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Advance Steel for Building Information Modeling (BIM): Seamless Workflow from Design to Fabrication

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Learning Objectives

- Learn how to export Revit Structure model and import into Advance Steel
- Learn how to create automated steel connections between the members imported from Revit
- Learn how to generate automated fabrication drawings and NC files
- Learn how to use Sync to review and import any Revit changes into Advance Steel or validate an Advance Steel model in Revit

Description

To maintain a competitive advantage, more and more structural engineers are trying to find a way to capitalize on their Building Information Modeling (BIM) data for steel detailing and fabrication. This class will focus on showing how Advance Steel software is proving to be the missing link that enables structural engineers to capitalize on their Revit Structure software models for steel detailing and fabrication. You will also learn how to use Connection Vault in Advance Steel software to create automated steel connections on the structural members imported from Revit software. You will then learn how to create the automated fabrication and erection drawings and NC files. This class will also show how the bidirectional sync between Revit software and Advance Steel software enables you to bring any Revit software changes into Advance Steel software or validate Advance Steel models in Revit software.

Your AU Expert

*Deepak is a qualified Mechanical Engineer with more than 17 years of experience of working with various CAD software. He is currently working as the Product Manager - BIM/MFG Solutions, with Cadgroup Australia and is a regular speaker at Autodesk University in Las Vegas, USA. Deepak is also one of the lead presenters showcasing the latest Autodesk technology at various events all around Australia. Deepak is the author of the Best Selling "**Up and Running with Autodesk Navisworks**" series of books and is also the author of the "**Up and Running with Autodesk Advance Steel**" book to be released in the first quarter of year 2016. In addition to his day job and the book writing hobby, Deepak is also a guest lecturer at the University of Technology Sydney (UTS) and University of New South Wales (UNSW), two of the biggest universities in Australia. More information about Deepak can be found on his website www.deepakmaini.com.*

Introduction to Autodesk Advance Steel

Autodesk Advance Steel is purpose-built software for structural engineers and steel detailers. Running on the AutoCAD platform, this software caters to the needs of the BIM and Plant/Mining industries by providing specialized tools to automate the process of creating complex structural models and connections. It also increases the user productivity by automatically generating detailed fabrication and shop drawings, reports, bill of materials (BOM), and NC/DSTV files for steel cutting. Figure 1 shows a structural steel model created for the mining industry.

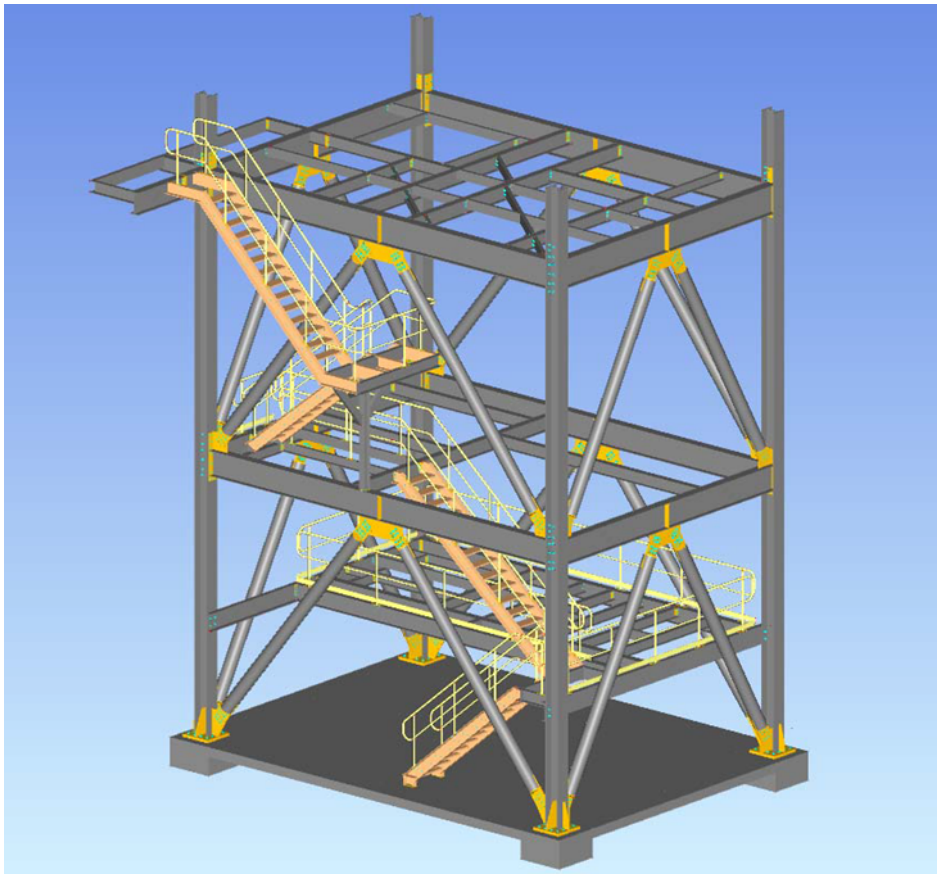

FIGURE 1: STRUCTURAL STEEL MODEL CREATED FOR THE MINING INDUSTRY

While working with Building Information Modeling (BIM) data, Autodesk Advance Steel has bidirectional workflows with Autodesk Revit. Using the Autodesk Advance Steel add-in for Autodesk Revit, you can directly import Autodesk Revit models into Autodesk Advance Steel for creating connections and generating detailed documentation. You can also import Autodesk Advance Steel models into Autodesk Revit for design verification. Figure 2 shows a structural steel model created in Autodesk Revit and imported into Advance Steel. The model used in the class demonstration was a section of this model.

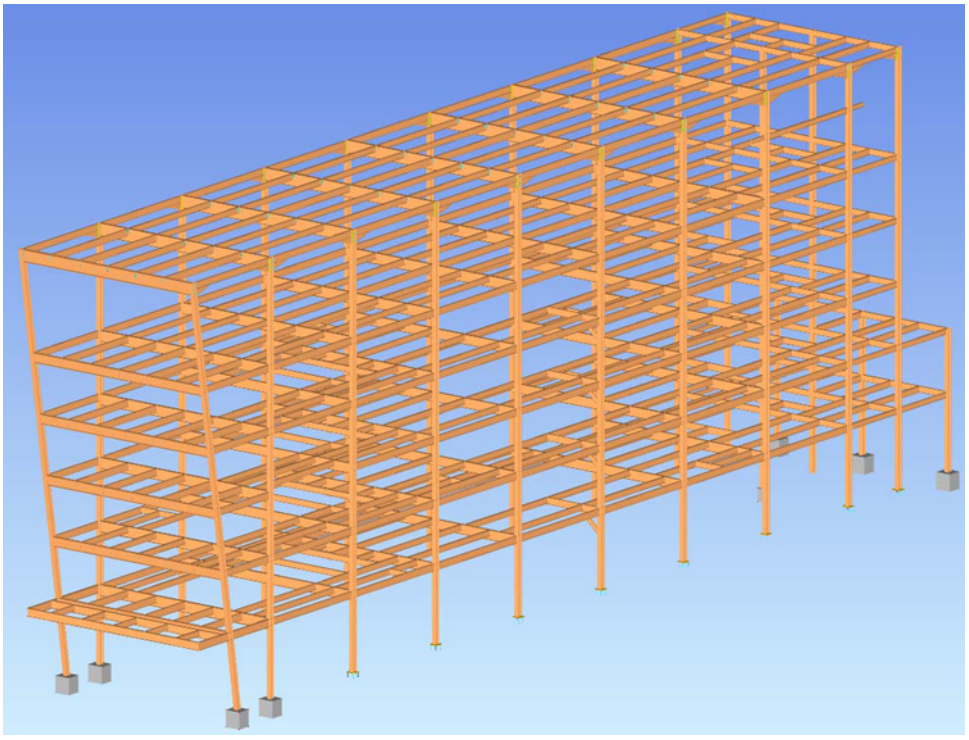

FIGURE 2: A STRUCTURAL STEEL MODEL CREATED IN AUTODESK REVIT AND IMPORTED INTO ADVANCE STEEL

Downloading the Advance Steel 2016 Extension for Revit

To be able to export the Revit Structure model for importing in Advance Steel, you need to download and install the **Advance Steel Extension**. The following section shows how to download this extension.

