AUTODESK UNIVERSITY

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Advance Steel and Revit—A Seamless Workflow

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Learning Objectives

- Learn how to export a Revit Structure model and import it into Advance Steel
- Learn how to automate the creation of steel connections between members imported from Revit
- Learn how to synchronize, review, and import changes between the Advance Steel and Revit models
- Learn how to use Advance Steel connections inside Revit

Description

It's time to end the disconnect between the intelligent model and the steel fabrication drawings. In this class, you will learn how to use Advance Steel detailing software to import Revit structural steel models, and then use bidirectional synchronization tools to compare and coordinate changes between the Advance Steel and Revit models, ensuring that both are always up to date. You will also learn how to add parametric connections between structural members and quickly produce fabrication and erection drawings and generate NC files.

Speaker(s)

David is the Senior Content Manager for CADLearning® products at 4D Technologies, where he develops content standards and creates affordable training solutions for Autodesk software, including AutoCAD, AutoCAD LT and ReCap. He has more than 30 years of hands-on experience with AutoCAD and 15 years with Revit as a user, developer, author and consultant, and is an Autodesk Certified Professional for both AutoCAD and Revit. A contributing editor to *Digital Engineering* magazine, he is also the former senior editor of *CADalyst* magazine, and is the author of more than a dozen books about AutoCAD. A licensed architect, David was also one of the earliest AutoCAD third-party software developers, creating numerous AutoCAD add-on programs. As an industry consultant, David has worked with many companies, including Autodesk. He has taught college-level AutoCAD courses and has consistently been a top-rated speaker at Autodesk University.

What is Advance Steel?

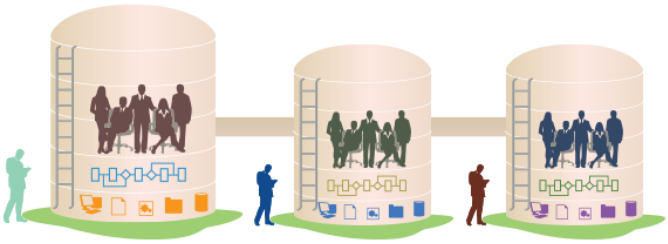
Autodesk Advance Steel is a purpose-built steel construction program for structural engineers and steel detailers built on top of AutoCAD. It provides tools for creating 3D structural models and connections from which drawings are then created.

To use Advance Steel, you must create and store the 3D model of the steel structure in the AutoCAD DWG drawing format. The Advance Steel model then becomes the master reference for using other Advance Steel tools to:

- Automatically create dimensioned and labeled construction documents and shop drawings.
- Manage the arrangement of drawings using the Advance Steel Document Manager.
- Create Bills of Materials (BOMs) and NC-information, including part marks and quantities.

Traditional Steel Detailing Workflow

In a traditional workflow, the steel detailer receives drawings from the design team (typically, from the structural engineer), creates fabrication drawings, and then passes them back to the design team for verification. Once the steel fabrication drawings are approved, the steel components are manufactured, shipped to the site, and erected.



This method has some serious drawbacks:

- Duplication of effort often results in errors.
- Design changes require manual rework.
- Project coordination and productivity suffer.

Advance Steel can be used in this traditional workflow, because the software includes all the tools necessary to create the entire 3D structural model inside its AutoCAD-based environment. But creating the 3D structural model inside Advance Steel still represents a duplication of effort.

As Building Information Modelling (BIM) becomes more prevalent, the design team often creates the building model using Autodesk Revit. When Advance Steel is used in conjunction with Revit, the steel detailer receives model data directly from the design team in electronic form. That data is then imported into Advance Steel, automatically creating a version of the 3D structural model inside Advance Steel. The steel detailer then uses tools in Advance Steel to add connections and other miscellaneous steel components. He then uses Advance Steel to create the necessary drawings, part lists, and so on.

This method offers some very significant improvements:

- Using a single unified model from design to documentation reduces redundant effort and eliminates errors.
- Design changes can be quickly incorporated by exporting an updated Revit model.
- Project coordination and productivity are improved because the Advance Steel model used to create the steel detail drawings can be checked against the Revit model.

The Advance Steel – Revit Workflow

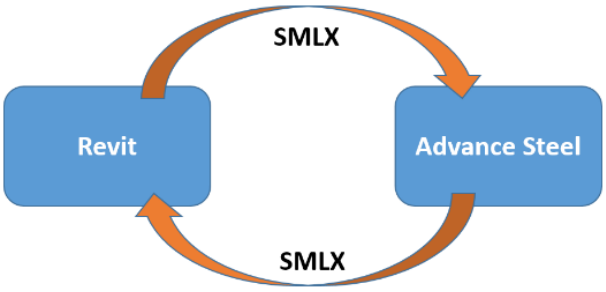
Advance Steel and Revit support the bi-directional, interoperable flow of information. You can export the 3D structural model from Revit in the Steel Mark-up Language (SMLX) format, and then import that file into Advance Steel. Doing this automatically recreates the entire 3D structural model inside Advance Steel.

You can then use the tools in Advance Steel to add connections, handrails, stairs, and so on to the steel model.

Once these miscellaneous components have been added to the model, you use the tools in Advance Steel to generate the necessary assembly drawings, fabrication drawings, and erection drawings.

If the structural engineer makes changes to the structure, you can export an updated version of the SMLX file and synchronize the Revit model with the Advance Steel model, while maintaining all the connections and other components that have already been added in Advance Steel.

Once the steel fabrication drawings have been completed in Advance Steel, you can export an SMLX file from Advance Steel. The structural engineer can then synchronize that data with the Revit model to validate that the Advance Steel fabrication model matches the Revit structural model.



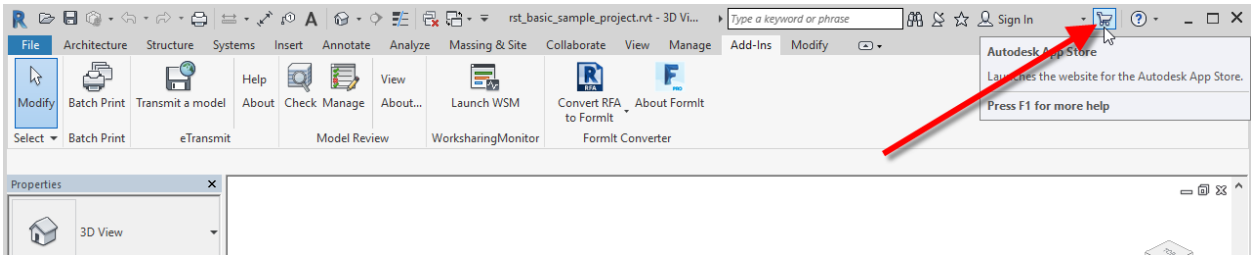
Downloading the Advance Steel Extension for Revit

To be able to export a Revit Structure model that can then be imported into Advance Steel, you must download and install the **Advance Steel Extension** for Autodesk Revit. If you have used the Autodesk Desktop app to install updates, this add-in may already be installed.

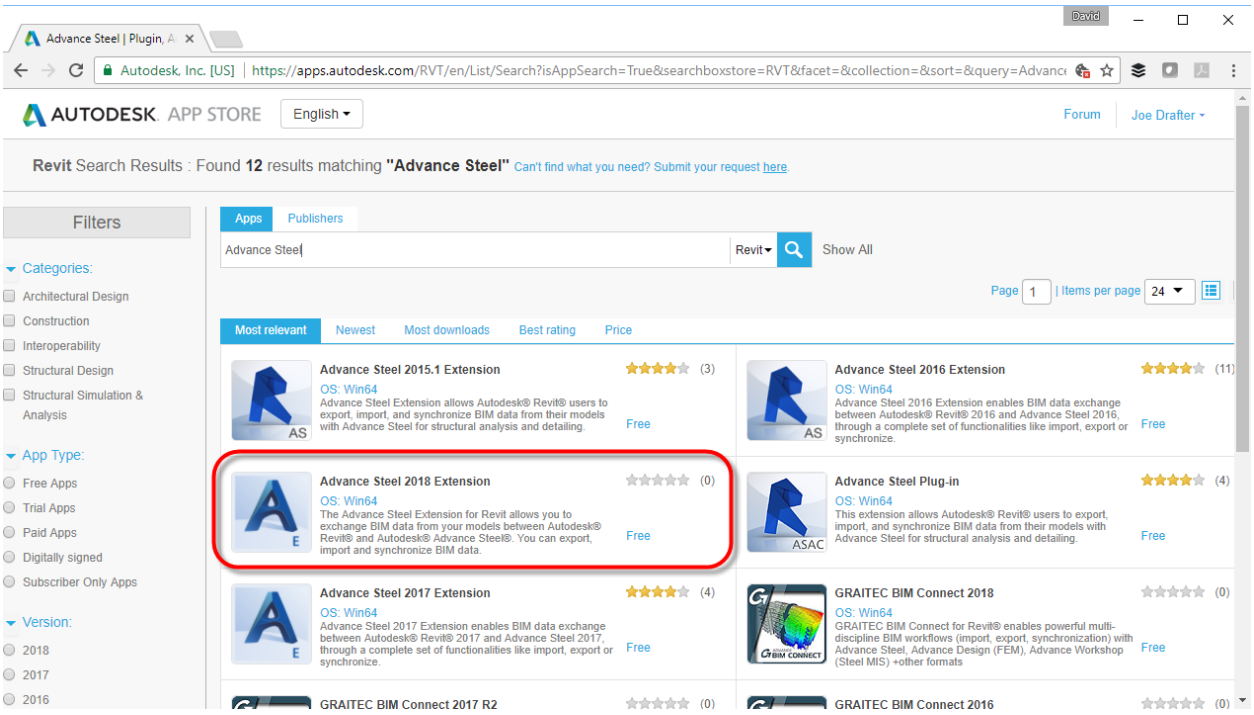
For example, start Autodesk Revit and open a project. On the **Add-Ins** ribbon, if you do not see the Advance Steel Extension for Autodesk Revit, you will need to download and install this extension.

