



CADS Revit SCIA Engineer Link

Best Practices



Version: 2018.0

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GLOBAL CONSTRUCTION
SOFTWARE AND SERVICES



Microsoft Partner
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1 Installation

The current version of **CADS Revit SCIA Engineer Link** works with **Revit Structure** 2016, **Revit** 2017 and **Revit** 2018. You will also need a copy of **SCIA Engineer** installed on your system but it does not need to be authorised. **CADS Revit SCIA Engineer Link** needs to know the version of **SCIA Engineer** in order to create the correct version of the export file.

For full details and the installation file for **Revit** please go to http://www.cads.co.uk/revit_interface.html and download the documents relating to the installation and use of the program in addition to this document.

| Document | Description |
|-----------------|---|
| Release Notes | This details the supported versions of Revit and SCIA Engineer and the enhancements and bug fixes to the latest version of CADS Revit SCIA Engineer Link . |
| Getting Started | CADS Revit SCIA Engineer Link configuration and basic usage notes. |
| Check List | Aide memoir when creating projects, this list should be submitted for all requests for support on CADS Revit SCIA Engineer Link . |

Please refer to this document before installing or using the software.

Note:

We suggest that you uninstall the previous version of **CADS Revit SCIA Engineer link** before starting the installation of the latest version of **CADS Revit SCIA Engineer link**.

The mapping databases is updated in the latest version of **CADS Revit SCIA Engineer link** (2018.0). If you wish to use any of the existing databases or any pre-defined customised databases, please copy them into the folder C:\ProgramData\CADS\Revit to Scia Engineer\Revit 20xx\Mapping Databases.

Please note that the user table created in the previous versions of **CADS Revit SCIA Engineer link** cannot be used with the new version.



2 Work flow

2.1 Revit Architecture model to SCIA Engineer round trip

In the instance where you have to use a project created in **Revit Architecture** to create the **Revit Structural** model it is advisable that you use the *Link Revit* command and the *Copy and Monitor* feature to produce your own model in **Autodesk Revit** using the default **Structural** template. This ensures that your model is defined correctly using **Structural** elements as opposed to Architectural Concept Elements.

2.2 Revit model to SCIA Engineer round trip

Create your **Revit** model based on the correct **Structural** template for the code of practice you are using. This ensures that the model is created using **Structural** elements and the *Analytical* model is enabled. The model that is exported from **Autodesk Revit** to **SCIA Engineer** is based on the *Analytical* stick model and not the presentation model.

2.3 SCIA Engineer to Revit round trip

Models created in **SCIA Engineer** are based on the analytical centre line. When the model is transferred from **SCIA Engineer** to **Revit** the members will be transferred based on the analytical stick model created in **SCIA Engineer**. Member offsets and eccentricities will be transferred if they are supported by the particular elements in **Revit**. Where these offsets and eccentricities are not supported a warning message will be issued in the transfer log file in **CADS Revit SCIA Engineer link**. These individual elements will need to have the eccentricities applied manually in **Revit** to create the correct presentation model and corresponding general arrangement drawings.

3 Creating the Revit model

Listed below are some suggestions that will help optimise the transfer of the **Revit** model to **SCIA Engineer**.

3.1 Revit template

You may use your customised **Structural** template but ensure that the customised template is created from a default **Revit Structural** template deployed by a **Revit** installation. The template should be configured to use the same *Units* as the **SCIA Engineer** model.

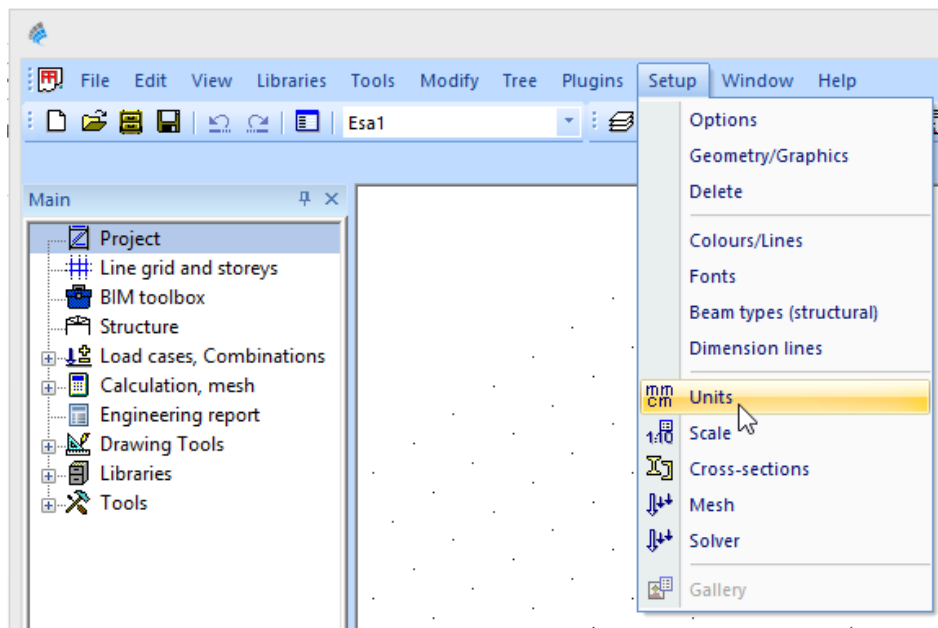


Figure 3-1: SCIA Engineer - Units

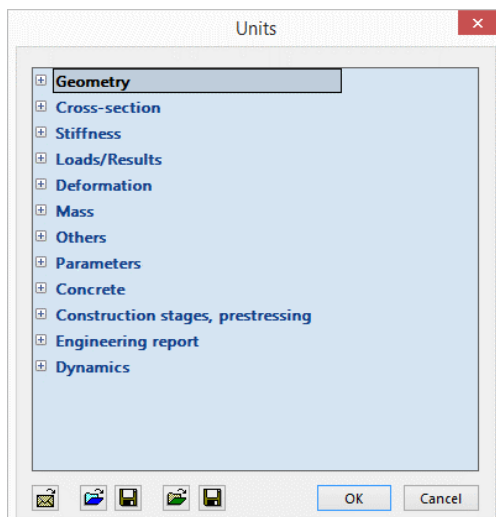


Figure 3-2: SCIA Engineer – Units dialog

It is recommended that you upgrade your customised template file when migrating to a higher version of **Revit**.

3.2 How to view the Analytical model

The model transfer to **SCIA Engineer** is based on the Analytical Stick Model created in **Revit**.

You can view the analytical model in Revit Structure by going to the *Properties* dialog and selecting the *Visibility and Graphics Overrides* then clicking on Edit and switching on the Analytical Model.

If required you can disable the *Model Categories* to give a clearer view of the Analytical Model.

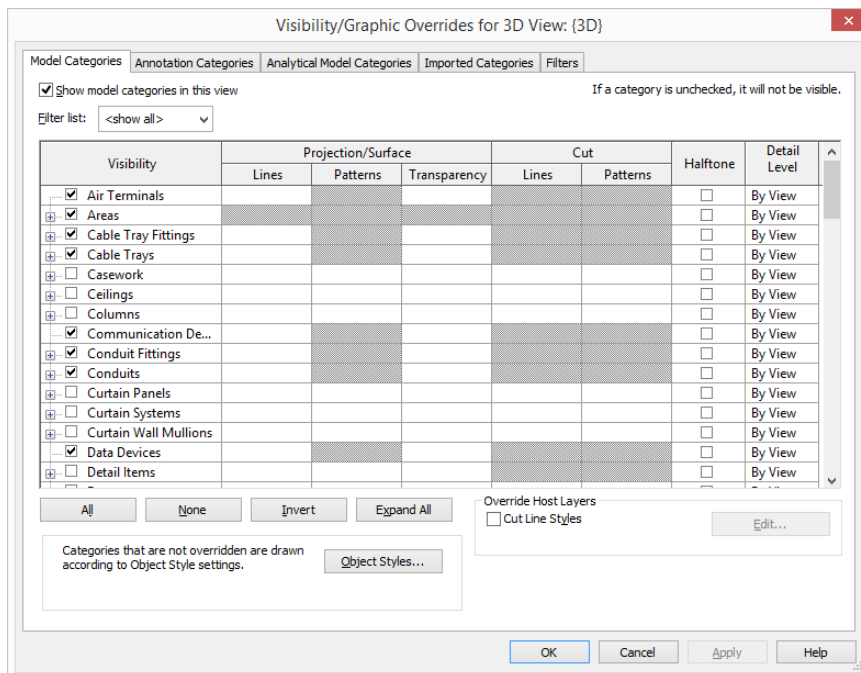


Figure 3-3: Revit Structure - Visibility/graphics overrides

3.3 Creating a test model

Before using the **CADS Revit SCIA Engineer link** on a major project it would be wise to become familiar with the software by creating a test model. A few key points to look for:

1. This model should incorporate the structural features you wish to specify in your projects so that it will allow you to test the round trip from **Revit** to **SCIA Engineer** and vice versa. For example, if you are using a custom *Revit Structure family (*.RFA file)* then it will be useful to create a member using the *Revit Structure family (*.RFA file)* and exporting it to **SCIA Engineer** to check if the cross section type and member eccentricities are transferred correctly.
2. Ensure that the analytical model is in the correct position and connected before attempting to export it to **SCIA Engineer**. Please see the section below on **Analytical Checks**. **CADS Revit SCIA Engineer Link** uses the *Analytical Model* in **Revit** for exchanging models between **Revit** and **SCIA**

Engineer. The analytical alignment can be adjusted in **Revit** for all structural elements. The figure below shows an example of a Beam.