1. From the Revit software, click on the **Exchange Apps** button, as shown in Figure 3.

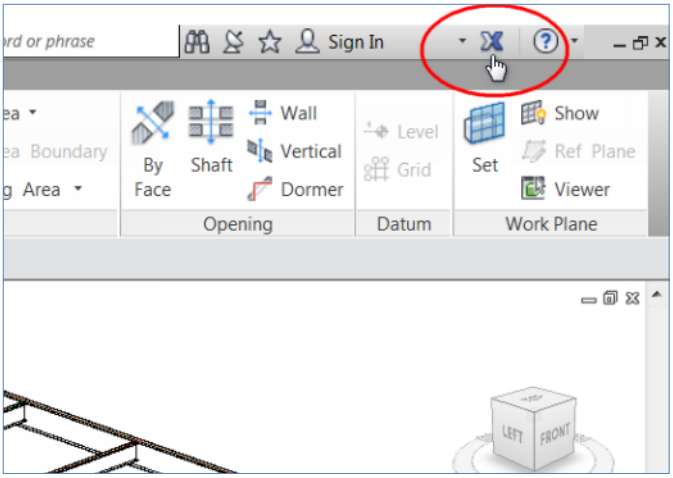

FIGURE 3: THE **EXCHANGE APPS** BUTTON

2. On the Exchange Apps store, search for **Advance Steel 2016 Extension**. It is a free Add-In for the Autodesk Subscription customers.

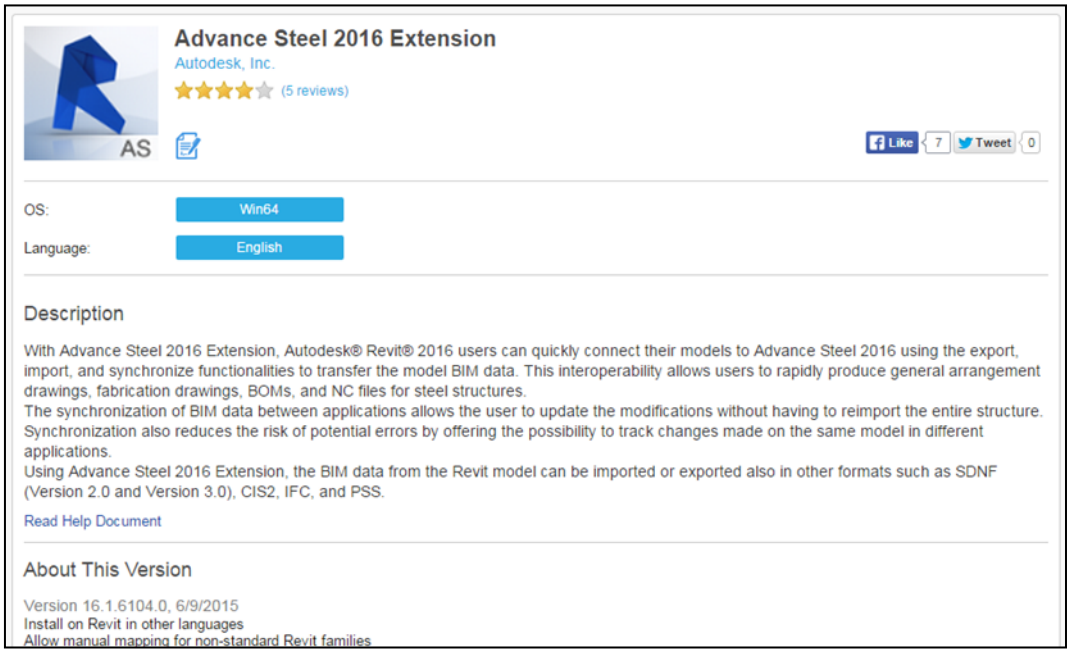

FIGURE 4: THE **ADVANCE STEEL 2016 EXTENSION**

3. Download and install this add-in. You will have to close Autodesk Revit before installing this.

4. After the add-in is installed, it will be listed in the **Add-Ins** tab, as shown in Figure 5

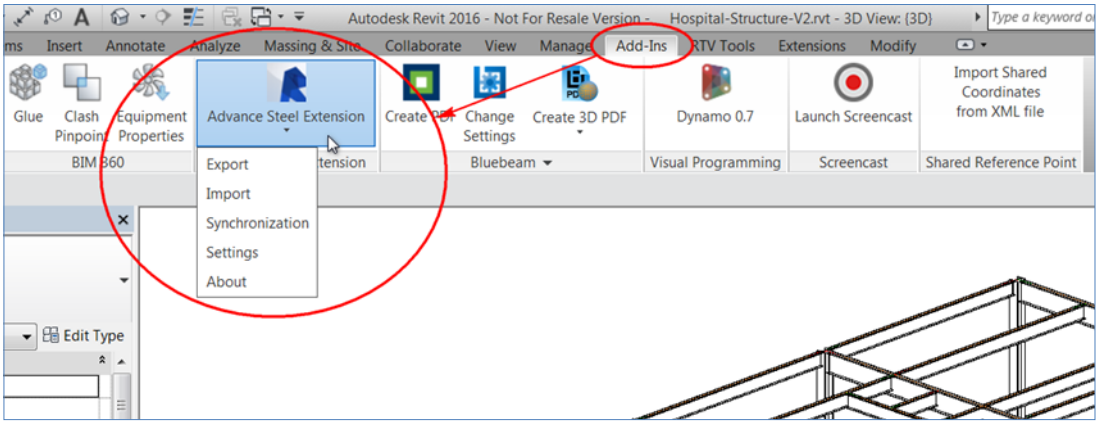

FIGURE 5: THE **ADVANCE STEEL EXTENSION** ADD-IN

Exporting Revit Structure Models

Now that you have installed the Advance Steel add-in, you are ready to export the Revit Structure model. The recommended format for exporting the Revit Structure model is SMLX format (Steel Markup Language). However, it is a good idea to first check the export settings to make you the right content gets exported. The following section explains how to configure the export settings and then export the model.

1. From the **Add-Ins** tab > **Advance Steel Extension** flyout, click **Settings**; the **Settings** dialog box is displayed, as shown in Figure 6.