To download and install the Advance Steel Extension:

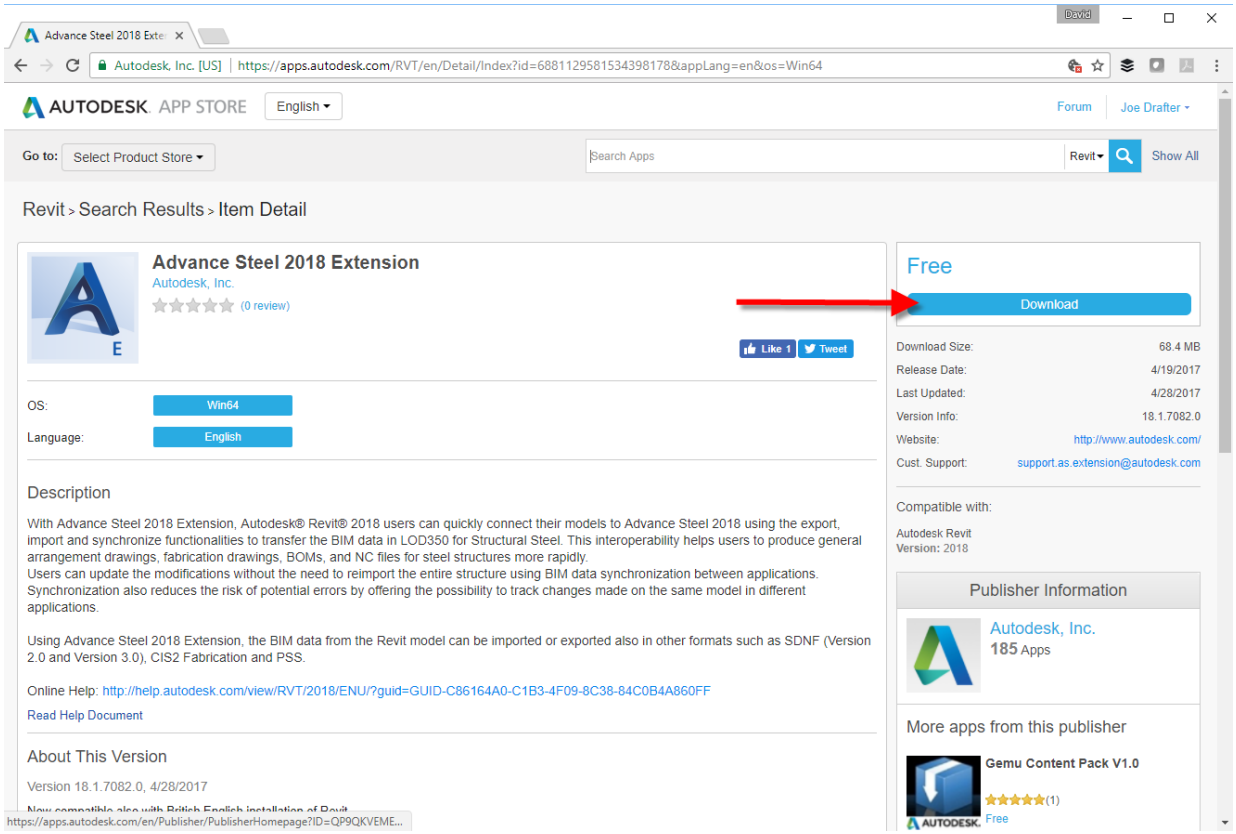
1. In Revit, in the **InfoCenter** toolbar, click the **Autodesk App Store** button to open the Autodesk App Store website in your web browser.



2. On the Autodesk App Store, click in the **Search Apps** field, type "**Advance Steel**", and press **ENTER**. The search quickly returns a list of applications that match your search.



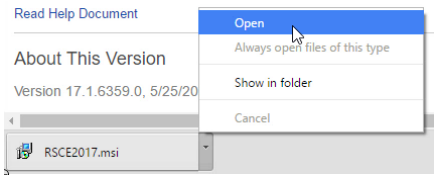
3. Locate and click the version of the extension matching your version of Revit (in this case, the **Advance Steel 2018 Extension**) to go to its page in the App Store.



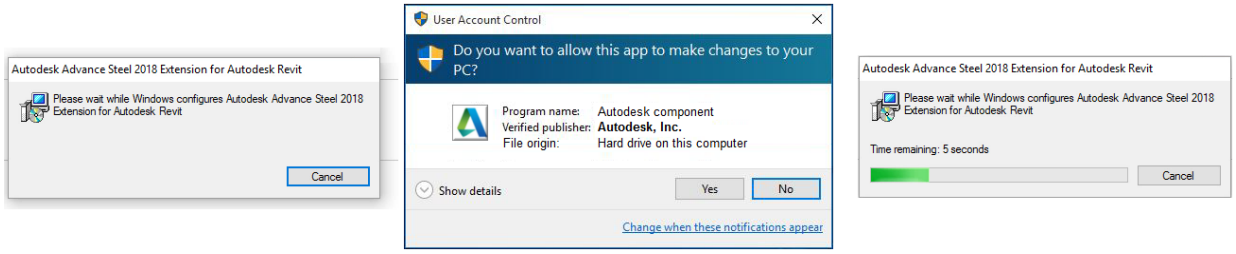
4. On the right side of the page, click **Download**. (Note: If you are not already logged in, you will be prompted to sign in using your Autodesk ID and password. Once you are logged in, click the **Download** link again. At this point, you can close Revit.)

If you have never used the App Store before, you may need to read and agree to the terms of use and end-user license agreement.

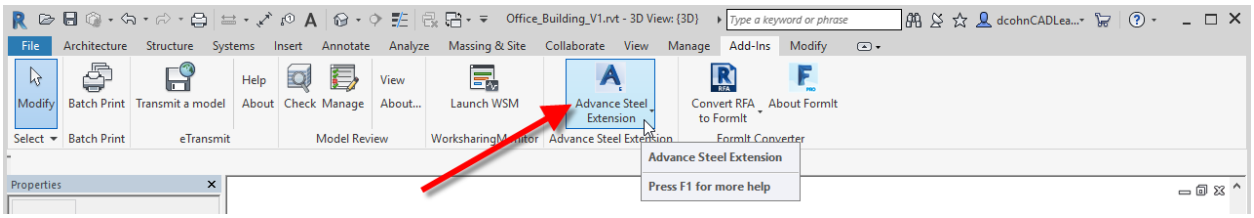
5. Once the download is complete, click the link to install the app.



6. You will see a dialog box asking you to wait while Windows configures the Autodesk Advance Steel Extension for Autodesk Revit. You may need to agree to allow the program to make changes to your system.



7. Once the app has been installed, the next time you start Revit, the Advance Steel Extension app will appear on the **Add-ins** ribbon, in the **Advance Steel Extension** panel.

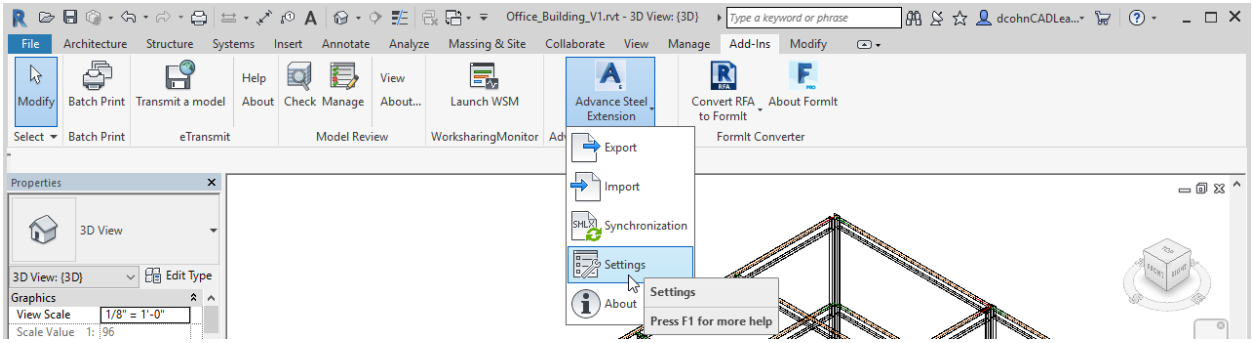


Exporting a Revit Structural Model

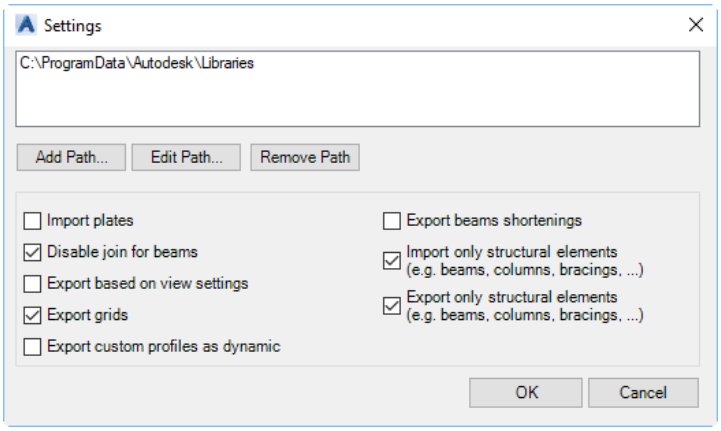
Once you have installed the Advance Steel Extension for Autodesk Revit, you can export a Revit structural model, saving the model in the SMLX (Steel Mark-up Language) format. Once it is saved as an .smlx file, you can import that file into Advance Steel.

Before exporting a Revit structural model, you should make sure that the Advance Steel Extension for Autodesk Revit is configured properly. To do so:

1. In Autodesk Revit, open the model to be exported.
2. On the **Add-ins** ribbon, in the **Advance Steel Extension** panel, expand the **Advance Steel Extension** drop-down and click **Settings** to open the **Settings** dialog.



3. In the top portion of the **Settings** dialog, the path to the Revit libraries should already be established. If necessary, you can use the **Add Path…** or **Edit Path…** buttons to set the proper libraries for the structural sections used in your Revit model.

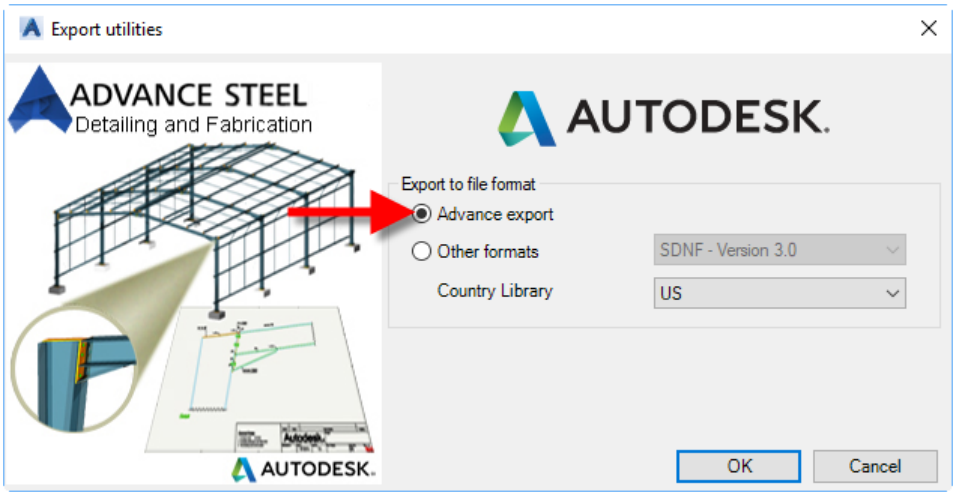


4. In the lower portion of the dialog, you can select the **Export grids** checkbox, so that grid lines will be included in the .smlx file and imported into Advance Steel.
5. Clear the **Export beam shortenings** checkbox. This ensures that beam shortenings created in Revit will not be exported. When you add connections in Advance Steel, the beams will automatically be shortened.
6. Select **Export only structural elements** if you do not want to export other elements such as concrete slabs, footings, and so on. You can leave the other settings as shown.
7. Click **OK**.

Now you are ready to export the Revit structural model. Press **ESC** twice to make sure that nothing is selected in Revit. If objects are selected when you export the model, only those objects will be included in the .smlx file.

To export the model:

1. Expand the **Advance Steel Extension** drop-down again and click **Export**. The program displays the **Export utilities** dialog.



