

SCIA & Allplan
User Contest 2015

The *Art* of Structural Design



Dear Reader,

It's a real pleasure to present this year's User Contest Book 2015, aptly named "The Art of Structural Design".

This impressive ninth edition illustrates dozens of inspiring projects of structural and civil engineering and the designers behind them. This year's competition transcends all previous editions with no less than 134 remarkable projects that are spread over four different continents. It is also remarkable how widespread the application of BIM workflows has now become!

Our international jury of renowned experts and academics was amazed with how our users contribute to the global engineering community reflecting the very 'art of structural design'. The panel was also excited to see what great engineers can achieve with SCIA and Allplan's technology and software tools. Four winners were selected from all contest categories and the favourite "BIM" project received the much desired "Prize of the Jury".

A close personal relationship with our customers is a central priority for us. Feedback from our users inspires us to improve our services and steers many new software developments. In this contest as well, our users got a voice and for the first time in this contest's history we introduced the new "Prize of the Public" award.

In name of the SCIA and Allplan teams, I sincerely congratulate the winners of this contest and would like to express my appreciation to all participants for having shared their know-how with us.

Enjoy this book!

Patrik Heider

Spokesman of the Executive Board
CFOO Nemetschek Group



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Winners and Nominees

Winner Category 1: Buildings

Design of buildings, residences, apartments, roof spans for houses, also high-rise buildings... for which SCIA Engineer and/or Allplan Engineering software has been used for modelling, analysis, design and detailing.

Pell Frischmann

Blavatnik School of Government - Oxford, United Kingdom 16



Nominees Category 1

Building Design Partnership

AstraZeneca's New Global R&D Centre - Cambridge, United Kingdom 20

De Bondt, s.r.o

Stadium, Administration Building - Bratislava, Slovakia 22

VK Engineering

Brussels, Belgium 24

Winner Category 2: Civil Structures

Any type of structure that fits within civil engineering, for which SCIA Engineer and/or Allplan Engineering software has been used. It regards structures including each type of bridge (beam, arch, cable-stayed, suspension bridge...), tunnels, bulkheads, locks, dams, in short general infrastructure...

BAS bvba

Pedestrian Bridge - Wenduine, Belgium 78



Nominees Category 2

ACS-Partner AG

Aarebridge Olten (SO) - Kanton Solothurn, Switzerland..... 80

Schroeder & Associés

Reconstruction of the Bridge OA401 - Luxembourg / Germany 82

Witteveen+Bos

"Verlengde Waal Brug" - Lent, The Netherlands..... 84

Winner Category 3: Industrial Buildings and Plants

Design of general steel or concrete structures, power plants, frame structures, large span halls and hangars, pre-engineered buildings... for which SCIA Engineer and/or Allplan Engineering software has been used.

BG Ingénieurs Conseils

Nant de Drance - Chamonix Aiguilles Rouges Massif, Switzerland .. 106



Nominees Category 3

ARCADIS Belgium nv

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Ryklin STATIK

Container Hall - Mannheim City, Germany 110

VK Engineering

'Eurosilo' Construction of 16 New Grainsilos - Ghent, Belgium..... 112

Winner Category 4: Special Projects

Specialty structures – Sustainable, Ecological and Green Structures – Scaffolding – Works of art – Mechanical equipment... Larger projects (storage tanks, conveyer belts, cold storage installations, supporting structures), playground equipment, cranes, tubular connections... for which SCIA Engineer and/or Allplan Engineering software has been used. To this category also belong stadiums, spectacular roofs.

Royal HaskoningDHV

Markthal - Rotterdam, The Netherlands 138



Winner Special Prize of the Jury

In each of the 4 categories, one winner and three nominees were selected. From all the participating projects the jury also chose a 'Special Prize of the Jury'. Special consideration went to projects illustrating the best practical application of Open BIM.

Building s.r.o.

Modern Office Building 'Aviatica' - Prague, Czech Republic 18



Winner Prize of the Public

A "Prize of the Public" was organized by a voting system through the social media channel Facebook independently of the jury gathering. Any Facebook user could vote on any project by clicking its 'vote' button. It was allowed to like multiple projects.

AECOM

Serpentine Gallery Pavilion 2014 - London, United Kingdom 140



Nominees Category 4

AECOM

Serpentine Gallery Pavilion 2014 - London, United Kingdom 140

Baudin Châteauneuf

Solar Sail "Cité Musicale" - Boulogne Billancourt, France 142

Construtora Norberto Odebrecht

Fast Track P-76 - Rio de Janeiro, Brazil 144

SCIA Engineer, BIM-ready modelling, analysis and design in one program.

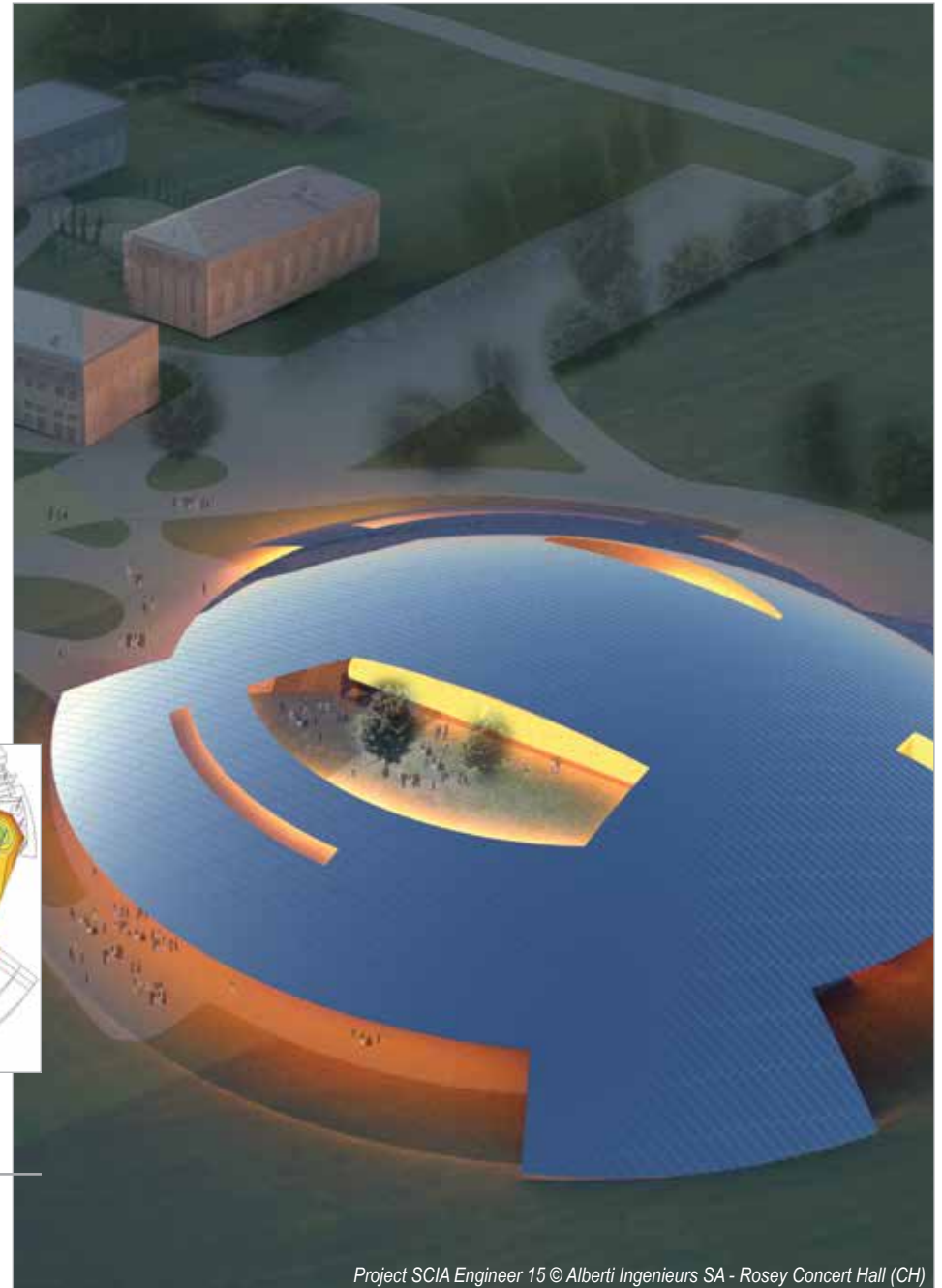
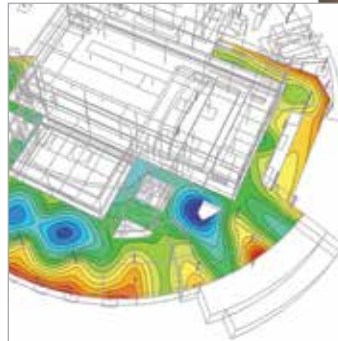
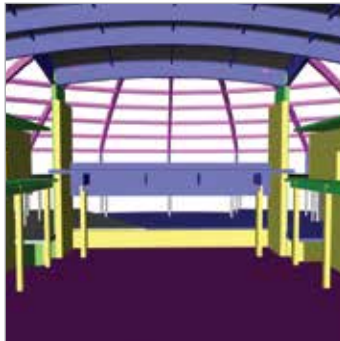
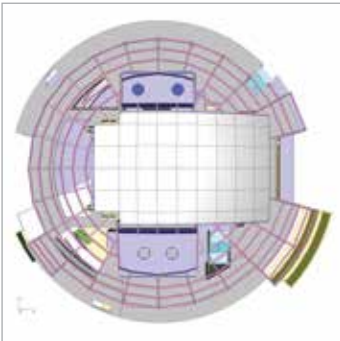
SCIA Engineer is an integrated, multi-material structural analysis and design software for all kinds of projects. Its wide range of functionality makes it usable for all kinds of projects: design office buildings, industrial plants and bridges, all within the same easy-to-use environment.

