

**SCIA**  
ENGINEER



# REVIT SCIA ENGINEER LINK BEST PRACTICES



 **AUTODESK.**  
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# 1 Installation

The current version of **CADS Revit SCIA Engineer Link** works with **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](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 <b>Revit</b> and <b>SCIA Engineer</b> and the enhancements and bug fixes to the latest version of <b>CADS Revit SCIA Engineer Link</b> .
Getting Started	<b>CADS Revit SCIA Engineer Link</b> configuration and basic usage notes.
Check List	Aide memoir when creating projects, this list should be submitted for all requests for support on <b>CADS Revit SCIA Engineer Link</b> .

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 custom databases, you may use the "Import database" option in the Mapping tables to import the user tables.

## 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 **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

Ensure that you 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 that the *Analytical* model is enabled. The model that is exported from **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 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.

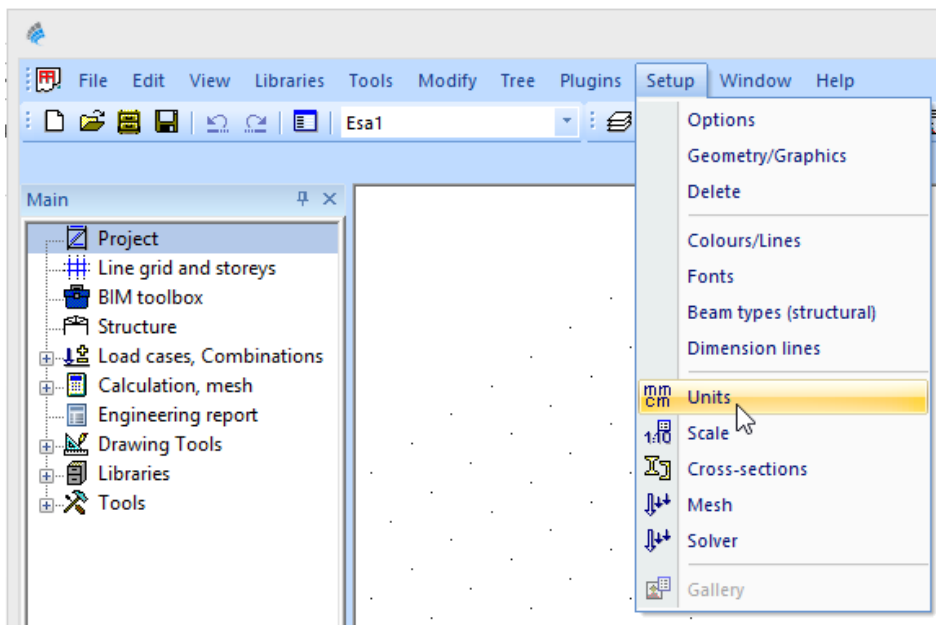


Figure 3-1: SCIA Engineer - Units

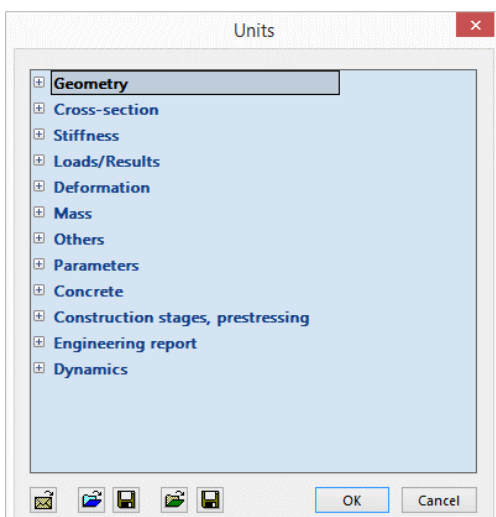


Figure 3-2: SCIA Engineer – Units dialog

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.