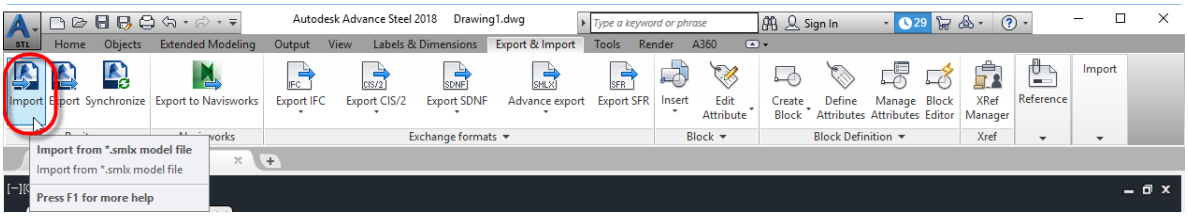
2. In the **Export to file format** group box, make sure that the **Advance export** radio button is selected, so that the structural model will be exported in the SMLX format.
3. Click **OK**. The program displays a **Save As** dialog.
4. Navigate to the folder where you want to save the file, specify the file name, and then click **Save**. You can then close the Revit model.

Note: The SMLX file is much smaller than the RVT file from which it was created. For example, the .rvt file used in the demonstration is 7MB. The .smlx file exported from Revit is 5KB.

Importing the Model into Advance Steel

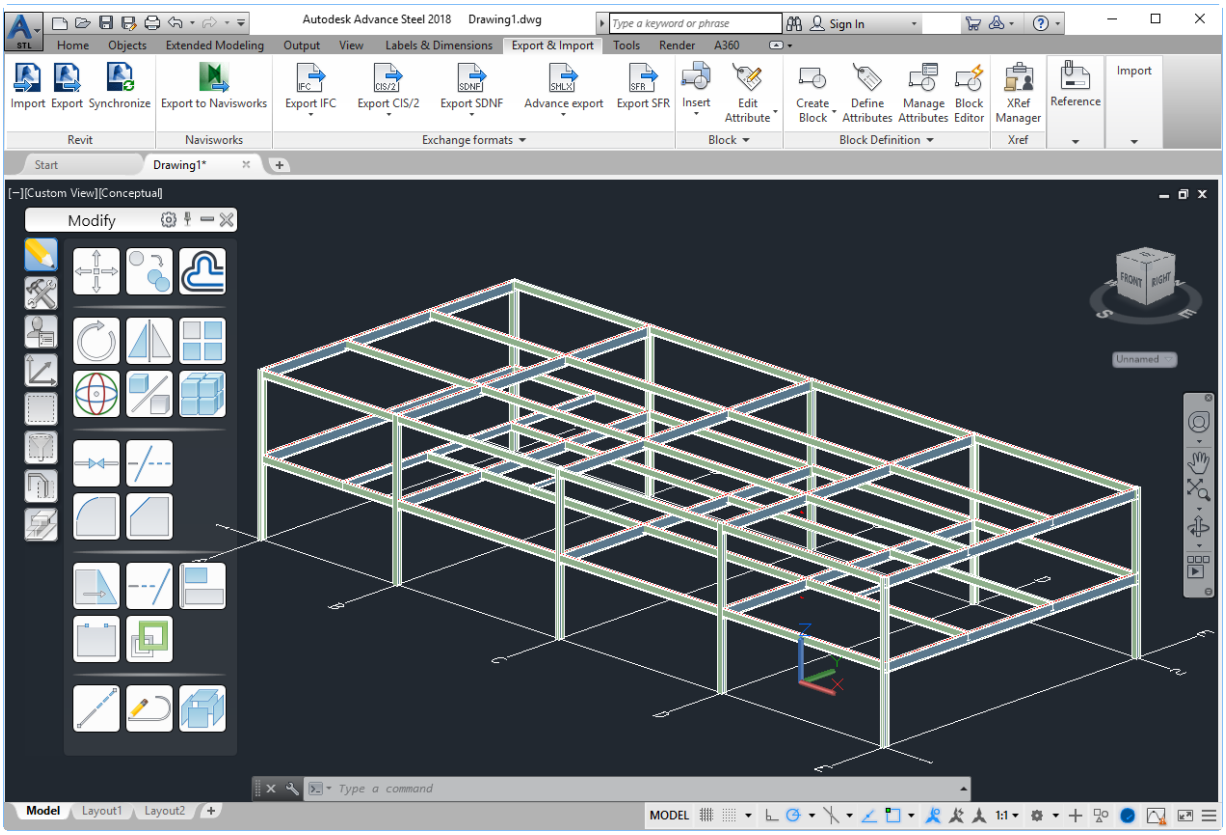
Now that the .smlx file has been saved, you can import it into Advance Steel. To do so:

1. In Advance Steel, start a new file using the Advance Steel template.
2. On the **Export & Import** ribbon, in the **Revit** panel, click **Import**.



3. The program displays a file **Open** dialog. Navigate to the folder in which you saved the .smlx file, select that file, and click **Open**.

Advance Steel will immediately begin importing and processing the .smlx file. When finished, the model will be displayed in Advance Steel. You can then work with the model as you would any other model in Advance Steel.



Note that when importing an .smlx file, if Advance Steel cannot automatically map the structural members from Revit, the program will display a **Section Conversion** dialog so that you can manually map the Revit steel sections to an Advance Steel section or a user profile. Also, if a material cannot be mapped automatically, the program will display a **Material conversion** dialog so you can manually match the Revit material with an existing Advance Steel material.

Working in Advance Steel

Once you have imported the Revit structural model into Advance Steel, you will typically use the tools in Advance Steel to add connections between the various structural members and add any other miscellaneous steel components that were not part of the Revit model.

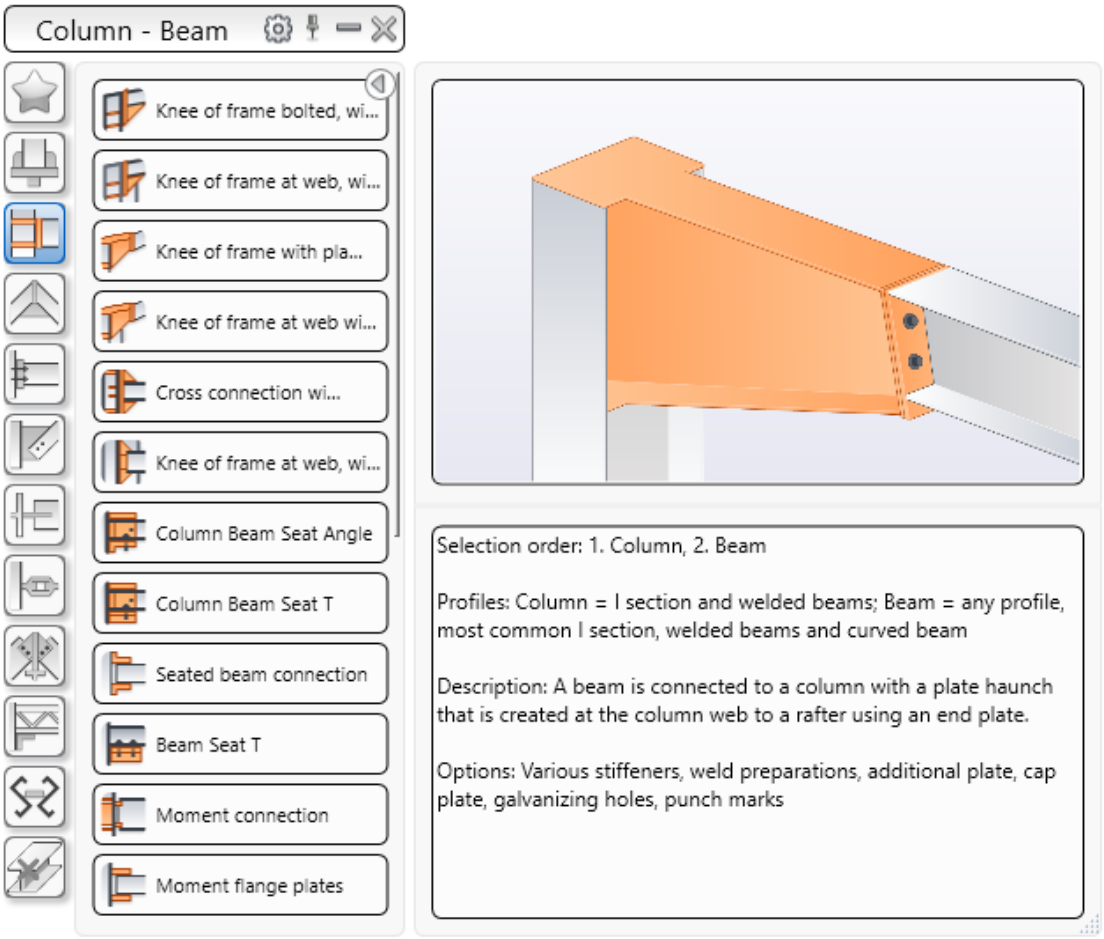
Adding Connections and Miscellaneous Components

The **Connection Vault** tool displays a palette from which you can select appropriate connections and use them to join the structural members.

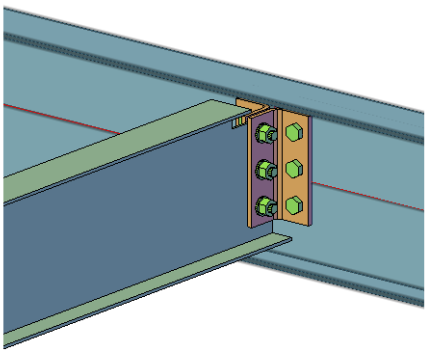
On the left side of the palette, you see 12 tabs, which organize the connections by type, such as Plates at beam, Column – beam, Platform beams, and so on. There is also a Favorites tab on which you can place the connections you use most often.

When you select a tab, in the second column from the left, you see all the connections of that type. When you select a specific connection, you see a preview of that connection in the upper-right. Note that you can pan and zoom within this preview window.

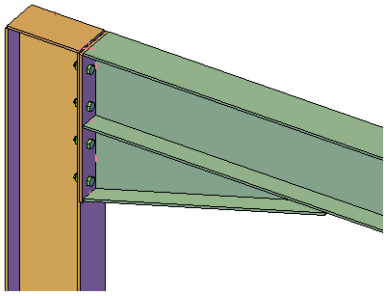
In the panel below the preview, you see a brief description of the selection order you must use when adding the selected connection, as well as the types of profiles that can be connected, a description of the connection, and any options available for the selected connection.



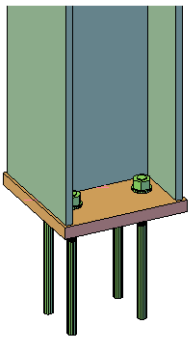
While Advance Steel provides an extensive library of connections, you will likely use some more often than others. The illustration below shows some typical connections.