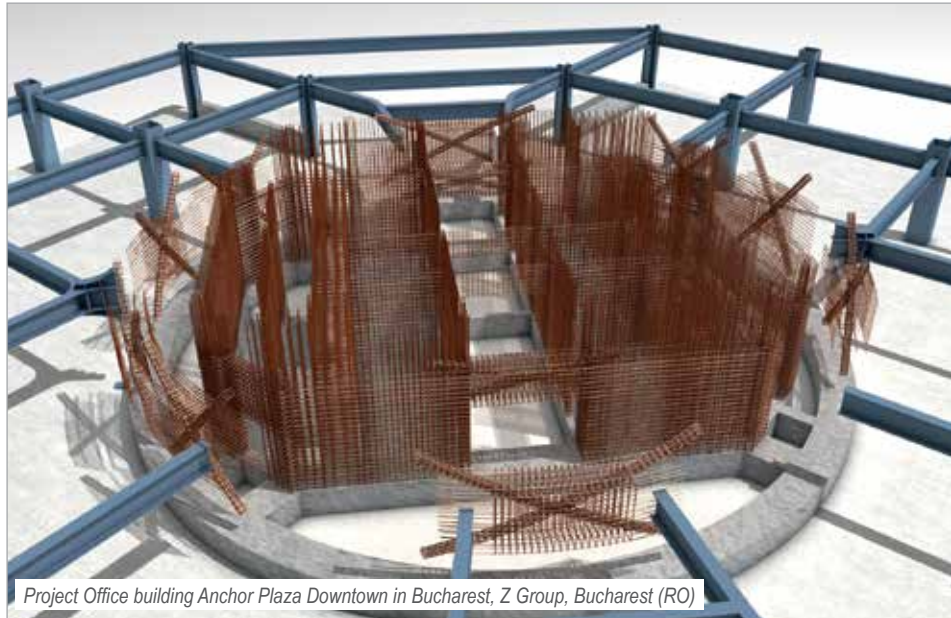
In addition to a state-of-the-art modelling, mesh generator and high-performance finite element solver, it features integrated tools to check or optimize the structure to a variety of international and national building codes.

Simply put, SCIA Engineer goes further than the traditional structural analysis software.

Thanks to its intuitive and productive environment and its wide applicability, it will provide you several benefits:

- Fast and efficient modelling
- Advanced analysis
- Multi-material design
- Coordinated documentation and reporting
- Interoperability and collaboration





Project Office building Anchor Plaza Downtown in Bucharest, Z Group, Bucharest (RO)

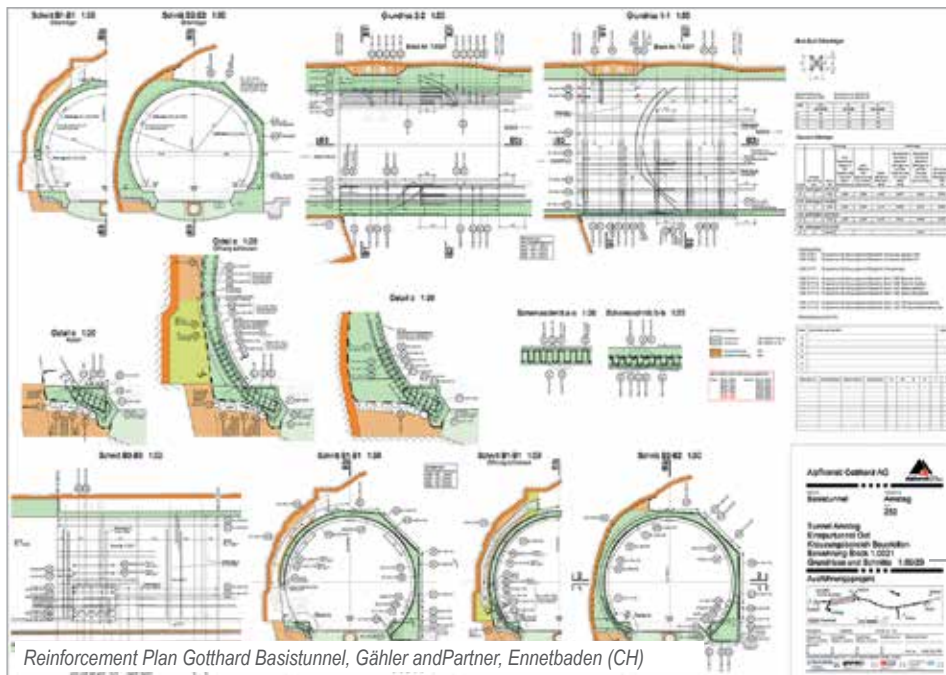
Allplan Engineering, a building is more than the sum of its parts.

Allplan Engineering is a high-performance BIM solution that supports the complete design process for engineering and other planning offices, as well as construction companies. The special strength of Allplan Engineering lies in three dimensional general arrangement design and reinforcement detailing which saves time and lowers the risk of error. The classic two-dimensional or hybrid methods of operation are also possible. A wide range of current industry standard and file formats (including DWG, DXF, DGN, IFC, PDF, SKP, 3DM and C4D) are available for smooth data exchange. Together with Frilo Statik or SCIA Engineer, Allplan Engineering offers an integrated solution for CAD and structural analysis from a single source.

The powerful layout and design tools enable you to create impressive planning documents that set you apart from other engineering offices and enable you to demonstrate the value of your work to clients more effectively.



Project Flyover Haarlem © Design by Royal HaskoningDHV, Joris Smits, photograph by Jane van Raaphorst



Reinforcement Plan Gotthard Basistunnel, Gähler andPartner, Ennetbaden (CH)

For more information about Allplan Engineering, visit www.allplan.com/engineering

The Jury



How were the projects judged?

An international jury, from both the academic and professional community, gathered in July 2015 for the evaluation of all submitted projects.

The jury took the following characteristics into account:

- The technical level of the design, detailing and/or the calculations (doubled points)
- The originality and prestige of the project
- The attractiveness and completeness of the presentation and the uploaded documentation
- The optimal use of the software functionalities and the illustration of a BIM process
- The overall impression of the project

In each of the 4 categories, one winner and three nominees were selected. From all the participating projects the jury also chose the 'Special Prize of the Jury'.

Mr. Vladimir Benko



**Slovak University of Technology,
Faculty of Civil Engineering**

- Department: Concrete Structures and Bridges
- Function: Vice-Dean
- Specialty: Structural Design and Earthquake Engineering



Mr. Peter Buffel



Technum Tractebel Engineering

- Department: Structural Engineering
- Function: Senior Expert
- Specialty: Steel and Instability



Mr. Laurent Heinen



INCA Ingénieurs Conseils Associés

- Department: Building Physics, Informatics
- Function: Head of Department and Chief Information Officer
- Specialty: Building Physics, Concrete Refurbishment and Informatics



Mr. Pierre Latteur



Catholic University of Louvain

- Department: Civil and Environmental Engineering
- Function: Professor
- Specialty: Structural Engineering



Mr. Mark Lawson



University of Surrey

- Department: Civil Engineering
- Function: Professor of Construction Systems
- Specialty: Structural Engineering and Composite Systems



Mr. Bas van Loenen



Volker InfraDesign

- Department: Civil Engineering
- Function: BIM Specialist
- Specialty: BIM in Infrastructure



Mr. Gurvan Sayer



Socotec SA

- Department: Business Development Department
- Function: Expert Engineer
- Specialty: Earthquake Engineering and Modelling



Mr. Harri Siebert



CE-N

- Department: Civil Engineering
- Function: Managing Director
- Specialty: Structural Engineering and Free Form Structures



