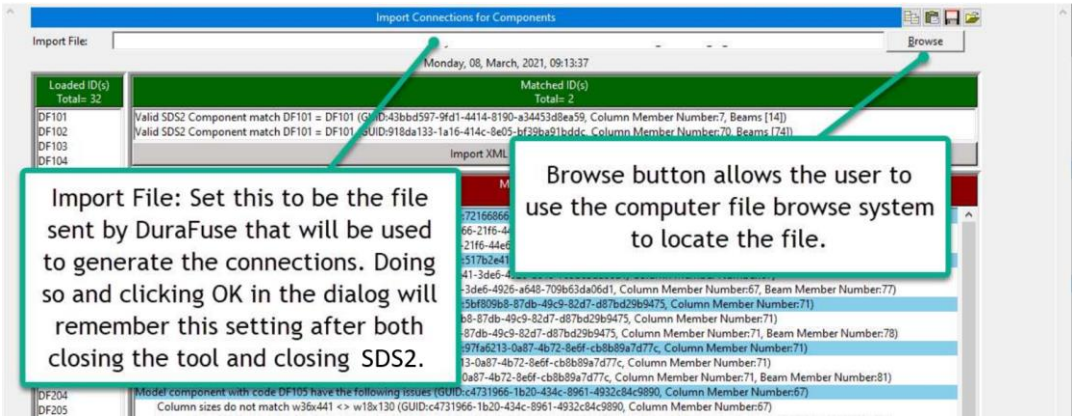

Figure 13. Locate and Import XML Data

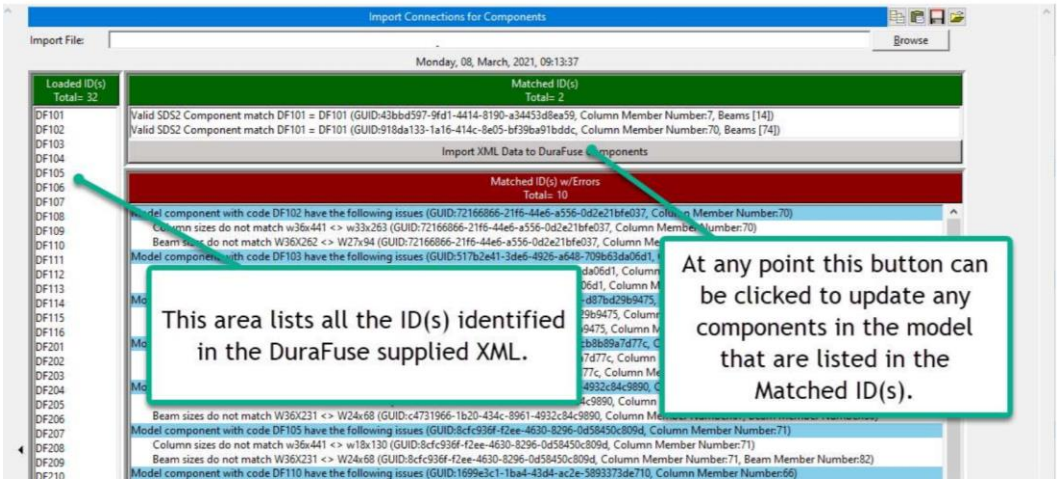

Figure 14. Update the XML and Identified Connection ID's

4. Once the import is complete, there are several sections in the dialog that will let the user know if the components were added successfully or if there are any errors. See Figure 15 through Figure 18 for an explanation each section of the window. Reported items:

- 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

5. Address any errors and make necessary changes to the model or assigned connection ID's.
6. Once the parameters have been imported and all connections rendered, review each connection for accuracy.
7. At this point, the application of the DFF connections is complete, and the user can move on to using the detailing template in section 6. For more information regarding the *DuraFuse Component Dialog* or included configurations, see sections 7 and 8, respectively.