Clip Angle

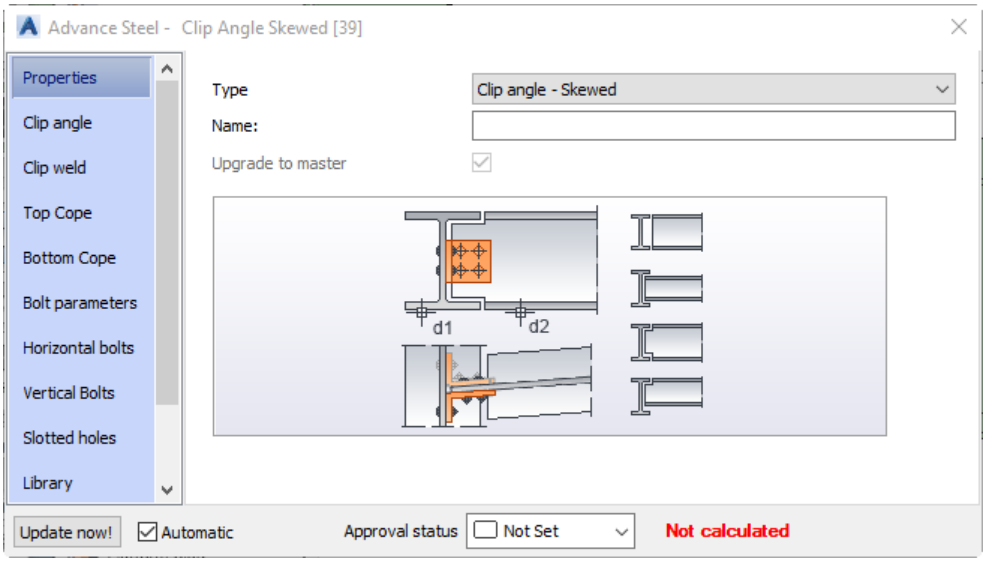


Knee of Frame, bolted with haunch joint

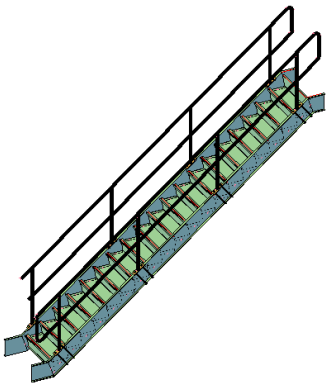


Base Plate

When you add a connection, Advance Steel displays a Joint Properties dialog. You can then use the various tools within this dialog to control the properties of the connection.

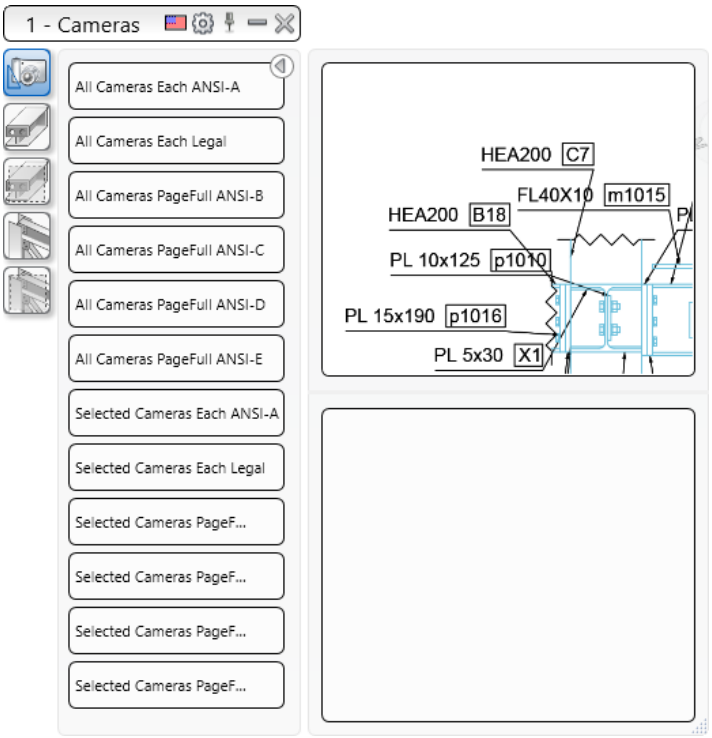


You can also use tools in Advance Steel to create various types of stairs and handrails.

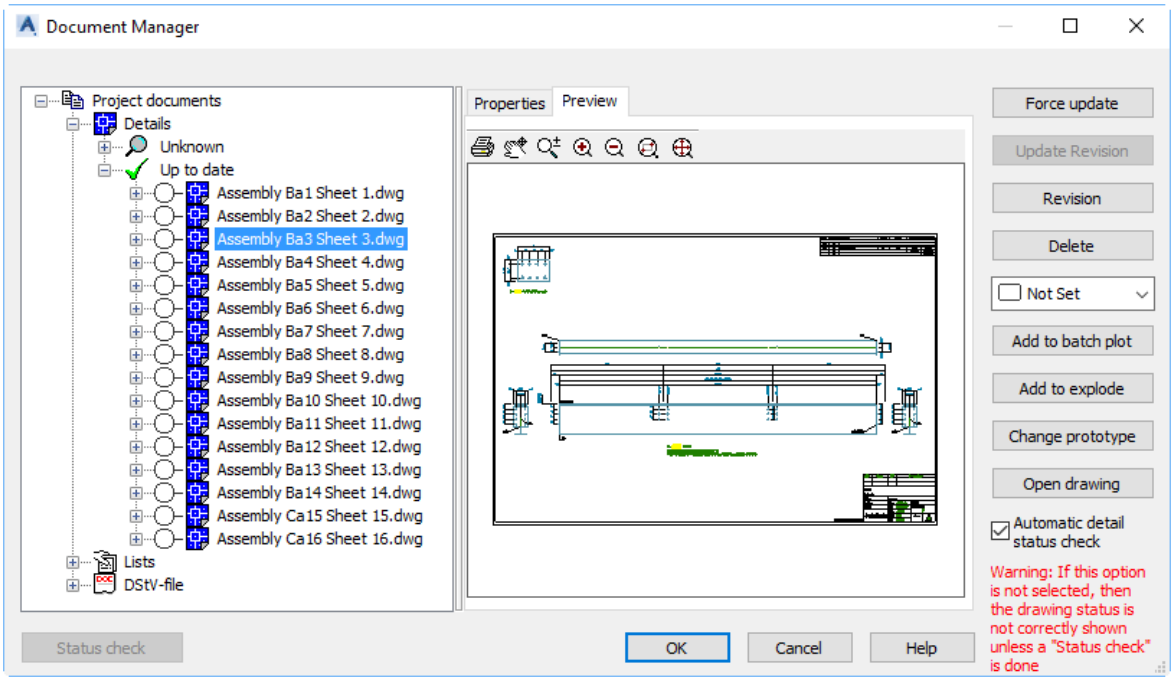


Creating Steel Fabrication Drawings

Once you have added connections and other miscellaneous components, and numbered all the components, you are ready to generate the assembly drawings, fabrication drawings, erection drawings, and so on. You do this using the tools in the **Drawing Processes** palette.



Once generated, all the drawings appear in the **Document Manager**.



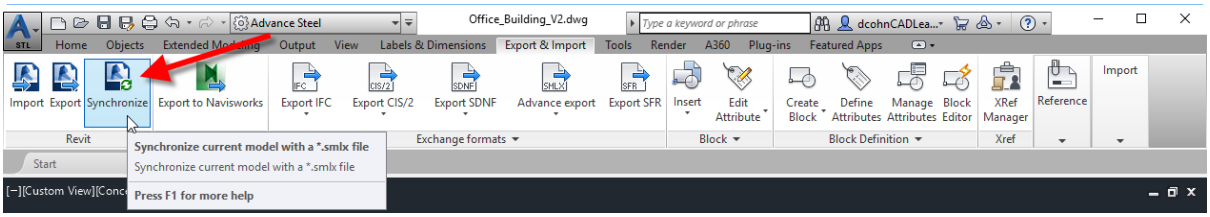
Synchronizing the Advance Steel Model

There is a high likelihood that the Revit structural model will continue to change even after you have imported it into Advance Steel. For that reason, you need to be able to see what has changed, and you need to be able to update the Advance Steel model to ensure that the model you use for steel detailing is the same as the design model. You can accomplish this by synchronizing the Advance Steel model with the Revit model.

For example, suppose you have been working in Advance Steel and have added connections. In the meantime, the structural engineer has made some changes to the model in Revit.

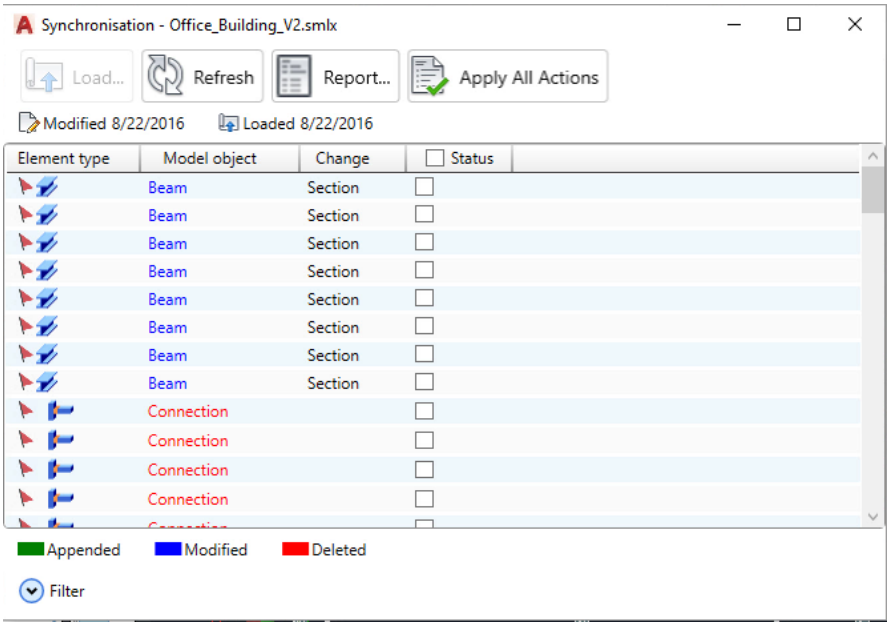
To update the Advance Steel model, you (or the structural engineer) must first use the Advance Steel Extension for Revit to export an updated copy of the model in the SMLX format. You can then use the Synchronize tool in Advance Steel to import the new .smlx file.

1. With the model already open in Advance Steel, on the **Export & Import** ribbon, in the **Revit** panel, click **Synchronize**.



2. The program displays the **Synchronization** dialog. Click **Load…**. In the file **Open** dialog that appears, navigate to the folder in which you saved the new .smlx file, select that file, and click **Open**.

   Advance Steel will immediately begin importing and processing the .smlx file. When finished, the Synchronization dialog displays a list of all of the differences between the existing Advance Steel model and the updated Revit model.

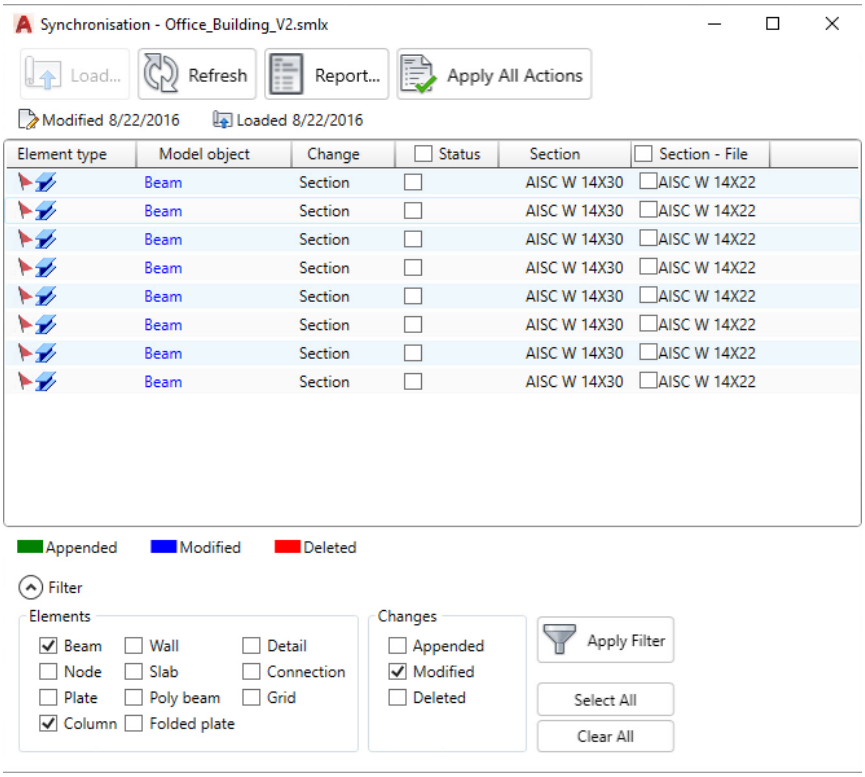


The differences are color-coded. New sections that were added to the Revit model display in green, sections that have been modified display in blue, and sections that have been deleted display in red. Information in the **Change** column describes what has changed. Initially, the list also displays all the connections that have been added in Advance Steel.

