SCiA ENGINEER

REVIT SCIA ENGINEER LINK
GETTING STARTED

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Contents

1 Introduction

CADS Revit SCIA Engineer link facilitates the bi-directional exchange of members, loads and supports between Autodesk Revit and SCIA Engineer and in doing so plays a vital role in the overall Building Information Modelling (BIM) process. A structure modelled in Revit can be transferred to SCIA Engineer for structural analysis and design using *CADS Revit SCIA Engineer link*. Once the structural analysis and design has been completed in SCIA Engineer, the updated model can be sent back to Revit. The modelling - analysis - design process may require a few iterations to arrive at the final design. *CADS Revit SCIA Engineer link* will save time by avoiding duplication and reducing errors.

This Getting Started guide will help you with instructions on how to install the software and make the best use of *CADS Revit SCIA Engineer link* to manage your BIM process successfully.

The Content libraries in Revit are stored as a collection of the *Revit family (*.RFA)* files. The Revit 2023 Content Packs may be downloaded from here.

2 Compatibility

CADS Revit SCIA Engineer link is shipped with a *Release Notes* document which lists the versions of Revit and SCIA Engineer with which it is compatible. You can also find this document in the following folder:

C:\Program Files\Revit To SCIA Engineer\Revit20xx\Docs

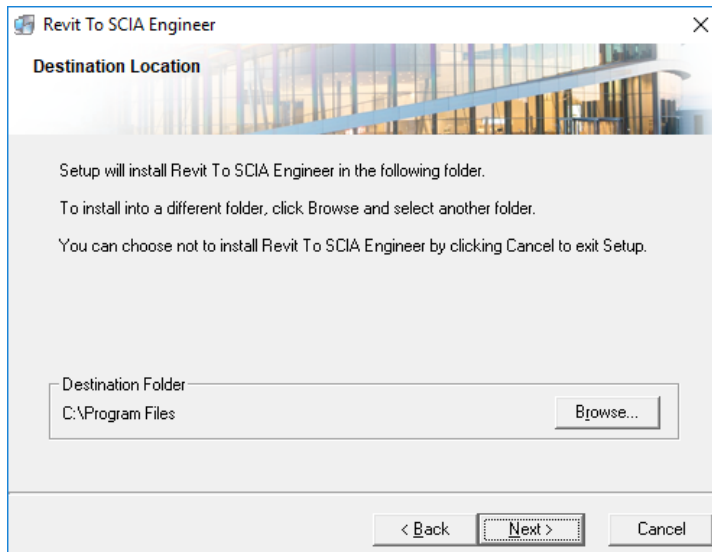C:\Program Files folder is the default installation folder for *CADS Revit SCIA Engineer Link*.

Figure 2-1: CADS Revit SCIA Engineer Link installation folder

Revit20xx is the Revit version number on which *CADS Revit SCIA Engineer link* is installed.

3 Workflow

CADS Revit SCIA Engineer link supports the following workflows:

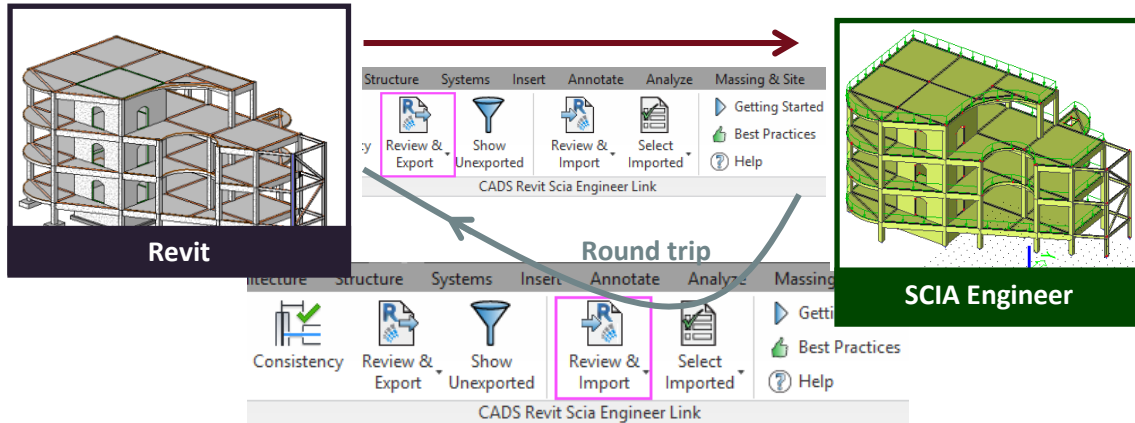## 3.1 Revit to SCIA Engineer round trip

Figure 3-1: Revit to SCIA Engineer round trip

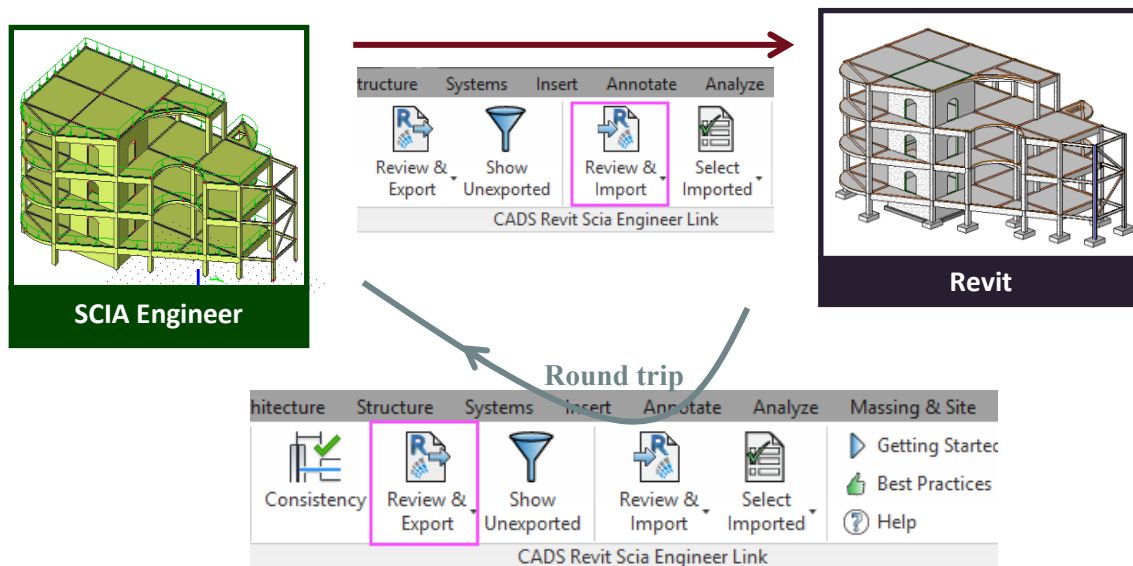## 3.2 SCIA Engineer to Revit round trip

Figure 3-2: SCIA Engineer to Revit round trip

Note: In Revit 2023, the analytical model feature has been modified significantly. The approach for generating the analytical model is now changed from "Derived analytical model" to "Contextual analytical model". For more details about Structural analytical modelling in Revit, please visit the link here.

4 Installation

This section sets out how to install *CADS Revit SCIA Engineer link* on various system environments.

If you wish to have a direct link between Revit and SCIA Engineer, you should have both applications installed and licensed on your system.

If only one of the applications is licensed (i.e. Revit or SCIA Engineer) and you wish to share your model with your colleague then you need to use the file based transfer method. This means, you will have to create a **.R2S file* from either of the applications and then import it into the other application.

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.

4.1 Revit and SCIA Engineer licensed on the system

- Check in the *Release Notes* whether the Revit version is compatible with the version of *CADS Revit SCIA Engineer link* you wish to install on your system. If yes, then continue with the installation, or else install the required version of either Revit or SCIA Engineer.

