Image © SETEC BÂTIMENT - CANOPY OF CULTURAL COMPLEX - MASCATE, OMAN

NEMETSCHEK
Scia

Scia Engineer, Open BIM software for analysis, code-design and optimisation of structures

Scia
Engineer

OPEN BIM™

How far dare you go?

Structural engineers from all corners of the world face similar problems. On the one hand, they have to deal with audacious plans of architects; on the other, they have to tackle effectively the everyday tasks of engineering practice.

Scia Engineer meets both of these challenges and provides structural engineers and designers with a comprehensive and robust tool for the modelling, analysis, design and drawing of steel, concrete, timber, aluminium and composite structures.

Analysis - Checking - Optimisation

Scia Engineer performs static, dynamic, stability, nonlinear and other special types of analysis. The results are directly used for design and checks according to appropriate technical building standards. Scia Engineer employs the displacement-based finite element method, but does not work with finite elements directly. Instead, the program exploits structural elements for which the finite element mesh is generated "behind the scenes".

Calculation results are directly used for design and code checking. Structural engineers can perform basic checks as well as advanced checks for specific situations (e.g. fire resistance) and structures (e.g. bridges, prefabricated elements). The integrated checks are available for numerous national and international codes such as IBC, BS and the Eurocodes with National Annexes.

The integrated optimisation tools then help produce safe, economical and environmentally friendly designs.

Structural BIM

Scia Engineer is well-known for its outstanding modelling capabilities and represents a compact structural BIM solution whose **True Analysis** feature makes it possible to handle two models in one project.
- **The structural model** describes in detail the shape of individual elements, their position and possible local adaptations (cut-outs, etc.)
- **The analysis model** contains all the information required for calculations and design

Scia Engineer with its Open BIM support smoothly exchanges data with a wide range of CAD/CAE programs through the certified IFC 2x3 interface (Archicad, Vectorworks) and imports and exports data from and to the generally used formats like SDNF, DWG, DXF and VRML. In addition, it has direct links with Allplan, Revit Structure, Tekla Structures and Etabs. The software has an open interface, which allows for the creation of customized applications for specific segments: pipe modelling, scaffolding, pre-engineered buildings, etc.

All kinds of structures in various sectors

- **Buildings**: apartments, high rise buildings, housing, offices, roof systems, curtain walls, glass structures, winter gardens…
- **Infrastructure**: bridges, train stations, airports, car parks, stadiums, theatres…
- **Industrial buildings**: portal frames, storage buildings, maintenance workshops…
- **Mechanical industry**: pressure vessels, pipelines, load bearing structures…
- **Environmental**: water treatment and soil purification plants, containment vessels, tanks…
- **Harbour construction**: quays, lock doors, shutters…
- **Prefab concrete structures**: plate decks, slabs, walls, girders and columns...
- **Specials**: transport installations, plants, cranes, masts, towers, scaffolds, stairs and other structural parts.
- **Soil-structure interaction**, underground structures: tunnels, excavations, metros...
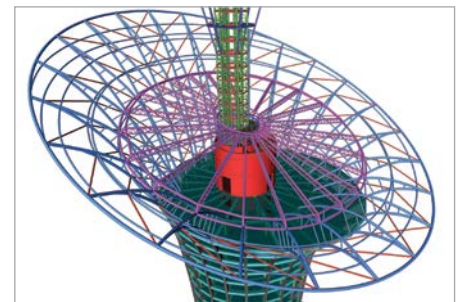
Wuhan New Energy Insitute, Grontmij Nederland BV (NL)
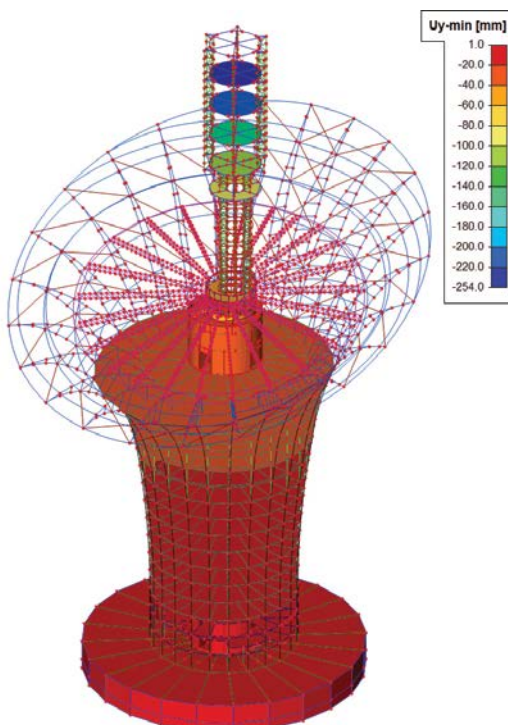
Innovation & Quality

Cutting edge interface - Fastest calculation engine - Unique technologies

Scia Engineer is a reliable partner for everyday use in engineering practice. It is based on time-proven principles of CAE systems such as a robust finite element engine and intuitive graphical user interface. Nevertheless, it moves them to a higher level thanks to the application of the latest technologies and series of unique concepts and features.

- True Analysis: two models integrated in one project: the structural model and analysis model. The engineer is mastering his analysis model, while keeping integrity with the architects and detailers.
- Member Recognizer: automatic conversion of general structural shapes to analysis elements
- Parametric Modelling: fast solution for repetitive analysis; user-defined libraries of components
- Direct modelling with structural elements such as beams, walls, shells, etc. Fast finite element engine works "behind the scenes"
- AutoDesign following building codes for steel, concrete, composite, aluminium…
- Template Analysis: rapid and easy reuse of user-generated parametric models for the creation of new designs
- User-defined attributes (information) for structural entities (e.g. cost, surface treatment...)

- Automated General Arrangement Drawings directly linked to the 3D model
- MS Excel link allowing for external checks with results displayed directly in Scia Engineer
- Open program interface for linking of user-defined or tailored modules
- Support of 64 bit computers and cloud computing - file hosting service including automatic synchronisation with local data
- Continuous development and customer support provided by an ISO 9001 / 2001 certified company
- Detailed reports about the performed calculation and executed code checks
- Automated tests countinuously verify the stability and correctness of the program

Three optimisation levels

AutoDesign: optimisation of steel cross-sections and optimisation of reinforcement in concrete members.
**Parametric Structural Optimisation**: optimisation of the structure based on user-defined parameters. The user selects the "optimal" variant.
Multi-Object Optimisation Tool:
global optimisation of the structure using a dedicated optimisation engine. This optimisation covers both local parameters such as cross-section size and global factors such as the shape of the structure.

True Analysis

Most structural analysis and design software systems traditionally work with what is called an **analysis model** that consists of just enough information to perform the analysis. Scia Engineer is unique in that, it allows the engineer to very quickly define the **relation between this analysis model and the real shape** of the structure used in CAD systems (structural model).
This **structural model** can even contain entities that are not included in the analysis model (e.g. banister, window panes, etc.).
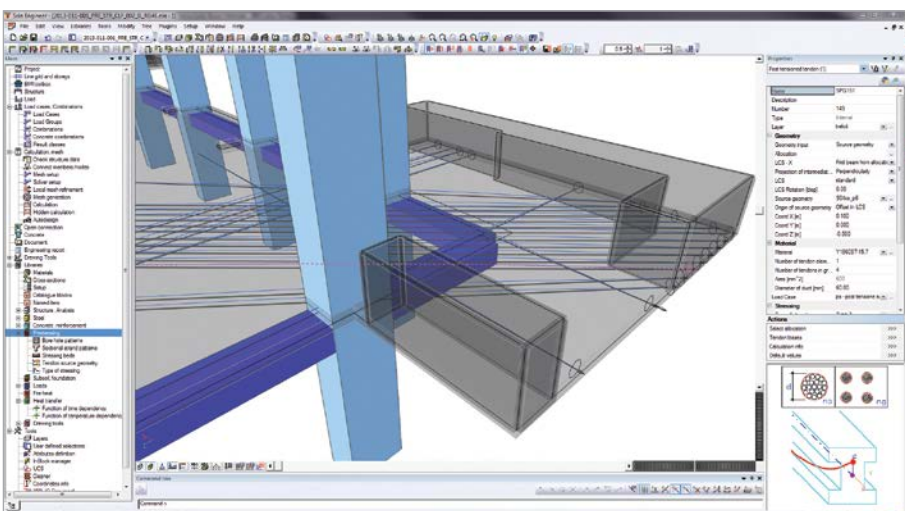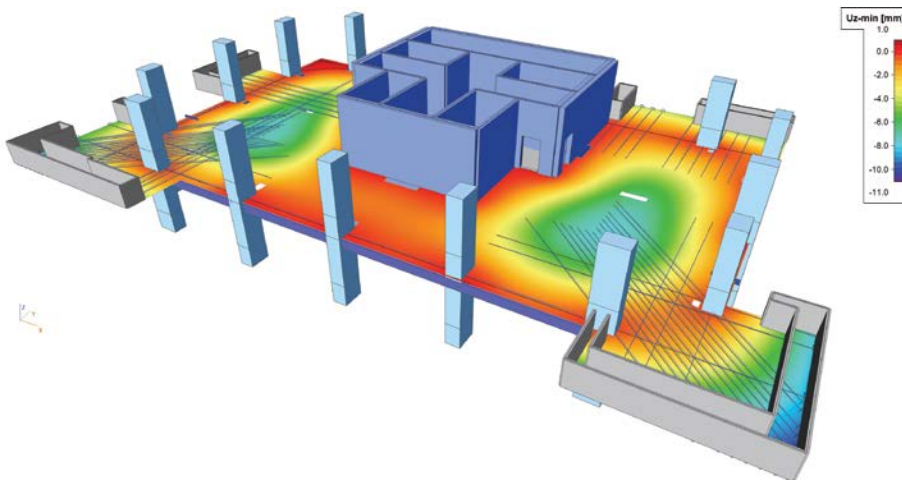
Porta Nuova Isola Bosco Verticale,
Holzner Bertagnolli Engineering GmbH Srl (IT)

BIM & Communication

Integration of the full design process from concept to design and detailing

Smooth connection of the worlds of architects and structural engineers is one of most crucial aspects in structural design. Deadlines are short, investors push for minimisation of investments and, at the same time, demand more impressive constructions. Building Information Modelling (BIM), Open BIM in particular, is the path to take to cope with all these challenges.