Mr. Simon Wijte



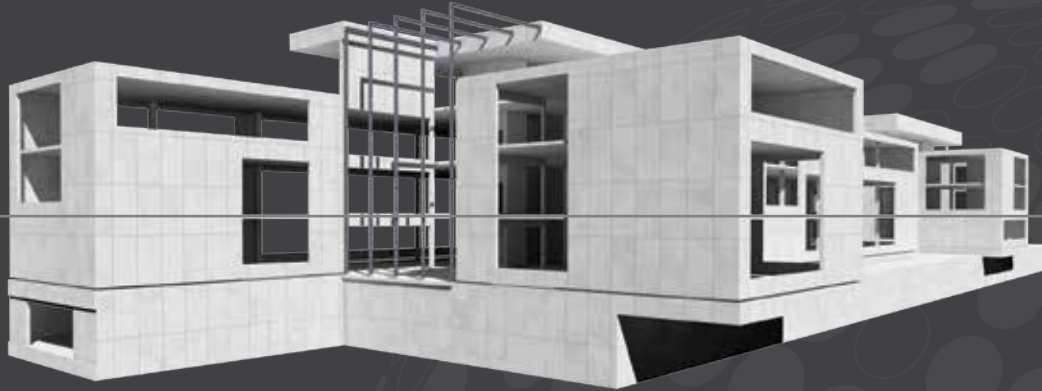
TU Eindhoven

- Department: Faculty of the Built Environment
- Function: Professor
- Specialty: Structural Design