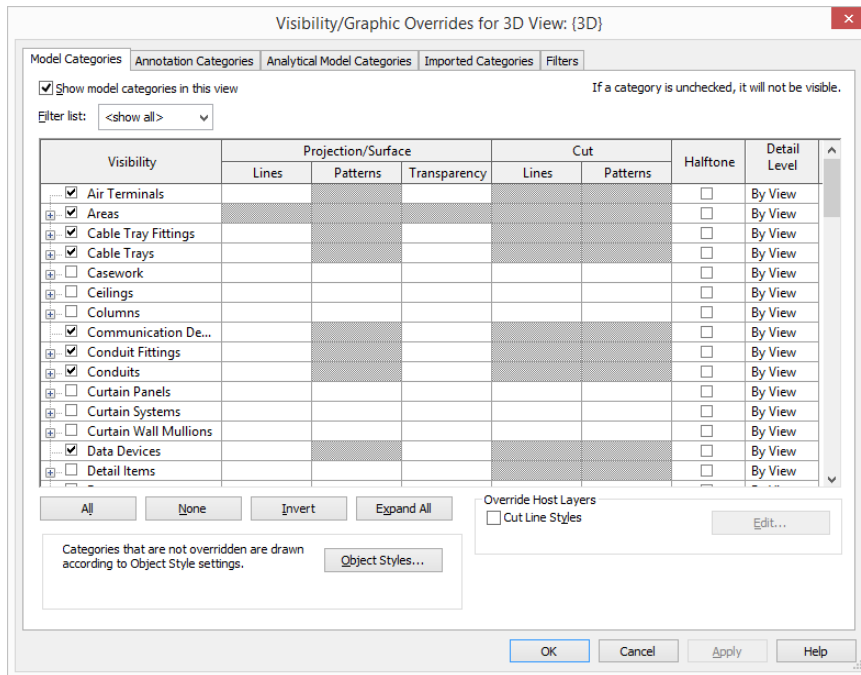


Figure 3-3: Revit Structure - Visibility/graphics overrides

## 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.

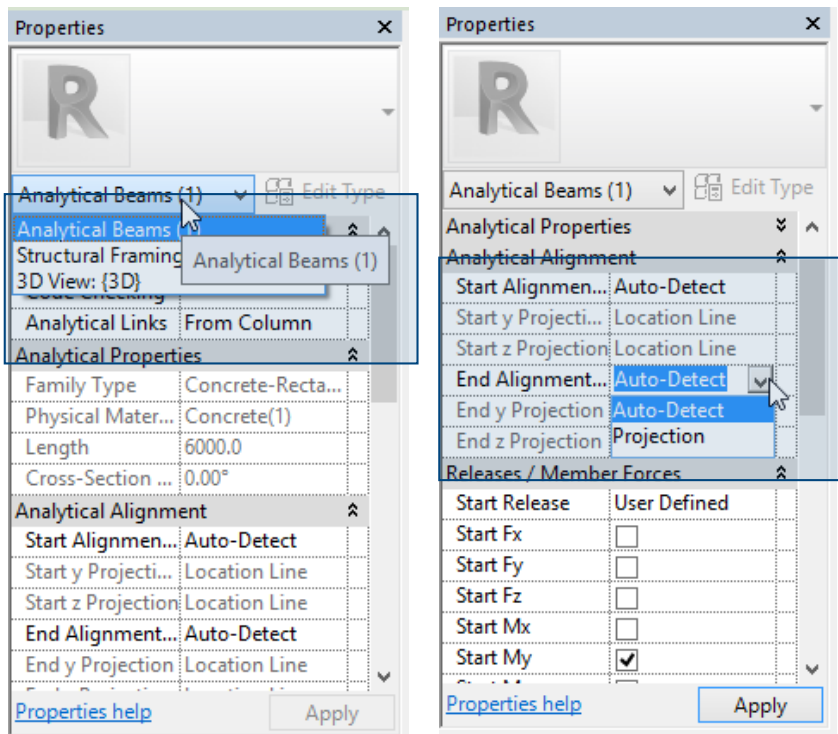
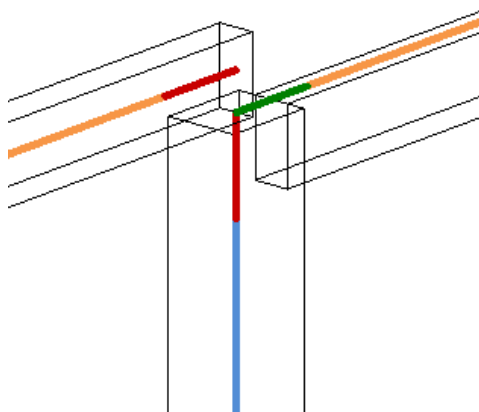
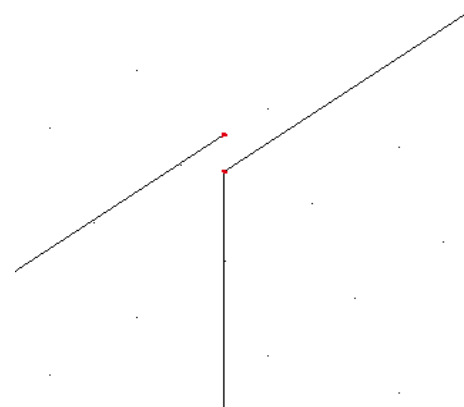


Figure 3-4: Revit - Analytical properties

- 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:



**Revit:** Although these members appear to be joined, the analytical lines are not connected.



**SCIA Engineer:** Members are transferred on the basis of analytical lines; hence, one of the members is not connected.

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**.

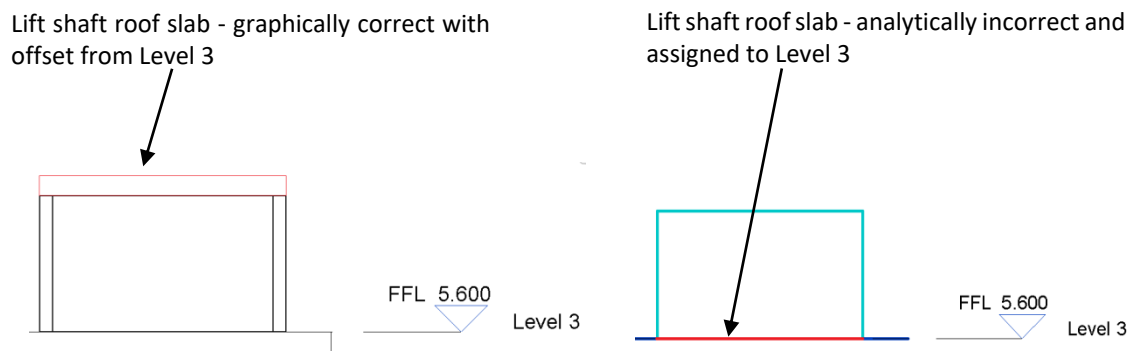


Figure 3-6: Revit model - Difference between physical and analytical floor position

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.

