



ADVANCED TRAINING INTEGRATION WITH BIM WORKFLOWS

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Table of Contents

Introdu	ction		5	
	Мос	dules		5
	Oth	er ap	plications	5
Chapte	r 1:	Ar	nalytical model versus structural model6	
	1.1.	Di	fferent representations explained	6
	1.2.	Ge	enerating the structural model in SCIA Engineer	6
	1	1.2.1.	Mode	7
	1	1.2.2.	Priority	8
	1	1.2.3.	Alignment and eccentricities	8
	1	1.2.4.	Gaps/Cuts	8
	1	1.2.5.	Example with advanced settings	9
Chapte	r 2:	Op	Den BIM & IFC	
	2.1.	Op	ben BIM & IFC	10
	2	2.1.1.	OpenBIM	10
	2	2.1.2.	IFC format	10
	2.2.	IF	C exchange in SCIA Engineer	11
	2	2.2.1.	Shape representations	11
	2	2.2.2.	Profile definitions	12
	2.3.	Ex	port IFC	13
	2	2.3.1.	IFC/BIM Properties	13
	2	2.3.2.	Available file formats	14
	2	2.3.3.	Exporting an IFC from SCIA Engineer	14
	2	2.3.4.	Export of specific elements or geometry	15
	2.4.	Im	port (or Update) IFC	17
	2	2.4.1.	IFC/BIM Properties	17
	2	2.4.2.	Available file formats	17
	2	2.4.3.	Importing (or Updating) an IFC in SCIA Engineer	17
	2	2.4.4.	Import of specific elements or geometry	21
	2.5.	BI	M Toolbox	22
	2	2.5.1.	Convert	22
	2	2.5.2.	Align	23
	2.6.	Ex	change with BIMPLUS or BIMCloud	28
Chapte	r 3:	Ex	change via the Revit-link	
	3.1.	In	stallation of the Revit-link	33
	3.2.	0	/erview	35
	3.3.	Ex	change from Revit to SCIA	37

3.3.1.	Generating the analytical model in Revit	37
3.3.2.	Exporting the model to SCIA Engineer	40
3.3.3.	Managing the mapping tables	44
3.3.4.	Opening the model in SCIA Engineer	47
4. Excl	nange from SCIA to Revit	48
3.4.1.	Exporting the model to Revit	48
3.4.2.	Opening the model in Revit	49
Excl	nange via the Tekla-link52	
1. Insta	allation of the Tekla-link	52
2. Ove	rview	55
3. Excl	nange from Tekla to SCIA	56
4.3.1.	Generating the analytical model in Tekla	56
4.3.2.	Exporting the model to SCIA Engineer	58
4.3.3.	Opening the model in SCIA Engineer	62
4. Excł	nange from SCIA to Tekla	63
4.4.1.	Exporting the model to Tekla Structures	63
4.4.0		64
	3.3.2. 3.3.3. 3.3.4. 4. Excl 3.4.1. 3.4.2. Excl 1. Insta 2. Over 3. Excl 4.3.1. 4.3.2. 4.3.3. 4. Excl 4.4.1.	 3.3.2. Exporting the model to SCIA Engineer

Introduction

The construction industry is split up in many separate providers, from designers up to building part suppliers; each party is using software for different tasks (design, costs, detailing, fabrication...). Today we are aware that a major part of the inefficiency in construction is due to inadequate cooperation between the construction partners, resulting in errors, repetitive work, extra costs etc.

There are solutions to fundamentally improve the cooperation between construction partners, even with each party keeping its own existing software. If we agree on how to exchange information, if we use digital 3D models of structures, if we use standard exchange formats and if we can control the workflow between project partners, then we all win.

This manual will explain the different methods for exchanging BIM models with SCIA Engineer and discuss the possible workflows and correct procedures to have a good model exchange.

Modules

MODULE	CODE	INCLUDED IN	LINK TO RESOURCE CENTRE
Revit link	Sen.11	Concept edition Professional edition Expert edition Ultimate edition - Can be purchased as separate module	https://www.scia.net/en/resource/fact- sheet/interoperability-bim/sen11-revit-link
Tekla link	Sen.12	Steel edition Concept edition Professional edition Expert edition Ultimate edition - Can be purchased as separate module	https://www.scia.net/en/resource/fact- sheet/interoperability-bim/sen12-tekla-link
BIM toolbox*	Sen.10	Steel edition Concept edition Professional edition Expert edition Ultimate edition Precast edition - Can be purchased as separate module	https://www.scia.net/en/resource/fact- sheet/interoperability-bim/sen10-bim-toolbox

The SCIA license modules that are needed for exchanging certain data to and from SCIA Engineer are:

No additional modules are needed for import/export of these file formats: XML, DNF, FGBM, SAF, Bimplus, BIM Cloud, IFC, IFC compressed, Allplan (IFC), SDS/2, CEA plant-4D, Stepsteel, or graphic formats like jpg, dwg, dxf, pdf and others.

(*) The BIM toolbox is still available but it's more efficient to turn to the SCIA Autoconverter.

Other applications

Another SCIA application that can assist in the exchange of BIM models to SCIA Engineer, is the SCIA Autoconverter. IFC-models can easily be converted to an analytical model (SAF-format) to use in SCIA Engineer.



APPLICATION	PACKAGE	LINK TO WEB PAGE
	Annual subscription Includes Allplan Bimplus Professional with 3 users	
Scia Autoconverter	 Issue management Validation process CAD AddOn API BIM attribute management 	https://www.scia.net/en/software/scia- autoconverter

Chapter 1: Analytical model versus structural model

There are several different representations of a model to be considered in each project. The two representations we are dealing with in SCIA Engineer are the analytic model and the structural model. It's important to know and understand this, since every export or exchange option uses only one of these representations.

1.1. Different representations explained



The **analytical model** is used for calculations. It is a model in which a beam or column is represented by a single line. The cross-section that belongs to that beam or column is assigned to that line, and thus the properties of that beam or column are assigned to that line as well. A plate or wall in the analytical model is represented by a plane with no thickness, but the information about the material and the thickness of the plate or wall are also assigned to that plane.



The **structural model** shows the volumes and shows how the structure will be built, so the elements are connected to each other in a realistic way. It can be used for construction drawings amongst other things. In SCIA Engineer, it's possible to generate this representation. Of course, the correct settings need to be used to ensure generating it correctly. In order to see it, you must activate the functionality for the structural model. In modelling software like Revit and Tekla, the emphasis lies on this volumetric representation.

SCIA, being calculation software, mainly uses the analytical model. When exchanging models between SCIA and Revit or Tekla using the plugins, the analytical model is being exchanged and it is very important to make sure it is properly constructed. The IFC format, however, uses the structural model.

Some modelling programs offer the possibility to generate the analytical model, but this does not necessarily ensure a *good* underlying analytical model at all. As you can see in this figure, a good-looking structural model can contain a very bad underlying analytical model. The beam is clearly not connected to the columns in the analytical model.



1.2. Generating the structural model in SCIA Engineer

In order to generate the structural model in SCIA Engineer, you must activate the functionality for the structural model in the project settings dialog.

(GENERAL	DETAILED
	Property modifiers	▲ Subsoil
11	Model modifiers	Soil interaction
	Parametric input	Pad foundation check
	Climatic loads	▲ Steel
	Mobile loads	Fire resistance checks
	Dynamics	Steel connections
	Stability	Scaffolding
FA	Nonlinearity	7DoF 2nd order analysis for LTB
	Structural model 🔽	Girders with sinusoidal webs
	IFC properties	Concrete
	Prestressing	Code dependent deflection
	Bridge design	
	Excel checks	_
	CADS Composite add-on	
2		

The structural model can then be activated, either via the visualisation options or the view settings from the context menu (right click).

۲				
🚡 Undo view change				
💰 Redo view change				
Visibility		🔯 Zoom all	View parameters setting	
Zoom		Q Zoom cutout	Check / Uncheck gro	Lock position
Views 🕨		View settings for all entities		۴ 🕅 🔍
Clippingbox		Print table	+ Service	
Visualization	Analysis model - volumes	Table to report	Style + colour	normal
The state to a stress			Draw member system line	✓
Global UI settings	Analysis model - axes	Print image Ctrl+P	Member system line style	system line
User configuration	A Structural model	🔛 Image to gallery	Model type	structural model
Colours & lines	Generate structural model	😭 Save image to file	Display both models Member surface	~
	Generate su ucturat model	Copy image to clipboard	Rendering	rendered
Fonts settings		Copy mage to empound	Draw cross-section	
		Screenshot to report	Cross-section style	section
Structural beam types settings		Live image in scale to report	+ Effective width of plate ribs	
Dimension lines settings			+ Panel	
	-	Live image to report	+ Structure nodes	
Line grid manager Ctrl+Shift+G		📣 Wired model in view manipulations	+ Member parameters	
Dot grid settings		Advanced graphic settings	+ Local axes	
Wired model in view manipulations	-	Coordinates info Ctrl+Shift+D	Show names in tab	OK Apply Ca

When the structural model functionality is activated, the properties window will show a section for the structural model (in advanced mode, so be sure to have all properties unfolded by showing the red arrow on the top right). Priorities, alignments, eccentricities and gaps or cuts can be defined here.

The principles are explained below. All settings are explained in detail on *help.scia.net* > Modelling > Geometry > Structural model.

1.2.1. Mode

Three mode options are available, with varying degrees of settings that will be automatically handled by the software or must be defined manually.

- General: Only one checkbox can be changed to lock the geometry. This mode is most suitable for members with special geometry (like solids with openings in them for instance). Imported members often have this mode by default, but this can cause unwanted behaviour when the members are exported again to IFC.
- Automatic: Settings are taken 'automatically' from the member definition. Default values are shown but can be changed manually.
- **Manual:** This mode follows the same logic as 'Automatic', but more options are now available for end-cuts.



1.2.2. **Priority**

Note that the type of a member plays a role in the default priority settings. These are defined by the number between brackets, 80 in the example on the previous page. The priority can be changed by choosing another type or overwriting the priority in the structural model section.

To explain this behaviour, let's look at the following examples:



The first picture shows the visualisation of the analytical model, where the column and beam are simply drawn to the node.

The second picture shows the structural model, with priority 80 for the beam and 100 for the column. Note that the shape and orientation of the cross-section are taken into account to connect the members.

In the third picture, the priority is 100 for the beam and 80 for the column. The beam is now drawn on top of the column.

1.2.3. Alignment and eccentricities

With the alignment, you can change the way the member is drawn with respect to the member system line of the analytical model. They are drawn the same way by default. The line is usually in the centre of the cross-section. You can change this so for example the member is drawn under this line, with the value 'Top' for the alignment as shown in the picture below. Or you can define the eccentricity values manually, for instance to -80mm as shown below. Note that these changes only affect the structural model, so the eccentricities will not generate additional internal forces in the structure when calculating. This can be used when some members are for instance lower than other members, without changing the analysis model.



1.2.4. Gaps/Cuts

With end-cuts, you can define the end detail of the profile manually. A regeneration of the structural model is necessary before the changes are visible. In the example below, the structure is shown without gap first, and secondly, a gap of 50 mm is defined between the end of the beam and the column.



1.2.5. Example with advanced settings

As an example, the following structural model can be achieved with the setting for end-cuts and eccentricities shown below. (The columns are 3,6m high, the beam is 3m long.) The orange lines show the analytical model, the volumes are shown for the structural model. Please pay attention to the way the members are connected in blue.



Detailed information for each setting of the structural model can be found on: *help.scia.net* > Modelling > Geometry > Structural model.

Chapter 2: Open BIM & IFC

2.1. Open BIM & IFC

2.1.1. **OpenBIM**



OpenBIM®¹ extends the benefits of BIM (Building Information Modeling) by improving the accessibility, usability, management, and sustainability of digital data in the built asset industry. At its core, openBIM is a collaborative process that is vendor neutral. openBIM processes can be defined as sharable project information that supports seamless collaboration for all project participants. openBIM facilitates interoperability to benefit projects and assets throughout their lifecycle.

