lateral buckling restraint - attaches - steel check - creep - charges climatiques - dynamic analysis - lateral buckling - brandweerstandsanalyse - timber - 1st order - verstijvers - buisverbinding - diseño de planos de armaduras - pandeo lateral - verbindingen - shear connection - verificación - armatures longitudinales - pórtico - unión base columna - voorontwerp - unión tubular - haunch - connexion moment - cimbras - vérification acier - unity check - Eurocode 2 - mesh - retaining wall - raidisseur - Eurocode 3 - longitudes de pandeo - connections - ACI - acero - 2nd ordre - portal frame - Eurocode 8 - andamios - kip - dwarskrachtverbinding - BS - dalle de fondation - seismische analyse - armaduras longitudinales - BIM - gelaste verbinding - 2de orde - buckling - funderingszool - poutre sur plusieurs appuis - maillage - malla - uniones - 2D raamwerken - fire resistance analysis - voiles - cracked deformation - gescheurde doorbuiging - longueurs de flambement - pandeo - reinforcement - unity check - cantonera - dynamische analyse - hout - ossatures 3D - koudgevormde profielen - placa de extreme - 1er orden - continuous beam - connexion soudée - momentverbinding - praktische wapening - integrated **connection design** - renforts au déversement - fluencia - estribos - déformation fissurée - EHE - beugels - Eurocódigo 3 - platine de bout - análisis dinámico - column base plate - kruip - rigid link - welded connection - charpente métallique - AISC - moment connections - estructuras 2D - kniestuk - assemblage métallique - 3D raamwerken - second ordre - beam grid - cargas climáticas - Eurocode 2 - Eurocode 5 - wall - deformación fisurada - lien rigide - enlace rígido - 2D frames - estructuras 3D - éléments finis - vloerplaat - steel connection - seismic analysis - scheurvorming - armatures pratiques - analyse sismique - nieve y viento - practical reinforcement - charges mobiles - dalle - wapening - perfiles conformados en frío - Eurocode 3 - connexion tubulaire - unión a momento - 3D frames - treillis de poutres - roof truss - practical reinforcement design - portique - kipsteunen - análisis sísmico - B.A.E.L - uniones atornilladas - bolts - **Eurocode 8** - ossatures 2D - eindige elementen - losa de cimentación - restricciones para el pandeo lateral - optimisation - wand - kniklengtes - end plate - dakspanten - kolomvoetverbinding - stirrups - acier - staalcontrole - cálculo de uniones integrado - paroi - dessin du plan de ferraillage - stiffeners - mobiele lasten - Eurocódigo 8 - Eurocódigo 5 - longitudinal reinorcement - doorlopende liggers - rigidizador - beton armé - fluage - CTE - connexion pied de poteau - langswapening - connexions - hormigón - neige et vent - elementos finitos - armaduras - cold formed steel - jarret - uittekenen wapening - puente grúa - analyse dynamique - flambement - keerwanden - optimisation - steel - cercha - 2º orden - slab on grade foundation - entramado de vigas - Eurocode 5 - prédimensionnement - multi span beam - bouten - armatures - floor slab - poutre continue - pared - staal - 1er ordre - connexion cisaillement - losa - déversement - viga continua - predimensionering - 1ste orde - unión metálica - CM 66 - madera - análisis resistencia al fuego - verbindingen - 2nd order - bois - Eurocode 2 - profilés formés à froid - verificación acero - predesign - unión soldada - fisuración - beton - muro de contención - optimalisatie - foundation pads - fissuration - concrete - AISC - HCSS - assemblage métallique - Eurocode 3 - viga con varios apoyos - armaduras prácticas - balkenroosters - unión a cortante - buckling length - boulons - cracking - Eurocode 8 - knik - Eurocode 2 - radier - eindplaat - Eurocódigo 2 - FEM - tornillos - NEN - moving loads - balk op meerdere steunpunten - cargas móviles - funderingsplaat - étriers - analyse resistance au feu

STRUCTURAL DESIGN ANALYSIS SOFTWARE

# Diamonds

AN ENGINEER'S BEST CHOICE

# Contents

# Diamonds by BuildSoft

# Diamonds

## An engineer's best choice

Diamonds is an easy-to-use finite element software for the analysis and design of frames, beam grids, slabs, plates, rafts and complete 3D structures in steel, concrete and timber. Being a structural engineer, Diamonds will be your ideal tool to easily define model geometry, boundary conditions and loads, and finally analyse the in colors represented results. The graphic input does not only mean an enormous save of time, but you also lower the risk of making mistakes, thanks to the permanent visual control over the model. Your learning curve is short - guaranteed, in no time you are up and running with Diamonds.

## Superior user comfort

Diamonds is the structural engineer's natural working environment. Allowing for a fully transparent management of your structural design analysis models, Diamonds accommodates itself to your needs and preferences. Its highly intuitive and versatile working environment enables you to do your job in the shortest possible time frame.

## Top performance

Diamonds' analysis engine is based on the robust and powerful PARDISO sparse solver technology. Combining high-speed performance with minimal memory usage, Diamonds will solve both simple 2D and complex 3D structural analysis models in no time.

## Complete solution

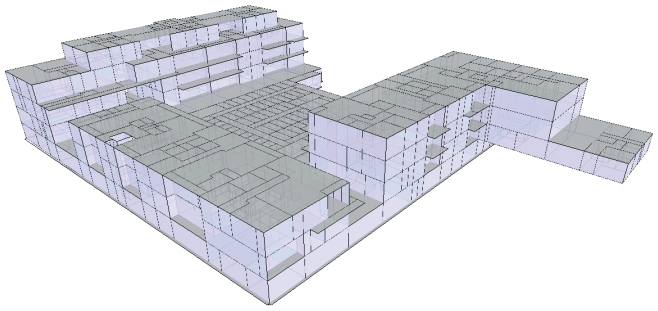
From within the user-friendly Diamonds environment, the structural engineer can easily accomplish various tasks related to the structural design analysis process — up to the creation of a well-structured report.

## Flexible product structure

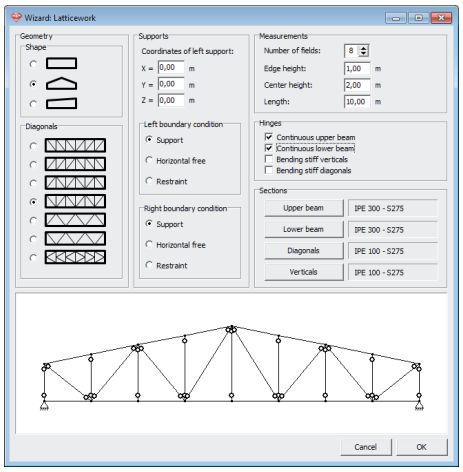
Through a series of well-planned Design Packs, Diamonds offers attractively priced solutions tailored to various customer needs. Any Design Pack can easily be extended to comply with evolving design analysis requirements

# Modeling

## Model geometry

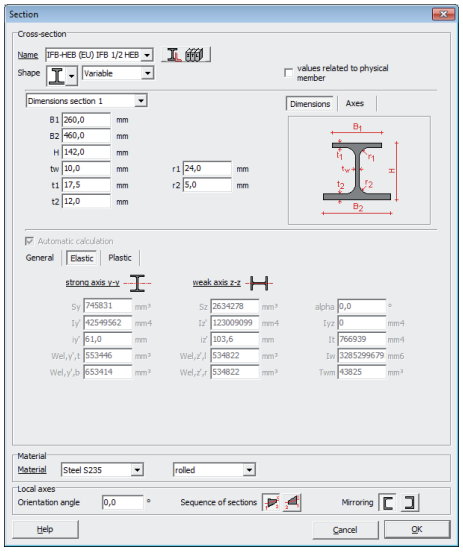


Diamonds offers you access to a wide range of tools which considerably speed up the drawing work for a 2D or 3D structure. You start by drawing the 2D model on a fixed or variable drawing grid, directly on the screen or by introducing node coordinates with your numeric keypad. You define the axes for a frame structure in a front view, the contour lines for a slab in a top view or for a wall in a side view. On selecting a series of lines in one plane, Diamonds will create all possible plates from which the contour is composes by lines out of this selection. You can always make use of the functions 'Translation', 'Copy', 'Rotation', 'Extrusion', ... to adjust and complete the model geometry with ease. This way, you built up, without any significant effort, a geometry model in 3 dimensions. If your structure is a 3D plate model, you can facilitate your work by organizing your model floor by floor with the level manager.



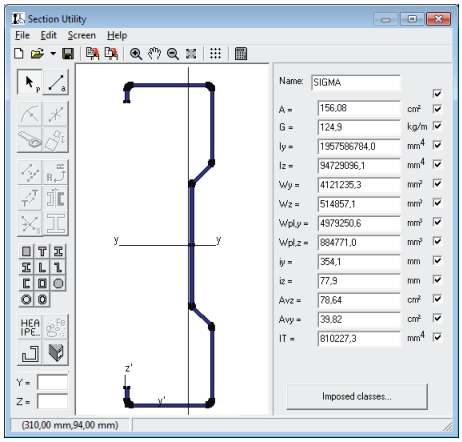

Next to the various drawing functions, Diamonds has a built-in model wizard, to quickly create a number of typical structures. You only need to enter a few parameters to generate an arch, a frame, a roof, a truss, ...

A Diamonds geometry model can also be imported from a DXF-file. Evenso, you can export a DXF-file, in order to exchange data with other CAD software.



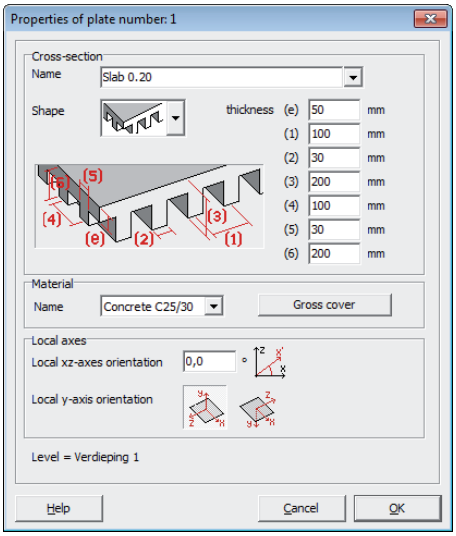

## Model properties

A Diamonds geometry model consists of points, lines and surfaces, each of them can have specific properties assigned. To bar elements, you can assign a cross section and corresponding material properties (steel, concrete, timber, ...) from the extendable material library. The cross section can be chosen from the built-in section library (which can be extended at will). Bar cross sections can also be defined based on predefined parametric shapes , like a rectangle, a tube, an I - section ,... And in order to satisfy even your most far-reaching demands, Diamonds has a built-in section generator, in which you can compose cross sections with an arbitrary shape, consisting of one or more materials.

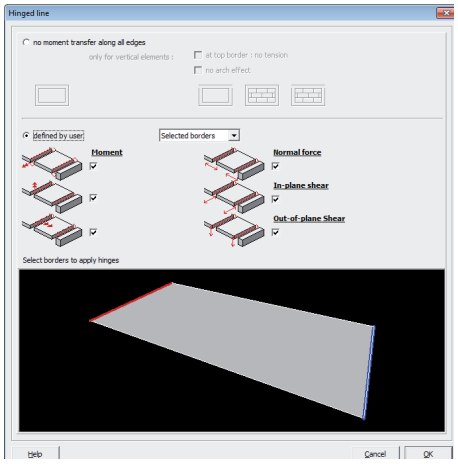



To plate elements, you can assign elastic material properties (steel, concrete, tim-

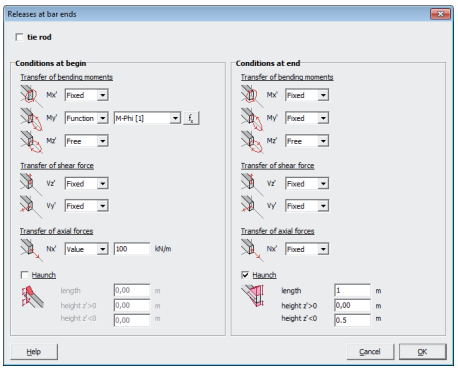
# Modeling



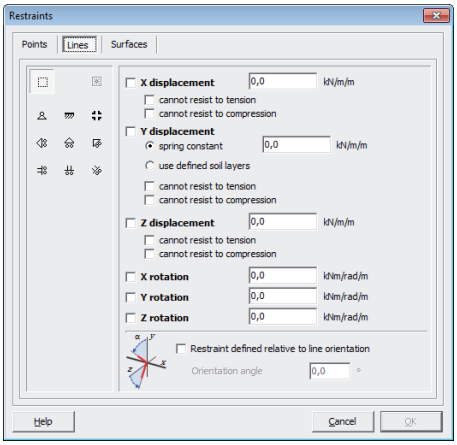

ber, ... ) and a cross section. By default, Diamonds will consider all plates isotropic and bearing in two (perpendicular) directions. Besides that, it is possible to calculate a other configurations. With Diamonds, you can calculate orthotropic plates, like pre-slab floors, ribbed slabs, waffle slabs, voided slabs, and slabs bearing in a single direction. These cross sections are easily defined by means of a limited number of physical parameters.




Obviously, you can indicate how elements should behave with respect to each other in the structure you are calculating. The connection between elements is considered as rigid by default. However, it remains possible at any time to adapt such rigidity, between bar and plates, as well as between plates or bars mutually. Furthermore, you can add a lower or upper haunch to bar ends, for which you can take into account the resistance and stiffness in the global analysis.




Moreover, you can declare bars as tie rods and vertical plates as (brick) walls with no tension transferat the top border possible. In that case, Diamonds will perform an iterative calculation, for which tie rods/tension transfer (in case of brick wall) will be eliminated if they would be active otherwise. This procedure is repeated until a valid equilibrium is found.

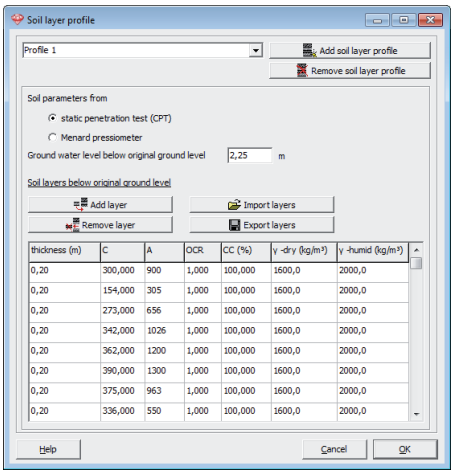



## Supports

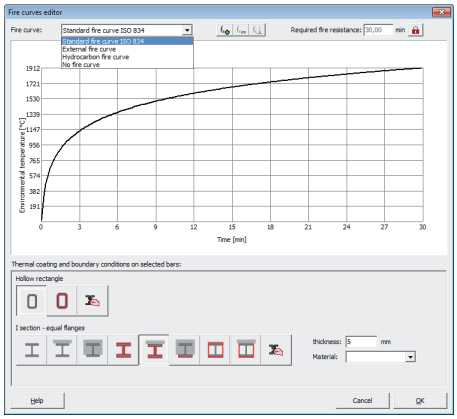
Once the model geometry is set you can define supports for points, lines and plates. Diamonds allows you to configure each of the six degrees of liberty, allowing you to create any possible support. Each point, line or plate support can be chosen as fix or defined by a spring constant. Furthermore, you can take into account the nonlinear behaviour of supports not able to take any tension or compression forces. In this way, you have a wide range of possibilities at your disposal.

# Modeling

## Foundation slabs



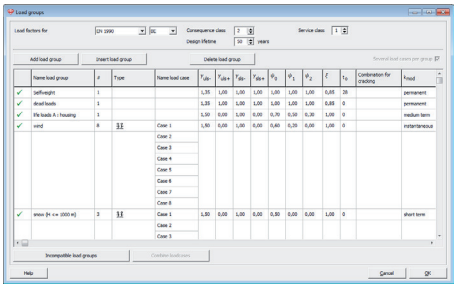

Diamonds has extremely advanced iterative calculation possibilities, by which you can describe accurately the local compressibility of soil layers under foundation slabs. The soil under the slab is replaced by displacement springs in all mesh points and the structures is calculated a first time with an arbitrary value for the springs. The iterative calculation is based on laws of soil mechanics (Boussinesq & Terzaghi). These laws can be used to calculate the stress changes due to the vertical reactions in the springs on the settlements resulted from those changes. The calculated settlements are being compared with the deformation of the foundation slab. Depending on the difference between both, the spring elements describing the soil behaviour are adjusted, until the difference becomes negligible. It speaks for itself that soil mechanical laws can only be applied if the relevant soil properties are known. These can be directly derived from the soil testing report, composed of meterings by conducted with a penetrometer or Ménard pressiometer. The above method does not only provide a great precision for the calculation of foundation slabs, it also allows you to take into account the effect on subsoil of adjacent structures or excavations. In case of excavation, Diamonds will consider appropriately the reloading constant A instead of the compressibility constant C. Thus, you can calculate more realistic and possible risks can be curtailed.