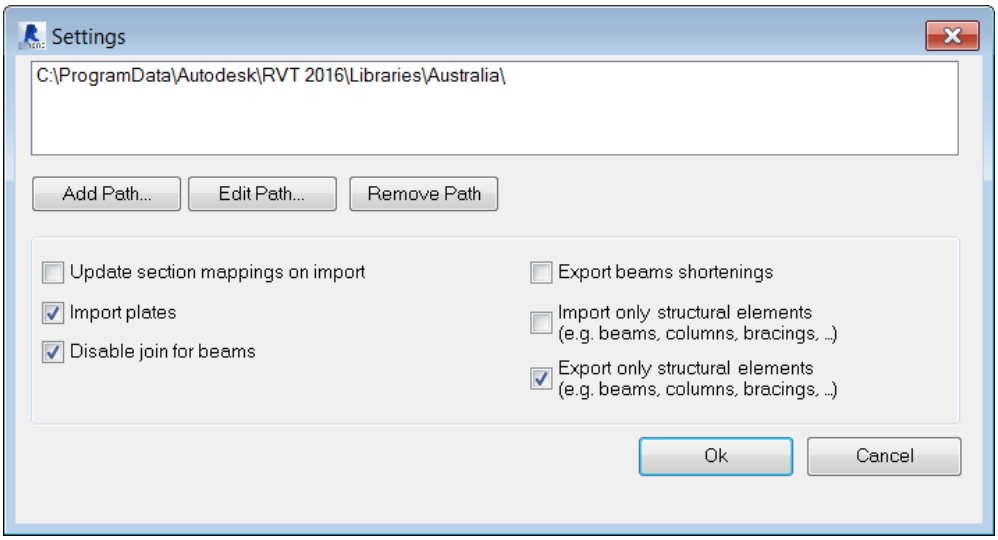

FIGURE 6: THE **SETTINGS** DIALOG BOX

2. Clear the **Export beams shortenings** tick box. This will ensure the beam shortenings created inside Autodesk Revit is not exported. This is because the beams will automatically be shortened while creating connections in Advance Steel.

3. Select the **Export only structure elements** tick box if you do not want to export elements such as concrete slabs, footings, etc.

4. Click **OK** in the dialog box.

***Tip**: Before exporting the model, you need to find if you want to export the entire model, or the selected items from the model. If you want to export the entire model, you do not need to select anything before exporting. The entire model will be automatically selected for exporting. However, if you want to export only some items from the model, you need to select those items first from the Autodesk Revit window before you invoke the **Export** tool.*

5. From the **Add-Ins** tab > **Advance Steel Extension** flyout, click **Export**; the **Export utilities** dialog box is displayed, as shown in Figure 7.

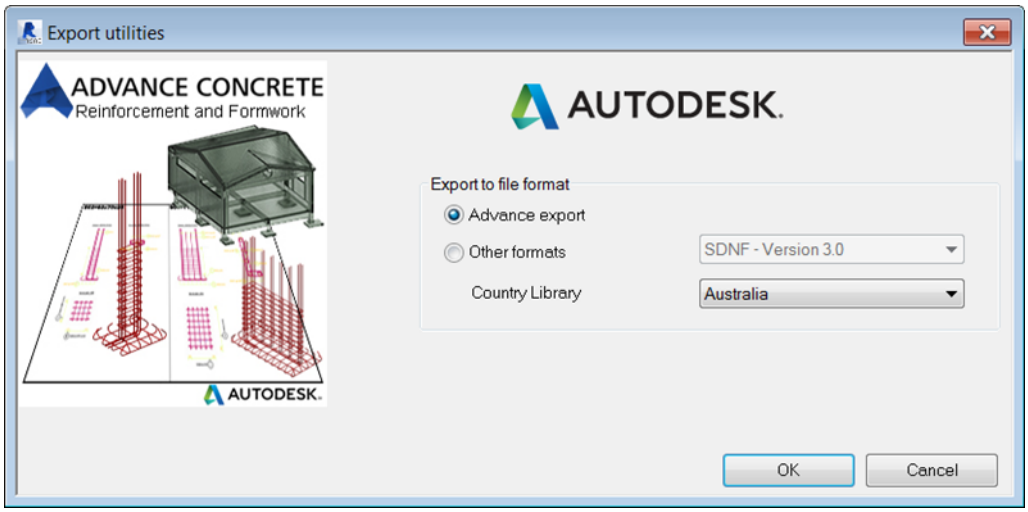

FIGURE 7: THE **EXPORT UTILITIES** DIALOG BOX

6. By default, the **Advance export** radio button is selected. This will ensure the model is exported in the SMLX format. Click the **OK** button; the **Save As** dialog box is displayed prompting you to specify the name and location of the SMLX file.

7. Specify the name and location of the SMLX file and then click **Save** in the dialog box.

Importing the Model into Advance Steel

Once you have exported the SMLX file from Autodesk Revit, you are ready to import it into Advance Steel. The following section shows how to do that.

1. Start Autodesk Advance Steel.

2. From the **Export & Import** ribbon tab > **Revit** ribbon panel, click **Import**; as shown in Figure 8.

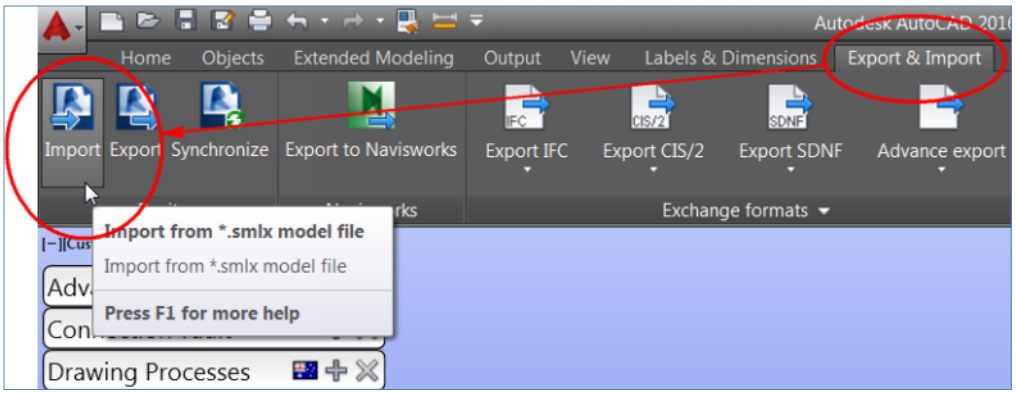

FIGURE 8: IMPORTING THE SMLX MODEL FROM AUTODESK REVIT

3. In the **Open** dialog box, browse and select the SMLX file that was saved from Autodesk Revit. If mapping of structure members or material is required, a dialog box will be displayed, as shown in Figure 9.

