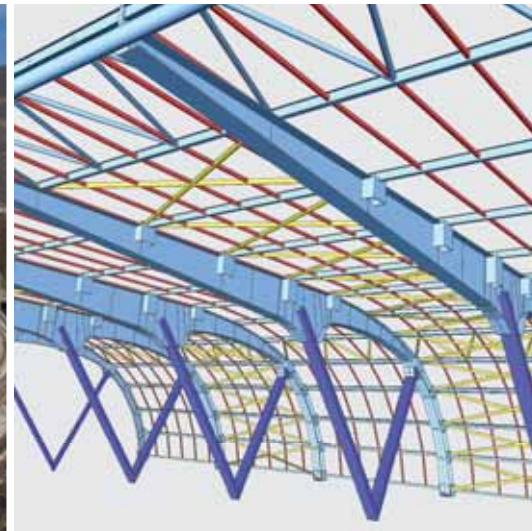




Stade des Alpes - Grenoble
Etudes et Techniques Internationales (ETI)



The latest technology for modelling, analysing, designing and detailing of all types of structures in 1D, 2D, 3D and 4D

Supporting Structural BIM (Building Information Modelling)

Innovation



Scia Engineer is a software platform for structural engineers. It models, analyses, designs and details any type of structure.

Versatility

- From the simplest to the most complex constructions made of concrete, steel, aluminium, plastic, timber or mixed materials
- Local and international codes integrated
- Internal link between analysis and drawing components
- Bi-directional coherent link between the analysis and structural models (CAD) with a BIM (building information modelling) workbench
- Extensive calculation functionality (linear, 2nd order, stability, prestressing, dynamics...)
- International applicable software (with a comprehensive range of design codes for various countries)
- Structures with simple to complex geometry: straight beams, curved beams, flat and curved surfaces with reinforcement and varying inertia
- Detailing: design of bolted and welded steel connections as well as practical concrete reinforcement
- The newest design techniques, e.g. fire safety control for steel, concrete and composites
- "Member Recognizer": automatic transformation of general structural shapes to analysis elements
- "Parametric modelling": fast solution for often-repetitive analysis; user-made libraries of components; optimization – design with variety of parameters
- Open program interface for customization by users
- Continuous development by an experienced and erudite international development team



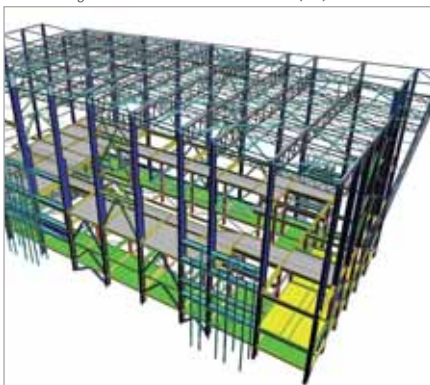
Bratislava airport terminal,
VIN Consult s.r.o. (CZ)

"Template Analysis"

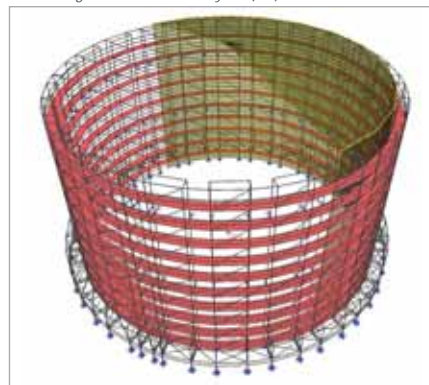
"Template Analysis" provides fast, dedicated and easy-to-use solution for **repetitive calculations**. If the engineer wants to use the same kind of project in the future, then he defines his model in Scia Engineer using the standard way of working, **assigns parameters** to the relevant properties (spans, loads, supports, etc.) and saves the project as a **template**. Typical application: precast RC beams, steel portal frames, concrete slabs or simple bridges, water tanks, etc...