## Fire hazard

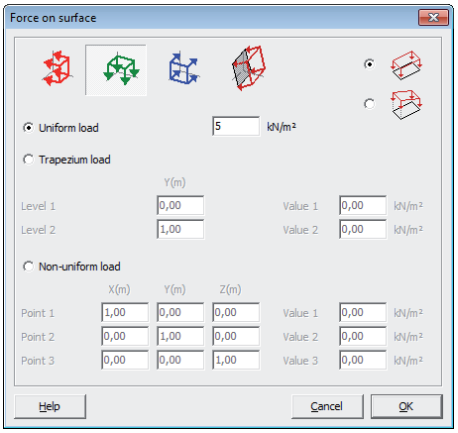
Within Diamonds' user-friendly environment thermal and structural calculation are perfectly integrated. You easily define a fire hazard based on the imposed fire curve and the required fire resistance time. You can choose from several fire curves: standard fire ISO 834, external, hydrocarbon and parametric fire. Next you specify the required fire resistance duration. Standard I or H sections from the library or sections based on a built-in shape can have three sides or all sides exposed to fire, or can be coated with a thermal coating. Diamonds allows you to create for each bar several variations of fire protection with the purpose of being able to quickly select the best possible protection.

# Modeling



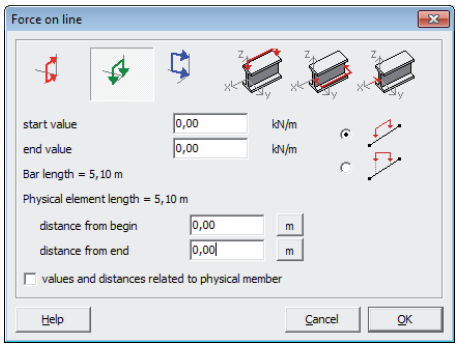
## Load groups and load combinations

With Diamonds, you have a very handy tool at your disposal to quickly define load cases and load groups according to the design standard of your choice. It goes without saying that you remain full control over all applicable safety and combination factors, design life time and consequence class. Based on the predefined load cases a corresponding coefficients, Diamonds will create automatically all requested load combinations, for ultimate limit state ULS (fundamental, accidental and seismic combination) and service limit state SLS (rare, frequent and quasi-permanent combinations). If desired, Diamonds will take into account that some load cases will act always together or never together, using sub load cases or incompatible loads.



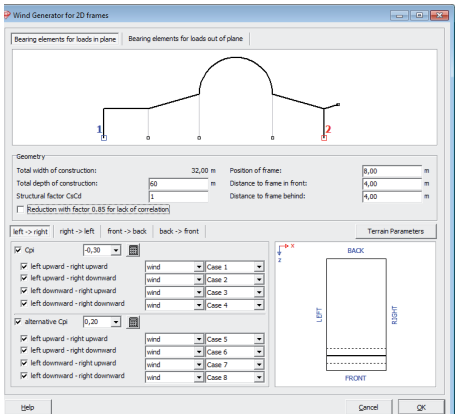

## Load types

In Diamonds, you can choose between different kinds of loads: point loads and moments in nodes of on bars, uniformly or trapezoidally distributed line loads on bars, temperature loads on bars and plates, uniform or non uniform surface loads. Such loads can be oriented according to the global axes or local axes of the elements. Distributed line loads resulting from a surface load are calculated automatically by selecting the bars caarying those loads. The input of loads is extremely easy, and thanks to the visual representation in the dialog box, an incorrect input is practically impossible.

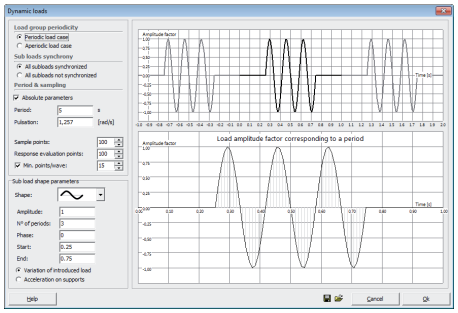



## Wind & snow generator

Thanks to the built-in climate generators, the definition of wind and snow loads is very straight forward with Diamonds. The values are are set automatically, according to the design code of your choice. Next, they calculate for you the wind and snow loads on the selected structures, based on all relevant terrain and environmental parameters. Moreover, you only need to call out the wind or snow generator only once to create all possible load cases requested by the design code. In case of wind, you can create both wind loads in plane and out of plane in one single gesture.



# Modeling

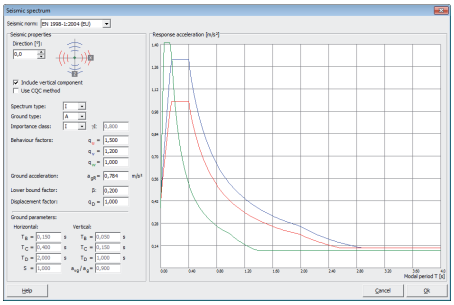


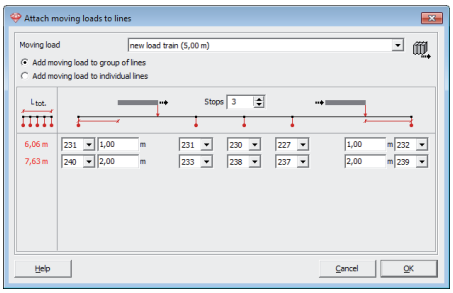

## Dynamic loads

Diamonds allows you to consider an unlimited number of loads as dynamic loads. You can take into account various types of dynamic loads: harmonic (like loads caused by a machine working at a stationary number of rotations), periodic (like loads caused by people moving around in a building) or even transient loads (of which the variation in time does not have any periodic repetition). Dynamic actions can be considered as a variation of the defined loads or as an acceleration of the supports.

## Seismic loads

For structures in seismic sensitive regions, you can impose at the base of the model a ground acceleration. The corresponding action on the structure is described by a seismic design spectrum. Diamonds can not only take the horizontal seismic action into account, by means of the seimic design spectra in two perpendicular actions, but it can also generate the vertical component of the seismic action.



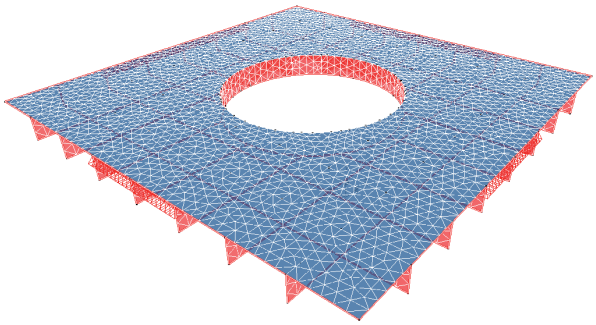

## Moving loads

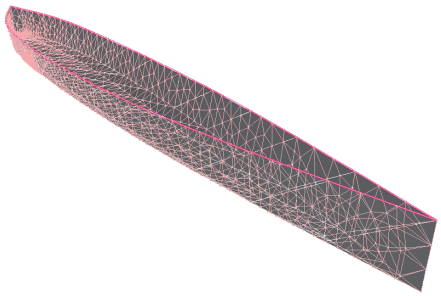
A load train is by definition a set of charges that move together according to a specified path. The flexible definable load trains are available for each load group and are modeled along straight or curved paths. A load train may consist of one single or multiple point and/or line loads. Load trains can be synchronized with each other by means of stops in between. In addition, all ever defined Diamonds last trains collected in a 'Load Train' library, available for each Diamonds project. Multiple load trains can be combined within a load group, so that the deformation and resistance of double girder crane tracks under the action of moving loads are easily assessable. When there are one or more load trains are defined, simultaneous movement can be visualized, thanks to an animated representation of the rolling load trains.

# Analysis

## Mesh generator

Diamonds has a fully automated Delaunay type mesh generator, which creates a regular triangular mesh, based on the minimum and maximum dimensions set by the user. Thanks to this mesh generator, arbitrary plate contours can be provided with a finite element mesh.



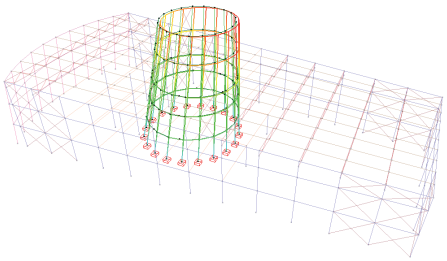


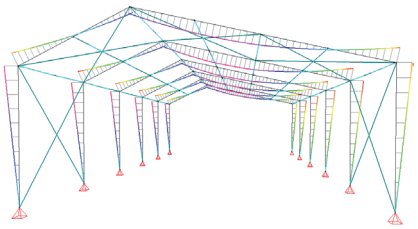
## Solver

The Diamonds solver is based on the robust and high performance PARDISO sparse solver technology. For the calculation of plates, Diamonds makes use of the triangle elements of the DKT-type (Discrete Kirchoff Theory). Such elements have outstanding convergence properties. Thanks to the degrees of liberty in the corners and the midpoints of the sides of the triangles, you can calculate with these elements accurate deformations and internal forces, even for relatively course triangular meshes. Diamonds allows you to treat easily operation intensive applications aan within a limited time frame, like the iterative calculation of foundations on soil or the calculation of deformation in time for concrete structure.

## Static analysis

On launching the static analysis, you can opt for a first-order or second order calculation. In both cases, Diamonds can take into account global imperfections by introducing a tilt. An iterative calculation will be started if the model has tie rods, brick walls or nonlinear supports. Thanks to the powerful finite element solver, Diamonds calculates elastic deformations, internal forces (M, N and V), stresses and reaction forces. All calculated results can be consulted for the individual load cases, for combinations in serviceability limit states or ultimate limit states and for envelopes of the several limit states. A clear graphical representation of the calculation results (by means of a 3D colour model, contour lines, grid, ...) allows you to analyse and interpret the outcome correctly.



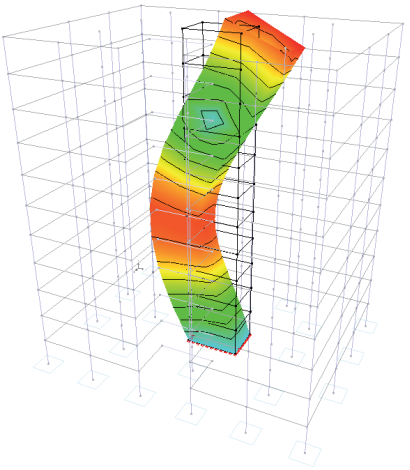


## Dynamic analysis

A dynamic load on a construction is different from a static load, because damping forces and inertia forces cannot be neglected any longer. Within the linear scope of a building, the dynamic behaviour can be described by means of eigenfrequencies and corresponding eigenmodes on the one hand, and damping properties on the other hand. Eigenfrequencies and eigenmodes are calculated by Diamonds via a modal analysis. The vibration response of the structure, for periodic loads (described by means of a Fourier spectrum) as well as non-periodic loads (described by means of time integration), is calculated by Diamonds by modal superposition. Based on this method, envelopes for deformations and internal forces are deduced.

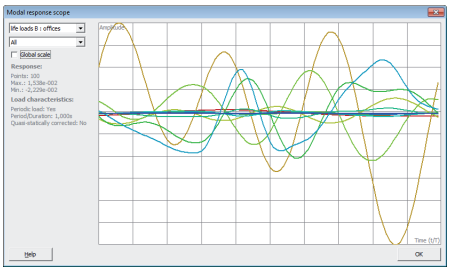
# Analysis

## Seismic analysis



Constructions in seismic sensitive regions should be designed and executed to have a sufficient high degree of probability to resist the seismic actions, without having a local or global failure. Only this way it is ensured that a structure will remain intact after an earthquake, and that it can keep on fulfilling its assigned function.

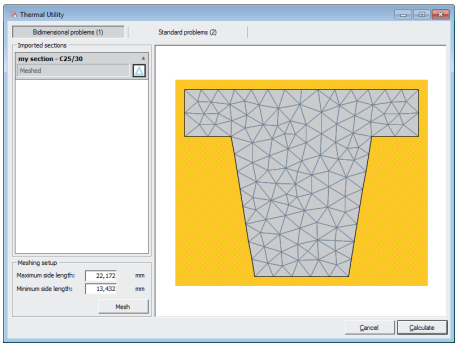
After applying the seismic design spectrum, Diamonds uses a multi-modal calculation scheme to compute the response of the construction under the seismic excitation. Here the concept of 'effective modal mass' is used. The importance is found in the fact that the sum of the effective modal masses (in case of an unlimited number of modes) is equal to the total mass of the construction.




In case where the sum of the effective modal masses of the calculated eigenmodes is smaller then the total mass, Diamonds will apply a quasi-static correction. This takes into account the contribution of the non-calculated eigenmodes on the dynamic behaviour of the structure.

## Thermal analysis

Diamonds has an advanced thermal calculation heart that is adequate to calculate the thermal response for both slender steel as to calculate massive concrete cross-sections. First of all, temperature rise or temperature gradient in the cross-section is calculated. The thermal response analysis depends upon the defined cross-section. The temperature rise in a standard steel cross-section is in the application of a nominal fire curve calculated on the basis of simplified differential equations. For all other sections, the temperature distribution over the cross section is calculated in the advanced thermal solver.

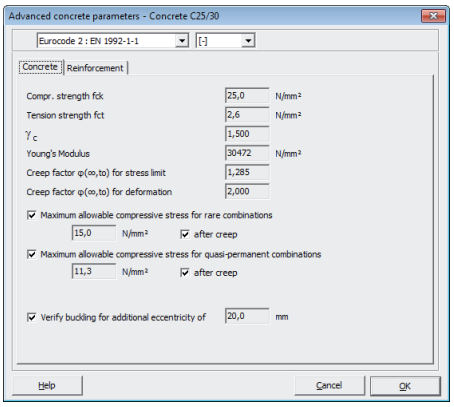



Finally, the different load groups and combinations are calculated. For steel, respectively concrete, the user needs to carry out an unity check reinforcement calculation, on the basis of the obtained internal forces. Of course, all the theoretical reinforcement sections and the strength - and stability checks have taken into account all generated combinations and reduced elastic properties. There is access to all the results on the thermal response calculation through a detail view of the heated section. The animated display shows the global warming of the section for the requested fire resistance duration.

# Concrete design

## Concrete and reinforcement parameters

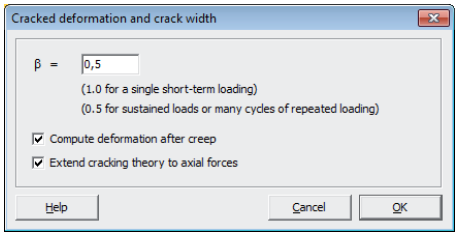
For members in reinforced concrete (beams, slabs, columns, plates), Diamonds will calculate the theoretical reinforcement quantities, required to resist the internal forces. Such an organic calculation is based on the mechanical properties of steel and concrete (yield strength, compressiong strength, tension strength, E-modulus, creep factor, ...), and determines for all cross-sections the required reinforcement quantities, within the proposed minimum and maximum limit values.

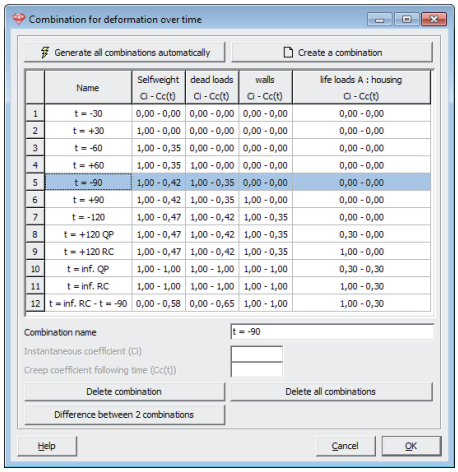



## Reinforcement quantities calculation

The organic calculation of reinforced concrete members can be executed in Diamonds according to Eurocode 2 (EN 1992-1-1 with National Annex), AC and many national European standards. Both the requirements in ultimate limit state and serviceability limit state will be checked. If the minimum required reinforcement quantity is larger than allowed the maximum value, the user will be informed by Diamonds in an explicit way.

The representation of the calculated reinforcement quantities is by the means of a 3D colour model (with colour scale in function of the (practical) reinforcement), iso-lines, or a grid. It remains at all times possible to export the calculated reinforcement of the beams to ConCrete Plus. Based on these theoretical quantities from Diamonds, a detailed reinforcement plan can be generated.




## Cracking calculation

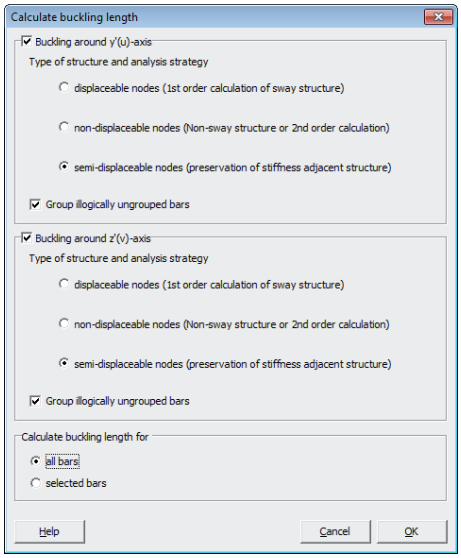
One of Diamonds' strongest points is the possibility to calculate the real (cracked) deformation of reinforced concrete members. Such a calculation remains a challenge, because of the cracking and creep (whereby concrete cannot be considered as an elastic linear material anymore), causing concrete sections not to fully contribute anymore to the bending stiffness. After the calculation of the reinforcement quantities, Diamonds will determine the total deformation, taking into account the effects of concrete cracking and creep. In addition, the minimum reinforcement quantities (according to the design code) and practical reinforcement defined by the user are also taken into account.

Besides that, BuildSoft has developed an innovative method for the calculation of time dependant deformation for reinforced concrete members. Diamonds calculates the evolution of the deformation by on the one hand considering the evolution of the loads as a function of time and by on the other hand monitoring the effects of cracking and creep in time. Such a method does not only allow you to calculate the total deformation, but also to determine the additional deflection after applying specific loads.