Interoperability

- Advanced collaboration: conceptual design alternatives are quickly shared with the project owner, architect, MEP engineer, fabricator, contractor…
- Open BIM through numerous data exchange formats
- Efficient change management thanks to the BIM engineering toolbox
- Engineers have full control over changes in the model made by architects
- Both structural and analysis model interlinked in one project: smooth transition from drawings to calculation and vice versa
- Easy and fast detection of conflicts in structure and reinforcement

Data exchange formats

- Seamless data exchange via IFC, XML, DWG, DXF, VRML…
- Round-Trip Engineering: sharing of the structural model with Allplan, including geometry and reinforcement
- Direct support of Revit Structure and Tekla Structures API's, ETABS
- Steel industry data exchange standards: SDNF, DSTV, Step Steel

Structure2Analysis

The powerful Structure2Analysis algorithm **transforms a typical CAD-model** (with improper alignment of building parts) **to a correct model for analysis**. Presence of this functionality in the structural analysis software (CAE) ensures that it is the engineer who is the master of his model.

Open BIM

Scia Engineer, the first CAE program with the IFC 2x3 certification, fully supports Open BIM, which means exchange of data between different applications through a versatile and open data file.

Using the Open BIM approach a structural engineer can easily control the process of data flow without affecting the working habits of others. The only thing the other parties have to do is run the import from or export to IFC or any other standard exchange format.

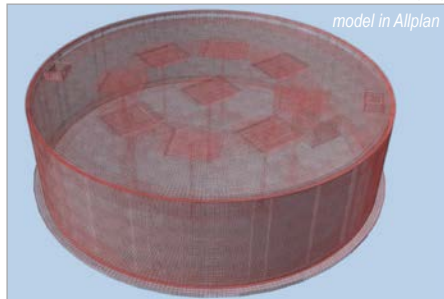*5 apartments, Adams Bouwadviesbureau bv (NL)*

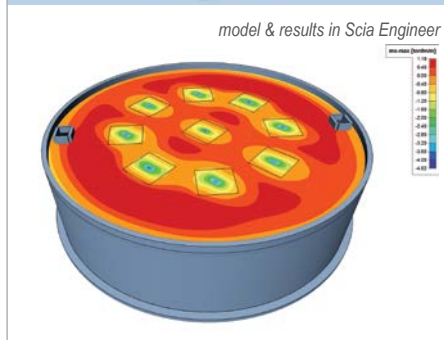*architectural model*

structural model
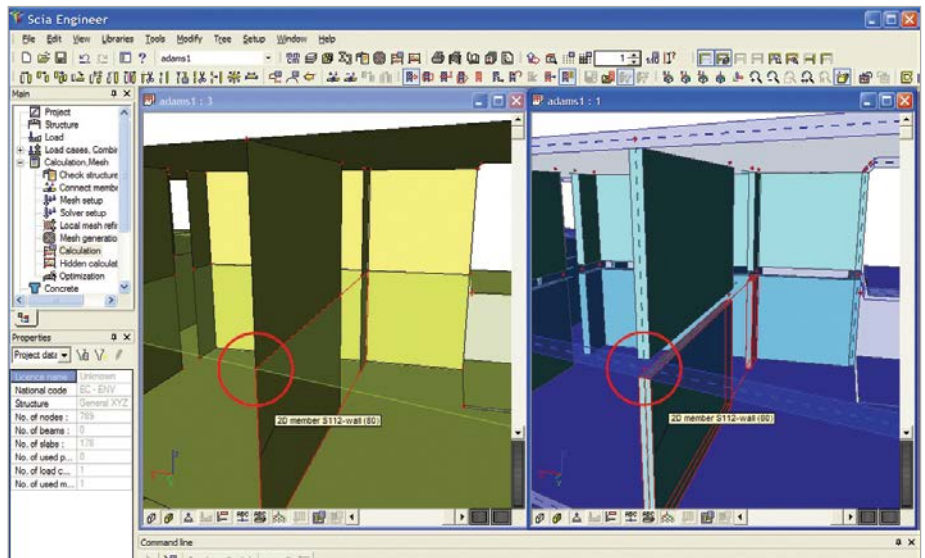
analysis model

Supported Tank 2000 m³, Procalc (BR)

model in Allplan

model & results in Scia Engineer

Structure2Analysis

Analysis & Design

## Advanced analysis and design functionalities

Fast and accurate calculation and code compliant design go hand in hand in the structural design process. Moreover, both these steps become interlinked due to the calls for optimal and most economical solutions. Scia Engineer smoothly connects the calculation phase with the design and checking according to technical standards. Its optimisation tools then meet the last of the above mentioned requirements.
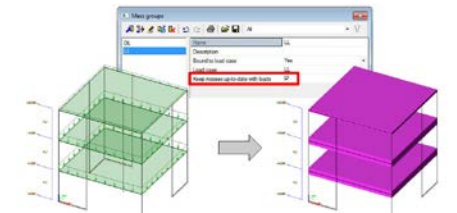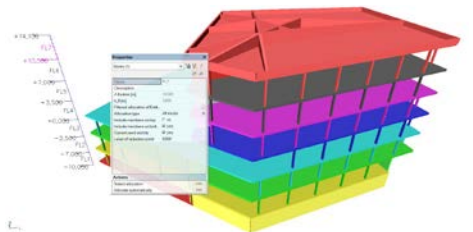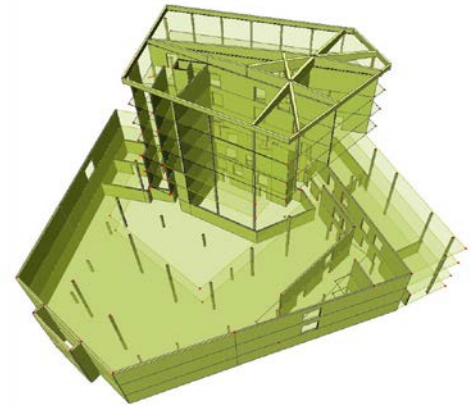

Analysis

- Analysis of all types of structures from the simplest to the most complex constructions made of concrete, steel, aluminium, plastic, timber or mixed materials
- Code compliant: Eurocodes (with National Annexes), US and other international design codes
- Simulation of various loads (wind, snow, soil, earthquake, water accumulation)
- Calculation of natural frequencies and modes and analysis of response to harmonic, seismic and general dynamic load for projects where dynamics plays an important role
- Efficient design of cable-stayed and masonry structures with the help of dedicated non-linear calculations
- Large deformations and stability analysis in the case of slender steel structures and shells
- Construction stages analysis for simulation of the building process
- Time Dependent Analysis for prestressed structures
- Seismic analysis of buildings
- Optimisation functions to find the optimum design variant

Design

- Design integrated with detailing: steel connections with bolts, welds…; reinforcement with practical layouts
- Advanced design competence: fire resistance, concrete cracking, plasticity
- Dedicated know-how for specific structures integrated in the program: high rise buildings, prestressed slabs, precast concrete, post-tensioned bridges, steel towers, pipelines, scaffolds…
- All calculated results, including design checks, visualized graphically and included in structured reports with all details
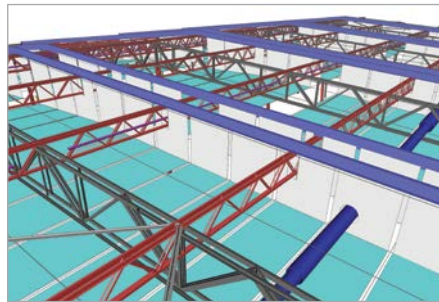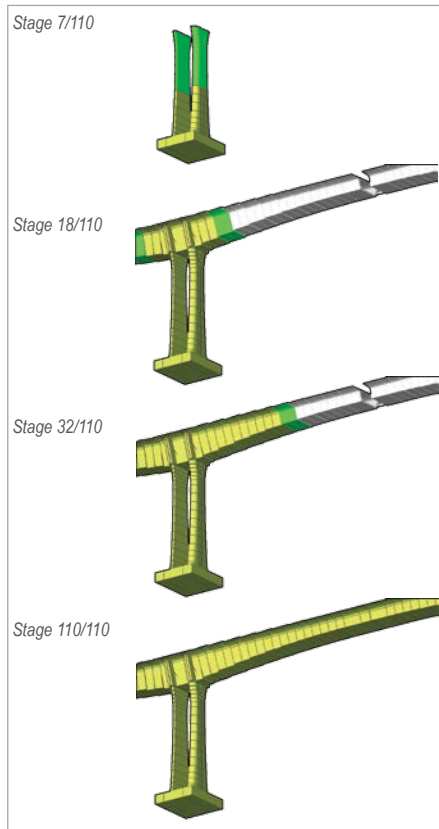

Fire protection ceiling, Dipl.-Ing. S. Ryklin STATIK (DE)

ACPC Building, Engineering Group GIBES (CH)

Construction stages analysis:
Bridge over the Berounka River, Novák&Partner, s.r.o. (CZ)

Stage 7/110

Stage 18/110

Stage 32/110

Stage 110/110

Sequential Analysis

A sequential analysis can help experienced users to obtain results that are not available through a single analysis. In general, the second analysis starts where the first one ends. In practice, a useful combination is for example a nonlinear static analysis followed by a natural vibration analysis. This results in eigenmodes and eigenvalues determined for a deformed structure with e.g. ties subjected to compression eliminated from the calculation.

AutoDesign

Scia Engineer allows for an optimum design of steel and concrete structures. Advanced automatic optimization is performed according to design code provisions and additional rules specified by the user. Structural items that can be optimized include: hot-rolled and built-up steel profiles, steel connections, concrete reinforcement, etc...

Project documentation

Impressive presentation of models and results

Finalising the project on time is critical. And the completed project must be presented to the owner for approval and to the constructor who will execute the construction. In addition, some intermediate stages of the design need to be discussed. Scia Engineer therefore comes with a wide range of tools for production of clear and comprehensive documents and reports and a set of intelligent tools for the preparation of drawings.