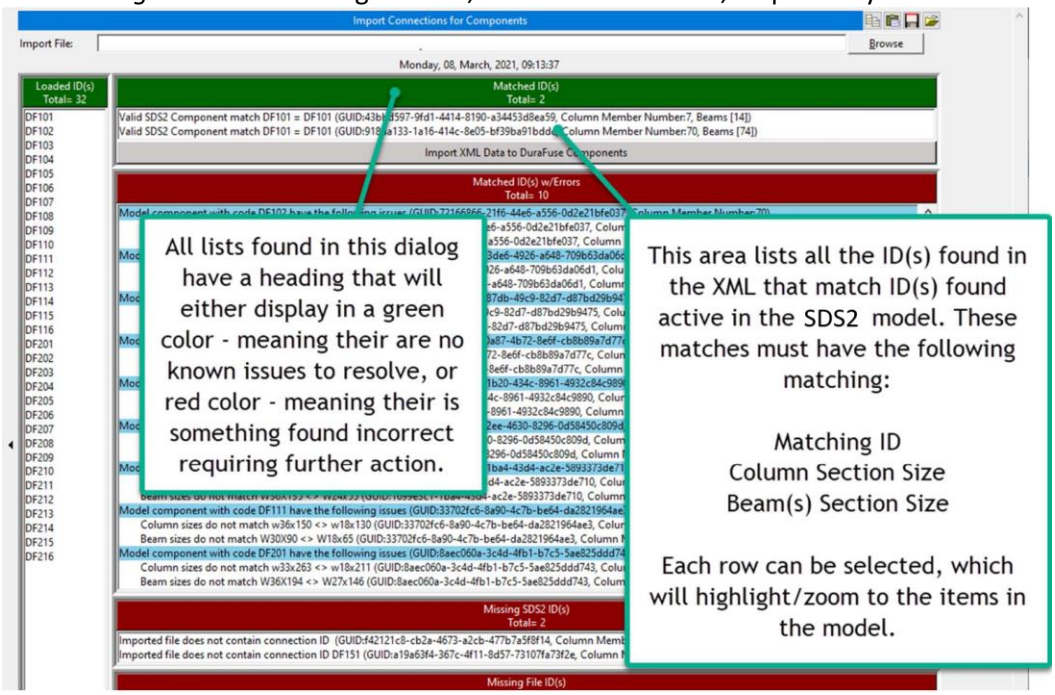

Figure 15. Matched Connection ID's

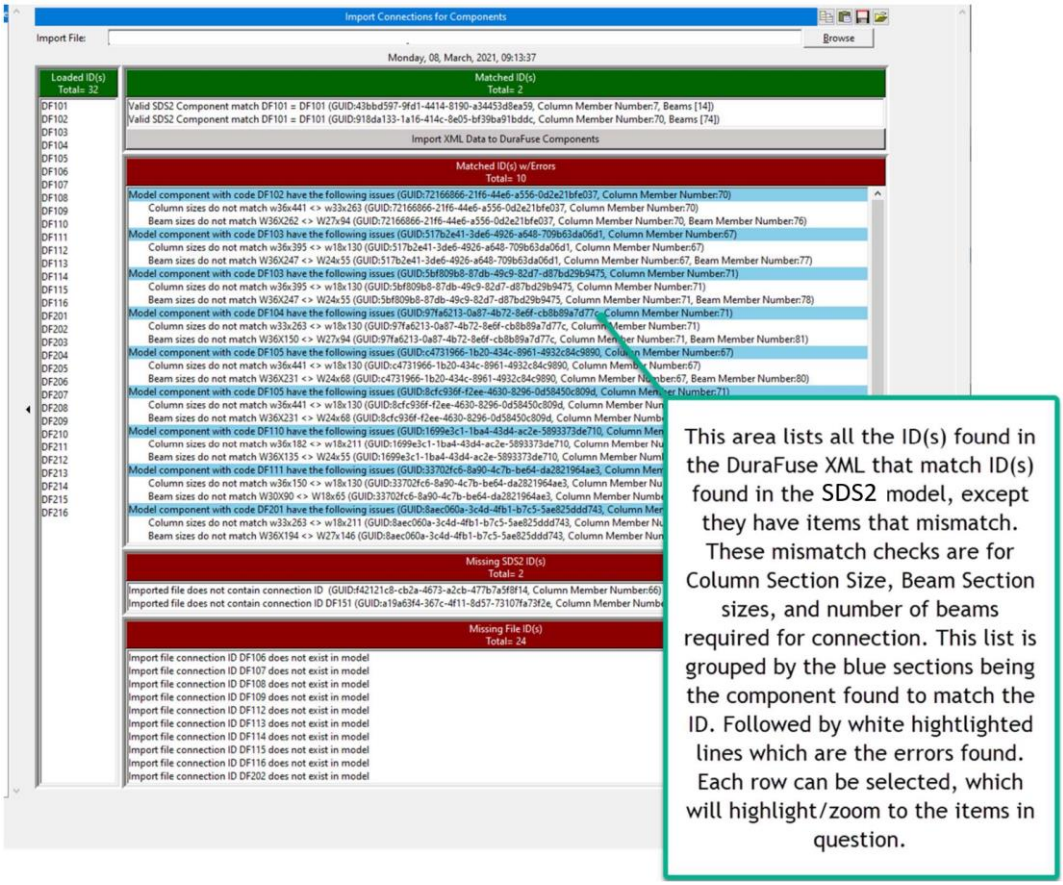

Figure 16. Matched Connection ID's with Mismatched Members

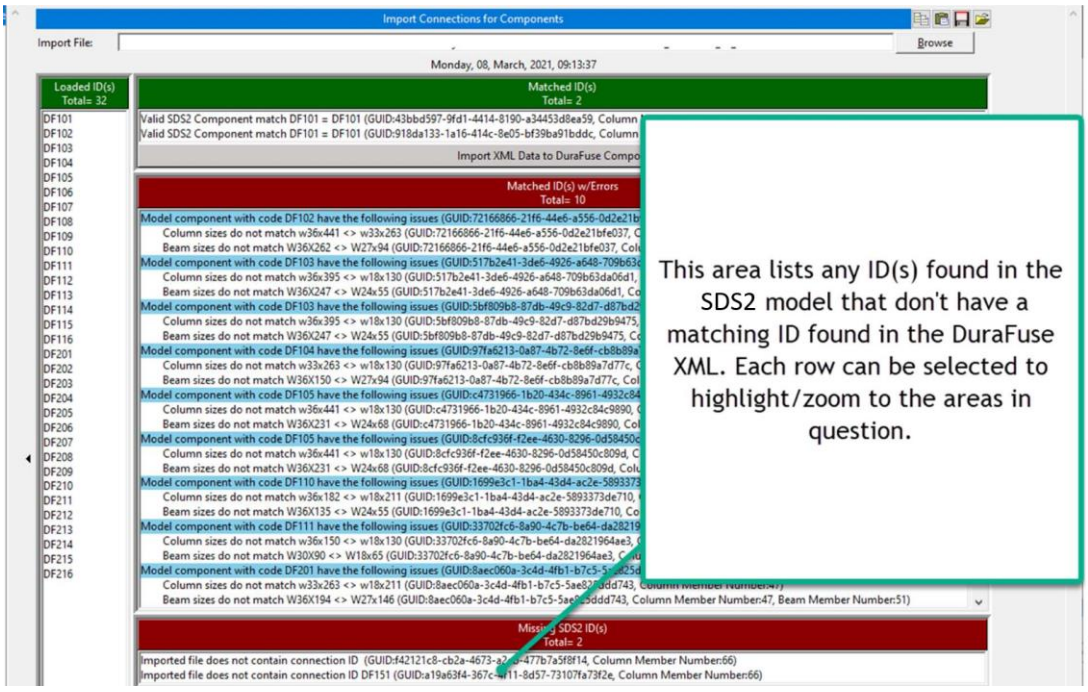

Figure 17. ID's Assigned in the Model That Do Not Exist in the XML File

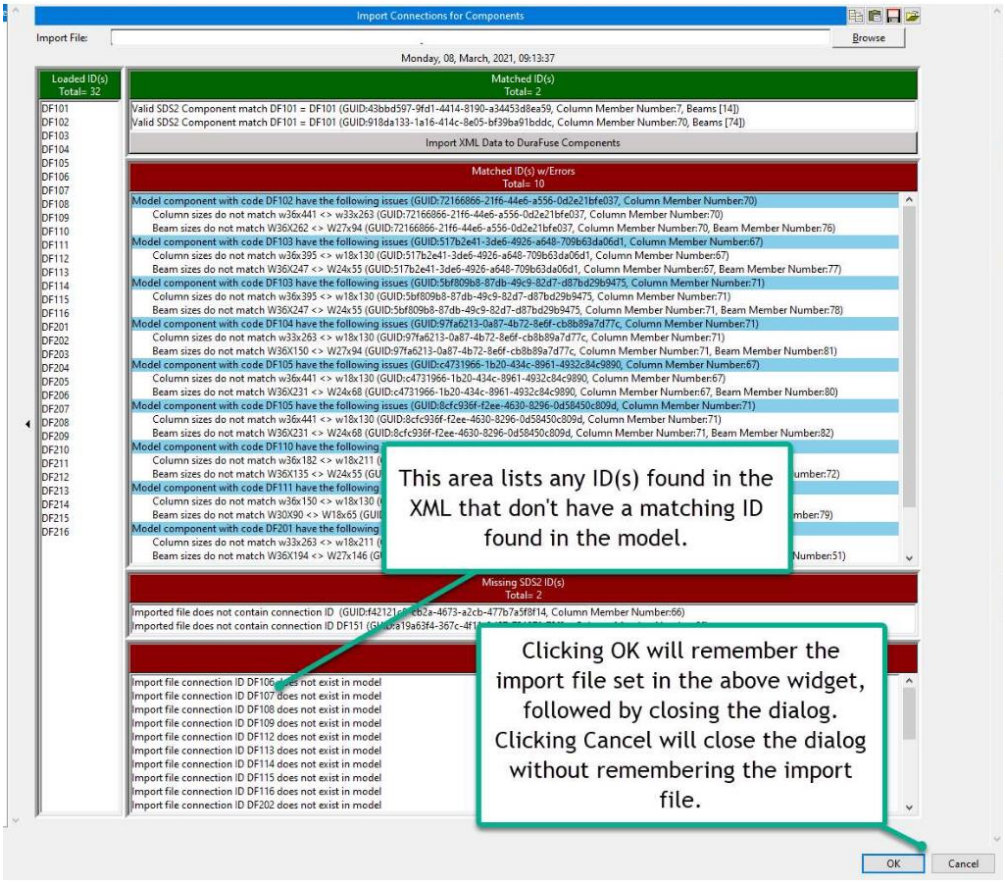

Figure 18. ID's In XML That Has Not Been Assigned in the Model

6 Detailing Templates

Built into the component are detailing templates, specific to the component. When the component is installed, the templates are automatically included. For older projects that did not have the templates or if the user makes an update to the SDS2 software, detailing templates will need to be set up prior to using. The following sections outline how to set up the detailing templates correctly for new and existing projects.

6.1.1 Copying Detailing Templates to Existing SDS2 Projects

Any existing projects can be updated with the new detailing template. If a project was created prior to running the component installer, use the following steps to update the detailing template. Otherwise, new projects can be created without these steps.

1) Open the existing SDS2 project.
2) Select **Utility Functions** from the **SDS2 Main Menu**.
3) Select **Copy Detailing Templates** in **Utility Functions**.
4) On the *Copy Templates Utility* screen (see Figure 19):
    I. Select **Template Folder**. The default path should be the correct location.
    II. Select **Erase existing files from the destination source**.
    III. Click **OK**.

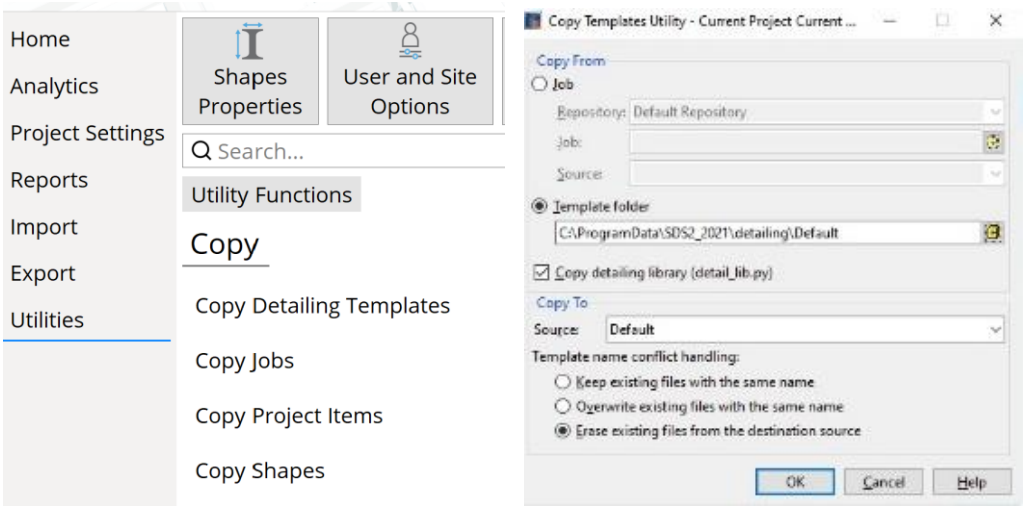

Figure 19. Copy Templates Utility Screen

6.1.2 Copying Detailing Templates to Data Directory

In the SDS2 data directory, there is a *Detailing* folder containing a *Default* and *SDS2* folder. For the first installation of SDS2 software, detailing templates are copied into both folders. However, for additional installations, such as new versions of components or SDS2, only the *SDS2* folder will be updated. This eliminates the possibility of overwriting users' template file modifications in the *Default* folder, which is used when creating new projects. Therefore, when an update is installed for the component or SDS2, the component detailing template will need to be copied from the *SDS2* folder to the *Default* folder for use on new projects.