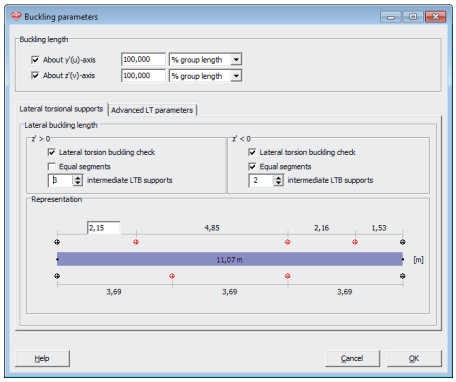
It suffices that you indicate at what time each load will be applied. As function of this, Diamonds calculated the deflection right before and right after applying each additional load. Diamonds distinguishes the permanent part of the life loads and the variable part, assuming that only the permanent part will have an influence on the concrete creeping.

# Steel & timber design

## Buckling & lateral buckling parameters

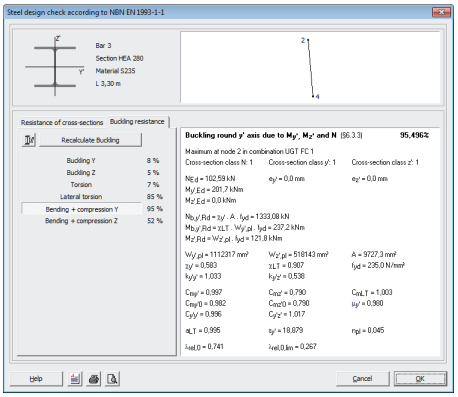


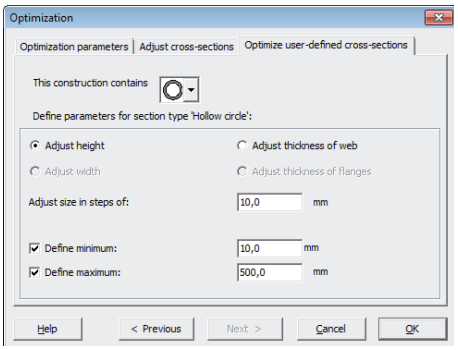

With Diamonds you have to possibility to enter yourself the buckling lengths for each bar, in function of the bar length or the group length, or to let them calculate automatically according to the generalized Euler theory. Thanks to the unique visual representation of the groups of bars considered for buckling, you define directly on the screen which bars behave together or not and consequently can buckle together or not. Buckling lengths are calculated around the strong and weak axis, according to the calculation scenario of your choice: displaceable nodes (1st order/sway structure), non-displaceable nodes (2nd order calculation/non-sway structure or semi-displaceable nodes (with preservation of the stiffness from the adjacent structure). Thanks to the built-in intelligent lateral buckling support definition, your input for lateral buckling supports will be minimal. Where needed, you can easily add lateral buckling supports to upper or lower side, uniformly distributed or at any freely chosen position. Buckling lengths and lateral buckling supports are required for the design code buckling verification, mostly important for bars subjected to compression forces and/or bending moments.




## Steel and timber verification

For all sections of the default section library and a vast number of parametric shapes in steel and timber, Diamonds will perform the resistance and (lateral) buckling verification, according to the chosen design code. All checks can be executed according to Eurocode 3 (EN 1993-1-1/3 with National Annex), AISC and many national European standards. Diamonds presents you the enveloping results graphically, allowing you to verify the efficiency and safety level at a glance. That way you can easily identify the zones with possible problems. Finally, you can request the detailed calculation results for each bar, indicating the unity check value and most critical load combination.

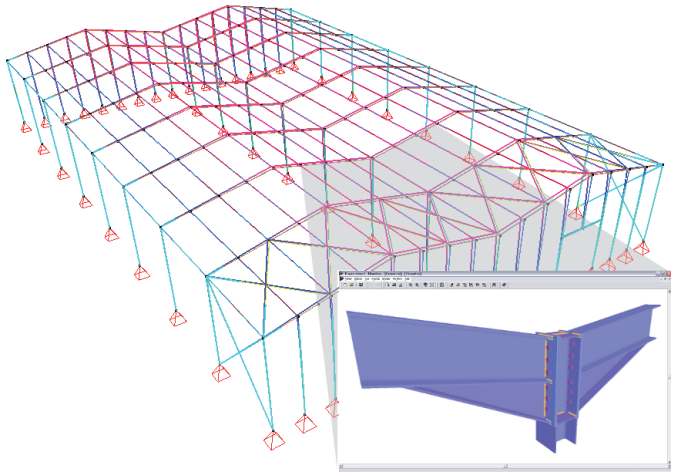



## Cross section optimisation

Starting from the verification checks for members in steel or timber, Diamonds offers you the possibility to automatically adjust such sections to desired security level or the desired efficiency. This optimisation is being performed based on the built-in section library, or by varying one of the cross-section parameters of the original section (height, width, diameter, ...). Furthermore, you can control the optimisation intelligently, by imposing additional requirements, like that bars of the same design type should be modified in to the same section. This way, the optimisation function becomes a very powerful tool to guide you in the shortest period of time to the best possible design of the structure.

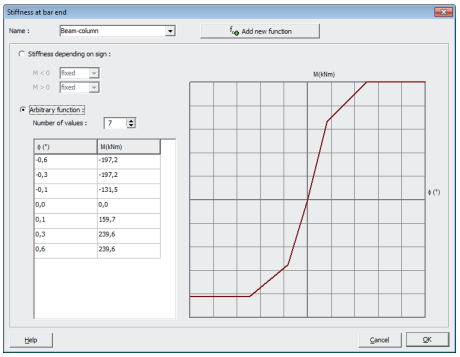
# Connection design

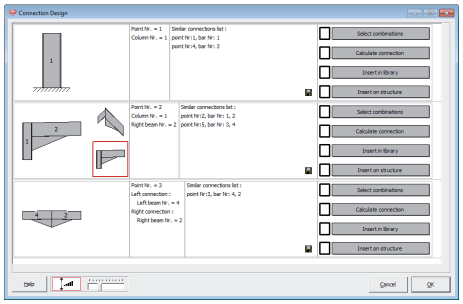


## Steel connection calculation

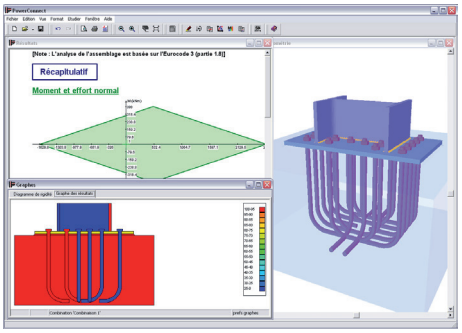
Diamonds offers you a powerful solver for the calculation of steel connections, allowing you to verify the resistance of joints according to the regulations in Eurocode 3 and AISC. Moreover, this solver will calculate the connection's rotational stiffness and stiffness diagram, in order to integrate this in the global 3D analysis of the construction. This way, you obtain a very close integration between the global design of the structure and the connection detailing.

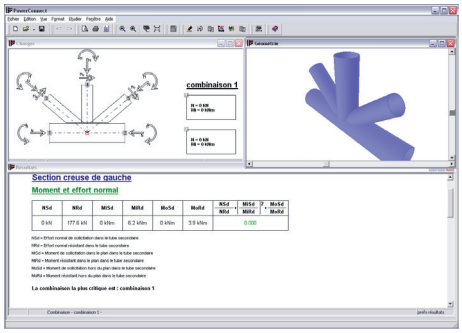
This solver can handle welded connections as well as bolted connections with end plate or angle cleats, column base connections, tubular connections, ... Furthermore, you have a wide range of stiffeners at your disposal, to modify the connection.



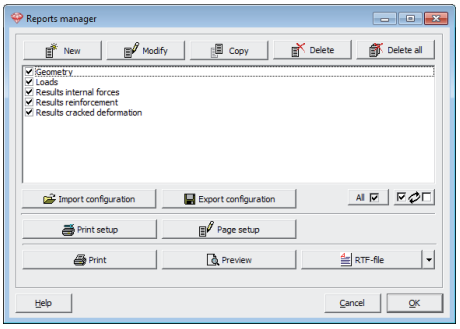



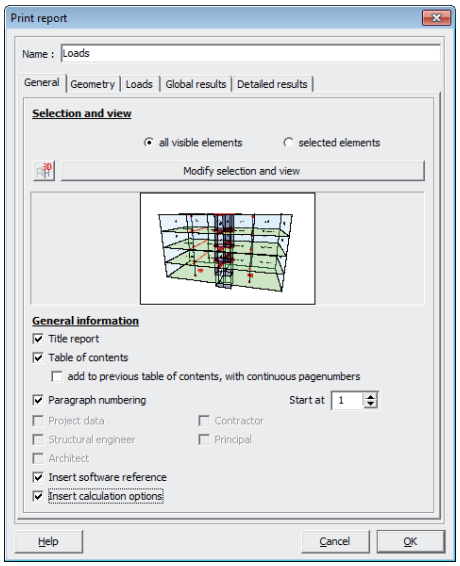

Once the calculation is designed, you can save it in a library within your project or in an external library, for re-use in another calculation project. Based on the calculated resistance and stiffness diagram, you can easily verify this connection in another similar configuration. The calculation of the connections is quick and easy with Diamonds, thanks to the possibility to select multiple connections at once. Nodes are automatically identified and intelligently grouped together for further processing.



# Report




You can document your work in a clear and organized report. The unique sub-report method allows you to create a fully custom report. In the report manager dialogue you get an overview of all created sub-reports. For each sub-report, you define the contents (geometry, loads, global & detail results), point of view and the elements to be included. The way of working allows you to focus on specific important elements in the structure. A handy dialogue window guides you through the numerous options and possibilities to insert data and results, represented both in a graphical way as well as in a table.

Diamonds generates for you automatically a table of contents, based on the report's titles. This table of contents can be made for each sub-report separately or for the selected sub reports together. At page's header and footer you can easily add your company name, company logo, creation date, name of the project, ... or any arbitrary text. The final report can be sent to the printer directly (with preview possibility), or can be saved as an RTF file (Rich Text Format), which can be opened in your favourite text editor. This way you can modify the document at all times and deliver a complete personalized report. Each sub-report is saved with the calculation project. Furthermore, you can save the configuration settings of each report and import them in a next calculation project.

# Diamonds design packs

**Advantageous**

Thanks to its well-planned combination of functionalities, Design Packs offer clear and easy-to-understand solution packs that are optimally tuned to the the most common needs of structural engineers.

**Flexible**

Through its ingenuous license structure, Diamonds can at any time be tailored to your needs. Existing Diamonds solutions can easily be extended at any time to comply with your evolving design analysis requirements.

| ✓: standard included<br>€ : in option<br>* : PowerFrame | My Custom Design Pack | Concrete Design Packs | | |
|---|---|---|---|---|
| | The modules of my choice | 2D Concrete Slabs & Beams | 2D Concrete Walls | 3D Concrete Structures |
| MODEL | | | | |
| Work Space | ✓ | ✓ | ✓ | ✓ |
| 2D Bars | ✓ | ✓ | ✓ | ✓ |
| 3D Bars | ? | € | € | ✓ |
| 2D Slabs | ? | ✓ | ✓ | ✓ |
| 2D Plates | ? | € | ✓ | ✓ |
| 3D Plates | ? | € | € | ✓ |
| BIM Gateway | ✓ | ✓ | ✓ | ✓ |
| ANALYZE | | | | |
| 1st order Linear Static | ✓ | ✓ | ✓ | ✓ |
| 2nd order Linear Static – Bars | ? | € | € | € |
| Moving Loads | ? | € | € | € |
| Linear Dynamics | ? | € | € | € |
| Seismics | ? | € | € | € |
| Fire Safety | ? | € | € | € |
| DESIGN | | | | |
| Concrete Design | ? | ✓ | ✓ | ✓ |
| Steel Design | ? | € | € | € |
| Steel Connection Design | ? | € | € | € |
| Timber Design | ? | € | € | € |
| REPORT | | | | |
| Smart Reporter | ✓ | ✓ | ✓ | ✓ |

**Which modules to license?**

Or

- Select a preconfigured Diamonds Design Pack. In case extra functionality is needed, complete the selected license configuration with individual Diamonds modules. Select a preconfigured Diamonds Design Pack.
- In case extra functionality is needed, complete the selected license configuration with individual Diamonds modules.

| Steel Design Packs | | |
|---|---|---|
| 2D Steel Frames | 3D Steel Frames | 3D Steel Frames Plus |
| | | |
| ✓ | ✓ | ✓ |
| ✓ | ✓ | ✓ |
| € | ✓ | ✓ |
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| ✓ | ✓ | ✓ |

| Structural Design Packs | | | | |
|---|---|---|---|---|
| 2D Frames | 2D Frames and Slabs | 3D Frames on Slabs | 3D Structures | 3D Structures Plus |
| | | | | |
| ✓ | ✓ | ✓ | ✓ | ✓ |
| ✓ | ✓ | ✓ | ✓ | ✓ |
| € | € | ✓ | ✓ | ✓ |
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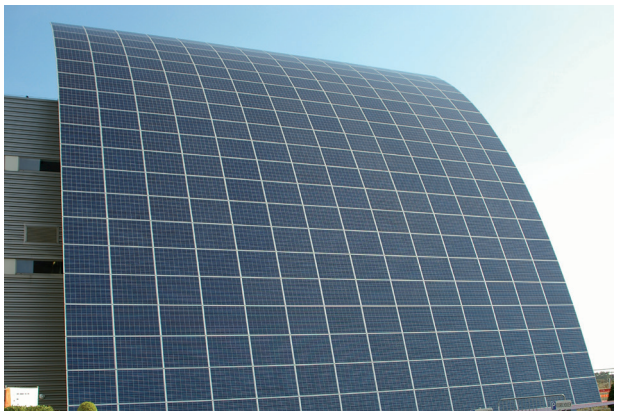
# Work Space

**MODEL** - ANALYZE - DESIGN - REPORT

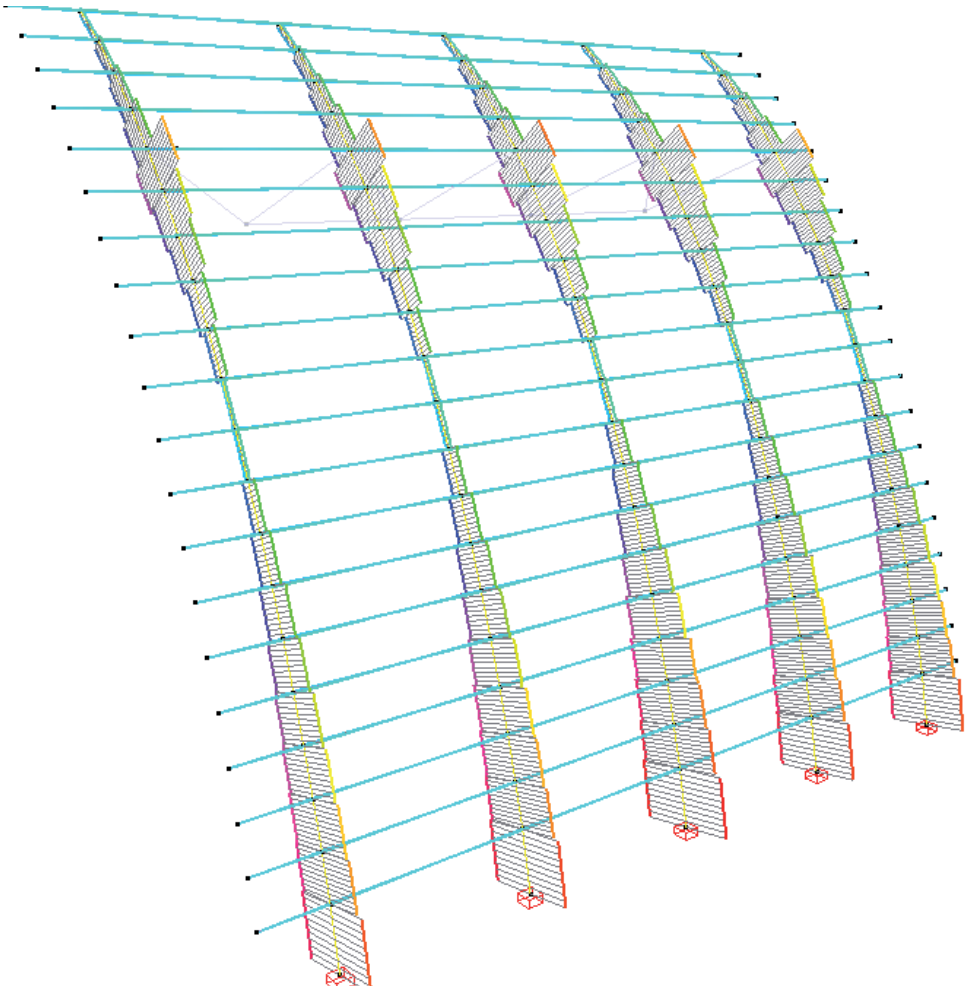


**Fast & accurate**

Both the regular and the occasional user will be able to translate structural design concepts into powerful analysis models, allowing for inventive yet economical designs that comply with current design standards.

**User-friendly**

Allowing for a fully transparent management of your structural design analysis models, Diamonds accommodates itself to your needs and preferences. Its highly intuitive and versatile working environment enables you to do your job with minimal effort.



"The Energy Arc", Construction with solar panels in front of the Photovoltech offices, Tienen (B) - Engineering office: LISST, Loonbeek (B) - Architect: AST 77 (B)

# FEATURES

**Model definition**

Graphical definition on regular or variable grid.