- Run *CADS Revit SCIA Engineer link* installation and select the options as prompted in the dialogs.

- Finish the installation.

## 4.2 Only Revit licensed on your system

- Check in the *Release Notes* whether the Revit version is compatible with the version of *CADS Revit SCIA Engineer link* you wish to install on your system. If yes, then continue with the installation or else install the required version of Revit.

- Run *CADS Revit SCIA Engineer link* installation and select the options as prompted in the dialogs.

4.3 Only SCIA Engineer licensed on your system

CADS Revit SCIA Engineer link installation is not required. As long as you have the *Revit plug-in* installed on your system you can export or import the **.R2S* file from *SCIA Engineer* as explained in <u>Section 5</u>.

Copyright © Computer and Design Services Limited
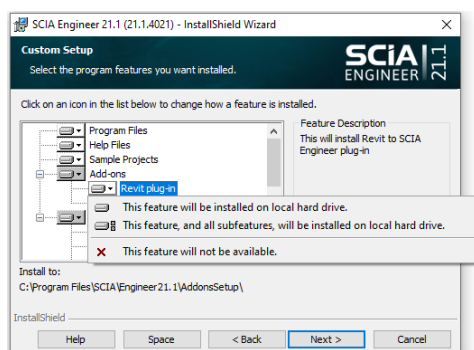
5 Basic commands

In order to transfer the model from Revit to SCIA Engineer, you must specify the following:

5.1 Code of practice

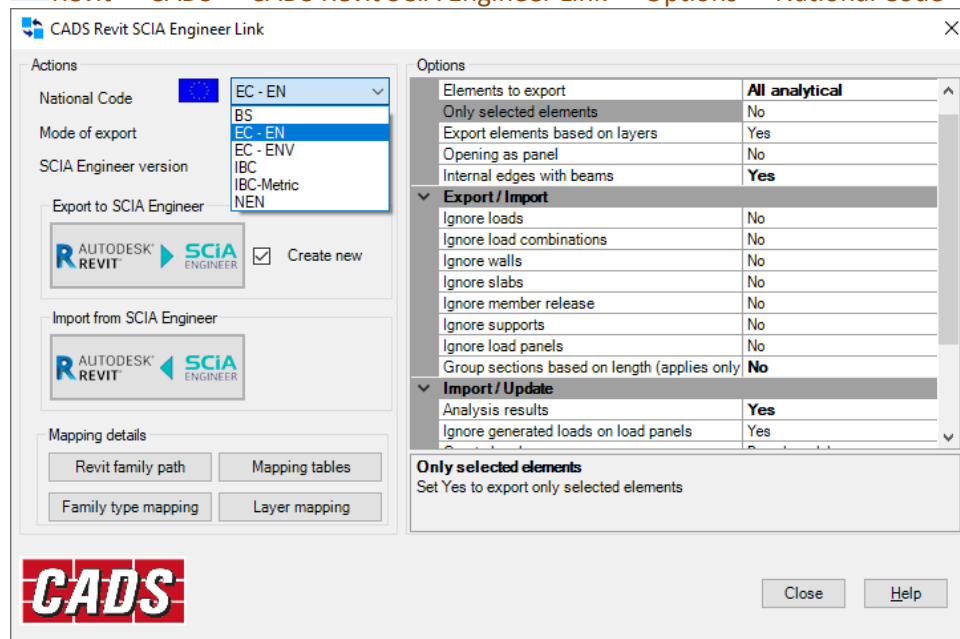Revit -> CADS -> CADS Revit SCIA Engineer Link -> Options -> National Code

Figure 5-1: CADS Revit SCIA Engineer Link - National Code

Select the National Design Code you wish to use in SCIA Engineer before exporting the model from Revit. *CADS Revit SCIA Engineer Link* will automatically select the appropriate SCIA Engineer template to create the model.

The first time you import a project from SCIA Engineer into Revit, ensure that you create a new Revit file and select the correct template file as per the country code used for creating the job in SCIA Engineer.
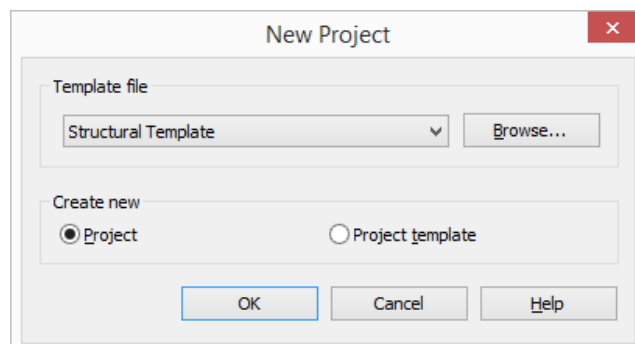
Revit -> New -> Project

Figure 5-2: Revit - New project dialog

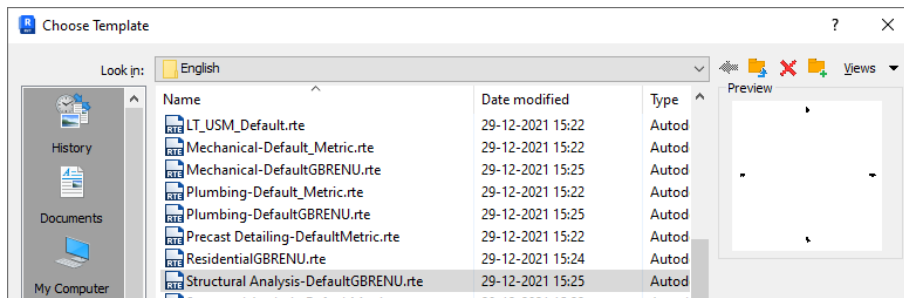Use the *Browse* button to locate the correct template file.

Figure 5-3: Revit - Choose template dialog

You may choose any customised Revit Structural template file as well, but make sure that the units are the same as those used in the SCIA Engineer model. For example, if the SCIA Engineer model is created in Metric units, then the Revit Structural template should also be in Metric.

Ensure that the Revit libraries of structural members are available in the default Revit installation folder, for example the library of UK cross sections are available in the following folder for Revit 2023 by default.

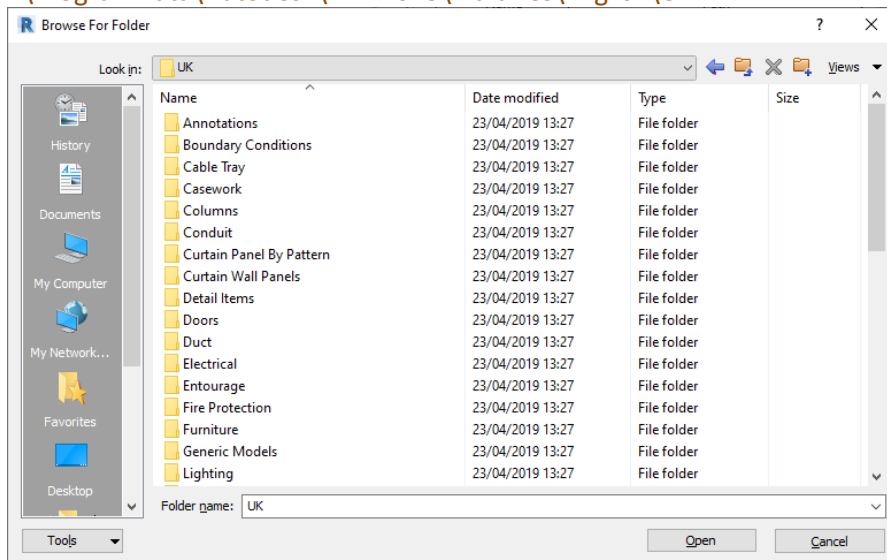..\ProgramData\Autodesk\RVT 2023\Libraries\English\UK

Figure 5-4: Revit - Family folder

If you are using the library of customised Revit families and/or the library of Revit families stored in LAN, you have to configure the folder location where these Revit families are stored.