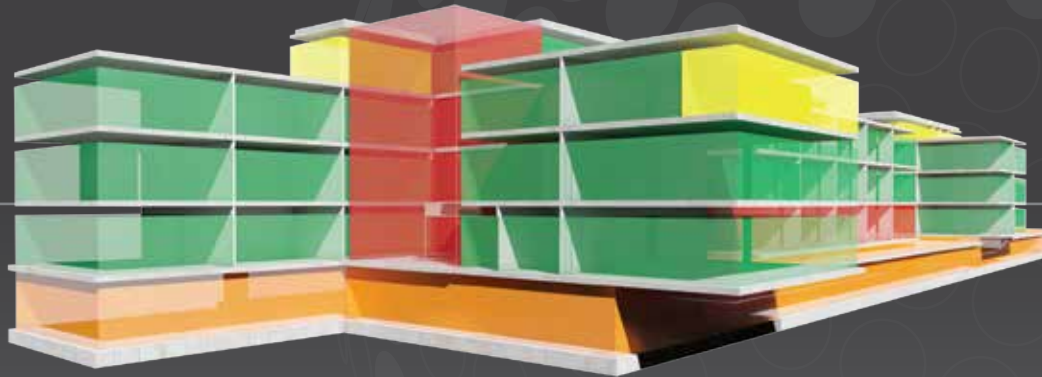
OPEN BIM™

STRUCTURAL



BEST-IN-CLASS
MULTIDISCIPLINARY

ANALYTICAL



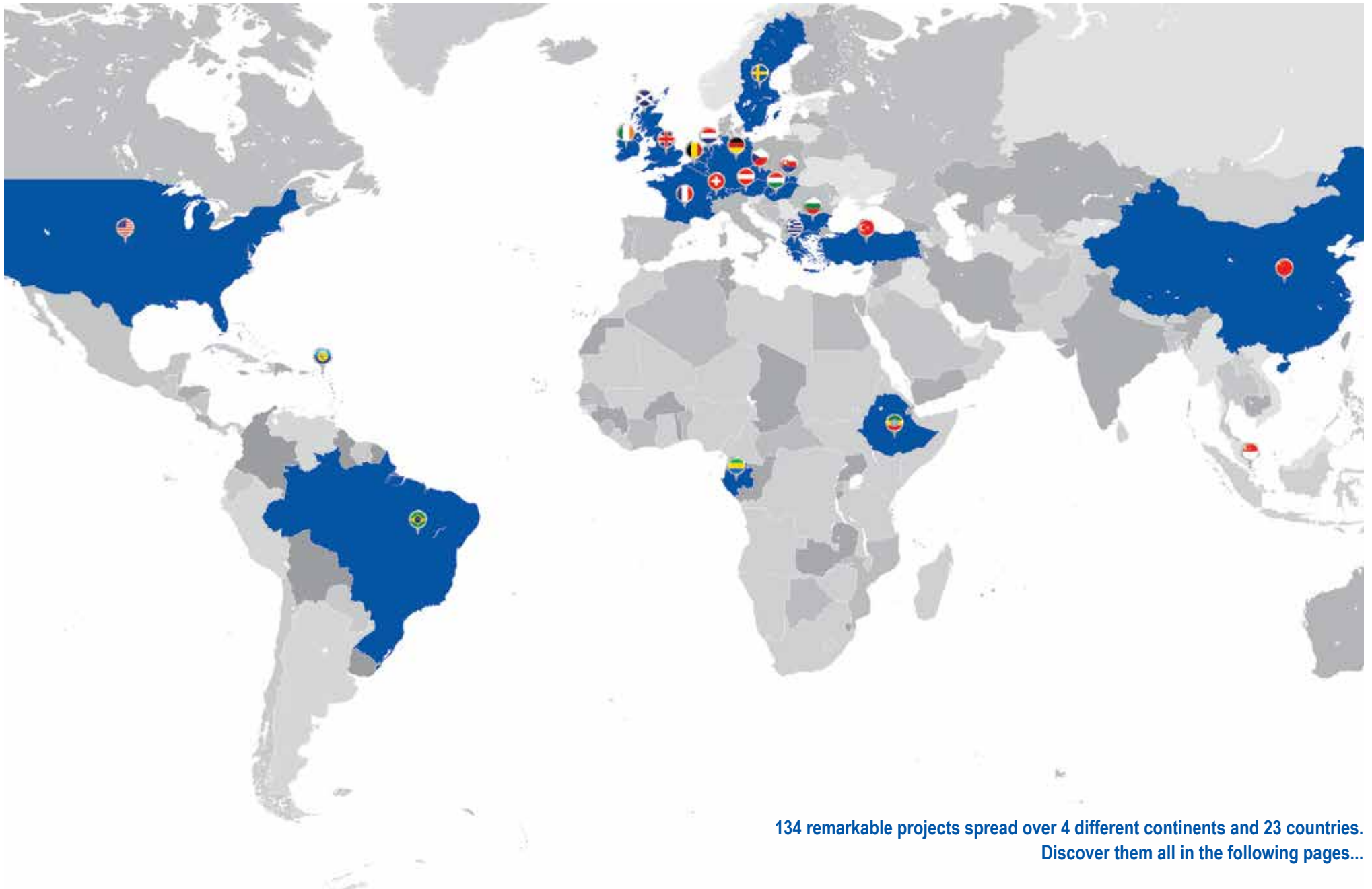
COORDINATION
WORKFLOW

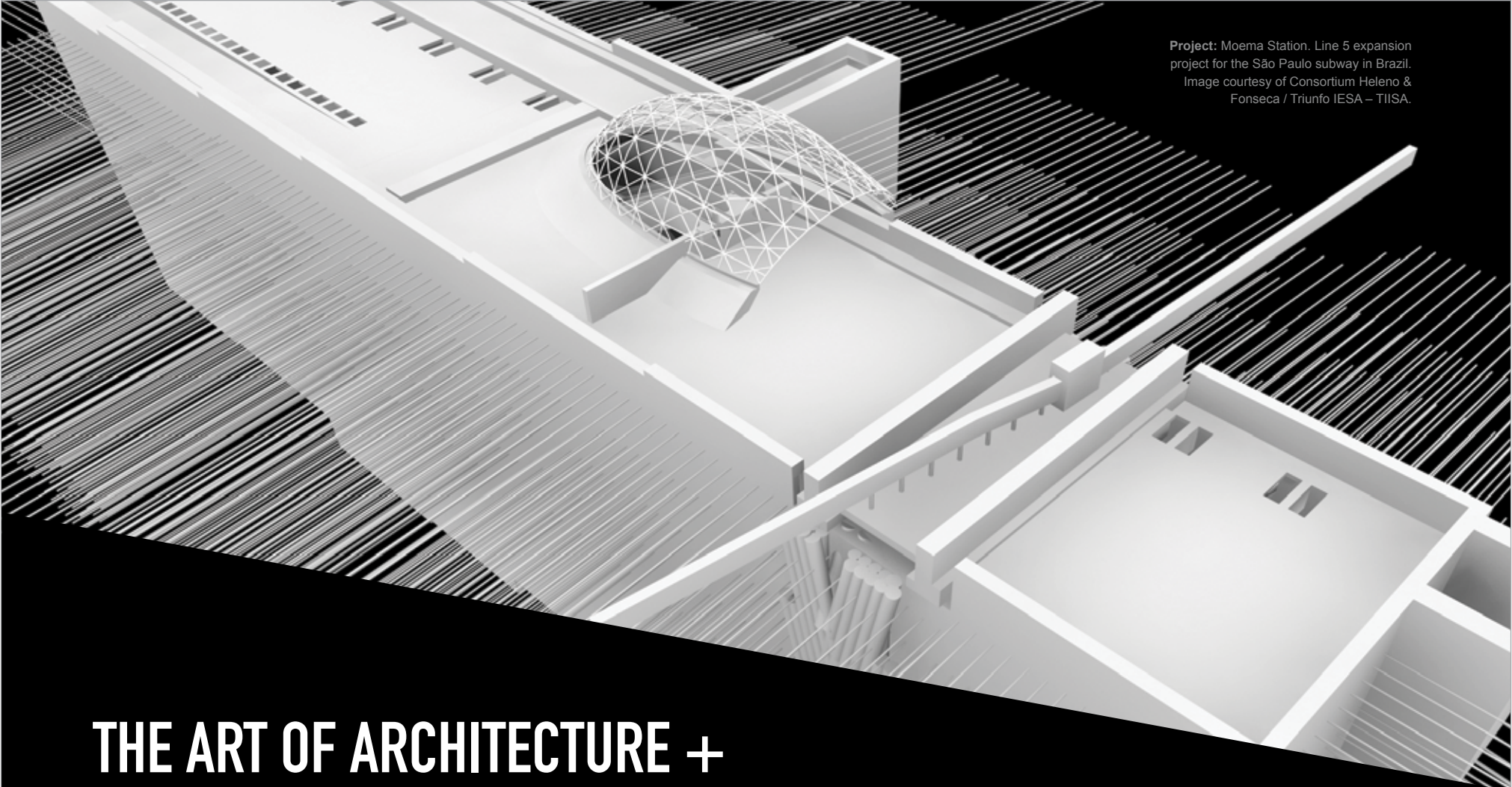
ARCHITECTURAL



MICROSOFT OFFICE COMPLEX
GRAPHISOFT PARK, BUDAPEST, HUNGARY
DESIGNED BY LUKÁCS AND VIKÁR ARCHITECTS

GRAPHISOFT®
ARCHICAD





Project: Moema Station. Line 5 expansion project for the São Paulo subway in Brazil.
Image courtesy of Consortium Heleno & Fonseca / Triunfo IESA – TIISA.

THE ART OF ARCHITECTURE + THE SCIENCE OF ENGINEERING

Vectorworks develops a line of BIM software products that simplify design decisions for easy coordination with civil and structural engineers. The result? A powerful, integrated A/E workflow with Scia Engineer.

Email info@vectorworks.net to get a free 30-day trial.



VECTORWORKS
A NEMETSCHEK COMPANY

Design of buildings, residences, apartments, roof spans for houses, also high-rise buildings... for which SCIA Engineer and/or Allplan Engineering software has been used for modelling, analysis, design and detailing.

Buildings

1

Winner Category 1

Quote of the Jury: *"The uniquely intricate and complex 3D circular shape of the concrete structure of the Blavatnik School in Oxford was appropriately considered in the design by using a full 3D model. Moreover, the analysis of the construction stages allowed the engineers to precisely assess the need for temporary supports and to accurately predict deflections."*

Owner Oxford University
 Architect Herzog & de Meuron
 General Contractor Laing O'Rourke
 Engineering Office Pell Frischmann
 Construction Period 2013 - 2015

Commissioned by Oxford University, the new building will host a facility that aims to train future world leaders. Such an ambitious idea demands an ambitious project. A cohesive design team formed by Herzog & de Meuron architects and Pell Frischmann worked together to shape this iconic building.

The structure has an intricate geometry that consists of a series of stacked toroids which are offset, on plan from floor to floor resulting in set-backs and cantilevers to the external elevation and to the inside face of the forum. Due to the complex interaction of structural members the building had to be analyzed as a whole. SCIA Engineer was used to create a full FE model and generate the analysis output used in the design. Code dependent deflections assessment was carried out to establish long-term displacements. Although post tensioned slabs were designed using a specialized software, SCIA Engineer proved to be very flexible with data input. Data was imported through table input to effectively simulate tendon forces within the slabs. The Construction Stages module was used to assess temporary supports as well allowing for more accurate deflection prediction for the permanent case.

Pell Frischmann

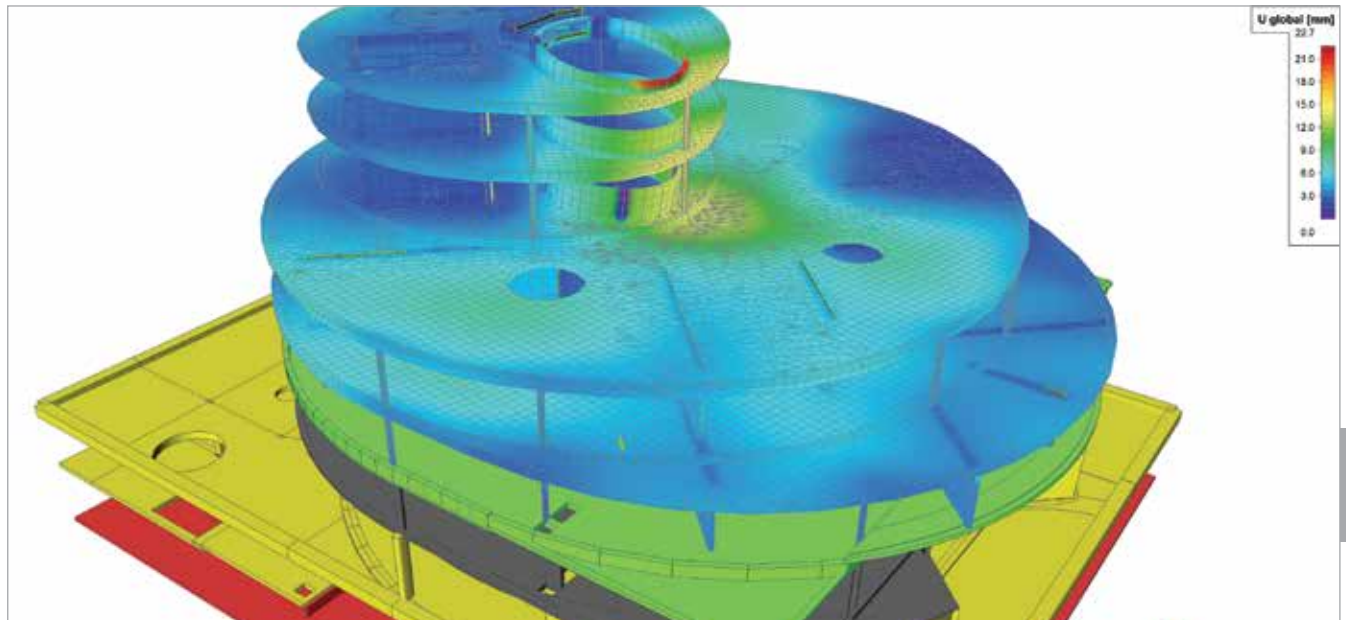
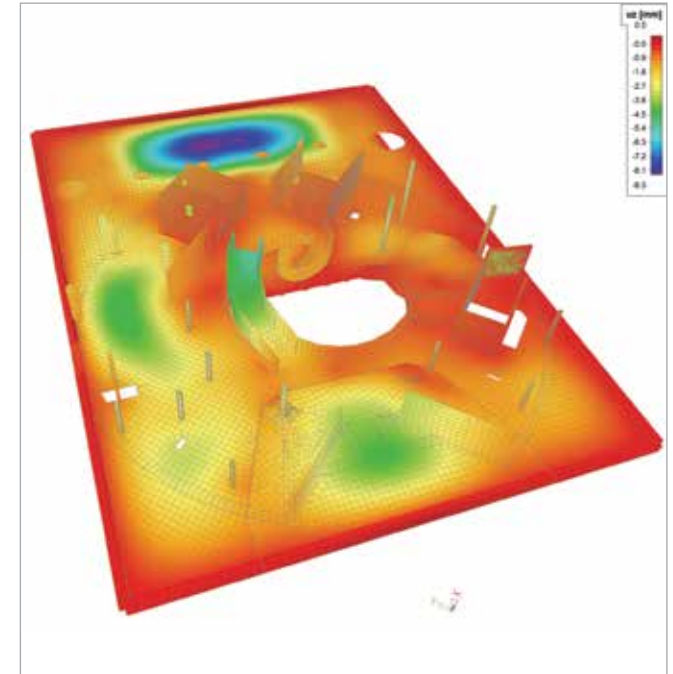
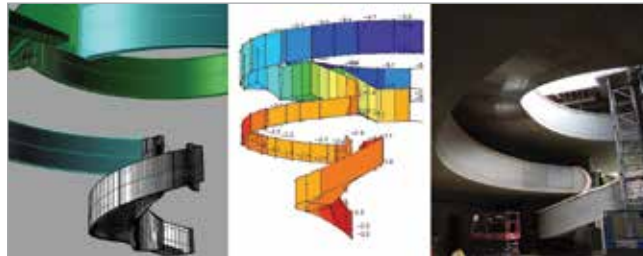
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 Website www.pellfrischmann.com

Pell Frischmann

Pell Frischmann is a diverse engineering, development and management consultancy delivering innovative solutions for public and private clients world-wide. Annually, we are responsible for more than £1 Billion of construction projects.

Our structural engineer capabilities cross the sectors and we work both in the UK and internationally.

In recently years our approach to resolving highly technical projects has been widely recognised and celebrated in the industry through such awards as the ACE's Building Structures Firm of the Year 2014 and by being awarded the Queens Award for Enterprise and International Trade in 2015.