Definition based on absolute or relative point coordinates.

Various supporting drawing functions: translate, copy, rotate, mirror, extrude, projections ...

Control measurement function.

Import of DXF, PowerFrame, PowerPlate and Diamonds files.

Export to DXF, DSTV, BMP and BIM Expert files.

**Model management**

Level-based management of building models (definition, visibility, ...).

Logical grouping of physical elements into design types.

**Model visualisation**

Wide range of visualisation options:

- wireframe rendering
- transparent or non-transparent surface rendering
- volume rendering ( black-and-white or colour )

Hide/show parts of the model for improved readability.

Model visualisation based on four standard window configurations (Geometry, Loads, Mesh, Results) or configurations definable by the user.

Quick adjustment of size of fonts, symbols, loads and results.

**Model interaction**

Selection of elements based on different criteria (number, section, material, design type, ... ).

Convenient zoom/orbit/pan functions.

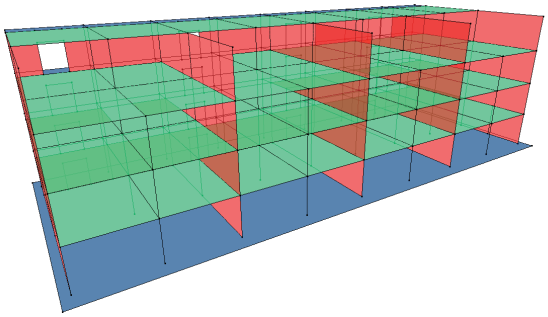
**Working environment**

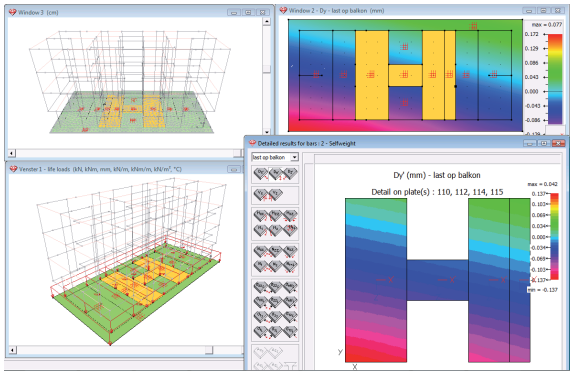
Choice between English, French, Dutch, German, Spanish and Polish language.

Built-in unit management system.

Automatic save and backup options for Diamonds files.

Easy access to built-in context-sensitive Help function from each dialog box.





# 2D Bars & 3D Bars

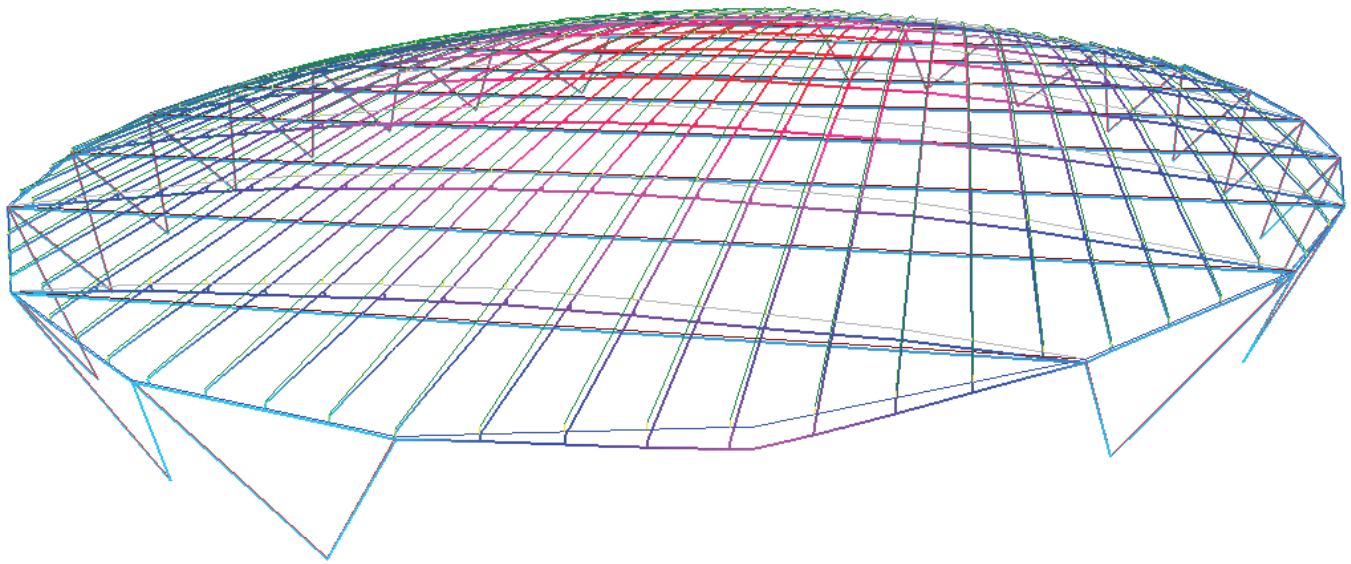
**MODEL** - ANALYZE - DESIGN - REPORT

**Powerful & versatile**

Various types of structures can be modeled with minimum effort, thanks to a wide range load and (internal) restraint types.

**Intuitive**

Thanks to the built-in, extendable section library and the parametric definition of sections, all relevant properties are easily assigned to bar elements. Properties as well as results are clearly displayed on the geometry model, bringing your design analysis model to life.



Bicycle shed on the renovated station square in Sint-Niklaas (B) - Architect: Cepezed, Delft (NL) - Engineering office: Eurostation, Anderlecht (B)

photo © Fas Keuzenkamp

# FEATURES

Graphical definition of model geometry using points and lines. Import of geometry model from DXF-file. Wizard for basic structures.

Definition of beams and columns coming from on extendable section library, based on parametric section types or a section completely definable by user.

Modeling of beams, columns, 2D or 3D frames, beam grids (possibilities depend on license), ...

Rigid link elements for modelling eccentric connections between bar elements.

Transparent management of construction materials from within extendable material library.

Release at bar ends using generalized hinge elements:

- release with respect to axial force, shear force and/or moments
- full or partial release (elastic connection elements based on stifness value or stifness diagram)

Definition of tie rods.

Elastic or rigid restraints, allowing for elimination of tensile or compression reaction forces.

Elastic support of bar elements according to Winkler theory or using inhomogeneous elastic support based on soil layer profiles (iterative equilibrium approach based on Boussinesq & Terzaghi laws)

Graphical definition of loads and restraints on model geometry, according to global or local coordinate system.

Easy load management with load groups and subgroups.

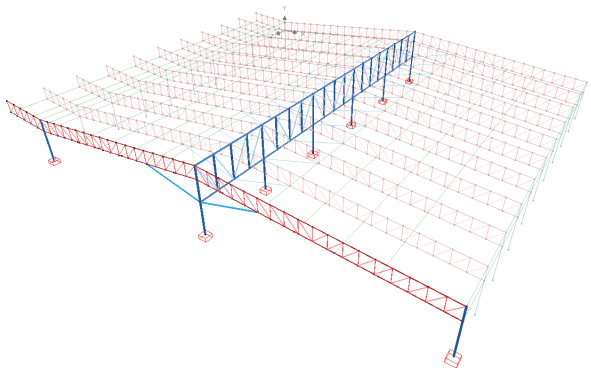
Wide choice of mechanical loads (point loads, line loads & surface loads) and thermal loads (temperature raise/fall & temperature gradient).

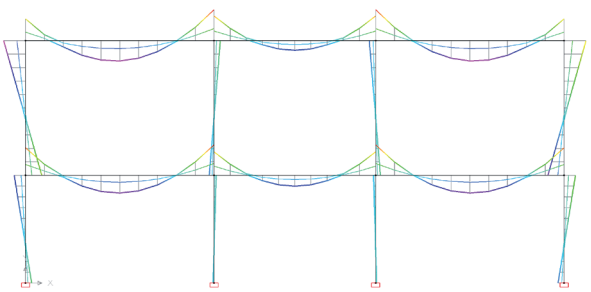
Automatic generation of wind and snow loads according to Eurocode EN 1991 (with relevant national annex),.

Automatic generation of design load combinations based on load combination and safety factors according to Eurocode EN 1990 (with relevant national annex), ASCE 7-10 LRFD, NSR-10, NEN 6702, NEN 8700, CTE and SI 412.

Geometry and load element informations available and editable in tables.

Fast copy-paste function for sections, supports and loads.





# 2D Slabs, 2D Plates & 3D Plates

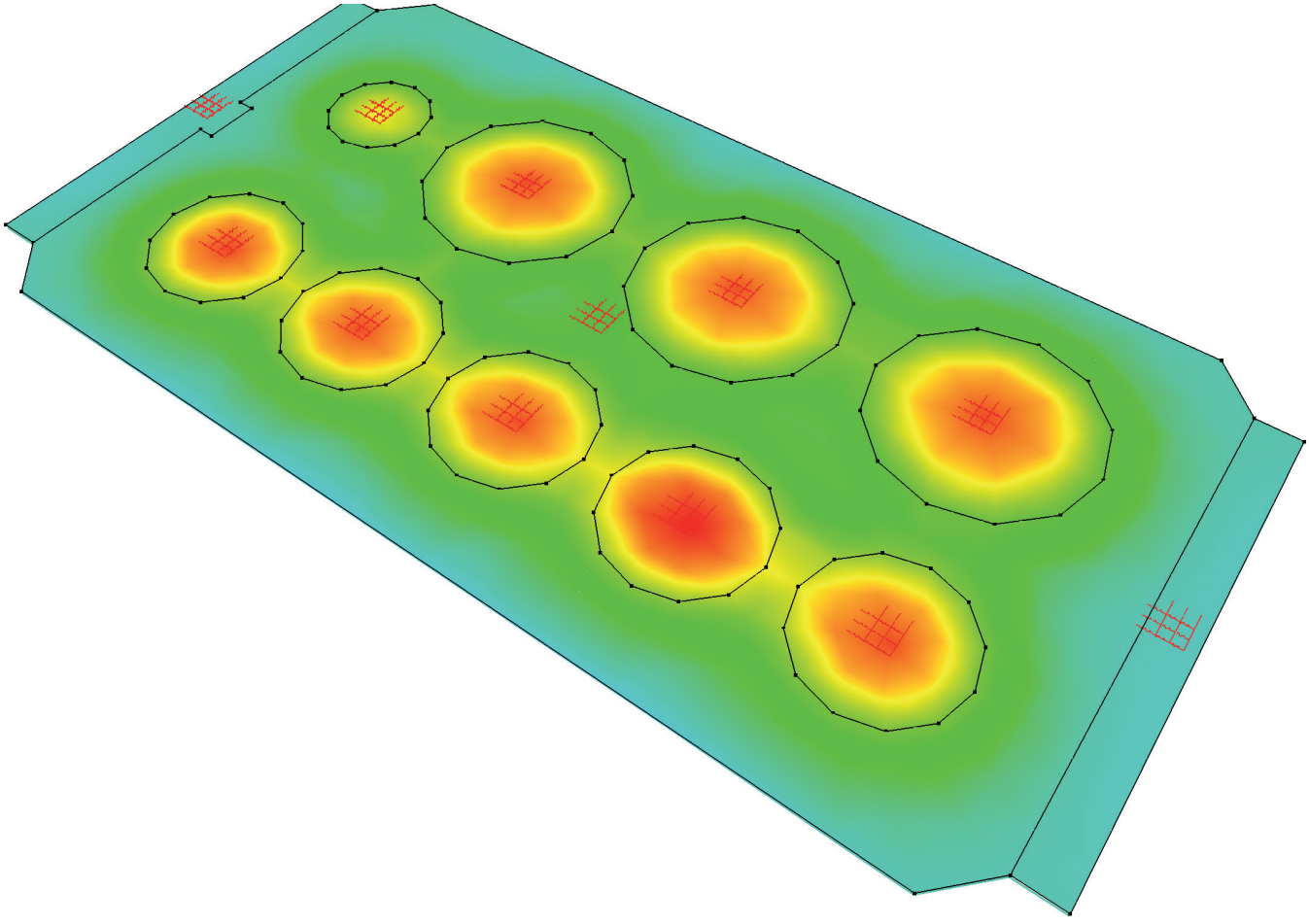
**MODEL** - ANALYZE - DESIGN - REPORT

### Powerful & versatile

Using the built-in, extendable material library, various types of structural floor and wall elements can be modeled and analysed with minimal effort.

### Intuitive

An extensive range of restraint conditions allows to solve a wide variety of practical problems: foundation slabs on medium quality soil, various types of regular or irregular floor slabs, transfer of gravity loads through masonry walls, ...



Tank part ADP0 in the port of Antwerpen (B) - Engineering office: Stubeco, Overpelt (B)

# FEATURES

Grafical definition of model geometry using point, lines & surfaces. Import of geometry model from DXF-file.

Modelling of floor-slabs, pre-slabs, mushroom slabs, orthotropic floor slabs, hollow-core slabs, ground beams, rafts,...

3D analysis of structurs built up of floors, walls and foundation elements. (depending on license)

Transparent management of construction materials from within extendable material library.

Rigid link elements for modelling eccentric connections between bars and plates.

Release at plate edges using generalized hinge elements:

- release with respect to axial force, shear force and/or moments
- full or partial release (elastic connection elements)

Definition of masonry wall elements.

Graphical definition of loads and restraints on model geometry, according to global or local coordinate system.

Elastic or rigid restraints, allowing for elimination of tensile or compression reaction forces.

Elastic support of bar elements according to Winkler theory or using inhomogeneous elastic support based on soil layer profiles (iterative equilibrium approach based on Boussinesq & Terzaghi laws)

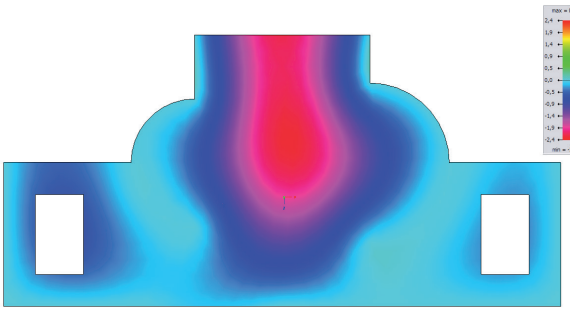
Easy load management with load groups and subgroups.

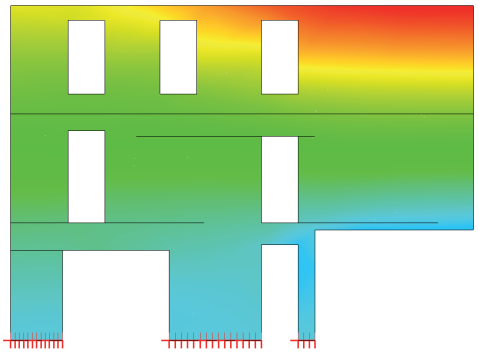
Wide choice of mechanical loads (point loads, line loads & surface loads) and thermal loads (temperature raise/fall & temperature gradient).

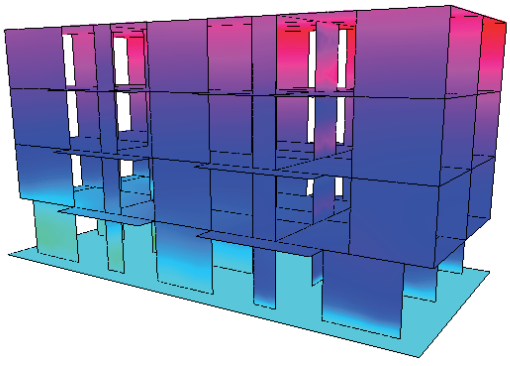
Automatic generation of design load combinations based on load combination and safety factors according to Eurocode EN 1990 (with relevant national annex), ASCE 7-10 LRFD, NSR-10, NEN 6702, NEN 8700, CTE and SI 412.

Geometry and load element informations availabel and editable in tables.

Fast copy-paste function for sections, supports and loads







# 1st & 2nd Order Analysis

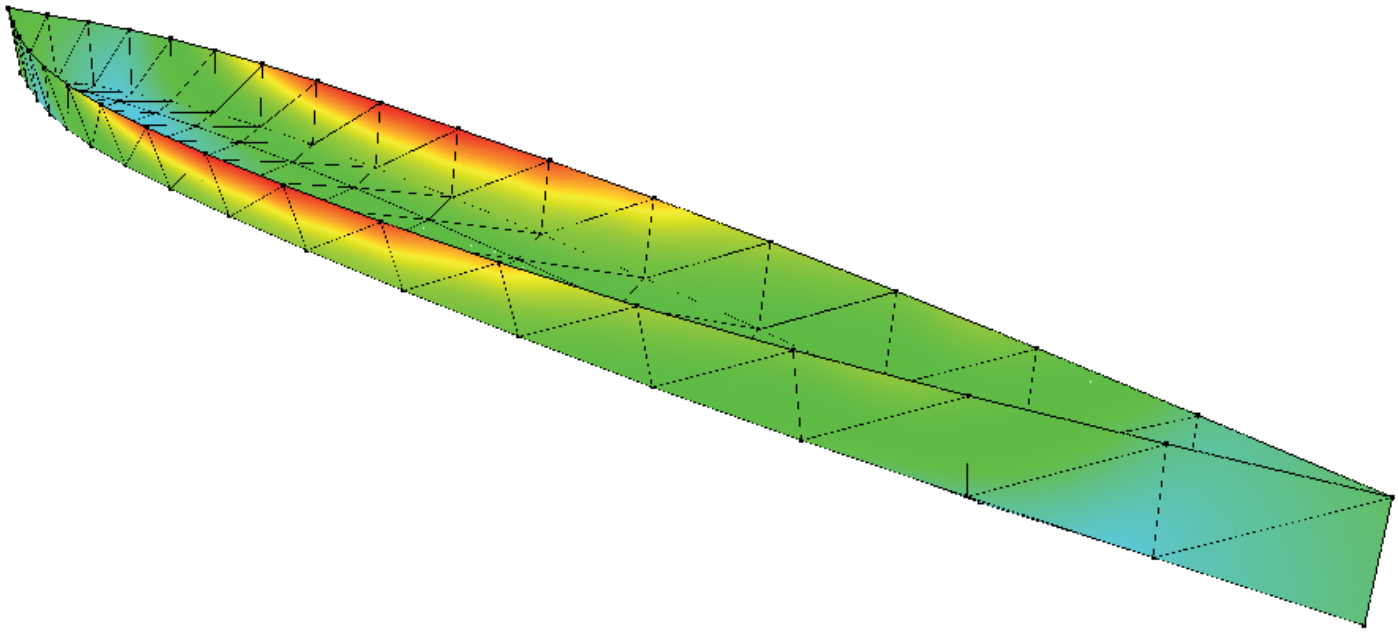
MODEL - **ANALYZE** - DESIGN - REPORT


**Efficient**

The 3D analysis engine based on PARDISO sparse solver technology makes optimal use of the RAM-memory available on your workstation, solving even highly complex models in a short time frame.