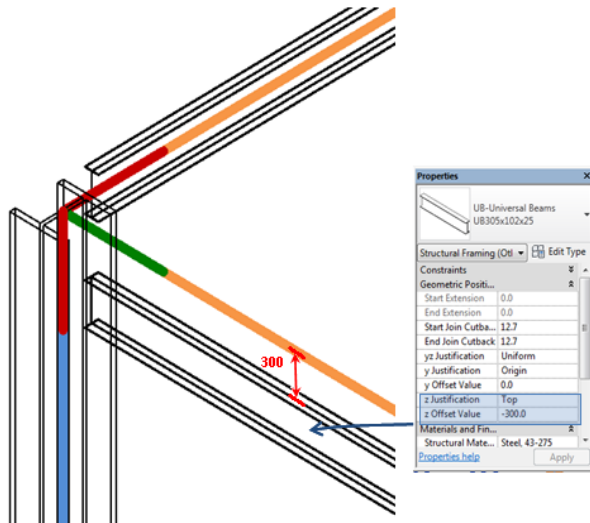


Figure 3-7: Revit Structure - Vertical offset provided with z Offset Value

**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:

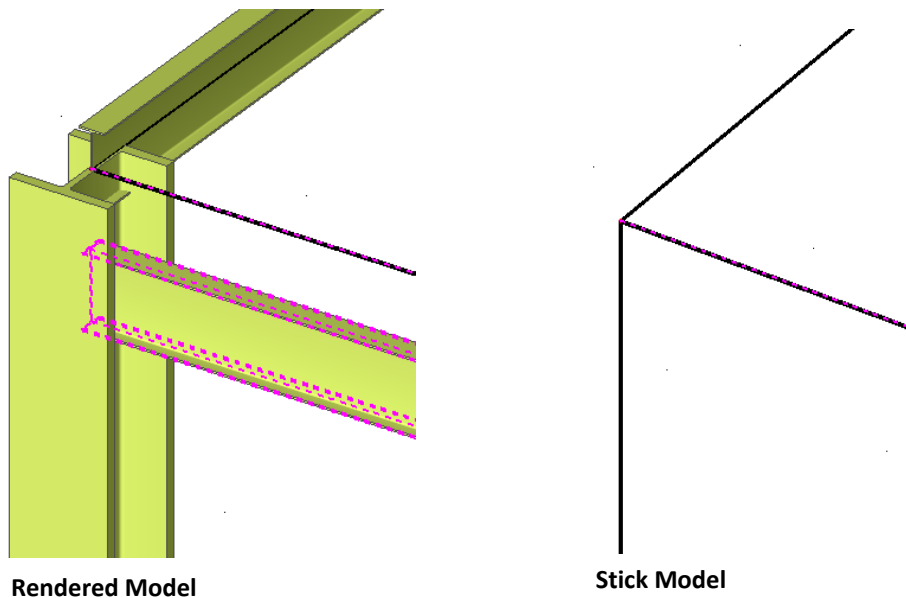


Figure 3-8: SCIA Engineer - Vertical offset case 1

### 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.

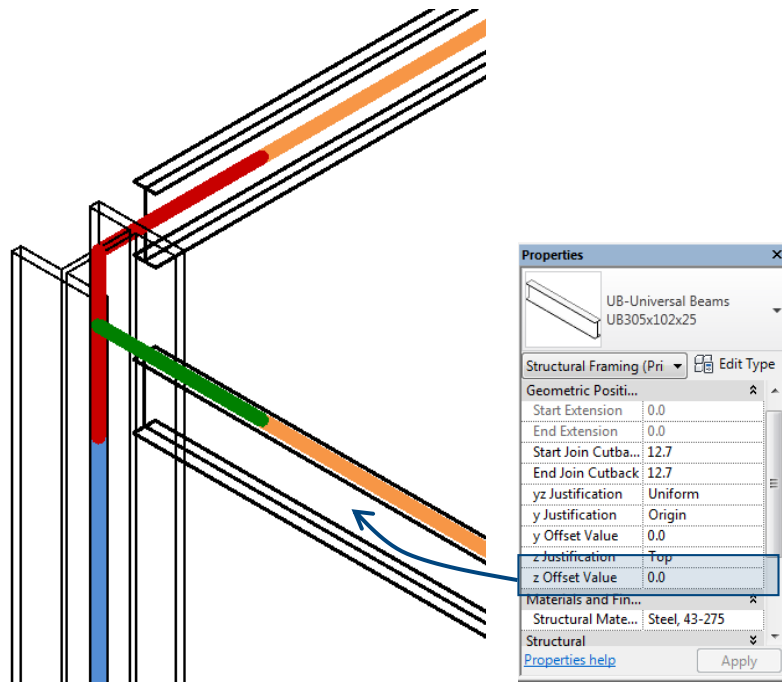


Figure 3-9: Revit model - Beam drawn in place with Z Offset Value = 0

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

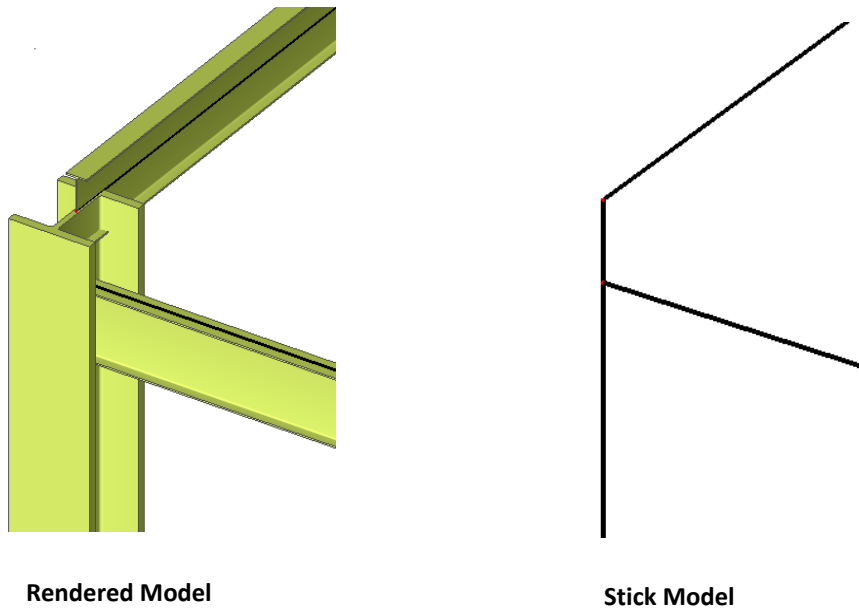
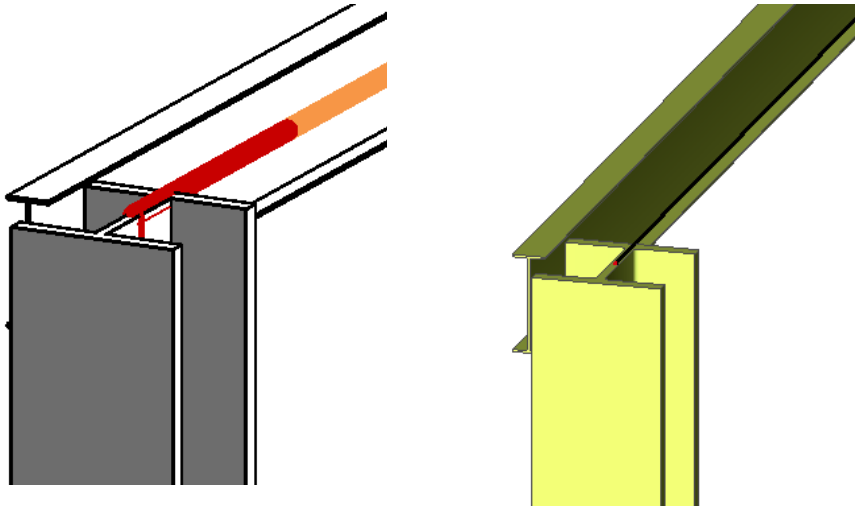


Figure 3-10: SCIA Engineer - Vertical offset case 2

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,  $e_y = 250$ 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:

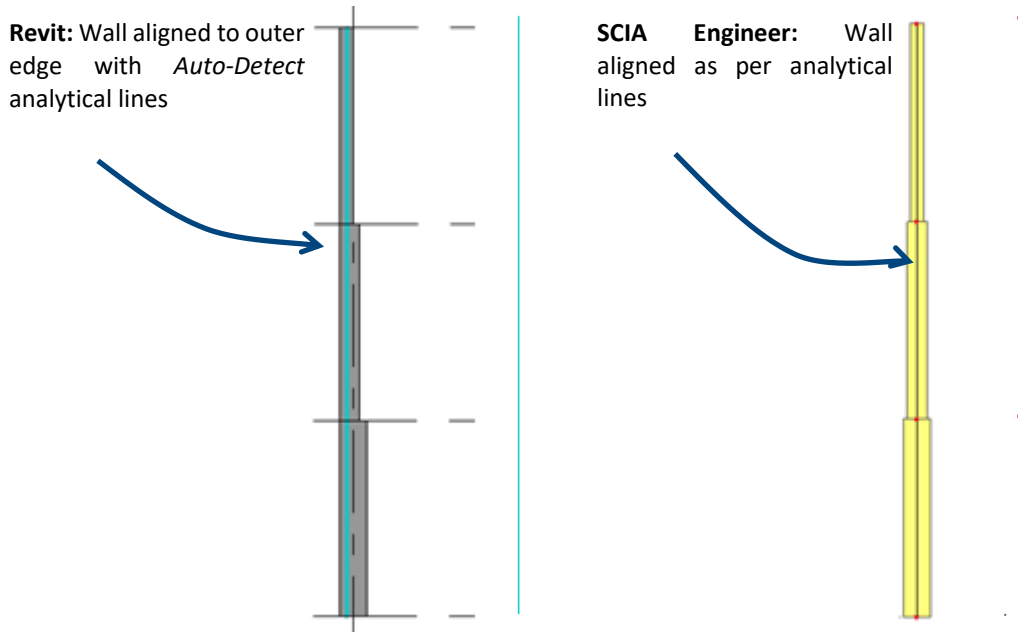


Figure 3-12: Wall aligned to outer edge with *Auto-Detect* analytical lines in Revit

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

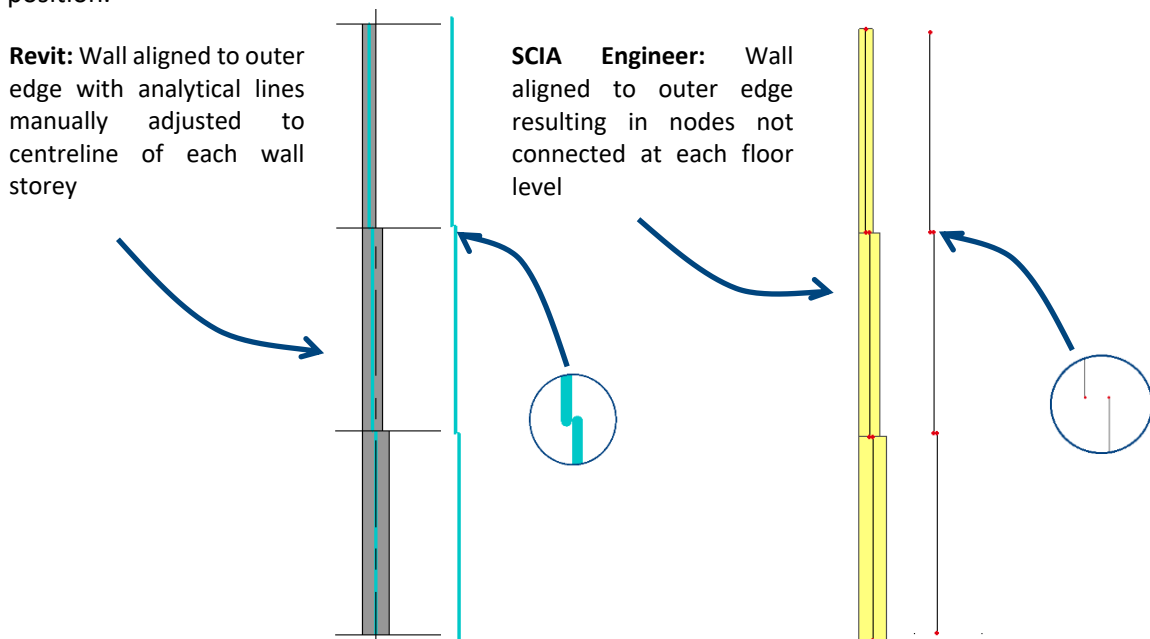


Figure 3-13: Wall aligned to outer edge with manually adjusted analytical lines in Revit

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 every 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 the elements.

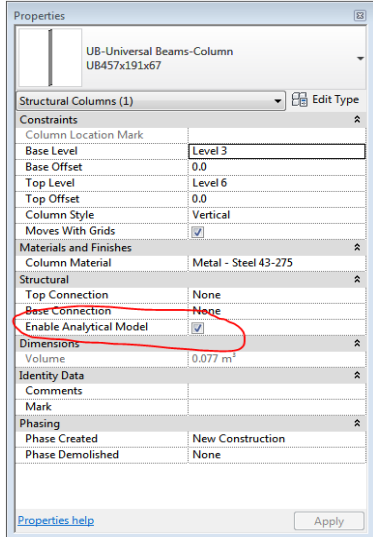


Figure 3-14: Revit - Enable Analytical Model

### 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 may 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”.

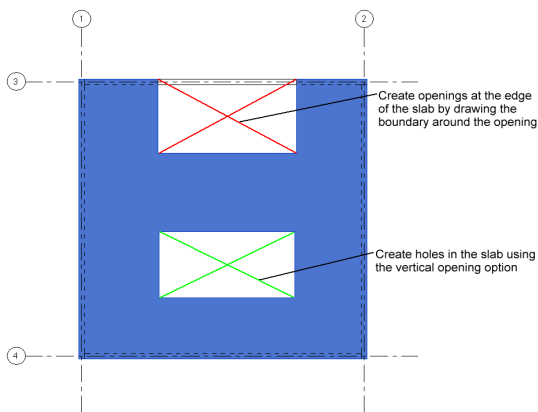


Figure 3-15: Revit– Slab openings

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 structural element used to join adjacent members that do not line up well. Dummy elements will not be exported from **Revit** to **SCIA Engineer** and will be shown in the transfer log file. Rather than use a dummy element, we suggest that you join the awkward connections with either model or detail lines.