Drawings

- Picture gallery: stored pictures are linked with the 3D model. Both geometry and results are updated on the user's request
- Automated generation of general arrangement drawings and connection drawings from the 3D model
- Generated images can be edited and amended with texts and dimension lines

- All drawings remain connected to the original model, which means they are automatically regenerated if necessary
- Drawings can be exported to DXF, DWG, BMP, WMF, 3D PDF and other formats

Hilton hotel, Astron Buildings s.a. (LUX)

Active document

Paperspace

Sections and general arrangement drawings
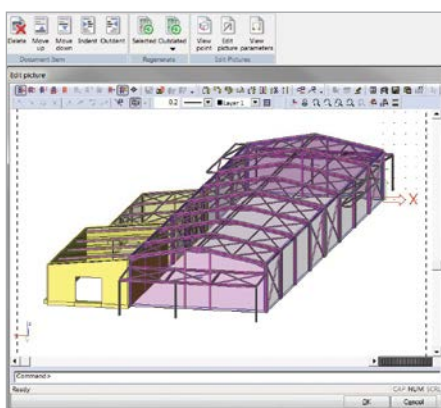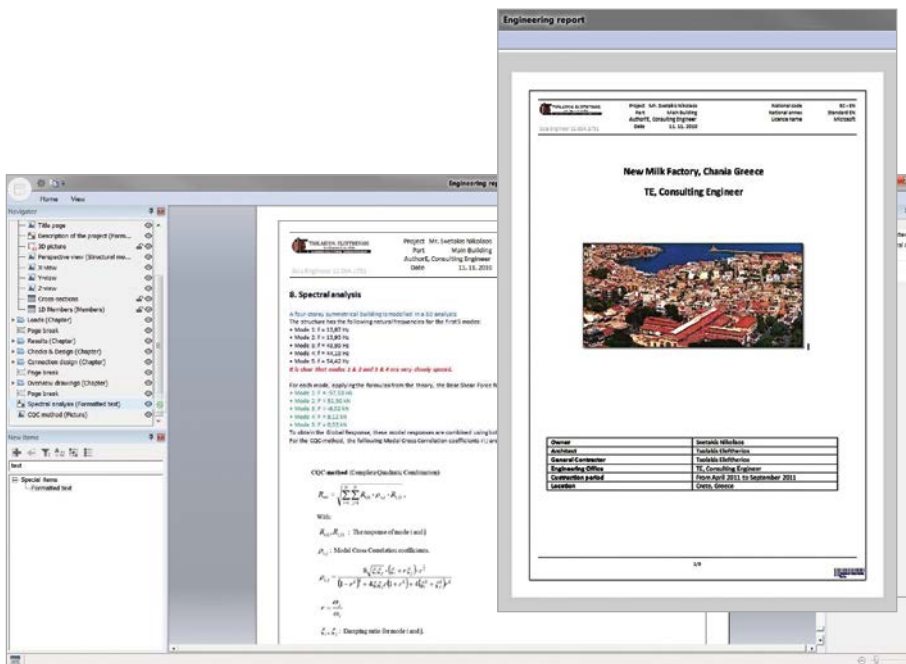

Automated General Arrangement Drawings

The Automated General Arrangement Drawings functionality in Scia Engineer offers simple, fast and automated generation of drawings from the Scia Engineer model.
In addition, it contains basic drawing tools that allow for final hand-tuning of the generated drawing. Also important is the option to predefine a style of the generated drawing and produce all the drawings in a unified company-defined style.

Engineering Report

The new tool - first released in Scia Engineer 2013 - Engineering Report - contains everything that is needed to explain project details, ranging from project definition data to static analysis results, design checks and overview drawings. It is the entire project put on paper. There is no more need to keep track of separate documents: all input and output data related to the project can be bundled into one global report by means of this new tool.

- Full control over all included information: refresh on user's demand.
- All tables and pictures regenerated to reflect any recent changes in the model and to correspond to the latest status of the project.
- The report can contain both data read directly from the project (including images) as well as additional and external data such as nicely formatted texts, photos, third-party images, etc.
- Once generated, the report can be printed or exported in different file formats, ranging from MS Word document or Excel spreadsheet, to the astonishing 3D *.pdf, which allows for the model to be viewed using the zoom, pan and rotate options.
- Engineering Report runs as a separate application which brings numerous advantages: several reports can be opened at the same time, the user can work with Engineering Report and Scia Engineer simultaneously, should it happen and one of these applications stops responding, the other one is still fully functional, and much more.

Scia Design Forms

Open Design Checks architecture

With the new Scia Design Forms additional strength is given to structural engineers enabling them to perform their own static and dynamic calculations for all stages of construction projects, from design to construction including maintenance.

Scia Design Forms is new software that enables users to write custom calculation procedures, save them, and reuse them as either standalone tools or link them with Scia Engineer. Sample forms are available to help the user set up their own design calculation (for reinforcement design in reinforced concrete, crack width control, foundation design, masonry structures design, timber and steel design, etc.). The scripting language is very easy and it enables engineers that are interested in the method to the have full computational power needed to perform advanced structural design.

Scia Engineer can link to the new software to perform **external design checks**.
Many users tend to use various applications in their daily work. Some use simple spreadsheets, others spreadsheets with included macros, and others even develop their own in-house software using different programming languages: VB, C++, C#, etc. The common denominator in all these situations is the requirement to input data like overall geometry, material and cross sections properties, load cases, combinations, resultant internal forces, displacements, etc. Until now, it was necessary to find these data in Scia Engineer and manually retype them in the custom-made application. Consequently, no results could have been transferred back to Scia Engineer after the checks have been completed.
The openness of our new solution ensures a **smooth data flow between Scia Engineer and application for the external checks**. If the 3D model is defined in usual way in Scia Engineer, the required data are then sent to the external application and the desired user-defined calculation can be performed. The results are then displayed again in Scia Engineer, exploiting all the presentation capabilities of the system.

Highlights Scia Design Forms

- Easy to use tool, dedicated for users or developers
- +85 certified design templates included
- Predefined engineering libraries
- Possibility to market your own forms
- WYSIWYG- output
- Different levels (detailed / brief / ...) of representation
- Both the interface and forms can be localised to your local language
- IntelliSense-support
- Design Forms community
- Integration with Scia Engineer (Open Checks) is possible

Highlights Open Design Checks

- They provide unilateral and bilateral data exchange with external software
- Open Checks support Excel and Scia Design Forms by default
- Feature can be extended to any possible external application which uses our toolbox and protocol
- Open Checks allow users to create their own checks and remain in full control
- Open check open the clients the way to new types of calculation and new markets

Overview Scia Engineer Editions
Comparison chart

Scia Engineer is a versatile CAE system that provides users with very wide functionality. It stands to reason that not everyone needs everything. Therefore, Scia Engineer is offered in several Editions tailored to the needs of specific groups of users.
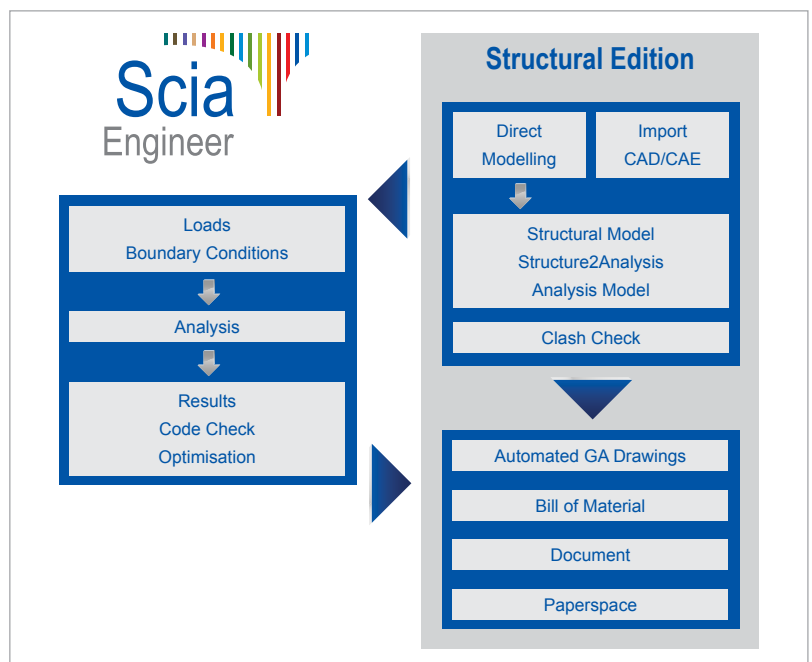
Each Edition offers a set of features that are typical for the target group of users. The Concept, Professional and Expert Editions focus on analysis and design. The Structural Edition is a special Edition for engineers who specialise in modelling and interoperability. Moreover, any Edition can be extended by separate additional options.

	Concept	Professional	Expert	Structural
Modeller				
Modeller, Productivity toolbox with active document, IFC, DWG, DXF, VRML	x	x	x	x
BIM engineering toolbox, parametric modelling, general cross-section, Allplan, Tekla, ETABS interface		x	x	x
Link to Revit Structures; Free-form modeller				x
Load generators				
Load generator: wind, snow, plane load generator	x	x	x	
3D wind load generator, Mobile load		x	x	
Advanced mobile loads, Train loads			x	
Analyser				
Linear static analysis	x	x	x	
Non-linear static analysis (tension only members, pressure only supports), Geometrical non-linearity	x	x	x	
Advanced non-linear static analysis (springs and gaps for beams, pressure only slabs), Stability analysis, Dynamic analysis (eigenmodes, harmonic, seismic, general dynamic load)		x	x	
Advanced calculations: Soil interaction, Cables, Non-linear stability, Membranes, Sequential analysis, Friction springs			x	
Linear and non-linear construction stages			x	
Pre-stressed structures, Time Dependent Analysis			x	
Steel designer				
Steel code check - incl. optimisation of cross-sections	x	x	x	
Fire resistance check, Cold-formed sections check, Plastic analysis		x	x	
Steel connections modeller		x	x	x
Steel connections checks		x	x	
Concrete designer				
RC design and check, Punching shear check, Code dependent deformations	x	x	x	
Input of practical reinforcement	x	x	x	x
Fire resistance check for RC beams		x	x	
Pre- and post-tensioned members: design and check; Input of prestressing cables			x	
Detailer				
Automated General Arrangement Drawings		x	x	x
Detailed connections drawings		x	x	x
Foundations				
Pad foundations		x	x	

Optional modules
Material non-linear analysis for 1D concrete structures
Global optimization
Non-uniform damping
Water accumulation
Lateral Torsional Buckling (2nd order)
Cellular beams design
Aluminium design
Timber design
Composite steel-concrete columns design
Composite steel-concrete beams design
Voided slabs
Hollow-core slabs
Pile design
Scaffolding checks
High-voltage power masts

For other additional options, please contact your sales representative.