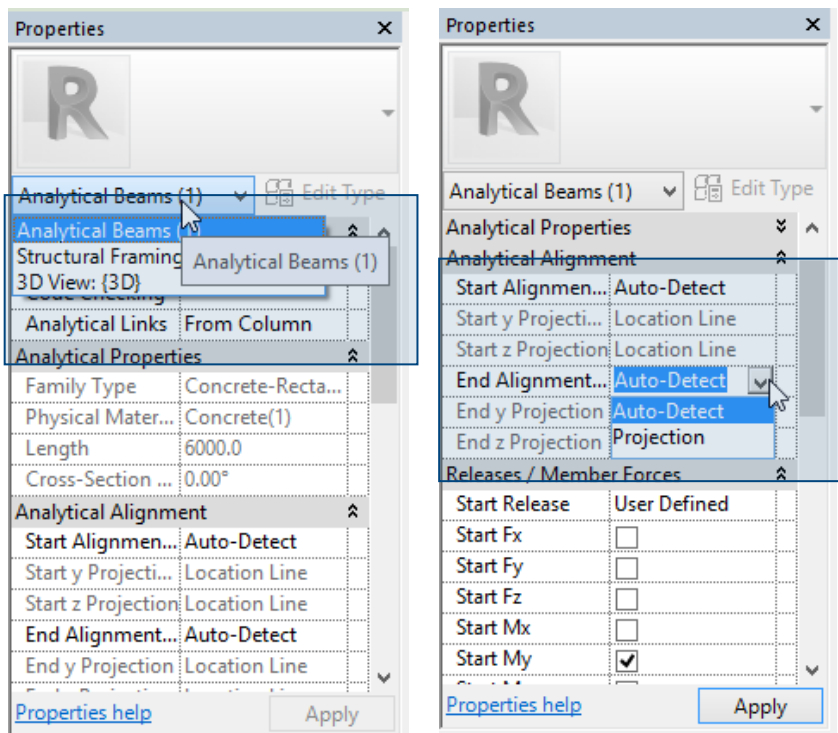


Figure 3-4: Revit - Analytical properties

- Most importantly, make sure that the building you model in **Revit** is one that you could model in **SCIA Engineer** and is a valid model that can be analysed. For example, if the members are not connected in **Revit** then the same problem will be reflected in the **SCIA Engineer** model too. Please refer to the figure below:

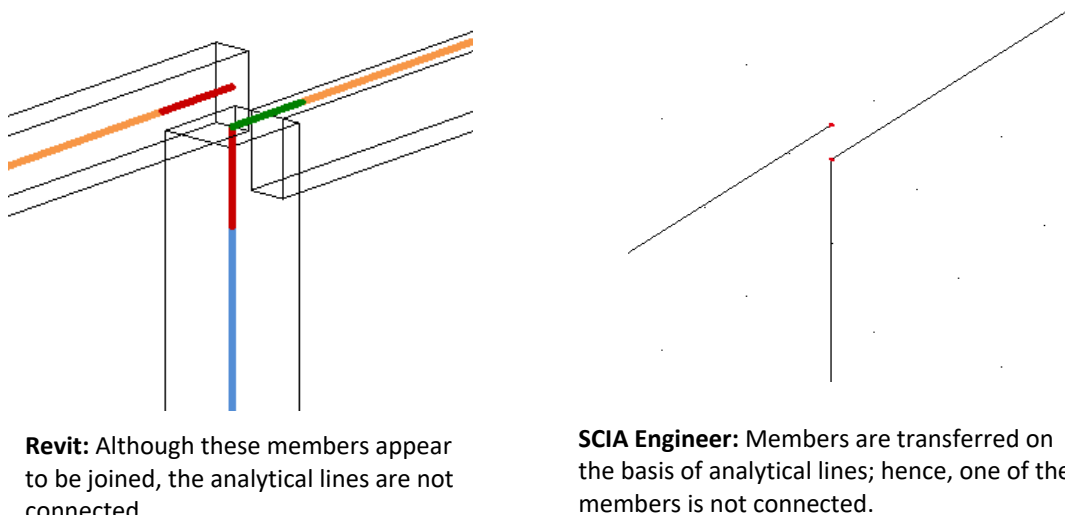


Figure 3-5: Analytical lines not connected in Revit model

- The **Revit** model must be saved before attempting to export it to **SCIA Engineer**.

3.4 Levels

Ensure that the *Base Level* and *Top Level* of columns & walls are set to the nearest **Revit Level**. Otherwise **SCIA Engineer** may not be able to resolve the position of the element correctly. If the vertical offsets (*Top Offset* and *Base Offset*) in **Revit** are applied, do not allow them to cross another *Level*. Floor slabs should also be assigned to the nearest *Level*, otherwise the analytical slab position in **SCIA Engineer** will be incorrect.

In the **Revit** example shown below a separate level for the lift shaft roof was not created. The roof has been offset from *Level 3* and the *Analytical Floors* setting was set at *Projection -> Level 3*. Whilst the presentation model is correct, the analytical model is incorrect and would be drawn on *Level 3* when exported to **SCIA Engineer**. This behaviour is sometimes observed when a **Revit** file is migrated from the lower version to a higher version of **Revit**.

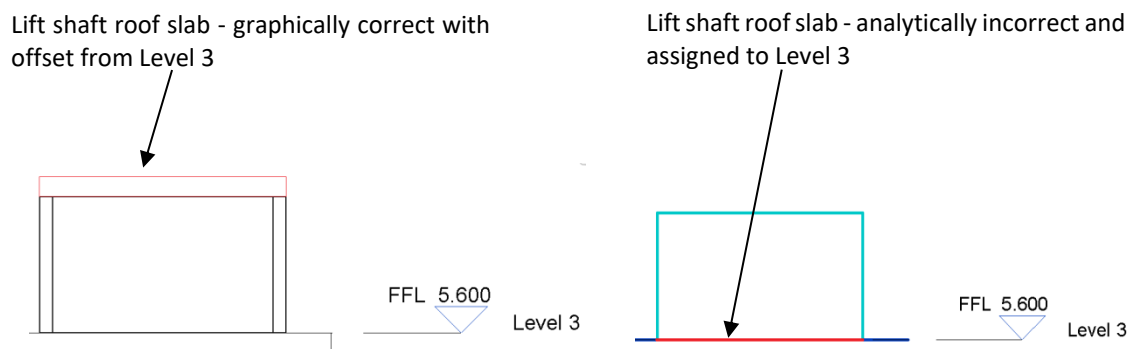


Figure 3-6: Revit model - Difference between physical and analytical floor position

The correct thing to do in this instance is to create another level above *Level 3* with the *Analytical Floors* settings set to *Auto-Detect* and assigning the lift shaft roof to this level.

3.5 Offset framing & Column members

3.5.1 Vertical offsets

The vertical offsets for beams can be provided in several ways. Two different cases and their implications are described below. It is always useful to agree with the Structural Engineer on the preferred method of modelling to ensure minimum rework is required by the Structural Engineer in **SCIA Engineer**.

Case 1: Vertical offset using *Z offset value* in Revit

In this case, a beam is drawn in the floor level, aligned with other beam and column top positions, but offset by 300 mm using the **Revit** properties.

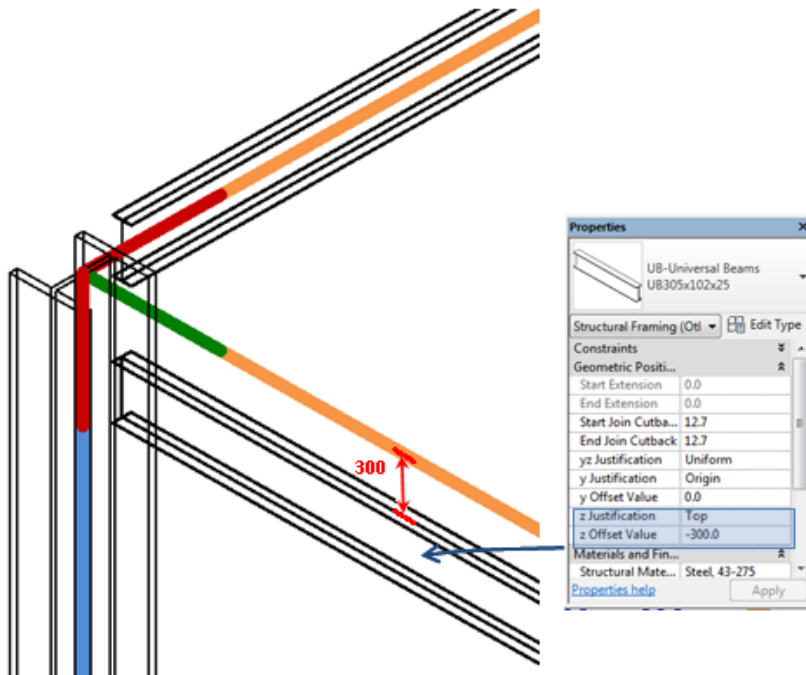


Figure 3-7: Revit Structure - Vertical offset provided with z Offset Value

CADS Revit SCIA Engineer Link transfers the model to **SCIA Engineer** based on the Analytical lines. Hence, the analysis model in SCIA Engineer will be as shown below:

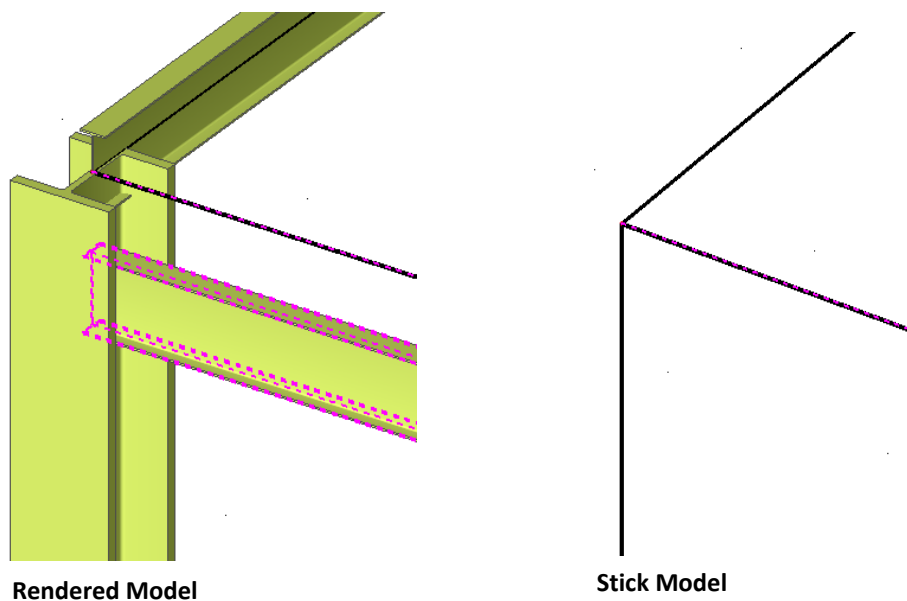


Figure 3-8: SCIA Engineer - Vertical offset case 1

Case 2: Vertical offset by drawing the beam in position

In this case the beam is drawn in place by creating a work plane in **Revit** instead of specifying an offset from the floor level. Although the physical position of the beam is the same as that described in Case 1, **Revit** automatically adjusts the analytical line for the beam to align with the top of beam.