You can access this from:

Revit -> CADS -> CADS Revit SCIA Engineer Link -> Options -> Mapping Details -> Revit Family Path
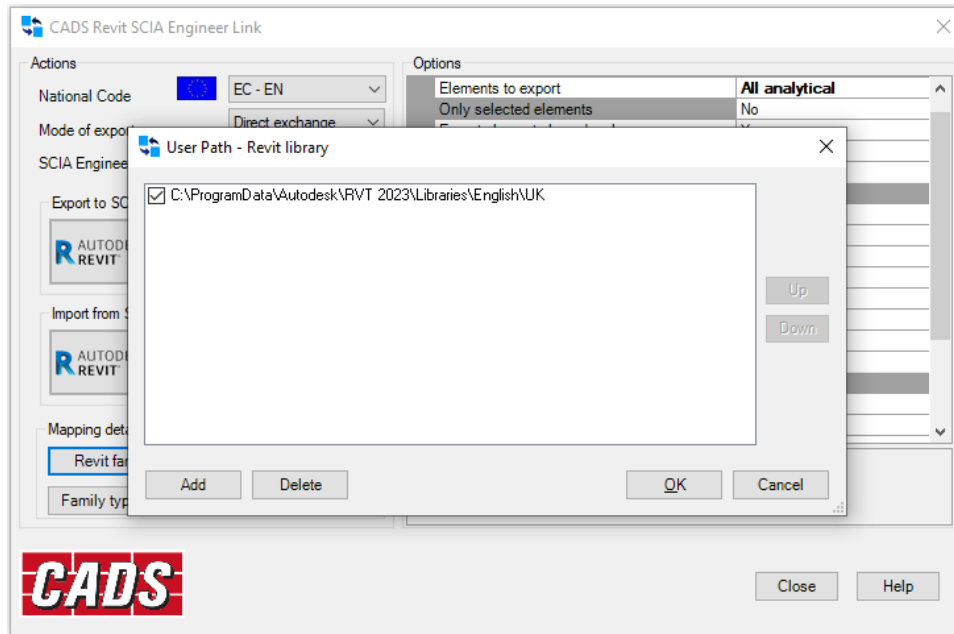
Figure 5-5: CADS Revit SCIA Engineer Link - Revit family path

5.2 Mode of Export

There are two ways in which a model can be exchanged between Revit and SCIA Engineer:

- *Direct exchange method*: In this method the model is transferred directly between Revit and SCIA Engineer without the need of any data exchange file. You must have both Revit and SCIA Engineer licensed on your system to use this method of model exchange;

- *R2S file exchange method*: If you have either Revit or SCIA Engineer licensed on your system then you can exchange modes using a data exchange file in the **.R2S* format.

Should you wish to transfer a model using the *Direct exchange method*, you should set the option *Mode of Export* to *Direct Exchange*.

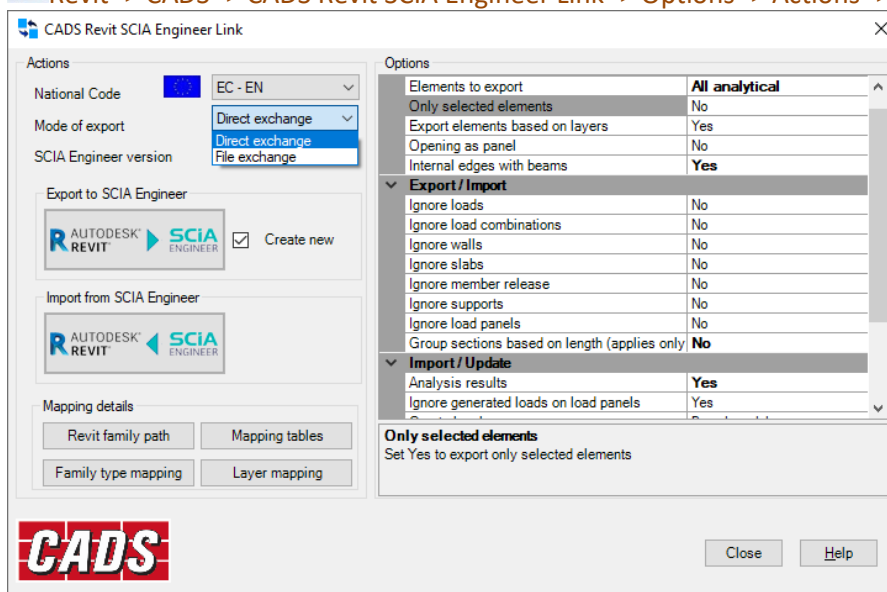Revit -> CADS -> CADS Revit SCIA Engineer Link -> Options -> Actions -> Mode of Export

Figure 5-6: CADS Revit SCIA Engineer Link - Launch SCIA Engineer

The matrix below shows how the *CADS Revit SCIA Engineer Link* works when you use the export or import feature from Revit or SCIA Engineer.
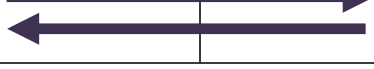
		Revit		SCIA Engineer	
		Export	**Import**	**Export**	**Import**
Mode of Export = Direct Exchange		Invokes SCIA Engineer automatically with the same file name and folder location as that of a Revit Structure job.	Imports the SCIA Engineer job into Revit #	Prompts you to specify the file name for the *.R2S *file* you wish to create which can be imported into Revit.	Prompts you to select the *.R2S file* you created / modified from Revit.
Mode of Export = File Exchange		Prompts you to specify the file name for the *.R2S file* you wish to create which can be imported into SCIA Engineer.	Prompts you to select the *.R2S file* you created/modified in SCIA Engineer.		

Figure 5-7: Model export & import matrix

#*Owing to certain programming API limitations, while importing the job into Revit you might get an error message 'Unable to find SCIA Engineer model'. In such cases, please follow the following steps:*

1. *Save the job in SCIA Engineer;*
2. *Close SCIA Engineer;*
3. *Open Revit;*
4. *Create a new job with Structural template;*
5. *Save the new job with a dummy Revit file name, e.g. Test.rvt;*
6. *Export the job to SCIA Engineer with Mode of Export as "Direct Exchange";*
7. *A new session of SCIA Engineer will be created. Open the original job (point 1) in this session of SCIA Engineer;*
8. *Now import the SCIA Engineer job into Revit.*

5.3 Elements to Export

You can choose the type of elements to be exported to SCIA Engineer from Revit. The options available are:

- All analytical – All analytical elements are exported to SCIA Engineer irrespective of its association with the structural model. The elements will be exported to SCIA Engineer based only on the analytical member properties. Boundary conditions, member end fixities, and loads if defined in Revit will be exported. If this option is selected, the link will not read any structural elements or properties from structural member;

- All structural - All structural elements are exported to SCIA Engineer irrespective of its association with the analytical model. The elements will be exported to SCIA Engineer based only on the structural member properties. Boundary conditions, member end fixities, and loads if defined in Revit will not be exported. If this option is selected, the link will not read any analytical elements or properties from structural member;

- With both analytical and structural – The structural members which are associated to the analytical members only are exported to SCIA Engineer. If this option is selected, the link will not export the members which has only one type of elements, namely those members having only structural or analytical elements. The geometry of members and the properties like material, cross-section and section rotation will be read from analytical model and the additional properties like alignment, composite deck info are read from structural properties. Boundary conditions, member end fixities, and loads if defined in Revit will be exported;

- All - All elements in Revit are exported to SCIA Engineer. If the structural members are associated with analytical members, the properties of analytical model will take precedence.