Scia Engineer

Loads
Boundary Conditions
↓
Analysis
↓
Results
Code Check
Optimisation

Structural Edition

Direct Modelling | Import CAD/CAE
↓
Structural Model
Structure2Analysis
Analysis Model
Clash Check
↓
Automated GA Drawings
Bill of Material
Document
Paperspace

Concept Edition

Best choice for daily work

The Concept Edition attracts engineers modelling and analysing common structures made of steel, concrete or another material.

For daily work the Concept Edition of Scia Engineer is often the best choice. It is design software whose quality will support engineers in convincing construction owners and authorities.

Modeller

The modeller offers capabilities for input and effective editing of straight or curved beam members and plates, walls and shells. The geometry is stored using the unique **True Analysis** technology that supports both the structural model (suitable for drawings) and the analytical model (required for calculations and code checks).

Communication with third-party software is made through common file formats such as IFC, DWG, DXF, VRML. Easy-to-make printouts with tables, pictures and **Active document** feature that automatically regenerates the documentation after any modification, clearly describe the defined model and present the obtained results.

Loads

Not only geometry, but also other data of the analytical model are input effectively. Boundary conditions, loads and other types of data that are necessary for the calculation are defined using intuitive functions. Automatic generators are available for more complex loading conditions, such as plane-load distributed to load-bearing beams or wind and snow load.

Modelling and Analysis

- Straight or curved beam members
- Flat or curved plates and shells
- Modelling in 3D or 2D
- Wind and snow generator
- Area load transferred to beams
- Static linear analysis
- Geometrical non-linear analysis
- Automatic mesh generator
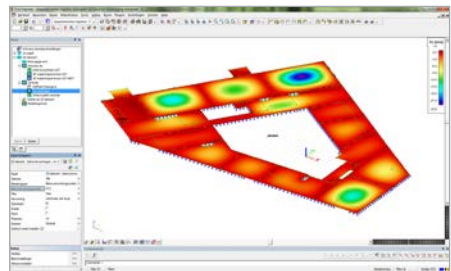
"Aarschot op Sporen", Residence with Commercieal Space, Grontmij Belgium (BE)
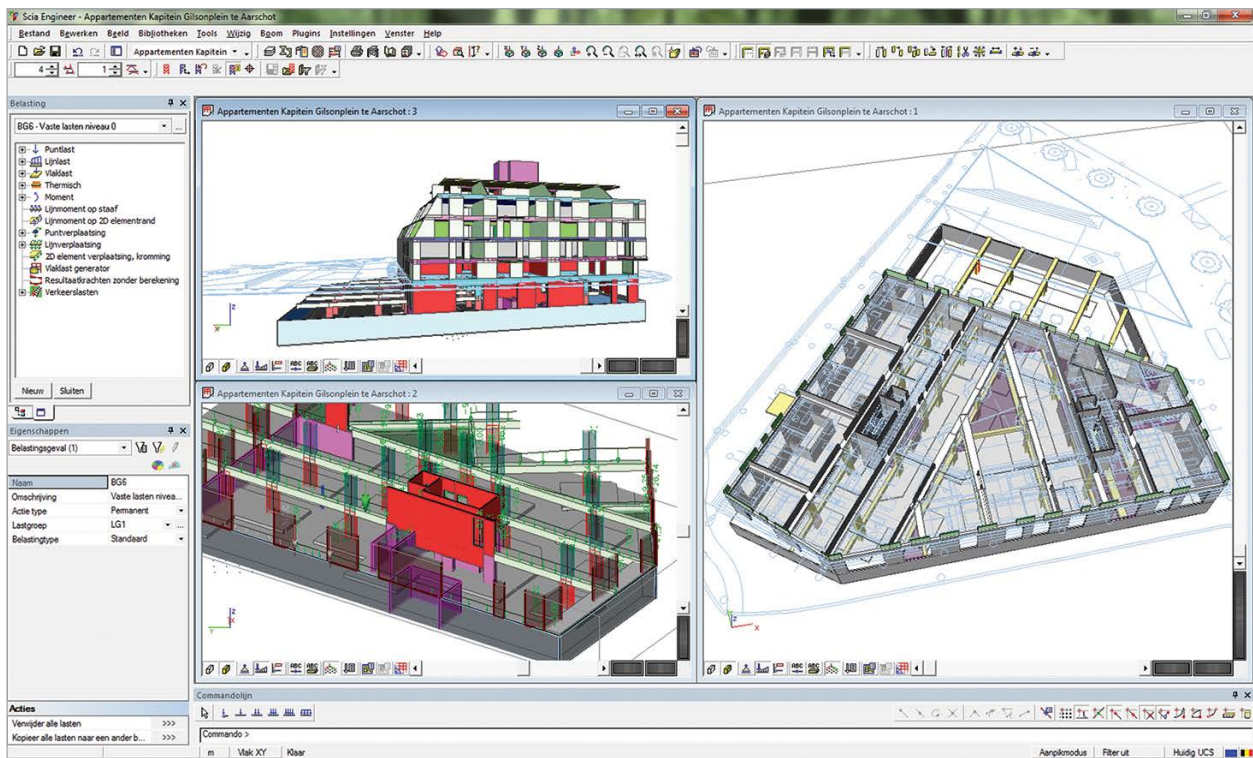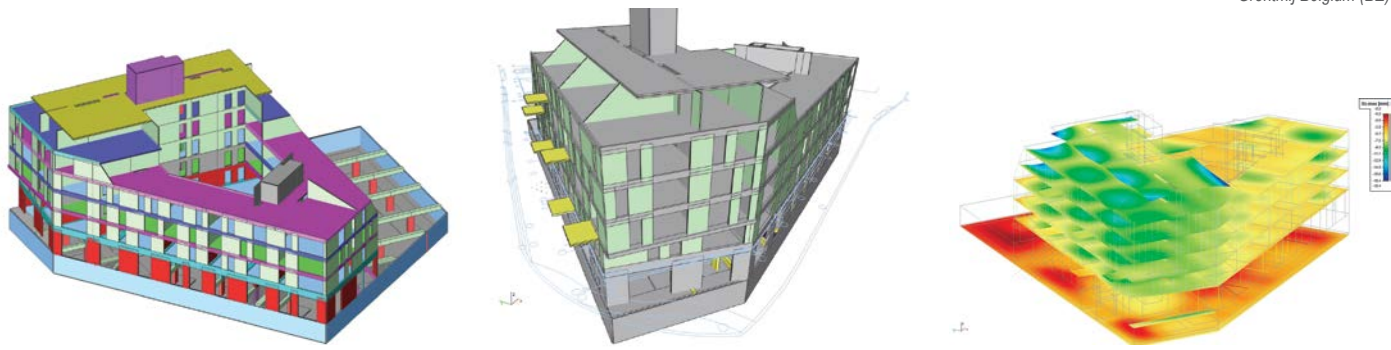
Analysis and design of steel and concrete structures

Analysis

The Concept Edition performs static linear calculations. In addition, some advanced types of analysis are also offered: tension-only members, pad foundations, geometrically non-linear analysis.

Design

The Concept Edition is a good partner for design and checking of the structure according to the latest codes. It works for steel and concrete.

For steel structures, it offers functions for the effective design, checking and even optimisation of rolled and welded cross-sections. For concrete, the functionality covers the design of required reinforcement, input of practical reinforcement, automatic design of rebars for beams and slabs, schemes of reinforcement, interaction diagrams, check of deflections and cracks, punching shear on slabs.
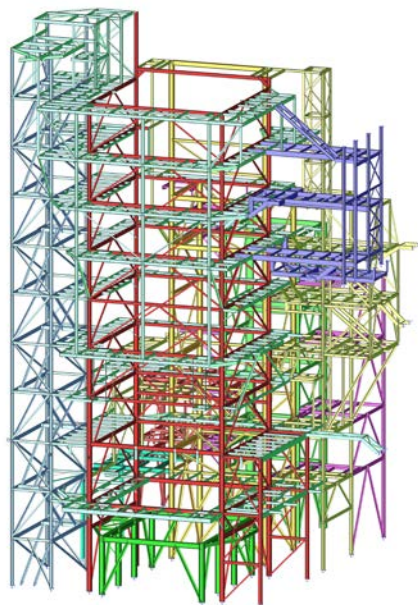
Steel code check

- Unity check, stresses
- Stability checks: buckling, LTB…
- Optimisation of cross-sections
- Libraries of rolled, built-up, pair, and other cross-sections

Concrete code check

- Design of reinforcement for beams and columns or plates and walls
- Practical reinforcement
- Crack control
- Punching shear check
- Check of long-term deflection with cracks and creep taken into account

Steel structure for Blomass boiler and service platforms, Bilfinger Babcock CZ s.r.o (CZ)
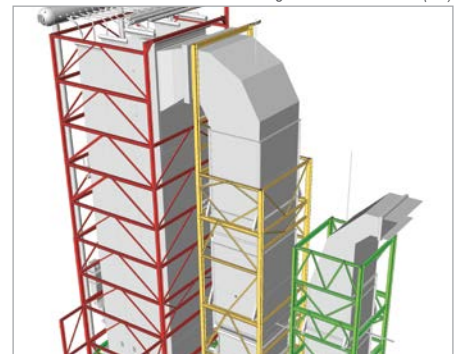
Movable bascule bridge, Hollandia b.v. (NL)
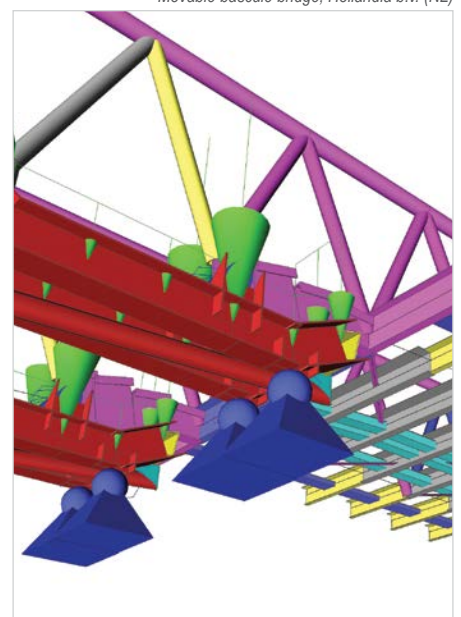
Professional Edition

Steel connections - General Arrangement Drawings

The Professional Edition is for engineers having higher demands in terms of analysis, design and BIM. It extends the modelling capabilities of the Concept Edition by, for example, a general cross-section with the shape defined by the user. Steel designers obtain a powerful tool for the design of steel connections including the ability to generate drawings of connection parts. Calculation options include stability and dynamics including general dynamics and earthquake.