OpenBIM ensures that:

- 1. Interoperability is key to the digital transformation in the built asset industry
- 2. Open and neutral standards should be developed to facilitate interoperability
- 3. Reliable data exchanges depend on independent quality benchmarks
- 4. Collaboration workflows are enhanced by open and agile data formats
- 5. Flexibility of choice of technology creates more value to all stakeholders
- 6. Sustainability is safeguarded by long-term interoperable data standards

Open BIM is a universal approach to the collaborative design, realization and operation of buildings based on open standards and workflows. Open BIM is an initiative of BuildingSMART and several leading software vendors using the open BuildingSMART Data Model.

2.1.2. IFC format

At its core, buildingSMART enables the entire built asset industry to improve the sharing of information throughout the lifecycle of project or asset. By breaking down the silos of information, end users can better collaborate and cooperate regardless of which software application they are using. buildingSMART's technical core is based around Industry Foundation Classes (IFC) which was ISO certified in 2013.

IFC is a standardized, digital description of the built asset industry. It is an open, international standard (ISO 16739-1:2018) and promotes vendor-neutral, or agnostic, and usable capabilities across a wide range of hardware devices, software platforms, and interfaces for many different use cases.

Industry Foundation Classes, IFC, are the main BuildingSMART data model standard to facilitate interoperability in the architecture, engineering, and construction (AEC) industry. The IFC format is registered by ISO as ISO/PAS 16739. IFC is used to exchange and share BIM data between applications developed by different software vendors without the software having to support numerous native formats.



BuildingSMART International awarded SCIA nv as the first company to pass the certification of the interoperability standard IFC 2x3 "Version 2.0" for structural model exchange with SCIA Engineer, as was announced during the international BuildingSMART meeting in Waltham (Boston, USA), 11-15 March 2013.

	®	Vendor 4	Product	\$ Schema \$	Exchange Requirement \$	Import / ÷ Export	Status 🕈	Started \$	Completed \$	Report (link) \$
V2	.0	NEMETSCHEK Scia	Scia Engineer	IFC 2x3	CV 2.0	Import	Finished	2010-07- 13	2013-09-17	https://ifc2x3.b- cert.org/ords/ifc/certification/getCertificationReport/201
ιUC		NEMETSCHEK Scia	Scia Engineer	IFC 2x3	CV2.0-Struct	Export	Finished	2010-07- 13	2013-04-16	https://ifc2x3.b- cert.org/ords/ifc/certification/getCertificationReport/104

The newer IFC4 format is supported only for import in SCIA for now. Reference View and Data Transfer View are supported. In general, all entities and representations which are supported in IFC2x3 are supported. Additionally, the new shape representation that was introduced, Tessellation, is also supported in SCIA Engineer.

The status of IFC4 support in SCIA Engineer can be found on: *help.scia.net* > Data exchange > IFC > Support of IFC4.

¹ Source of all information on this page: https://www.buildingsmart.org/about/openbim/

2.2. IFC exchange in SCIA Engineer

2.2.1. Shape representations

Elements can be represented in different ways in the IFC-format. Each representation has its own purpose and advantages. Some of these representations are shown here to understand the import possibilities and effects of the export settings that are available.

SweptSolid/AdvancedSweptSolid

A profile (1D element) or flat element (2D element) represented by a SweptSolid is defined and extruded along a curve or axis. Elements with this representation can be converted to native SCIA Engineer members after import.



Objects with this representation can contain information/properties about the geometry such as cross-section, thickness etc.

Clipping



An element created by a difference between swept area solids is represented by 'Clipping'.

Elements with this representation can be converted to native SCIA Engineer members after import, with a defined structural model representation.

Boundary representation / Brep



An element represented by a Brep is described with vertices, interconnected with lines, in order to define a volume. This is most useful for complex geometry that isn't easy to represent using other definitions.

These entities are imported into SCIA Engineer as general volumes (general solids). In this case, there is a possibility to use the member recognizer functionality to convert them to native SCIA Engineer members. This representation lacks information about thickness, cross-section etc.

CSG

Like 'Clipping' for SweptSolids, a CSG representation is the result of a difference between solid elements. These entities are also imported into SCIA Engineer as general volumes (general solids).

Sectioned spine



Elements with haunches or arbitrary profiles can be represented by a sectioned spine. A sectioned spine is a representation of the shape of a three-dimensional object composed by a number of planar cross sections, and a spine curve. The shape is defined between the first element of cross sections and the last element of the cross sections.

Rules that are followed for exporting specific elements according to their possible shape representations can be found on *help.scia.net* > Data exchange > IFC > Ifc file format extension.

2.2.2. **Profile definitions**

SCIA Engineer supports the following IFC classes for profile definition:



Other profiles will be imported as general cross-sections in SCIA Engineer.

Rules that are followed for exporting specific elements according to their possible profile definitions can be found on *help.scia.net* > Data exchange > IFC > Ifc file format extension.

2.3. Export IFC

A model in SCIA Engineer can be exported to IFC. Remember that it is the structural model, which is exported, as mentioned in chapter 1. To see the model in the way it will be exported, it is therefore useful to generate the structural model view in SCIA Engineer. Please pay special attention to the 'Mode' in which the element is generated in the structural model, as mentioned in section 1.2.1.

2.3.1. IFC/BIM Properties

The functionality 'IFC properties' can be switched on in the Project Data. A group of BIM related properties then appears in the properties window. It has two main parts. The first section has advanced options for export. The general export settings can be overwritten here for specific elements. The other one is a subgroup 'Attributes'.

Project data		×	▼ BIM PROPERTIES	
Tojeer data		~	ShapeRepresentation	Default 🗸
Basic data Fun	ctionality Actions Unit Set Protection		Profile	Default \checkmark
	GENERAL	DETAILED	IFC Entity	Default \checkmark
	Property modifiers	▲ Subsoil	ATTRIBUTES	
		Pad foundation check	Reference	
	Model modifiers		Slope [deg]	0,00
	Parametric input	4 Steel	IsExternal	\overline{O}
	Climatic loads	Fire resistance checks	LoadBearing	
	Mobile loads	Steel connections	FireRating	
	Dynamics	Scaffolding	FileRaulig	
	Stability	7DoF 2nd order analysis for LTB	BIM PROPERTIES	
			ShapeRepresentation	Default 🗸
	Nonlinearity	Girders with sinusoidal webs	IFC Entity	Default 🗸
	Structural model 🔽		ATTRIBUTES	
	IFC properties 🔽		Reference	
	Prestressing		AcousticRating	
	Bridge design		FireRating	
			Ŭ.,	
	Excel checks		Combustible	\bigcirc
AN OWNERS AND	Substitution beam		SurfaceSpreadOfFlame	
			ThermalTransmittanc	0,00
			IsExternal	\bigcirc
	×	×	LoadBearing	
			Compartmentation	\bigcirc
		OK Cancel	PitchAngle [deg]	0,00

Export options

The advanced export options are different for different elements, e.g., 'Profile' is only there for straight 1D members with SweptSolid geometry. The element is exported using the setting in the BIM properties instead of by the rules defined in the export dialog. If the value is set to default, that means the element is exported by the rules defined in the export dialog.

ShapeRepresentation and **Profile** represent the specific export settings for elements as explained in the previous section of this manual.

The **IFC Entity** can change the object type of the element in the IFC. For instance, a shell is exported as Ifcslab by default, but you can choose here to export it as IfcWall.

Attributes

Additional information can be attached to an IFC Entity by means of a 'PropertySet'. SCIA Engineer support the '*Common' property sets and their standard properties for all 1D members exported as IfcBeam, IfcMember or IfcColumn, all 2D members exported as IfcWallStandardCase of IfcSlab and all general volumes exported as IfcWall. This means some additional properties can be assigned and will be visible in the IFC in the PropertySet Pset_BeamCommon for beams, Pset_WallCommon for walls etc.

2.3.2. Available file formats

IFC and IFCzip

SCIA Engineer supports both plain IFC and IFCzip for export. The IFCzip file format is a zipped plain IFC. The packing and unpacking during export and import is done automatically by SCIA Engineer.

Allplan

Since version 15.2, a special export option allows the users to export an IFC file with predefined settings for Allplan. The exported file is a plain IFC which is exported according to Allplan user needs.

2.3.3. Exporting an IFC from SCIA Engineer

Before exporting, be aware if you have an active selection. If a selection of certain members is active, only these elements will be exported.

The model can be exported from the menu:



A dialog will open to choose a file location and name:

 ♥ ♥ Search Desktop ■ ▼ ?

ems match your search.
~
~
r

You can choose the view definition 'Coordination View' or 'Simplified View'. The first one allows you to choose the representation per member type. The second one exports everything in brep representation. The units in which the model is exported can be chosen, and certain member types can be included or excluded from the export.

PROJECT SETTINGS				
View definition: Coordination View 👻	Units: mm ¥			
EXPORT ENTITIES	1D MEMBERS	1D REINFORCEMENT		
 1D members 2D members General volumes 	SweptSolid SweptSolid, not using parametric Brep	SweptSolid Brep 2D REINFORCEMENT SweptSolid Brep		
 Steel connections Stiffeners 1D reinforcement 2D reinforcement 	Shape representation of arbitrary and haunched members: Use 'SectionedSpine' representation			
 Tendons Foundation pads 	2D MEMBERS	TENDONS		
 Attributes Line grids 	• SweptSolid Brep	• SweptSolid Brep		

After confirmation, a report will be shown for the export process. This shows the number of exported entities and errors or notifications.

IFC export report		_		×
EXPORTED ENTITIES 21 members 43 columns 20 beams 9 slabs 1 line grids	ERRORS AND NOTIFICATIONS No errors or notifications we	re report		Ŷ
		ОК	Save	as

2.3.4. Export of specific elements or geometry

Openings and subregions

All **openings in 1D members** are exported as IfcOpeningElement with a parametric or general profile. If the repetition is set, all openings are exported as separated objects.

Openings and subregions in 2D elements are exported as an IfcOpeningElement of type 'opening' or 'recess'. The subregion thickness must be lower than the thickness of the main slab/wall. In case the subregion is thicker than the slab/wall, the subregion is not taken in account and the model is exported without the subregion.

When the opening in 2D member is modelled as a cut-out, no opening element is exported. This means that for elements with a SweptSolid representation, an entire member is exported (without cut-outs). For Brep, the correct shape (with cut-outs) is exported.

Steel connection parts

SCIA Engineer supports export of **flat steel connection parts**, **cleats**, **and stiffeners** to IFC as independent plates (IfcPlate). Information about a **weld** (IfcFastener entity) and **bolts** (IfcMechanicalFastener entity) are also exported. Each plate has a material as assigned in SCIA Engineer. **Plates** are exported as SweptSolid or Brep whereas bolts are only exported as Brep. All bolts in a **bolt assembly** are defined as mapped items.

Concrete reinforcement

The default export of **concrete reinforcement** and **free bars** is done by means of the AdvancedSweptSolid representation. In case you export it as Brep, all reinforcement is exported with boundary representation.

Note: **1D concrete reinforcement** is exported with overlapping anchorage. This can cause problems during import in some applications. A workaround is to explode the reinforcements in free bars in SCIA before exporting.

Concrete 1D member reinforcement and free bars are always exported as IfcReinforcingBar. Free bars which have defined a repetition and stirrups are exported as one reinforcing bar with mapped items. 2D Reinforcement is always exported as IfcReinforcingMesh.

Building storeys

The current SCIA Engineer version fully supports export and import of **building storeys**. If storeys are defined in a project, then all members are assigned to the storey in which they are located. If a member is allocated in more storeys, then it is exported only to the first one. If a member is allocated to no storey, then it is assigned to the building itself. In case no storey exists in the project, no building storey is exported to the IFC file and all members are assigned to the building.

Line grids

Only **circular and rectangular 2D line grids**, and **rectangular 3D line grids** are exported. The rectangular 3D line grid is exported as a set of 2D line grids because the IFC file format does not support a 3D grid.