**Transparent**

Diamonds offers a direct, no-nonsense access to its multitude of design analysis results. Make the analysis results speak for themselves and increase your insight into the structural behaviour of your building models.



Concrete Canoe for concrete canoe race in 2011 - calculated by student sorority Betonbrouwers of UTwente
photo © Victoria Kühne

# FEATURES

### 1st Order analysis

Rapid, automated conversion of geometry model into design analysis model by means of Delaunay mesh generator.

Powerful 3D finite element analysis engine based on PARDISO sparse solver technology, with support of bar-, beam-, slab- and plate elements.

First order elastic analysis for statics with equilibrium check and possibility to take imperfections into account .

Calculation of deformations, deflections, angular rotations, internal forces, elastic stresses and reaction forces.

Visualisation of analysis results:

- for individual load cases,
- for serviceability or ultimate limit state combinations,
- for various limit state envelopes.

Visualisation of analysis results on entire model geometry or on selection of model objects.

Visualisation using colour map or isocontours.

Visualisation of analysis results on slabs and walls along section cuts. Evaluation of total and average values along section cuts.

Complementary results window for detailed representation of analysis results:

- on selection of plate elements within a single plane,
- on selection of beam elements along a single line,
- on selection of section cuts along a single line.

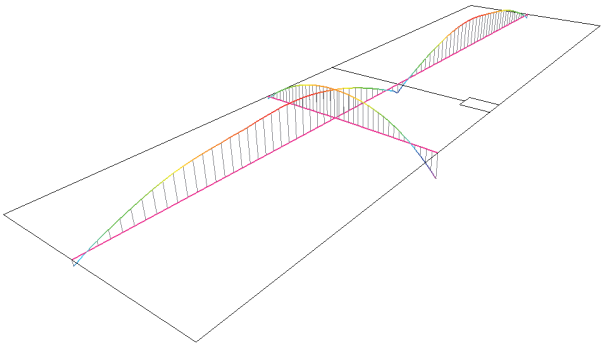
Complementary detailed results window with graphical representation of stresses in bar's cross-section.

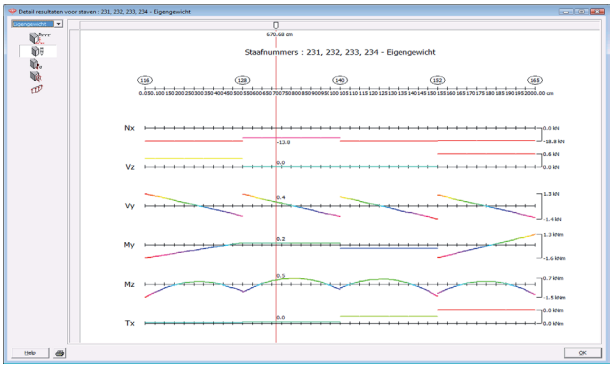
Quick access to exact results at a specific bar or plate position.

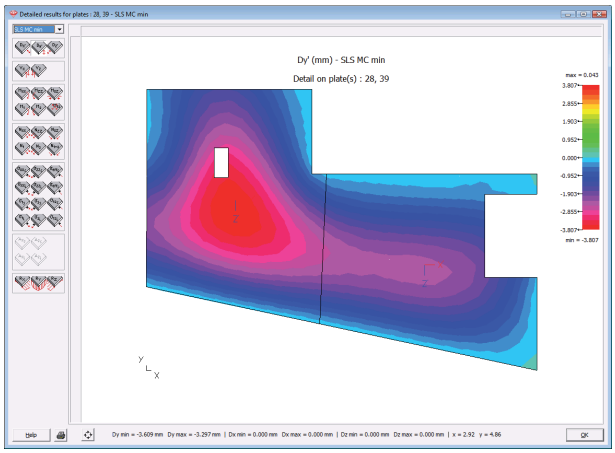
### 2nd Order analysis

Second-order static analysis with user-controlled accuracy level.

Calculation of global buckling factor for each load group and 1ste mode of global buckling.

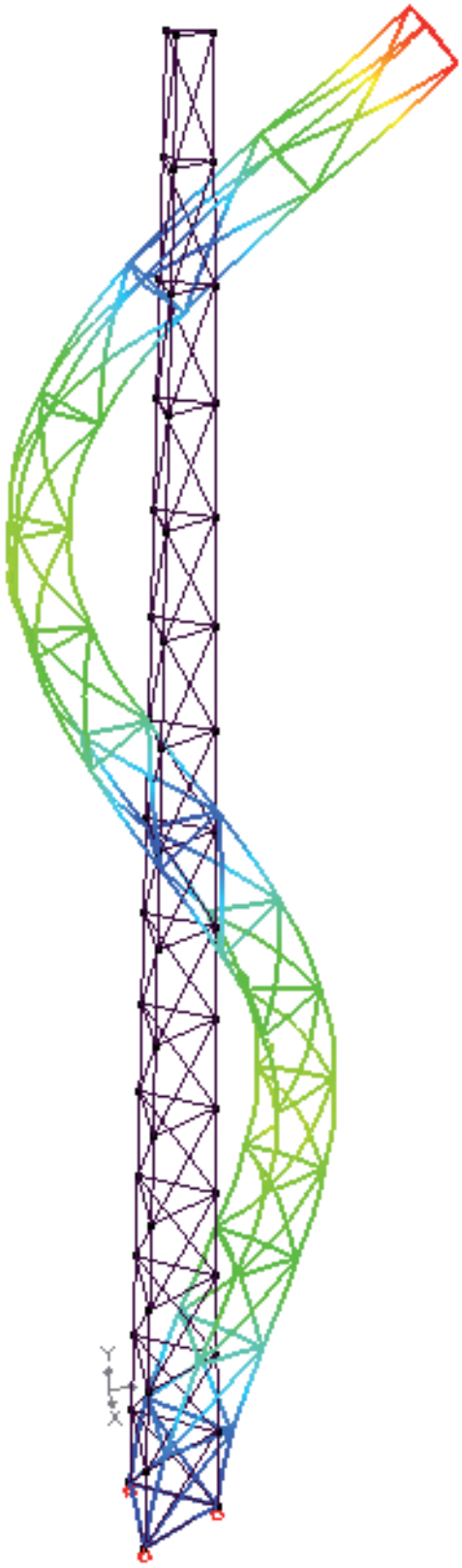




# Dynamic & Seismic Analysis

MODEL - **ANALYZE** - DESIGN - REPORT

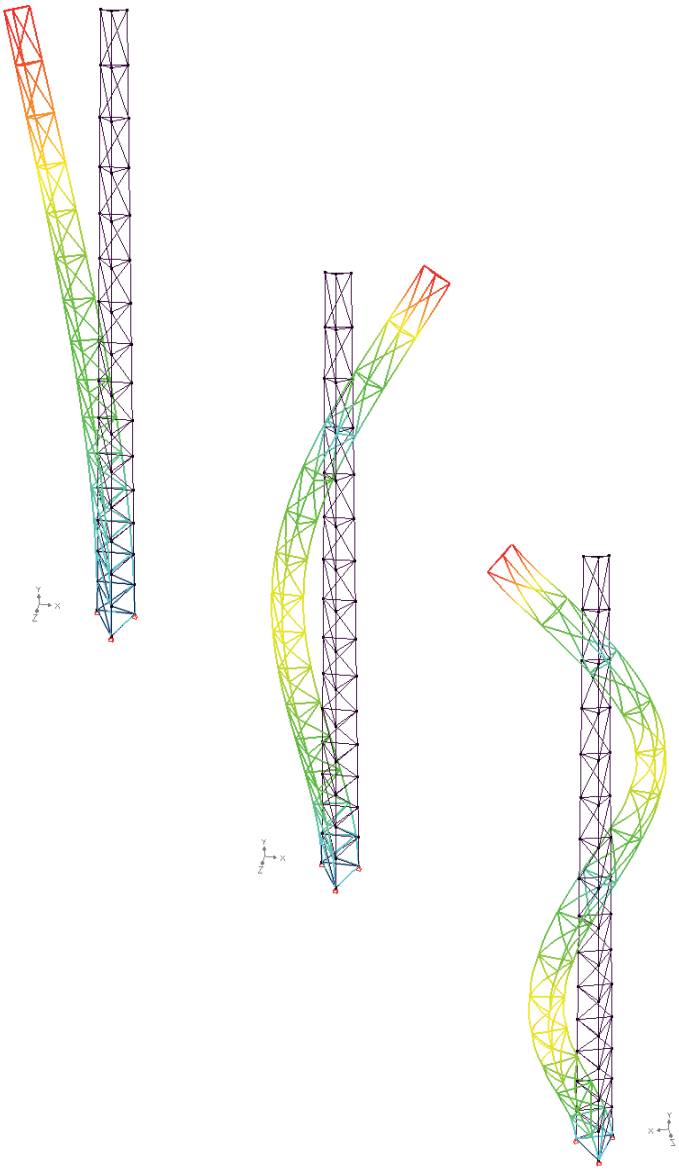


**Convenient**

Thanks to its advanced dynamic and seismic analysis modules, Diamonds enables engineers to easily design steel, concrete and timber structures for maximum economy, also for regions in which earthquake resistance is a fundamental requirement.

**Robust**

Diamonds' multi-modal response analysis capabilities allow seismic design for 3D frame and plate analysis models, not imposing any restrictions on the building structure's regularity.



# FEATURES

Automated definition of design gravity loads to be considered during modal analysis. Design gravity loads are derived as a function of the permanent loads and a fraction of the life loads through correlation coefficients.

Calculation of a user defined number of eigenfrequencies and eigenmodes, within a custom frequency interval. Choice between Rayleigh damping and measered damping ratios.

Visualisation of structure's deformations, angular rotations, internal forces, elastic stresses and reaction forces for calculated eigenmodes.

**Seismic analysis**

Definition of the seismic action based on the design spectrum according to Eurocode 8, ASCE 7-10, INPRES-CIRSOC 103, NSR 10 and NCH 433.

Interactive definition of the seismic action's principal directions. Automatic derivation of the vertical component of the seismic action. Combination of the effects related to the horizontal and vertical components of the seismic action, by SRSS (Square Root of the Sums of the Square) or CQC (Complete Quadratic Combination) method.

Seismic design analysis through multi-modal response analysis. Selection of the structural modes based on their effective modal masses corresponding to the seismic action's principal directions.

Seismic analysis using modal superposition method - re-use of available eigenmodes upon modification of seismic action, damping, ...

According to Eurocode, non-linear structural behaviour during a seismic event is accounted for through an equivalent linear elastic analysis based on the seismic design spectrum and the behaviour factor q.

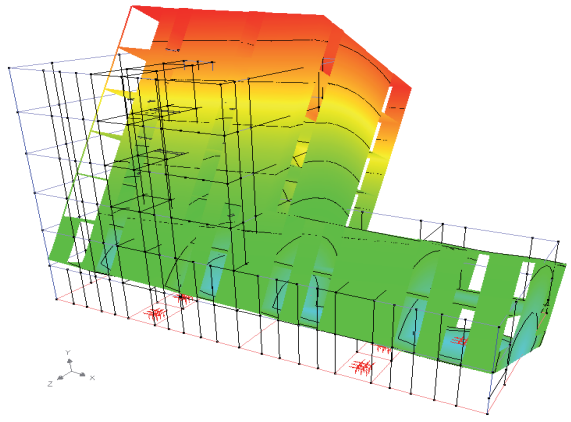
**Dynamic analysis**

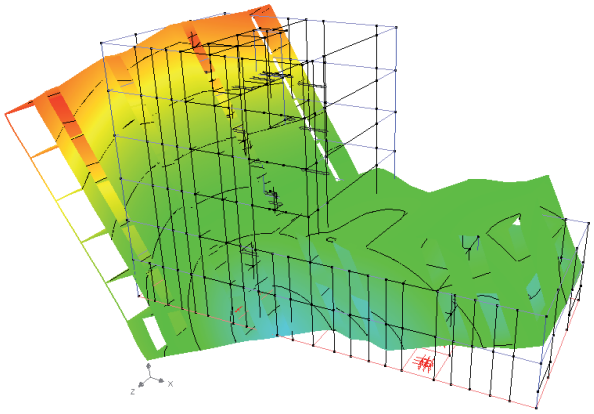
Dynamic variation of loads or uniform acceleration of supports.

Interactive definition of periodic and aperiodic dynamic loads. Subload groups can act seperately or together, in this last case, they can be synchronised or not.

Absolute main period definition or relative to reference eigenperiod with custom adjustment factor.

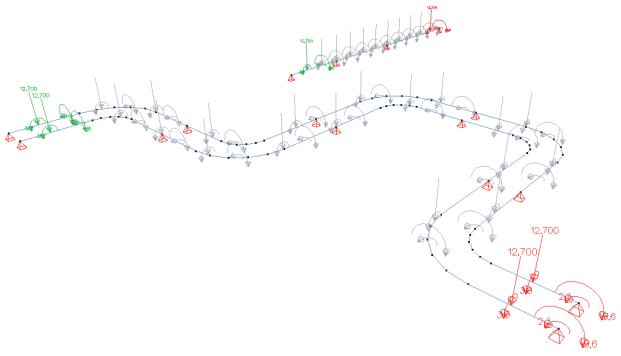
Subload group parameters include type of signal (harmonic, pulse, linear or custom defined), amplitude, number of periods, phase, delayed start and end time.





# Moving Loads Analysis

MODEL - **ANALYZE** - DESIGN - REPORT

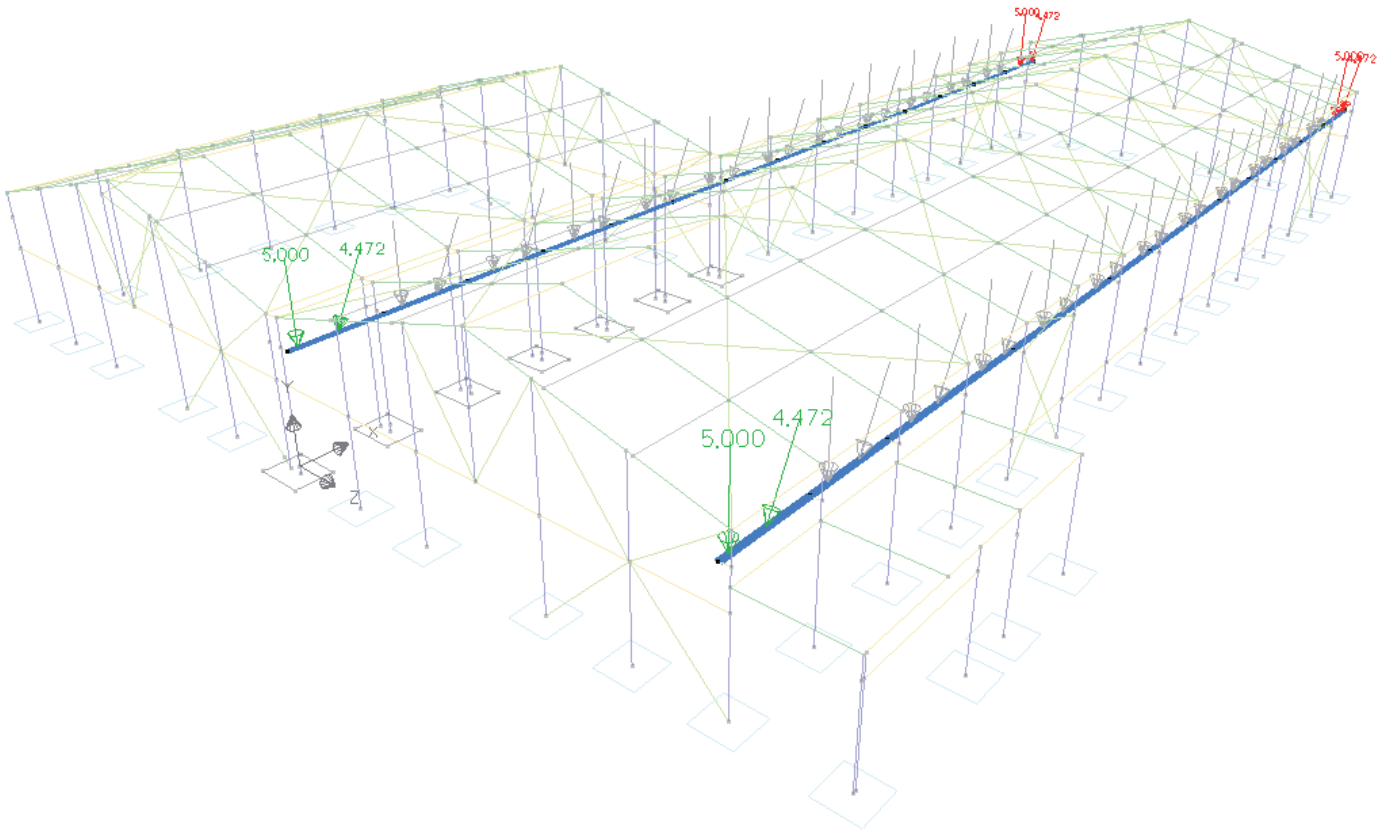



### Comfortablz

In order to define moving loads in a comfortable way, you can make use of a 'load train'. Diamonds calculates the structure through for each position of the load train and compile the results in the form of an envelope.