Steel connections and drawings

The Professional Edition includes the module for design and code-checking of steel connections with endplates, bolts, stiffeners and welds.

A special wizard for the preparation of detailed drawings of the connections helps the engineer to communicate better with draftsmen, manufacturers and investors.

Automated General Arrangement Drawings

The Edition offers simple, fast and automated generation of drawings from the 3D model: Automated General Arrangement Drawings. Besides the automatic generation of the drawings, this Edition contains sufficient drawing tools for final hand-tuning of the generated drawings.
Also important is the option to predefine a style (or several of them) of the generated drawing and thus produce all the drawings in a unified company-defined style.

Parametric input

Parametric Modelling applicable to any part of the model is convenient for engineers who often work on similar types of structures because typical parts of structures or even whole buildings can be stored as templates and re-used later with different dimensions, cross-sections, material grades, loads, etc. Parameters also allow for effective optimisation of the shape and dimensions.

Federal state hospital, TOMS ZT GmbH (AU)
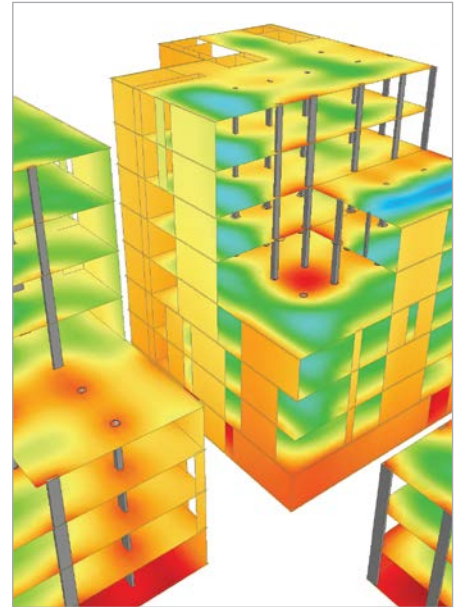
Groninger Forum , ABT bv (NL)
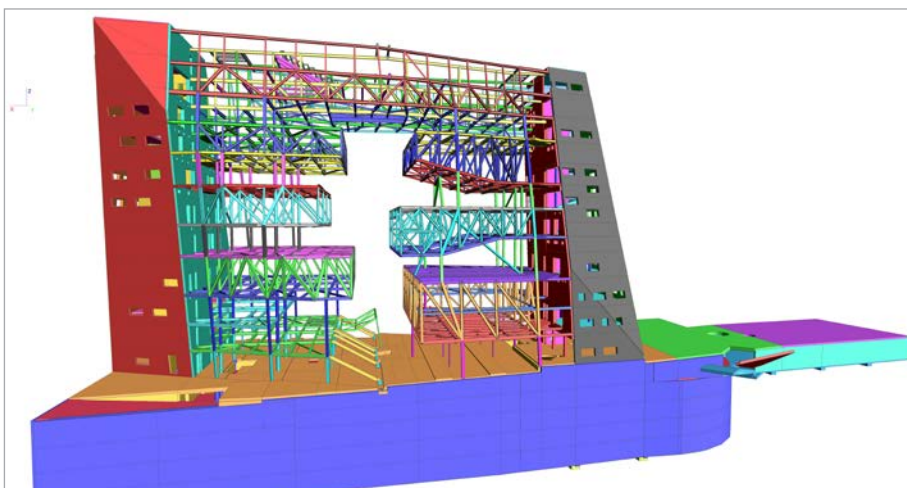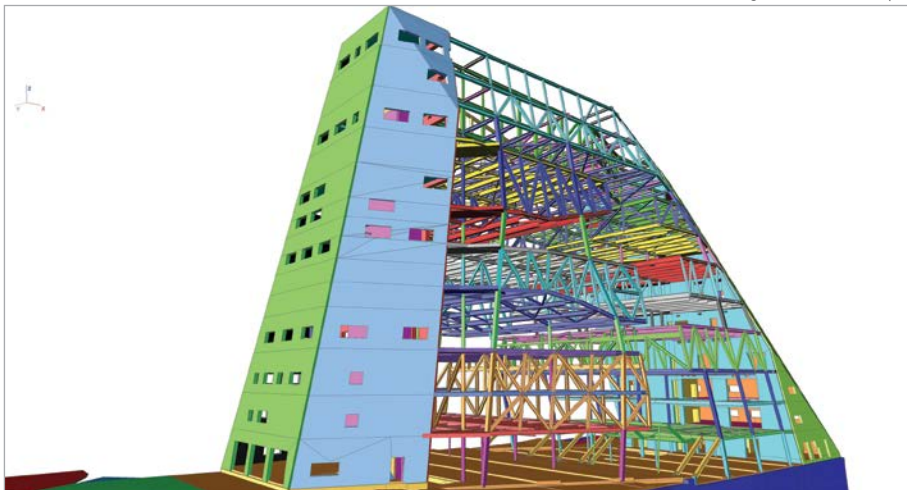
Advanced analysis

- Advanced non-linear analysis
- Stability analysis
- Natural frequencies and modes, harmonic and seismic load, general dynamics

Steel connections

- Frame rigid and pinned
- Column footings
- Bolted diagonals
- Grid connections
- Expert system library

Generation of drawings

- General arrangement drawings
- Assembly drawing of connections
- Foundation plan drawing

Parametric modelling

- Geometry, cross-sections
- Loading, stiffness, etc.
- Parametric templates

BIM engineering toolbox - Dynamic and stability calculations

Open BIM

This Edition contains a BIM engineering toolbox, enabling the exchange of models with other software packages. It includes intelligent member recognition, powerful **Structure2Analysis** conversion, automatic alignment and other functions.

The modelling capabilities are extended by intelligent detection of conflicts between structural entities. Both the geometric entities (beams, slabs) and reinforcement bars are tested for possible collisions.

Round-Trip Engineering with Allplan makes the exchange of geometry and reinforcement very comfortable and easy. The certified IFC 2x3 interface opens the doors to a whole new dimension of communication. A special link module is available for the exchange of data with Tekla Structures.

Effective teamwork is supported by a sophisticated update function that can take data from two sources (either two Scia Engineer projects or one Scia Engineer project and one structural model read from CAD software), compare them, highlight differences and merge them together.

Round-Trip Engineering with Allplan

Scia Engineer

Allplan Engineering

Advanced analysis

This Edition allows for a whole set of advanced types of calculation. Stability analysis is applicable to slender structures that may fail due to buckling.

Advanced options in non-linear analysis allow for the calculation of 2D members that are capable of resisting only compression forces, for example brick walls. Non-linear springs and gaps between individual structural members can be taken into account as well.

For projects where dynamics plays an important role, this Edition offers the calculation of natural frequencies and modes and analysis of the response to harmonic, seismic and general dynamic load. Engineers dealing with moving loads will welcome the ability to take them into account thanks to the influence lines analysis.

Design

The design of steel structures includes fire resistance checks, plastic analysis and cold formed sections.
The fire resistance checks are also available for concrete structures.