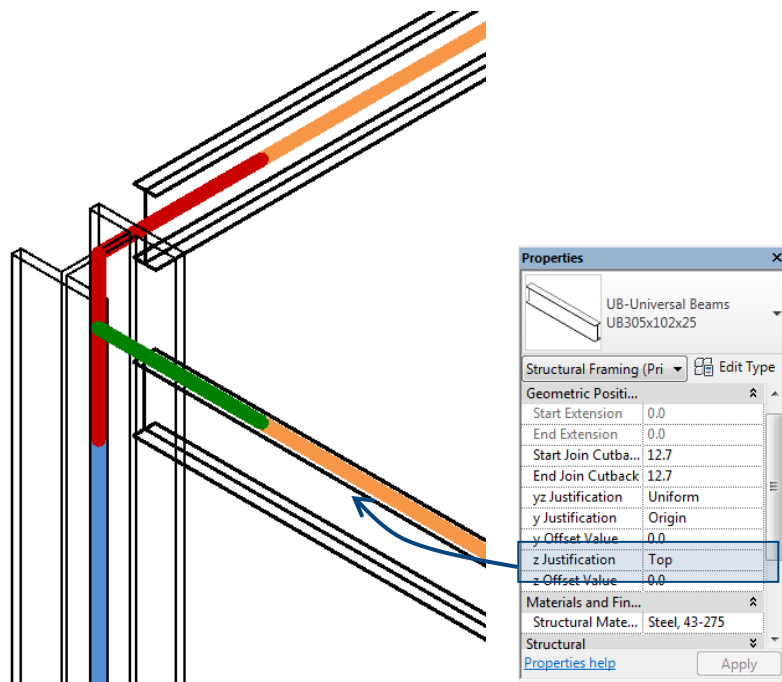


Figure 3-9: Revit model - Beam drawn in place with Z Offset Value = 0

The analysis model transferred to **SCIA Engineer** in this case will be as shown below:

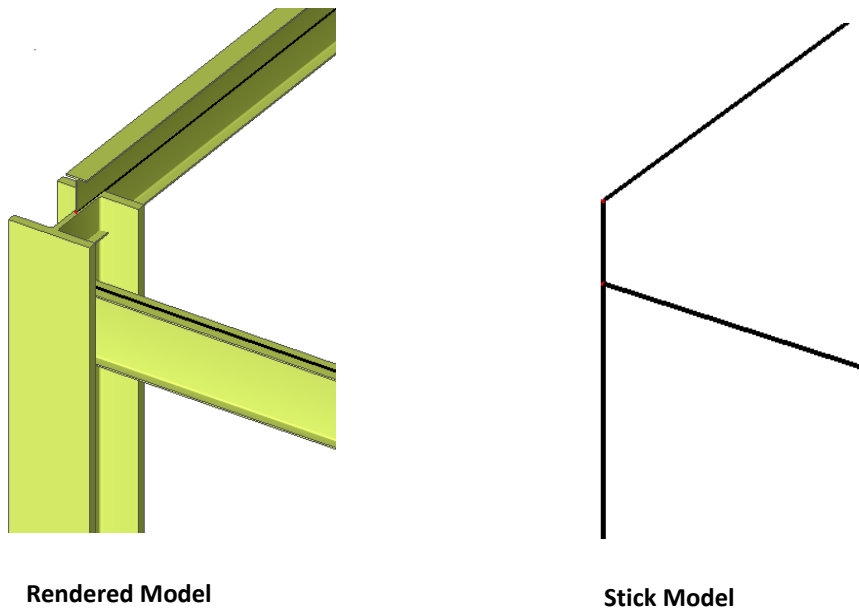
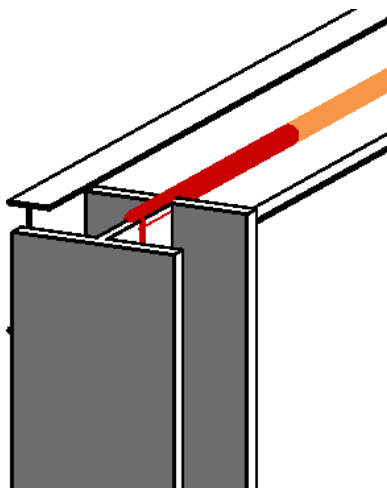


Figure 3-10: SCIA Engineer - Vertical offset case 2

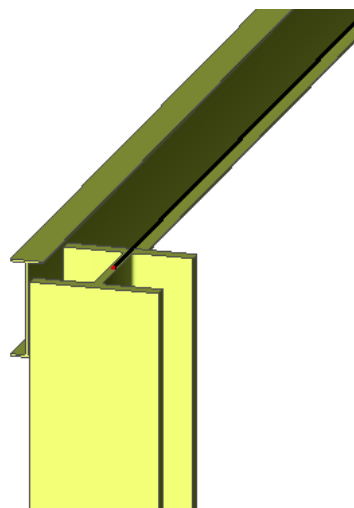
The physical locations of the beam in both cases were identical, but owing to the difference in the analytical line position the model transferred to **SCIA Engineer** is different.

3.5.2 Lateral offsets

Lateral offsets are allowed only for beams and braces in **Revit**. The lateral offsets can be applied to beams and braces in **Revit** and are mapped appropriately in **SCIA Engineer**.



Revit: Beam with lateral offset, Y
Offset Value = 250mm



SCIA Engineer: Beam with lateral
offset, $e_y = 250\text{mm}$

Figure 3-11: Lateral offset between Revit model and SCIA Engineer model

Note that there is no provision to offset columns from its local reference axes in **Revit**. The implications are elaborated in the *Eccentricities* section.

3.5.3 Eccentricities

In the **Revit** model you might be required to align framing elements to one face over several storeys. An example of this would be walls of different thicknesses and concrete columns of different section sizes. **Revit** will automatically adjust the analytical stick model to align them together whilst keeping the presentation model correct. These eccentricities are correctly exported to **SCIA Engineer**.

If the section properties are not changed in **SCIA Engineer** and the model is exported back to **Revit**, the framing members will keep the original alignment in **Revit**. Otherwise, they will need to be adjusted manually in **Revit** to ensure the presentation model is correct.

You can track amendments to your **Revit** model using the *Review & Export / Review & Import / Select Changes* options which will highlight the changes in geometry, section size and material type as well as new elements that have been added. Please refer to the section on this command at the end of the document.

In the example given below, a three storey high wall is modelled in **Revit**. The analytical line is automatically aligned based on the centre line of the top column (may vary depending on how the wall is modelled).

CADS Revit SCIA Engineer link will transfer the model based on the *Analytical lines*. Thus columns will be aligned as shown below:

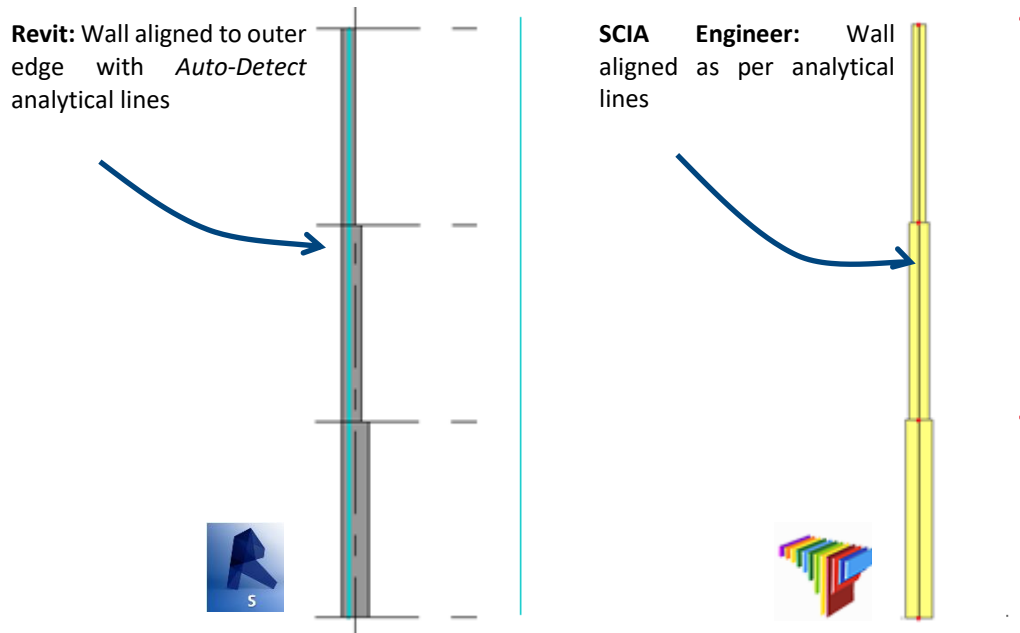


Figure 3-122: Wall aligned to outer edge with *Auto-Detect* analytical lines in Revit

Another alternative is to manually change the analytical line position using the **Revit** feature for each wall position.