Winner Special Prize of the Jury

Quote of the Jury: "The 'Aviatica' project stands out for the nice curved structure and use of OpenBIM: using the IFC format to exchange the models between Allplan Engineering and SCIA Engineer in the design phase and finally using the full model for future facility management."



Owner Penta Investments s.r.o.
 Architect Cigler Marani Architects a.s.
 General Contractor PSJ a.s.
 Engineering Office Building s.r.o.
 Construction Period 12/2013 - 06/2015

The office building Aviatica represents the first development of a new city district. It has two basements measuring 180 x 84 m and from 4 to 9 stories. The structural system consists of a main reinforced concrete skeleton, steel trusses and thin concrete slabs on cantilevered roof extensions, load bearing roof grid and concrete prestressed truss supporting the entrance arch part. The basement next to the Metro is vibro-insulated. Foundations have been drilled using large-diameter piles. The building has an interesting rounded shape, as almost only the elevator shafts are rectangular.

The Aviatica project is the first partial application of BIM in our company. The 3D model in SCIA Engineer was used for modelling and calculating, and formworks and reinforcements were drawn in Allplan. The general IFC format was used for data transfer. The prestressing was implemented with external loads. Vibro-insulation was applied as two slabs connected with a dense field of short columns.

Many structural engineering tasks are concentrated in this one project, from prestressing and vibro-insulation to column transfers. An engineer is only able to meet all the requirements by processing a lot of individual projects. The investor wanted to have not only an interesting building, but also a modern project design using BIM with the advantage of further use for client requirements and building maintenance.

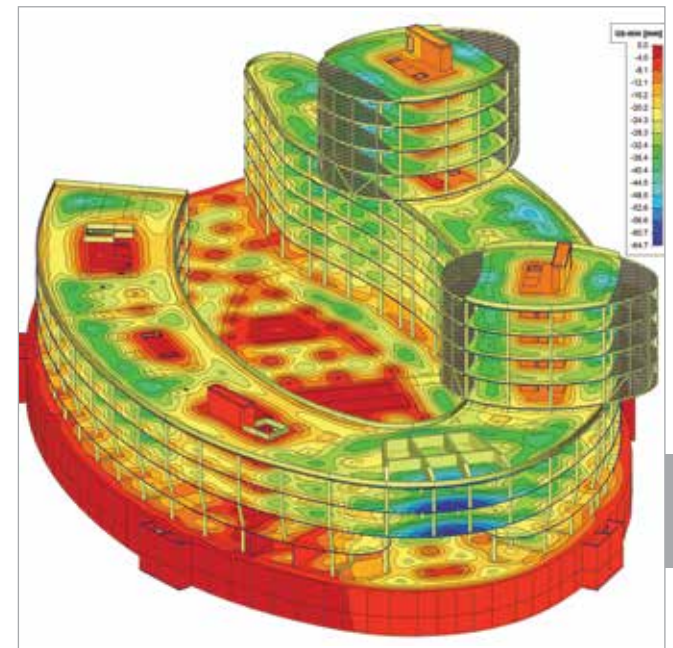
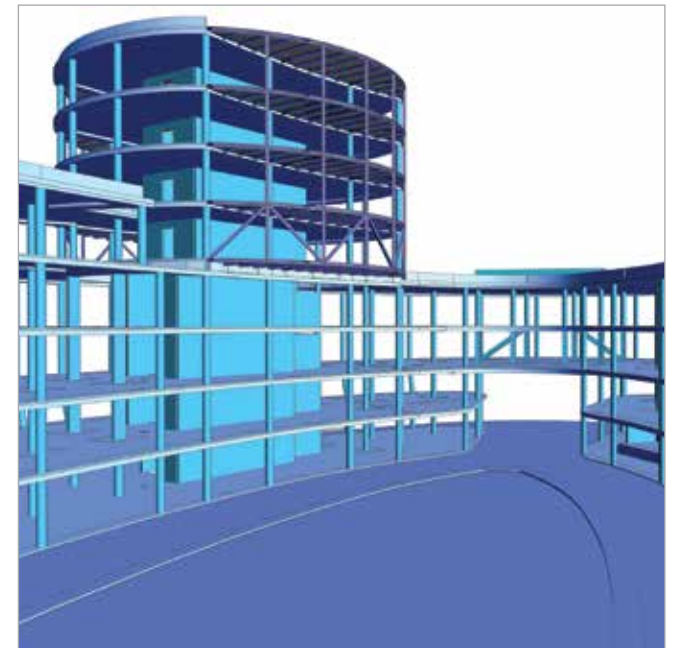
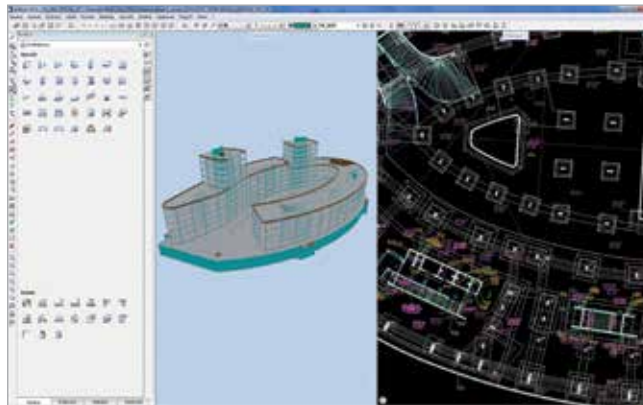
Building s.r.o

Contact Vaclav Toman
 Address Slavikova 20
 13000 Praha 3, Czech Republic
 Website www.building-sro.cz



Building s.r.o. was set up in February 1992 as a design and engineering office. The firm focuses on designing office and residential buildings and public facilities at all stages, provides engineering services and a supervision of construction execution. Reinforced concrete constructions are our main specialization. We also collaborate with other architectural studios.

Building s.r.o. is a certified quality management system holder according to EN ISO 9001. Our vision is to provide modern buildings according to the latest knowledge in building design.





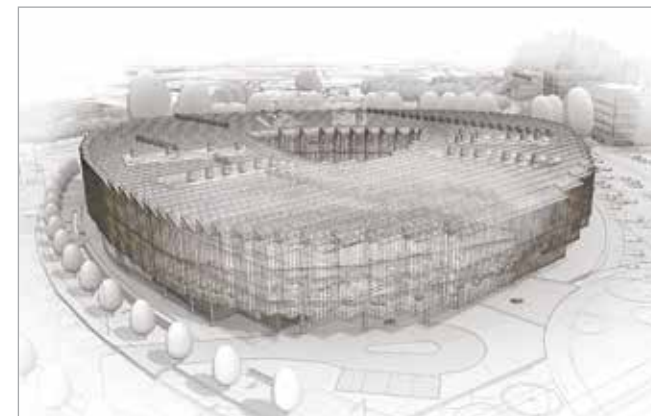
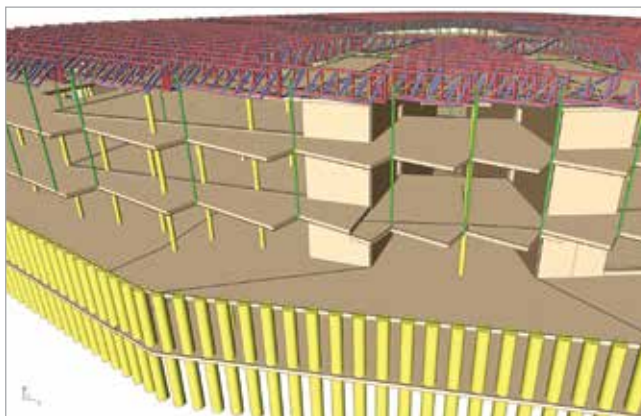
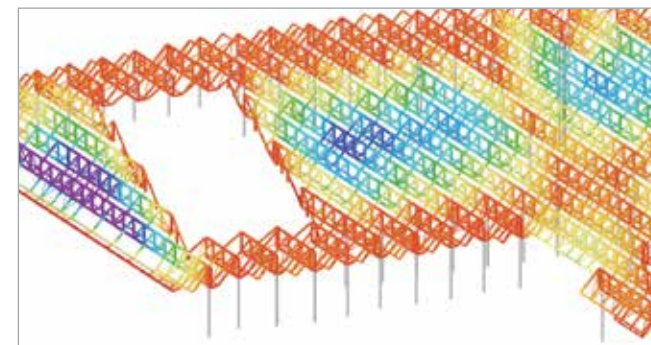
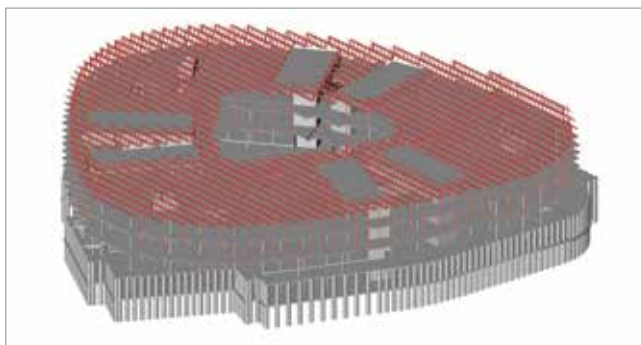
Owner AstraZeneca
 Architect Herzog & de Meuron
 General Contractor SKANSKA
 Engineering Office Building Design Partnership
 Construction Period 04/2015 - 07/2016

BDP were responsible for the design of a new research and development laboratory and office for AstraZeneca, in collaboration with Herzog & de Meuron architects. The building consisted of a 5 storey concrete framed structure, with a steel roof. The lowest 2 levels were situated in a basement, whilst the upper 2 storeys incorporated large cantilevers to the external envelope of the building, and around an internal courtyard.