Obtain better and more complete understanding of behaviour of structures

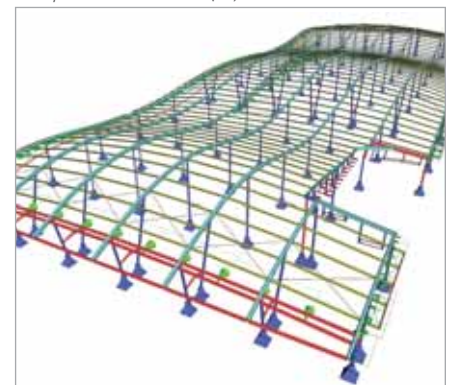
Nuclear engine room, Baudin Chateauneuf (FR)



Scaffolding around tank, Travhydro (BE)



Transport terminal, Movares (NL)



Speed and Quality



Exceptionally user-friendly, precise and complete interface, clear visualization, calculation functionalities and professional outputs.

Speed

- Working graphically with intelligent structural objects (beams, columns, walls, floors, shells...)
- An open library of parametric models for fast generation of new structures
- Load generators (3D wind, load panels transferring loads to beams and/or nodes, snow, soil, water accumulation...)
- Automatic finite element meshing including mesh refinement for accurate results
- "Autodesign" and detailing following building codes for steel, concrete, composite, wood, aluminium ...
- "Active Document" with bi-directional link between the project model and calculation report
- "Template Analysis": fast and easy reuse of user-generated parametric models for creation of new designs
- Support of 64 bit processors: allowing higher computing speed and utilization of the entire available memory

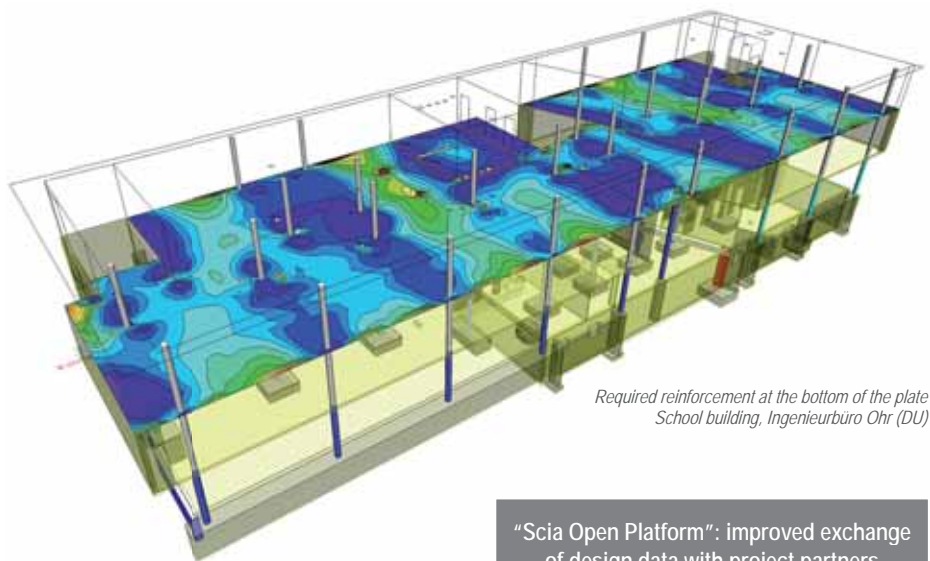
Quality

- Analysis and structural model are integrated: possible mistakes are eliminated
- High quality visualization of both model and results
- Reliable calculation results make it an indispensable tool for everyday use
- General arrangement and connection drawings are automatically generated from the 3D model
- Professional calculation reports
- Continuous development and customer support provided by an ISO 9001 / 2001 certified company

"Autodesign"