NOTE: IF MODIFICATIONS ARE MADE TO THE TEMPLATE FILES, PLEASE CONTACT SDS2 SUPPORT FOR HELP IN COPYING FILES

To copy detailing template files from the SDS2 folder to the Default folder:

1) Open the *SDS2* folder in Windows Explorer. The default location is: C:\Program Data\SDS2_202X (current version)\detailing\SDS2.
2) Open the US folder, which is inside the *SDS2* folder.
3) Select all files and right-click **Copy**.
4) Navigate to C:\ProgramData\SDS2_202X (current version)\detailing\Default\US folder and right-click **Paste**.
5) When prompted, choose to **replace the existing files**.

6.1.3 Applying Templates in the Model

The user should perform a few steps to ensure the templates are applied correctly in the model.

Right click on a fuse plate in one of the connections and select **Show Detail**. When the *Annotations and Dimensions* dialog pops up, make sure to turn on the option to **Detail Using Templates,** see Figure 20. Proceed to detail the plate.

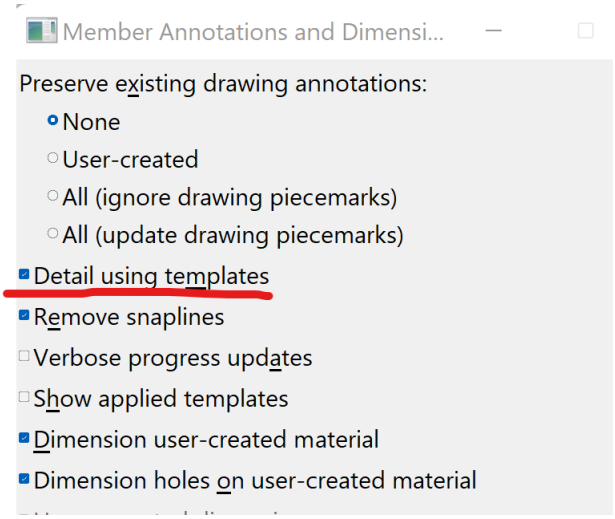

Figure 20. Detail Using Templates

When the detail window shows up, the fuse plate will look like what is shown in Figure 21. Specifically, the fuse plate will be hatched, indicating the protected zone (with accompanying note), and the dimensions shown will be helpful in checking specific DFF parameters included in the schedules. The template also applies other detailing specifics for the column, beam, and other plates for the DFF connection.

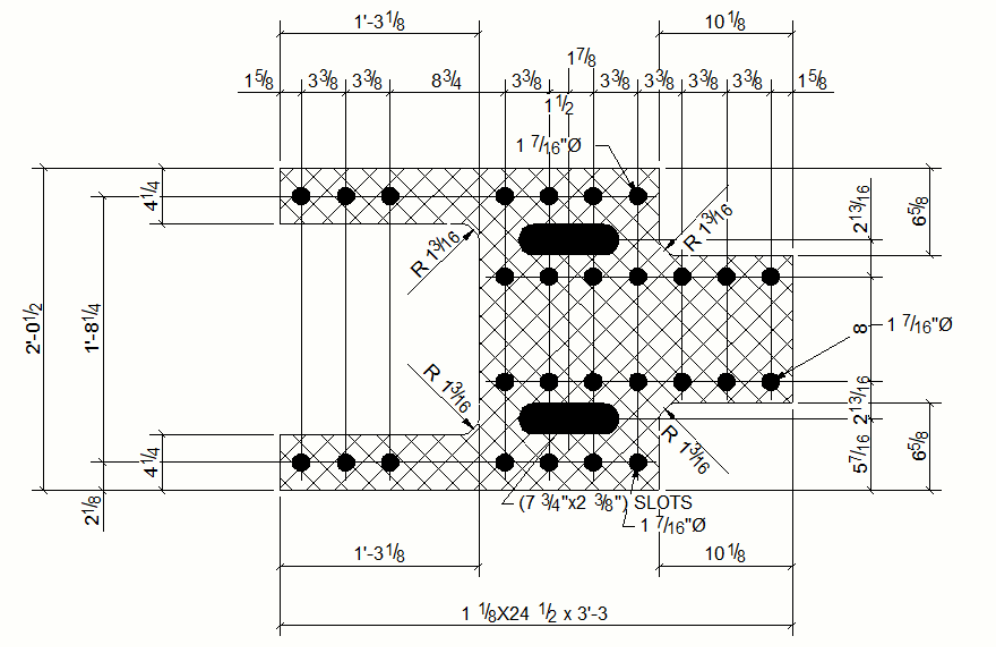

Figure 21. Fuse Plate Detail

7 DuraFuse Component Dialog

Once the data from the XML file has been imported, the fields in the *DuraFuse Component Dialog* should NOT be changed. The following sections outline the information included in the *DuraFuse Component Dialog*.

The *DuraFuse Component* dialog has four sections, see Figure 22 below:

- Graphical Settings
- General Settings
- DuraFuse Connection Settings (Manual /Automated Input)
- User Connection Settings (Automated calculated fields/Overrides)

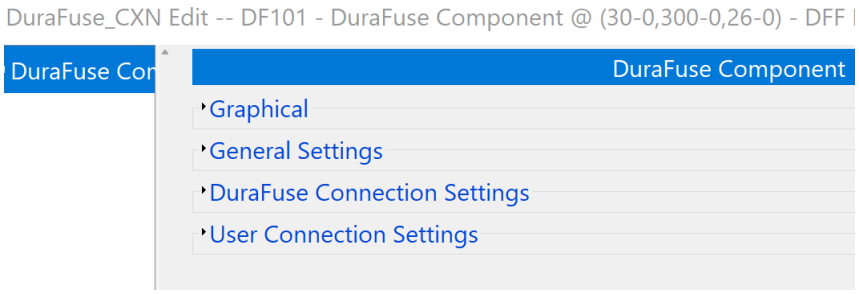

Figure 22. DuraFuse Component Dialog Sections

7.1 GRAPHICAL SETTINGS

Under *Graphical Settings,* the check box indicates whether to keep the component graphical or not. If the check box is not selected (default), then all parameters will be updated automatically. If box is checked next to *Graphical* the component will no longer process and create solids, i.e., it is locked in its current state. A connection will become graphical by any change made to connection materials, welds, holes, bolts, etc. outside of the scope of the component.

Leave the box next to **Graphical** unchecked for typical application.

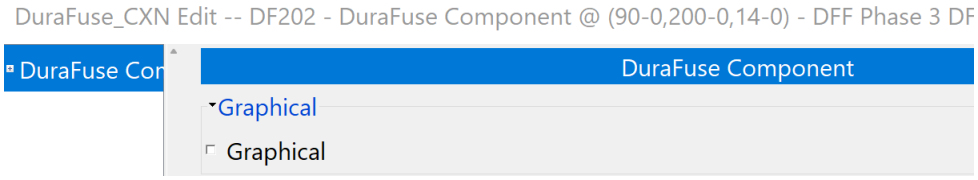

Figure 23. Graphical Settings

7.2 GENERAL SETTINGS

Under *General Settings* (Figure 24), **Connection elevation**, **Connection type**, and the **Connection ID** are displayed:

I. The **Connection elevation** is automatically populated based on the elevation of the selected beam(s).
NOTE: BEAM AND COMPONENT ELEVATION MUST MATCH FOR COMPONENT TO DISPLAY CORRECTLY.

II. If viable connecting beam(s) are found, the **Connection type** will have either *One* or *Two-Sided* options available. For two-sided connections, the “near side” beam always determines the elevation.

- For two beams with the same elevation, a two-sided connection type will automatically be assigned.
- For two beams with differing elevations (step), the connection may not automatically recognize a two-sided connection unless the **Beam Elevation Offset** is indicated for the far sided beam under the section *User Connection Settings*. Refer to section 7.4.1, *Beam Naming Conventions* for more information.

III. The **Connection ID** will be listed as *Custom*. The displayed **Custom ID** will correspond to what the user assigned in section 4.

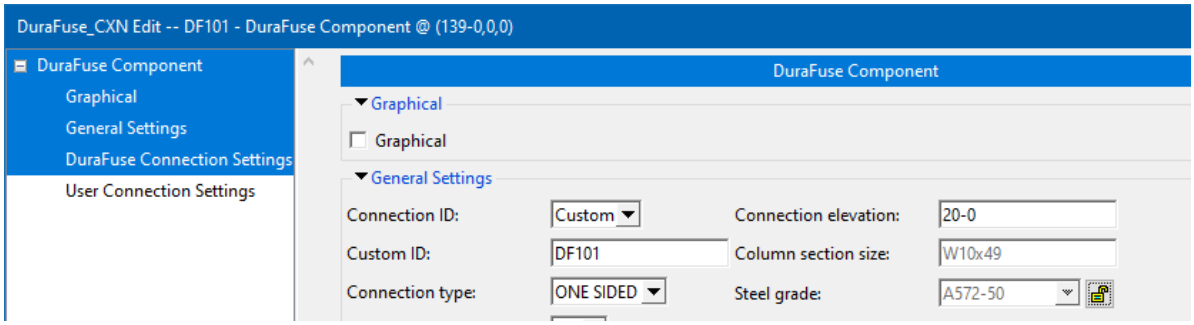

Figure 24. General Settings

7.3 DURAFUSE CONNECTION SETTINGS

Information from the XML file will auto-populate the fields listed under *DuraFuse Connection Settings.* These fields should NOT be overridden or changed. Fields include plate thicknesses, dimensions, weld sizes, bolt size, etc., for each connection ID.