Since you are only interested in the beams and columns that have changed in the Revit model, you can filter the list to make it easier to see those changes.

3. Click **Filter** to expand the dialog.
4. Click **Clear All** to deselect all the filters.
5. In the **Elements** group box, select **Columns** and **Beams**.
6. In the **Changes** group box, select **Appended** and **Deleted**, and then click **Apply Filter**. The list is now blank, indicating that no new beams or columns have been added to the model.
7. In the **Changes** group box, clear **Appended** and **Deleted**, select **Modified**, and then click **Apply Filter** again. Now you can see that several beams have changed.

   You can also add additional information to the list to see what has changed.
8. Right-click any column header and choose **Add Column** > **Model** > **Section**. Now you can see the type of section being changed in the Advance Steel model.
9. To include the name of the updated section in the Revit model, right-click any column header and choose **Add Column** > **File** > **Section – File**. Now the list also includes the modification that was made in the Revit model.



When you double-click an object in the list, the model zooms to display that object in the model. If you wish, you can click **Report…** to create a Word .doc file containing a report of all the changes that will be made to the Advance Steel model.

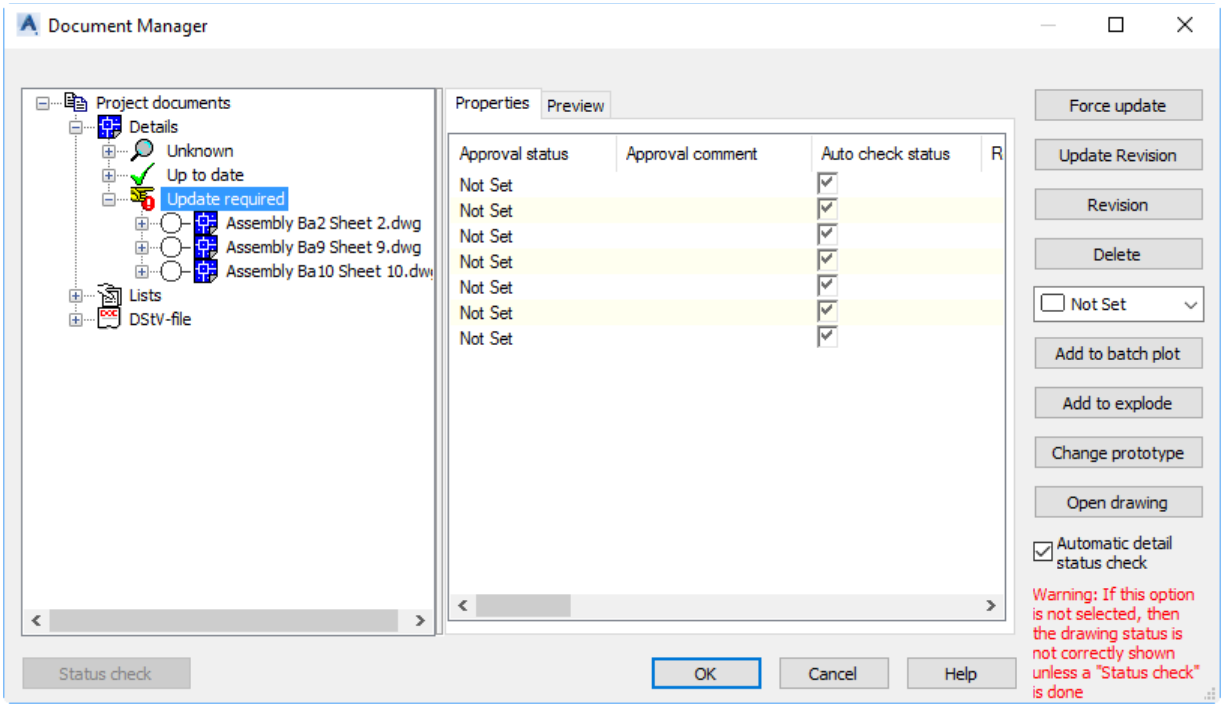
10. In the **Status** column, you can select just those objects that you want to update. In this case, you would select all the beams that have changed. To do so, select the checkbox in the **Status** column header, and then click **Apply All Actions**.

    As changes are applied, the model updates. Once all the changes have been applied to the model, the list in the dialog will be empty, indicating that no additional changes need to be made.

11. Click the **X** to close the Synchronize dialog.

Updating Fabrication Drawings

After synchronizing the Advance Steel model with new data from the Revit model, if changes were made, you will likely need to update the fabrication drawings. You do not need to guess about this, however. When you reopen the Document Manager, you can clearly see if an update is required.

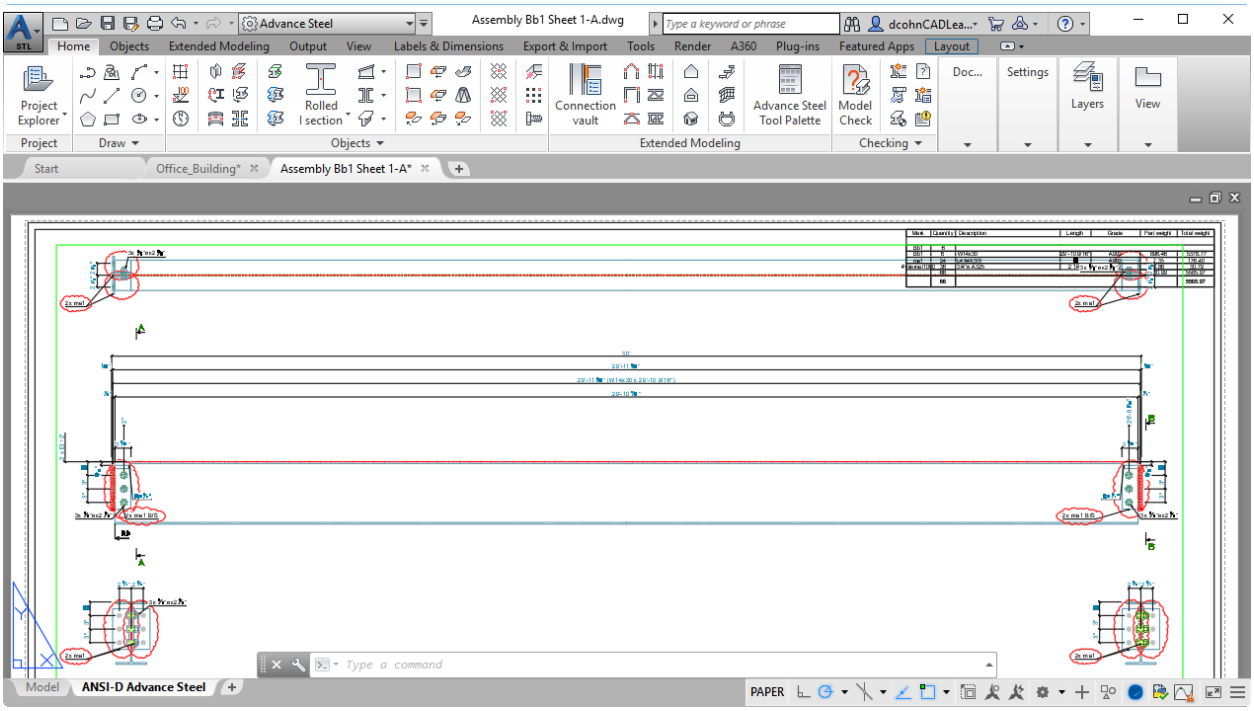


For example, in the image above, you can see that three assembly drawings need to be updated. You can then choose what you want to do:

- **Force update –** updates the selected item
- **Update revision –** updates the drawing and records changes in the revision table
- **Revision –** adds a revision mark to the current drawing or drawings that require updating
- **Delete –** deletes the selected items

If the drawings have not yet been issued, you would select **Force update**. If the drawings have already been issued, you would most likely select **Update Revision** to update the drawings, add revision marks, and update the revision table.

Once the updates have been applied, in the Document Manager, you again see that all drawings are up-to-date. If you had selected **Update Revision**, when you look at any of the drawings that were updated, you can clearly see the revisions that were made.

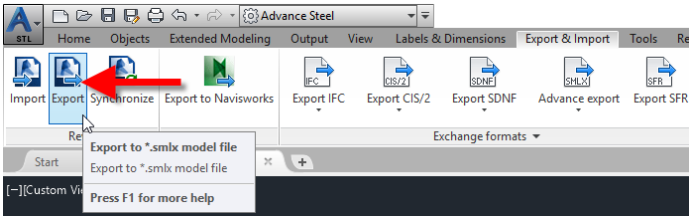


Validating the Advance Steel Model in Revit

Since the Revit structural model is typically created by the structural engineer, while the Advance Steel model is used to create the fabrication drawings, the structural engineer will often want to validate the Advance Steel model in Revit to make sure that the fabrication drawings use the proper sections. You can validate the Advance Steel model in Revit. First, export the model from Advance Steel in the SMLX format, and then synchronize it with the Revit model. Note that in order to include connections that were added in Advance Steel, you must have already installed the Revit 2018 Steel Connections (as described in the next section).

First, you need to export the model from Advance Steel:

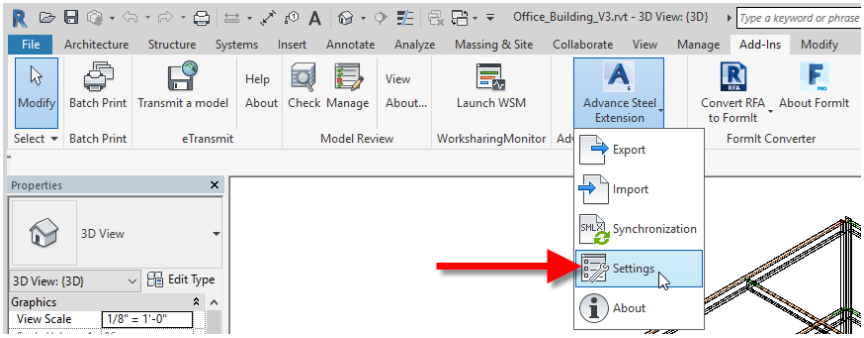
1. On the **Export & Import** ribbon, in the **Revit** panel, click Export.