Carnal Hall, Alberti Ingenieurs SA (CH)
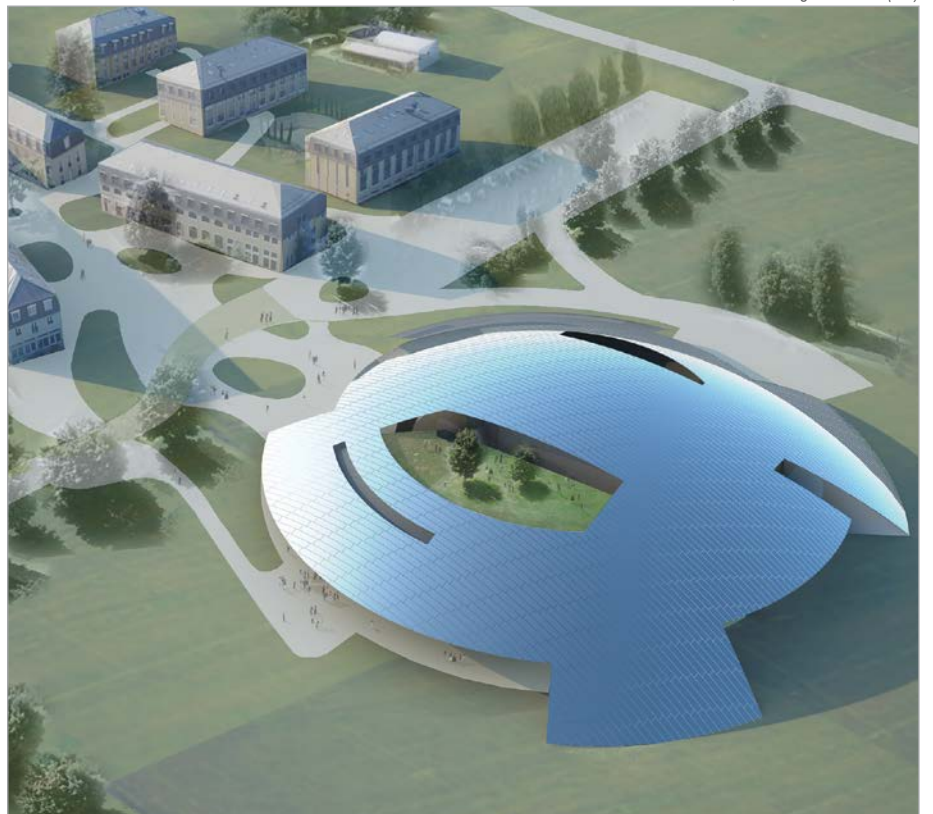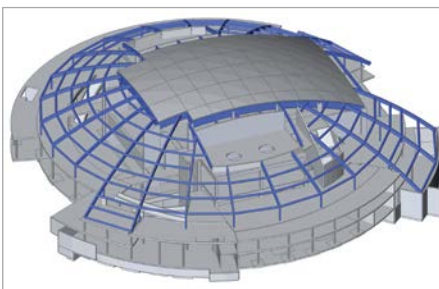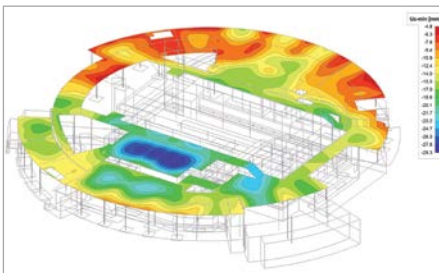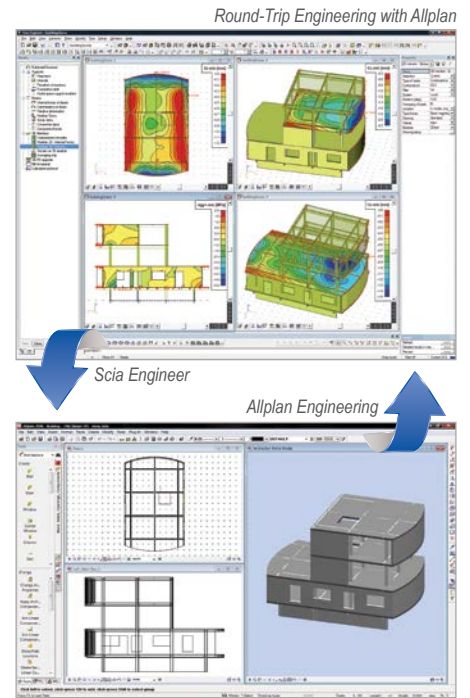
Expert Edition

Sequential analysis - Soil-structure interaction

The Expert Edition extends the Professional Edition and addresses the most demanding users. It comes with highly advanced calculation modules for slender and suspended structures as well as for structures sensitive to the construction process.

This Edition provides design tools for precast and bridge industries.

Loads

Advanced functions for input of multiple mobile loads and train loads suit engineers who must take into account the loads due to traffic.

Analysis

The Expert Edition is capable of performing such advanced types of calculation as soil-structure interaction, analysis of membranes and cables, nonlinear stability, friction springs and sequential analysis.

Design

Modern concrete structures can achieve considerable economies by using precast prestressed units or a combination of hybrid systems of precast and cast-in-place concrete.

The Expert Edition enables the engineers to design and check prestressed structures, analyse and check prestressed concrete beams, columns and concrete slabs.

For pre-tensioned structures the Edition enables the user to define the position of strands in the element, properties of the stressing bed and automatically determine the transmission lengths, even if some strands are discontinuous e.g. due to openings in the element.
In pre- and post-tensioned structures, the Edition calculates both the short-term and long-term losses and displays the primary and secondary effects of prestressing, which helps the user to analyse the behaviour of the structure in detail.
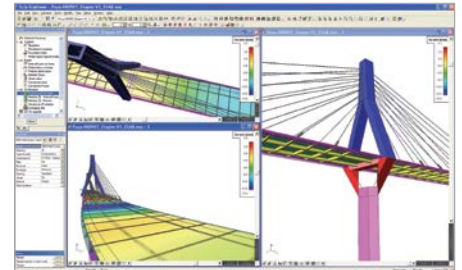
Poya bridge, GVH St-Blaise (CH)

Congress centre, Skála a Vít s.r.o. (CZ)
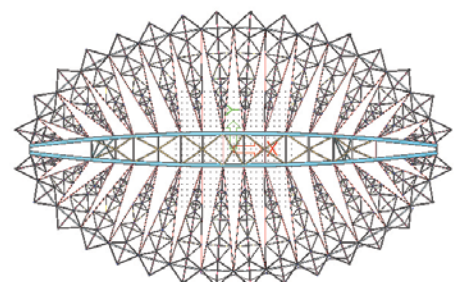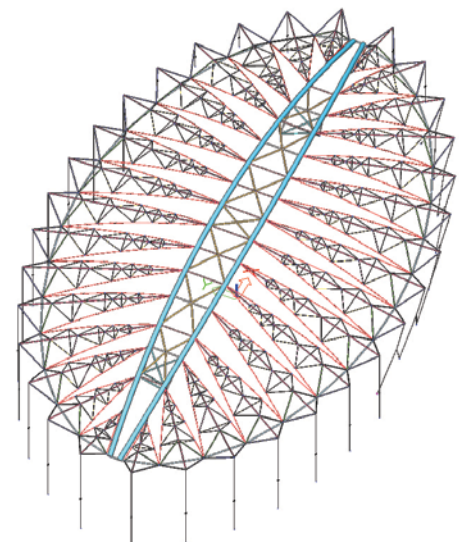
Prestressed reinforced concrete - Construction stages

Construction and operation stages

Bridge and complex building designers will welcome linear and nonlinear construction stage analysis and time dependent analysis.

The Edition represents an efficient tool for calculations of both prestressed and non-prestressed structures built in stages. Static models for the stages are generated automatically considering successive assembling or casting, change of boundary conditions and rheological effects of concrete.

The Edition allows for gradual application of load and prestressing and removal of temporary structural members. It is possible to model the complete history of the fabrication of a precast element (prestressing, casting, storage, final supports, assembling supports) and also the successive construction of multi-storey buildings.

Advanced analysis

- Soil-structure interaction
- Cables, membranes, friction springs
- Non-linear stability
- Sequential analysis

Construction stages

- Temporary supports / elements
- Precast / cast-in-place segmental construction
- Linear and non-linear construction stages

Prestressing

- Pre- and post-tensioning
- Internal and external tendons
- Short and long term losses
- Automatic transmission lengths
- Code checks

River house - Bratislava, Prodis plus s.r.o. (SK)

Bridge over the Berounka river, Novák&Partner, s.r.o. (CZ)
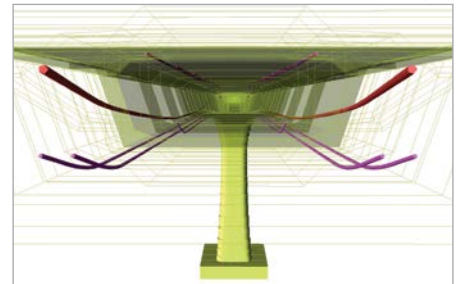
Structural Edition

Edition for engineers and draftsmen

The Structural Edition has been developed in particular for engineers and draftspersons who design engineering structures without performing the analysis or who prepare models for structural engineers (who eventually perform calculations and code design).

This Edition focuses on three main areas: modelling, structural BIM and drawings.

Modelling

The program has been designed with the main focus laid on an interactive graphical CAD-style work to enable the user to really "draw" the model of the structure on the computer screen. On the other hand, a detailed numerical input is also available.

Engineers who often work on similar types of structures will surely welcome "Parametric Modelling" that enables them to store typical parts of structures or even whole buildings as templates and re-use them later with different dimensions, cross-sections, material grades, etc.

The Structural Edition allows for an effective modelling of various types of steel connections, including automatically generated detailed dimensioned drawings for all connection parts.

Specially for engineers dealing with reinforced structures the Edition offers functions for direct input of reinforcement in beams and slabs and an open library of predefined reinforcement templates.

Interoperability - Open BIM

Successful, economical and fast realisation of a construction project requires an effective cooperation of all parties involved: architects, structural engineers, design professionals, facility managers.

The Structural Edition represents a compact Open BIM solution that makes it possible to handle structural and analysis models in one project. The Edition offers a vast number of import and export formats that facilitate exchange of data with both close colleagues and external partners.

The sophisticated update function moves the ordinary import/export capabilities to a new dimension with its capability to merge together analytical models from two separate projects or from revisions of the same project.