On the bottom left of the dialog is a check box for “Show Images”. When this is checked, the images to the right of the input boxes will show up. Dimensions corresponding to the DuraFuse connection are shown on the images to help guide the user for each of the populated fields.

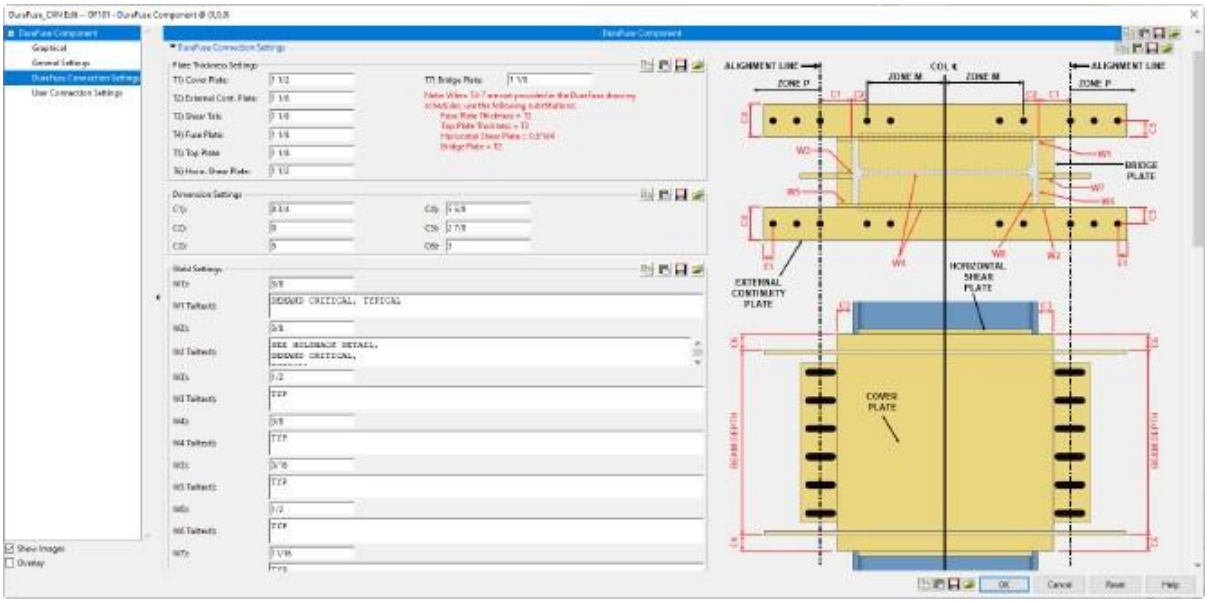

Figure 25. DuraFuse Connection Settings

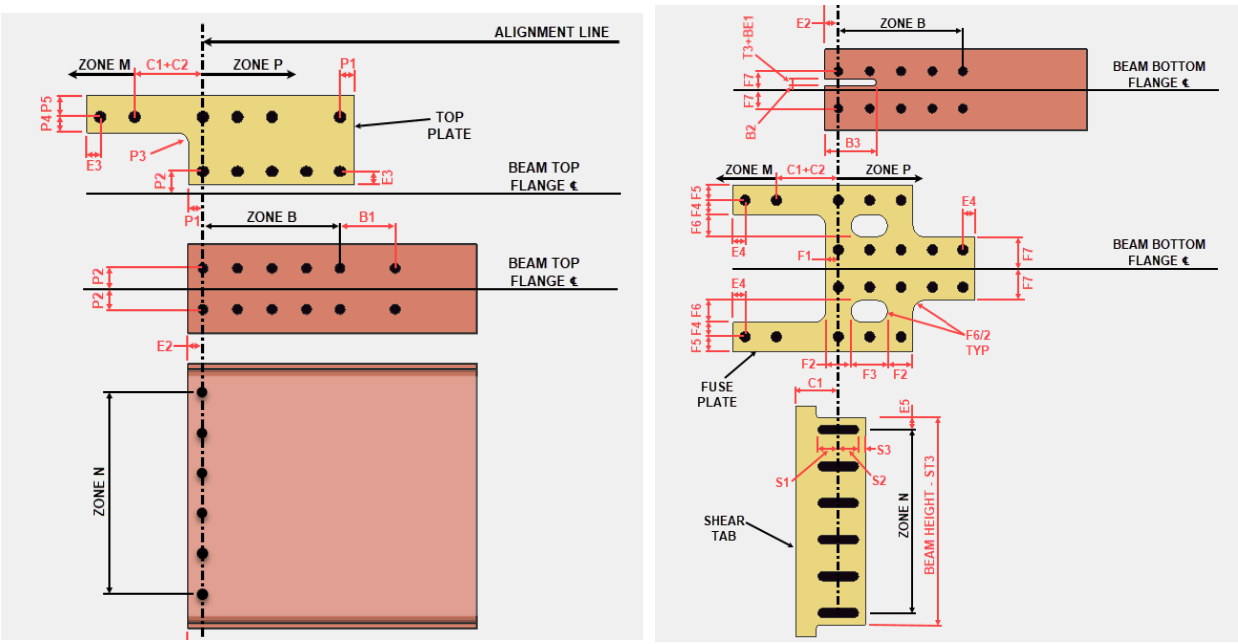

Figure 26. DuraFuse Connection Images & Dimensions

7.3.1 DFF Detailing Rules

DFF schedules may have zeros for some of the component inputs. These zeros indicate that either a plate or weld does not apply. Observe the following rules when reviewing applied components in the model, (refer to connection schedules for applicability):