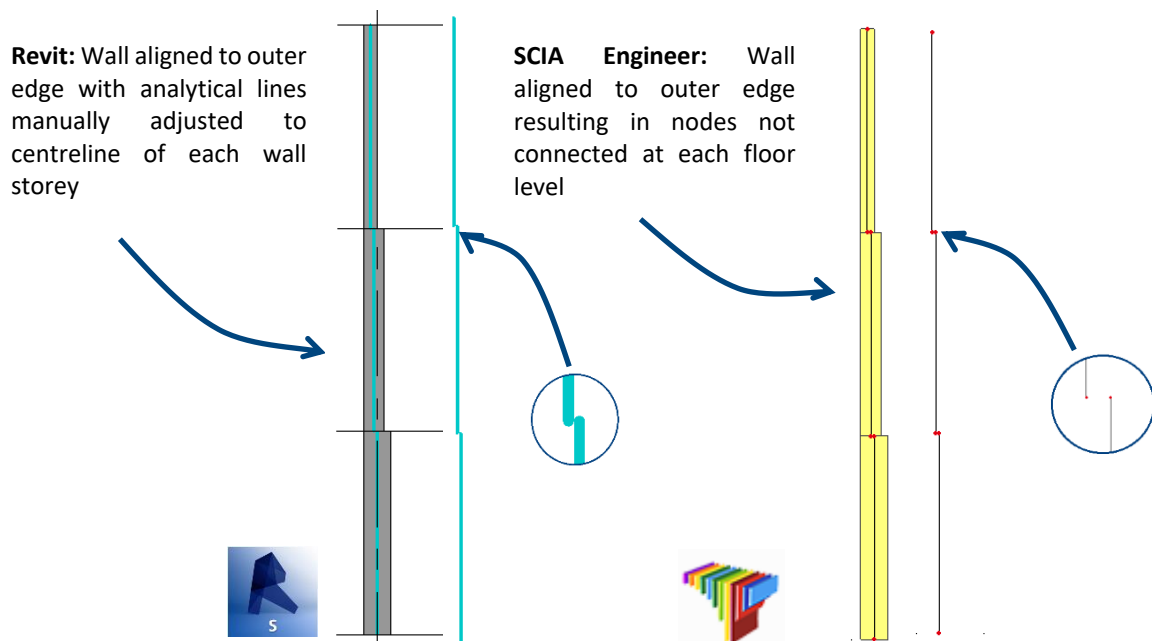


Figure 3-13: Wall aligned to outer edge with manually adjusted analytical lines in Revit

The walls are still physically aligned to the left edge but the analytical line is present at the centre line of each wall storey. In this case, **CADS Revit SCIA Engineer Link** will transfer the model to **SCIA Engineer** to match the physical location of the wall in **Revit** as above but the nodes at each storey level will be disconnected.

The adjustment made to the **SCIA Engineer** model will not be overwritten by **CADS Revit SCIA Engineer Link** in a subsequent update if the member to which the adjustment is made is not changed in **Revit**.

For example, the structural engineer may provide eccentricity for Wall 1 in **SCIA Engineer**, in a subsequent update from **Revit** the eccentricity in Wall 1 will be retained as long as Wall 1 is not changed in **Revit**.

3.6 Enable Analytical model

Ensure that any structural element you want to export to **SCIA Engineer** has the option *Enable Analytical Model* ticked in the **Revit Properties** dialog. You may also have to enable the structural model on some elements.

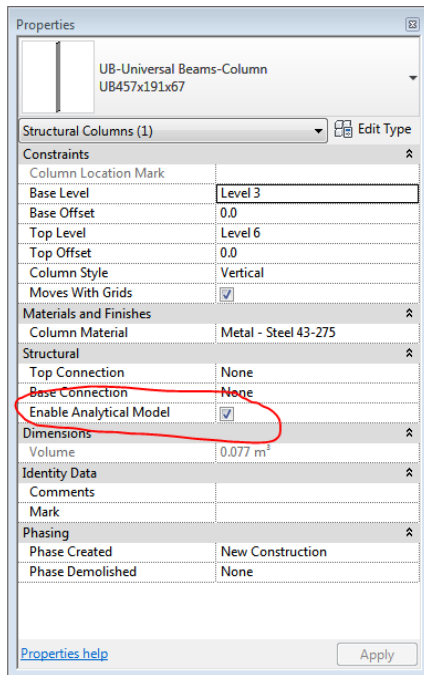


Figure 3-14: Revit - Enable Analytical Model

3.7 Zero length elements

If there are elements on the model which have no physical length, **CADS Revit SCIA Engineer Link** will flag them in the log file while exporting the model to **SCIA Engineer**. You need to remove them from the model before trying to export to **SCIA Engineer**.

3.8 Openings in slabs or walls

Where an opening coincides with the edge of a slab, or a wall, it is best practice to define the boundary of the slab around the opening.

When a hole is required within the perimeter of a slab or wall do not use the edit boundary option to add the hole. Instead, you may create the holes using the "Opening option".

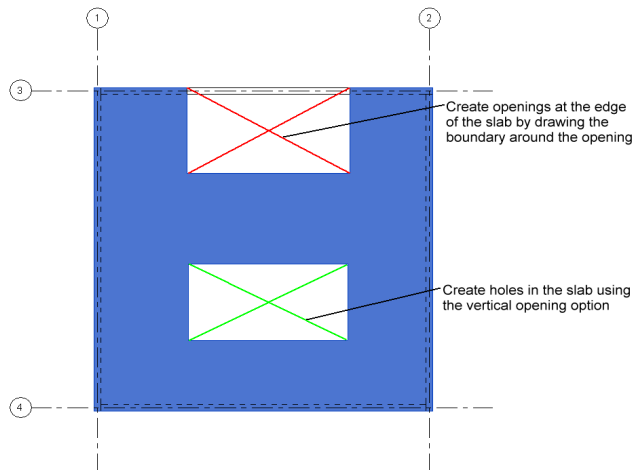


Figure 3-15: Revit– Slab openings

Owing to application limitations, it is not possible to import changes to the slab boundary in **SCIA Engineer** if the number of nodes is modified. It is best practice to use the *Opening* option whenever possible.

3.8.1 Shaft openings

In Revit it is possible to define an opening passing through the entire height of a building or through selected levels using the shaft opening option. These openings are transferred from Revit to SCIA Engineer as individual openings as there is no associated type for such an opening in SCIA Engineer.

When shaft openings are defined in Revit, care should be taken while updating the model from SCIA Engineer. It is recommended to set the option *Update 2D member openings* to *No* during import otherwise the openings will be lost on import. An alternative to avoid the issue is to define them as individual openings in Revit rather than using the shaft opening option.

From Revit link v3.1 onwards, any change done to the shaft openings in SCIA Engineer will be automatically ignored on import to avoid the loss of opening during round trip.

3.9 Dummy elements

A dummy element is a short piece of structure. Rather than use a small element, join the awkward connections with either model or detail lines. Dummy elements will not be exported from **Revit** to **SCIA Engineer** and will be shown in the transfer log file.

3.10 Multiple slabs

While creating multiple slabs in Revit it is necessary to create them using individual actions in Revit rather than continuing the same command. This will ensure the slabs are identified individually otherwise they could be lost on export.

4 Checking the model

The following lists the checks you should carry out prior to exporting the model to **SCIA Engineer**.

4.1 Analytical checks

In the *Structural Settings* dialog under the *Analytical Model Settings* tab you can activate automatic checks for *Member Supports* and *Analytical/Physical Model Consistency*. This will mean that **Revit** will automatically adjust your model and check for inconsistencies.

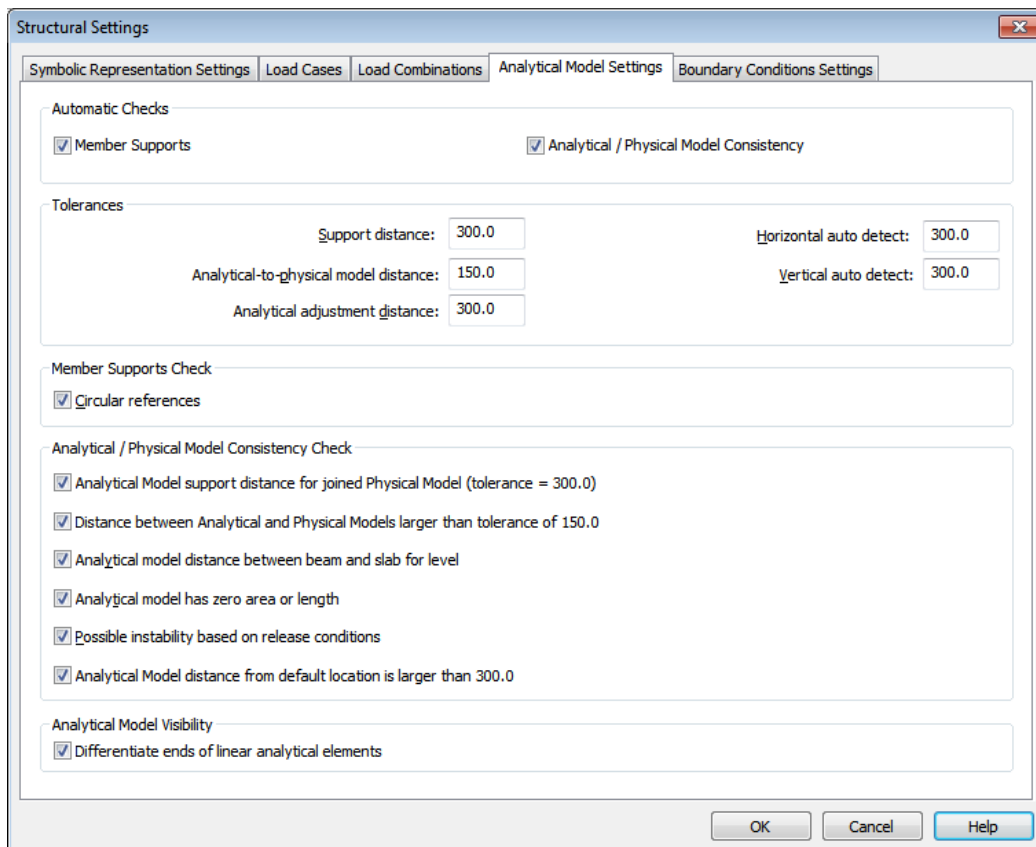


Figure 4-1: Revit - Structural settings

In case you prefer to apply these checks manually, leave them unchecked, and when you are ready run the *Check Supports* and *Consistency Checks* from the *Analyze* Tab.