SCIA Engineer was utilized on virtually every aspect of the project. To speed up analysis, the building was split into 2 models - one consisting of the concrete frame, whilst the other formed the roof. These models were initially created by importing a revit model into SCIA Engineer. From this we were able to analyze virtually everything on the structure.

Overall the project itself proved a major challenge, with SCIA Engineer proving particularly valuable in the following areas:

- Monitoring long term and short term vertical slab edge deflections.
- Monitoring vertical and horizontal deflections at the roof-facade interface.
- Establishing movement joint requirements across the slab by considering the impact of thermal load cases.
- Value engineering - Working out upstand beam requirements for the slabs and member reduction for the roof.
- Accurately modelling the forces and stresses within the slab with an extremely irregular column array.



Building Design Partnership

Contact Tom Carr
 Address 16 Brewhouse Yard Clerkenwell
 EC1V4LJ London, United Kingdom
 Website www.bdp.com

BDP.

BDP is a major international, interdisciplinary practice of architects, designers, engineers and urbanists; embracing all the skills needed to provide an integrated, comprehensive service. We work closely with users, clients and the community to create special places for living, working, shopping, culture and learning across the world. BDP has a leading track record in all major sectors including health, education, workplace, retail, urbanism, heritage, housing, transport, leisure, public safety and energy utilities.





Owner *Národný futbalový štadión a.s*
 Architect *Ing. arch. Karol Kállay st.,
 Ing. arch. Karol Kállay ml.,
 Ing. arch. Branislav Bolčo,
 Ing. Radovan Valenta*
 General Contractor *Národný futbalový štadión a.s*
 Engineering Office *De Bondt, s.r.o.*
 Construction Period *2015 - 2018*

The objective of the project was to construct a National Football Stadium which would fulfil the UEFA criteria. The building will also accommodate retail stores, an information centre and the administration offices.

A complex, three-dimensional structural model was created in SCIA Engineer. The model enabled us to design effectively and optimise the load-bearing structural system. It was especially useful in identifying the flow of internal forces in the structural members when the load-bearing system on the fourth and sixth floor changed. As a result, correct and efficient dimensioning of the structural members was achieved.

There is a 1.25 m thick ceiling slab on the fourth floor. The columns from the upper part of the building terminate on the sixth floor and the forces are then transferred via transverse walls to the two columns of the oval cross-section. Part of the sixth floor is made from the 1,000 mm thick slab.

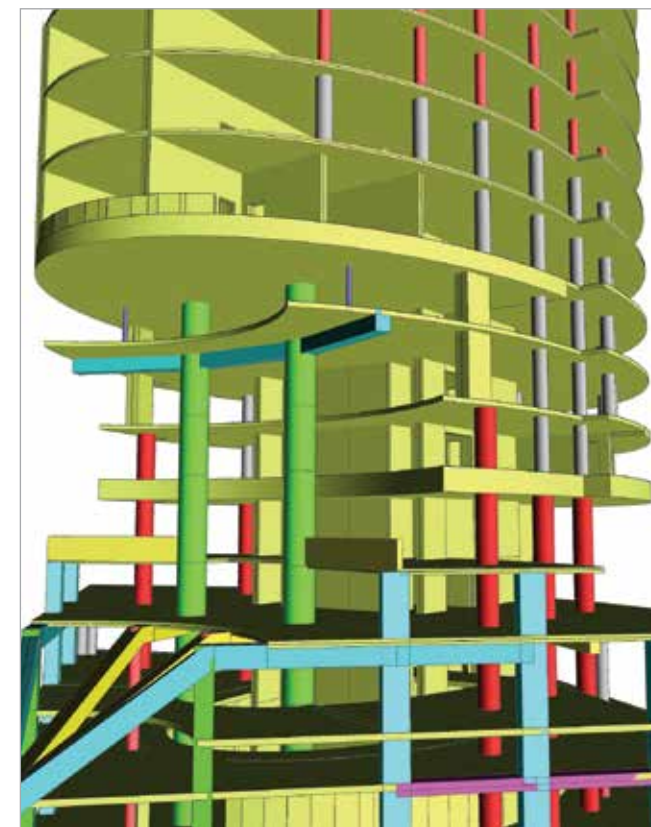
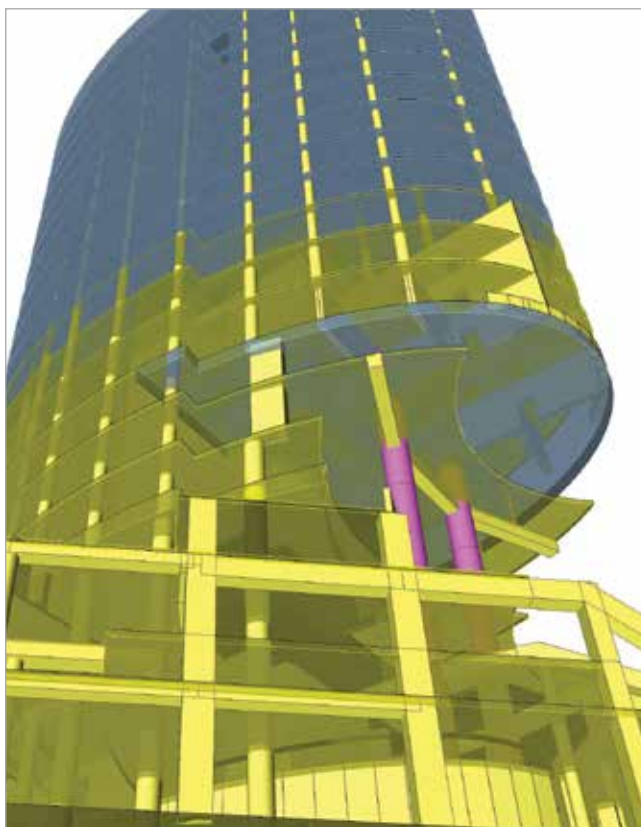
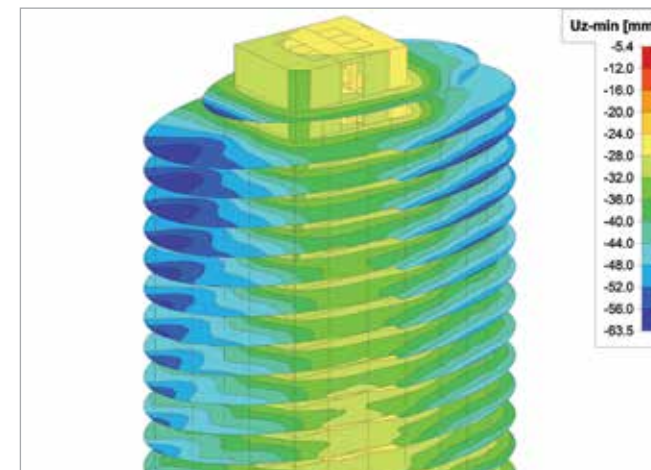
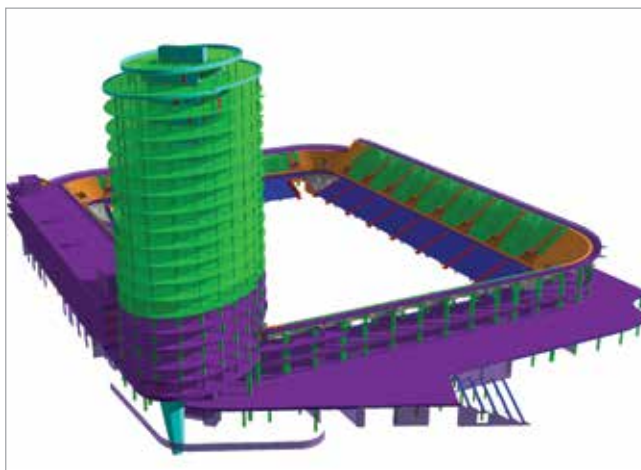
De Bondt, s.r.o.

Contact *René Meravý Murárik*
 Address *Rybárska 7389
 91101 Trenčín, Slovakia*
 Website *www.debondt.sk*



The planning and engineering office De Bondt, s.r.o. was founded in December 1996. Since then the company has designed and consulted on many industrial, commercial and residential projects all over Europe and outside Europe - Saudi Arabia, Canada, Afghanistan.

De Bondt, s.r.o. specialises in providing the following technical services: statics of steel, reinforced concrete, prestressed concrete and masonry constructions - engineering of constructions - plans and shop drawings of steel and reinforced constructions - optimization of constructions, and in providing consulting package for developers.