2.4. Import (or Update) IFC

2.4.1. IFC/BIM Properties

The functionality 'IFC properties' can be switched on in the Project data, but is also switched on by default after IFC file import. Any additional information related to specific elements, that was exported in the IFC, can be viewed in these properties.

Project data				×	BIM PROPERTIES	
					ShapeRepresentation	Default ∨
Basic data Fun	ctionality Actions Unit Set Protection				Profile	Default \checkmark
	GENERAL		DETAILED		· · · · · · · · · · · · · · · · · · ·	Default \checkmark
	Property modifiers	^	▲ Subsoil	^	ATTRIBUTES	
1	Model modifiers		Pad foundation check		Reference	
	Parametric input		▲ Steel			0,00
	Climatic loads		Fire resistance checks		IsExternal	\bigcirc
					LoadBearing	
	Mobile loads		Steel connections	-	FireRating	
	Dynamics		Scaffolding		BIM PROPERTIES	
	Stability		7DoF 2nd order analysis for LTB		ShapeRepresentation	Default 🗸
	Nonlinearity		Girders with sinusoidal webs		IFC Entity	Default 🗸
	Structural model 🗹				ATTRIBUTES	
	IFC properties 🔽				Reference	
	Prestressing				AcousticRating	
	Bridge design				FireRating	
	Excel checks				Combustible	$\overline{\mathcal{O}}$
	Substitution beam				SurfaceSpreadOfFlame	2
					ThermalTransmittanc	0.00
					IsExternal	
		~		~	LoadBearing	
		_			Compartmentation	$\overline{\mathbf{O}}$
			OK Can	cel	PitchAngle [deg]	
			UK Call		PitchAngle [deg]	0,00

2.4.2. Available file formats

SCIA Engineer supports both plain IFC and IFCzip for import. During import, it is automatically recognized if it is the plain IFC or the zipped one. Therefore, the same function is used.

2.4.3. Importing (or Updating) an IFC in SCIA Engineer

IFC files can be opened in SCIA Engineer. This can be done in two ways, by importing or updating. Importing will open a new, empty project and open the IFC. Updating will use the current project in SCIA Engineer, apply changes from the IFC file while keeping as much as possible from the existing project, like load cases and combinations for example.

Importing or updating an IFC in SCIA Engineer can be done from the menu:

Project browser			🔁 Pr	oject browser		
+ New	Ctrl+N		🕂 Ne	ew	Ctrl+N	
Dpen	Ctrl+O		🕒 or	pen	Ctrl+O	
Open from	•	XML file	Oţ	pen from	•	
Recent projects	۱.	Revit file	Re	ecent projects	•	
Project settings		Tekla file	D Pr	oject settings		
Save	Ctrl+S	SDNF file	💽 Sa	ave	Ctrl+S	
Save as	Ctrl+Shift+S	FRILO GEO Building Model (FGBM)	Sa	ave as	Ctrl+Shift+S	
Save all		SAF model	🖸 Sa	ave all		
Update from	•	Bimplus	Up	odate from	Þ	XML file
Export to	*	BIM cloud	Ex	port to	•	Revit file
Print	+	IFC file	Pr	int	•	Tekla file
X Close Project	Ctrl+F4		× cl	ose Project	Ctrl+F4	FRILO GEO Building Model (FGBM)
Close all			, Cl	ose all		SAF model
Cuit	Alt+F4		📑 Q1	uit	Alt+F4	Bimplus
•						FC file
						c project (ESA)

A dialog will open to browse for the IFC file:

Mport IFC file	Х	👺 Update IFC file	Х
\leftarrow \rightarrow \checkmark \uparrow \blacksquare > This PC > Desktop	✓ ひ	\leftarrow \rightarrow \checkmark \uparrow \blacksquare \rightarrow This PC \rightarrow Desktop	✓ ひ
Organize - New folder	🛋 - 🔲 💡	Organize - New folder	■ • ■ ?
Desktop		Desktop	
Documents		Documents	
Downloads		Downloads	
Music		Music	~
Pictures Export.ifc		Export.ifc	Update.ifc
Videos		Videos	
🦺 OS (C:)		😂 OS (C:)	
File name: Export.ifc	✓ IFC file (*.ifc; *.ifczip) ✓	File name: Update.ifc	✓ IFC file (*.ifc; *.ifczip) ✓
	Open Cancel		Open Cancel

You can now choose how to import/update the model:

lfc Import Options	×
IMPORT ENTITIES	GEOMETRY
 1D members 2D members Reinforcement 	as members as reference model
TendonsOthers	Analysis shape only Run member recognizer
TENDONS • as internal as free	MATERIAL TABLE Choose File Edit
STOREYS	NATIONAL CODE Change
	OK Cancel

You can choose which **entities** to include or exclude from the import. **Tendons** can be imported as internal or free and storeys can be imported.

The geometry can be imported **as members**, to continue working with the model in SCIA Engineer. All supported members with SweptSolid representation are imported as SCIA Engineer native elements. Or **as reference model**, for visual purposes and to draw members over the model for instance. All members are imported as general volumes.

Without 'Analysis shape only', the full structural shape of the model is imported. Creation of the structural shape can take a lot of time. With this option activated, all elements are imported without clipping.

You can choose to '**Run member recognizer'** in the background, so all supported members (beams, columns, walls, and slabs) which are imported as general volumes will be attempted to be converted into native elements. After conversion a report with a result is shown.

The **National Code** needs to be chosen to start an esa-project for this model. If the material names are in accordance with this code, they will be recognized automatically. If the material names in an IFC file are not in accordance with code names it is necessary to define a **material conversion table** in the Import dialog. For the first opening of a file with defined material table there is the button 'Choose file...'. For following modifications, the button 'Edit' is available. The file has *.con file extension and it is a plain text file, for example:

Material	table.cor	n - No	tepad		_	\times	
File Edit F	ormat \	/iew	Help				
[materia] ;	1	-					^
Concrete: Concrete:							
							\sim
<						>	
Ln 5, Col 1	100%	Wind	dows (CRLF)	UTF-8		

The first name is the name of the material in the IFC file and the second name is the code name of the material which is used in SCIA Engineer. It is necessary to respect all characters.

Such a file can be created by opening a new txt-file, and saving it with the .com extension (be sure to choose 'All Files (*.*).

Save As		×
\leftarrow \rightarrow \checkmark \uparrow	> This PC > Desktop ~ ひ / Search Desktop	
Organize 🔹 Nev	w folder 🔊 💌 💌	?
> 🖈 Quick access		^
✓ ■ This PC		
> 🗊 3D Objects	~	~
> Deskton		
File name:	Material table.con	\sim
Save as type:	All Files (*.*)	\sim
∧ Hide Folders	Encoding: ANSI V Save Cano	el

It can then be opened from the Import dialog:

🛃 Open				×
\leftarrow \rightarrow \checkmark \uparrow \blacksquare > This P	C > Desktop	ٽ ~		
Organize 🔻 New folder			•	
📃 Desktop	^ 			^
Documents	- and the second second			
🖶 Downloads				
Music				
Pictures	Material			
Videos	✓ table.con			~
File name:	Material table.con	~	Material table (*.con)	\sim
			Open	Cancel

The report will be shown for import:

IFC import report		-		×
IMPORTED ENTITIES	ERRORS AND NOTIFICATIONS			
43 columns 20 beams 5 crosssections 9 slabs 2 slab openings and subregions 1 solids	Unsupported entity types: IfcGrid			
	(ок	Save	as

When using the update function, a dialog will be shown for the changes in the model.



The changes need to be interpreted correctly. Especially if you used the BIM Toolbox to convert or align a previous version of the model. IFC describes the volumes of objects. This means that connecting and alligning the structure after an update is seen as a modification of the structure. If you don't want to undo these actions, you should untick these boxes.

All beam/column nodes are generated during the import. This implies that after the update action these nodes are placed in the groups "New entities" and "Deleted entities".

Click on accept to import the new entities. A message will be shown:

RoundTri	p		
Entitie	es were replac	red succesfu	llv
	ou want to di		-
	Yes	No	

By clicking yes, you will get a full report on the updated entities.

eport		>
New entities selected for the update :		^
- N33		
- N34		
• N35		
- N36		
- N37		
- N38		
N39		
N40		
- N41		
- N42		
· N43		
- N44		
• N45		
- N46		
- N47		
- N48		
- N49		~
	Class	
	Close Save	

2.4.4. Import of specific elements or geometry

Openings and subregions

SCIA Engineer supports import of an IfcOpeningElement with SweptSolid representation in 1D members, with a SweptSolid representation, as a native opening.

All IfcOpeningElements defined with a SweptSolid representation in flat walls and slabs are imported correctly as native SCIA Engineer **openings or subregions**. If opening elements are defined as Brep, no opening is imported in the analysis shape, but in most cases the opening should be included in the structural model.

Concrete reinforcement

Both IfcReinforcingBar and IfcReinforcingMesh defined with AdvancedSweptSolid representation are imported into SCIA Engineer as **free bars**. If the reinforcing bar or mesh have defined mapped items, all mapped items with the same geometry and distances are imported as a free bars with correct repetition. If a reinforcing bar or mesh is defined as Brep then they are imported only as **general volumes**.

Building storeys

The current SCIA Engineer version fully supports export and import of **building storeys**. During import to SCIA Engineer, native storeys are generated using the elevations defined in the IFC file. If no elevation is defined, then storeys are generated using the placement defined in the IFC file. In case building storeys are mixed with defined and non-defined elevations the result may be unexpected.

Line grids

Import of line grids is not supported.

2.5. **BIM Toolbox**

The BIM Toolbox offers some functionalities to handle imported models, especially IFC's.

Sometimes, after importing a model from another application a structure consists of unconnected **general solids**. These can often be converted to SCIA native members using the BIM Toolbox.

On the other hand, a structure can be aligned using the BIM Toolbox. As explained in chapter 1, an IFC uses the structural model representation. When such a model is imported, the generated analytical model is often not connecting the members in the right nodes. **Aligning the structure** fixes this issue.

The BIM Toolbox and its commands can be found in the 'Tools' menu.



Note that there are a lot of settings to consider in the 'Align' functionality and this can take up a lot of time or become very complicated for large models. The **SCIA Autoconverter** was developed to overcome these difficulties and automate this process.

2.5.1. **Convert**

Via the BIM Toolbox you can convert volumetric elements (i.e., solids) into native SCIA Engineer elements (beam, column, plate, wall). This is a necessary step in order to be able to calculate the imported project because you cannot generate a mesh (thus calculating) on solids in SCIA Engineer.

This can be easily done by selecting the elements and using the proper command for the correct conversion type (1D/2D). An automatic recognition algorithm detects the associated cross-section during the conversion of solids to 1D-members. The same applies for 2D-members in which the associated thickness is detected and assigned to it.

Below an example of imported solid elements (left side). After conversion (right side) you will obtain native SCIA Engineer 1D-members with their associated cross-section.



2.5.2. Align

A model consisting of solids are interconnected based on their volumes. But in analysis software like SCIA Engineer it is necessary to have a connection in the member system line for 1D-members or the member system plane for 2D-members.

Below an example of not aligned & not connected 1D-members (left side). Via the align functionality in the BIM toolbox a connection in 1 node (right side) can be obtained.



Structural elements can be aligned by moving the nodes of the 1D-/2D-members or the entire 1D-/2D-member to the master planes. This is done with the 'Align' command in the BIM Toolbox.