### Visual

Thanks to the animated display of the rolling load trains you have full control at any time. If you have defined different load trains in a single load group, you can visualize the simultaneous movement of the trains. Thus, one can easily verify that all load trains were defined correctly.



# FEATURES

Fast modelling of load train along straight or curved trajectories.

Flexibele definition of loads within a moving load (number, type, direction, size).

Automatic creation of a load train library containing all in Diamonds ever defined load trains.

Definition of train loads for several selected trajectories at once.

Automatic recognition of the utmost pathway length along selection of connected bars.

Choice to apply the train load on the longest group of bars pathway or on each of the individual bars.

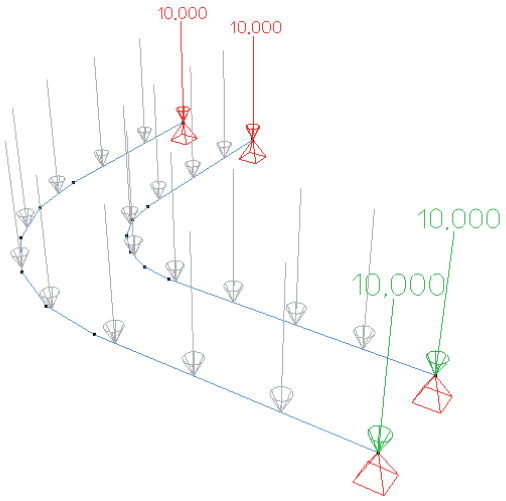
A load train offset can be specified from start point and/or end point of pathway.

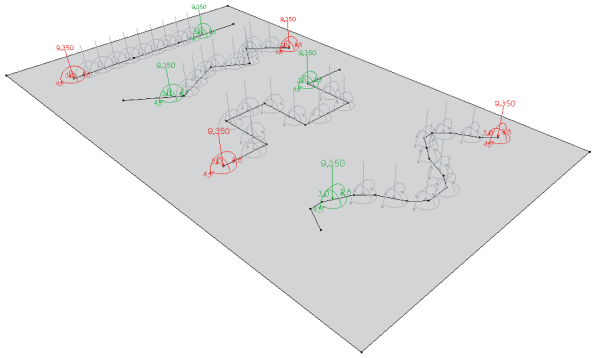
Synchronization points or stops assignable to each point of the pathway in order to synchronize different trajectories with each other.

Import and export of moving loads.

Summary window with all defined moving loads on model.

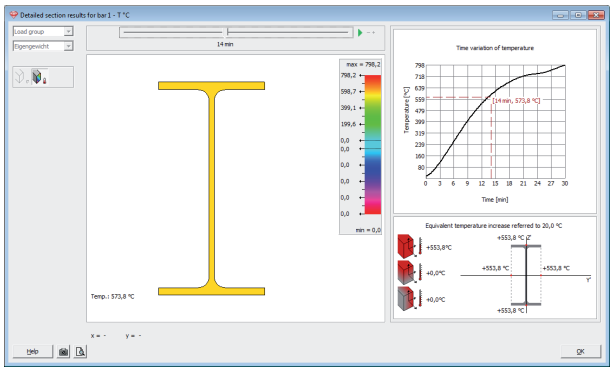
Animated display of the progressive train load, with visualization of the simultaneous movement of multiple load trains.



# Fire Resistance Analysis

MODEL - **ANALYZE** - DESIGN - REPORT

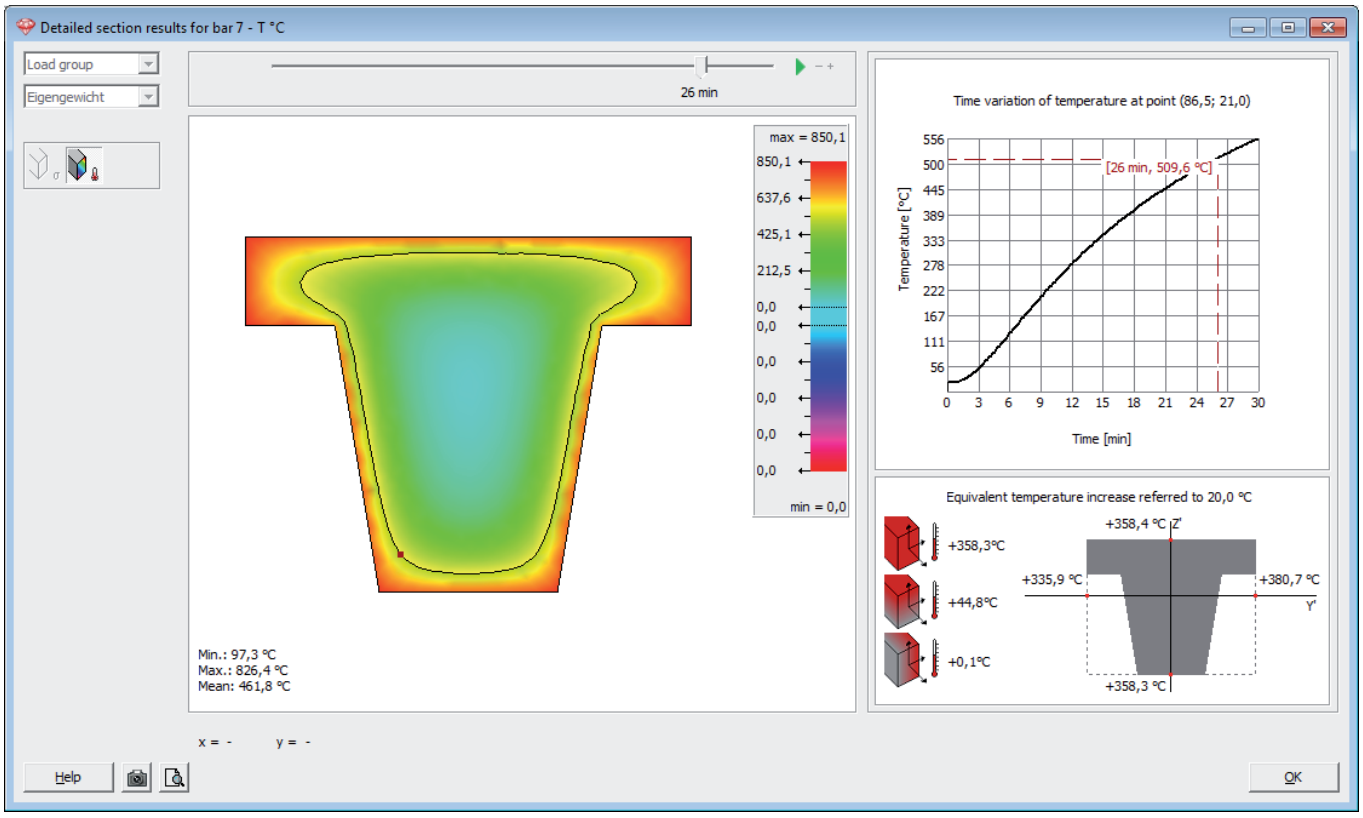


### Flexible

Diamonds' extensive material library and flexible section utility tool allow for a quick and efficient definition of a wide range of composite cross-sections, both in terms of mechanical and thermal properties.

### Powerfull

As Diamonds includes an advanced thermodynamic solver, both solid and slender type of cross-sections can be analysed accurately with respect to fire resistance requirements.



# FEATURES

Extensive material library, fully customizable by the user. Several material types can be defined using an appropriate set of material properties: idealized fire buffers, fire protection materials, general construction materials.

Standard material library is completed with thermal characteristics such as thermal capacity, thermal conductivity and emissivity for steel, concrete & timber grades.

Definition of fire hazard through an appropriate fire curve and the imposed fire resistance requirements. Choice between ISO 834, external, hydrocarbon and parametric fire curves. Import and export of custom fire curves.

Wide variety of predefined thermal protection and boundary conditions for standard cross-sections: no protection, thermal coating, boxed thermal protection, exposed to fire loads at one side only, at all sides or at bottom flange only.

Efficient definition of composite sections using an embedded section utility tool, perfectly integrated with the material library.

Hands-on creating of alternative configurations of thermal protection and/or boundary conditions for each single cross-sections.

Automatic generation of accidental combinations upon activation of a fire hazard.

Automatic selection of most appropriate analysis strategy depending on cross-section type: FEM Solver for solid cross-sections vs. Analytical Solver for slender cross-sections. Easy conversion from one analysis strategy to another for comparison.

Thermodynamic analysis of structural members subjected to fire, accounting for heat radiation, convection and conduction.

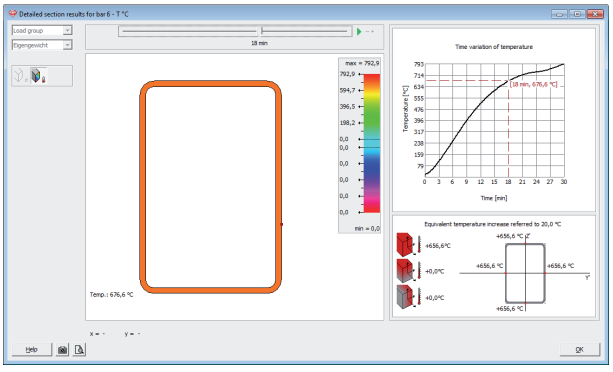
Calculation of indirect actions (tension, compression, bending,...) caused by a global temperature increase and/or temperature gradient, considering imposed deformation restraints. Indirect actions can be limited to account for plastic behaviour of nodes.

Evaluation of impaired mechanical properties as a function of temperature.

Detailed thermal results window with an animation and graph of cross-section's temperature variation over time. Temperature can be consulted at any position of the cross-section.

Automatic calculation of temperature gradient and global temperature change resulting in the same thermal deformations as the calculated fire effect at a given time.

Verification of steel member resistance and stability, considering fundamental and accidental loads combinations. Impaired mechanical properties are automatically accounted for within the verifications for accidental loads combinations.



# Concrete Design

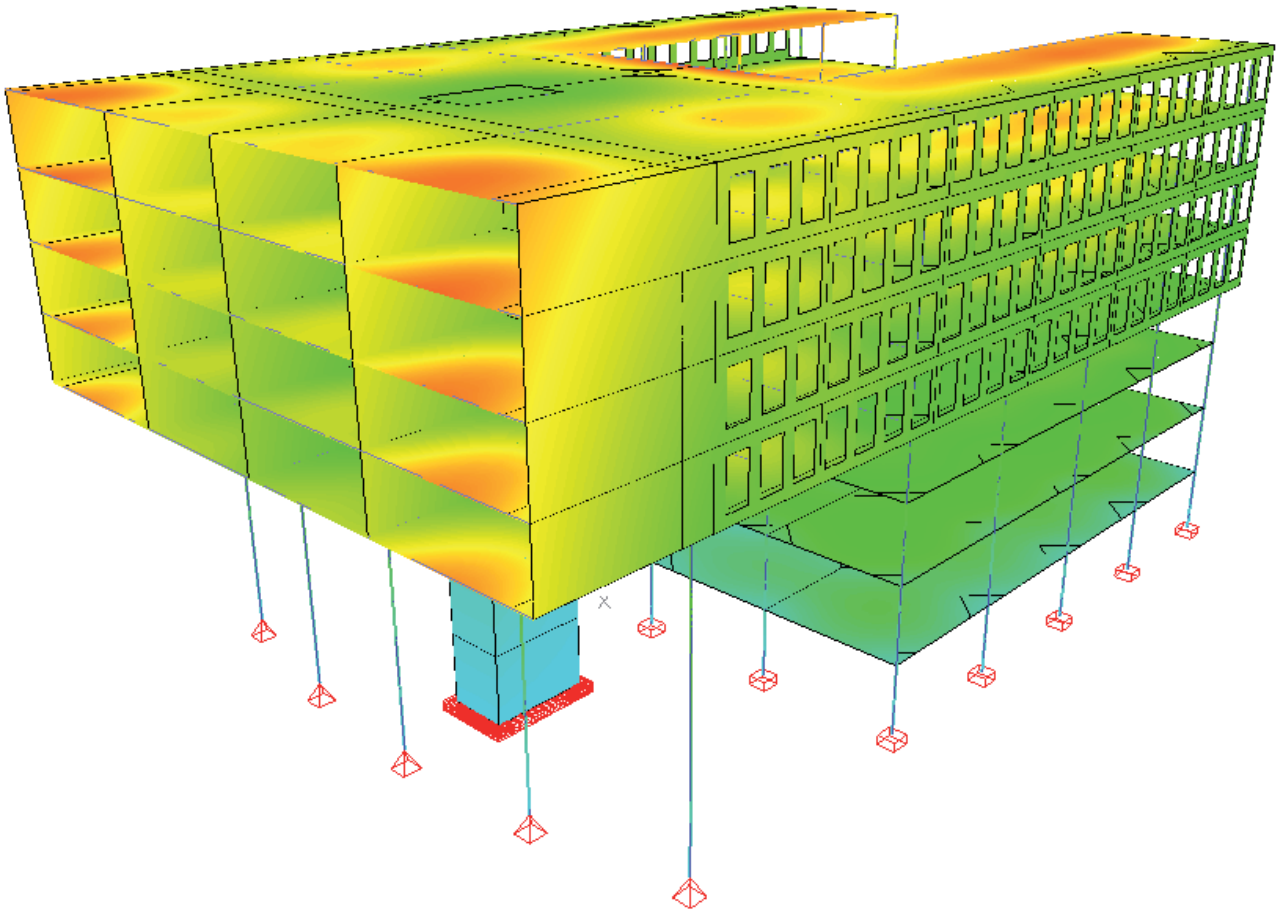
MODEL - ANALYZE - **DESIGN** - REPORT

### Complete

Diamonds calculated the optimal reinforcement solution according to a wide range of design standards. This serves as a starting point for a practical reinforcement solutions, which can then be used to calculate cracked deflections and crack width for bar and plate elements.

### Practical

Calculated reinforcement quantities are easily translated into a practical solution using the built-in, extendable re-bar mat library. Practical reinforcement schemes for bar elements can be exported for further elaboration in concrete detailing software.



Hospital Mary Mediatrix, Ghent (B) - Engineering office: Studiebureau Rissauw-The Klerck Engineering, Bruges (B) - Architect: Architects LLOX, Wilrijk (B) - Contractor: Cordeel, Temse (B)

# FEATURES

Definition of footings.

Calculation of longitudinal and transverse reinforcement according to Eurocode EN 1992 (including appropriate nationale annex), ENV 1992 and national design standards (NEN 6720, BAEL 91, DIN 1045E, NBN B15, ACI 318, BS 8810, EHE)

Calculation of reinforcement for all elements or a selection of elements.

Definition of a practical reinforcement solution for bar and plate elements.

Assignment of rebar mats to plate elements from within extendable mat library.

Analysis of cracked deformation and crack width for bar and plate elements taking into account theoretical and practical reinforcement quantities (possibly accounting for effects of creep).

Analysis of cracked deformation over time, taking into account the actual load history and the effects of creep.

Buckling verification of compression elements using the model column approach, either using manually defined or automatically calculated buckling lenghts.

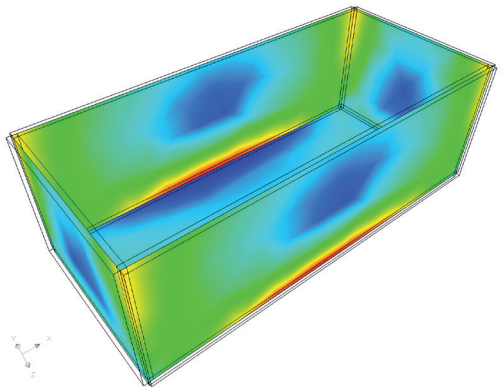
Visualisation of practical reinforcement quantities on bar and plate elements. Rapid identification of areas in which additional reinforcement is required.

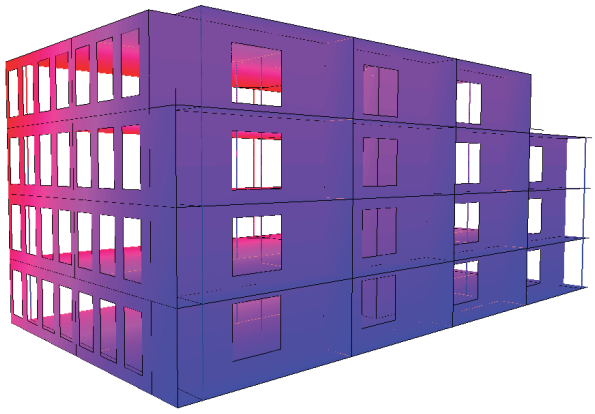
Visualisation of cracked deformation and crack width on entire model geometry or on a selection of bar and plate elements.