### 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.

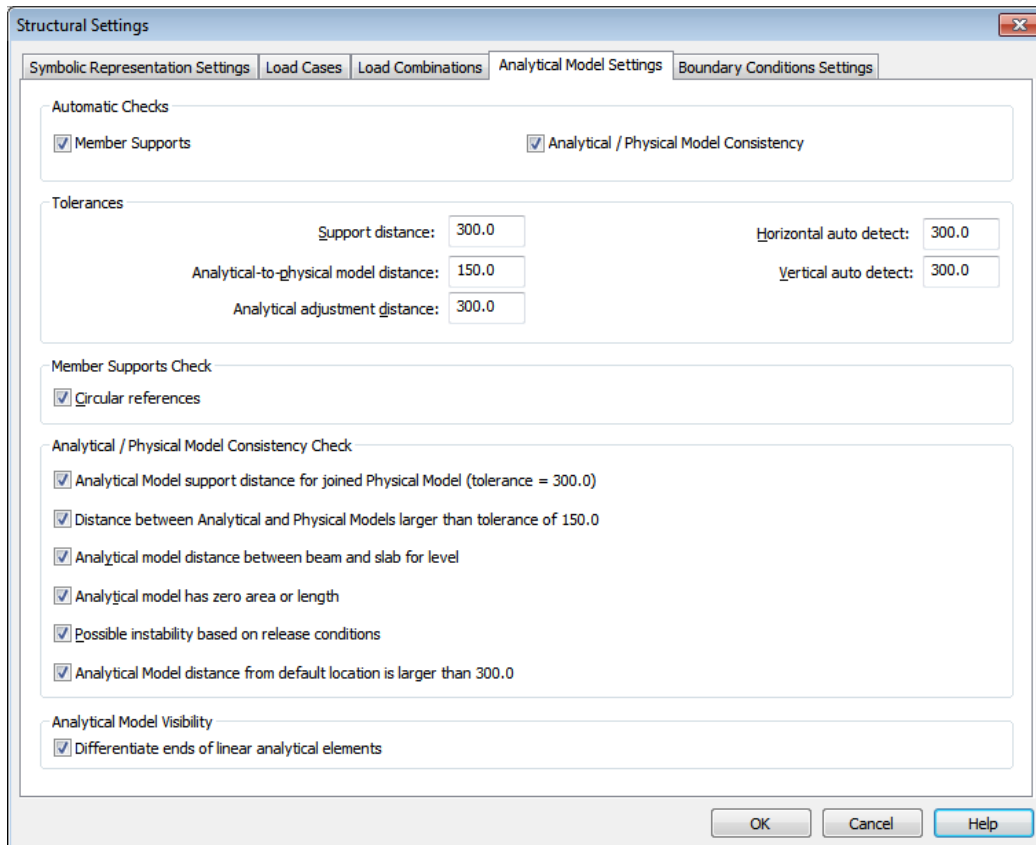


Figure 4-1: Revit - Structural settings

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.

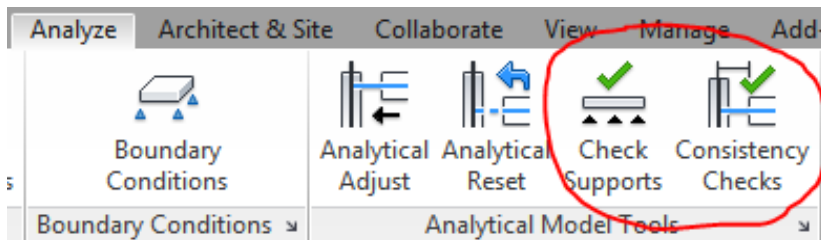


Figure 4-2: Revit – Analysis check options

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.

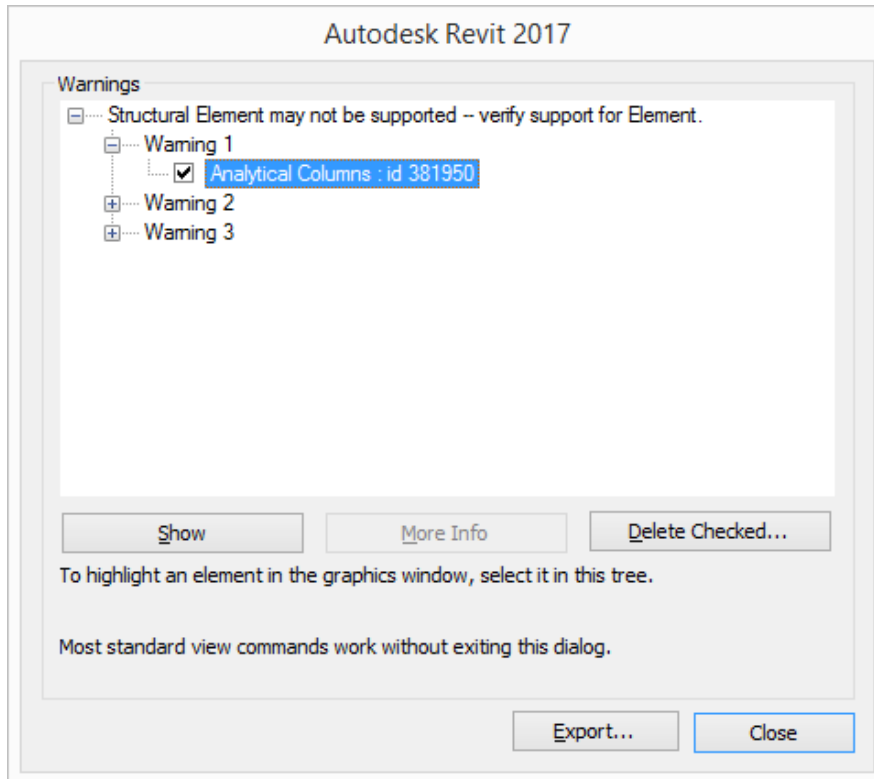



Figure 4-3: Revit - Warnings

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.