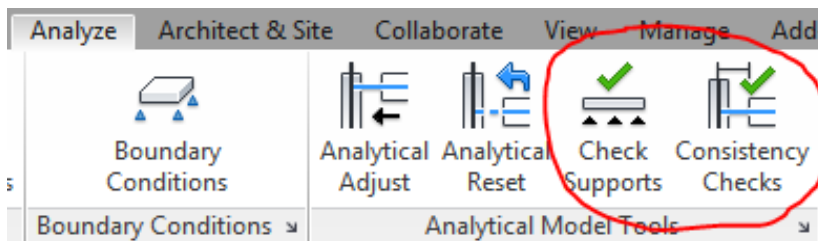


Figure 4-2: Revit – Analysis check options

In *Revit SCIA Engineer link*, the standard Revit command to perform *Analytical Consistency Check* is automatically invoked before starting the export. It checks for any *errors/warnings* and prompts you to review the same prior to export.

4.2 Check supports

The *Member Support* check will warn and highlight any unsupported elements within the model. You can choose to show or delete the check elements depending on the warning you get. If you use the show option you can adjust the properties of the element as required.

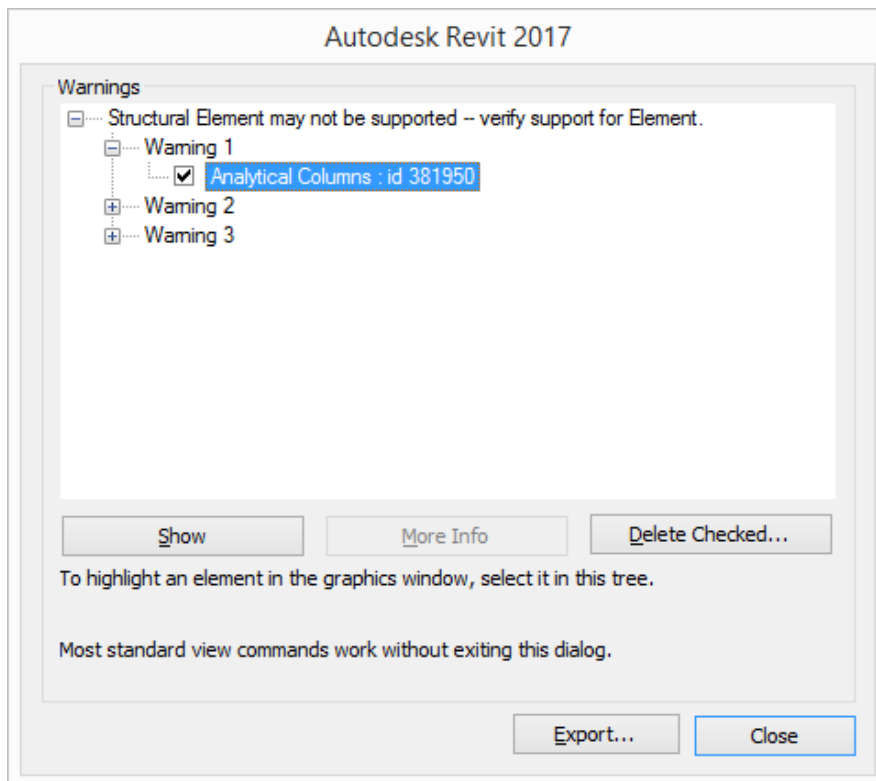



Figure 4-3: Revit - Warnings

You can access these Warnings once the dialog has been closed by going to the *Manage* tab – *Inquiry* panel and selecting *Warnings*  *Warnings* .

4.3 Analytical / Physical consistency check

The criteria set in the *Structural Settings* dialog is applied to your model and a warning will be generated where the model does not comply. These errors need to be corrected before exporting the model to **SCIA Engineer**. You can use the *Show* button to highlight the element or use the *Revit ID* number to locate it using the *Select by ID* on the *Modify* Tab.

5 Configuration settings

The settings applied inside the **Revit to CADS Revit SCIA Engineer Link** will affect the way the model is transferred between **Revit & SCIA Engineer**.

5.1 Options

Generally the settings inside the Options dialog box should be set-up as follows with a few exceptions that are explained in the subsequent section.

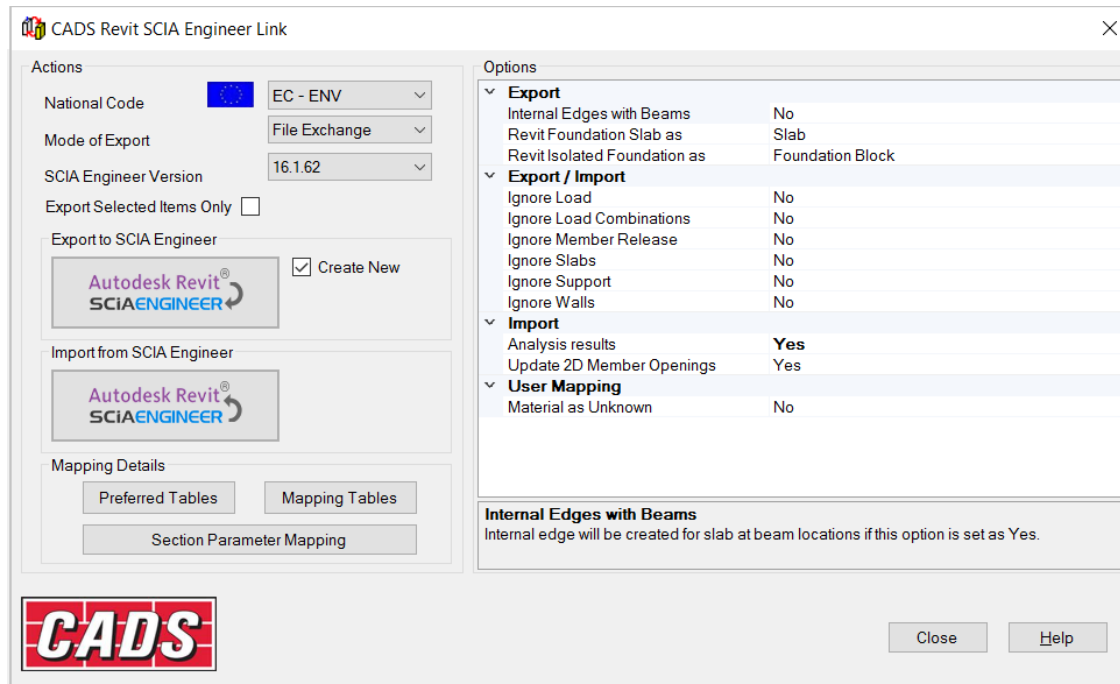


Figure 5-1: CADS Revit SCIA Engineer Link - Options dialog

5.2 National code

Make sure that the *National Code* in **CADS Revit SCIA Engineer Link** matches the *National Code* set in **Revit** and **SCIA Engineer**. The *National Code* depends on the *SCIA Engineer Version* selected.

5.3 Mode of Export

If you have an authorised copy of **SCIA Engineer** on your system, setting this option to “Direct Exchange” will mean that **SCIA Engineer** will be automatically started and your model will be loaded into the program. Setting the option to “file Exchange” will mean that a transfer file will be created in the same folder as your **Revit** model unless you specify a different location. The transfer file will have the extension *.R2S. The transfer file can be opened inside **SCIA Engineer** using either the *File-> Import* option or the *File -> Update* option.



5.4 SCIA Engineer Version

You will not be able to use the link software unless you configure the version of **SCIA Engineer** that is installed on your system. Click on the field and browse to the location of your **Esa.exe** file which is usually located in your **C:\Program Files (x86)\Scia\Engineerxx.x** folder”.

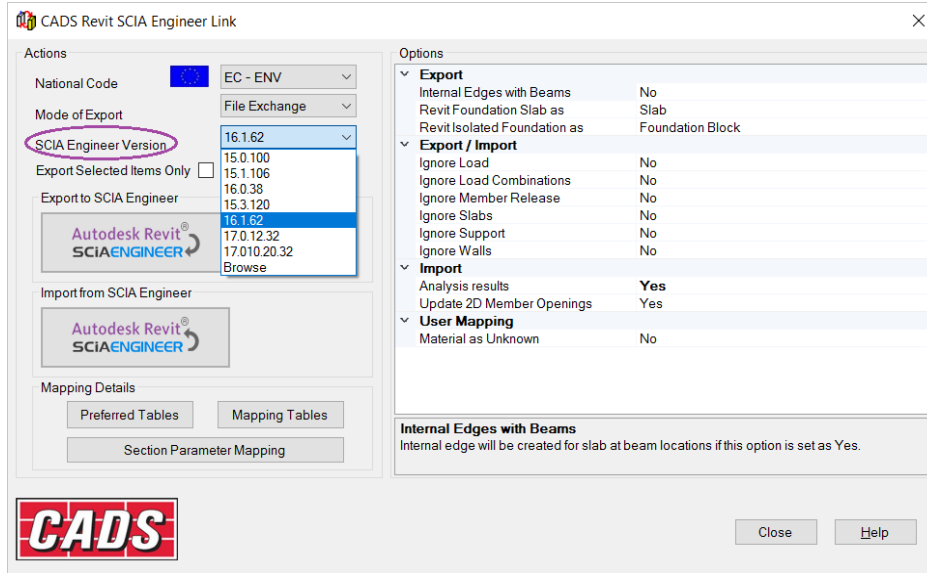


Figure 5-2: CADs Revit SCIA Engineer Link - SCIA Engineer version

5.5 Export selected items only

Generally you will be exporting/importing the whole model to and from **SCIA Engineer**. On some occasions you may only want to export part of the structure, select the option *Export Selected Items Only* and the link will only export the items selected in **Revit** to **SCIA Engineer**.