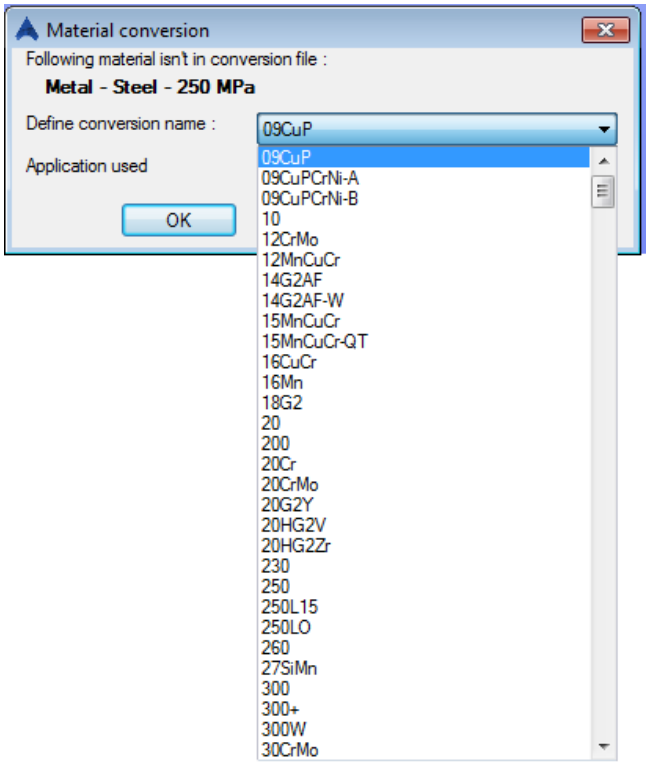

FIGURE 9: THE **MATERIAL CONVERSION** DIALOG BOX

4. Once the section and material mapping is completed, the model will be opened in Advance Steel, as shown in Figure 10.

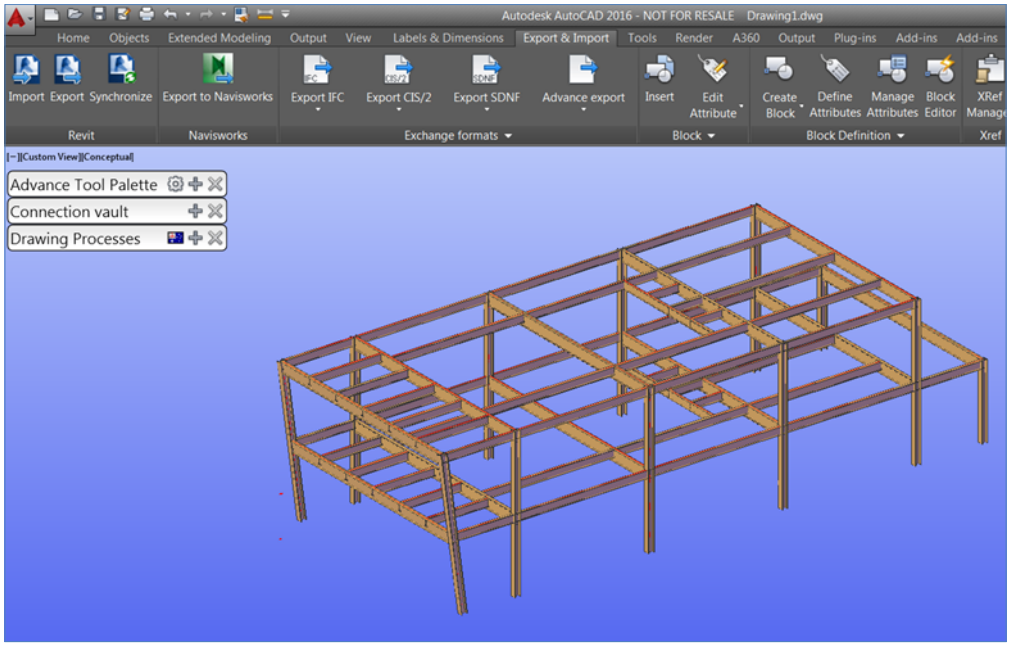

FIGURE 10: AUTODESK REVIT STRUCTURE MODEL OPENED IN ADVANCE STEEL

Adding Connections to the Steel Model

In Advance Steel, the **Connection Vault** palette provides you various connection types to join structural members together. This palette comprises of four sections. Various types of connections categories are organized in the toolbar format on the left side of this palette, as shown in Figure 11. When you pick a tool button for a connection category, all the available connection types for that category are displayed in the middle section of this palette. The upper right section shows the preview of the connection type, the selection order for creating this connection. The lower right section shows a brief description of the selection order, profiles that could be selected and the connection type.

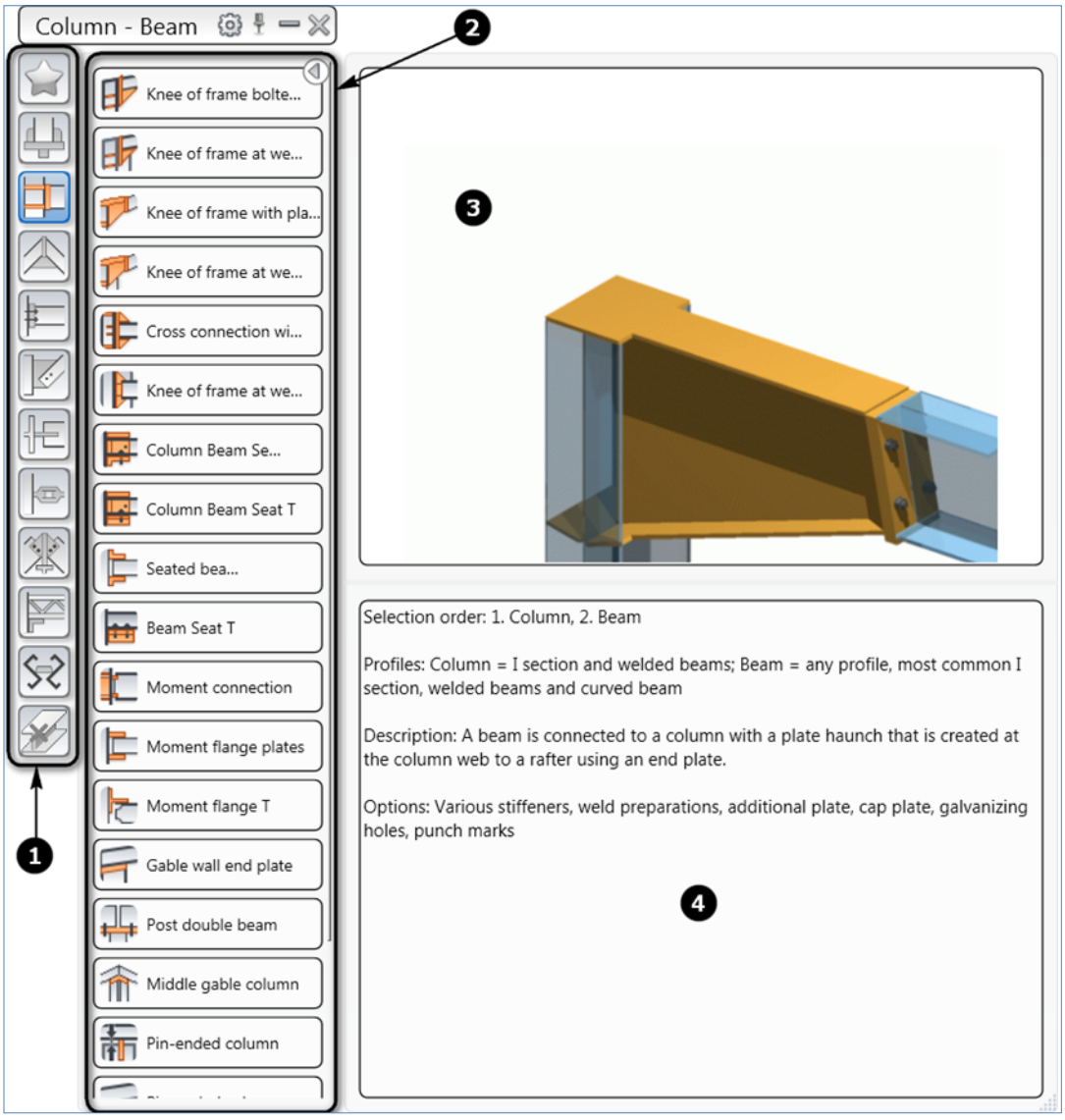

FIGURE 11: THE CONNECTION VAULT

Connection Types

In Advance Steel, you can create various types of connection between the steel members. Some of these are listed below:

Base plate Joint

This type of joint is used to insert a base plate at the bottom of a vertical or inclined column. This joint type allows any section type to be used as the column. Figures 12 and 13 show various types of base plate joints.