## 4.4 Mapping Tables

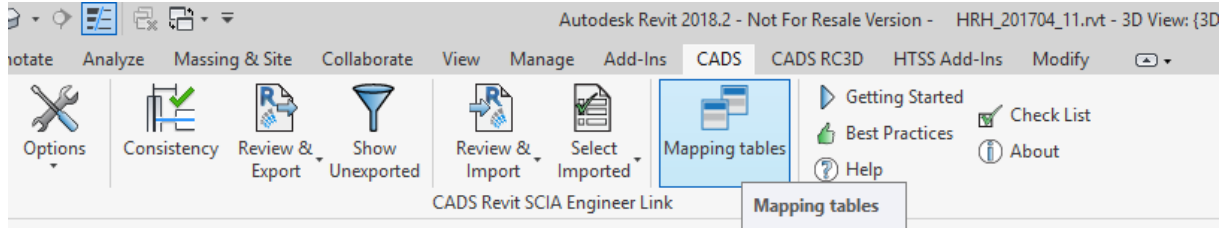
The standard cross section and material libraries in both **Revit** and **SCIA Engineer** are comprehensive but are labelled differently. The materials and cross sections are being mapped between the applications using mapping databases. The pre-installed database contains the mapping for materials, cross-sections and Profile sheets of Revit families and its types with equivalent SCIA Engineer entities.

Most of the standard materials, sections, profiles will be automatically mapped between SCIA Engineer and Revit families. But in some cases you might modify the standard families or in other cases

## Revit SCIA Engineer link - Best Practices

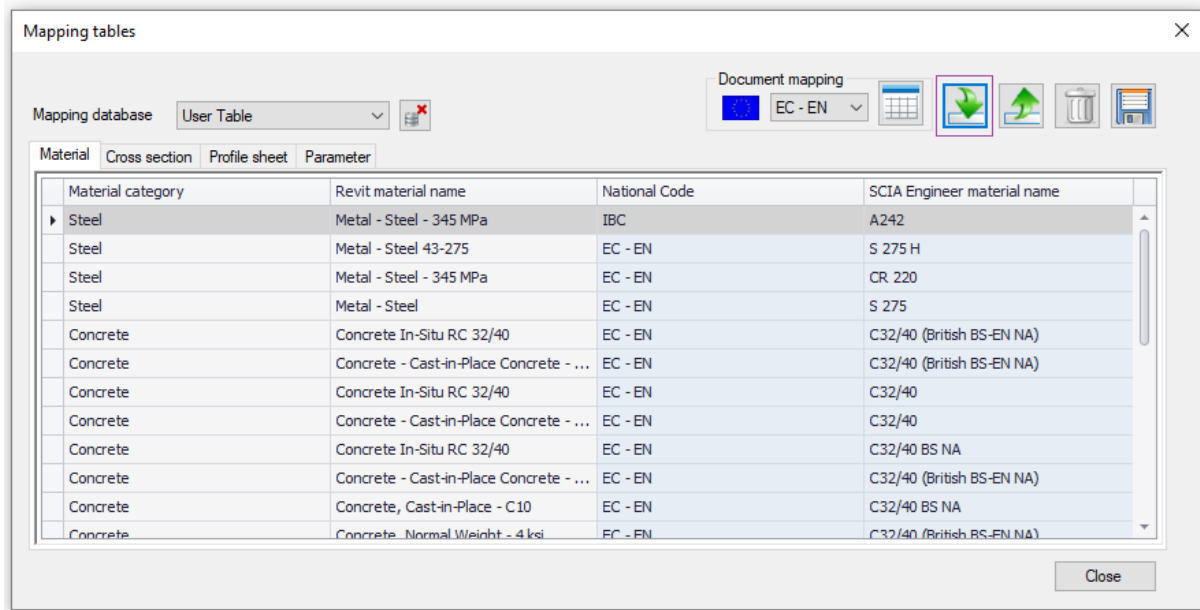
use non-standard materials, sections and profiles. In such instances, it is necessary to map them prior to export / import. The details of mapping will be added into the user table (database) and will be used for the subsequent export/ import process.

The command “Mapping tables” in the ribbon could be used to map the materials, families and profiles prior to export/import the model to/from **SCIA Engineer**.



The user may choose the option “Map all document sections/materials” button to map the materials, sections, profiles used in the document. The application will read and automatically map / suggested the appropriate equivalent objects. Once all the materials, sections and profiles are mapped, they will be added into the current database. The user can save the database and share it across different users.

Alternatively, the user may load any existing databases using the option “Import database” and use them prior to export or import. The user is also provided with the options to add / delete the mapping.



For full details on all the options in the mapping tables, please refer to the Help document.

## 5 Configuration settings

The settings applied in the **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.

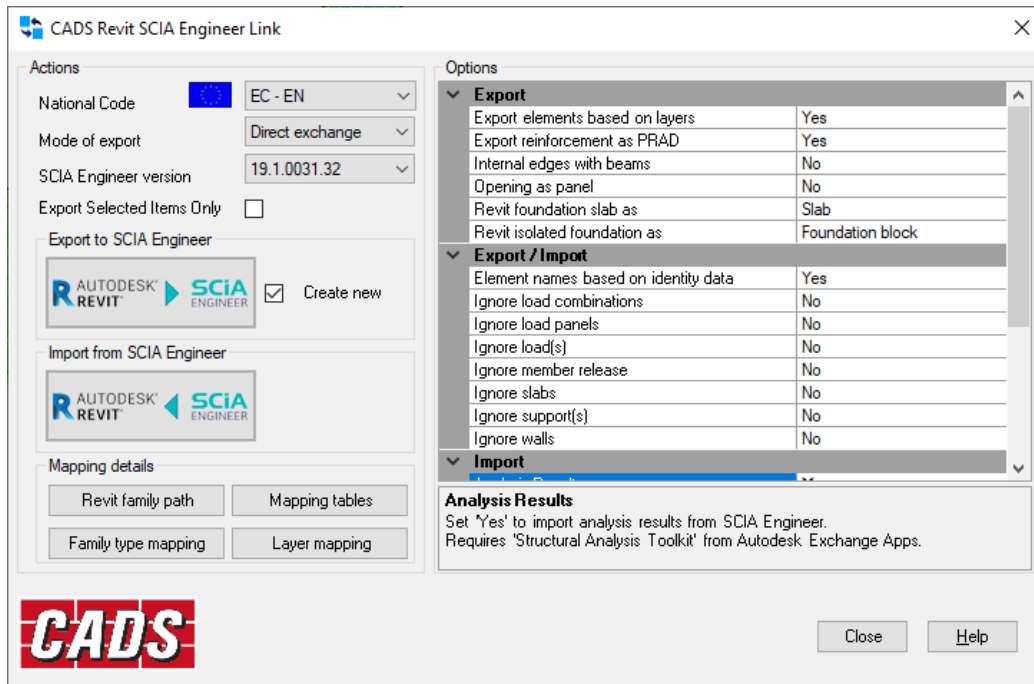


Figure 5-1: CADS Revit SCIA Engineer Link - Options dialog

### 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 material mapping is primarily dependent on the selected National code.