Interoperability - Open BIM

- Modelling in Scia Engineer
- Import of the model
- Merging of two models (teamwork)
- Alignment of entities
- Export of the model
- Generation of drawings
- Export of drawings

General arrangement drawings

Modelling of steel details

Reinforcement in beam
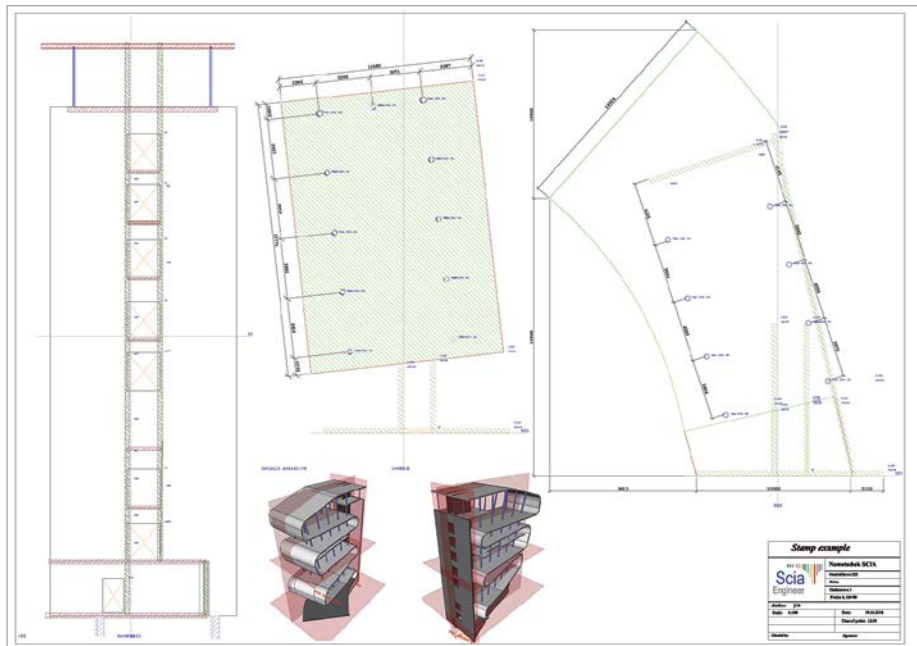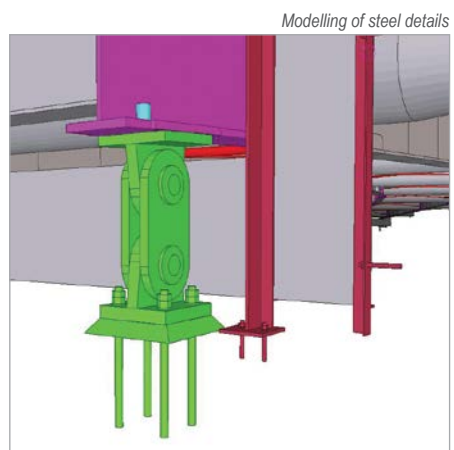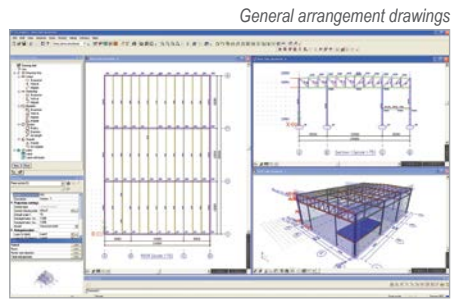
Facelift Umicore, Ney & Partners (BE)

Structural BIM with Automated General Arrangement Drawings

Drawings

Scia Engineer Structural Edition offers specialised tools for the fast and easy preparation of Automated General Arrangement Drawings. Besides the automatic generation of drawings, it is also possible to make manually the final touches in the generated drawings.

It is common practice that some details in the model must be changed at the very end of the design phase when the drawings have already been made. The drawings generated by the program can then be very simply updated as they keep complete references to the 3D model.

The Automated General Arrangement Drawings contain a set of predefined libraries for labels, dimensions and hatchings - called collectively "drawing rules". The drawing rules also provide automatic labelling of structural entities, thus reducing the manual labour. The users can use the included drawing rules or let themselves be inspired by them and set up their own company standard.

Import / Export formats

- Allplan
- IFC 2x3 (Archicad, Vectorworks)
- Revit Structure
- Tekla Structures
- Etabs
- SDNF
- DWG, DXF, VRML
- StepSteel
- XML
- Augmented Reality software

Office and Designpark, Ingenieursbureau Stendess N.V. (BE)
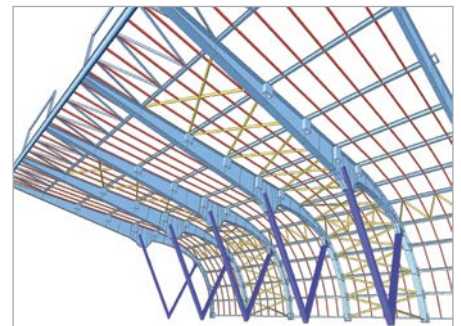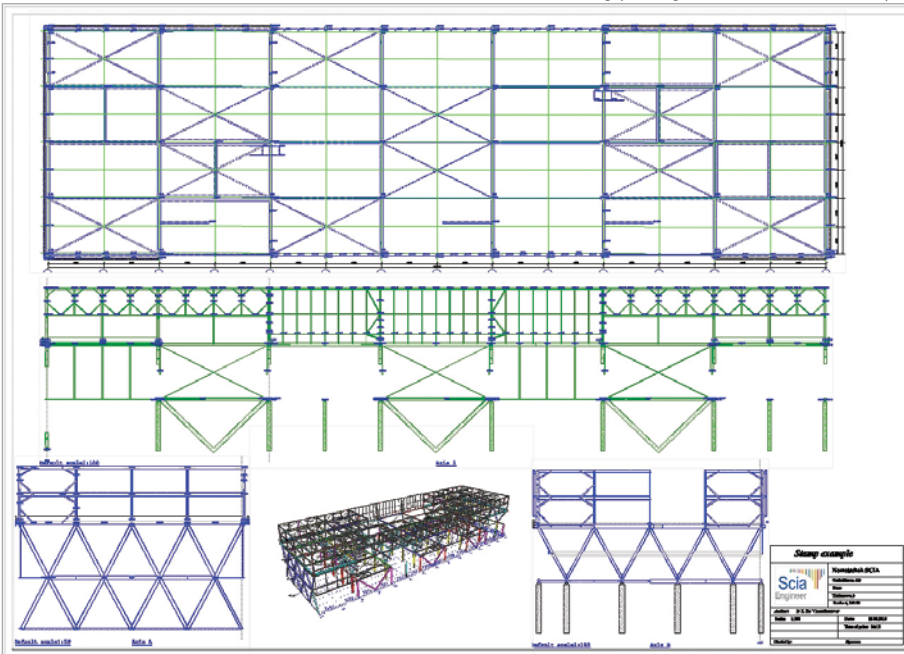
Stadium of the Alps, Grenoble,
Etudes et Techniques Internationales (FR)

Technical Specifications

Wide range of functionalities for all types of application

General - Scia Engineer user environment
- Object-oriented: with a simple right-click of the mouse button you can modify, delete, copy… everything, everywhere
- Well-structured property dialogues are used for fast viewing and editing of all object properties
- Parametric Modelling: geometry and loads
- Templates and user defined models: individual generators
- Autodesign of steel profiles and concrete reinforcement according to different codes
- Several languages to be selected for the user interface and reporting: English, Dutch, German, French, Czech, Slovak, Portuguese, Greek, Spanish, Romanian, Polish, Russian

Modeller - Input of your structure
- Beams can be straight, curved, with haunches, with holes or completely arbitrary
- Flat or curved surfaces of constant or variable thickness can have intersections with cut-outs, holes, sub-regions of different thickness or ribs
- The calculation model is 2D and 3D with a perfect integration of beams and surfaces
- A wide range of cross-sections is available in the standard profile library. It includes standard steel cross-sections (HEA, IPE, L, RHS, CHS, C, T…), concrete cross-sections, welded sections, thin-walled sections, pairs of sections, built-up sections, composite sections, aluminium sections, bridge sections…
- Load generators: water and snow accumulation, wind, soil loads, etc.
- Round-Trip Engineering with Allplan: two-way communication of geometry and reinforcement data between the engineer and draftsman
- Import and export of the model using DXF, DWG, VRML, PSS, IFC, SDNF, DSTV, XML, PDF 3D. Links are available for Allplan, ArchiCAD (Structural Work Link), Vectorworks, Tekla Structures, Revit Structure, Etabs, etc.

Calculation
- A wide variety of calculation types including linear, non-linear, prestressing, dynamics and global buckling analysis
- Linear analysis (1st order)
- Non-linear analysis
- 2nd order with initial deformation and curvature of the structure, large displacements
- Beams with pressure-only, tension-only, limited pressure or tension behaviour
- Gap elements
- Non-linear springs in hinges and supports (soil)
- Cables
- Dynamic analysis
  - Natural modes and frequencies
  - Harmonic loads
  - Seismic loads (modal superposition)
  - Non-uniform damping
  - Time-history analysis
- Soil-structure interaction
- Global structure stability (structural buckling: linear and non-linear)
- Mobile and convoy loads
- Membrane elements (tents)
- Pressure only shell elements (masonry walls, non-reinforced concrete walls)
- Code dependant concrete deflections (creep and cracking)
- Material non-linear analysis for concrete (redistribution of internal forces)
- Torsional buckling (warping)
- Time dependant analysis for (prestressed) concrete structures including creep, stress history, shrinkage, ageing, long-term losses, relaxation and stress redistribution
- Construction stages (linear and non-linear)
- Sequential analysis: results from one analysis are used as the initial state for a new analysis

Results
- All standard results in beams and slabs: deformations, internal forces, supports reactions, connections forces, internal stresses, contact stresses, foundation load table…
- Results are viewed generally for the whole structure or detailed for a selection of elements
- The graphical representation of results is flexible and the user chooses between different possibilities

Output - Document
- The user defines the layout of the document:
  - Tables to be printed
  - The content and layout of each table
  - ChapterMaker, fast creation of pictures and tables for a set of items
  - Customizable front page, headers and footers
  - The order: by load case, by element…
- Picture gallery for graphical views
- The document is dynamic: the tables with results are updated automatically when the input data are changed and the structure is recalculated
- A well-structured output is obtained using the automatic paragraph numbering
- The user-defined layouts are stored as a template so that they can be reused for other projects
- Active Document: the user may change the project input data directly in the document.
- The document is exported to HTML, ASCII, RTF, PDF, PDF 3D