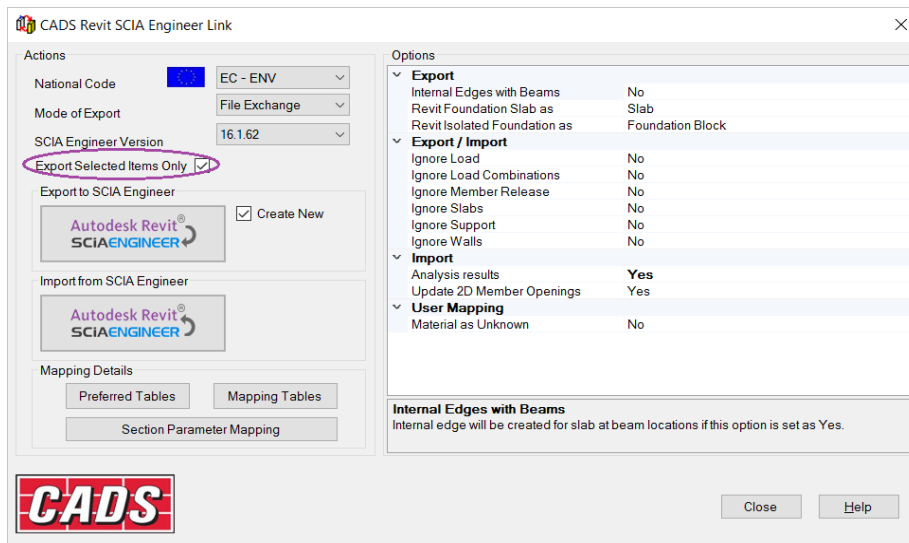


Figure 5-3: CADs Revit SCIA Engineer Link - Export Selected Items Only



5.6 Mapping Details

The standard cross section and material libraries in both **Revit** and **SCIA Engineer** are comprehensive but are labelled differently. The materials and cross sections are being mapped between the applications using mapping databases. The Database contains the mapping for cross-sections of Revit Structural Framing and Structural Columns families and its types with SCIA Engineer sections.

The user can review the databases, the order of preferences while exporting the model. These options are accessible by clicking the respective buttons under “Mapping Details” in the “Options” dialog.

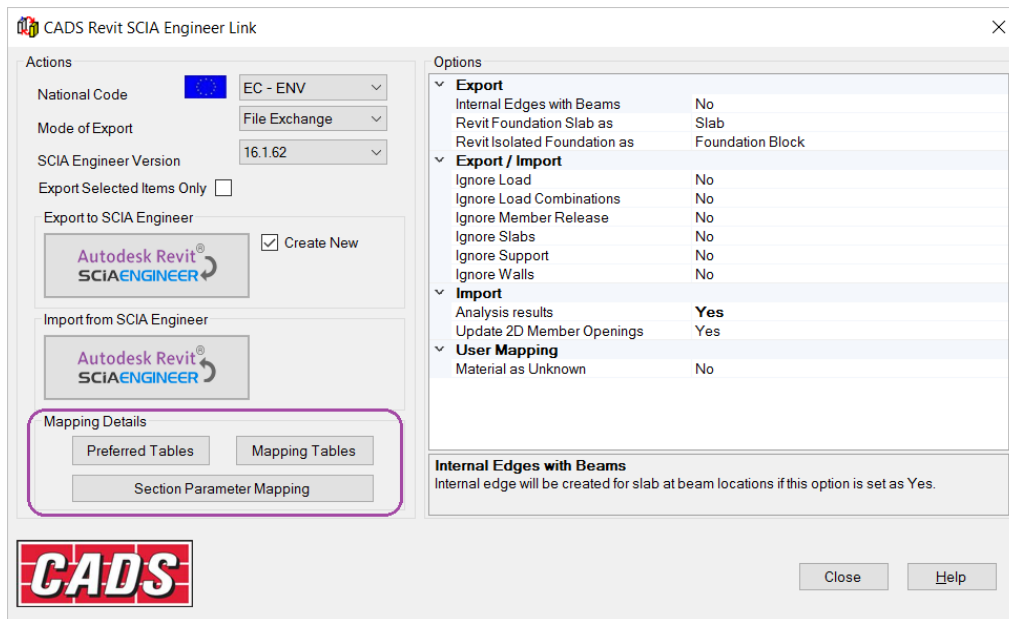


Figure 5-4: CADs Revit SCIA Engineer Link – Mapping Details

5.6.1 Preferred Tables

It is recommended that you move the preferred section databases you would like the link to use to the top of the list.

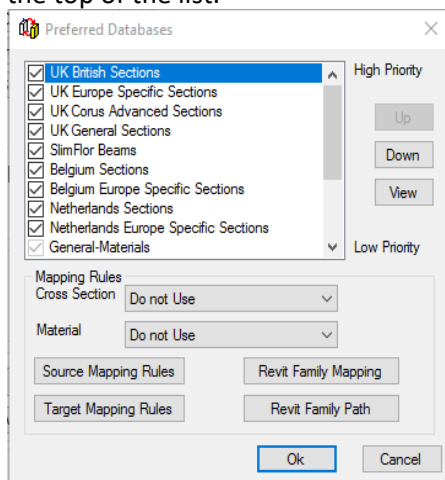


Figure 5-5: CADs Revit SCIA Engineer Link - Preferred Database

5.6.1.1 Mapping rules

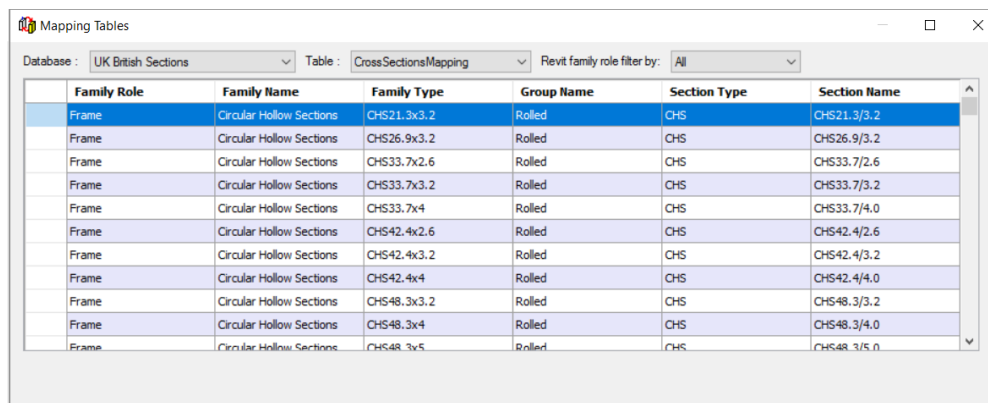
Set both the *Cross Section* and *Material* to “Use if Not found”. This means that if **CADS Revit SCIA Engineer Link** encounters a section or material not currently configured in its databases you will be prompted to choose a suitable section from the tables.

5.6.1.2 Revit family path

If your installation of **Revit** does not have the families installed in the default location on your hard drive you can use this option to configure the path to the libraries. The default location for the families on your hard drive is **C:\ProgramData\Autodesk\RVT 20xx\Libraries\UK**.

5.6.2 Mapping tables

This dialog, details the default mapping tables that are shipped with the **CADS Revit SCIA Engineer Link**. It illustrates the default **Revit** structural families (Materials, Columns and Structural Framing families) linked to the corresponding default **SCIA Engineer** materials/sections.



| Family Role | Family Name | Family Type | Group Name | Section Type | Section Name |
|-------------|--------------------------|-------------|------------|--------------|--------------|
| Frame | Circular Hollow Sections | CHS21.3x3.2 | Rolled | CHS | CHS21.3/3.2 |
| Frame | Circular Hollow Sections | CHS26.9x3.2 | Rolled | CHS | CHS26.9/3.2 |
| Frame | Circular Hollow Sections | CHS33.7x2.6 | Rolled | CHS | CHS33.7/2.6 |
| Frame | Circular Hollow Sections | CHS33.7x3.2 | Rolled | CHS | CHS33.7/3.2 |
| Frame | Circular Hollow Sections | CHS33.7x4.0 | Rolled | CHS | CHS33.7/4.0 |
| Frame | Circular Hollow Sections | CHS42.4x2.6 | Rolled | CHS | CHS42.4/2.6 |
| Frame | Circular Hollow Sections | CHS42.4x3.2 | Rolled | CHS | CHS42.4/3.2 |
| Frame | Circular Hollow Sections | CHS42.4x4.0 | Rolled | CHS | CHS42.4/4.0 |
| Frame | Circular Hollow Sections | CHS48.3x3.2 | Rolled | CHS | CHS48.3/3.2 |
| Frame | Circular Hollow Sections | CHS48.3x4.0 | Rolled | CHS | CHS48.3/4.0 |
| Frame | Circular Hollow Sections | CHS48.3x5.0 | Rolled | CHS | CHS48.3/5.0 |

Figure 5-6: CADS Revit SCIA Engineer Link - Mapping Tables

For full details on all the settings in the **CADS Revit SCIA Engineer Link Options** dialog refer to the Getting Started Guide and the Help file.

5.6.2.1 User tables

For non-standard materials and sections or if there are any changes in the name of the default **Revit** family, the materials or sections will not be mapped automatically, but a comprehensive algorithm has been developed which will suggest the equivalent sections in **SCIA Engineer**. The user can accept the suggested materials or sections, or map the equivalent section manually by loading all the databases, types and sections. These mappings will then be added to the User Table.

On first use of **CADS Revit SCIA Engineer Link** the user table will be blank and will be populated with user defined mappings as they are created by the user.

5.6.3 Section Parameter Mapping

The section parameter mapping is now saved with the project, unlike previously, where it was valid for the current session. The mapping data will be available when the project is closed and reopened.