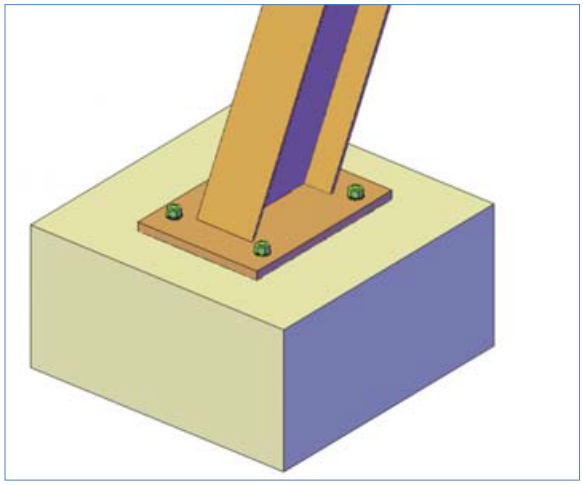

FIGURE 12: THE BASE PLATE JOINT

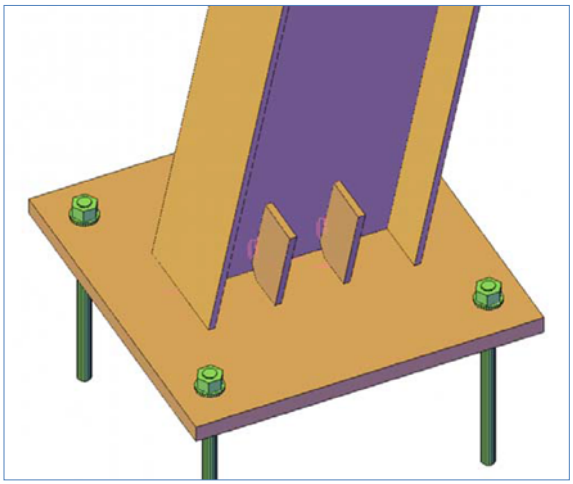

FIGURE 13: BASE PLATE JOINT WITH STIFFENERS

Knee of frame bolted, with haunch Joint

This type of joint is created between the flange of a column and a beam and a haunch is created from the beam or from the plates. Figures 14, 15 and 16 show various types of joints of this category.

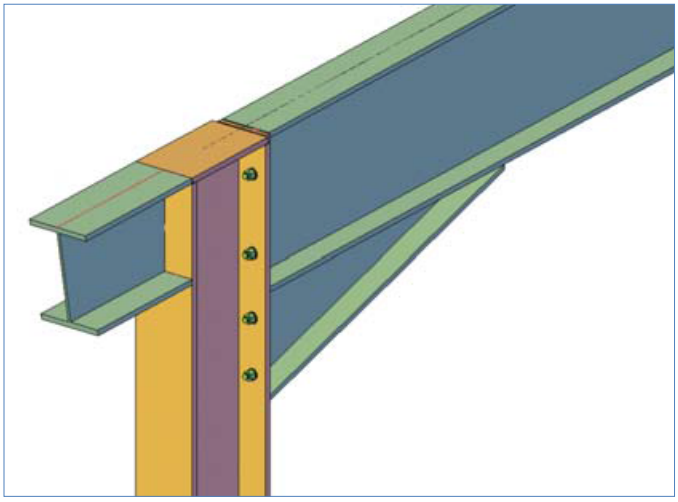

FIGURE 14: JOINT WITH ADDITIONAL RAFTER ALIGNED WITH THE PARENT RAFTER

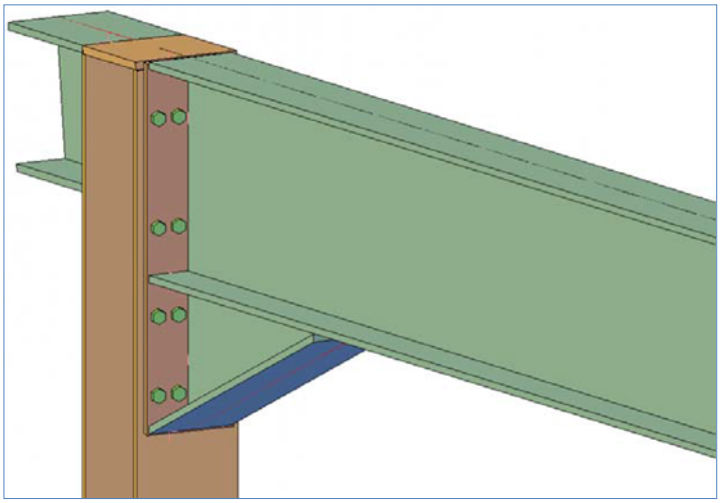

FIGURE 15: TWO COLUMNS OF BOLTS INSERTED ON EACH SIDE OF THE RAFTER

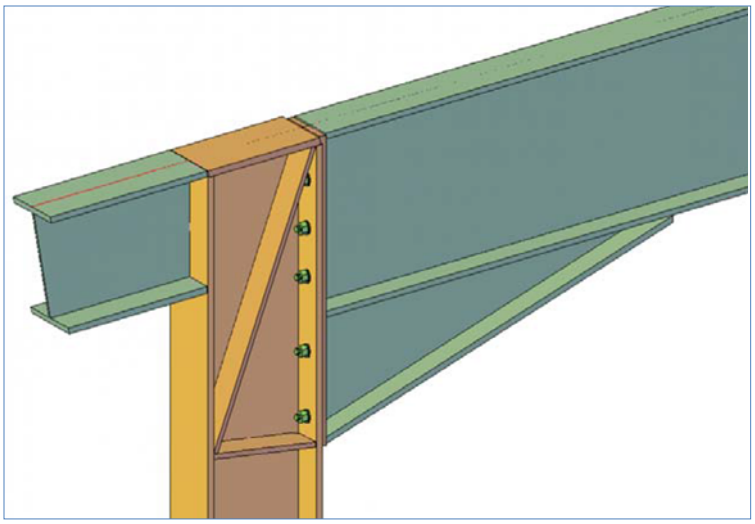

FIGURE 16: SLOPED STIFFENER AND STANDARD STIFFENER 3 INSERTED

Clip Angle Joint

This type of joint is used to connect two beams or a beam and a column by inserting a clip angle between the two. You can use equal angles or unequal angles to insert. You can also decide to bolt the sections to the angles or weld them. Figure 17 shows the clip angle joint with cleats inserted on both sides.

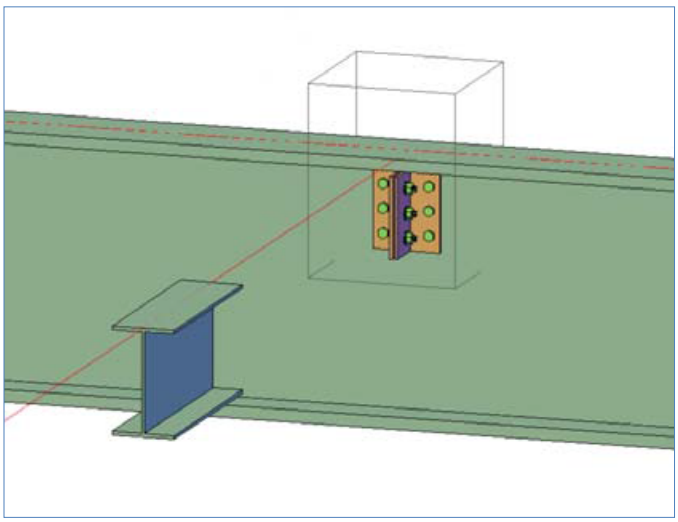

FIGURE 17: CLIP ANGLE JOINT WITH CLEATS INSERTED ON BOTH SIDES

Single Side End Plate

This joint is used to connect a main beam or column to a secondary beam using an end plate. This end plate will be welded to the secondary beam and bolted to the main beam or column. Figure 18 shows this type of joint.