Static and Dynamic Analysis of a Footbridge, Dipl. Ing. Stallinger Partner ZT-GmbH (AT)
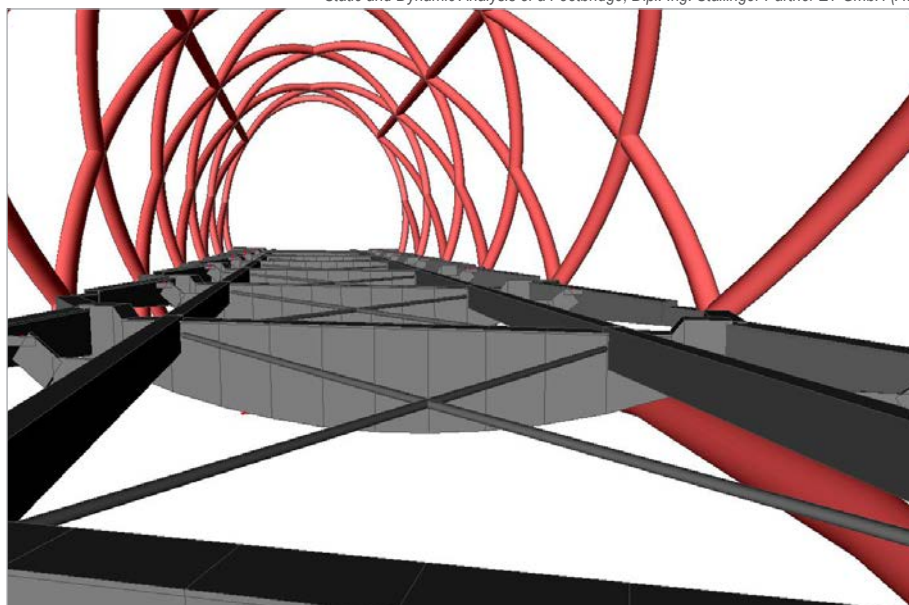
Forum Business Center Bratislava, Baran Projekt s.r.o (SK)

Steel, concrete, aluminium, composite, timber design

Steel Designer
- Steel code checks according to a large number of codes: EN 1993, AISC 2005, NEN 6770/6771, DIN 18800, CSN 73-1401, STN 73-1401.98, Önorm 4300, CM 66, SIA 263, BS 2000…
- The steel code checks include design and optimization of cross-sections, section checks, buckling and stability design, lateral torsional buckling (including 2nd order - LTB II)
- Automatic determination of buckling lengths with manual adaptations or input by the user
- Various analysis methods available: 2nd order analysis (p-delta effects, bow imperfections), non-linear analysis (hinges, supports, wind-bracings, members), seismic analysis (EN1998) and global stability analysis
- Fire resistance checks according to the latest EN, NEN and SIA
- Design of cellular beams (in cooperation with ArcelorMittal) according to ENV 1993 and BS
- Cold formed sections design according to EC-EN 1993-1-3 and AISI NAS 2007
- Connection design according to the latest EN, BS and DIN with bolted frame connections, welded frame connections, pinned frame connections, bolted diagonals and pinned grid connections
- Connection design with Parametric Modelling
- Expert system for optimal selection of a connection from an integrated library
- The design of connections with a large variety of shapes and with a large range of stiffeners, additional haunches…
- MS Excel check - possibility to display in Scia Engineer the results of checks performed in MS Excel

Timber Designer
- Timber design according to ENV 1995
- The design of timber includes the design and optimization of cross-sections and check of creep deformations

Aluminium Designer
- Aluminium design according to EN 1999
- The design of aluminium includes (bow) imperfections, transverse welds, HAZ data as well as the tools available in steel design modules (AutoDesign)

Concrete Designer
- Concrete design of beams, columns and slabs according to a large number of codes: EN 1992, BAEL 91, DIN 1045, NEN 6720, Önorm B4700, CSN, BS 8110, SIA 262, ACI 318…
- Autodesign of reinforcement in beams and columns
- Crack proof control
- Safe and economical design algorithm for bending and membrane forces in slabs, combined with an advanced algorithm for optimal steel reinforcement
- Punching check in slabs
- Prestressing and Time Dependent Analysis for EN 1992, DIN, CSN, ONORM and NEN code.
- Fire resistance according to EN1992
- MS Excel check - checks performed in MS Excel displayed in Scia Engineer

Concrete Precast Designer
- Precast Beams and Columns according to EN 1992-1-2 including fire resistance check
- Hollow core slab design according to EN 1168
- Library of Beam Strand Patterns and Reinforcement Templates
- Unique Template Analysis using Scia ODA (One Dialogue Applications)

Composite Structures
- Check of steel-concrete composite beams and columns in accordance with EN 1994 for buildings and BS 5950
- The design of structures includes final (composite) and construction (non-composite) stages and fire resistance design

Foundation Designer
- Pad foundation design according to EN 1997-1: design and optimization tool is available also in the Pad foundation stability check service as well as in the overall AutoDesign
- Pile design according to EN1997, NEN

Special Steel Designer Modules
- Scaffolding design: Input of initial deformation, member and connection checks for scaffolding structures according to EN 12811-1
- Power mast checks: special checks for high voltage power mast according to EN 50381-3-15

Scia Pipeline
- Design of 3D pipelines for onshore and offshore applications

Detailer
- Automatic generation of professional quality steel and concrete general arrangement drawings
- Generation of anchorage and implantation plan
- Different planes are selected and a picture is generated for each plane
- User-definable layout including all kinds of dimension lines
- Possibility to add texts, lines, circles…
- Final drawing is composed in the Paperspace mode and is printed or exported to DXF, DWG…

SONOCENTRUM, Hladik a Chalivopulos s.r.o (CZ)
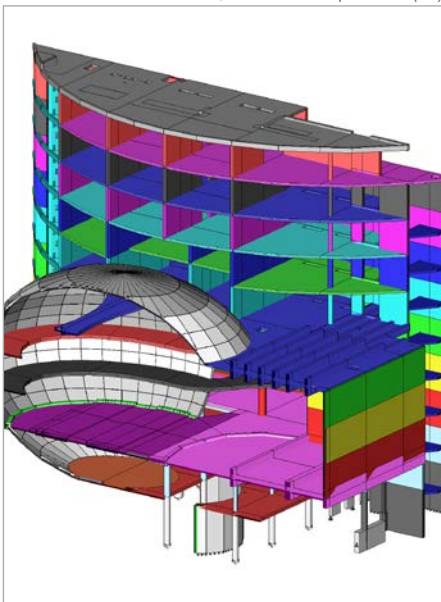
Scaffold above a Nuclear Power Plant, COMI service (FR)
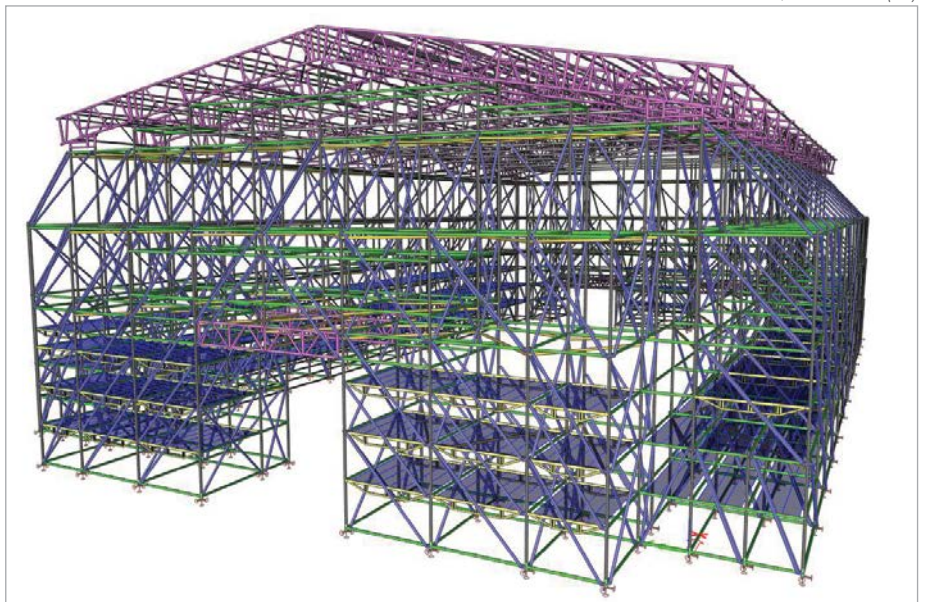
About Nemetschek Scia

Since the very first time computing devices entered our lives, engineers have been dreaming about an automated design of structures. The beginnings were humble but soon the dreams started to come true. The rapid development of hardware and software brought a revolution to the design process. Nemetschek Scia is proud to be one of the bearers of this revolution.

Established in 1974, Nemetschek Scia has become one of the world's leading developers of structural analysis, design and fabrication BIM supporting software and provides solutions for complete construction cycle for any kind of structure. Nowadays, Nemetschek Scia is a fully owned subsidiary of Nemetschek AG - a global leader in software that supports the Building Information Modelling (BIM) workflow.

We are specializing in the development of software for advanced engineering calculations. Constructions that are built with the help of Nemetschek Scia software can be found all around the globe: the shopping malls you shop in, bridges you drive over, roller-coasters that shake you up, tunnels that bring you to the other side of the mountain, the buildings you live and work in and many others. Thanks to the help of our software these engineering masterpieces are not only safe, but also resistant, innovative and technically impressive.

Nemetschek Scia in Figures

- 120 highly educated employees in 15 international branches and agencies
- Almost 40 years of experience
- Integrated building codes for 16 countries
- Software available in 13 languages and distributed in more than 50 countries
- More than 8 000 licenses sold to more than 5 000 customers
- In the top 3 of worldwide companies in its specific market

Product Segmentations

Nemetschek Scia's products target 4 business areas
- Structural analysis and design software (CAE)
- Software, services and projects for CAD, fabrication management and ERP for the construction industry
- Software, services and projects for CAD of reinforced concrete structures and production logistics for the prefab concrete industry
- Structural BIM solution

ISO 9001:2008 Certification

Nemetschek Scia has obtained the certification for its internal quality assurance system according to ISO 9001:2008. The scope of supply:
- Nemetschek Scia offers standard software on structural modelling, analysis, design and detailing for engineering consultants and contractors, industry and governmental offices
- Nemetschek Scia offers also customised software and IT services of design, detailing, project management and fabrication of steel and concrete structures
- Nemetschek Scia offers training, consultancy and advice on Scia products and Scia product related processes

The certificate concerns the following organisations and sites: Nemetschek Scia nv (Belgium), Nemetschek Scia BV (The Netherlands), Nemetschek Scia sarl (France), Nemetschek Scia s.r.o. (Czech Republic), Nemetschek Scia s.r.o.(Slovakia).

www.nemetschek-scia.com

SciaEngineer092013-EN