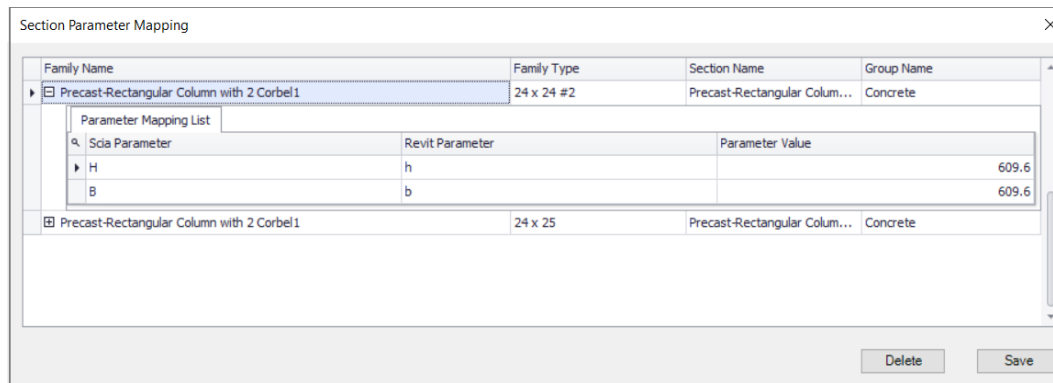


Figure 5-7: CADs Revit SCIA Engineer Link – Section Parameter Mapping

Upon completing the export, the mapping can be reviewed by opening the *Section Parameter Mapping* dialog from *Options*.

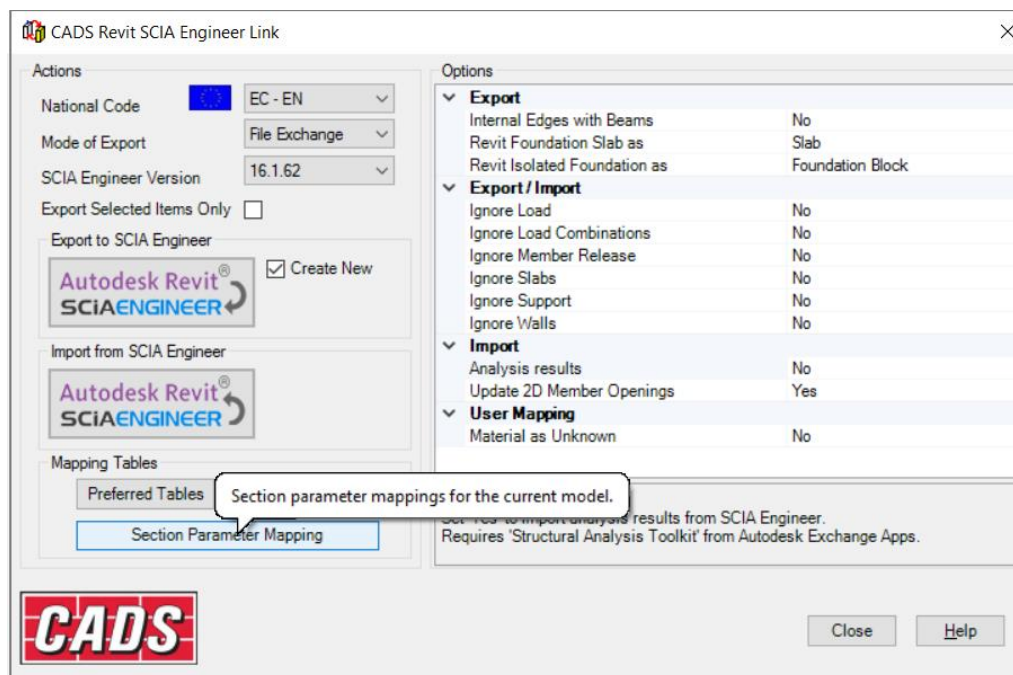


Figure 5-8: CADs Revit SCIA Engineer Link - Options

You can view, edit or delete the saved parameters that are being used in the project.

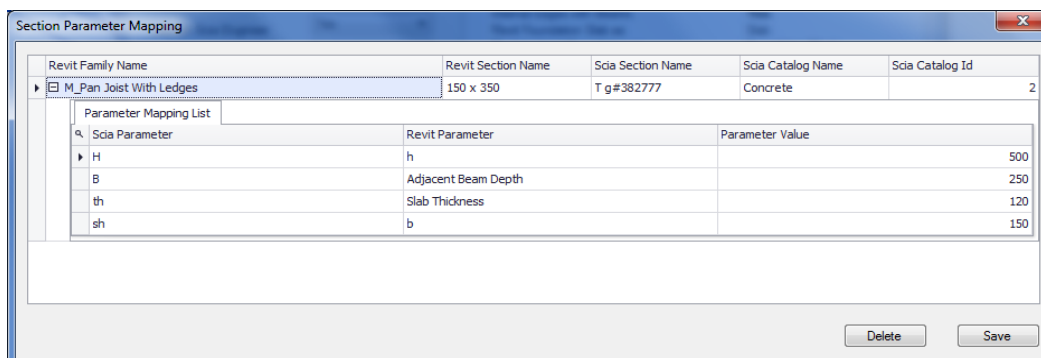


Figure 5-9: CADs Revit SCIA Engineer Link – Section Parameter Mapping

6 Export / Import tools

On the first attempt to export the model to **SCIA Engineer** after you have checked the analytical model, it is recommended that you open the *Options* dialog and check the configuration settings as explained in [Section 5](#) above. It is recommended to “*Purge and Save the Model*” before Exporting the Model to SCIA. The purge command will help to reduce the size of the **Revit** model and is available from the *Manage* tab.

Select the *Export to SCIA Engineer* option.

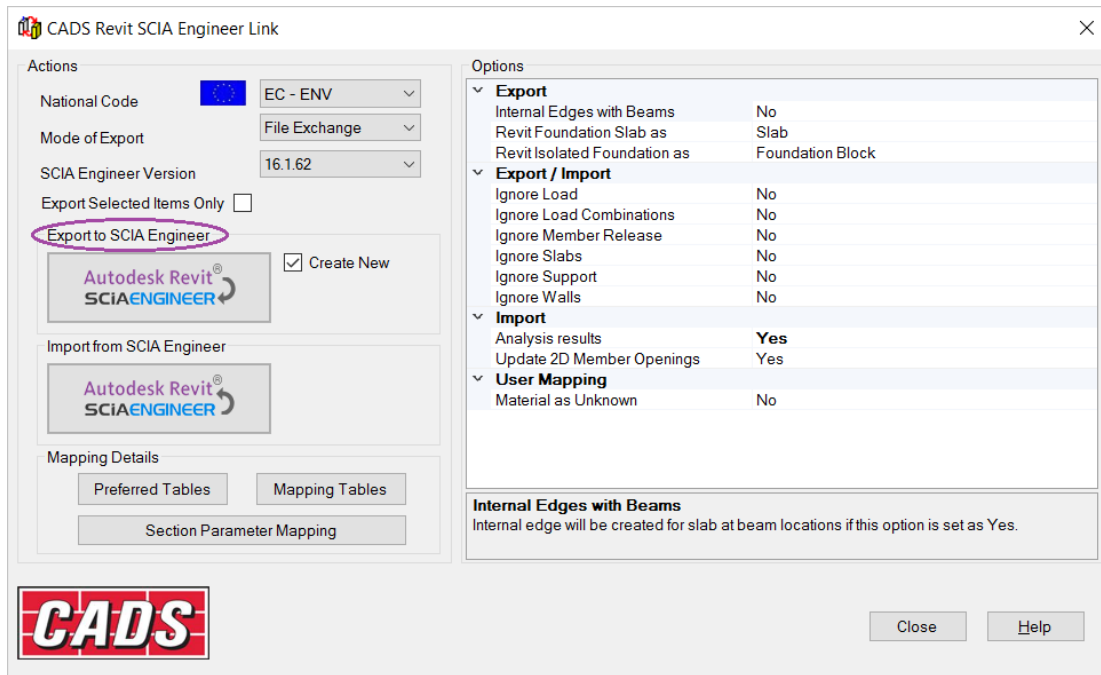


Figure 6-1: CADs Revit SCIA Engineer Link – Export to SCIA Engineer

The Log dialog is displayed and **CADS Revit SCIA Engineer Link** will read the **Revit** model, it will make a list of the total number of items from each category that is to be exported.

When **CADS Revit SCIA Engineer Link** encounters a material that is not in the material table, you will need to manually map the equivalent material. To make the user mapping easier, if a section or material is not found, **CADS Revit SCIA Engineer Link suggests a set of possible sections or materials**.

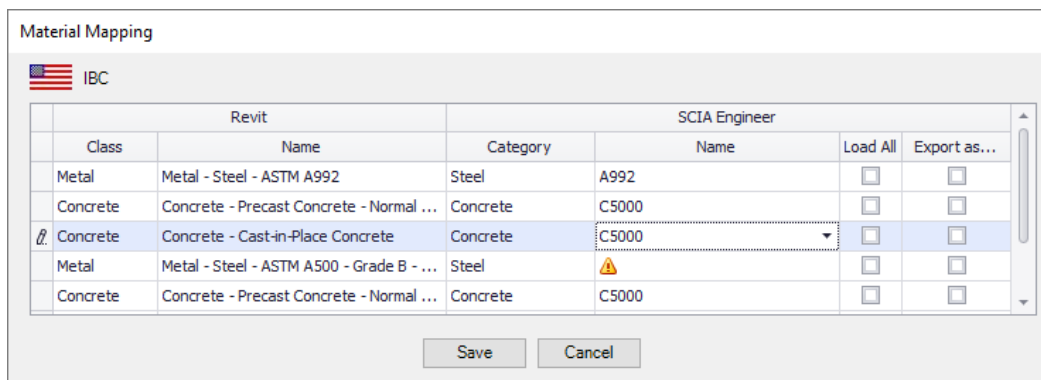


Figure 6-2: CADs Revit SCIA Engineer Link - Material Mapping

The “Material class” defined in Revit determines the equivalent material category in SCIA. Based on the material class, National code and the strength, the application will attempt to automatically find the equivalent material in SCIA Engineer.

If the application finds the exact material, which satisfies the material class, national code and strength it will be automatically mapped and this material will not be listed in the UI. If no equivalent material is found for one or more materials, a unified material mapping dialog will be shown and the user can map all the materials.