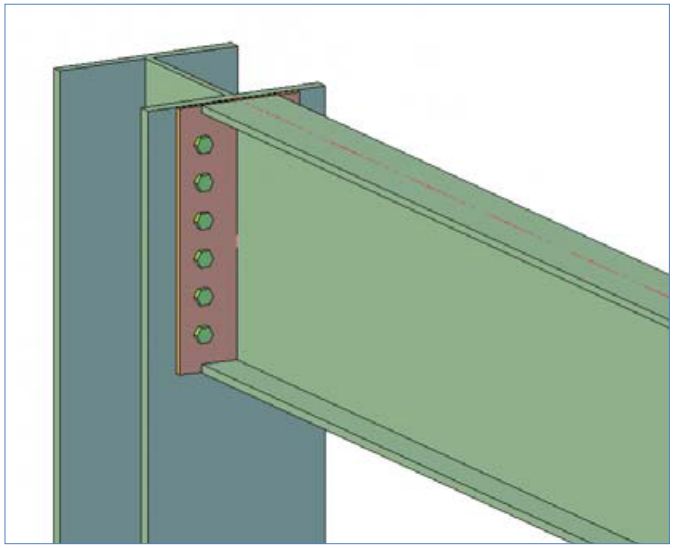

FIGURE 18: SINGLE SIDE END PLATE JOINT WITH SIX VERTICAL BOLTS IN GROUP 1 AND CENTER BOLT LAYOUT

Shear Plate Joint

This is one of the most commonly used joints and is used to connect a main beam to a secondary beam using a plate. This plate will be welded to the main beam and bolted to the secondary beam. Figures 19 and 20 show this type of joint.

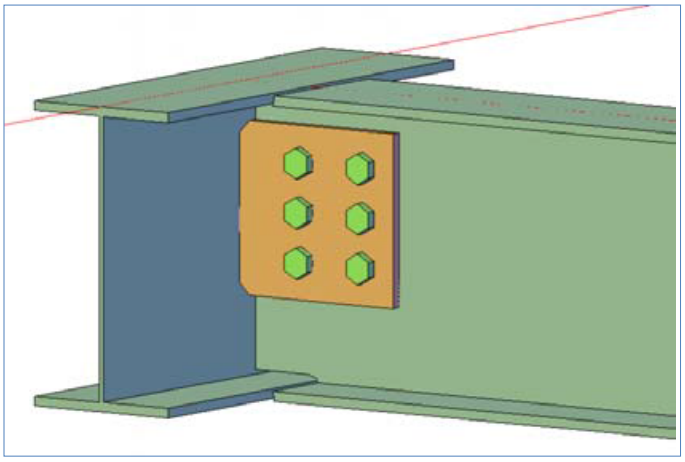

FIGURE 19: SHEAR PLATE JOINT WITH A RECTANGULAR PLATE, TWO NUMBERS OF HORIZONTAL BOLTS, AND THREE VERTICAL BOLTS IN GROUP 1

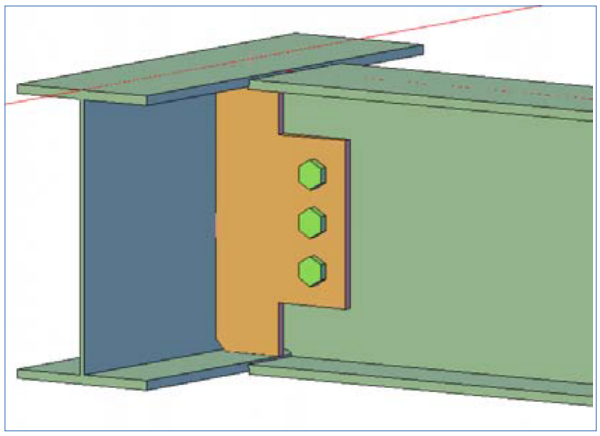

FIGURE 20: SHEAR PLATE JOINT THAT USES A PLATE WITH FLANGE ON BOTH SIDES, ONE NUMBER OF HORIZONTAL BOLT, AND THREE VERTICAL BOLTS IN GROUP 1

Adding Handrailings to the Steel Model

In Advance Steel, you can use the Hand-railing tool to create various types of handrails. You can change the railing ends to meet your requirements and even define the post connection as welded or bolted. Figure 21 shows handrails with looped ends and post bolted and Figure 22 shows handrails with loop return ends and posts welded. Note that in both these figures, the handrails on the two sides of the stairs are created separately.

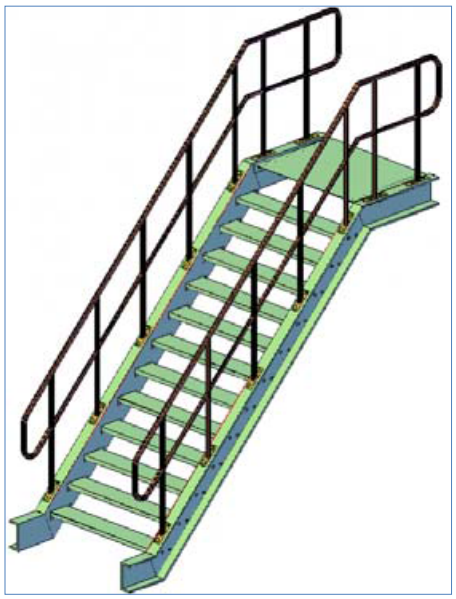

FIGURE 21: HANDRAILS WITH LOOPED ENDS

FIGURE 22: HANDRAILS WITH LOOP RETURN ENDS

Generating Fabrication Drawings

In Advance Steel, you can generate the assembly drawings, fabrication drawings, or erection drawings from parts or assemblies. This can be easily done using **Drawing Processes** palette shown in Figure 23.

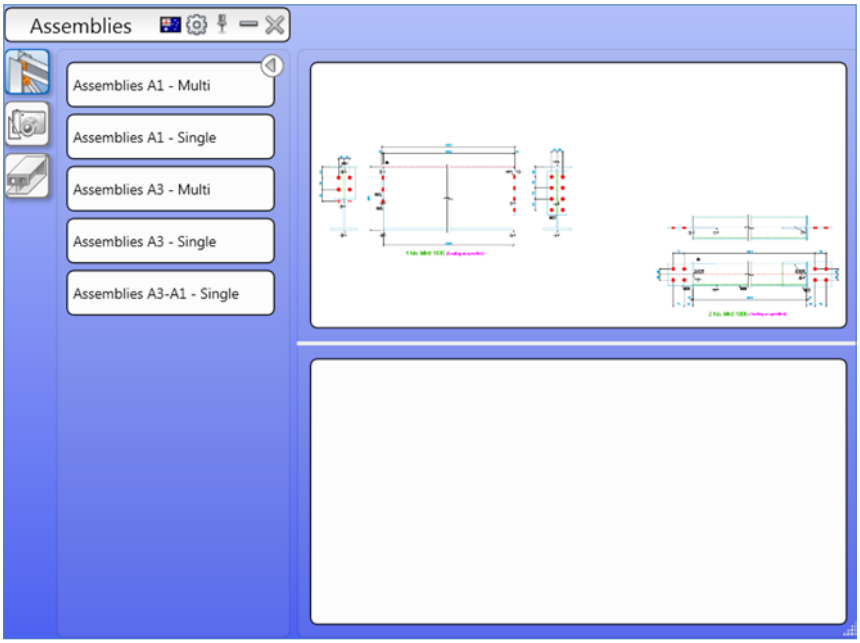

FIGURE 23: THE DRAWING PROCESSES PALETTE TO GENERATE DRAWINGS

All the generated drawings are available in the **Document Manager** shown in Figure 24.