1. If W4 = 0, shear plates are not created.
2. If W5, W6, and/or W7 = 0, bridge plates are not created.

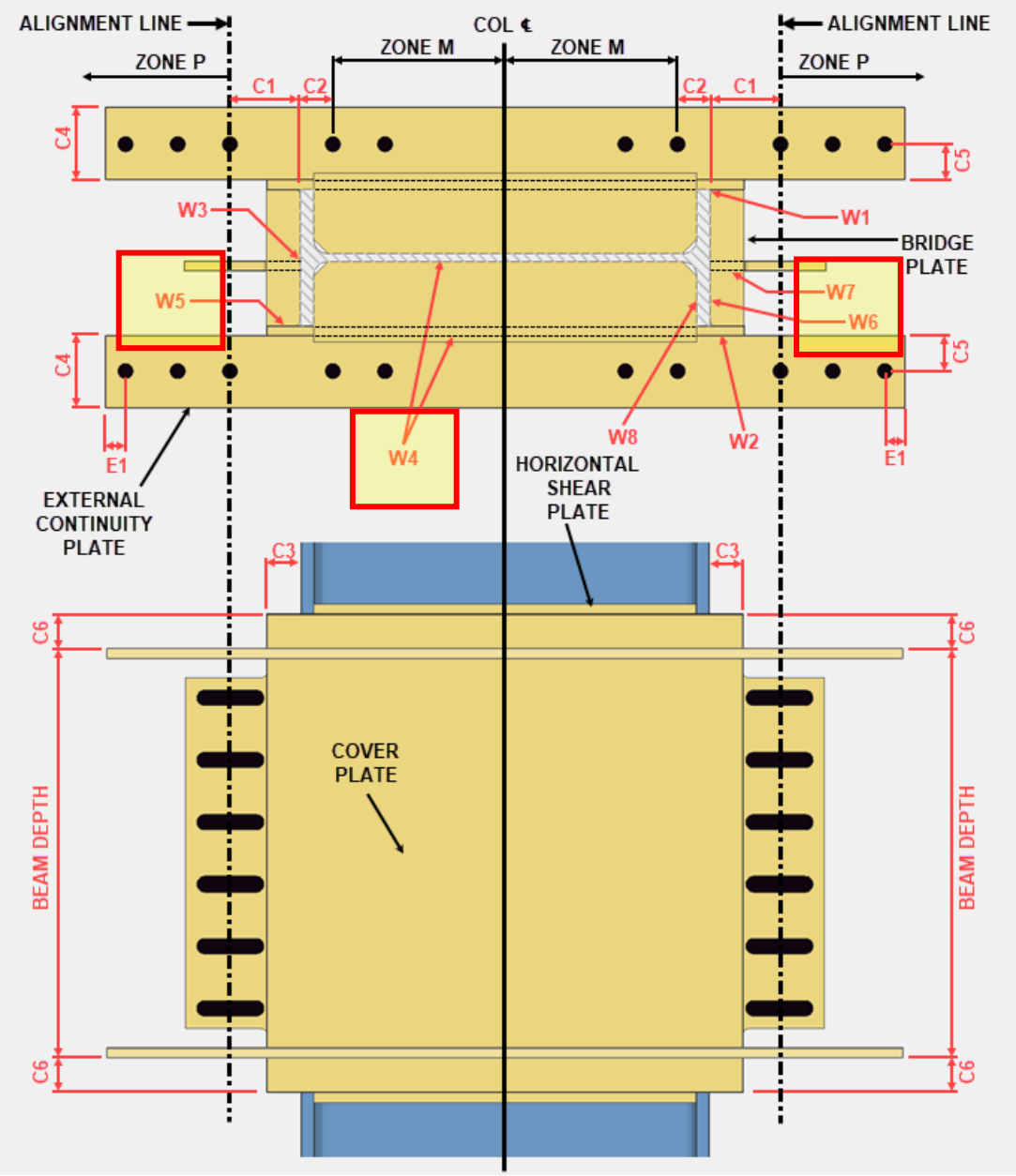

Figure 27. Shear and Bridge Plate Specifics

3. If F3 = 0, fuse hole disappears. F2 will need to be calculated and entered in the component dialog. F2 = F2 + F3/2 (see schedules).

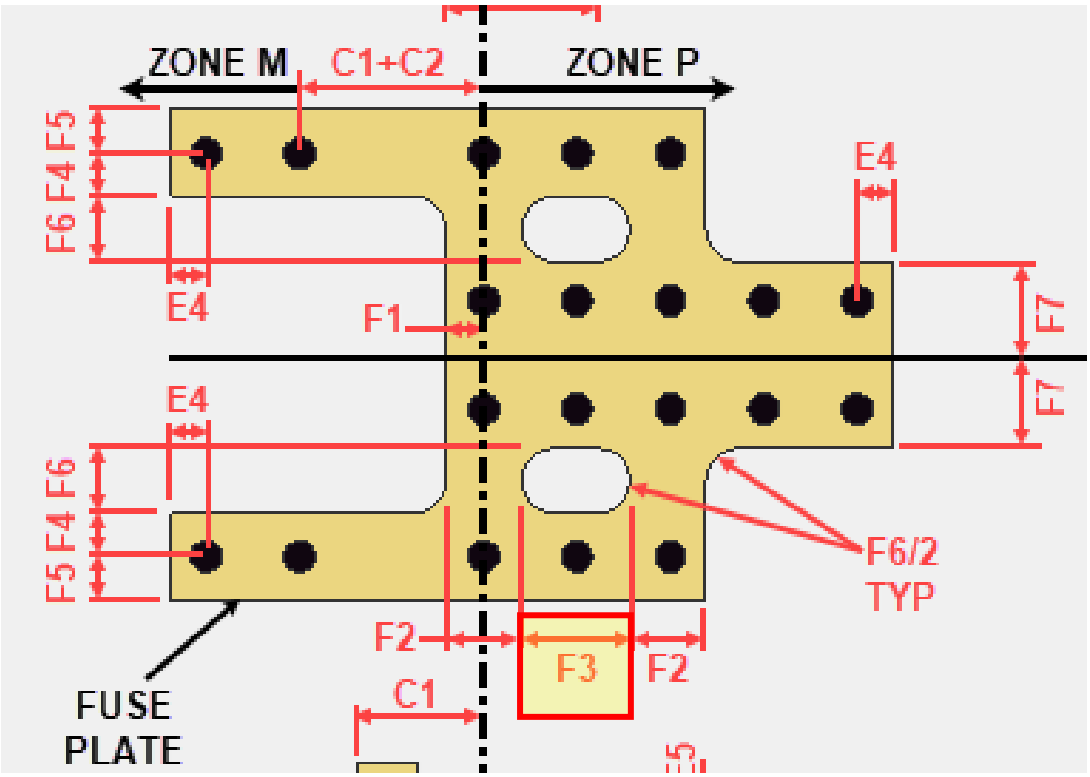

Figure 28. Fuse Hole Specifics

4. If B2 and B3 are “0” (zero), then the beam slot(s) disappears.

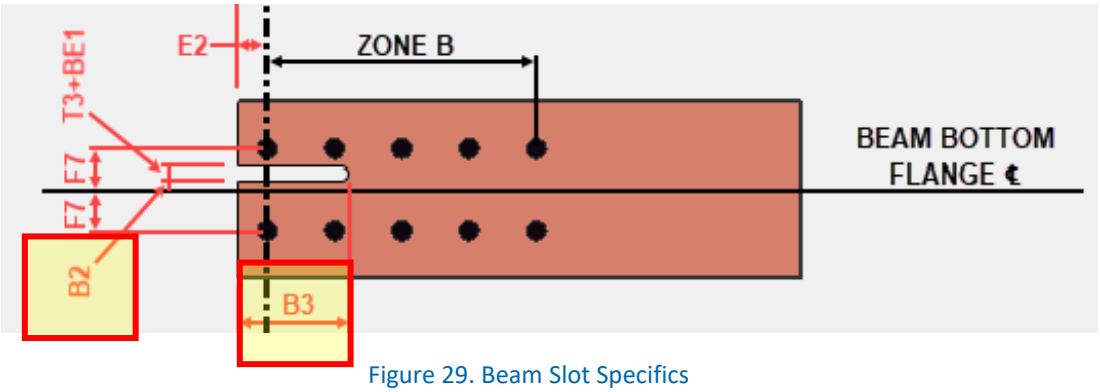

Figure 29. Beam Slot Specifics

7.3.2 Saving Forms

If a user chooses to manually create a connection for testing, at this point, they should save all inputs for a user-defined connection ID. Forms can be created to re-use defined parameters for other locations with the same ID. Use the following steps to create, save and re-use forms:

1. Enter all parameters for a single connection ID.
2. Select the save button at the bottom of the *DuraFuse Component Dialog,* see Figure 30.
3. Choose the location to save and name it after the connection ID, see Figure 31.
4. For a new location with a newly added component, select open when the component dialog opens, and select the form ID to apply to the joint.

5. Select open and the parameters will populate the input boxes.

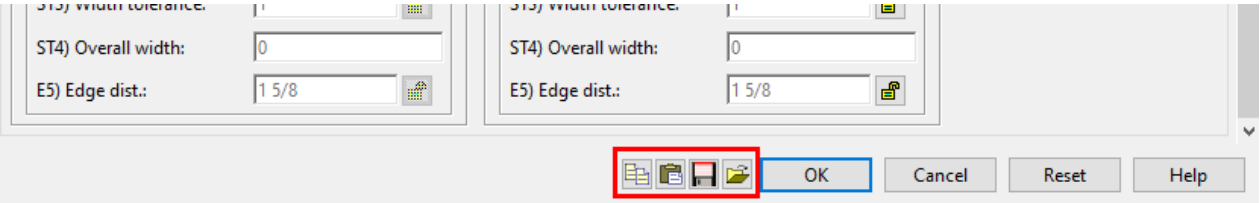

Figure 30. Save or Open Form

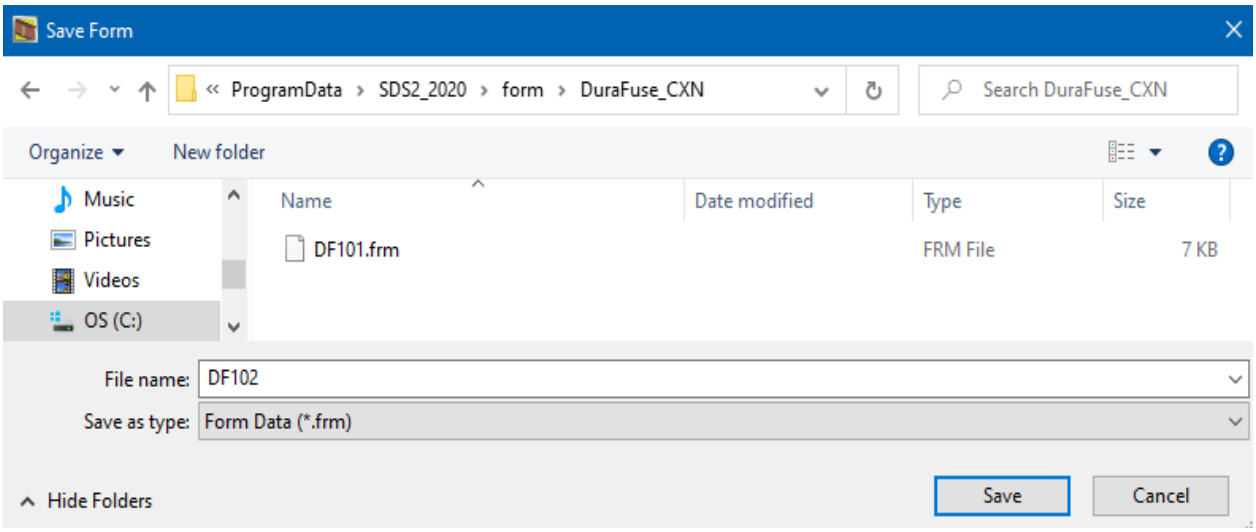

Figure 31. Save Form Dialog

7.4 USER CONNECTION SETTINGS

Fields under *User Connection Settings* are automatically populated based on the inputs fields in the *DuraFuse Connection Settings*. Under the *User Connection Settings*, there are two main columns, where the left column includes inputs for the near side beam and the right column for the far side beam (for more information about beam naming convention, refer to section 7.4.1). The component automatically determines which beam, or both for a two-sided connection, applies for the component and populates these fields.