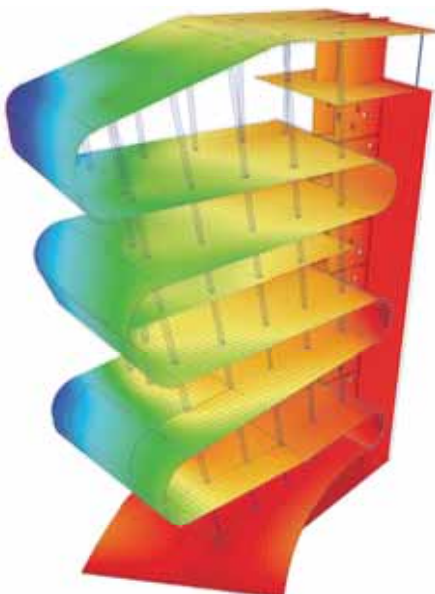
Scia Engineer allows for an **optimum design of steel and concrete structures**. **Advanced automatic optimization** is performed according to design code provisions and additional rules specified by the user who can also define relations between different parameters. Structural items that can be optimized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

Cooperation with industrial partners:
ArcelorMittal, Echo, Tekla, Deltares, etc...

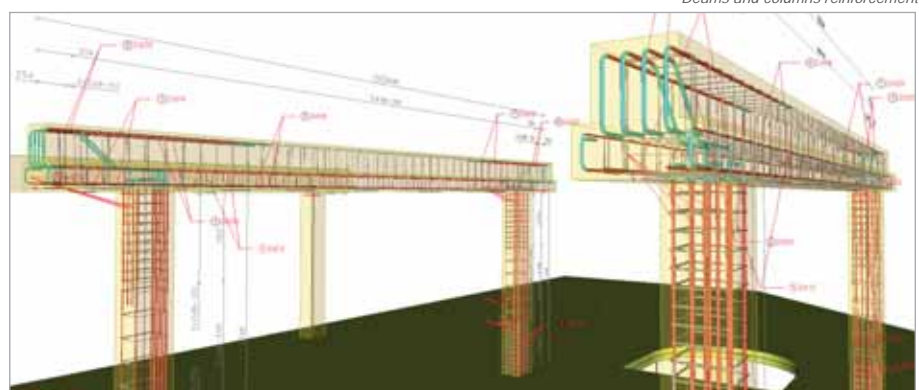


Required reinforcement at the bottom of the plate
School building, Ingenieurbüro Ohr (DU)

"Scia Open Platform": improved exchange
of design data with project partners



Office building "Umicore", Ney & Partners (BE)



Beams and columns reinforcement

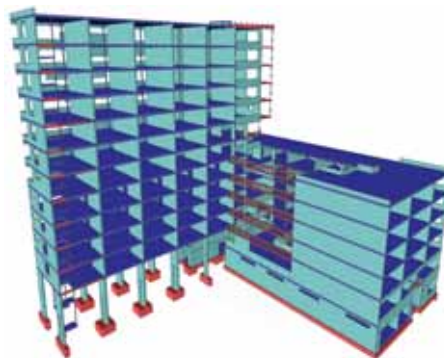
BIM solution



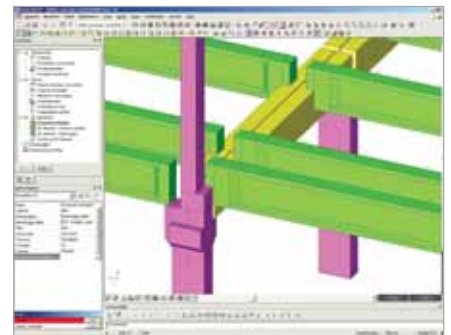
Scia Engineer is the building information modelling (BIM) solution that supports the full engineering work, from concept to detailing and construction.