Nominee



Owner THV Vastgoedruimte Noord nv-Immobil nv
 Architect Jaspers-Eyers Architects
 Project Developer Immobil
 Engineering Office VK Engineering nv
 Construction Period 04/2015 - 12/2016

The TBR Brussels Tower is **87 m high** and contains 80,000 m² of office space. The structure consists of a wide existing building and a plinth. The project involves the building of a **new tower (measuring 25 m by 25 m) on the foundation slab of the former plinth**. A steel bridge will connect the two towers.

In this project, SCIA Engineer has been used for several analyzes: the **global stability**, the deformation of the tower, a check of the **wind comfort**, a **second order check**, the analysis of the forces in the **existing foundation slab**, the **differential settlement** caused by the new tower, the **determination of the reinforcement**, etc.

To estimate the horizontal deformations, taking **cracked lintel shear beams** into account, sub regions with reduced stiffness were used. To determine the internal forces and the reinforcement in the lintel shear beams, **integration strips** were used.

The interoperability of SCIA Engineer has been used intensively:

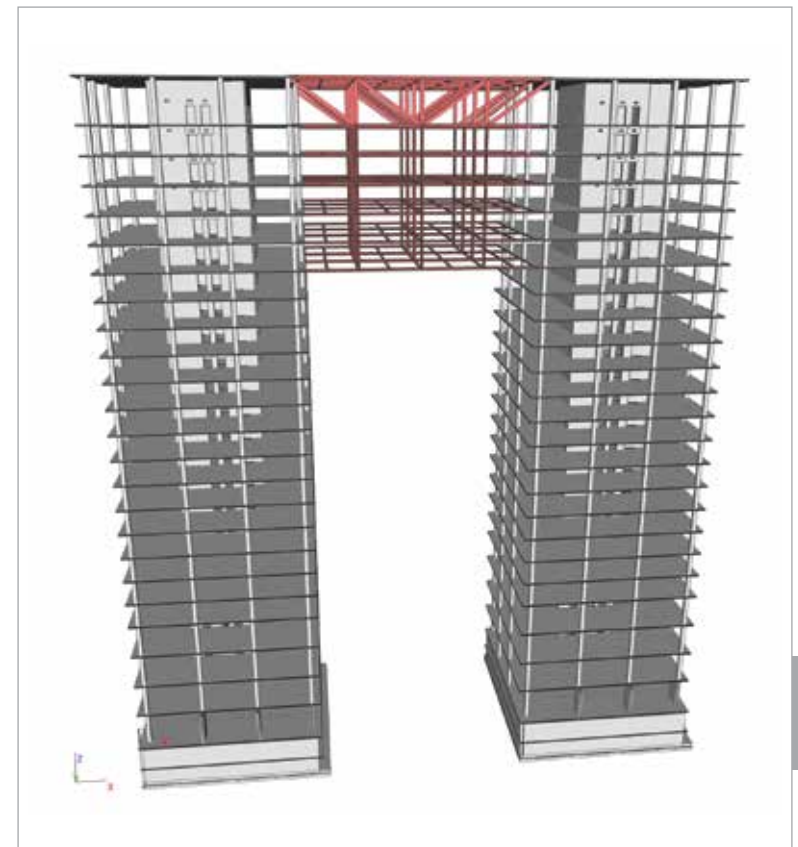
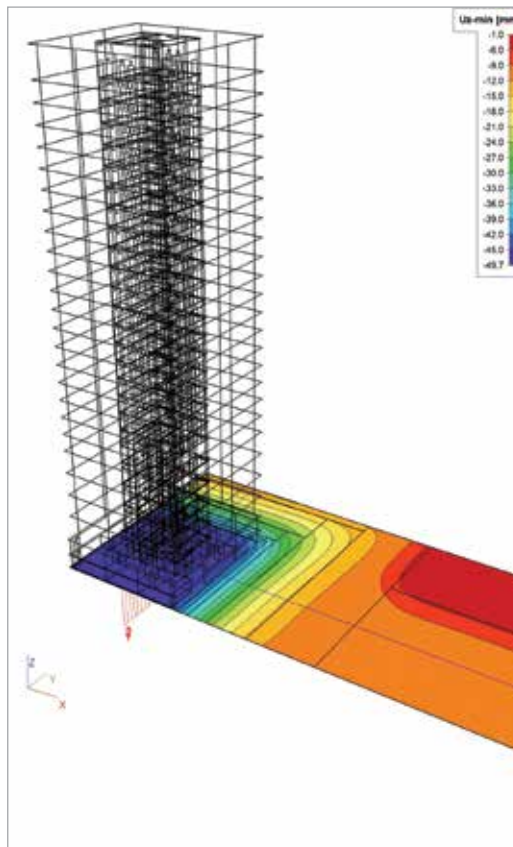
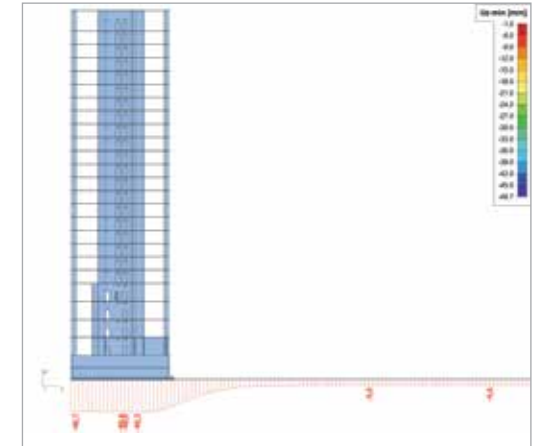
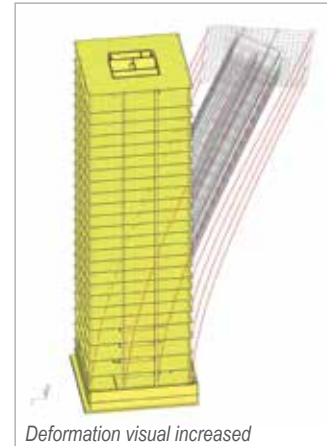
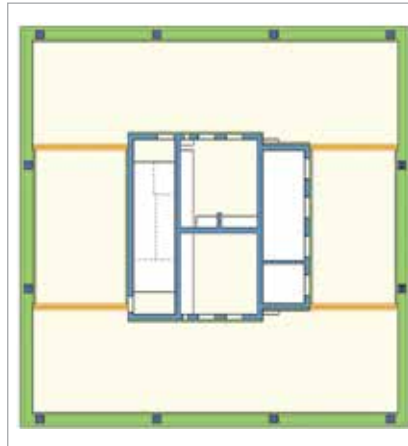
- The import and export tools of SCIA Engineer were used to optimise the sections of the columns with a spreadsheet developed by VK Engineering.
- The **R2S-link** is used to produce formwork drawings directly from the calculation model.

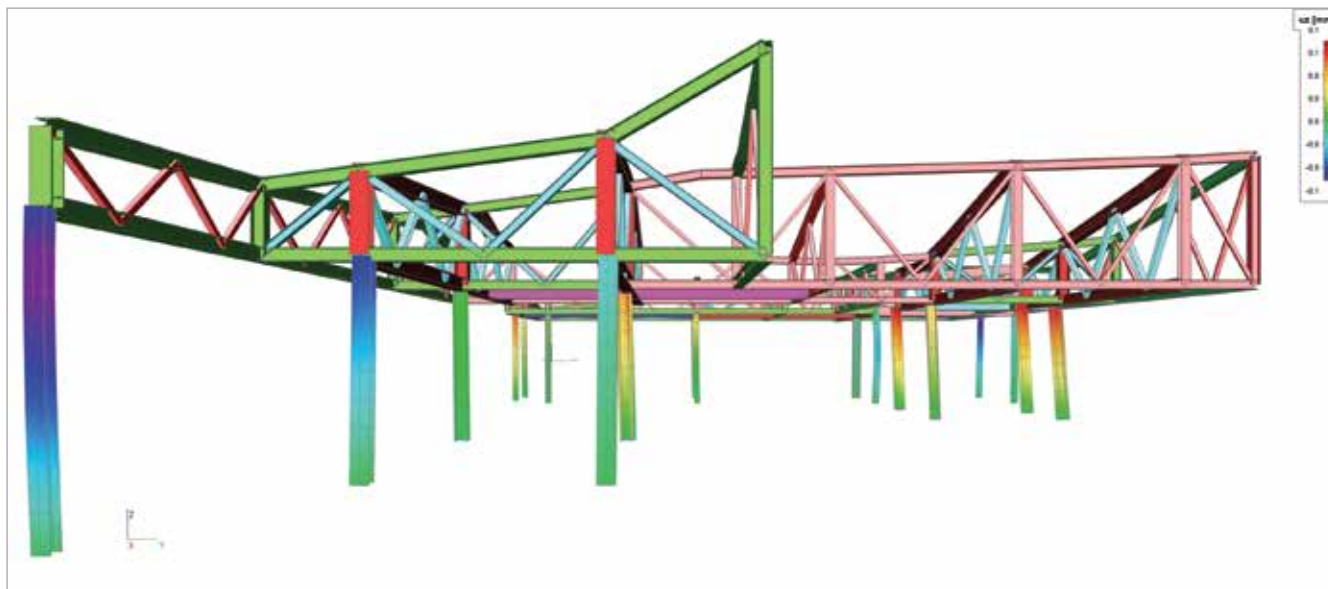
VK Engineering

Contact Gert Cocquyt, Frederique Noë,
 Henk Vanwalleghem
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 9820 Merelbeke, Belgium
 Website www.vkgroup.be



VK Architects & Engineers offers its services in healthcare, buildings, industry and public space. Our multi-disciplinary engineering building services and civil & structural engineering have a proven track record with renowned architects. VK's portfolio features many challenging and large-scale projects, new constructions, as well as renovations, expert assessments and management. The new NATO headquarters, the Antwerp law courts and the Ghent Ghelamco Arena are but a few examples.