Any fields in *User Connection Settings* should NOT be overridden or changed. Only a few of these fields can be changed without violating the DFF design (see sections 7.4.1, 7.4.2 and 7.4.3). In these instances, when the user needs to override these fields, select the “lock” button to the right of the input box. Change it to the “locked” position. The value in the input box can now be changed, see Figure 32. For specifics on overrides to bolt edge distance or shear tab bolt spacing, refer to sections 7.4.2 and 7.4.3.

NOTE: WHILE THE USER HAS THE ABILITY TO CHANGE INPUT FIELDS, THE PARAMETERS ARE SPECIFIC FROM THE DFF SCHEDULES AND SHOULD NOT BE ADJUSTED IN THE COMPONENT.

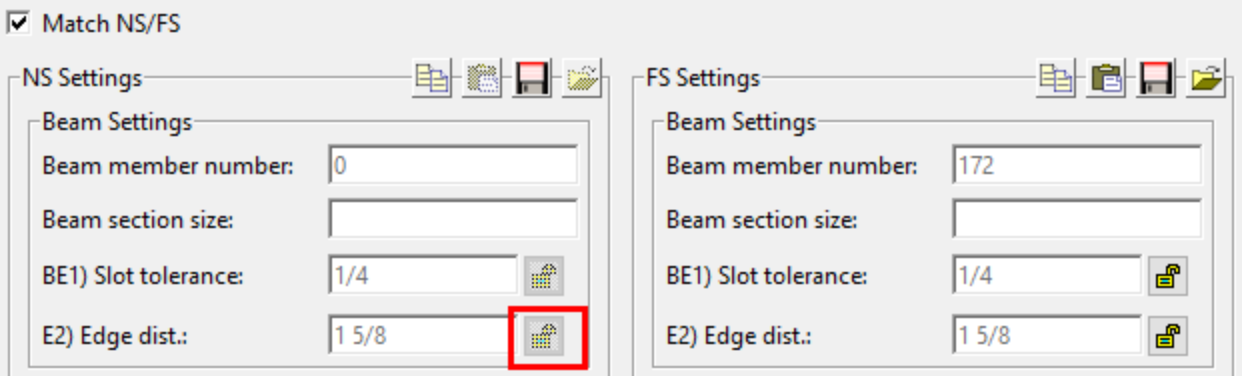

Figure 32. Override Values

7.4.1 SDS2 Beam Naming Convention & Beam Elevation Offset Override

Beams are labelled as near or far side beams. Near side beams are those closest to the datum of the model for a particular joint, and vice versa for far-sided beams. The near side beam always determines the elevation of the component. Understanding which beam is the near or far side becomes important when stepped connections apply. See the following rules for determining what side of the column a beam is on:

a. **One-Sided Connections**: the beam can be near or far sided and the component will automatically determine the elevation of the connection based on the single beam
b. **Two-Sided Connections**: the near sided beam will always be the beam that sets the elevation of the connection.
c. **Two-Sided Connections with Step**: The beam step dimension could be negative or positive, depending on the elevation difference between the near or far side beam. The step dimension will be entered into the far side beam. If the far side beam is higher in elevation than the near side, the step will be a positive number for the far side beam. If the far side beam is lower in elevation than the near side, the step will be a negative number for the far side beam. This offset will be entered under the *User Connection Settings* in the **Beam Elevation Offset** input box, see Figure 33. When beam steps apply, and the correct offset has been entered, the option for a Two-Sided Connection will be available and should be selected in the **Connection Type**, see section 8.4 *Steps* for more information.

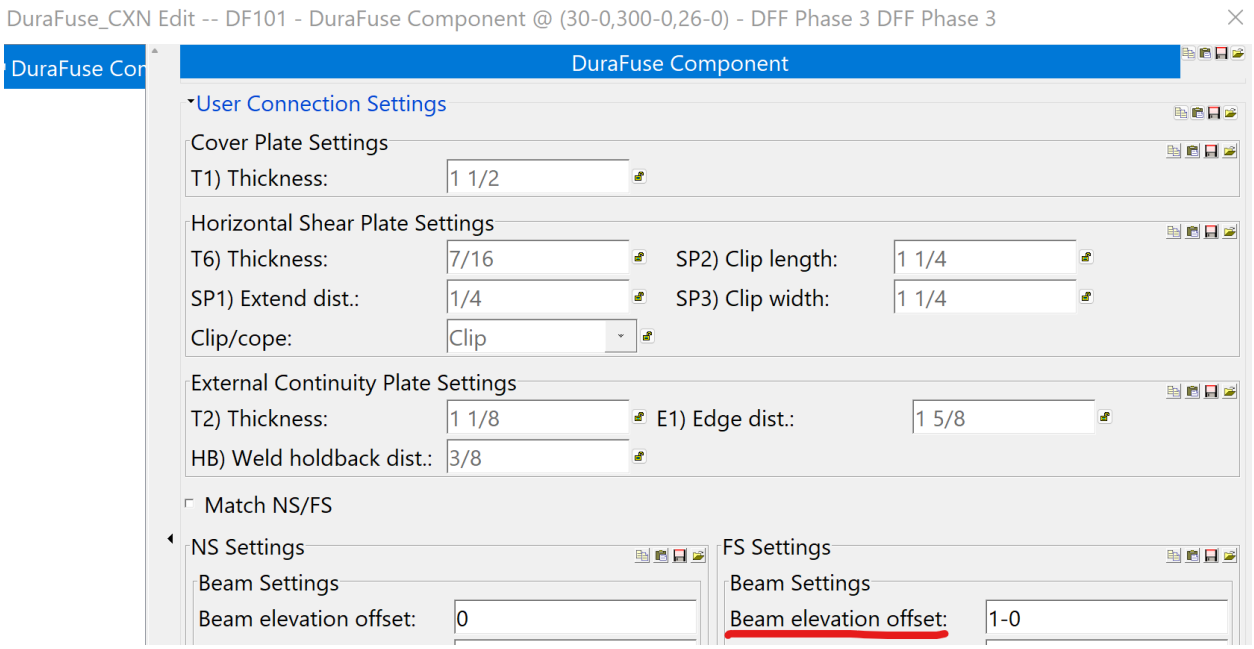

Figure 33. Beam Elevation Offset

7.4.2 Bolt Edge Distance Override

Bolt edge distance applies to several locations in the DuraFuse connection such as the shear tab, top plate, fuse plate and beam edge distance (see DFF drawings for where these edge distances apply). These edge distances are calculated from tables provided in AISC 360, based on the hole type and bolt diameter. The edge distance will be auto-populated based on the bolt diameter. If the user chooses to use something different than what is provided, it should be close to what is recommended by the code.

7.4.3 Shear Tab Bolt Spacing Override

Shear tab bolt spacing, ST1, is calculated based on the length of the shear tab, ST_Len:

ST_Depth = Beam T – 1”

ST1 = (ST_Len – 2*E5)/(N-1)

where, E5 is the edge distance for the shear tab

N = Number of shear tab bolts

The shear tab spacing will be auto-populated based on the previous equations. 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.

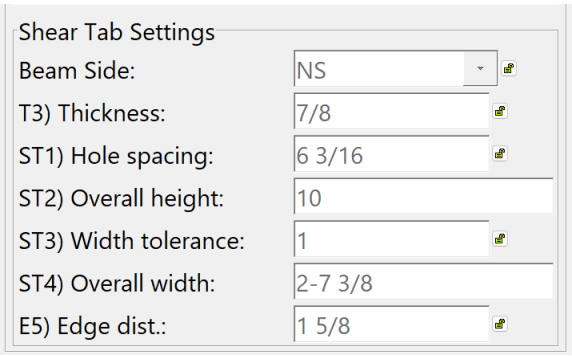

Figure 34. Shear Tab Edge and Bolt Spacing

8 Specific Information for Included Configurations

The component can accommodate several different configurations including the following:

- One-Sided
- Two-Sided Same Beams
- Cap Plates
- Steps
- Slopes
- Double Slopes
    - Bent Plate Option
    - CJP Option

See the following sections for details on modelling these specific connections. Not currently included are two-sided with beams of different depth, 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 of a one-sided connection modelled in SDS2 is shown below.