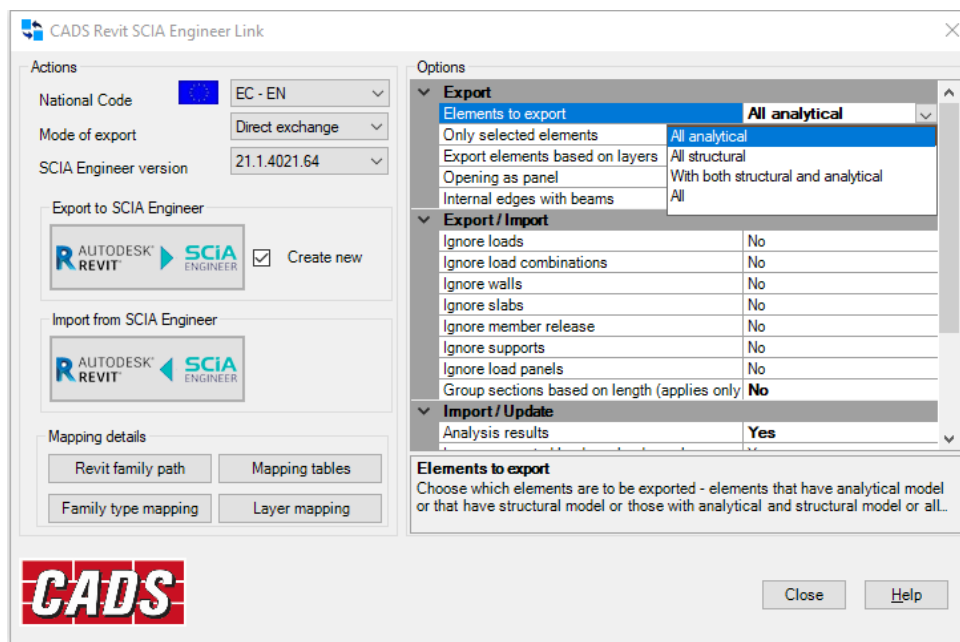Revit -> CADS -> CADS Revit SCIA Engineer Link -> Options -> Actions -> Elements to export

Figure 5-8: Elements to export

Please note that, the option specified during export will become read-only after successful export. To change the option, you have to export the model by setting the option "Create New" to true.

5.4 Version of SCIA Engineer

You will have to select the SCIA Engineer version you wish to use for export/import of models.

Revit -> CADS -> CADS Revit SCIA Engineer Link -> Options -> Actions -> SCIA Engineer Version -> Browse -> Add
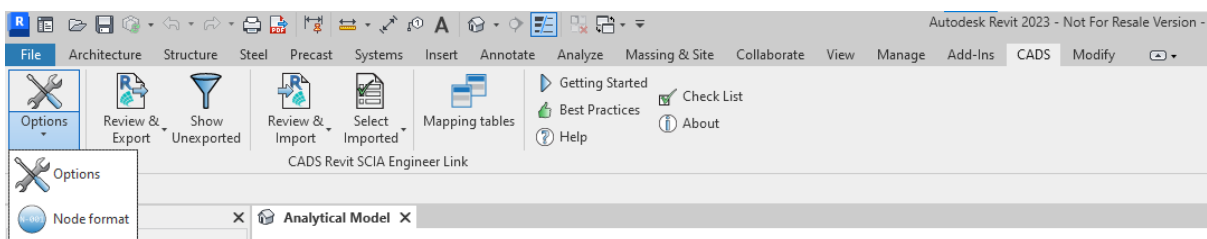

Figure 5-9: CADS Revit SCIA Engineer Link - Options button
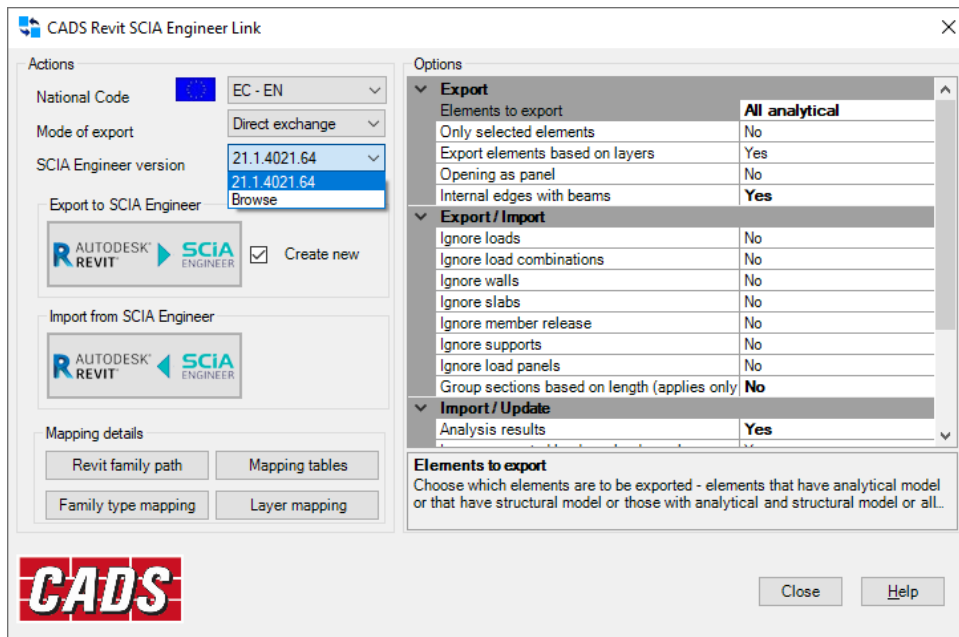
Figure 5-10: CADS Revit SCIA Engineer Link - Add SCIA Engineer version dialog

Click on the *Add* button to select the SCIA Engineer root folder as shown below:

Figure 5-11: CADS Revit to SCIA Engineer Link - Browse for SCIA Engineer folder

Select *OK* and then *Close* the previous dialog.

5.5 Case 1: Export from Revit to SCIA Engineer

Revit -> CADS -> CADS Revit SCIA Engineer Link -> Export

You can export the structural model in Revit to SCIA Engineer using the *Export / Review & Export* option.

Figure 5-12: CADS Revit SCIA Engineer Link – Export

CADS Revit SCIA Engineer Link application reads the Revit model and prepares a list of the elements from each category that is to be exported. The application then exports the Revit model into SCIA Engineer based on the settings listed in "Options" dialog.

On completion of the export action, a Log dialog shows the summary of the number of items exported. You can save the log file which can be opened in a text editor to review the transfer. Please save the Revit model once the export is completed in order to enable the review manager to track the changes for subsequent exports.

After export, for any reason, if you make some changes to the Revit model and export it to SCIA Engineer and if you want to review the changes to the model, you may choose the Review & Export option which updates the SCIA Engineer model.

Figure 5-13: CADS Revit SCIA Engineer Link - Export model from Revit to SCIA Engineer

Using the *Review & Export option, the application* will open the review manager that will list the changes to export by comparing the current Revit model with the last exported model. Please refer to the Help document for more details on this feature.