Settings

•	
ALIO	GN (1)
Show alignment info	
Live preview	
 MASTER PLANES 	
UCS XY planes	
LCS planes (2D memb	
LCS planes (1D memb	\bigcirc
Extend 2D member pl	\bigcirc
LIMITS	
Min. distance between	0,400
Min. angle between m	1,00
CORRECT ANGLE	OF PLANES SIMILAR
GCS main planes	
UCS XY planes	\bigcirc
 ACTIONS (ALIGN NOD 	
ALL 1D AND 2D MEN	
All 1D member types	
All 2D member types BEAMS TO	
Columns	\square
Walls	$\overline{\mathbb{O}}$
Plates	
All 1D and 2D members	
COLUMNS TO	
Beams	\cap
Walls	0
Plates	
All 1D and 2D members	
PLATES TO	
Plates	σ
Walls	\overline{O}
All 1D and 2D members	\overline{O}
WALLS TO	
Beams	\bigcirc
Walls	\bigcirc
All 1D and 2D members	\overline{O}
Max. node-to-master	0,510
 Max. total displaceme	0,510
 DISPLAY OPTIONS 	
Highlight master planes	\bigcirc
Highlight nodes with	\bigcirc
Preview shows maste	Ø
Preview shows nodes	$\overline{\mathbb{O}}$
Preview colour	
▼ ADVANCED	
Keep openings in their	
Offset master planes	
ACTIONS >>>	
Save & amp; New	
Delete action	
Run Align	
Cancel	
Refresh preview	
V Refresh preview	

The marked options are the properties that are usually modified during an alignment action.

Alignment information can be shown in a separate window. Also, before executing the alignment, you can see a preview appear in the model when activating "Live Preview".

Master planes can be chosen to which you can align the structural elements.

Alignmer	nt Info		
Confli	Master pla	Log	Actions prev
No co	onflicts		
lt is r	ecommended	to run C	Check data function af

The **alignment of nodes** from one structural type (beam, column, wall, plate) to another structural type can be specified

Maximum displacement settings can be specified. This is an important setting because if the node to master plane distance is higher than this value no alignment can occur for that node.

Display options can be modified

Advanced settings.

Workflow

The workflow to follow to align a structure is explained in the example below. Each structure will require specific settings. You can start the align function for either all entities or a selection of entities.

For this model, the following properties are checked: Live preview, all master planes.

When clicking on the current action tick box, you can see the preview of the alignment appear in the form of blue lines. This gives you feedback of the chosen alignment settings before running the alignment.



The master planes that are going to be used can be visualized by going to the tab 'Master planes'. If you click on planes you can see the master planes appear in the model.

To execute an alignment in an orthogonal matter (horizontal and/or vertical), the diagonal master planes shouldn't be used, so they can be ticked off.



To make sure the bracings are connected to the same nodes as the column and beam intersections, you can increase the maximum displacement settings. The correct alignment is now shown for the 'actions'.



Make sure the 'All actions' box is ticked before executing 'Run Align' at the bottom of the properties panel.

Now the entire structure is aligned as can be seen in the following pictures.



The structure has been aligned by moving nodes, which means there can still be duplicate nodes present. Therefore, it's still necessary to check the structure data. The members also need to be connected using the connect members/nodes command. They can be found in the following menu's:

\$	Undo	Ctrl+Z				*	Calculation & Mesh	•
\Rightarrow	Redo	Ctrl+Y					Selections	•
	Modify	•	ŀ	Move	Ctrl+X	+*	Explode line grid	
Ľ	Deletion settings		H	Сору	Ctrl+C		BIM toolbox	•
- 💉	Copy/paste properties	Ctrl+Shift+F	₽	Multicopy		×2	Clash check	
	Add data	•	1	Mirror			Check structure	_
	Metadata	•	D	Rotate	Ctrl+R	H		
	Polyline edit	•	4	Divide surface				
	Curves edit	•		Join surface				
	Solids	•	ę-	Connect members/nodes				
	Calculate member end-cuts	•	ĪP	Disconnect members/nodes				

ACTIONS >>> Save & amp; New

Delete action

🕥 Run Align

The standard settings are usually okay to proceed with. In this case, the process went as shown in the pictures:

Check of structure data			×	Result of check of nodes	
CHECK OF NODES				These problems have been found w	ith noc
Search nodes					
			0%	Members with undefined 0	
Search duplicate nodes		Ignore parameters		Free nodes 18	Corre
			0%	Duplicate nodes: 0	
CHECK OF MEMBERS				Nodes not in slab: 0	
Check members					
Search null members	0%	Null members: 0		Incorrect coord.	
Course dualizate accessor	0%0	Duplicate 0		Do you want to correct it?	
Search duplicate members	0%	Delete duplicate members			
	0.40	Invalid parts: 0			
		Delete invalid parts		OK Cancel	
CHECK OF DATA REFERENCES					
Check data references		Memory efficient method			
	0%	Fast method			
CHECK OF ADDITIONAL DATA				Data check report	
Check additional data position		Invalid position 0			
	0%	Correct position			
Check free load distribution points		Invalid loads 0		18 nodes have been d	
	0%				eleteu
CHECK OF STEEL CONNECTIONS					
		Invalid 0			
	0%	Delete invalid connections			OK
Check load panels Check	cross-li	nks			
Check additional data Check du	olicity of	names Check	Cancel		
Check additional data	plicity of	Check	Cancer		

ОК	

Setup for connection of structura	al entities		Х
	Align structural entities to planes (moving Align		^
	▲ Geometrical tolerance		
	Min. distance of two nodes, node to curve [m]	0,000	
	Max. distance of node to 2D member plane [m]	0,000	
*	Connect (generate linked nodes, intersecti		
	Connect	Image: A start of the start	
	Autorestore buckling group when reconnecting	 Image: A set of the set of the	
1	Connect 1D members as ribs		
	Connect 1D members with rigid links		
	Max. length of rigid link [m]	0,100	
	Create new linked node for master node	¥	
	Check structure data		
	Check (merge duplicate nodes, erase invalid entities		
			~
			_
U ř ř	ОК	Cance	21



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0%

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2.6. Exchange with BIMPLUS or BIMCloud



The **BIMPLUS platform** facilitates the workflow of a BIM project, providing you with a wide range of features for collaboration. This platform operates in the cloud (i.e., a BIM server). BIMPLUS is a service provided by Allplan. It is mainly developed for Allplan but users of different software (e.g., Revit) should be able to use it also because the IFC-format is a vendor neutral format.

Regardless of the tool you use, you should always check the IFC files you created yourself or you received from partners in two respects:

- Check that the geometry of the building is correct and that the components are positioned correctly. In addition, make sure that the model is complete.
- Check that the attribute sets (Psets) of the objects include all necessary parameters, attributes, and pieces of information.

Compared with any IFC viewer, the open BIMPLUS platform provides you with many more features and options. You can use the platform not only to **check** data but also to **collaborate and communicate** with your partners throughout the project.



You can upload multiple IFC models to BIMPLUS and assign tasks and communicate on this platform. The communication between all the partners happens via BCF (Building Collaboration Format). Whereas IFC as a neutral format is used to exchange models and building information in a BIM project, **BCF** is the format partners and project participants use to communicate.

Models can be exchanged between SCIA Engineer and BIMPLUS through the import/export functions:

D		
	Project browser	
•	New	Ctrl+N
	Open	Ctrl+O
	Open from	•
	Recent projects	•
٥	Project settings	
	Save	Ctrl+S
	Save as	Ctrl+Shift+S
	Save all	
	Update from	•
	Export to	۱.
	Print	•
×	Close Project	Ctrl+F4
	Close all	
P	Quit	Alt+F4

Project (ESA)

You will be asked to log in with your BIMPLUS Account:

Login Username: Your user name Password: LOG IN LOG IN		
Your user name Password: LOG IN		
Password:	Username:	
LOG IN	Your user name	
	Password:	
Need an account? Sign Up	LOG IN	
	Need an account? Sign Up	

Choose a team, choose or create a project, model and revision, and send it to BIMPLUS using the 'Update' button.

SIMPL	US exchange	— C	x c
🐣 Lise	Bibert © FileNotConnected	2	€
$\mathbf{\Sigma}$	命 Team SCIA nv Belgium - 28		Ŧ
	III Project	Select (or check for Create)	
(i)	Test import		•
	â Model	Select (or check for Create)	
∠_	Export from SCIA		•
	∇ Revision Actual revisions count 1	Create	
	Revision name	Revision description	
	1	1	
	Export loads		
	 Results are not available(no calculation done) 		
		U	PDATE

The model will now be exported and the progress is shown.

A report shows if the transfer was successful.

BIMPLUS exchange	-		×
BIMplus export OK			
First step of upload to BIMPLUS has succeeded.			
The model will now be processed into the BIMPLUS database.			
You will be notified by mail when this is finished. Please do not forget to save your project in SCIA Engineer this to store the relation between SCIA Engineer project and BIMPLUS			
GO TO MODE	E	ОК	

The process of importing/updating from BIMPLUS is very similar and can be done from the menu:

D			
-	Project browser		
Ē	New	Ctrl+N	
	Open	Ctrl+O	· · · · · · · · · · · · · · · · · · ·
	Open from	<u>ا</u>	XML file
	Recent projects	•	(AML)
D	Project settings		Bevit Revit file
P	Save	Ctrl+S	SDNF file
	Save as	Ctrl+Shift+S	FRILO GEO Building Model (FGBM)
	Save all	our onne o	SAF model
			Bimplus
	Update from		
	Export to		IFC file
	Print	•	IFC II CHIE
D			
	Project browser		
Ð	New	Ctrl+N	
	Open	Ctrl+O	
	Open from	•	
	Recent projects	•	
	Project settings		
\square	Save	Ctrl+S	
	Save as	Ctrl+Shift+S	
D	Save all		
Ē	Update from	×	XML file
	Export to	•	Revit file
	Print	•	
×	Close Project	Ctrl+F4	FRILO GEO Building Model (FGBM)
	Close all		SAF model
P	Quit	Alt+F4	Bimplus
-			IFC file
			EsA project (ESA)
			ESA

You will be asked to select a team, project, model and revision:

C Lise Bibert	∢
血 Team Select team !	
Select team	▼
Project	
Select project	▼
â Model	
Select model	▼
▽ Revision	
Select revision	~
CLOSE	

The download process is shown:



A window can be shown for SAF exchange, just click on 'OK' and the model will be opened in SCIA Engineer.

Similarly to BIMPLUS, exchange with the collaboration platform **BIMcloud** by Graphisoft is also available.



Chapter 3: Exchange via the Revit-link



The CADS Revit SCIA Engineer link facilitates the bi-directional exchange of members, loads and supports between 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. When 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 requires numerous iterations to arrive at the final design. CADS Revit SCIA Engineer link will save time by avoiding duplication and reducing errors.

Note: Make sure you read the introduction and understand the concept of structural and analytical models.

3.1. Installation of the Revit-link

There are two ways to install the Revit plugin. It can be done from the setup of SCIA Engineer, or the plugin can be installed from a separate setup.

It's possible but not necessary to have SCIA installed on the same computer as Revit and the Revit plugin. This means that employees that use Revit but don't work with SCIA, can still install the plugin and provide exported files to the Engineers that use SCIA Engineer, or import files coming from SCIA. The use of these files in SCIA, and exporting from SCIA to Revit, is then possible as long as the needed modules for Revit Exchange are available in the SCIA license.

The plugin can be installed from the SCIA Engineer Setup in the following way. First, download the SCIA Engineer setup from the website:

https://www.scia.net/en/support/downloads

This is recommended over modifying the existing installation directly, because all the necessary files and relations are directly available in the setup. Otherwise, a message could appear stating that some files cannot be found.

SCIA Engineer 21.0 (21.0.102	1) - InstallShield Wizard X	SCIA Enginee	r 21.0 (21.0.1021) - InstallShield Wizard X
SCIA 10 ENGINEER	Welcome to the InstallShield Wizard for SCIA Engineer 21.0	Program Maint Modify, repair,	or remove the program.
ENGINEERIN	The InstallShield(R) Wizard will allow you to modify, repair, or remove SCIA Engineer 21.0. To continue, click Next.	 Modify Pepair 	Change which program features are installed. This option displays the Custom Selection dialog in which you can change the way features are installed. Repair installation errors in the program. This option fixes missing or corrupt files, shortcuts, and registry entries.
	< Back Next > Cancel	Remove	Remove SCIA Engineer 21.0 from your computer.

Choose to 'Modify' the installation, click 'Next >' and select the Revit plug-in under Add-ons. Select 'This feature will be installed on local hard drive'.

