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

Scia Engineer 2010
New and Improved Features

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Table of contents

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General improvements

Performance

When working on big projects, speed and memory consumption are often the limiting factors. Scia Engineer 2010 has been tuned to support that kind of projects in a better way. We did some speed measurements, investigated memory leaks and came up with memory optimization.

We also would like to point out that Microsoft Windows operating system supports up to 3 GB on 32bit machines and up to 4 GB on 64 bit machines on condition that proper system settings are used.

Productivity toolbox

The productivity toolbox contains a number of tools to boost your productivity. Most users will know the project templates, the active document, the picture gallery or the recently implemented external check via Microsoft Excel.

New features in this 2010 version are:

- New 3D-dimensionlines with pre-definable dimension-styles

- Storeys

- Next to the existing 3D linegrids, there are also 2D linegrids. In combination with storeys, 2D linegrids make a perfect 3D grid, but with added value for drawings and a clearer representation in model view.

InBlocks

InBlocks in Scia Engineer are like a family: the definition of the InBlock is like a parent and all the instances are the kids; when daddy changes his mind (the definition is updated) all the kids will comply (instances are modified accordingly). The types of InBlocks are comparable with those of the old blocks, but with added value that they are linked to the parent-definition. InBlocks can be managed and stored in a library and used in other projects.

Reverse parameters

Templates rely on parameters. Reverse parameters are parameters which use existing values of the model - a kind of second layer in the parametrical approach of projects.

Let's take coordinates as an example. In the past the start point of a beam could be determined via a parameter which was linked to coordinates x,y or z. The endpoint would then be this value + the parameter "length" of the beam.

In version 2010 the coordinates of the start point are directly available and can be used in formulas.

Various improvements in the GUI

- Customizable GUI: our beloved graphical user-interface has also been subject to improvements. As of now you yourself can customize the property dialogues (organizing the parameters in multiple tabs) and toolbars (creating your own toolbars with the desired buttons).

- When modelling in Scia Engineer is what you spend most time on, you should take a look at the new tracking and ortho mode. They can really speed up your design.

- Those who need to export to DWG/DXF will appreciate the compatibility of layers. The resulting DWG will have the same layers as the project in Scia Engineer.

- Protection was also subject to ameliorations: the names of the commercial modules, required for opening, are now displayed in a clear way.

- Check for updates of the version. No need to go to the website and look if there is a newer version or patch. Just click the check (menu Help) and you will learn whether it's time for a download.

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- Those who deal with prestress will appreciate the bill of materials specifically made for prestress-reinforcement

- A number of thin-walled geometrical shapes were added to the profile-library. The new profiles are cold- formed channel sections, cold formed C-sections and cold formed Z-sections. Rigid link hinge-hinge is the equivalent to the "atypical beam" in Esa Prima Win. It allows selection of the internal forces which are transmitted through the 1D-member

- A number of correction sheets which focus on EN 1993-1-1, EN 1993-1-2 and EN 1993-1-5 were published recently. The necessary modifications to the codes were implemented

- We also pursued some changes in the setups, which allow easy editing of the NA-properties (concrete, steel, aluminium, wind, snow and combinations). The setup was also extended with an additional Load Default-button for entering the NA-values.

Loading

Load Panels

Load panels are auxiliary entities with the sole purpose to distribute loads onto the structural elements of the structure. A perfect solution to handle load-transfer-and-distribution in a model. In Scia Engineer we can distinct between 3 types of load panels

Load to beams

The user can create a panel with a certain number of beams.
When a surface load is applied on the panel, the load is automatically distributed to the underlying beams

Generic load panels

The Generic Load Panels option allows for a quick distribution of the surface load to the panel nodes (point loads), the panel edges (line loads) or even the opening edges

Load face panels

Load face panels are the integration of this new feature in another new development: 3D wind generator (see below). To apply 3D wind onto a building, the different facades needs to be divided into zones, according to specific load codes – each zone has its own Cp-factor which is derived from the load code.
The new loading face is a kind of surface element and works as a generator of loads for floors, wind, snow and other purposes. For wind in particular, the wind loading face is determined by its type (wall/roof) and definition of a zone.