CADS Revit SCIA Engineer Link will open an instance of SCIA Engineer and create a SCIA Engineer model with the same file name as that of Revit. You may either choose to create a new SCIA Engineer file or overwrite an existing one by setting the following option:

Revit -> CADS -> CADS Revit SCIA Engineer Link -> Options -> Export to SCIA Engineer -> Create New
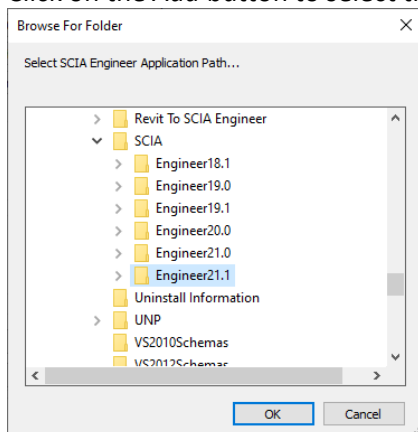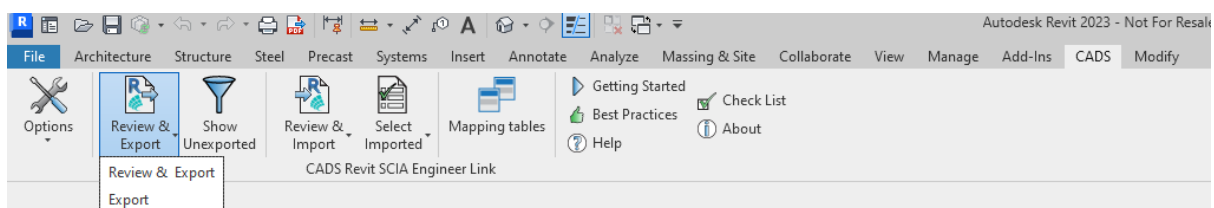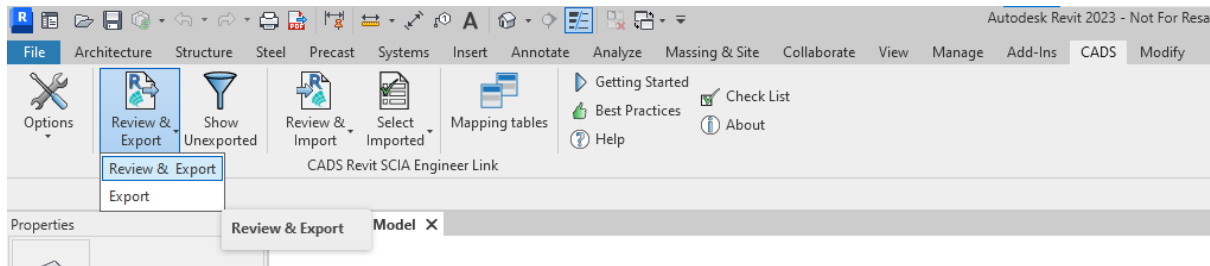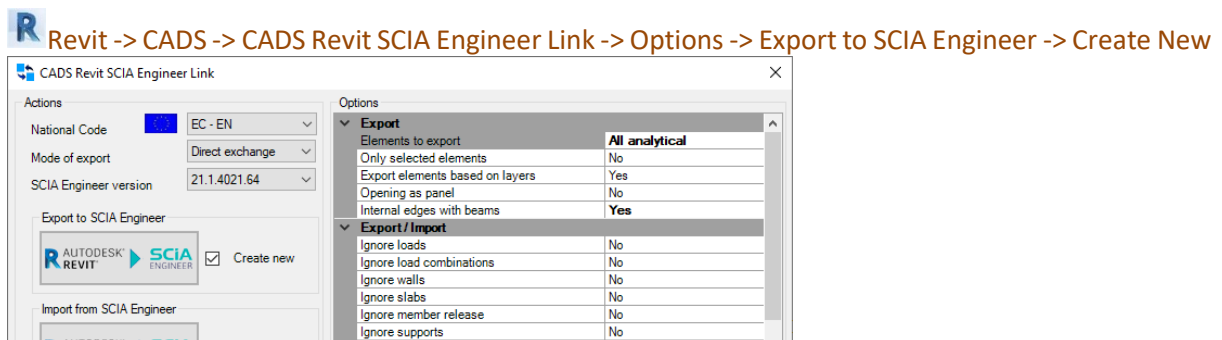

Figure 5-14: CADS Revit SCIA Engineer Link - Create new SCIA Engineer file

When the option *Create New* is *un-ticked*, only the changes in the model will be updated to the existing SCIA Engineer file. Where the model is being transferred for the first time then *CADS Revit SCIA Engineer Link* will automatically create a new SCIA Engineer file *(*.ESA)* with the model.

If the option *Create New* is *ticked*, *CADS Revit SCIA Engineer Link* will overwrite the entire model information in the SCIA Engineer file. If an existing SCIA Engineer file with the same name is available then the old data in the file will be completely replaced by the new model data.

 If you already have a SCIA Engineer session open in your system then *CADS Revit SCIA Engineer Link* may open another session owing to certain programming limitations.

For the *File exchange method* of model exchange, the **.R2S* file generated from Revit can be imported into SCIA Engineer using the *Import* or *Update* option.

SCIA Engineer -> File -> Import -> Revit File
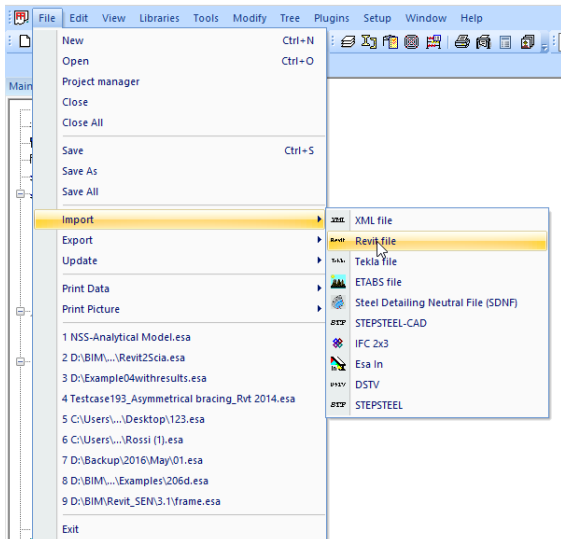
Figure 5-15: SCIA Engineer - Import Revit file

The *Import* option will create a new SCIA Engineer file and add the model information to it.

SCIA Engineer -> File -> Update -> Revit File
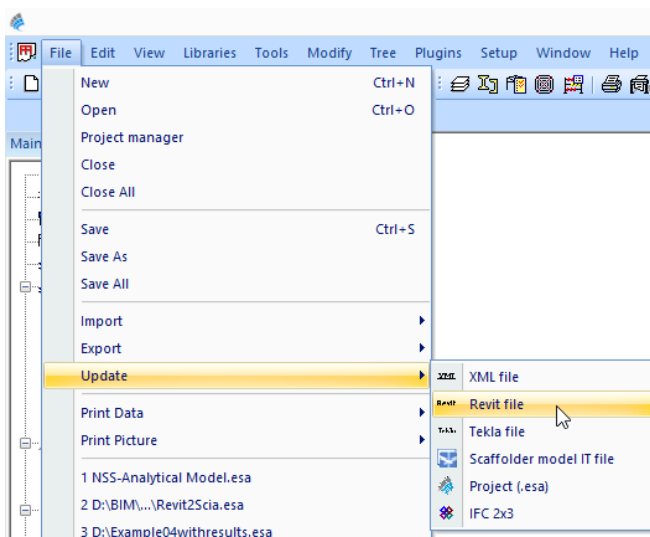
Figure 5-16: SCIA Engineer - Update Revit file

The *Update* option will update only the changes to an existing SCIA Engineer file.

5.6 Case 2: Import from SCIA Engineer to Revit

Revit -> CADS -> Revit SCIA Engineer Link -> Import
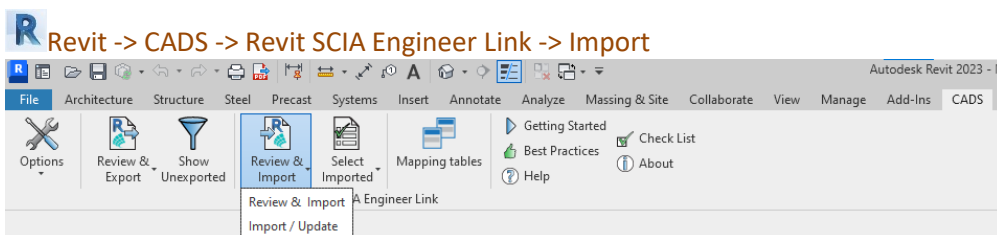
Figure 5-17: CADS Revit SCIA Engineer Link - Import model from SCIA Engineer to Revit Structure

You can import a SCIA Engineer model into Revit Structure using the *Review & Import / Import* option.