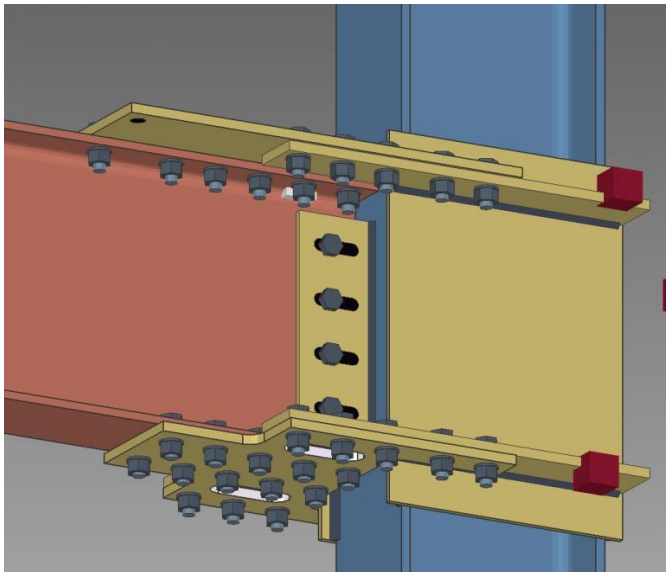

Figure 35. DuraFuse Frames 1-Sided Connection

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.

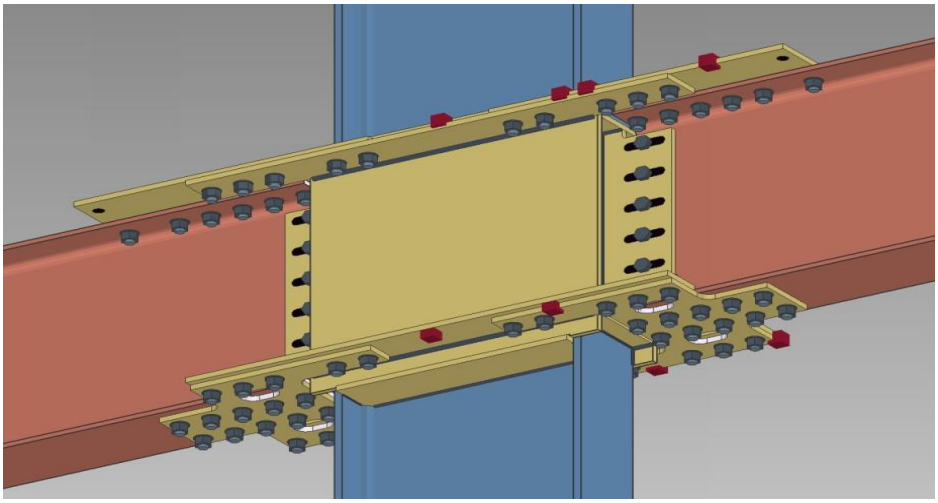

Figure 36. DuraFuse Frames 2-Sided Connection

8.3 CAP PLATES

A cap plate option is available for connections at the top of a frame. The **Roof Cap Connection** option can be selected in the *General Settings* section of the Component Dialog, see Figure 37. Instead of having separate shear and external continuity plates, the cap plate replaces those with a single plate, see Figure 38 for typical cap plate connection.

NOTE 1: IF THE TOP OF COLUMN ELEVATION IS TALLER THAN THE BEAM ELEVATION, THE COLUMN WILL BE CUT TO THE CORRECT ELEVATION WHEN THE CAP PLATE IS APPLIED. IF THE COLUMN IS

SHORTER THAN THE BEAM ELEVATION, THE COMPONENT WILL NOT DISPLAY CORRECTLY. MAKE SURE TO EXTEND THE COLUMN TO THE CORRECT HEIGHT TO AVOID THIS ISSUE.

NOTE 2: THE CAP PLATE OPTION DOES NOT APPLY AT DOUBLE SLOPED CONNECTIONS. THEREFORE, THE BENT EXTERNAL CONTINUITY PLATE OPTION (ONLY APPLICABLE TO DOUBLED SLOPED CONNECTIONS) WILL BE GREYED OUT WHEN CAP PLATE CONNECTIONS APPLY. (SEE Figure 37**).**

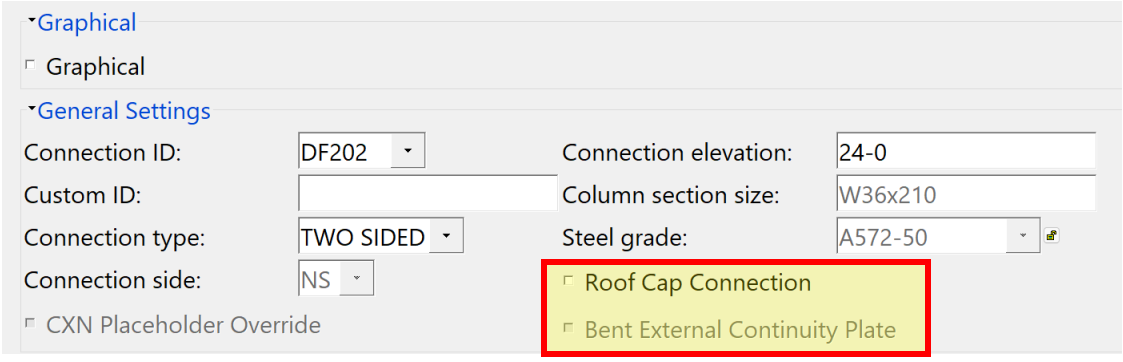

Figure 37. Cap Plate Option

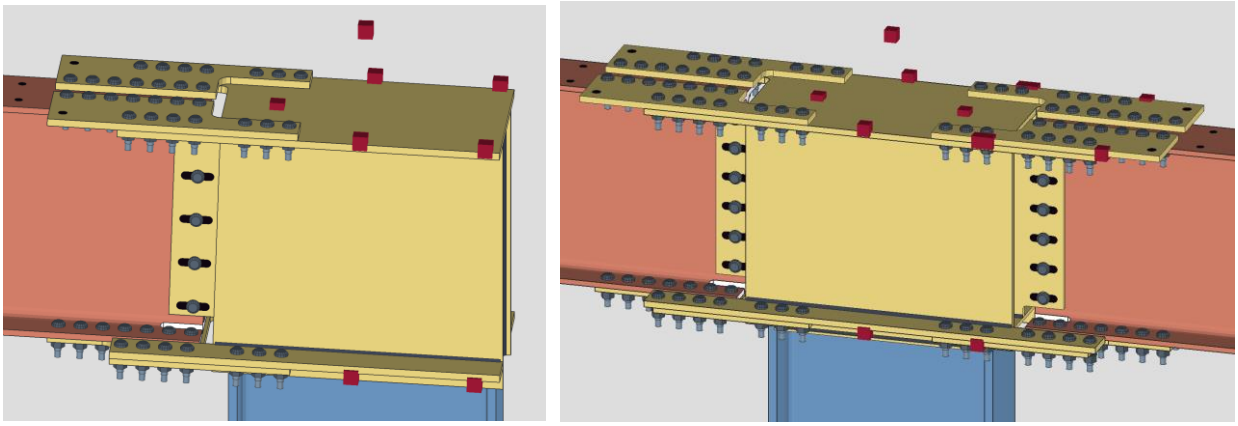

Figure 38. Cap Plate Connection

8.4 STEPS

Beams may be offset from each other by a minimum of 6”. See Figure 39 for a typical stepped connection. The near side beam will establish the elevation of the component. The offset should be entered in the far side **Beam Elevation Offset** under the *User Connection Settings* in the component dialog, refer to Figure 33.

NOTE: 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.