Wide support of the BIM process

- Any material, any geometry, and any size: the full structure is modelled with Scia Engineer
- First "Parametric Modelling" software for structural engineers
- User-defined templates to generate building parts and speed up modelling
- Information rich objects, user-defined attributes
- "True-Analysis": two models aligned internally, i.e. the structural model and analysis model. The engineer is mastering his analysis model, while keeping integrity with the architects and detailers
- Efficient change management through the BIM workbench
- Advanced collaboration: conceptual design alternatives are quickly shared with the project owner, architect, MEP engineer, fabricator, contractor ...
- Changes to the model are automatically reflected in all related tasks: design and analysis, engineering reports, bill of material, drawings



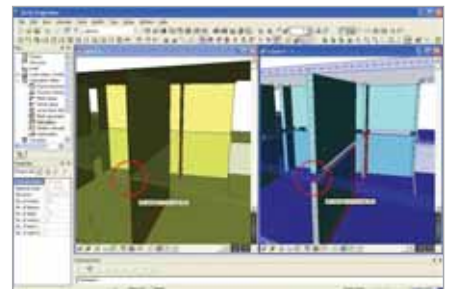
Block of apartments,
Adams Bouwadviesbureau bv (NL)



Prefab elements, Structo (BE)

"True Analysis"

Most structural analysis and design software systems traditionally work with what is called "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 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.). The user can decide which of the models is the primary one and the other one is automatically created by Scia Engineer.



Structure-2-Analysis

React quickly 'in real time' to each modification to the structure and increase the profit margin

Guaranteed quality and contribution to safety control

"Parametric Modelling"

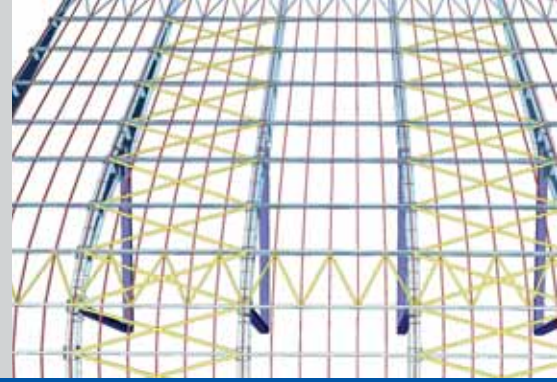
In "Parametric Modelling" numerical values of selected properties of a model, such as node coordinates or load values, are replaced by variables. These can hold a simple value or even a formula with standard arithmetic and Boolean operators. Parametric properties are: coordinates, sections, materials, all types of loads, masses, diameters of rebars, prestressing force, etc. This is used for parametric project templates and for optimization. The designer is able to quickly analyse and evaluate different project variants.

Interoperability is an essential part of Scia's BIM concept (Building Information Modelling)



U2 stage 2009 tour - "The Space Station",
Stageco (BE)

Communication



Innovation and productivity in structural design are getting a big boost thanks to interoperability options of Scia Engineer.

High level of interoperability

- A structural model is obtained directly from the CAD-package and possible changes are sent back
- "Member Recognizer" creates the analysis model automatically
- "Round-Trip Engineering": sharing of the structural model with Allplan, including geometry and reinforcement
- Direct support of Revit® Structure and Tekla Structures API's
- Steel industry exchanging standards: SDNF, DSTV, Step Steel
- Seamless data-exchange via IFC, XML, DWG, DXF, VRML, etc.
- Engineers have full control over changes in the model made by architects
- Collision check for geometry of structure and reinforcement

Competitive advantages

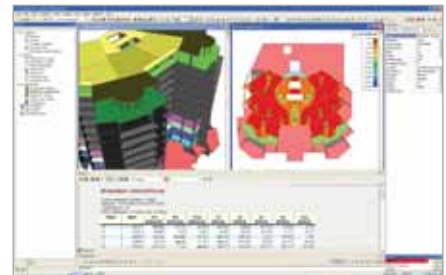
- Shorter time to design a project
- Higher productivity with improved quality of engineering work
- Cost reduction thanks to optimization of weight, correct design and code compliance
- Better communication and coordination: real help to understand the structural behaviour
- The best structural design software in the BIM process
- Easier and faster detection and correction of conflicts and errors



Storage structure, PRECI (FR)

"Structure-2-Analysis"

The powerful "Structure-2-Analysis" 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 the model.