3D wind generator

For many years, Scia Engineer contains a functionality to generate wind loads on halls. This is done by means of the 2D wind generator. The input of the frame distance is needed and the equivalent line loads are calculated on beam elements of the hall.
From now on, this functionality will be extended by a new tool: the 3D wind load generator for closed buildings. A link between the CADS wind load engine (WLE) and Scia Engineer has been created and the new 3D wind load generator in Scia Engineer allows the user to create wind loads on closed 3D buildings. The functionality is available for codes: IBC, EC-EN and EC-EN/NA UK.
The following 2D elements are supported by this wind generator: Slabs, Walls and Panels.

Traffic loads

Bridge designers tend to search for the location of traffic loads which cause the worst effects on the structure. The precise solution is very difficult and mostly the specific position causes the worst effect only for one specific quantity (moment, reaction, displacement,…) in one specific position. All solutions used in current design practice mainly lead to approximate results.

Scia Engineer offers a tool which can help the user to cover higher probability for the majority of worst cases.
With the Lane Load Validity option in the Lane Load Manager, the user can input positions to define intervals, including the applicable factors for each interval.
The lane validity items for the traffic load generation are stored in a standard library.
The validity of the generated loads is visualized in the graphical window with its own view parameters.

IBC improvements

IBC 2006 seismic spectrum

Scia Engineer already offers a wide range of standards when it comes to seismic spectra. As of v2010 the input type "IBC 2006" will be available in the code parameters for generating the seismic spectrum

2D wind & snow generator for ASCE 7-05

In the general project data, when using the international building code IBC, a special wind and snow setup can be found

Load combinations according to ASCE 7-05 and IBC code environment

Specific settings for loads, concrete and steel and cold formed structures are accessible in the project data dialog.

Interoperability

Structure2Analysis improvements

Structure2Analysis is used to transform a CAD-model into a model which is suited for structural analysis. Version 2010 offers additional features to make your transformation even easier. 1D members can be joined with a slab or considered as ribs. The import of general shapes – even the more complex ones - and their conversion to beams, walls or slabs has been improved.
For the alignment and connection of 1D members a new approach was implemented.

Interfaces

Nemetschek is one of the leading forces in the BIM-development and is always looking for the best ways to exchange data between different software. Lack of openness is one of the major inhibitors for a good BIM philosophy. The IFC-format is already strongly supported by many parties, but we are also convinced that proprietary interfaces are part of Building Information Modelling.

In version 2010 you will find a number of interfaces which are new or have been improved.

ETABS 9

The new ETABS link is developed to combine the strengths of the two programs and allow engineers to reach the sky.

ETABS is strong in calculations of high-rise buildings, but Scia Engineer is much better in modelling and meshing a structure.. By providing a good exchange of models a user can do some modelling in ETABS, import the model to Scia Engineer for meshing and additional modelling. Later, the model can be sent back to ETABS for some specific checks. Scia Engineer also allows ETABS-adepts to use design codes which are not available in ETABS but are present in Scia Engineer.

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Design of slabs and prestressed elements is also easier in Scia Engineer.
When importing or exporting to and from Scia Engineer, the project data, geometry, cross-sections, 2D member-profiles materials, supports and loads are supported

IFC export extensions

As mentioned above, Nemetschek Scia is one of the strong believers in the IFC-technology.
That's why we tend to support this format in the best possible way.
Improvements in the 2010 version include identification of SQL-objects, identifications of edges, improvements for entity labels and descriptions, tapered members and project data.

Allplan Link 2010

Allplan – Nemetschek's CAD-application for architects and engineers – has been supported by Scia Engineer since a long time. With the new release not only Allplan 2009 is supported, but also Allplan Precast 2008.2a and Allplan Precast Part manager (Nemetschek Engineering's logistics software). As of version 2010 the Allplan 3D lines can be transferred as well.