Click on *Review & Import* to track the changes between the SCIA Engineer model and the current Revit model.
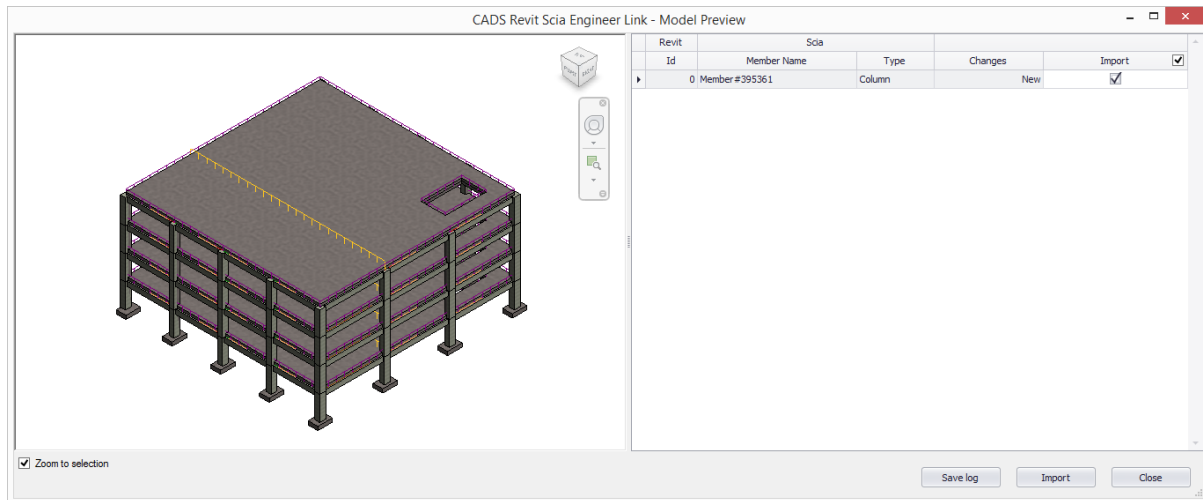
Figure 5-18: CADS Revit SCIA Engineer Link – Review & Import – Model Preview

Please refer to the Help document for more details on this feature.

First, set the standard Code of Practice and ensure the cross section library is mapped correctly before starting the import as detailed in Section 5.1 Code of practice.

You may import the model into Revit from SCIA Engineer using the **.R2S* file too.

In both cases, you can use the *Select Changes* option to highlight the new or updated elements.

 Revit -> CADS -> CADS Revit SCIA Engineer Link -> Options -> Select Imported

Figure 5-19: CADS Revit SCIA Engineer Link - Select changes

For the *R2S file exchange method*, you will have to first create a **.R2S* file from SCIA Engineer using the following option:

 SCIA Engineer -> File -> Export -> Revit File


Figure 5-20: SCIA Engineer - Export Revit file

5.7 Mapping tables

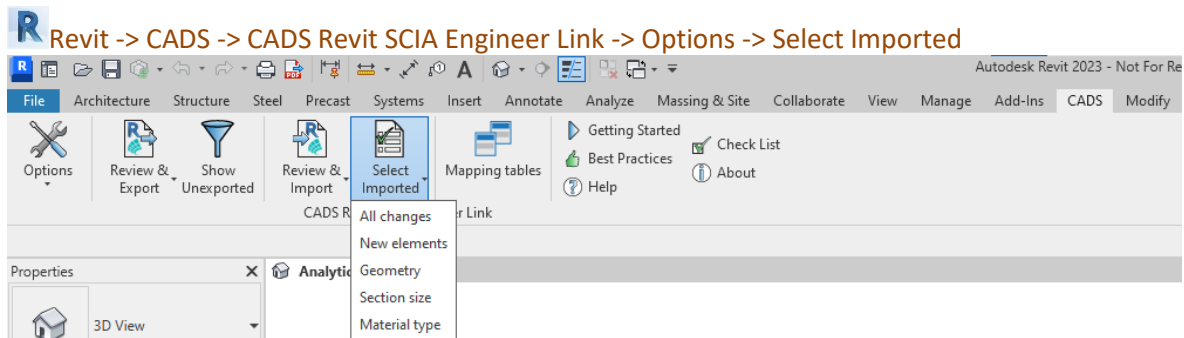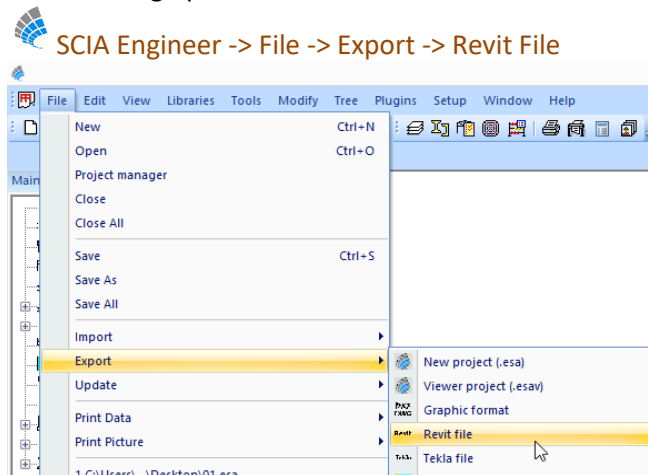The standard cross section and material libraries in both Revit and SCIA Engineer are comprehensive but are labelled differently. Therefore, *CADS Revit SCIA Engineer link* is shipped with a pre-installed mapping databases which matches materials, cross-sections and profile sheets between SCIA Engineer and Revit.

In many cases, you may require to use custom families in addition to the standard families. In such cases, the pre-defined database which contains the entries of standard material mapping or the section mapping is not enough to transfer the data between Revit and SCIA Engineer. Hence it is necessary for you to map the custom Revit families with equivalent SCIA Engineer materials/ sections.

The "Mapping Tables" command will allow you to create your own database for custom family mapping. On the first use of *CADS Revit SCIA Engineer Link* the user table will be blank. The application will allow you to add/create new entries for any new family (cross section) / material / profile sheet.
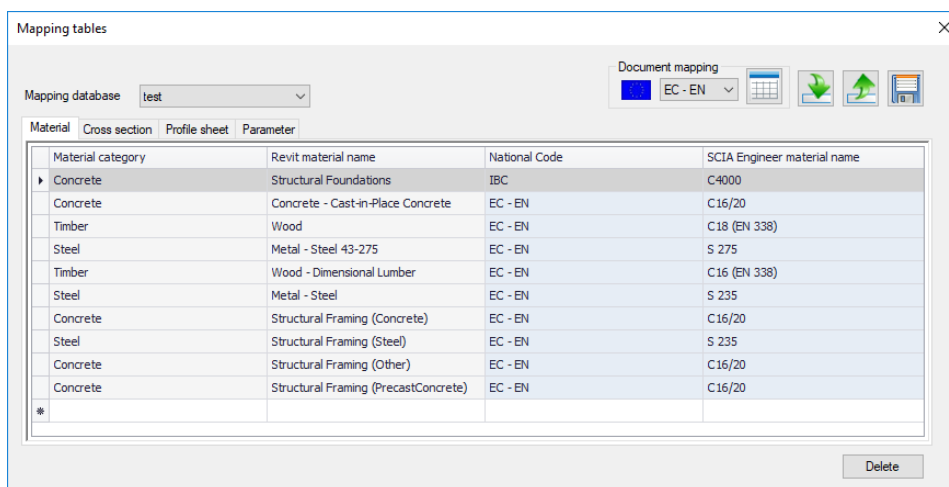

Figure 5-21: CADS Revit SCIA Engineer Link - Mapping tables

The application will also allow you to save and export the mapping database and this file can be shared across the users. The "Import" option will allow you to load any database into the project and use them during export/import. For more details on mapping tables, please refer to the help document.