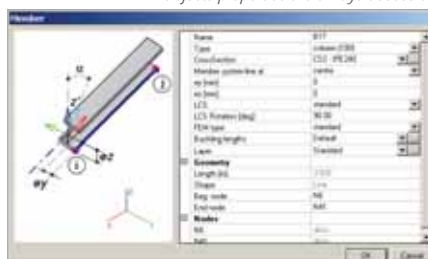
Round-Trip Engineering
between Scia Engineer and Allplan

Enabling innovative structures

"Round-Trip Engineering"

The "Round-Trip Engineering" link between Scia Engineer and Allplan represents an iterative process of reviewing, refining and changing of structure details during the preparation of the project. This two-way communication of geometry and reinforcement data between the engineer and draftsman reduces the time required for completion of the project, helps avoid mistakes and results in substantially increased productivity in comparison with paper transfer.

Objects properties are always accessible



Scia Engineer Certifications:
CTICM, Komo, IFC 2x3...

Analysis and Design



Advanced analysis and design functionalities integrated with modelling and reporting.
All-in-one software platform.

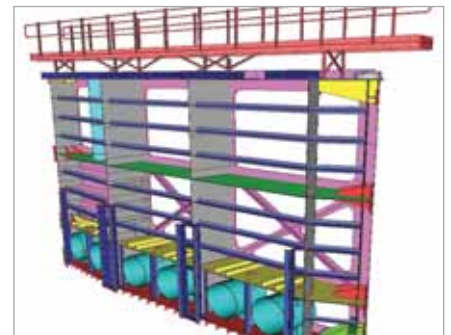
Analysis

- Analysis of all types of structures are performed by the fastest finite element computing engine
- Simulation of various loads (wind, snow, soil, earthquake, water accumulation)
- For projects where dynamics play a role, calculation of natural frequencies and modes and analysis of response to harmonic and seismic load are available
- Efficient design of cable-stayed and masonry structures with the help of non-linearity functionalities
- Large deformations and stability analysis allow for analysis of slender steel structures and shells
- Experienced engineers welcome "Sequential Analysis" that moves the design to the utmost limit of the contemporary technical capabilities

Design

- Truly code compliant: Eurocodes (with N.D.P.'s), American and other international design codes
- "SnapCheck" for fast assessment of local structural safety
- Design decisions visualized graphically
- Reflecting the evolution of technical codes for all materials: steel, concrete, composite, wood, aluminium...
- "Autodesign" functions automate the design process to find out the minimum weight or cost

- Design integrated with detailing: steel connections with bolts, welds ...; steel reinforcement with practical layouts
- Advanced design competence: fire resistance, concrete cracking, plasticity, Pi Delta effect
- Dedicated design know-how for specific structures: high rise buildings, prestressed slabs, precast concrete, post-tensioned bridges, steel towers, pipelines, scaffolds, plastic tanks...
- Special modules for pre-engineered buildings



Lock complex, Stendess (BE)