🕼 SCIA Engineer 21.0 (21.0.1021) - InstallShield Wizard 🛛 🗙	😹 SCIA Engineer 21.0 (21.0.1021) - InstallShield Wizard X						
Custom Setup SCIA Select the program features you want installed. SCIA	Ready to Modify the Program The wizard is ready to begin installation.						
Click on an icon in the list below to change how a feature is installed. Feature Description This will install Revit to SCIA Engineer plug-in Add-ons X Revit plug-in This feature will be installed on local hard drive. B This feature, and all subfeatures, will be installed on local hard drive. This feature will not be available. Click on an icon in the list below to change how a feature is installed. Click on an icon in the list below to change how a feature is installed. Feature Description This will install Revit to SCIA Engineer plug-in This feature will be installed on local hard drive. This feature will not be available. Feature Description This featur	Click Install to begin the installation. If you want to review or change any of your installation settings, click Back. Click Cancel to exit the wizard.						
InstallShield < Back Next > Cancel	InstallShield < Back Cancel						
Installing SCIA Engineer 21.0 (21.0.1021) - InstallShield Wizard - × Installing SCIA Engineer 21.0 SCIA Engineer 21.0 SCIA Engineer 21.0 The program features you selected are being installed. SCIA Engineer 21.0 SCIA Engineer 21.0	SCIA Engineer 21.0 (21.0.1021) - InstallShield Wizard ×						
Please wait while the InstallShield Wizard installs SCIA Engineer 21.0. This may take several minutes. Status: Installing Revit To SCIA Engineer	The InstallShield Wizard has successfully installed SCIA Engineer 21.0. Click Finish to exit the wizard.						
< Back Next > Cancel	< Back Finish Cancel						

The latest version of the plugin and its separate setup should be available on the SCIA Website:

https://www.scia.net/en/support/downloads/plugin-revit-structure-scia-engineer And on the CADS website:

https://cads.co.uk/support-and-learning/product-downloads-updates/

The installation is straightforward and is shown in the images below. Recent versions of the plugin support two versions of Revit at the same time. Older ones were installed only for one version of Revit, so if there were multiple versions of Revit installed on your computer, it would automatically take the 'default' version. Note: The latest plugin supports almost all previous versions of Revit, so it's not necessary to download a specific older version of the plugin.

🕼 Revit to SCIA Engineer Setu	p — 🗆	\times	Revit to SCIA Engineer Setup	_		\times
CADS	Please read the Revit to SCIA Engineer License Agreement	2	Installing Revit to SCIA Engineer			
	SOFTWARE LICENCE Parties 1. This Licence is between Computer and Design Services Limited, Arrowsmith Court, 10 Station Approach, Broadstone, Dorset BH18 8AX ("CADS") and the "Licensee", being the person by whom or on whose behalf this Licence is signed. The Software 2. This Licence governs the Licensee's use of the CADS software named in the Particulars including its programs, documentation, ✓ I accept the terms in the License Agreement	~	Please wait while the Setup Wizard installs Revit to SCIA Engineer. Status:			
Print	Back Install Canc	el	Back Ne	xt	Cane	cel



Once the installation is complete, the following message should appear upon opening Revit:

Securit	y - Signed Add-	In		×							
	This signed add-in has been found. What do you want to do?										
	Name: Revit To Scia Engineer Publisher: Computer and Design Services Ltd Location: C:\Program Files\Revit To SCIA Engineer\Revit2022\Cads.RevitEsaPT.Exchange Issuer: Sectigo RSA Code Signing CA Time stamp: 04/23/2021 15:28										
s	how details		Always Load Do N	ot Load							
What a	are the risks?										

The recommendation is to 'Always load' so the message will not appear again. The following toolbar will now be available under the tab 'CADS':

R 🗈 🖂 😳 + 🗇 + 🛱 😂 + 🖉 🖄 🛱 + ଟ 🖓 🛱 + 🖛						• •	Autodesk Revit 2022 - Example06.rvt - 3D View: Edit analytisch								🔹 🕮 👤 j.vancauwenb 🔹	· 😭	_ 8 ×		
	File Are	hitecture	Structure	Steel Precas	t Systems	Insert	Annotate A	nalyze	Massing & Site	Collaborate	View	Manage	Add-Ins	CADS	Modify	• •			
	\times	K	Bauiau	Show	Paulau 8	Falact	_ Mapping t		Getting Starter Best Practices	d 🗹 Check L	ist								
	Options	Consistenc						(ables	🕐 Help	About									
CADS Revit SCIA Engineer Link																			

3.2. Overview

Here's an overview of all available options:





Note that the **direct exchange** method is (due to technical limitations) only linked to one SCIA Engineer interface. For SCIA21, this is the old interface, so SCIA Engineer 21 Legacy.
3.3. Exchange from Revit to SCIA

3.3.1. Generating the analytical model in Revit

As referred to in chapter 1, modelling a structure in Revit concerns the structural model. For exchange with SCIA Engineer, we are interested in the **analytical model**. This representation is automatically generated in Revit and can be visualised.

An important note is that only **analytical elements** can be exported from Revit to SCIA. If the model contains any architectural entities, then they won't be exported. This also applies for elements for which 'Enable analytical model' has not been ticked on. Some versions of Revit or some Revit families don't allow/have this option, so be careful about that.



It's very important that the analytical model is correctly constructed in Revit. This depends on the modelling of the structural model. As you can see in the above figure, a good-looking structural model can contain a very bad underlying analytical model. The beam is clearly not connected to the columns in the analytical model.

These issues can be prevented in Revit Structure by maintaining the analytical model or you can correct these issues to a certain extent later on in SCIA Engineer via the BIM Toolbox.

Shown below are two examples of structural/analytical elements that can be exported to SCIA Engineer when the correct settings are used:





The analytical model can be shown using the visibility settings (hotkey 'vv'), by not showing the general model categories but showing the analytical model categories instead.

□ □ Casework □ ■ □ □ ■	
Visibility If a category is unchecked, i If a	
Image: Show analytical model categories in this view If a category is unchecked, i Image: Show analytical model categories in this view If a category is unchecked, i Image: Image: Show analytical model categories in this view If a category is unchecked, i Image: I	
Areas Filter list: <multiple> Audio Visual Dev Projection/Surface Cable Tray Fitting Lines Cable Trays Analytical Beams Override By</multiple>	
Areas Projection/Surface Cable Tray Fitting Visibility Cable Trays Lines Cable Trays Querride Casework Projection/Surface	
Image: Cable Tray Fitting Visibility Image: Cable Trays Visibility Image: Cable Trays Image: Cable Trays Image: Cable Trays Image: Cable Trays <td></td>	
Image: Cable Trays Lines Patterns Transparency Image: Cable Trays Image: Cable Trays Image: Cable Trays Image: Cable Trays Image: Image: Cable Trays Image: Cable Trays Override Image: Cable Trays Image: Image: Image: Cable Trays Image: Cable Trays Image: Cable Trays Image: Cable Trays Image: Image: Image: Image: Cable Trays Image: Cable Trays Image: Cable Trays Image: Cable Trays Image: Image: Image: Image: Image: Cable Trays Image: Cable Trays Image: Cable Trays Image: Cable Trays Image: Image: Image: Image: Image: Image: Cable Trays Image: Cable Trays Image: Cable Trays Image: Cable Trays Image:	
Image: Second secon	Detail Level
	View
	/ View
	/ View
	/ View
	/ View
	/ View
	/ View
	/ View
	/ View
	/ View
By Canalytical Surfaces	/ View
All Not - Analytical Wall Foundations By	/ View
By Analytical Walls	/ View
Categories that are not q	/ View
	/ View
Categories that are not q 🛛 🗹 Boundary Conditions 🔤 🖉 Boundary Conditions	/ View

The picture below shows the structural model and the underlying analytical model in Revit for an example model.



This analytical model can be checked for problems by doing a consistency check from the CADS Toolbar:



A message will be shown that the check has been completed, or some warnings might be shown that can be used to correct some inconsistencies.

Warning	×
Analytical / Physical Model Consistency check is complete.	٠
	+
	٩

Another remark is that the model you wish to exchange need to be opened in the original Revit model. Elements from linked models are not exchanged.

3.3.2. Exporting the model to SCIA Engineer

Either from the 'Review & Export' button or the 'Options' button on the toolbar, the analysis model can be transferred to SCIA Engineer, either via direct exchange or file exchange. Open a 3D view to do so.



It is advised to first check the settings in the 'Options' dialog, even when exporting via the 'Review & Export' button. Make sure to check the options on the right.

ctions			Options	
National Code	EC - EN	\sim	Export	
	Discological		Export elements based on layers	Yes
Node of export	Direct exchange	\sim	Export reinforcement as PRAD	Yes
	21.0.1021.64	\sim	Internal edges with beams	No
SCIA Engineer version	21.0.1021.01		Opening as panel	No
xport Selected Items Only			Revit foundation slab as	Slab
			Revit isolated foundation as	Foundation block
Export to SCIA Engineer			✓ Export / Import	
			Element names based on identity da	
	Create new		Group sections based on length (ap	
REVIT P ENGINEER	Cicate new		Ignore load combinations	No
			Ignore load panels	No
Import from SCIA Engineer			Ignore load(s)	No
			Ignore member release	No
			Ignore slabs	No
			Ignore support(s)	No
			Ignore walls	No
			∽ Import	
Mapping details			Analysis results	No
Revit family path	Mapping tables		Analytical adjust	Yes
			Analysis results	
Family type mapping	Layer mapping		Set 'Yes' to import analysis results from	n SCIA Engineer.
, and the point of	, -, mapping		Requires 'Structural Analysis Toolkit' fr	om Autodesk Exchange Apps.

You can now click the 'Export to SCIA Engineer button to start the exchange, or close the dialog and use the 'Review & Export' button.

It is possible you will be asked to save the Revit project before continuing to the options dialog:

R Save As						? ×
Save in:	Desktop				~ 🔶 📑	🗙 📴 Views 👻
History	Name	^	Date modified	Туре	Size	
Documents						
My Computer						
٢						
My Netwo						
Favorites						
Desktop	File name:	Project1			~	
<u> </u>	Files of type:	Project Files (*.n	rt)		\sim	Options
Too <u>l</u> s 🔻					Save	Cancel

If the 'Direct exchange' mode of transfer is selected, the model will be opened in SCIA Engineer directly. If the 'File exchange' mode of transfer is selected, a dialog will open to save the file.

Save as SCIA Engineer	.r2s file			×
← → ∽ ↑ 🗖	> This PC > Desktop	√ Ü	🔎 Search Desktop	
Organize 🔻 Nev	v folder		•	?
 ✓	^			^
 Desktop Documents 				
> 🖊 Downloads	~			~
File name:				~
Save as type:	SCIA Engineer r2s file (*.r2s)			\sim
 Hide Folders 			Save Can	el .:i

The benefit of using the 'Review & Export' button, is that an extra dialog is shown that identifies changes regarding a possible previous version of the exported/imported model.



You'll have to fill in the mapping tables to define which materials and families from Revit correspond to which materials and cross-sections from SCIA Engineer.

These settings will be remembered for future exchanges, even for different models.

Ma	terial mapp	ing											
	EC-E	N											
		Revit		_			SCIA Engir	neer					
	Class	Nam	ne			Category	Name	Ŷ	Loa	Export as			
•	Metal	Metal - Steel 43-22	75			steel	<u> </u>						
	Concrete	Concrete				concrete	<u> </u>						
			М	lat	erial map	ping							
					EC-	EN							
						Revit				SCI	A Engineer		
					Class		Name	Cate	gory	I	Name	Loa	Export as
					Metal	Metal - Steel 4	3-275	steel		S 275			
				I	Concrete	Concrete		concrete		C20/25	•		
								Save		Cancel			

Based on the available materials and cross-sections in SCIA and Revit, the application will already make a suggestion for most mappings. This is primarily based on the material type and National Code. If all the parameters are satisfied, the application will automatically map the equivalent SCIA Engineer material. If one or more parameters do not match, the application will prompt you with an exclamation mark to map the equivalent materials.