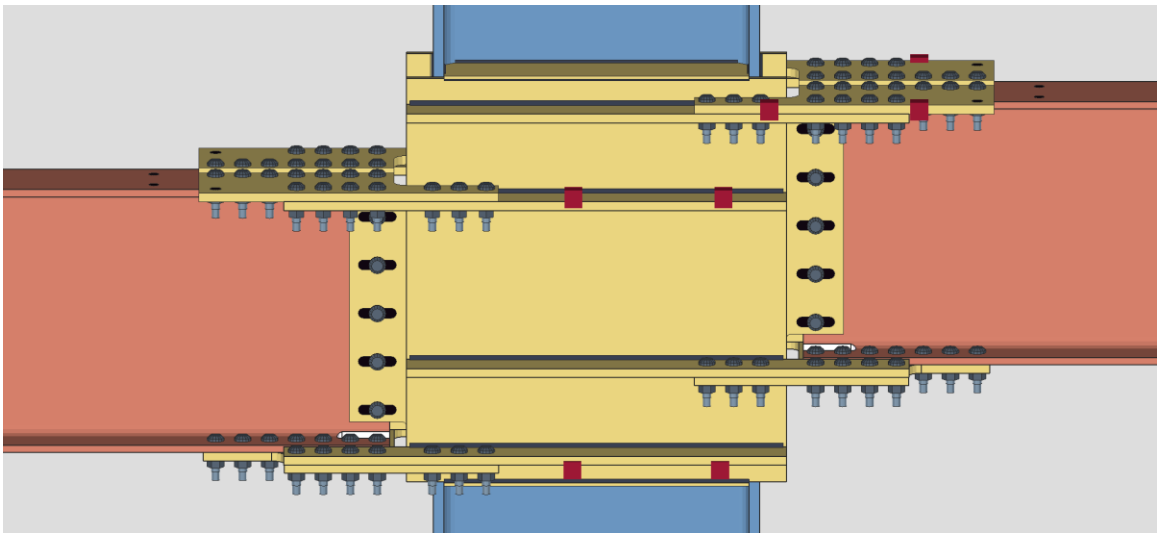

Figure 39. Beam Step

8.5 SLOPES

Slopes apply to one-sided and two-sided connections. See figures below for typical sloped connections.

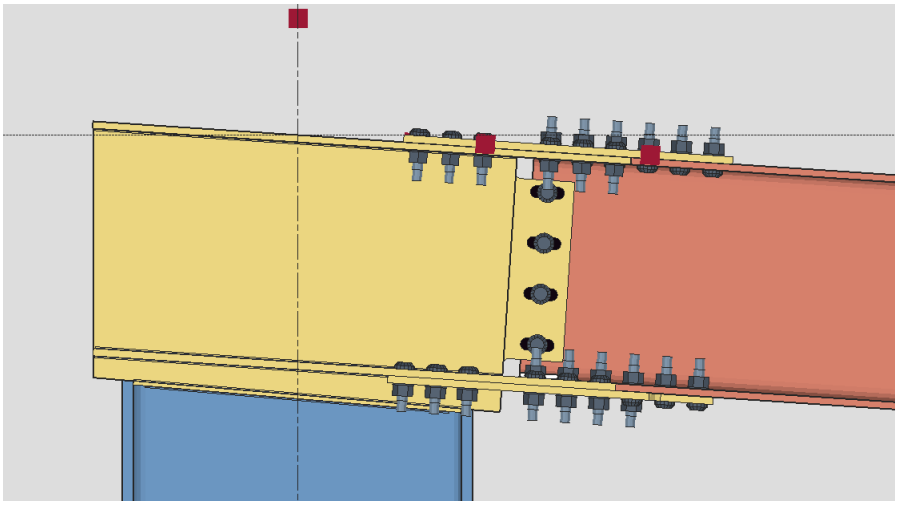

Figure 40. Sloped One-Sided Connection

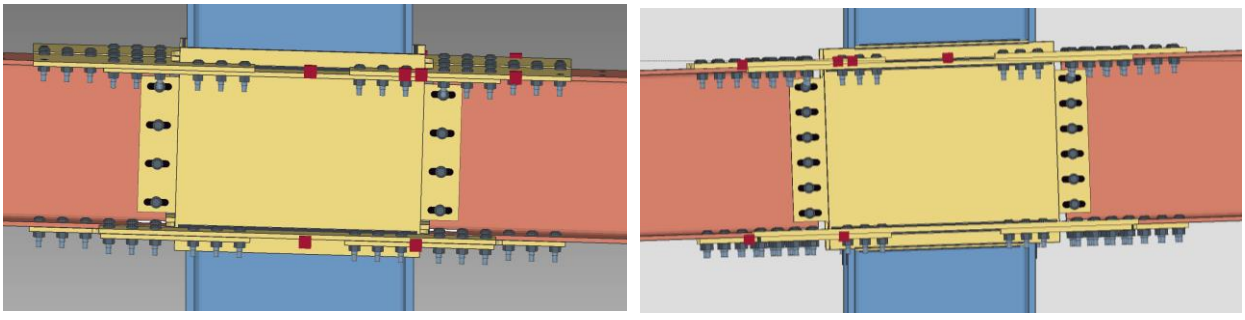

Figure 41. Sloped Two-Sided Connection

8.6 DOUBLE SLOPES

Double sloped connections apply for 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 in the *General Settings* section of the Component Dialog, see Figure 42. If it is not selected, the CJP option will apply. See figures below for various examples of sloped conditions with bent plates or CJP options.

NOTE: THE CAP PLATE OPTION DOES NOT APPLY TO DOUBLE SLOPED CONDITIONS. THE OPTION WILL BE GREYED OUT FOR THESE CONDITIONS.

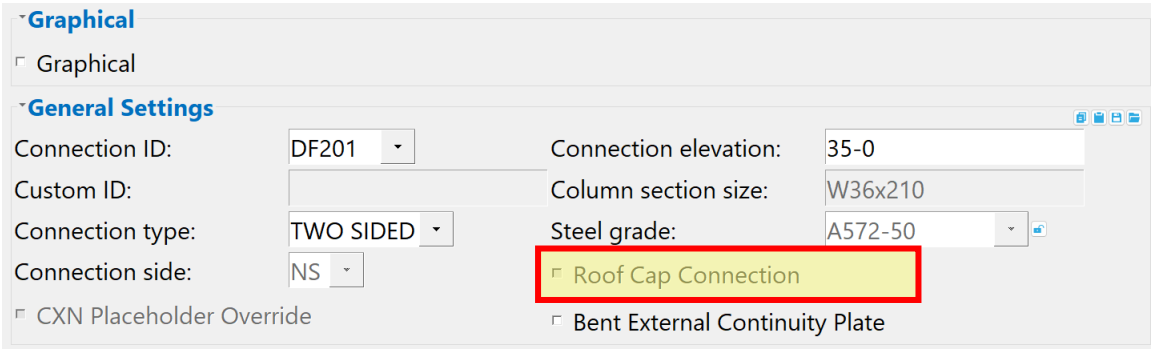

Figure 42. Bent External Continuity Plate Option

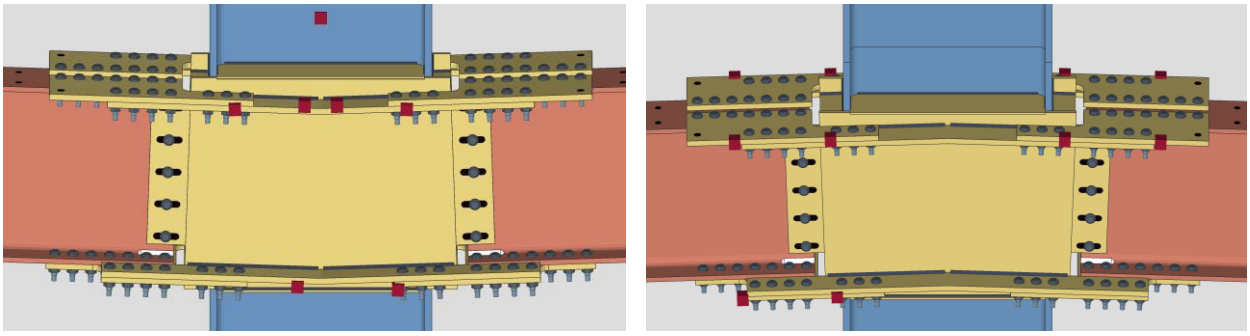

Figure 43. Double Sloped - Bent External Continuity Plate Option

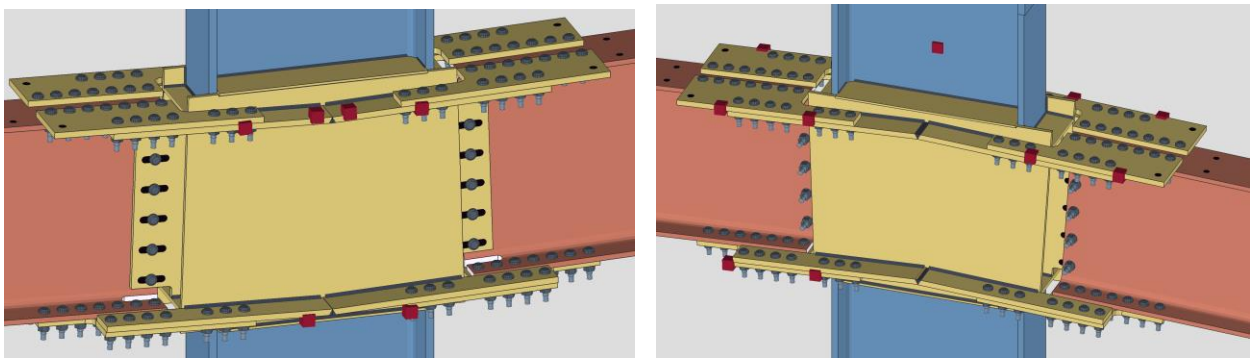

Figure 44. Double Sloped - CJP External Continuity Plate Option