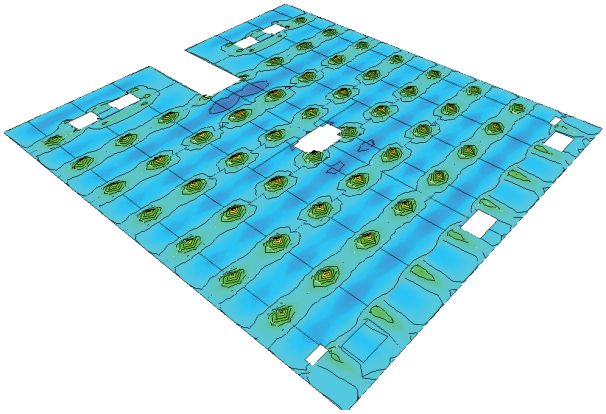
Visualisation using colour map or isocontours.

Punching shear verification for plate elements and foundation slabs.

Export of reinforcement sections to ConCrete Plus in order to create reinforcement plans and cutting lists for bar elements.







# Steel Design & Timber Design

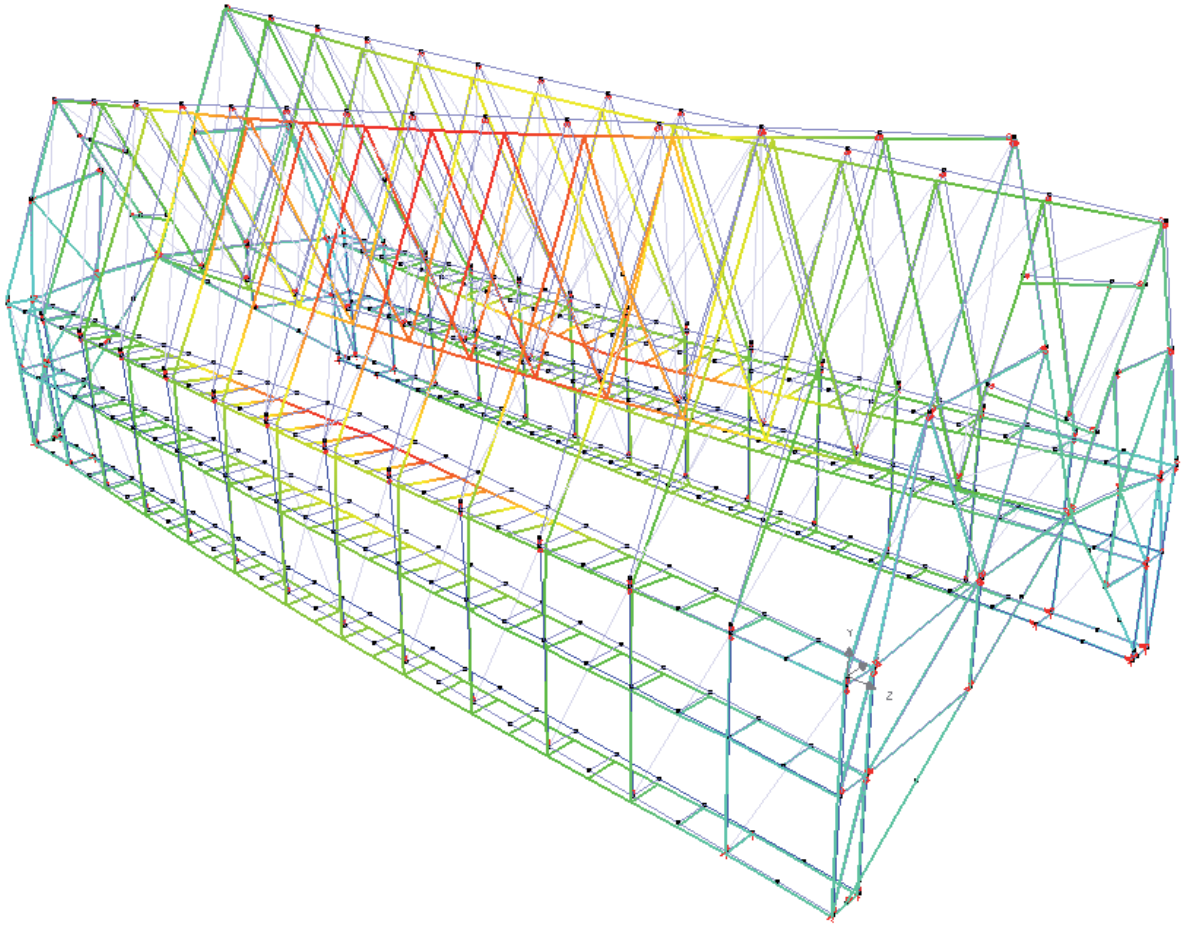
MODEL - ANALYZE - **DESIGN** - REPORT

**Complete**

Design standard checks automatically take into account the appropriate cross-section classification. The results of design standard checks are documented extensively, such that the user can take well-informed decisions on how to change the structural design to ensure structural integrity.

**Practical**

The user stays in control, at any time. Just select the bar elements for which design checks need to be made, or even specify which design checks are requested for which bar elements. Buckling lengths and lateral torsional buckling support can be specified in no time.



City Hall, Ghent (B) - Nomination Steel Construction Contest Belgium 2012 - Engineering office: BAS Office for Architecture and Stability, Leuven (B) - Architect: Robbrecht and Daem architects, Ghent (B)
photo © Johnny Umans

# FEATURES

Manual definition of buckling & lateral torsional buckling lengths for bars or groups of bars.

Automatic calculation of buckling lengths for all bar elements or a user-defined selection of bar elements. Calculation based on generalized Euler theory.

Automatic calculation of lateral torsional buckling lengths based on definition of lateral torsional supports, definable for upper and lower flange. Graphical representation of automatic and manual lateral torsional buckling supports.

Verification for all elements or a selection of elements.

Load combination filter for code verification, via global threshold of via a particular threshold for each internal force or tension separately.

Graphical representation of design standard checks on entire model geometry or on a selection of bar elements.

Access to detail results of design standard checks, with indication of most critical loads combination.

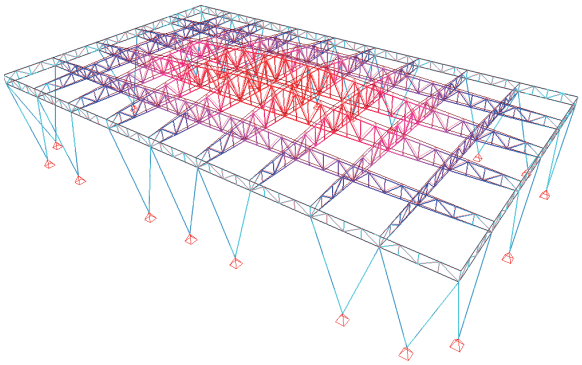
Automatic section optimisation, in function of cross-section resitance and/or element stability.

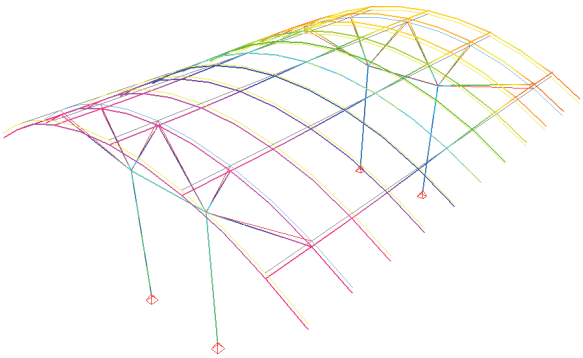
**Steel**

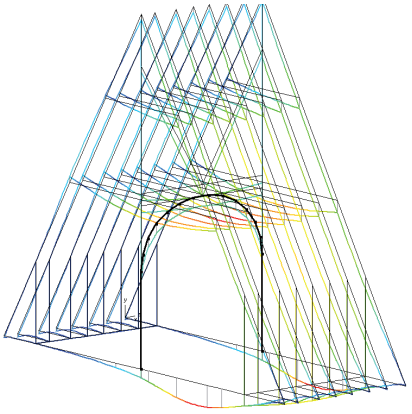
Verification of cross-section resistance and elements (lateral torsional) buckling stability according to Eurocode EN 1993-1-1 (including appropriate national annex), Eurocode EN 1993-1-3, ENV 1993 and national design standards (AISC-LRFD, NEN 6770, CTE, EAE, NSR-10 and SI 1225)

**Timber**

Verification of cross-section resistance and elements (lateral torsional) buckling stability according to Eurocode EN 1995 (including appropriate national annex).

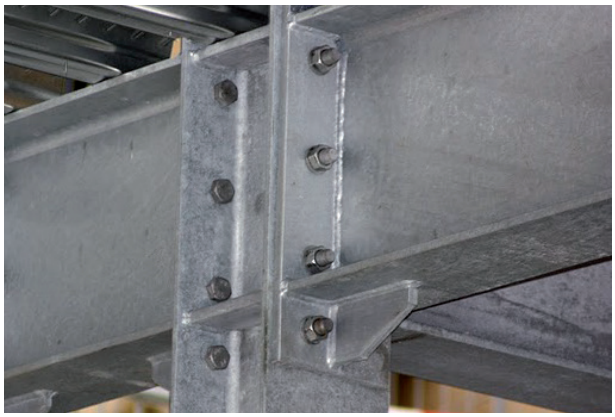






# Steel Connection Design

MODEL - ANALYZE - **DESIGN** - REPORT

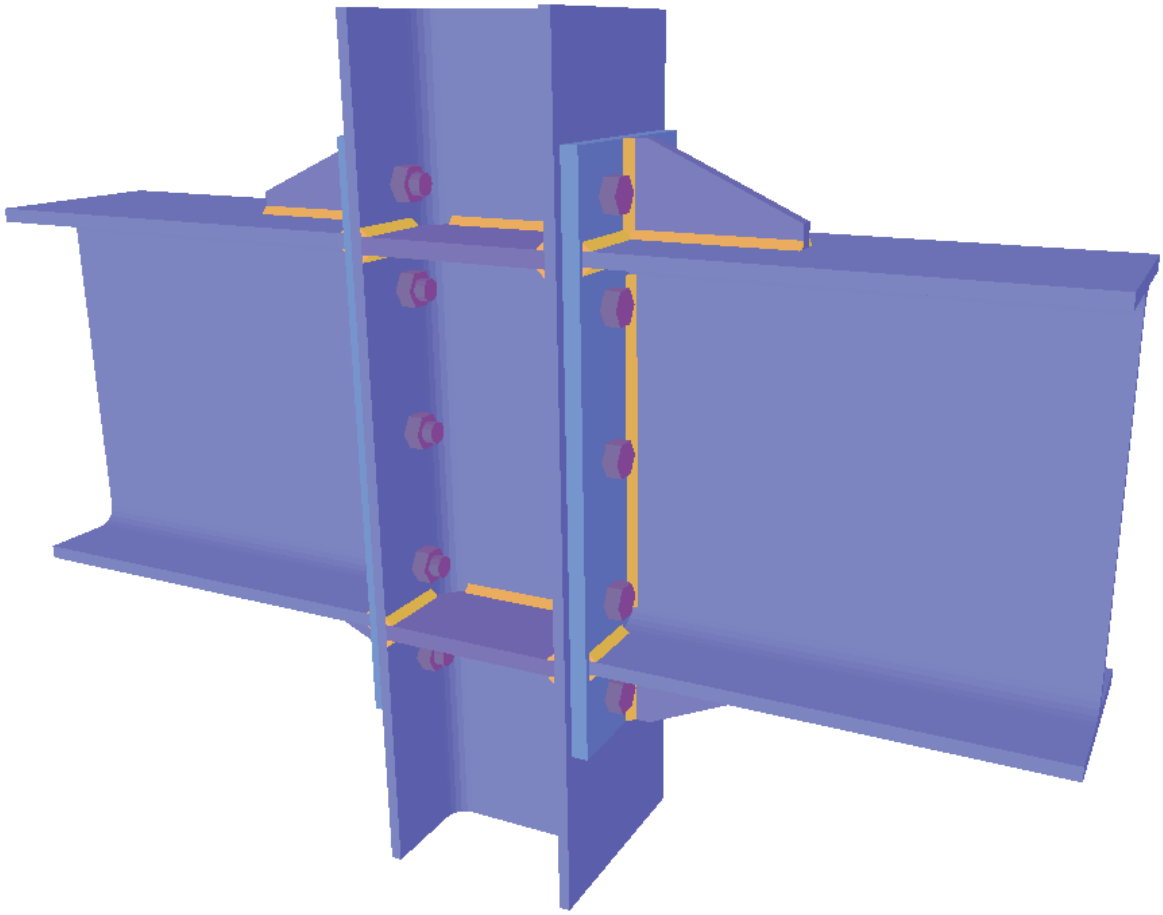


**Powerful**

The Steel Connection Design module's strong solver capabilities enable you to evaluate almost instantly the impact of design changes on the connection's design resistance and stiffness according to Eurocode 3 or AISC.

**Complete**

Select the appropriate nodes in the 3D analysis model, and Diamonds will automatically create the connection model and complete it with the relevant load data. Connection design changes can easily be defined, such that different options can be compared in a short time in order to select the most optimal solution.



"Open House", educational tool for students of Architecture at the University of Rotterdam - Architect: Academy of Architecture (NL) - Client: University of Rotterdam (NL) - Structural engineer: M.J. Roos
photo © M.J. Roos

# FEATURES

Limit state design of bolted and welded connections, integrated with global limit state design of portal frames.

Evaluation of model design stiffness diagram and feedback to Diamonds model for limit state design of structural steel frames.

Optimisation of bolt positions. Calculation of weld strength.

Fast identification of undersized and oversized components through colour-coding on connection geometry of each component's level of exhaustion.

Creation of plan views including annotation. Export capability to DXF.

### Moment connections

Extensive range of connection types: beam-column, beam-column-beam, beam-beam, column base, beam-beam with bolted plate on flanges and/or web.

Choice between wide range of stiffeners: end plate, end plate stiffener, web stiffener, backing plate, web plate, haunch, base plate with cramps, bolted plate on beam flange or web, connection angle, ...

Calculation of design resistance for bending moment, shear force, normal force and rotational stiffness for fully restraint and partially restraind connections according to Eurocode EN 1993-1-8 , AISC-LRFD and IS800.

### Shear connections

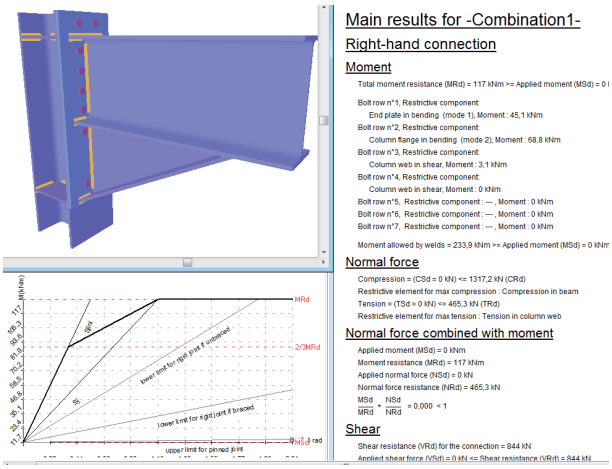
Extensive range of connection types: beam-column, beam-column-beam, beam-beam with fin plate, flexible end plate or bolted angles.

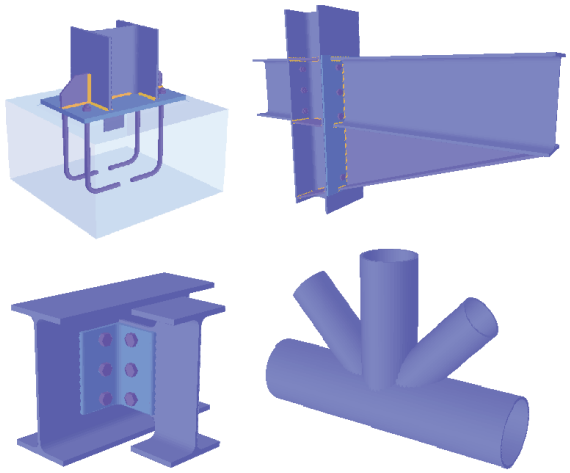
Calculation of design resistance for shear force and normal force for shear connections according to Eurocode EN 1993-1-8 and AISC-LRFD.

### Hollow structural section connections

Analysis of tubular connections of type T, Y, DY, X, K, N, KT & DK (circularn  rectangular and I cross-section).

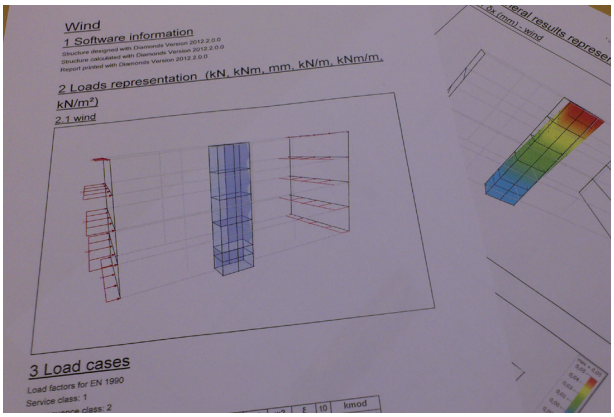
Calculation of axial force resistance and in- plane and out-of-plane bending moment resistance, according to Eurocode EN 1993-1-8 and  AISC-LRFD.