If you are not happy with the suggested list of materials, selecting 'Load all' will show all available options in the drop-down lists so you can change/choose the best option from the selected National Code.

You can select 'Export as unknown' to later define the material in SCIA. No material name is then filled in.

Cross	section m	apping						
_								
		Rev	it			SCIA Engineer		
	Family	Family name	Family type	Load all	Group name	Section name	Export as "Numerical Section"	Export as "General Section"
•	Column	Precast-Col	300x300-2 Levels	\checkmark	Precast	A		
					Save	Cance	l	
					Save	Cance	I	

Selecting 'Export as numerical' will generate a numerical cross-section in SCIA Engineer. You can no longer choose a profile shape and section name.

Selecting 'Export as general' will generate a general cross-section in SCIA Engineer. You can no longer choose a profile shape and section name.

Note: you can check the 'Help' button in the main dialog of the Revit link application to see which sections are supported in the version of the plugin you are using.

For mapping certain parametrized sections, another dialog will appear to map the parameters or choose a custom value.

Section Param	eter Map	ping				
Family name:		Precast-Column with	Multi	-Layer Corbels		
SCIA Section	Precast1		,	~		
SCIA parame	eter	Revit parameter		Parameter value (mm)	Section b3	
b1		b	~	300.00		<i>,</i> 1
b2		b	~	300.00		Ţ,
b3		None	~	400		_ 일
h1		h	~	300.00		되기
h2		None	~	20.00		
fillet		Chamfer	~	25.00	filletb1	
					ок	Cancel

After saving the mapping, a dialog will be opened, showing the export process. You can see the number of exported, failed, and ignored entities on the left. The log is shown on the right, with a message for every step that was taken in the export. Messages for the failed entities will be shown in red. Interpreting these can help to solve the problem with the export of these entities.

, (ADS Revit SCIA Enginee	er Link				×
	Category	Total Items	Exported	Not exported	Internal edges with beams: No	^
•	Structural Framing	4	4			
	Structural Columns	4	4		Exporting	
	Load case	8	8			
	Load Nature	8	8		Revit Material :"Metal - Steel 43-275" is mapped as "S 275" based on user mapping.	
	Floors	1	1		Revit Material :"Concrete" is mapped as "C20/25" based on user mapping.	
	Total	25	25		Mapped cross section(s):	
					 "UC305x305x97" is mapped as "UC(ARC)305x305x97" 	
					• "UB305x165x40" is mapped as "UB305/165/40"	
					Summary: 4 out of 4 Structural Framing exported 4 out of 4 Structural Columns exported 8 out of 8 Load case exported 9 out of 8 Load Nature exported 1 out of 1 Floors exported 1 out of 1 Floors exported: 25 End time : 12/09/2021 18:15:06	
					Total Time : 00:01:36.9414431	
						~
	ort to SCIA Engineer is con se save this Revit model to		tion with the exported	SCIA Engineer model.		
			1 2]	Close	Save log

You can save a log file after export, with the button on the bottom. You will be asked to save it and open it:



3.3.3. Managing the mapping tables

You have the possibility to manage some mapping tables in the Revit link. The tables can be viewed from the options dialog or from the toolbar.

There are some differences depending on which function you use, namely which tables can be viewed, and also whether the table can be exported.

From the toolbar



Using the function from the toolbar as shown above, opens the following dialog with the options explained below.



From the options dialog

In the options dialog, the mapping details can be viewed and edited to a certain extent.

			Options		
National Code	EC - EN	\sim	 Export Export elements based on layers 	Yes	
	Direct exchange	\sim	Export reinforcement as PRAD	Yes	
Mode of export			Internal edges with beams	No	
SCIA Engineer version	21.0.1021.64	\sim	Opening as panel	Ne	
-	_		Revit foundation slab as	Slab	-
Export Selected Items Only			Revit isolated foundation as	Foundation block	
Export to SCIA Engineer			Y Export / Import		
			Element names based on identity da	ta Yes	
			Group sections based on length (app		_
	Create new		Ignore load combinations	No	
			Ignore load panels	No	
Import from SCIA Engineer			Ignore load(s)	No	
Importation SCIA Engineer			Ignore member release	No	
			Ignore slabs	No	
			Ignore support(s)	No	
			Ignore walls	No	
		_	✓ Import		
Mapping details			Analysis results	No	
Revit family path	Mapping tables		Analytical adjust	Yes	
rioritidani, patri	inapping tables		Analysis results		
Family type mapping	Layer mapping		Set 'Yes' to import analysis results from	SCIA Engineer.	
·3 -34 ··443			Requires 'Structural Analysis Toolkit' fro	om Autodesk Exchange Apps.	

The same editing options are available for the user tables, but also the general tables from the chosen code can be viewed (not edited) here.

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

There is also a possibility to view and edit (only change the values) of the layers on which the elements will be placed.

					×
Load I	layers from standards	User			\sim
С	Category		Value	 	
F	rame		Beam		
С	olumn		Column		
► P	late		Plate		
N	Vall		Wall		

The path to the families that are used to map the cross-sections etc. in Revit, can be chosen or added here:

User Path - Revit library	×
C:\ProgramData\Autodesk\RVT 2022 C:\ProgramData\Autodesk\RVT 2021 C:\ProgramData\Autodesk\RLT 2021 C:\ProgramData\Autodesk\RVT 2022\Libraries\English\Belgium\Structural Columns\Steel\Belgium Spe C:\ProgramData\Autodesk\RVT 2022\Libraries\Custom	Up Down
Add Delete OK	Cancel

It's possible to add your own custom families. You can use these to extend the user mapping tables.

	Region	Family role	Family name	Family type	Section type	
	Europe Specific	Frame	Circular Hollow Sections	TRON	RO	
	Europe Specific	Frame	Circular Hollow Sections	TRON	CHS	
	Europe Specific	Frame	Circular Hollow Sections	TRON	CFCHS	
Europe Specific Frame		Frame	Circular Hollow Sections	TRON	CHS(Ce)	
	Europe Specific	Frame	Circular Hollow Sections	TRON	CHSCF	
	Europe Specific Frame		Circular Hollow Sections	TRON	CHSCF(Hy)	
	Europe Specific	Frame	Circular Hollow Sections	TRON	MSRR	
ŀ	Europe Specific	Frame	Circular Hollow Sections	TRON	ROR	
1	Europe Specific	Frame	Circular Hollow Sections	TRON	Y(CH)	
	Europe Specific	Frame	Flat Bars	FL	FL	

You can see the automated mappings here:

3.3.4. Opening the model in SCIA Engineer

Using the 'Direct exchange' mode of transfer will open the model directly in SCIA Engineer upon export. SCIA Engineer does not need to be open before starting the export.

There are two options for opening a r2s-file in SCIA, 'Open from' and 'Update from'. The first one will start a new SCIA Engineer project to open the file, the second one will use the project that is already open, and apply the changes made in Revit while keeping any additional information that might be in the SCIA project, like load cases and combinations, supports etc.

	Project browser				Project browser			
Ð	New Ctrl+			Ð	New	Ctrl+N		
	Open Ctrl+				Open	Ctrl+0		
	Open from	XML	XML file		Open from	•		
	Recent projects	Revit	Revit file		Recent projects	•		-
٥	Project settings	Tekta	Tekla file		Project settings			
	Save Ctrl+	SONF	SDNF file		Save	Ctrl+S		
	Save as Ctrl+Shift+	FGBM	FRILO GEO Building Model (FGBM)		Save as	Ctrl+Shift+S		
	Save all	SAF	SAF model	D	Save all			
	Update from	BIM+	Bimplus	Г	Update from	۱.	C.C	XML file
	Export to	E	BIMcloud		Export to	•		Revit file
	Print	IFC	IFC file		Print	•		Tekla file
×	Close Project Ctrl+F			×	Close Project	Ctrl+F4		FRILO GEO Building Model (FGBM)
×	Close all			×	Close all			SAF model
P	Quit Alt+F			P	Quit	Alt+F4		Bimplus
								IFC file
							ESA	project (ESA)
								BIMcloud

In both cases, a dialog will open, asking you to select the r2s-file.

Update Revit file									×			
\leftarrow \rightarrow \checkmark \uparrow \blacksquare > This PC	> D	esktop	~	Ü	۶	Search	n Desktop					
Organize • New folder							-		?			
This PC 3D Objects	^	🛃 Update Revit file							^			×
Desktop		$\leftarrow \rightarrow \checkmark \uparrow$ \blacksquare > This PC	> Des	ctop				~	Ö	Search Desktop		
Documents		Organize New folder								•		?
Downloads	~	🧢 This PC	^									^
File name:		3D Objects										
L		E Desktop										
		Documents										
		Downloads	~									~
		File name:							~	Revit file (*.r2s)		\sim
										Open	Cancel	

The code that was selected for the export will be shown next. It can be changed with the 'Add' button, or you can just continue using the 'Close' button.

Codes in project		×
Name EC - EN	Description EC - EN	
Add Delete	✓ Active code	Close

The model will now be shown in SCIA.

3.4. Exchange from SCIA to Revit

3.4.1. Exporting the model to Revit

For the 'Direct exchange' mode of transfer, a model should be opened in SCIA Engineer. No other action is required from SCIA side.

For the 'File exchange' mode of transfer, you can export a r2s-file from the menu:



A dialog will be opened to choose a file location to save the file.

Export Revit file				×
$\leftarrow \rightarrow \checkmark \uparrow$	> This PC > Desktop	ٽ ~		
Organize 🔻 Ne	w folder		•	?
This PC 3D Objects Desktop	^			^
Documents	•			~
File name:	Revit file (*.r2s)			~
∧ Hide Folders			Save Cano	:el

3.4.2. Opening the model in Revit

You can now open the model in Revit using the CADS Toolbar. Either use the 'Options' dialog or the 'Review & Import' function.

Options •	Export Unexported In	wiew & Select Maj Import Imported Select Ink	pping tables	d Check List
	Actions National Code National Code Direct exchange Mode of export SCIA Engineer version Export ScIA Engineer Export SCIA Engineer R MUTODESK Import from SCIA Engineer R MUTODESK Mapping details Revit family path Mapping details Family type mapping Layer mapping	Options * Export Export reinforcement as PRAD Internal edges with beams Opening as panel Revit foundation slab as Revit solated foundation as * Export / Import Element names based on identity data Group sections based on length (applie) Ignore load combinations Ignore load(s) Ignore slabs Ignore support(s) Ignore walls * Import Analysis results Analysis results Analysis results Analysis results Set Yes' to import analysis results from SC Requires 'Structural Analysis Toolkit' from	No ClA Engineer.	

Using the 'Direct exchange' mode of transfer will open the model that is open and active in SCIA Engineer. Using the 'File exchange' mode of transfer will prompt a dialog asking to select the r2s-file to be opened.

R Open SCIA Engineer .r2s file.		×
\leftarrow \rightarrow \checkmark \uparrow \blacksquare > This PC	ン Desktop v ひ / Search Desktop	
Organize New folder	— — — —	?
> 🧊 3D Objects	^	^
> 📃 Desktop		
> 🖹 Documents		
> 🖊 Downloads		
> 🎝 Music	×	~
File name:	 SCIA Engineer r2s file (*.r2s) 	\sim
	Open Cancel	

The next steps are very similar to the workflow for exporting a model from Revit. Make sure to check the options in the main dialog on the right and select the mappings in the upcoming dialogs.

м	ate	erial mapping					
		EC-EN					
	_		SCIA Engineer			Revit	
		Category	Name	Mapping database	Loa	Name	Skip
	Þ	Steel	C25/30	General-Materials 🔹		Concrete - Cast-in-Place Concret	
				Save Car	icel]	
Cro	ss	section mapping					

	SCIA E	ngineer			Revit						
	Section type Section name		L	Group name		Mapping database	Family role	Family name		Family type	Skip
•	CS	CS4 (General Sectio		General CS	A		Column	<u>A</u>	<u> </u>		
						ave Cancel					
					3	Calicel					

In case you are not satisfied with the available sections for mapping, you can download additional crosssections from the Autodesk website, like the following families:

https://knowledge.autodesk.com/support/revit/troubleshooting/caas/downloads/content/autodesk-revit-2022-content.html

The benefit of using the Import & Review button, is that an extra dialog is shown that identifies changes regarding a possible previous version of the model. You can choose which changes to apply in the model.