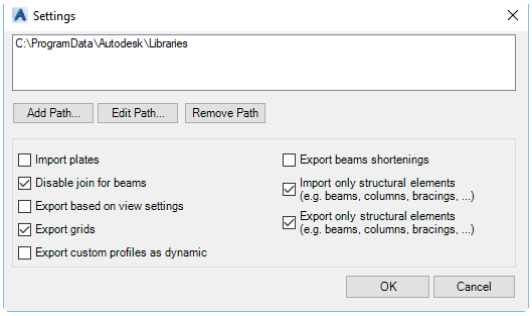
2. The program displays a **Save As** dialog. Navigate to the folder in which you want to save the file, specify the file name, and then click **Save**.

Once the .smlx has been saved, you can synchronize it with the Revit model:

1. In Revit, open the Revit model.
2. On the **Add-ins** ribbon, in the **Advance Steel Extension** panel, expand the **Advance Steel Extension** drop-down and click **Settings** to open the **Settings** dialog.



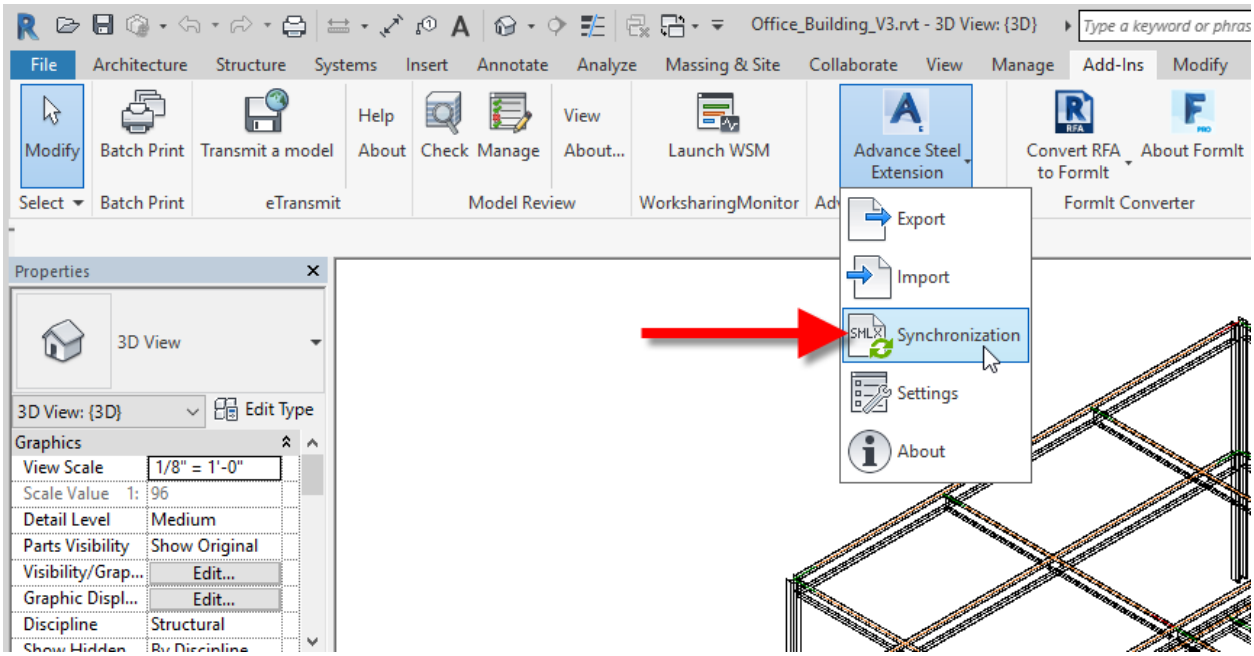
3. Make sure that **Import plates** is cleared and the **Disable join for beams** and **Import only structural elements** checkboxes are selected.



4. Click **OK** to close the dialog.

   Now you are ready to synchronize and validate the Advance Steel model with the Revit model.

5. Expand the **Advance Steel Extension** drop-down again and click **Synchronization**.



6. The program displays the **Synchronization** dialog. Click **Load…**.

7. The program displays a file **Open** dialog. Navigate to the folder in which you saved the .smlx file from Advance Steel, select that file, and click **Open**.

   The program immediately begins importing and processing the .smlx file. When finished, the Synchronization dialog displays a list of all the differences between the imported Advance Steel model and the Revit model.

   Again, the differences are color-coded. Now you can look more closely at the changes so that you can validate the model.

8. Click **Filter** to expand the dialog.

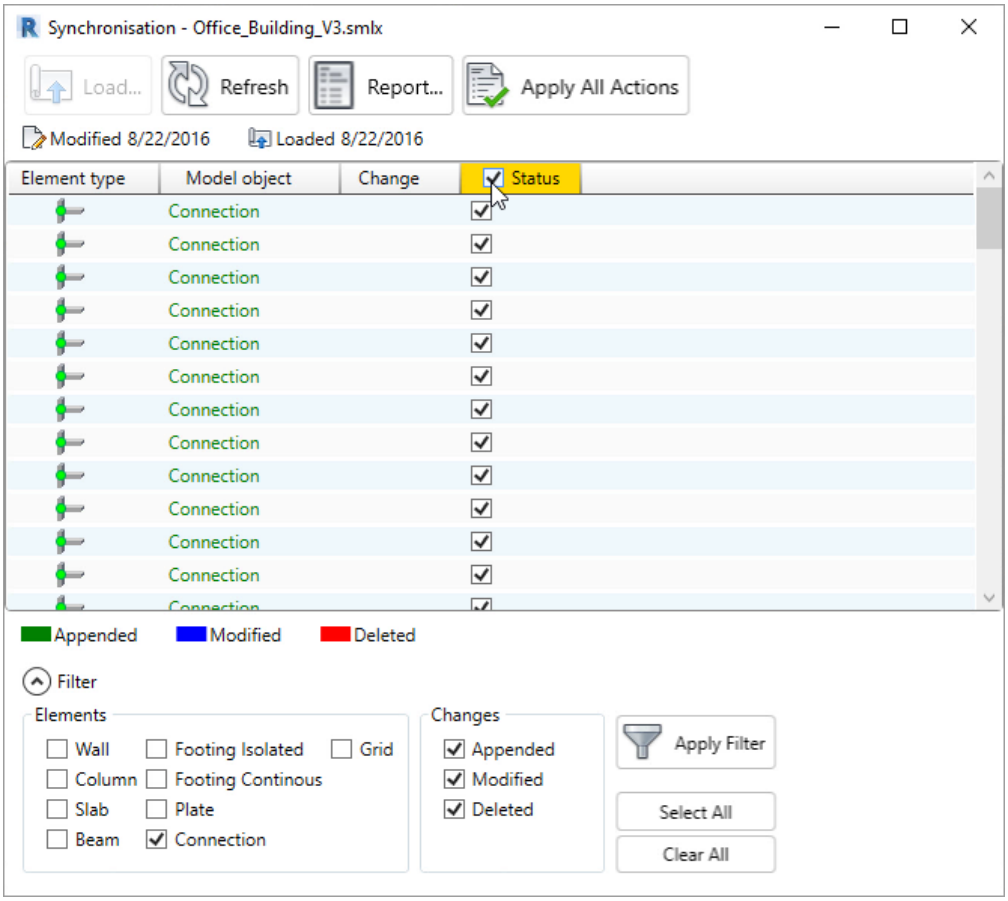
9. Click **Clear All** to deselect all the filters.

10. In the **Elements** group box, select **Column** and **Beam**. Then, in the **Changes** group box, select **Appended**, **Modified**, and **Deleted**, and then click **Apply Filter**. A blank list indicates that the beams and columns in the Advance Steel model match those in the Revit model.

11. In the **Elements** group box, clear **Column** and **Beam** and select **Connection**. Then, in the **Changes** group box, clear **Appended** and click **Apply Filter**. A blank list indicates that no connections were modified or deleted.

12. In the **Changes** group box, select **Appended**, and then click **Apply Filter**. Now you can see all of the connections that were added in Advance Steel and therefore need to be synchronized in order to update the Revit model.

13. Select the checkbox in the **Status** column header to select all of the connections.



14. Click **Apply All Actions**.

    As the changes are applied, the model updates. Once all of the changes have been applied to the model, the list in the dialog will be empty, indicating that no additional changes need to be made.

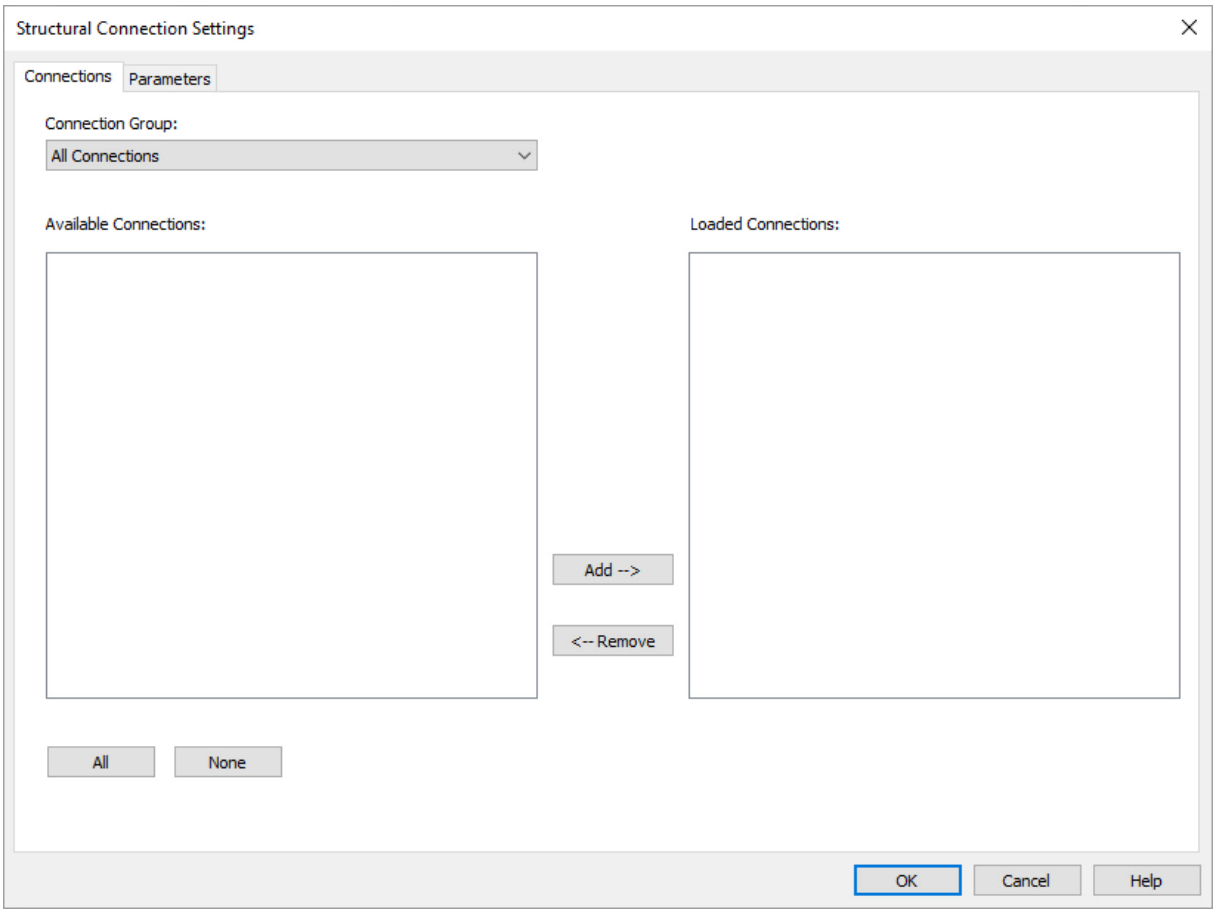
15. Click the **X** to close the Synchronization dialog.