Construction Stage 1



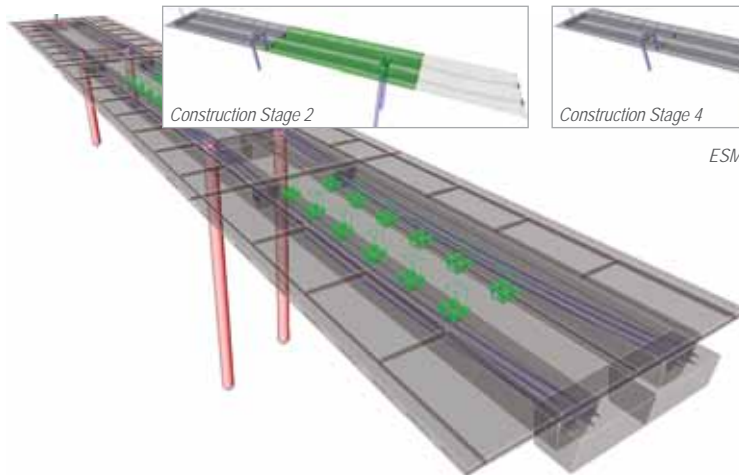
Construction Stage 3



Construction Stage 2

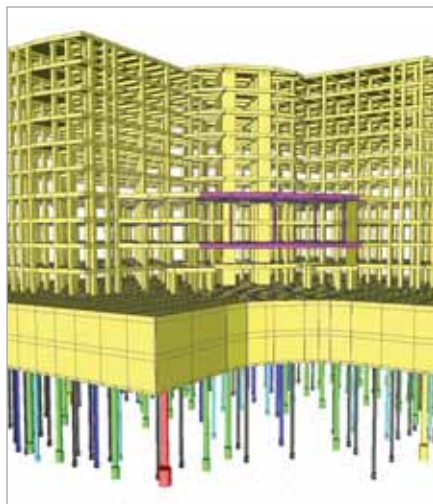


Construction Stage 4



ESM Ingénieurs Associés (CH)

Pile foundations



"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.

"SnapCheck"

"SnapCheck" gives the user the power to not only perform a global Yes/No check of the structure, but to quickly investigate **detailed results and code checks for any single element** in the structure. Whether a steel code check of a beam or steel connection, an analysis of reinforced concrete interaction diagram or stress/strain situation in a prestressed concrete section.

Reports and Drawings



Impressive presentation of model, calculation results, design options and final checks.

Reports

- Professional calculation reports consisting of input data and computed results presented in tables and illustrations
- "Active Document" with bi-directional link between the project model and calculation report
- "ChapterMaker" technology enabling fast and customized creation of sub-chapters for any collection of items like members, profiles, load cases, combinations, etc...
- Tailor-made composition of tables to suit particular needs of the customer or project-type
- Definition of a company style to create a uniform layout of all documentation
- Predefined document templates make reporting as easy as possible
- Export of reports to PDF (including 3D PDF), RTF, HTML formats

"Active Document"

Often as much as 30% of the work of the engineer is the preparation and updating of project-related documentation. With **"Active Document"** the user greatly saves that time, by:

- Creating fully customizable standard templates containing all desired information
- Updating the current document(s) to reflect the current state of the project
- Reducing the report update time to just a few minutes!

Complete and detailed control of the calculations and all results



"Active Document"

Significant added value thanks to comprehensive and professional calculation reports interlinked with the model

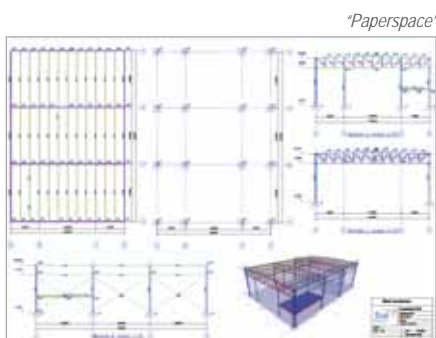
Drawings

- Extended picture gallery: stored pictures are linked with the 3D model. Both geometry and results are updated on user's request
- Automatic 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 with 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.