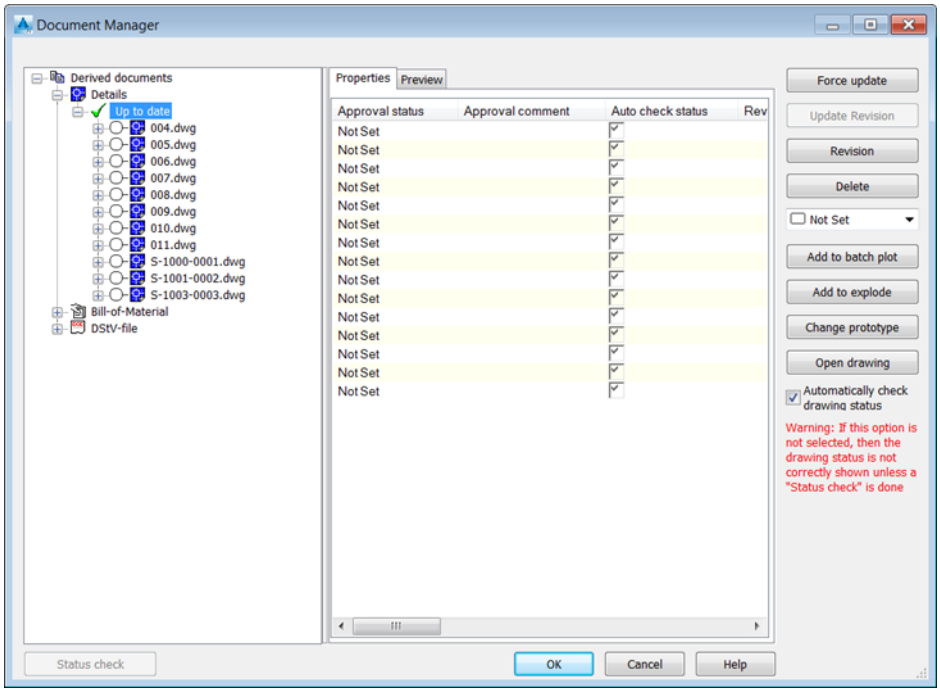

FIGURE 24: THE DOCUMENT MANAGER

Synchronizing Advance Steel Model with Autodesk Revit Changes

A very common issue that the structure detailers face is the Structural Engineers regularly modifying the original structure model. To cater to that issue, Advance Steel allows you to synchronize the Autodesk Revit model and import all the changes into your Advance Steel model, still maintaining all the connections in the model. To do this, simply export the modified Autodesk Revit model using the process shown in the earlier section of this handout. The following section shows how to synchronize the Advance Steel model.

1. In Advance Steel, from the **Export & Import** ribbon tab > **Revit** ribbon panel, click **Synchronize**, as shown in Figure 25.

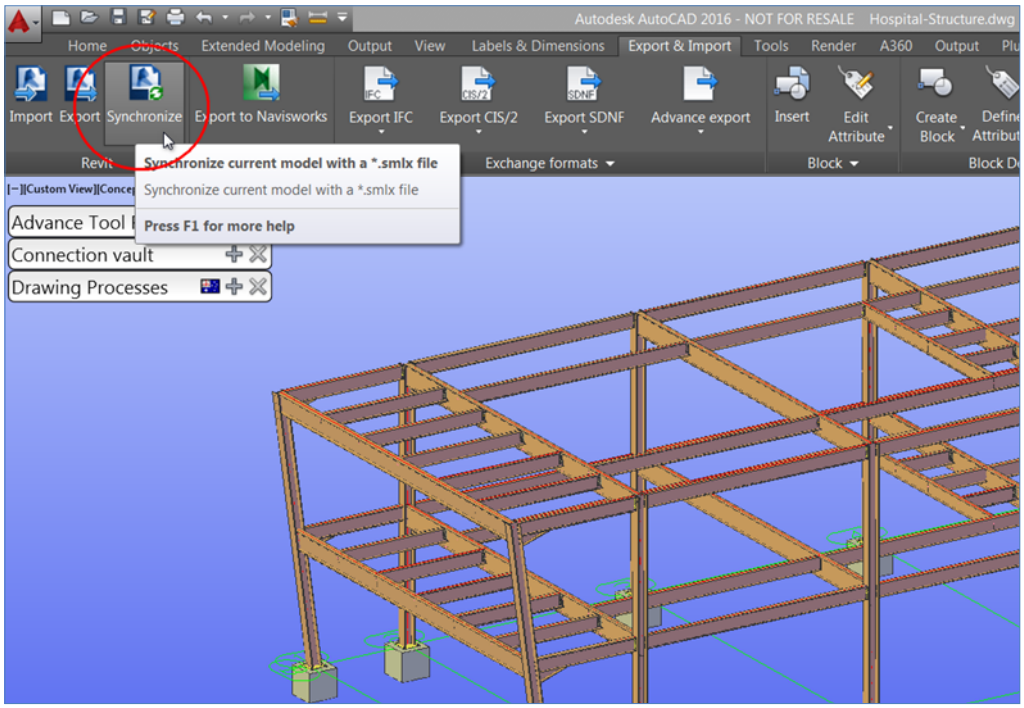

FIGURE 25: SYNCHRONIZING THE AUTODESK REVIT MODEL

2. In the **Synchronization** dialog box, click the **Load** button and load the modified SMLX file that was exported from Autodesk Revit after modifying the model.

3. Expand the dialog box by clicking on the **Filter** button on the lower left corner, as shown in Figure 26.

***Tip**: You can right-click on the **Status** column in the dialog box and select additional columns. For example, in Figure 25, the **Section** and **Section – File** columns are added using this method.*