# Smart Reporter

MODEL - ANALYZE - DESIGN - **REPORT**

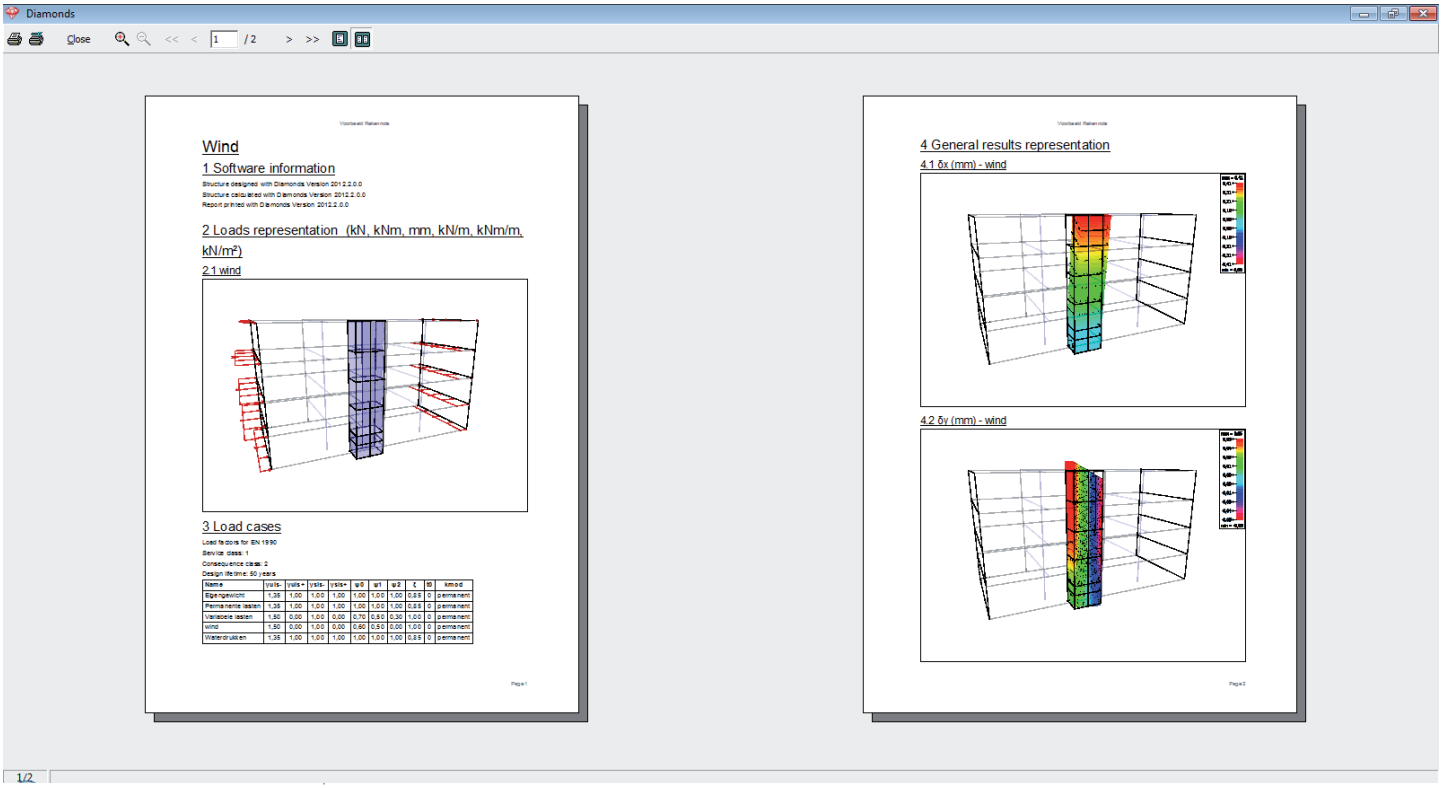



## Practical

Thanks to the unique Smart Reporter, well-structured reports can be designed quickly based on sub-reports. Simply define the appropriate model orientation and visibility for each individual sub-report, and create stunning reports that simply speak for themselves!

## Efficient

Definitions of report layouts are always saved along with the Diamonds project. Following any changes defined to the Diamonds analysis model, a new report can be created immediately using the previously defined reporting lay-out.



# FEATURES

Flexible report manager to control various sub-reports associated to a single Diamonds project.

Quick generation of report based on selection of available sub-reports.

Full interaction with the design analysis model during definition phase of sub-report lay-out.

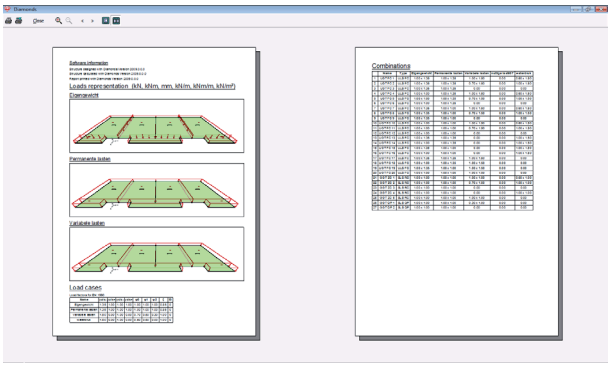
Layout of sub-reports is saved as part the Diamonds project, allowing for an automatic re-creation of reports following parameter changes to the original Diamonds model.

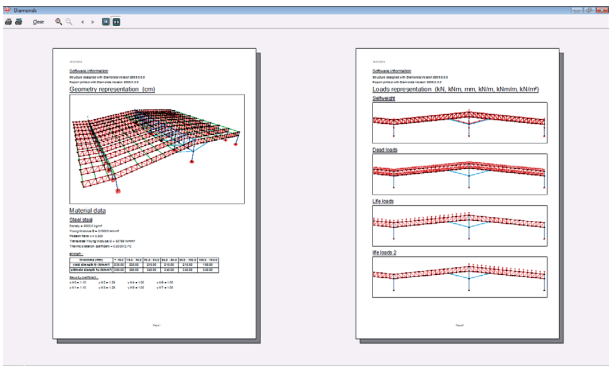
Reports can be saved electronically.

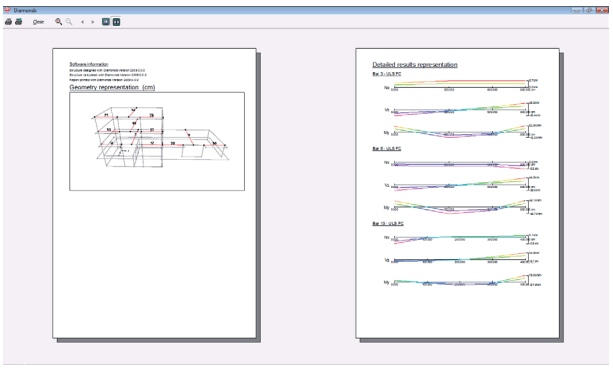
Lay-out of sub-reports can be saved as templates, for re-use with other Diamonds projects.

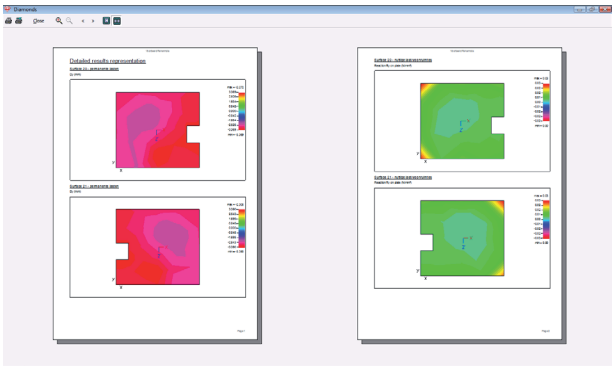
Automatically generated and continuous table of contents and paragraph numbers for sub-reports.

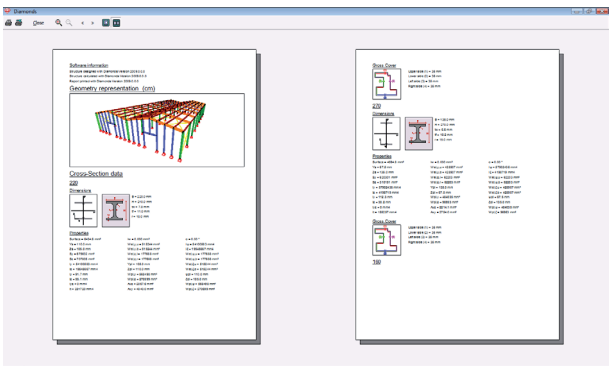
Page header and footer can be completed with custom text and placeholders for file name, date, page number and company logo.











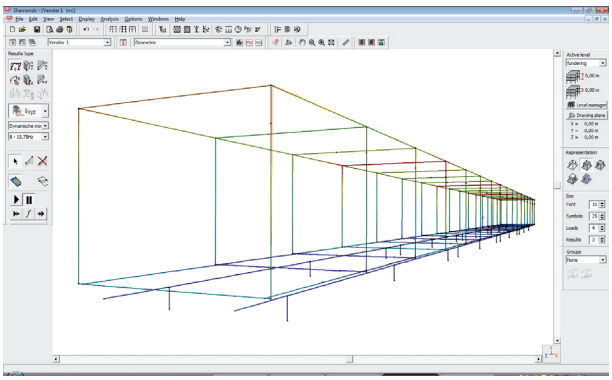
# Customer story

## Vleeshuis – Promotion centre for regional products

A tourist pavilion for local food is housed within the Vleeshuis, a medieval indoor meat market in the historic heart of Ghent. The subtle, rhythmic structure of the pavilion is confronted with the ancient weathered oak beams of its historic surroundings. The 50m long volume appears to float above the floor and strengthens its status as a light and irreversible intervention in the historic Vleeshuis, which is pervaded with a powerful sense of history. The minimal impact of the pavilion immediately strengthens its historical context.

The existing rhythm of the Vleeshuis extends in all directions and forms the basis for the steel rhythm of the pavilion. It was designed as a modular construction system, in which the vertical and horizontal framework is mounted on two steel tracks. The steel frameworks play a double role; the details are just as crucial for the architecture as they are for the structure. The result is a perfect integration of the architecture into the structure.

To achieve the floating character of the pavilion and to deal with problems concerning the foundation of the Vleeshuis, such as various cellars, different floor levels and an archaeological important underground, a structural system was devised on two tracks which span the various obstacles. They span the cellars, set off the different floor levels and protect the archaeological architecture by way of foundation slabs placed at a shallow level. The tracks literally form the foundation of the pavilion for both the structure and the architecture.



The modulation was designed from an architectural point of view with references to the historic architecture. It is used as a structural means to achieve the modular construction system in which this architecture expresses itself.

# Structural Engineering Office Mouton

Studieburo Mouton is a structural design office that has acquired a special position within the Flemish architectural landscape as well as a steadily growing international reputation. Conducting a stability study for a design goes much further than simply calculating a given situation. The office is ready to be involved in the architect's very earliest design stage. Its main aim is to provide a stability study in which the interaction with the architect strengthens the design. The main endeavor of Studieburo Mouton, is to arrive together with the designers at an intrinsically superior design process and structure. It is the intense cooperation between the architect and the engineer in which architecture and structure both reinforce and challenge one another: this is designing together. In its design process, Studieburo Mouton's task is to ensure that everything — ranging from the original artistic idea to architectonic detail — is correctly and optimally covered. The structure and stability of a design are not merely calculated, but designed. This method of work contrasts with the current view that the stability study is a phase that is separate from the architectural design. The Studieburo Mouton absolutely does not envisage architecture and stability as separate entities but as a powerfully expressed consolidation among partners that creates a superior final project. If the architect and the structural engineer are on the same wavelength, the stability and structure of a design form a natural whole with the architecture.

studieburo mouton bvba

## BuildSoft client since

1989

## BuildSoft software

- PowerConnect
- Diamonds
- ConCrete
- 12Build

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# About BuildSoft

BuildSoft is a Belgian company specialized in software solutions for the structural design analysis of buildings and the calculation of structures in reinforced concrete, steel and timber. BuildSoft develops specialized calculation software according to the latest Eurocode, American and many local standards. We highly invest in the user-friendly and intuitive quality of our analysis software. The software is meant for structural engineers, architects, contractors and building companies.

## User-friendly

Started in 1989 with the software ConCrete for continuous beams in concrete, BuildSoft has developed several time-saving programs. From the beginning, the usability was a key feature. With the increased capacities of the computers, the BuildSoft products have evolved from a 1D program to the powerful and reliable 3D finite element software Diamonds.

## VIP support

"Our unique mix of power, usability and service, appeals to the customers. We give you answers to your questions. Because we have a wide technical expertise on structural analysis and Eurocodes" , says Geert Goossens, CEO of BuildSoft.

## Worldwide

BuildSoft continues to innovate and invest in powerful user-friendly analysis software. The BuildSoft software is being used today in over 50 countries. With the help of resellers in Southern-Europe, Scandinavia, South America, India, Middle East and China, there are over 4000 BuildSoft licenses in use. For example, with a product like PowerConnect, for steel connection design, BuildSoft distinguishes itself from the market with both simplicity and performance and draws new customers worldwide.

## References

Examples of projects calculated with BuildSoft software and a complete list of our customers (engineering offices, contractors, governments and education) can be found on our website:
http://www.buildsoft.eu/en/references

## In figures

| 2000 | 26 | 4000 | 75% | 2200 |
|---|---|---|---|---|
| customers use BuildSoft software in more than 50different countries | years of experience in structural design analysis and design codes | licenses in use with customers | of the Diamonds customers have a maintenance or subscription contract | student registrations every year for a free educational license |

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lateral buckling restraint - attaches - steel check - creep - charges climatiques - dynamic analysis - lateral buckling - brandweerstandsanalyse - timber - 1st order - verstijvers - buisverbinding - diseño de planos de armaduras - pandeo lateral - verbindingen - shear connection - verificación - armatures longitudinales - pórtico - unión base columna - voorontwerp - unión tubular - haunch - connexion moment - cimbras - vérification acier - unity check - Eurocode 2 - mesh - retaining wall - raidisseur - Eurocode 3 - longitudes de pandeo - connections - ACI - acero - 2nd ordre - portal frame - Eurocode 8 - andamios - kip - dwarskrachtverbinding - BS - dalle de fondation - seismische analyse - armaduras longitudinales - BIM - gelaste verbinding - 2de orde - buckling - funderingszool - poutre sur plusieurs appuis - maillage - malla - uniones - 2D raamwerken - fire resistance analysis - voiles - cracked deformation - gescheurde doorbuiging - longueurs de flambement - pandeo - reinforcement - unity check - cantonera - dynamische analyse - hout - ossatures 3D - koudgevormde profielen - placa de extreme - 1er orden - continuous beam - connexion soudée - momentverbinding - praktische wapening - integrated connection design - renforts au déversement - fluencia - estribos - déformation fissurée - EHE - beugels - Eurocódigo 3 - platine de bout - análisis dinámico - column base plate - kruip - rigid link - welded connection - charpente métallique - AISC - moment connections - estructuras 2D - kniestuk - assemblage métallique - 3D raamwerken - second ordre - beam grid - cargas climáticas - Eurocode 2 - Eurocode 5 - wall - deformación fisurada - lien rigide - enlace rígido - 2D frames - estructuras 3D - éléments finis - vloerplaat - steel connection - seismic analysis - scheurvorming - armatures pratiques - analyse sismique - nieve y viento - practical reinforcement - charges mobiles - dalle - wapening - perfiles conformados en frío - Eurocode 3 - connexion tubulaire - unión a momento - 3D frames - treillis de poutres - roof truss - practical reinforcement design - portique - kipsteunen - análisis sísmico - B.A.E.L - uniones atornilladas - bolts - **Eurocode 8** - ossatures 2D - eindige elementen - losa de cimentación - restricciones para el pandeo lateral - optimisation - wand - kniklengtes - end plate - dakspanten - kolomvoetverbinding - stirrups - acier - staalcontrole - cálculo de uniones integrado - paroi - dessin du plan de ferraillage - stiffeners - mobiele lasten - Eurocódigo 8 - Eurocódigo 5 - longitudinal reinorcement - doorlopende liggers - rigidizador - beton armé - fluage - CTE - connexion pied de poteau - langswapening - connexions - hormigón - neige et vent - elementos finitos - armaduras - cold formed steel - jarret - uittekenen wapening - puente grúa - analyse dynamique - flambement - keerwanden - optimisation - steel - cercha - 2º orden - slab on grade foundation - entramado de vigas - Eurocode 5 - prédimensionnement - multi span beam - bouten - armatures - floor slab - poutre continue - pared - staal - 1er ordre - connexion cisaillement - losa - déversement - viga continua - predimensionering - 1ste orde - unión metálica - CM 66 - madera - análisis resistencia al fuego - verbindingen - 2nd order - bois - Eurocode 2 - profilés formés à froid - verificación acero - predesign - unión soldada - fisuración - beton - muro de contención - optimalisatie - foundation pads - fissuration - concrete - AISC - HCSS - assemblage métallique - Eurocode 3 - viga con varios apoyos - armaduras prácticas - balkenroosters - unión a cortante - buckling length - boulons - cracking - Eurocode 8 - knik - Eurocode 2 - radier - eindplaat - Eurocódigo 2 - FEM - tornillos - NEN - moving loads - balk op meerdere steunpunten - cargas móviles - funderingsplaat - étriers - analyse resistance au feu

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