6 Features

Structural elements present in Revit or SCIA Engineer can be exchanged between the two applications, provided both the products support them. For example, you can apply a *Moment in node* in SCIA Engineer but there is no equivalent feature in Revit, hence it will be ignored when you import a model into Revit from SCIA Engineer.

Similarly, structural properties may be known by different names, but are mapped based on their role. For example, the 'line support', known as *Boundary Condition – Line* in Revit is equivalent to *Support - Line on Beam* or *Support – Line on 2D Member* in SCIA Engineer.

A complete list of features supported is available in the *Help file.*

Revit -> CADS -> CADS Revit SCIA Engineer Link -> Help -> Introduction -> Bi Directional Link between Revit and SCIA Engineer
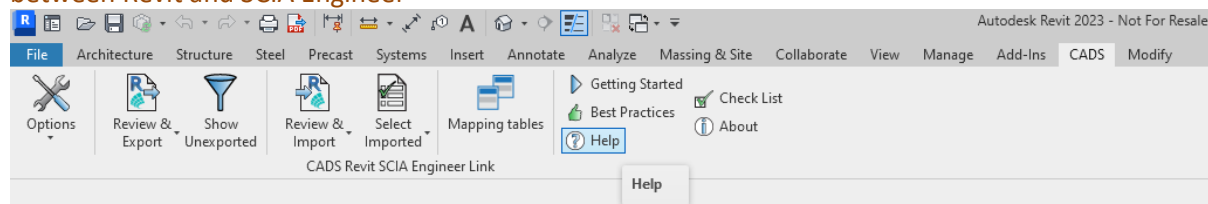

Figure 6-1: CADS Revit SCIA Engineer Link - Help button

It is possible to specify the format of the node names to be used in the SCIA Engineer model through the *Node format* option. It is used only for export from Revit to SCIA Engineer for the first time.

Revit -> CADS -> Revit SCIA Engineer Link -> Options -> Node Format
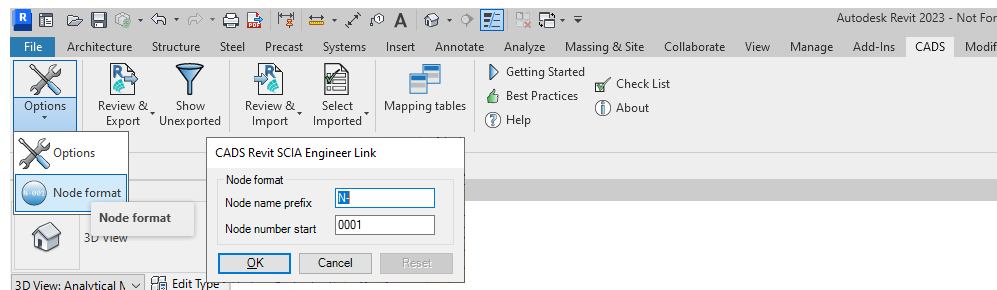
Figure 6-2: CADS Revit SCIA Engineer Link – Options – Node Format

Structural members visible in the Revit job but linked to external Revit or other CAD files will not be exported, for example linking an external Revit file using the *Insert->Revit Link* option.

You may choose to export only the selected members by ticking the configuration item *Export Selected Items Only*. This option could be very useful when you have a very large job but would like to analyse the structure in parts or would like to send updates for only a few members.

But there is no such option available when you export the job from SCIA Engineer. All structural elements present in SCIA Engineer will get imported into Revit.

6.1 Log of events

Whenever you export or import a model from Revit, a log of important events is created. For example:

"UC356x368x202" is mapped as "UC356/368/202"

Doors | Doors 4   - 225505: Not exported as this is not a structural element!

Where 225505 is the member ID in Revit

The log will list the different categories of items present in the model and their status.
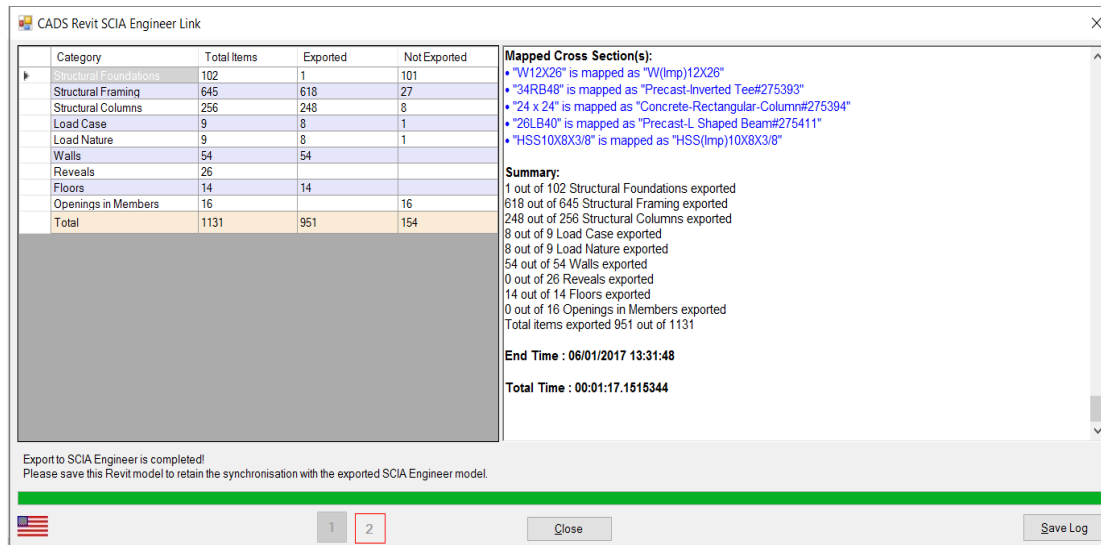

Figure 6-3: CADS Revit SCIA Engineer Link – Save Log file

It is recommended to save the log as a *.RTF file* using the *Save Log* button for checking and version control purposes.

Items which are successfully exported or imported are marked in blue. Elements that could not be exported/imported or have some issues attached to it are marked in red. You can highlight the affected member in Revit by using *Manage->Select by ID* option in Revit.

In the absence of a review manager, this is a very good option to highlight the elements marked in red in the log file and then take appropriate corrective action to export/import the member again.
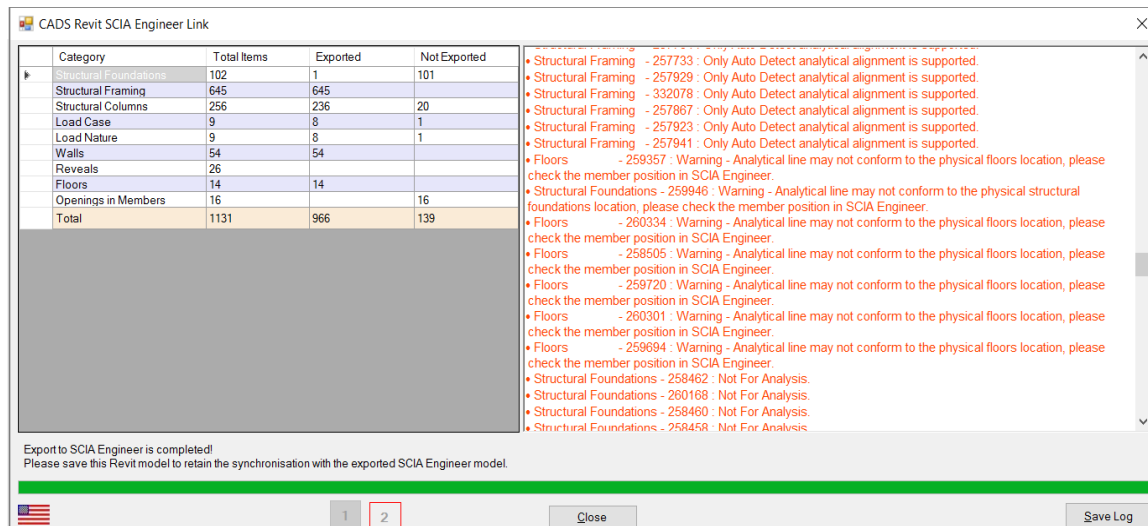