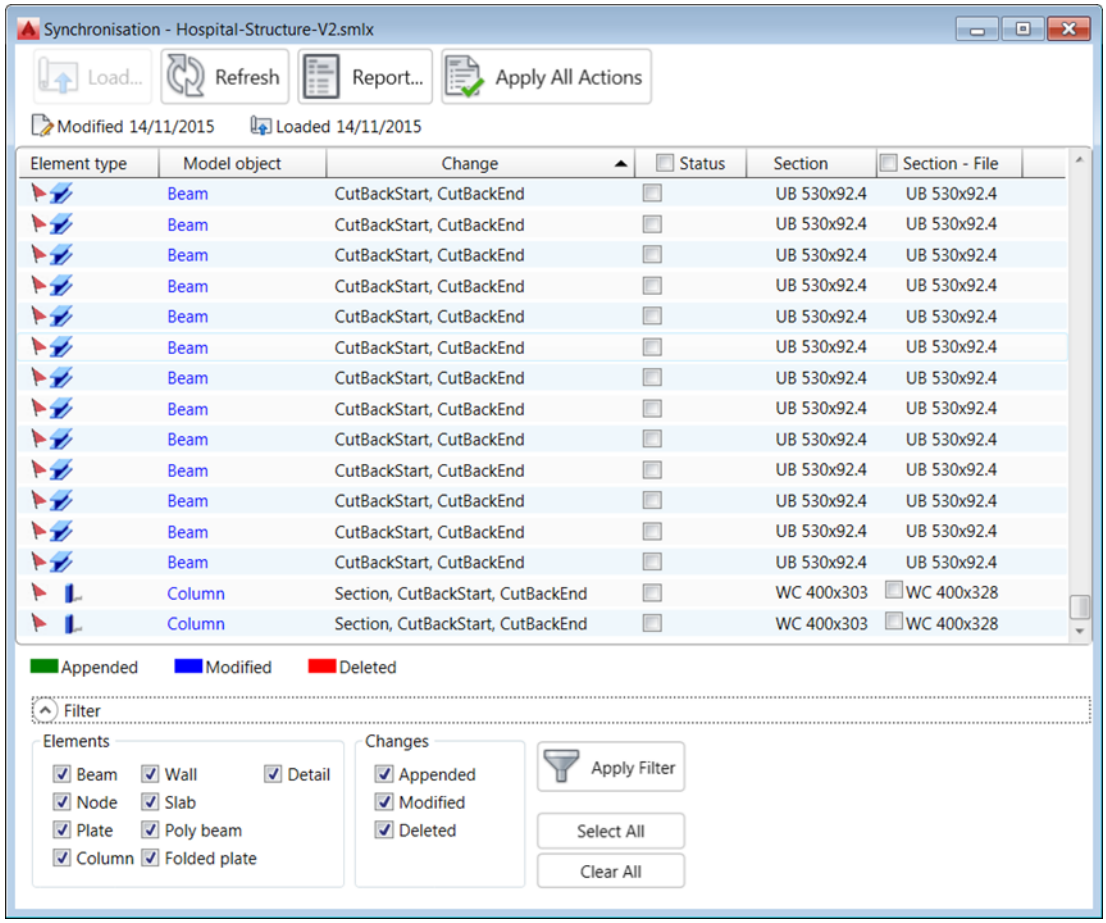

FIGURE 26: THE SYNCHRONIZATION DIALOG BOX SHOWING ALL THE CHANGES

***Tip**: It is extremely important to understand what are the changes listed in the dialog box. Sometimes, the changes are only showing the beam cut created in Advance Steel due to the joints that were created. However, if the Change column shows **Section**, in addition to the other changes, it means the section of the member has been changed, as shown in the bottom two columns in Figure 25.*

4. It is important to understand the color-code of the items listed in the **Model object** column. The elements listed in the Blue color are modified, the elements listed in Red color are deleted, and the elements listed in Green color are new elements that were added. Select the **Status** tick box of all the changes you want to import and then click the **Apply All Actions** button in the dialog box; the Advance Steel model will be updated with the changes.

Validating Autodesk Revit Model against Advance Steel Model

The Structural Engineers are very particular about making sure the fabricated model has all the right sections that they used in the Autodesk Revit structure model. To make the process easier for the Structural Engineers, the Advance Steel add-in that was installed in Revit allows you to synchronize the Advance Steel model with the Revit model for design validation. The process of doing that is discussed next.

1. In Autodesk Revit, from the **Add-Ins** ribbon tab > **Advance Steel Extension** ribbon panel, click **Synchronization**, as shown in Figure 27.

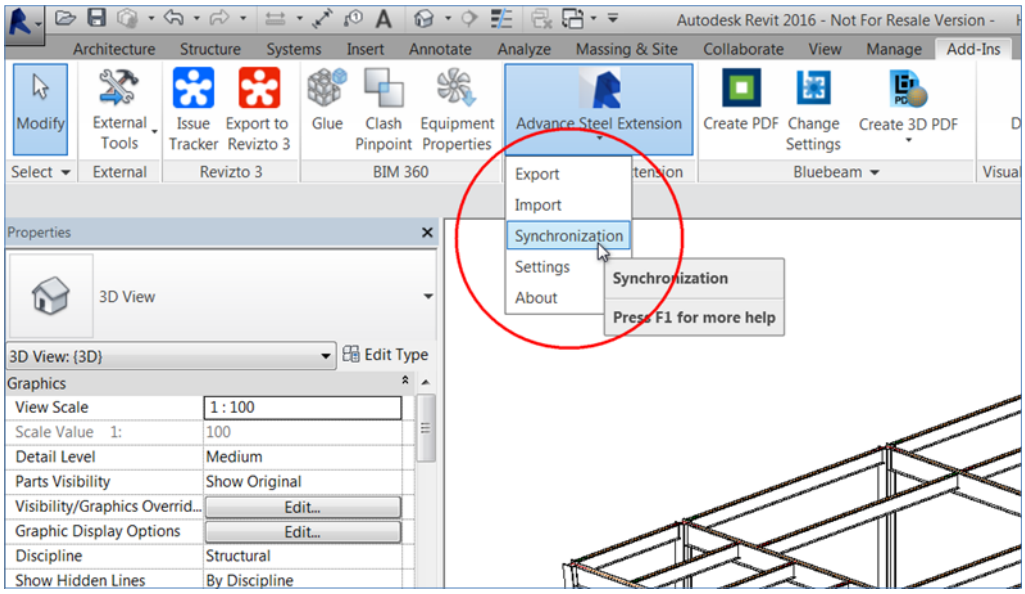

FIGURE 27: VALIDATING THE ADVANCE STEEL MODEL AGAINST AUTODESK REVIT STRUCTURE MODEL

2. In the **Synchronization** dialog box, click the **Load** button and load the SMLX file that was exported from Advance Steel.

3. Expand the dialog box by clicking on the **Filter** button on the lower left corner. Clear the filter of the changes you do not want to see. For example, Figure 28 only shows the appended elements.

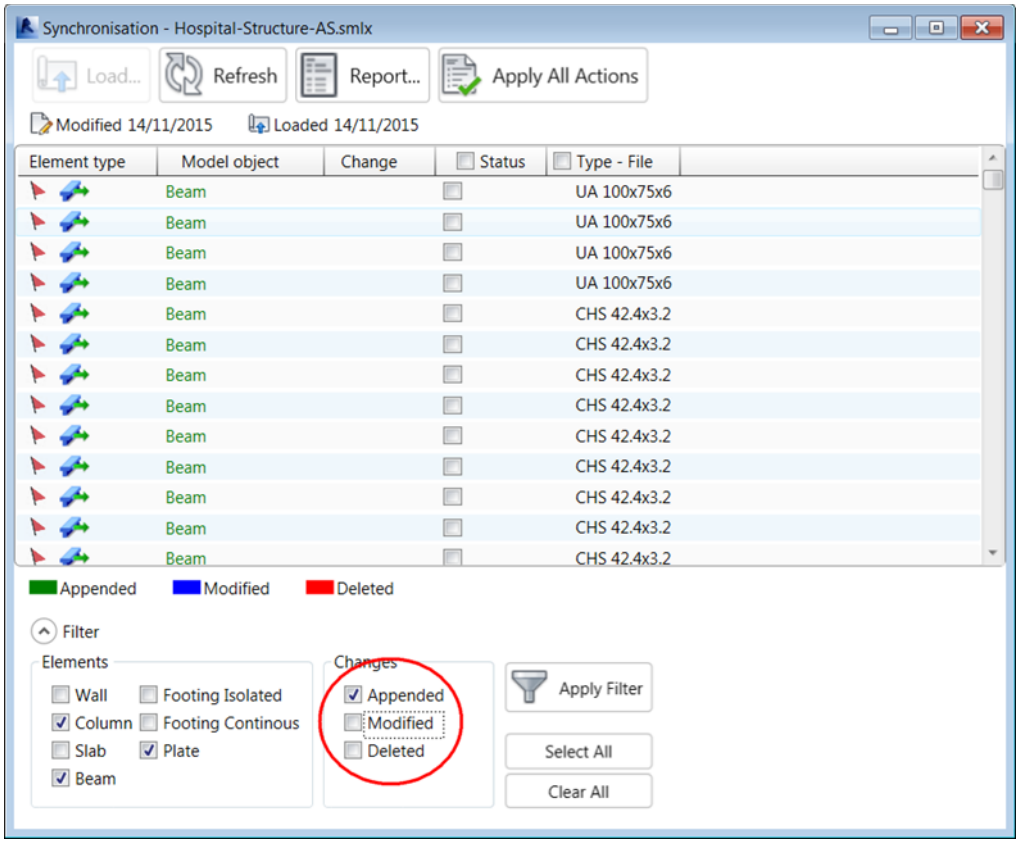

FIGURE 28: THE SYNCHRONISATION DIALOG BOX SHOWING THE APPENDED ITEMS

4. Select the status of all the elements you want to import into the Autodesk Revit model and click **Apply All Actions**; all the changes will be applied to the Autodesk Revit model.