Tekla link structural model

We offered a link to Tekla structures already in version 2009. This link allowed users to import Tekla models to Scia Engineer for structural analysis and some basic modifications to the model could be sent back to Tekla. In many cases however, the engineer does the initial design and additional detailing is done in e.g. Tekla Structures. This means that the exchange in the opposite direction was necessary as well.

Luckily enough, Tekla developed a new API just in time, based on Dot Net, which provided the ideal interface for sending Scia Engineer models to Tekla Structures .
We are now able to export 1D members to Tekla Structures and ensure property mapping.
Mapping is vital for use of the exported model in Tekla Structures as cross-section names and materials tend to differ in software.

Revit link

As far as Revit is concerned, the version 2010 supports more or less the same features as the 2009 link. In the meantime we are working hard to implement more features.

SDNF-interface

SDNF stands for Steel Detailing Neutral Format - an ASCII-format which is widely used in steel detailing practice. With version 2010 we also support import and export of this type of files (SDNF v2), including cross-section and material mapping.

COINS-interface

The objective of COINS is to improve the processes and the joint use of information in the construction-industry. Compare it with BIM if you want… but COINS takes the exchange of 3D models to a higher level. Coins takes a look at the processes which are related with setting up a 3D- model and tries to agree sector wide on the "which and how" of 3D building-objects.
Coins originates in a Dutch initiative, but as a member of BuildingSMART (IAI) it's getting more and more international attention – anyhow the underlying idea is universal.

Attributes – member data

In a BIM approach everybody wants to get as much out of the model as possible.
But before you can get things out of the model, they have to be put in. Scia Engineer provides a lot of properties for its entities, but for some users some properties are missing e.g. colour of member, pricing, insulation type,...

In version 2010 you can add custom properties to virtually any member. These are called attributes and can be evaluated inside or outside Scia Engineer.
Possible attributes are: text, numbers, check-boxes and combo-boxes. Attributes can be sent to

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the document or used for filtering

With the implementation of user-attributes in Scia Engineer, it was decided to transform all additional data (Add-data) to attributes. These so called system-attributes are also available in the property dialogue, next to the user-attributes

Analysis

Stiffness factors of structural members 1D and 2D

When dealing with high-rise buildings it is common practice to modify member properties for model calibration, like stiffness, mass and self-weight. Also when taking into account the cracked concrete in the linear analysis of a simplified model, property modifiers can be very useful. In general this kind of modifier is a multiplier value which is applied to the appropriate property. Scia Engineer 2010 now offers this new option to facilitate your work.

Integration strips

Integration strips make it possible to integrate internal forces in a section of a 2D element (e.g. wall) and evaluate the results as on a beam.

Sequential analysis

Another enhancement is Sequential Analysis; it allows the user to combine various predefined pairs of calculations and perform them in one run. The results of the first calculation are used as the initial state for the second calculation.
In practice, useful combination is for example a nonlinear static analysis followed by a natural vibration analysis. This results in eigenmodes and eigenvalues, needed for the deformed structure with e.g. bracing ties subjected to compression (which was eliminated from the calculation).

Steel

Cold formed sections

The steel design module Cold-formed steel design according to EC-EN1993-1-3 is an extension to the EC-EN module esasd.01.01 for steel code check and focuses on the design of cold formed profiles according to the European Standard EC-EN 1993. Both sectionchecks and stability-checks can be performed in the same way as for standard profiles.

Improved AutoDesign of cross-sections

When we look at the AutoDesign of cross-sections we also note some improvements. Sheet-welded sections can now be optimized according to parameters, which are within a preset range. In version 2009 it was only possible to optimize hot-rolled sections within their family (IPE only within IPE-family, HEA only within HEA-family). In version 2010 you can set up optimization-lists with cross-section families as far as they are from the library (sheet welded and library sections cannot be combined).

Concrete

New setups

For the whole Eurocode concrete environment a new type of setup was implemented with clear and self-explanatory input dialogues. The settings can be stored to an external file and shared with other users.