Adding Advance Steel Connections to Revit

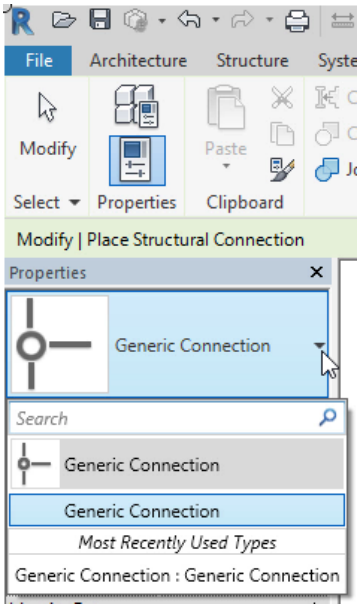
You can add steel connections to structural sections directly inside Autodesk Revit and also import connections from Advance Steel into Revit. This is particularly useful if you are a structural engineer and need to deliver a fabrication-level structural model (LOD 400 or above).

To include the steel connections inside Revit, you must first download and install the Steel Connections add-in for Revit. If you have used the Autodesk Desktop app to install updates, this add-in may already be installed.

For example, start Autodesk Revit and open a project. On the **Structure** tab, in the **Connection** panel, click the **Connection Settings** dialog box launcher to open the **Structural Connection Settings** dialog. If the Steel Connections add-in has not yet been installed, then the **Available Connections** list will be empty.



When you click the **Connection** tool to begin placing a structural connection, in the **Properties** palette, the only connection type available is a Generic Connection.

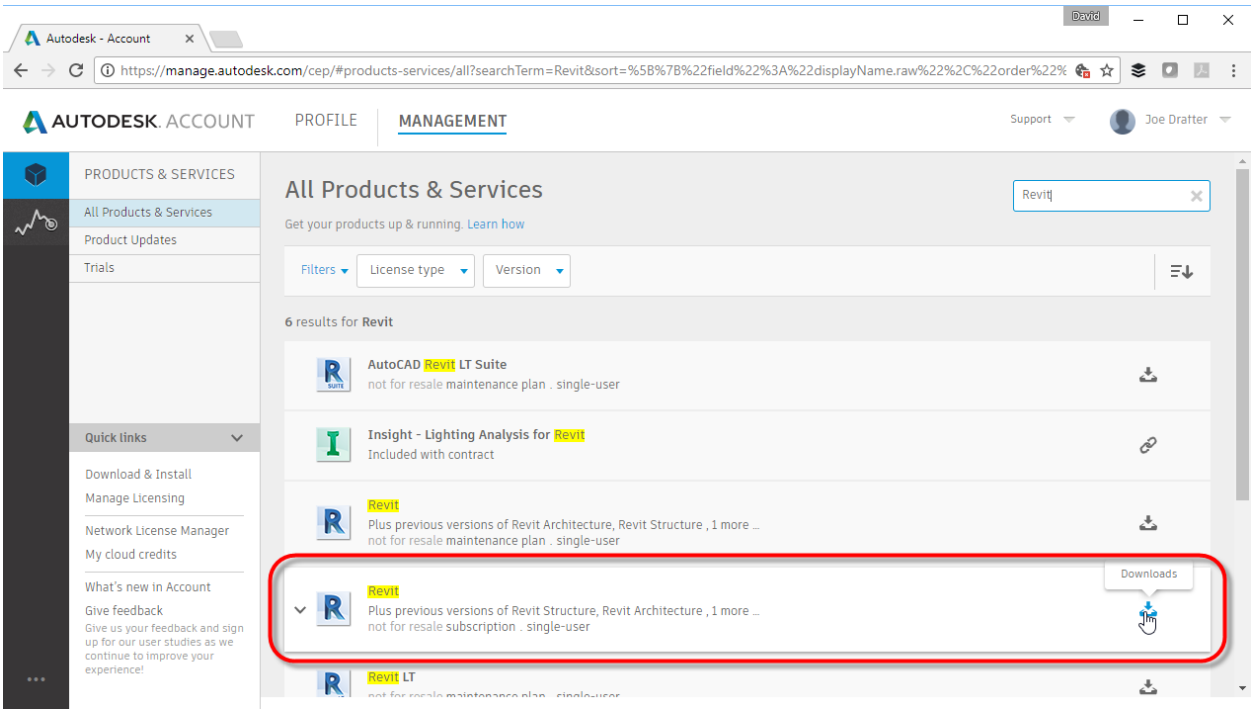


Close Revit and then download and install the Steel Connections add-in for Revit.

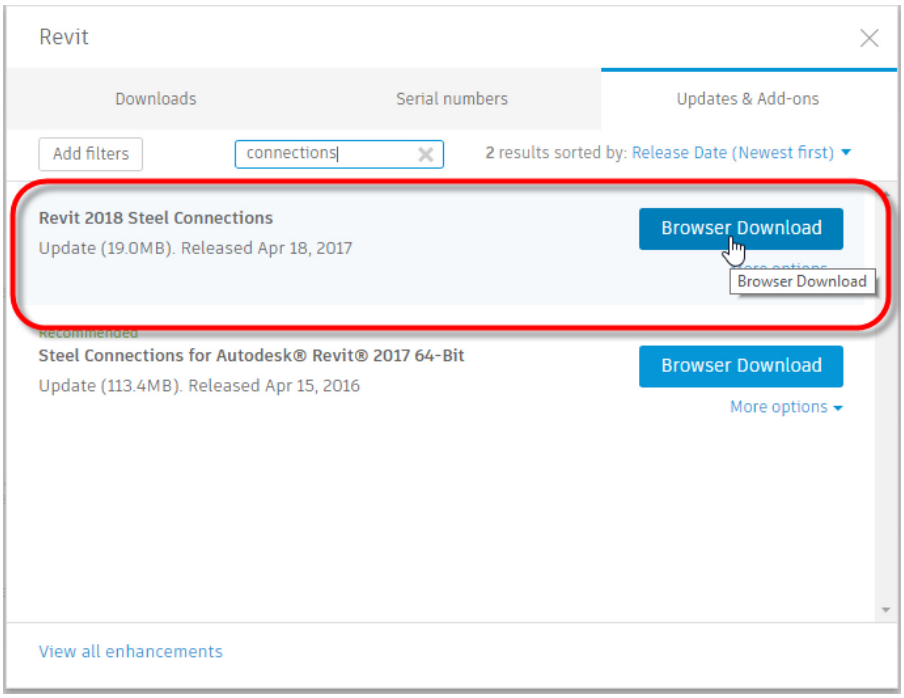
You can install the Steel Connections add-in either from within the Autodesk Desktop App or by using a web browser.

To install the Steel Connections add-in for Revit using a web browser:

1. Open a web browser and log into your Autodesk account by going to https://manage.autodesk.com.
2. Once the page opens in your browser, you see a list of all of the Autodesk products for which you have a license. You can scroll down to Revit, or expand the search field, field, type "**Revit**" and press **ENTER**.

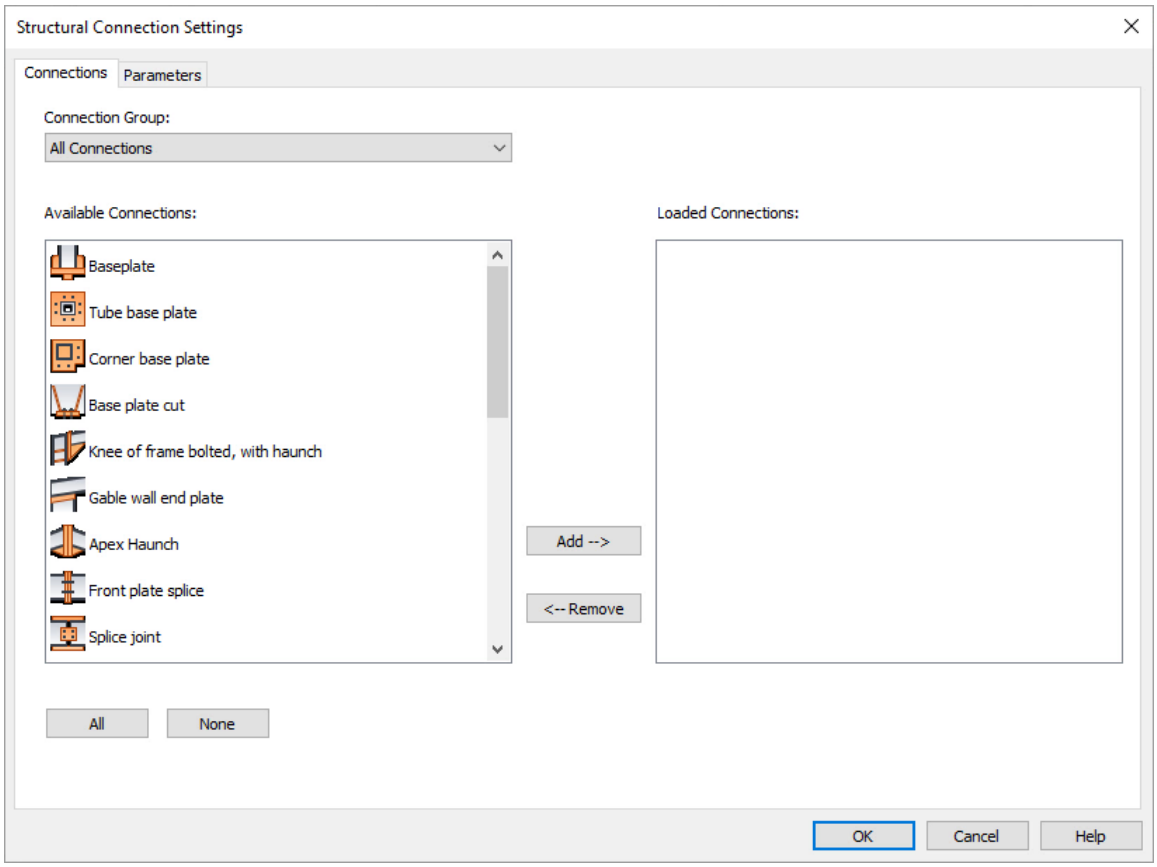


3. Once you locate your Revit license, click **Downloads** to open a downloads window.
4. Select **Updates & Add-ons** to see a list of available updates and add-ons. Expand the search field, type "**Connections**" and press **ENTER**. Locate the **Revit 2018 Steel Connections** add-on and click **Browser download**. If you see an additional window, click **Start download**.



5. Once the download is complete, click the link to install the add-in. The program will prompt you for the location in which to extract the files. Typically, you should click **OK** to accept the default location. You may need to agree to allow the program to make changes to your system.
6. You will then see an Autodesk install dialog. Click **Install**. On the next page, you must read and accept the license and services agreement, and then click **Next**. Then, click **Install** to proceed with the actual installation. Once the installation is complete, click **Finish** to close the dialog.
7. Start Revit again and open the structural model in which you want to add steel connections.
8. On the **Structure** tab, in the **Connection** panel, click the **Connection Settings** dialog box launcher to open the **Structural Connection Settings** dialog.