### 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 “SCIA Engineer version” and browse to the location of your Esa.exe file which is usually located in your **C:\Program Files (x86)\SCIA\Engineerxx.x** folder”.

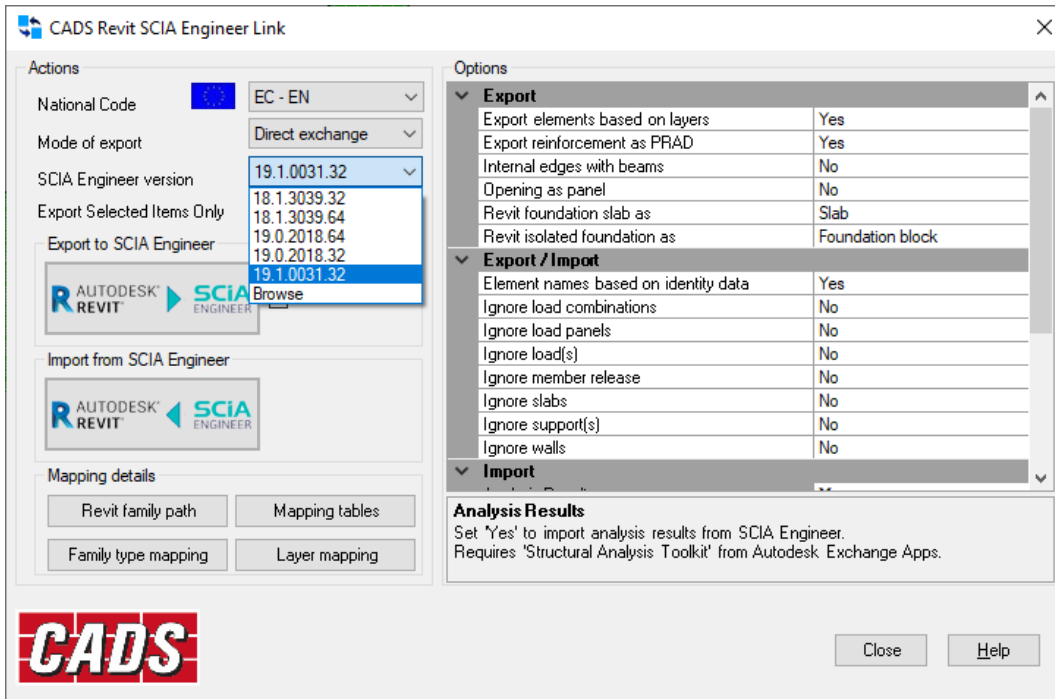


Figure 5-2: CADs Revit SCIA Engineer Link - SCIA Engineer version

## 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. To do this select the option *Export Selected Items Only* and the link will only export the items selected in **Revit to SCIA Engineer**.

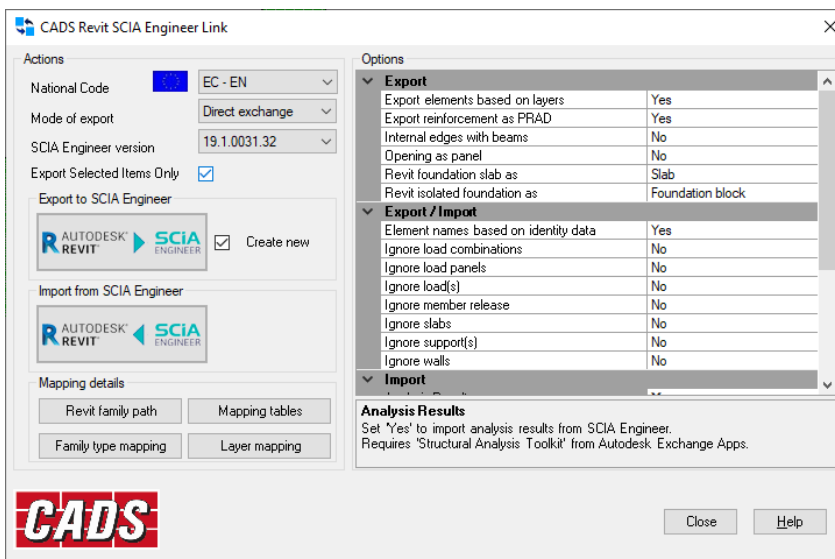


Figure 5-3: CADs Revit SCIA Engineer Link - Export Selected Items Only

## 5.6 Mapping details

**CADS Revit SCIA Engineer link** is being shipped with a pre-installed mapping databases which matches cross-sections and materials between **SCIA Engineer** and **Revit**. The database contains the mapping for different Revit families and its types with SCIA Engineer sections. The database files are being prepared primarily based on the content libraries of Revit families.

### 5.6.1 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\...**

### 5.6.2 Mapping tables

This dialog, details the Standard mapping tables that are shipped with the **CADS Revit SCIA Engineer Link and the user tables**. Standard mapping tables illustrates the default **Revit** families (Materials, Profile sheet and Virtual joists) linked to the corresponding default **SCIA Engineer** materials/sections.

Material category	Revit material name	National Code	SCIA Engineer material name
Concrete	Concrete Cast-in-Place - C20	BS	C16/20
Concrete	Concrete Cast-in-Place - C25	BS	C20/25
Concrete	Concrete Cast-in-Place - C30	BS	C25/30
Concrete	Concrete Cast-in-Place - C40	BS	C32/40
Concrete	Concrete Cast-in-Place - C50	BS	C40/50
Concrete	Concrete Cast-in-Place - C60	BS	C50/60
Steel	Steel 43-275	BS	Grade 43
Steel	Steel 43-355	BS	S355
Steel	Steel 50-355	BS	Grade 50
Steel	Steel 51-275	BS	S275
Steel	Steel 55-450	BS	Grade 55
Steel	Steel 64-460	BS	S460

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

For full details on mapping tables, please refer to the Help file.