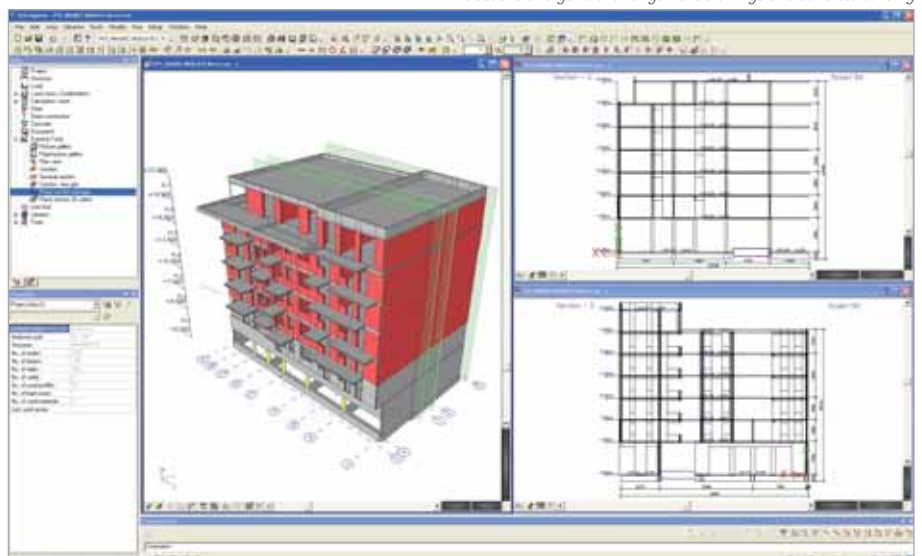
"ChapterMaker"

"ChapterMaker" automatically creates chapters and sub-chapters showing tables and images for each element of a specified set, always up-to-date with the corresponding numbers in the current project. The output may be nested, to show for example a bending moment diagram for each load case, etc...

Sections and general arrangement drawings of a concrete building



"Paperspace"



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, Spanish, Romanian and 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, sheet welded 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
- EN code implementation: easy and fast handling of national annexes
- Import and export of the model using DXF, DWG, VRML, PSS, IFC, SDNF, DSTV, XML, PDF 3D. Bi-directional links are available for Allplan, ArchiCAD (Structural Work Link), Vectorworks, Tekla Structures, Revit (Autodesk), 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

- A wide variety of results in beams and slabs is viewed: 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 - The document

- The user defines the layout of the document:
 - Tables should be printed
 - The contents and layout of each table
 - "ChapterMaker", fast creation of pictures and tables
 - 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
- 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 in the document.
- The project model will be adapted automatically, the structure is recalculated and the document (results...) will be adapted accordingly
- The document is exported to HTML, ASCII, RTF, PDF, PDF 3D

Steel Designer

- Steel code checks according to a large number of codes: EN 1993, NEN 6770/6771, DIN 18800, CSN 73-1401, STN 73-1401.98, Onorm 4300, CM 66, SIA 263, BS 2000, AISC 2005, IS 800...
- 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 Arcelor-Mittal) 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" and "SnapCheck" features
- Expert system for optimal selection of a connection from an integrated library of connections
- The design of connections with a large variety of shapes and with a large range of stiffeners, additional haunches...
- General arrangements and detailing drawings generated automatically for selected model sections or for each part of a connection

Timber Designer

- Timber design according to EC 5
- The design of timber includes the design and optimization of cross-sections and check of creep deformations

Aluminium Designer

- Aluminium design according to EC 9
- The design of aluminium includes (bow) imperfections, transverse welds, HAZ data as well as the tools available in steel design modules (optimization, etc.)

Concrete Designer

- Concrete design of beams, columns and slabs according to a large number of codes: EC 2, BAEL 91, DIN 1045, NEN 6720, Onorm B4700, CSN, BS 8110, SIA 262, ACI 318, IS 456...
- "Autodesign" of beams and columns
- Enhanced 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 according to EC 2, DIN, CSN, ONORM and NEN code.
- "SnapCheck" for prestressed and reinforced concrete
- Fire resistance according to EC 2

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

- Scia Mixbeam: Composite bridge modelling, analysis and checking according to French regulations
- Check of steel-concrete composite beams, slabs and columns in accordance with EN 1994 for buildings and BS 5950
- The design of structures includes final (composite) and construction (non-composite) stage 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 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
- Steel hall modeller: Special wizard for fast input of steel halls

Scia Pipeline

- "Autodesign" 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 "paper space" mode and is printed or exported to DXF, DWG...