;	ADS Revit SCIA Engineer L	ink				×
•	Category Load case	Total Items 9	Imported	Not imported 8	Column - 319113 : The material of the member 'Member#319113' is upo	lated.
	Column	4	4		•	
	Total	13	5	8	Column - 319207 : The material of the member 'Member#319207' is upo	ated.
					Column - 319379 : The material of the member 'Member#319379' is upo	ated.
					Deleted members: • Structural Columns:322364-Member#322364	
					Mapped cross section(s): • "CS" is mapped as "UC305x305x97"	
					Summary 1 out of 9 Load case imported 4 out of 4 Column imported Total items imported: 5 out of 13	
					End time : Tuesday, 14 December 2021 16:06:33	
					Total items00:00:03.4258939	
Imp	ort from SCIA Engineer comple	ted.				~
			1 2]	Close	Save log

The log shows the steps taken in the import process. Any failed items will be shown in red.

After closing this dialog, the model is shown in Revit.

Chapter 4: Exchange via the Tekla-link



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

Note: Make sure you read the introduction and understand the concept of structural and analytical models.

4.1. Installation of the Tekla-link

There are two ways to install the Tekla plugin. It can be done from the setup of SCIA Engineer, or the plugin can be installed from a separate setup.

It's possible but not necessary to have SCIA Engineer installed on the same computer as Tekla and the Tekla plugin. This means that employees that use Tekla but don't work with SCIA Engineer, can still install the plugin and provide exported files to the Engineers that use SCIA Engineer, or import files coming from SCIA Engineer.

The use of these files in SCIA Engineer, and exporting from SCIA Engineer to Revit, is then possible as long as the needed modules for Tekla Exchange are available in the SCIA Engineer license.

The plugin can be installed from the SCIA Engineer Setup in the following way. First, download the SCIA Engineer setup from the website:

https://www.scia.net/en/support/downloads

This is recommended over modifying the existing installation directly, because all the necessary files and relations are directly available in the setup. Otherwise, a message could appear stating that some files cannot be found.



Choose to 'Modify' the installation, click 'Next >' and select the Revit plug-in under Add-ons. Select 'This feature will be installed on local hard drive'.



The latest version of the plugin and its separate setup should be available on the SCIA Website: https://www.scia.net/en/support/downloads/plugin-tekla-structures-scia-engineer

And on the CADS website:

https://cads.co.uk/support-and-learning/product-downloads-updates/

The installation is straightforward and is shown in the images below. Recent versions of the plugin support two versions of Tekla at the same time. Older ones were installed only for one version of Tekla, so if there were multiple versions of Tekla installed on your computer, it would automatically take the 'default' version.





The following Application is now available under 'Applications & Components' in the menu on the right in Tekla Structures.

Applications & components	\sim
Show selected	¢?
SCIA X	1
Search results for 'SCIA' Sort by a-z	3
	Φ
	۲
SCIA Engineer	•
Show hidden items	

4.2. **Overview**

Here's an overview of all available options:

National Code: Choose the code according to which the model is built in Tekla (profiles, materials). This is only used for export to SCIA Engineer. SCIA Engineer version: Browse to the installation path of SCIA Engineer and	Export to SCIA Engineer: 'Direct exchange' as Mode of export: The model open in Tekla will be transferred to SCIA Engineer. 'File exchange' as Mode of export: The Tekla model will be exported as a t2s-file. You will get the option to choose a save location.	 Import from SCIA Engineer: 'Direct exchange' as Mode of export: The model open in SCIA Engineer will be transferred to Tekla. 'File exchange' as Mode of export: You will get the option to choose a s2t-file to open in Tekla.
choose the version you wish to make the exchange	-	ekla Structures to SCIA Engineer ×
to/from. This is only		
necessary for the direct	National code	
exchange method.	EC - EN	Export / Import + Ignore the following
Mode of transfer: <i>Direct exchange'</i>		Walls
The model is sent directly to	SCIA Engineer version	Slabs
or from SCIA. This is only	Ŭ	Member releases
possible when SCIA is	Mode of transfer	
installed and open on this computer. The correct SCIA	O Direct exchange File exchange	Rigid arms
Engineer version needs to be	Export items	Deleted items
specified in the next option	Full model Oselected items	Openings
and a valid Tekla Exchange	Export as	Reinforcements
module must be part of the SCIA Engineer license.	New project Update project	Export +
'File exchange'	Export to SCIA Engineer	Ignore the following
An exchange file is exported		
and saved, or imported. This	Import from SCIA Engineer	
is possible with or without installation of SCIA Engineer	Mapping details	Import +
on this computer.	Materials Cross sections	Ignore the following Ignore the following
Export items:		
Choose whether you wish to	Parameters	Mappings +
only export the current selection instead of the entire		Close Help English Version 1.5.131.0
model.		Close help
Export as:	•	
Choose whether you want to import the model as a new SCIA Engineer project or update the one that is open. This is only necessary for the direct exchange method.	Mapping details: Tables for mapping the Tekla mater cross sections, and other paramete the corresponding SCIA properties. Mappings that were made for previo model exchanges can be viewed he They cannot be edited or extended here but will be shown upon exchanging a new model.	Ins to Plugin can be changed here.

Note that the **direct exchange** method is (due to technical limitations) only linked to one SCIA Engineer interface. For SCIA21, this is the old interface, so SCIA Engineer 21 Legacy.

Although the Tekla link is a bidirectional link it uses two different file formats for the **file exchange**. If you export from SCIA Engineer to Tekla Structures the *.s2t-file format (**S**CIA**2T**ekla) is used. If you export from Tekla Structures to SCIA Engineer, the *.t2s-file format (**T**ekla**2S**CIA) is used.

4.3. Exchange from Tekla to SCIA

4.3.1. Generating the analytical model in Tekla

As referred to in chapter 1, modelling a structure in Tekla concerns the structural model. For exchange with SCIA Engineer, we are interested in the analytical model. This representation must be generated in Tekla before exporting a model to SCIA Engineer.

In Tekla, this functionality is called 'A & D models' and can be found in the 'Analysis & Design' toolbar.



Select 'New' to create an analytical model.

Analysis & De	sign Models				_		\times
Analysis model n	ame Analy	sis application	Analy:	Create New Copy	ſ		
				Properties		Delete	
				Select objects			
				Add selected objects	Remov	e selected	objects
				Load co	mbinatio	ons	
				Refresh		Rebuild	
<			>	Automatic refresh			
Analysis applicat	ion interface						
Export	Open application	Close application	on				
	Get results	Get results for sele	ected			(Close

The following dialog opens. You can define the properties as needed.

Analysis Model Properties		×
Save Load	✓ Save as	
Analysis model Analysis Job Output Se	ismic Seismic masses Modal analysis Design - Steel	Design - Concrete Design - Timber
Analysis application	Tekla Structural Designer 🗸 🗸	Set as the default
Analysis model name Analysis model filter	Cads.Tek.Plugin Tekla Structural Designer	Browse for export folder
Bracing member filter]
Secondary member filter	~ ~]
Analysis model content	Full model 🗸	
Use rigid links	Selected parts and loads Full model Floor model by selected parts and loads	
Analysis model rules	Analysis model rules	
Curved beams	Split into straight segments ~]
Consider twin profiles	Disabled ~]
Member axis location	Model default ~]
Member end release method by connection:	No ~]
Automatic update	Yes - Physical model changes are considered $\qquad \qquad \lor$]
Model merging with analysis application	Disabled]
OK		Cancel Help

Some important settings are:

- Analysis application: The analysis model will be generated based on different rules which may cause one application to be more suited for your model than another. This mainly affects the position of the member system lines and nodes.
- Analysis model content: Carefully choose to generate a model based on selected parts or the full model.
- Analysis model filter: if you have some connections in the model, (end plates, bolts...) these should not be exported to the analytical model and can be filtered out here.

You can create multiple analytical models. Upon exchange with SCIA, you can then select which model to use.

Analytical properties per member can be shown and changed with the function 'Get analysis properties' under the Analysis & Design tab.



The following dialog then opens with settings that affect the analysis model. The 'Axis' and 'Keep axis position' options can for instance be changed here.

The Beam Analysis Properties			X
Save Load standard	~	Save as	s standard
Analysis Start releases End r	releases Composite - Loading	Design	gn Position Bar attributes -
🗹 Axis	Reference axis	~	
Keep axis position	No	,	~
Connectivity	Automatic	,	~
Axis modifier X	None ~ X: 0.00		
Axis modifier Y	None ~ Y: 0.00		
Axis modifier Z	None ~ Z: 0.00		
✓ Offset	X: -0.00 Y: -0.00 Z:	-0.00	
✓ Longitudinal offset mode	Offsets are not considered	>	~
ОК Ар	oply Modify	Ge	Get P/T Cancel

More information about the analytical model and properties can be found on the Tekla support website:

https://support.tekla.com/doc/tekla-structures/2021/ana_working_with_analysis_design_models https://support.tekla.com/doc/tekla-structures/2021/ana_parts_analysis_properties

And also, in the CADS manual that can be opened from the 'Help' button in the main dialog of the Tekla link application.

Applications & compone	ents	0 X	>		
Show selected	≡	$\mathbf{x}^{\mathbf{k}}$	o?		
SCIA		×	1		
Search results for 'SCIA'	Sort by a-z	•	3		
			•	National code	Tekla Structures to SCIA Engineer
			۲		Export / Import +
SCIA Engineer			•		Ignore the following
				SCIA Engineer version	Walls
				21.0.2022.64 ~ 🕤	Slabs
				Mode of transfer	Member releases
				O Direct exchange	Supports
				Export items	Rigid arms
				Full model Selected items	Deleted items
				Export as	Openings Reinforcements
				O New project Update project	
					Export +
				Export to SCIA Engineer	Ignore the following
				Import from SCIA Engineer	Unmodified items
				Mapping details	Import +
					Ignore the following
				Materials Cross sections	End reactions
				Parameters	Mappings + .
Show hidden items		0		CADS SCIA	Close Help English Version 1.5.131.0

4.3.2. Exporting the model to SCIA Engineer

By opening the SCIA Engineer application and selecting the desired settings in the dialog, the analysis model can now be transferred to SCIA Engineer, either via direct exchange or file exchange.

Make sure to check the options on the right. Some extra information about the mapping options in this dialog: If 'Export as Unknown' is checked, the program will not prompt you for mapping a material whenever a material is not found in the mapping database.

If 'Show mapping dialog' is checked, the program will show the mapping dialog during export/import even if all the material/sections are found in the mapping database for us to verify.

Mappings	+
Export as unknown	
✓ Show mapping dialog	

Click the 'Export to SCIA Engineer button to start the exchange.

If the 'Direct exchange' mode of transfer is selected, the model will be opened in SCIA Engineer directly.

If the 'File exchange' mode of transfer is selected, a dialog will open to save the file.

Browse SCIA Engineer files	×
$\leftarrow \rightarrow \checkmark \uparrow$ \blacksquare > This PC > Desktop \checkmark \circlearrowright \circlearrowright Search	Desktop
Organize • New folder	📼 🔹 🕜
3D Objects	
Desktop	
Documents	
➡ Downloads	
Music Folder	
E Pictures	
🔢 Videos	
🐛 OS (C:)	
🔷 Network	
×	
En Encard D	
File name: Export.t2s	~
Save as type: Tekla - SCIA Engineer (*.t2s)	~
∧ Hide Folders Save	Cancel

If multiple analysis models were created, a dialog will ask you to select the one you would like to use:

Analysis models	×
nalytical models are found in this model. Please select to be exported from the list.	the
Model 1	
ОК Са	ncel

You'll have to fill in the mapping tables to define which materials and cross-sections from Tekla correspond to which materials and cross-sections from SCIA Engineer.