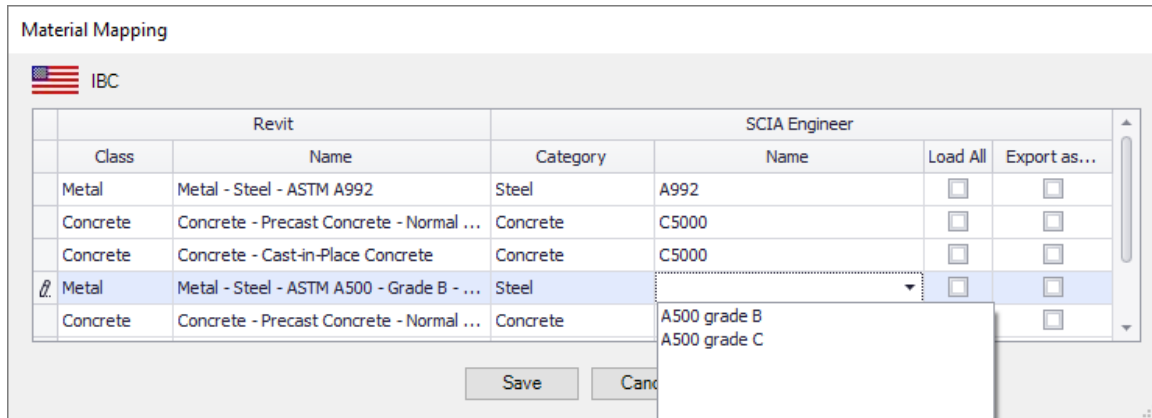


Figure 6-3: CADs Revit SCIA Engineer Link - Material Mapping – Suggested Mapping

If the material class in Revit is **Concrete, Metal, Masonry, wood**, the application will, by default, set the appropriate category and the user can then select the correct material from the standard list of materials that are available in SCIA Engineer.

When **CADS Revit SCIA Engineer Link** encounters a section that is not in the section tables, a unified section mapping dialog will be shown and the user can map all the cross sections. If the name of the family type matches exactly with the SCIA Engineer section, the section will not be listed in the UI. Otherwise, the application will suggest the equivalent SCIA Engineer section using an algorithm. This algorithm identifies the equivalent section by reading the family name, respective database and the family type.

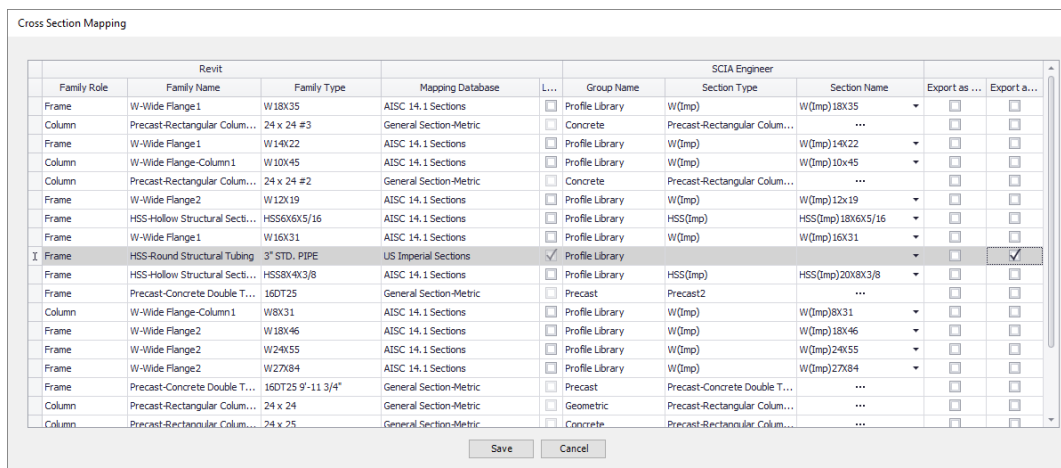


Figure 6-4: CADs Revit SCIA Engineer Link - Cross Section Mapping

On completion of the export routine, the Log dialog shows a summary of the number of items exported. You can save a log file which can be opened in a text editor to review the transfer.



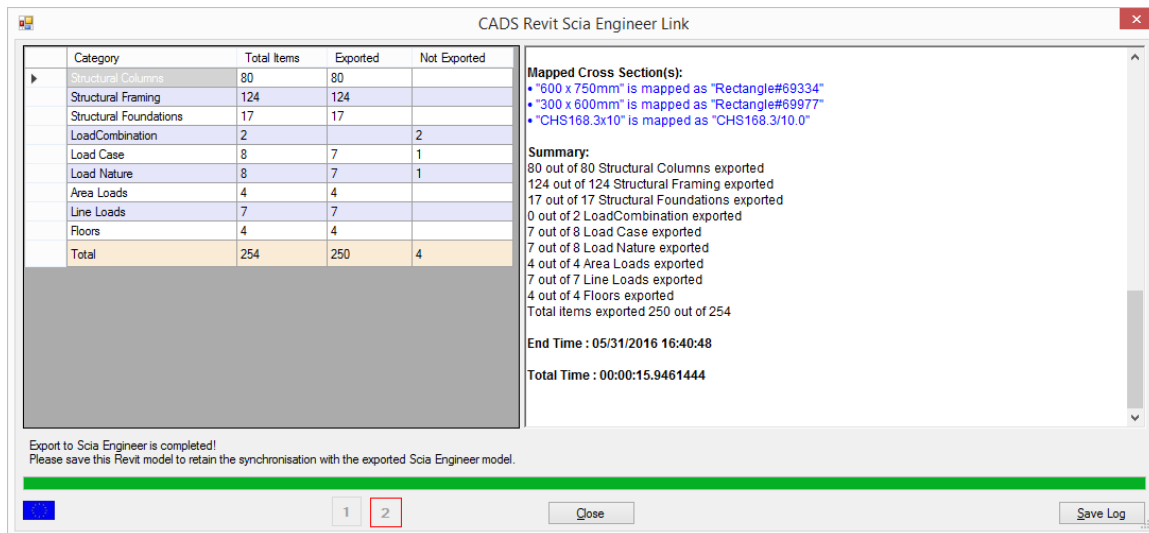


Figure 6-5: CADs Revit SCIA Engineer Link - Model exchange log

6.1 Filter

The filter option will allow you to locate any elements in the Revit model that have not been exported to **SCIA Engineer**.

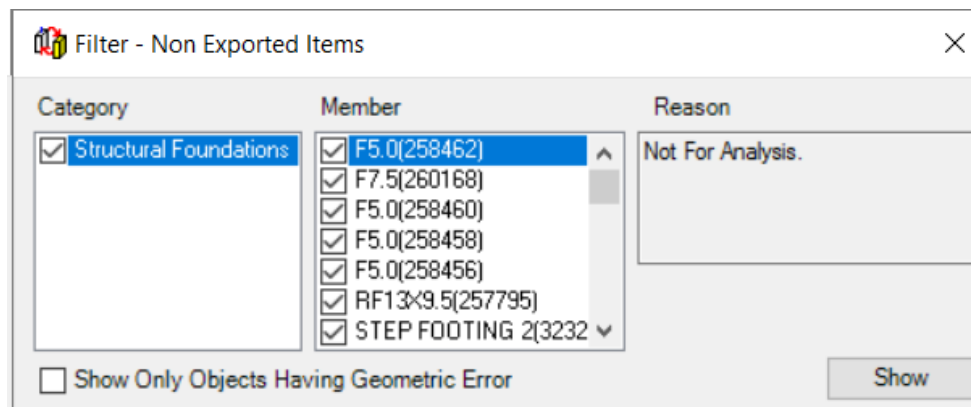


Figure 6-6: CADs Revit SCIA Engineer Link - Filter - Non Exported Items

Tick the elements you want to review and then click the show option; they will be highlighted in your **Revit** model.

6.2 Log files

The *Log* file is a text file which itemises each element that has been transferred between **Revit** and **SCIA Engineer**. It details the section / material and its mapping. Any elements that have not been successfully transferred are shown in red. At the end of the transfer of the model from **Revit** to **SCIA Engineer** and vice versa you are given the option to save this file and review it.

The *Log* file will show the *Revit ID* number of an element that has not transferred to/from **SCIA Engineer**. You can use the *Select by ID* command (*Manage* Tab) to highlight and investigate these elements in the **Revit**.

6.3 Select changes

This option will help you to review any changes that have been made to the **Revit** model when you import the model from **SCIA Engineer**. In the diagram below the section size of the concrete column was increased. Choosing the *Section Size* option on the *Select Changes* command will highlight the amended column in **Revit**.

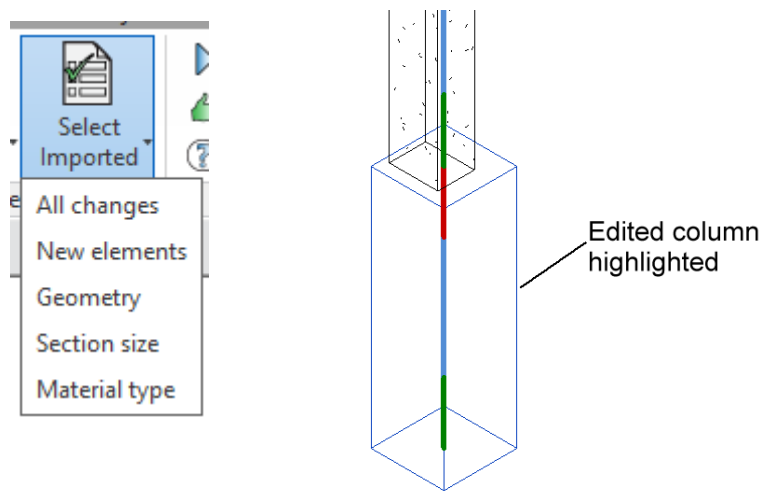


Figure 6-7: CADs Revit SCIA Engineer Link - Select Changes

6.4 Import / Export limitations

Refer to the Help pages in **CADS Revit SCIA Engineer Link** for the full list of items supported & unsupported in **Revit** and the corresponding items in **SCIA Engineer**. Also shown is a table of how physical **Revit** objects are transferred between **Revit** and **SCIA Engineer**. Refer to the topic on the *Bi Directional Link between Revit and SCIA Engineer*.