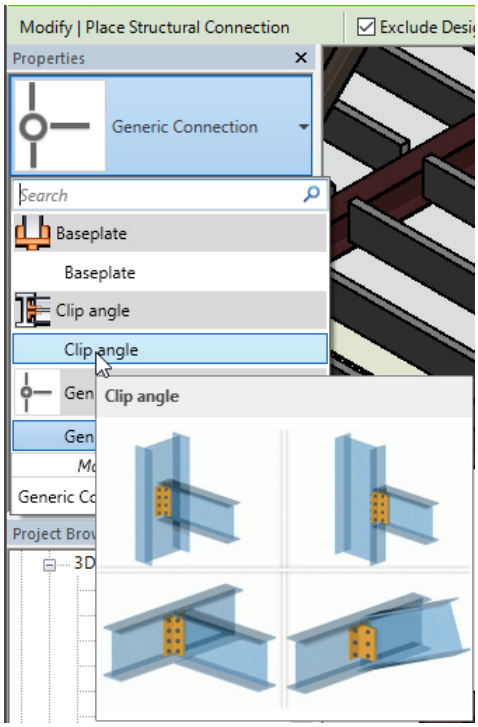
   Since the Steel Connections add-on has been installed, the **Available Connections** list now shows a complete list of available connections.



9. To load one or more connections into the current project, select them in the list on the left and click **Add-->** to add them to the **Loaded Connections** list on the right. Alternatively, you can double-click a connection to add it to the list of loaded connections.

   Remember that you can press **CTRL** to select multiple connections in the **Available Connections** list. Once you have finished adding the connections you want to use in the project, click **OK** to close the dialog. You can always repeat these steps to load additional connections into the current project.

   Note: *After installing the add-in, if you import an SMLX file from Advance Steel, you do not need to manually add connections to the current Revit project. They will be loaded automatically when you import the Advance Steel model.*



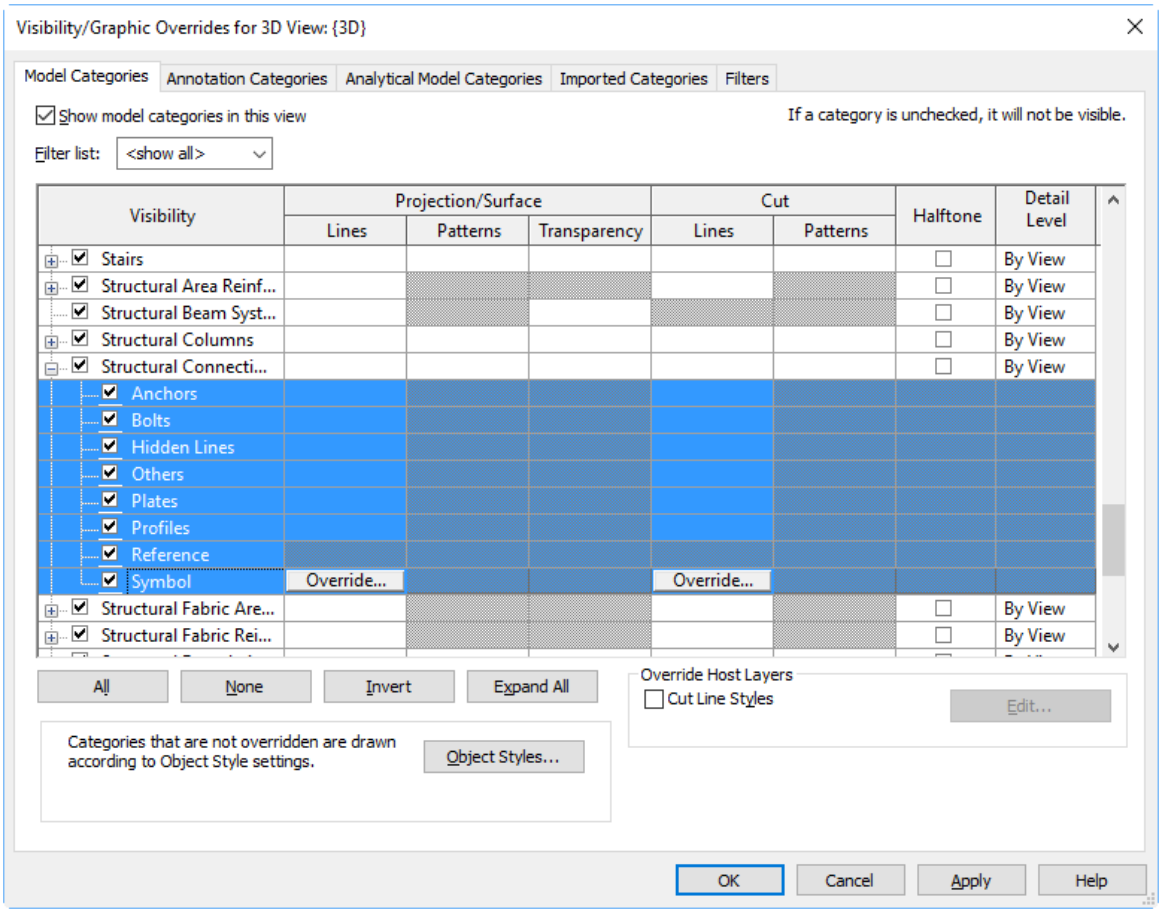
10. Once connections have been loaded into the current project, on the **Structure** ribbon, in the **Connection** panel, click the **Connection** tool. In the **Properties** palette, in addition to the Generic Connection that comes with Revit, you can now select one of the connections you just loaded.

Making Connections Visible in Revit

When you add steel connections to the model in Revit, you will not be able to see those connections until you make them visible within the Revit model. For example, when you switch to the default 3D view and zoom in on any location where connections have been added to the model, you do not see any of those connections.

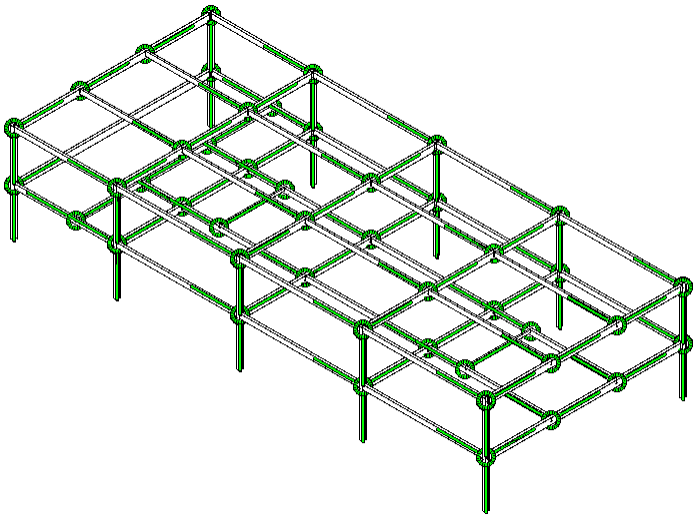
By default, the display of connection elements is not enabled in Revit. To make those connections visible:

1. Type **VG** to open the **Visibility/Graphic Overrides for 3D View** dialog.
2. On the **Model Categories** tab, scroll down, expand the **Structural Connections** category, and select the checkboxes for all the items within that category.



3. Click **OK** to close the Visibility/Graphic Overrides for 3D View dialog.

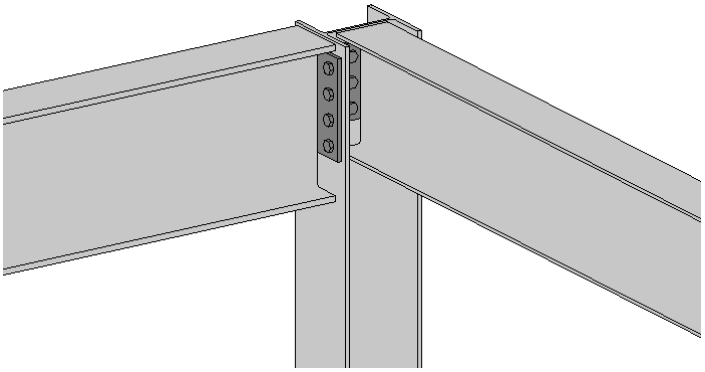
Now, the connection symbols are displayed in the model.



But the connection elements themselves are still not displayed, because those elements are only visible when the model is displayed using the Fine level of detail.

4. In the **View Control Bar**, expand the **Level of Detail** tool and choose the **Fine** level of detail.

   Once you do, you will be able to see all of the connection elements within the Revit model.

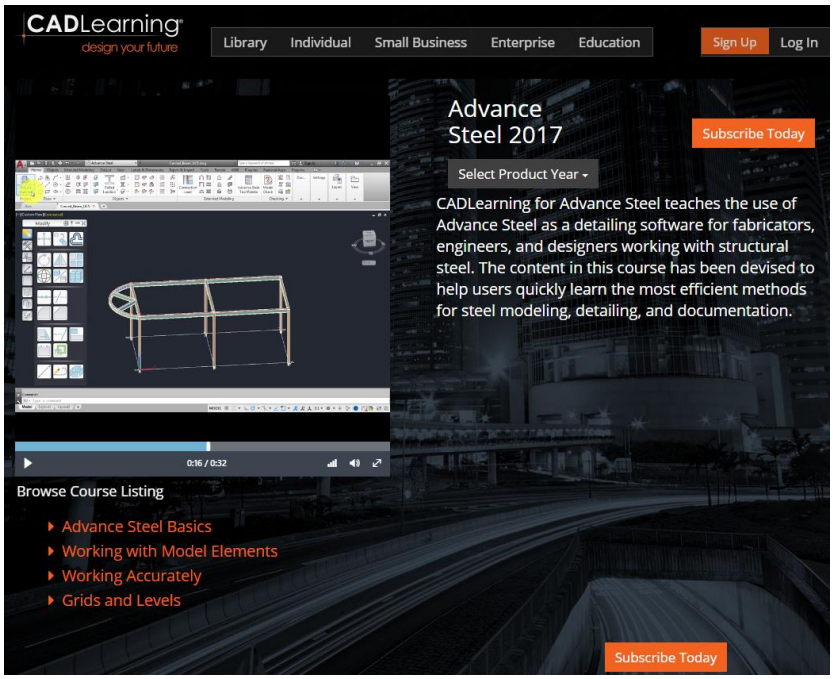


Conclusion

Clearly, the ability to exchange data between Revit and Advance Steel ends the disconnect between the Building Information Model and the steel fabrication drawings. Once you have installed the Advance Steel Extension for Autodesk Revit, you can use the bi-directional synchronization tools in both programs to compare and coordinate changes between the Advance Steel and Revit models, ensuring that both are always up to date. And with the addition of the Advance Steel Connections for Revit add-in, you will be able to work with those same Advance Steel Connections inside Autodesk Revit.

To learn more…

Do you want to learn more about Advance Steel? 4D Technologies offers a CADLearning course for Advance Steel that includes all the materials covered in this class, as well as lessons covering many of the other aspects of using Advance Steel for the creation of complete sets of steel fabrication drawings.



The Advance Steel course is just one of more than 100 courses covering a wide range of Autodesk products for architectural, engineering, construction, manufacturing, and media & entertainment. For additional information, please visit www.cadlearning.com.