## 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.

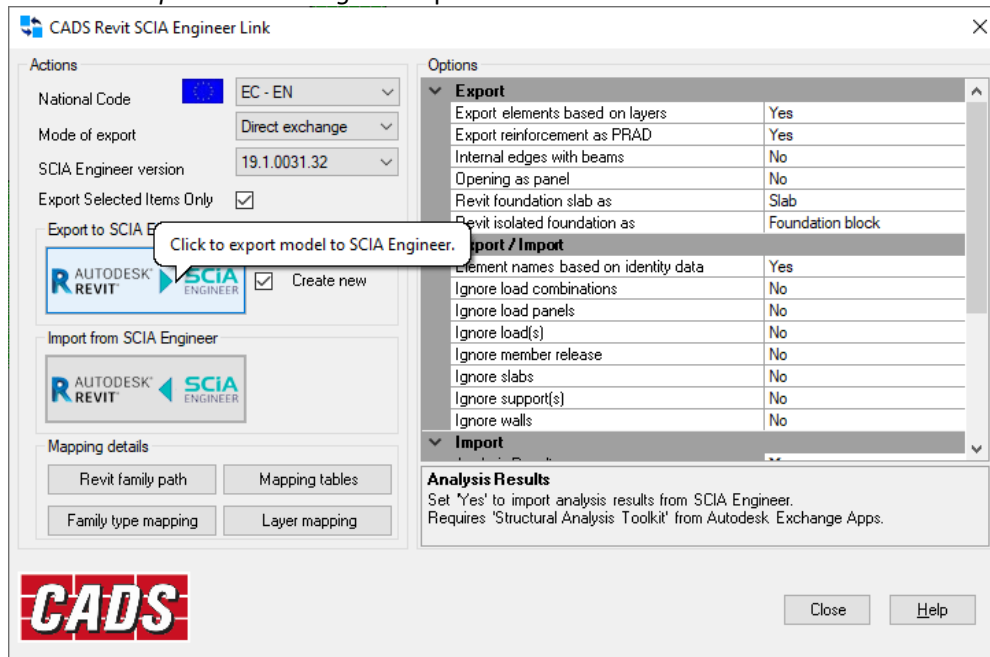


Figure 6-1: CADs Revit SCIA Engineer Link – Export to SCIA Engineer

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.

If **CADs Revit SCIA Engineer Link** encounters a material/section that is not mapped, you will need to manually map the equivalent objects.

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.

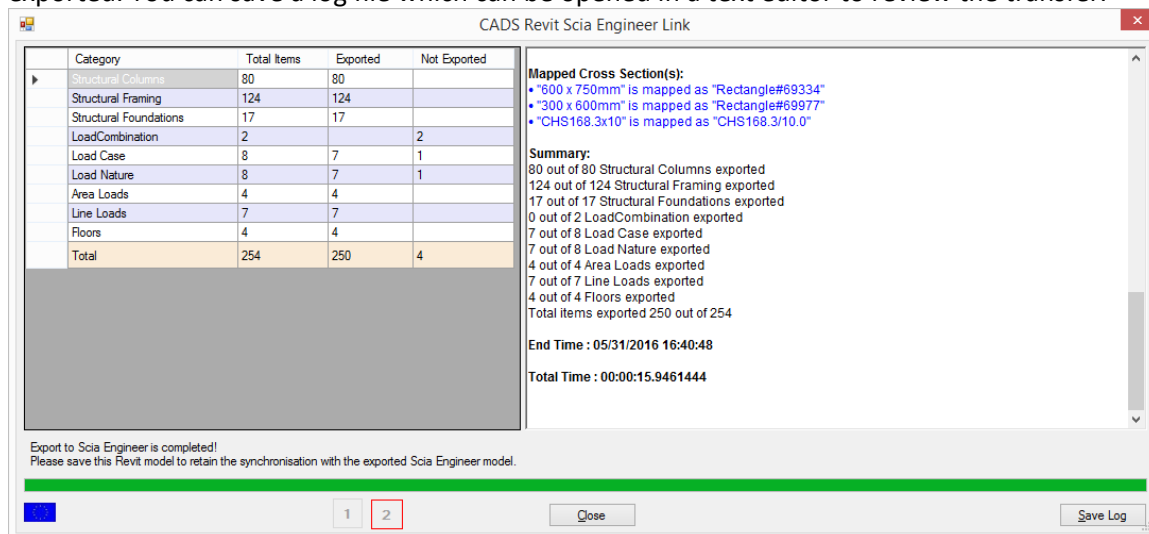


Figure 6-2: CADs Revit SCIA Engineer Link - Model exchange log

## 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**.

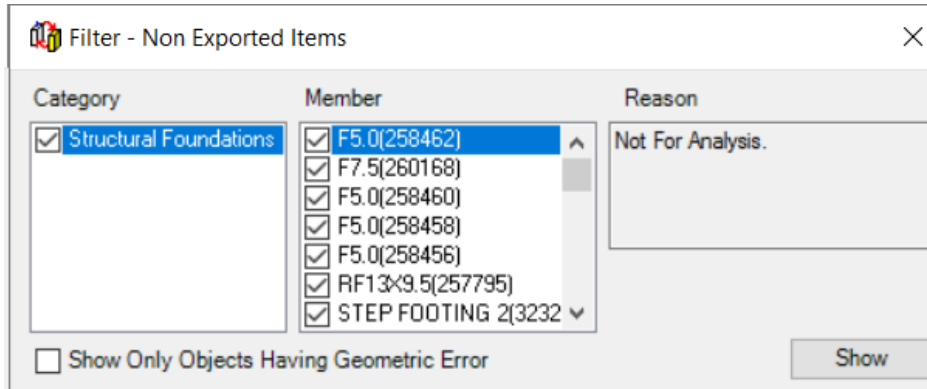


Figure 6-3: CADs Revit SCIA Engineer Link - Filter - Non Exported Items

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. 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/or 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**.

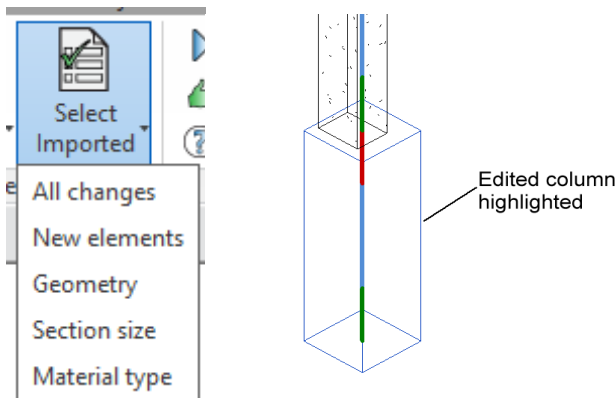


Figure 6-4: CADs Revit SCIA Engineer Link - Select Changes

### 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*.