These settings will be remembered for future exchanges, even for different models.

		Tekla Structures m	aterial mapping		×
Tekla S	tructures		SCIA E	ngineer	
Material type	Material name	Material type	Material name	Load all	Export as unknown
Steel	Steel_Undefined	Steel	S 235 🔹		
Show all		Save	Cancel		

Based on the available materials and cross-sections in SCIA and Tekla, the application will already make a suggestion for most mappings. This is primarily based on the material type and National Code. If all the parameters are satisfied, the application will automatically map the equivalent SCIA Engineer material. If one or more parameters do not match, the application will prompt you with an exclamation mark to map the equivalent materials.

If you are not happy with the suggested list of materials, selecting 'Load all' will show all available options in the drop-down lists so you can change/choose the best option from the selected National Code.

		Tekla Structures m	aterial mapping			×
Tekla S	tructures		SCI	A Ei	ngineer	
Material type	Material name	Material type	Material name		Load all	Export as unknown
Steel	Steel_Undefined	Steel	S 235	•	\checkmark	
			S 235 S 275 S 355 S 450			
Show all		Save	S 450 J0 (EN 10025-2) S 275 N/NL S 355 N/NL			

You can select 'Export as unknown' to later define the material in SCIA. No material name is then filled in.

Tekla Structures SCIA Engineer						
Material type	Material name	Material type	Material name	Load all	Export as unknown	
iteel	Steel_Undefined	Steel	Ψ			
	Steel_Undefined	Steel	· ·			

Tekla	Structures		SCIA Engineer							
Section name Material type		Profile shape	Profile shape Section na			Load all	Export as Numerical	Export as General		
L70/7	Steel	L Section	-	L70X7	•					
IPE160	Steel	I Section	•	IPE160	•					
IPE270	Steel	I Section	-	IPE270	•					
IPE220	Steel	I Section	•	IPE220	•					
IPE240	Steel	I Section	-	IPE240	•					
HEA140	Steel	I Section	•	HEA140	•					
HEA160	Steel	I Section	*	HEA160	•					
IPE100	Steel	I Section	•	IPE100	•					
HEA240	Steel	I Section	-	HEA240	•					

Selecting 'Export as numerical' will generate a numerical cross-section in SCIA Engineer. You can no longer choose a profile shape and section name.

Selecting 'Export as general' will generate a general cross-section in SCIA Engineer. You can no longer choose a profile shape and section name.

Tekla	Structures			SCIA Engineer		
Section name	Material type	Profile shape	Section name	Load all	Export as Numerical	Export as General
L70/7	Steel	L Section -	L70X7		\checkmark	
IPE160	Steel	I Section	IPE160			\checkmark
IPE270	Steel	I Section	IPE270			
IPE220	Steel	I Section	IPE220			
IPE240	Steel	I Section -	IPE240			
HEA140	Steel	I Section	HEA140			
HEA160	Steel	I Section	HEA160			
PE100	Steel	I Section	IPE100			
HEA240	Steel	I Section -	HEA240			

Note: you can check the 'Help' button in the main dialog of the Tekla link application to see which sections are supported in the version of the plugin you are using.

For mapping certain parametrized sections, another dialog will appear to map the parameters or choose a custom value.

Section parameter mapping ×								
SCIA Engineer parameter	Tekla Structures parame	ter	Parameter value (mm)					
Н	h	•	200]				
В	b	•	200					
	OK Cancel							

After saving the mapping, a dialog will be opened, showing the export process. You can see the number of exported, failed, and ignored entities on the left. The log is shown on the right, with a message for every step that was taken in the export. Messages for the failed entities will be shown in red. Interpreting these can help to solve the problem with the export of these entities.

Entity	Exported	Failed	Ignored	Beam B42 deleted.	
Beam	226	0	0	Beam RB10 deleted.	
Hinge	226	0	0	Beam RB11 deleted.	
Column	37	0	0	Beam RB12 deleted.	
Node	287	0	0	Beam RB13 deleted.	
Rigid arm	1	0	0	Beam RB14 deleted.	
Total	777	0	0	Beam RB16 deleted. Beam RB18 deleted.	
				Beam RB2 deleted.	
				Plate S9 deleted.	
				SCIA Engineer file created at C:\Users\lise\Desktop\Export.t2s	

You can open the report after export, with the button on the bottom. It looks like this:

Tekla Structures to SCIA Engineer - Export to SCIA Engineer							
Settings							
	National code		EC - EN				
	SCIA Engineer version		21.0.2022.64				
Summary							
Entity	Exported	Failed	Ignored				
Beam	226	0	0				
Hinge	226	0	0				
Column	37	0	0				
Node	287	0	0				
Rigid arm	1	0	0				
Total	777	0	0				
laterial mapping							
Tekla Stru	ictures	SCIA	Engineer				
Steel_Unc	lefined	Unknown_Steel					
ection mapping							
Tekla Stru	ictures	SCIA	Engineer				
L70/	7	L	.70X7				
IPE10	50	1	PE160				
IPE2	70	1	PE270				
IPE2	20	1	PE220				
IPE2-	40	11	PE240				
HEA1	40	н	EA140				

The log file will also be saved automatically in the job location in the folder ..\SCIA Engineer\Reports. It can be opened in a browser any time to review the transfer.

Г

4.3.3. Opening the model in SCIA Engineer

Using the 'Direct exchange' mode of transfer will open the model directly in SCIA Engineer upon export. SCIA Engineer does not need to be open before starting the export.

There are two options for opening a t2s-file in SCIA, 'Open from' and 'Update from'. The first one will start a new SCIA Engineer project to open the file, the second one will use the project that is already open, and apply the changes made in Tekla while keeping any additional information that might be in the SCIA project, like load cases and combinations, supports etc.

	Project browser				Project browser			
Ð	New Ctrl+N			Ð	New	Ctrl+N		
	Open Ctrl+O				Open	Ctrl+0		
	Open from	XML	XML file		Open from	•		
	Recent projects	Revit	Revit file		Recent projects	•		
٥	Project settings		Tekla file	0	Project settings			
	Save Ctrl+S		SDNF file		Save	Ctrl+S		
	Save as Ctrl+Shift+S	FGBM	FRILO GEO Building Model (FGBM)		Save as	Ctrl+Shift+S		
D	Save all	SAF	SAF model		Save all			
	Update from	BIM+	Bimplus	Г	Update from	•	L.C.	XML file
	Export to		BIMcloud		Export to	•		Revit file
	Print	IFC	IFC file		Print	•		Tekla file
×	Close Project Ctrl+F4			×	Close Project	Ctrl+F4	FGBM	FRILO GEO Building Model (FGBM)
	Close all				Close all		SAF	SAF model
P	Quit Alt+F4			P	Quit	Alt+F4	C BIM+	Bimplus
							IFC	IFC file
								project (ESA)
							(tuni	BIMcloud

In both cases, a dialog will open, asking you to select the t2s-file.

🛃 Import Tekla file		×		
\leftarrow \rightarrow \checkmark \uparrow \blacksquare > This PC > D	esktop v 🖑 🔎 Search Desktop	C		
Organize 👻 New folder	— •	• • • •		
> 3D Objects	Wpdate Tekla file	^		×
> Documents + Downloads	$\leftarrow \rightarrow \checkmark \uparrow$ This PC > Desktop	ٽ ~		
> Downloads	Organize - New folder		— •	
> Pictures	> 🖈 Quick access			^
File name:	> 🔷 OneDrive - SCIA nv			
	✓			
	> 3D Objects Export.t2s			
	> Desktop			~
	File name:	~	Tekla file (*.t2s)	\sim
			Open	Cancel:

The code that was selected for the export will be shown next. It can be changed with the 'Add' button, or you can just continue using the 'Close' button.

Codes in proj	ect		×
Name EC - EN		Description EC - EN	
Add	Delete	Active code	Close

The model will now be shown in SCIA.

4.4. Exchange from SCIA to Tekla

4.4.1. Exporting the model to Tekla Structures

For the 'Direct exchange' mode of transfer, a model should be opened in SCIA Engineer. No other action is required from SCIA side.

For the 'File exchange' mode of transfer, you can export a s2t-file from the menu:



A dialog will be opened to choose a file location to save the file.



4.4.2. Opening the model in Tekla Structures

You can now open the model in Tekla Structures using the SCIA Engineer application.

** Applications & components * × ** Show selected * * SCIA * Search results for 'SCIA' Sort by a-z SCIA Engineer *	 > o² ☆ ③ Mational code EC - EN SCIA Engineer version 	ekla Structures to SCIA Engineer × Export / Import + Ignore the following Walls
	21.0.2022.64 ✓ Mode of transfer Direct exchange ● File exchange Export items ● Full model Selected items Export as New project ● Update project	Slabs Member releases Supports Rigid arms Deleted items Openings Reinforcements
	Export to SCIA Engineer Import from SCIA Engineer Mapping details Materials Cross sections Parameters	Export + Ignore the following □ Unmodified items Import + Ignore the following ☑ End reactions Mappings + .
Show hidden items		Close Help English Version 1.5.131.0

Using the 'Direct exchange' mode of transfer will open the model that is open and active in SCIA Engineer. Using the 'File exchange' mode of transfer will prompt a dialog asking to select the s2t-file to be opened.

Browse SCIA Engineer files				×
\leftarrow \rightarrow \checkmark \uparrow \blacksquare > This PC > Desktop		~ Ū		р
Organize - New folder			-	• 🔳 🕜
OneDrive - SCIA nv				
🧢 This PC				
3D Objects				
Desktop				
Documents SCI	A to Tekla.s2t			
Downloads				
File name: SCIA to Tekla	.s2t	~	SCIA Engineer - Tekl	a (*.s2t) 🛛 🗸
			Open	Cancel

The next steps are very similar to the workflow for exporting a model from Tekla. Make sure to check the options in the main dialog on the right and select the mappings in the upcoming dialogs.

SCIA Engineer material mapping ×							
SCIA E	ngineer	Tekla Structures					
Material type	Material name	Material type	Material name		Load all		
Steel	S 235	Steel	Steel_Undefined	•	\checkmark		
Concrete	C25/30	Concrete	Concrete_Undefined	•			
✓ Show all		Save Cancel					

SCIA Engineer section mapping							
SCIA E	Tekla Structures						
Section name Material type		Profile shape		Section name		Load all	
Rectangle	Concrete	Rectangle	-	BL200*200			
IPE240	Steel	I Section	•	IPE240	•		
L80X8	Steel	L Section	•	UAP175	•		
✓ Show all		Save Cancel					

In case you are not satisfied with the available sections for mapping, you can download additional crosssections from the Tekla warehouse, like the following set:

https://warehouse.tekla.com/#/catalog/details/131d7061-666b-4592-8812-c427dbdf4bb1

The log shows the steps taken in the import process. Any failed items will be shown in red.

	Tekla Structures to SCIA Engineer ×						
E-tit.	lass sate d	Failed	less and				
Entity	Imported		Ignored	Beam B7 deleted.			
Column	4	0	0	Column B4 deleted.			
Beam	4	0	0	Column B3 deleted. Column B2 deleted.			
Contour plate	1	0	0	Column B2 deleted.			
Nodal support	4	0	0				
Total	13	0	0	Contour plate S1 created.			
				Contour plate S1 deleted.			
				Analysis properties are updated for member S1.			
				Analysis properties are updated for member B1.			
				Analysis properties are updated for member B2.			
				Analysis properties are updated for member B3.			
				Analysis properties are updated for member B4. Analysis properties are updated for member B5.			
				Analysis properties are updated for member B5.			
				Analysis properties are updated for member 80.			
				Analysis properties are updated for member 87.			
				Support conditions are modified for node 7			
				Support conditions are modified for node 9			
				Support conditions are modified for node 13			
				Support conditions are modified for node 15			
				Support conditions are modified for node 13			
				Support conditions are modified for node 13			
				Support conditions are modified for node 9			
				Support conditions are modified for node 7			
		[Close	Open report			

After closing this dialog, the model is shown in Tekla.