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Overall check

The major improvement in the concrete branch is the overall check.
A lot of checks already exist for concrete, but had to be performed by the user one by one: design ULS, check ULS, check SLS etc… What the customer really expects however, is a complete design for the appropriate construction element. This means that he wants to launch one action which does all the necessary checks. The main benefit here is that the overall check saves time and clicks. It also provides better overview. Currently 4 EN-checks are implemented for 1D non-prestressed members

- Design ULS (without detailing provisions)
- Check ULS (response or capacity)
- Check SLS (only crack width)
- Check of detailing provisions

Detailed outputs for 2D members

For 2D members we provide more output and a new service for 2D internal forces in the concrete tree. The existing reinforcement templates were revised. It's now easier and faster to insert them to the model.

Voided slabs

Voided slabs give engineers a way to eliminate concrete from a part of a floor slab that has no structural function. Void formers in the middle of a flat slab eliminate 35% of the slabs self-weight. With this module the engineer is able to adequately model, design and check a floor system made out of voided slabs. Focus is also laid on the optimization of the design and drafting process in order to make it as fast and economical as possible.
In addition, the calculated reinforcement can also be sent to Allplan for further detailing.

Other improvements

Version 2010 offers you some additional small improvements for designers of concrete structures:

- Single-layer reinforcement for walls
  Typical wall-types in the precast industry require the functionality to define only one layer in the middle of thin wall concrete elements.

- Transverse reinforcement in flanges
  Longitudinal shear stress can cause crushing and/or breaking of the flange of a cross-section. Being able to calculate and add transverse reinforcement in the flange helps to design the structure in a better and more detailed way.

- Shifting of moments
  Shear and torsion have influence on the longitudinal reinforcement; this phenomena is called shifting. In v2010 we implemented shifting into all service ULS-checks, services for design As (for prestressed as well as for non-prestressed members), check capacity (reduction of strain-stress diagram) and check response (increase of strain). As a result, the limit strain in the strain-stress diagrams will be reduced.

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Foundations

Pile design

Piles are defined as a type of support in Scia Engineer and they are integrated with the structure model and soil profiles. The soil profiles are generated from the Cone Penetration Test (CPT) data.

Pile design functionality is a dedicated tool in Scia Engineer developed in co-operation with Deltares. It enables the user to perform design and verification of bearing piles in accordance with the NEN national code.

Pad foundations

Pad foundations are used to support single columns, spreading the load to the ground below. They are generally square or rectangular in plan, with the plan area being determined by the permissible bearing strength of the soil. The shape in plan is enforced by the arrangement of the columns and the load to be transferred to the soil.
This functionality in Scia Engineer enables the user to perform a stability check of pad foundations in accordance with EC-EN 1997-1.

General Arrangement Drawings (GA Drawings)

Planviews and Sections

Modelling and structural analysis are important part of the design process but they are incomplete without proper graphical representation of the results. Scia Engineer 2010.1 is equipped with tools for the fast preparation of General Arrangement Drawings.
The GA Drawings tool works with sections: vertical sections, general sections, plan views. Based upon a new 2D linegrid and storeys, Scia Engineer 2010 produces planviews and sections automatically.

Drawings

Once the desired sections and planviews are defined, drawings can be produced. Every drawing is shown in a separate 2D window which acts as a drawing editor. Next to the automatic generation of the drawing content, it is also possible to add auto-dimensioning of the grid and autolabeling of the members. Openings in 2D-members and baseplate-connections can be dimensioned as well. All this is controlled by a set of predefined label types, hatching styles, dimension styles which are combined in drawing styles.

Those who want to upgrade the drawing even more, can use the manual dimensioning and labelling-tools within this editor.

Another powerful feature is that all member-properties are still accessible inside this drawing view. You can change them if you see fit and just refresh the drawing, of course with respect of the manual modifications to labels and dimensions.

Paperspace

The new plane sections can be inserted into the paperspace directly, on scale. No more need to put them in the picture gallery first. You can combine different plane sections with a border and even document-tables to create the perfect plan. Export to DWG, with respect to layer-structure or PDF are only two of the numerous ways of output.

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