Figure 6-4: CADS Revit SCIA Engineer Link – Error checking in log file

For example in the above log file, a warning that the analytical line is not in the proper position is given for floor slab 227544. You can use the *Manage->Select by ID* option in Revit to highlight the slab and take the required action.
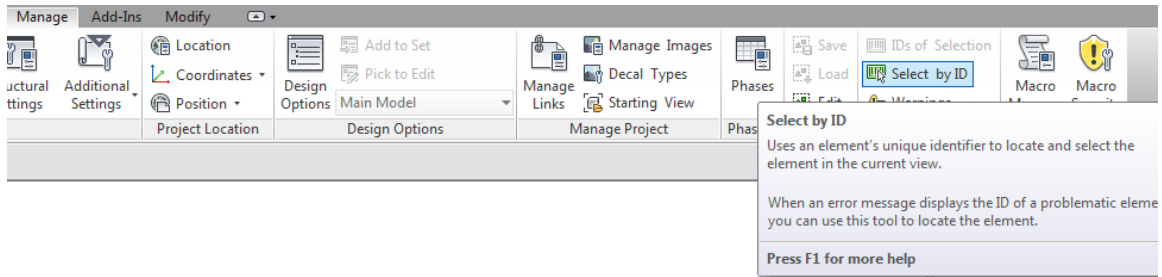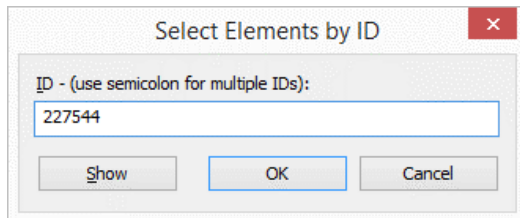
Figure 6-5: Revit - Select by ID

Figure 6-6: Revit - Select elements by ID

You may then change the required member attributes and send only the selected elements using the option *Export Selected Items Only*.

6.2 Rotation

CADS Revit SCIA Engineer Link has developed the mapping logic based on the default cross section library supplied with Revit. Since the *Revit family* implementation logic is not uniform in Revit you might find that the log file shows a message such as *Member rotated*. This is done to ensure that the cross section's handing (plane about which a cross section is mirrored) and orientation (member rotation about its centroid) with respect to the model are maintained in both Revit and SCIA Engineer.

This is generally not a problem with symmetrical sections, but with asymmetrical sections you might find that some sections are transferred with a different handing or orientation. In these cases please check if the *Revit family* used for member mapping is a custom made *Revit Family* or a default one supplied with Revit. For a custom made *Revit family* try changing the variables which affect member handing and orientation and use those values which gives the correct result. Please get in touch with the support team if there is any issue with the cross sections library supplied with Revit.

If the "Elements to Export" option is set as "All analytical" or "With both structural and analytical", the cross-section rotation specified in analytical model will be used in the members in SCIA Engineer. In these cases, the orientation of members in Revit Structural model may not be the same in SCIA Engineer.

6.3 Eccentricity

CADS Revit SCIA Engineer Link ensures that the member eccentricity is correctly updated during the model exchange between Revit and SCIA Engineer. Since the parameters required for defining eccentricity is different in Revit and SCIA Engineer, you may find the eccentricity parameters showing slightly different values, but the relative position of the member with respect to the centre line is maintained.

If the "Elements to Export" option is set as "All analytical" or "With both structural and analytical", the geometry of analytical model is exported to SCIA Engineer. In these cases, the position of members in Revit Structural model may not be the same in SCIA Engineer.

6.4 Support

Boundary conditions can be exported from Revit to SCIA Engineer as supports. If you have placed any *Boundary Conditions* (*Point*, *Line* or *Area*) in Revit then it will get exported as supports in SCIA Engineer with the same translational and rotational stiffness values as specified in Revit.

Where the support parameters are modified in SCIA Engineer and you do not wish them to get overwritten during the next export from Revit, set the configuration option *Ignore Support* to *Yes.* The boundary conditions cannot be exported if the "Elements to Export" option is set as "All structural".

6.5 Loads

Loads modelled in Revit can be exported to SCIA Engineer and you can import them back into Revit after modifying them in SCIA Engineer. You may also choose to model loads in SCIA Engineer and import it into Revit.

The self-weight of the structural member is not exported to SCIA Engineer from Revit. You may change the load values if required in SCIA Engineer using SCIA Engineer's standard product features.

If you are not interested to import the generated loads, they can be ignored by choosing the "Ignore generated loads options to "Yes". Please refer to the features list in the *Help file* to check how the load types are mapped between the two applications.

Bi-Directional exchange of load cases and load combinations are also supported by *CADS Revit SCIA Engineer link*. Structural Engineers may choose to ignore load cases and load combinations specified in Revit and handle them in SCIA Engineer separately. You can opt to ignore load cases and load combinations in Revit by setting the configuration option *Ignore Revit Load Combination* to *Yes*.

The loads will not be exported if the "Elements to Export" option is set as "All structural".

6.6 Composite Slabs

Composite slabs and Roof decks modelled in Revit can be exported to SCIA Engineer and you can import them back into Revit after modifying them in SCIA Engineer.

The composite slab decks are modelled in Revit as an assembly. The composite slab data are transferred from Revit to SCIA Engineer by reading the appropriate materials and dimensions of the different layers of the slab. A separate mapping database is used to automatically map the standard profile sheets from Revit and SCIA Engineer. The composite slab info can be exported only if the "Elements to Export" option is set as "All structural" or "With both structural and analytical".

Non-standard (user defined or user modified) families of profile sheets decks are not directly supported, but they can be exported to SCIA Engineer by mapping to the equivalent profile sheet.

If you have the composite beam design info for the members in SCIA Engineer, the design info will be imported into Revit. The design info includes camber, studs and the end forces on the member.

6.7 Virtual Joists

Steel bar joists modelled in Revit can be exported to SCIA Engineer as virtual joists. Virtual joists are light-weight steel truss which consists of parallel chords and a triangulated web system. Standard

mapping database is used to map the steel bar joists with the equivalent virtual joists. You can modify the virtual joists in SCIA Engineer.

After performing the design, if you store the design info, the steel bar joists in Revit will be updated with the joist designation specified in the design info. The end forces are also imported into Revit as member forces.

For Joists Girders, the number of joist spaces and the point load on each panel will be updated while importing the model from SCIA Engineer.

6.8 Levels

When the model is imported from SCIA Engineer, you may specify how the levels are to be created in Revit. You may optionally choose to create the levels based on the height of *Stories* if defined in SCIA or based on the elevations of slabs or based on the Z coordinates of the elements. The offsets on the elements and their levels in Revit are set according the geometric position.

6.9 Reinforcement

CADS Revit SCIA Engineer link allows you to import the user defined (Input) reinforcement from SCIA Engineer to Revit. CADS Revit SCIA Engineer link v 2020.1 or later also supports the import of practical reinforcement (Real bars converted from reinforcement design for 1D members) from SCIA Engineer to Revit. The 2D reinforcements defined for the slab will be imported as "Area reinforcement" in Revit.

For more details on import of reinforcement, please refer to the Help document.