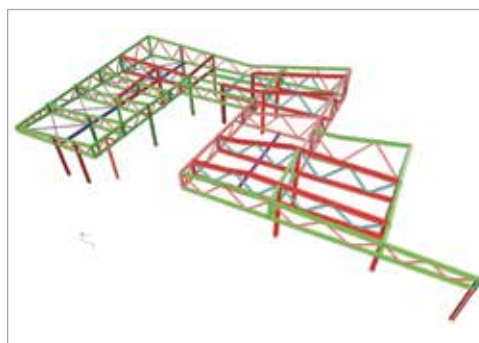
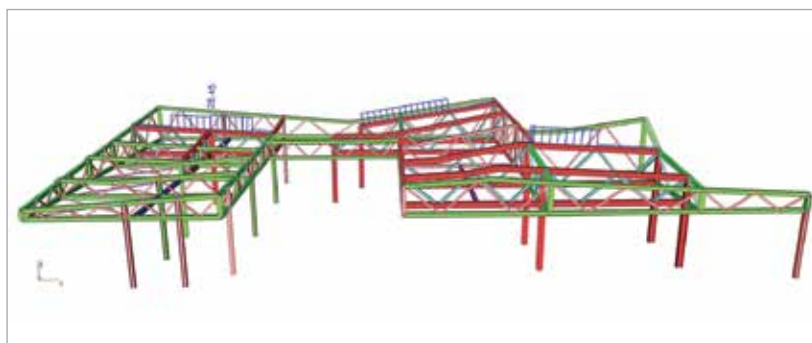
Owner Dhr. Krinkels
 Architect DDM Architectuur BVBA
 General Contractor Jos Dejongh BVBA
 Engineering Office Abicon N.V.
 Construction Period 07/2014 - 06/2015

During the design of Mr Krinkels' residence, the architect chose a concept with a lot of open spaces, big windows, walls and roofs made from natural stones. The residence has a ground surface area of 700 m² and includes several floors.

The architectural concept led to fewer possible positions for columns, which resulted in zones with big cantilevers. All this had to be combined with permanent actions (as a result of the weight of the natural stones).

SCIA Engineer has been used to design the supporting steel structure. We chose a concept with trusses. In some places, there was little height available to build trusses with enough rigidity.

We had to pay a lot of attention to the vertical deformations, particularly at the ends of the cantilevers. Due to the big windows directly under these trusses, these deformations had to be limited to an absolute minimum.



Abicon NV

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 8700 Tielt, Belgium
 Website www.abicon.be



Abicon N.V. is an engineering office, specialising in the calculation of constructions in concrete, steel and wood (for the public and the private sector). Our main activity is calculating the supporting structure of industrial buildings, flats and residences. We also give professional advice concerning the civil engineering aspects of soil rehabilitation, renovations and judicial expertise. We also deliver fabrication drawings of individual elements (steel & concrete; 2D and 3D). Our office has 30 years of experience, up-to-date knowledge and software. We attach great importance to personal advice, an economical & practical design and great flexibility.

Owner *European Bioinformatics Institute / Wellcome Trust*
 Architect *Abell Nepp*
 General Contractor *Willmott Dixon*
 Engineering Office *AECOM*
 Construction Period *06/2012 - 11/2013*

Technical Hub EBI: South Building is a collaboration with an exceptional architect to produce a landmark research building in the continued mapping of biological data. A three-storey steel-framed superstructure with an integrated services and structural zone, the South Building houses facilities for over 240 bioinformatics researchers and a training centre including a 150-seat lecture theatre, IT rooms and a media studio. Technical HUB EBI has recently been RIBA shortlisted.

A key design feature was to incorporate a brise soleil cladding solution which formed part of the heating strategy into the superstructure in an aesthetically elegant manner. SCIA Engineer allowed for a coordinated visualisation and analysis of multiple options and for rapid prototyping to be undertaken. Similarly SCIA Engineer was used to evaluate the dynamics of the floor plate and the feature 'scissor' stairs, providing an efficient solution in keeping with the ambitions of the design.

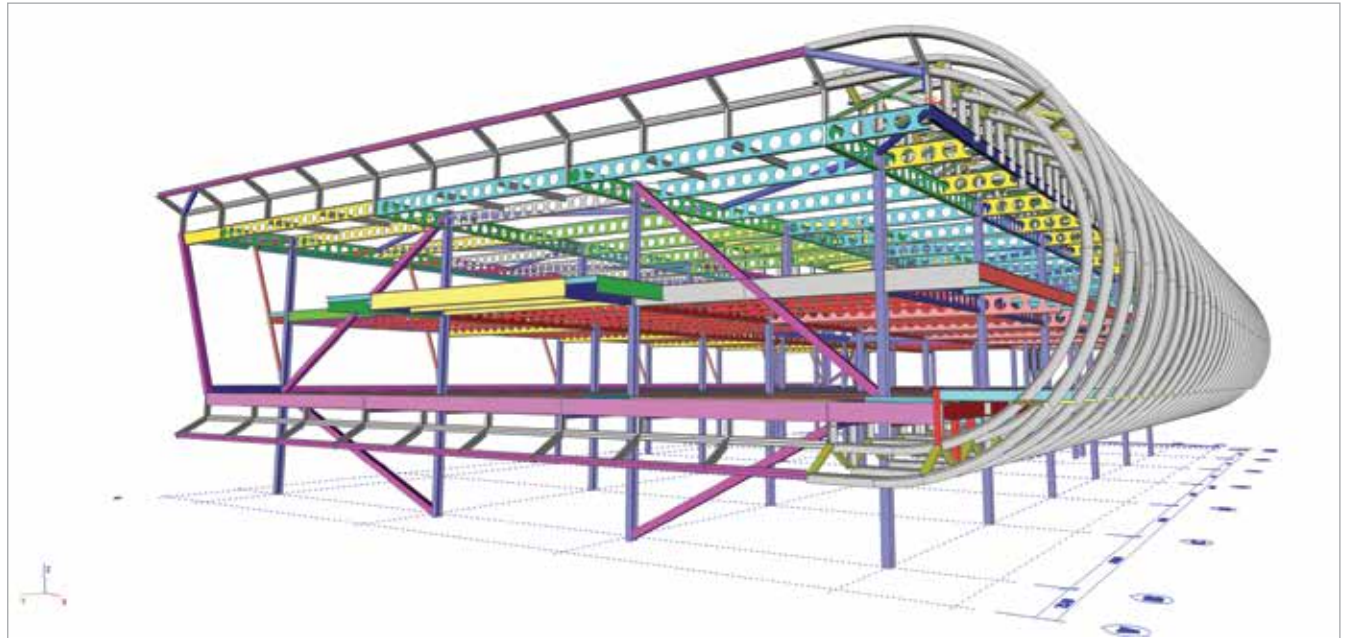
Design challenges included evaluating acceptable deflections on the cantilevered facade, designing long span steel floor structures with minimal vibration and evaluating stability with large feature end bracing. SCIA Engineer proved invaluable in effectively analysing multiple solutions and communicating their aesthetic to the design team.

AECOM

Contact *M. Burton, T. Webster, I. Hooper*
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 Website *www.aecom.com*



AECOM is a global provider of professional, technical and management support services to a broad range of construction and infrastructure markets. With approximately 90,000 employees around the world, our teams of award-winning engineers, designers, planners and project managers ensure that AECOM is a leader in all of the key markets that it serves, providing a blend of global reach, local knowledge, innovation and technical excellence in delivering solutions that create, enhance and sustain the world's built, natural and social environments.





Owner D.V. & Partners
Architect AIV Architects & Engineers
Engineering Office AIV Architects & Engineers
Construction Period 07/09/2015 - 01/09/2016

Situation/location: urban area of Deerlijk, Belgium
Use: 10 apartments
Dimensions: 37 x 19 m
Surface area: 1,650 m²
Total building surface area: 2,400 m²
Facade: concrete mounting panels and wood facing
Construction: concrete and steel

We chose to use Allplan Engineering as a means of analysing and maintaining total control of the architectural and structural aspects of our projects. This includes everything from form, distance, surfaces, materials and aesthetics to steel profiles, concrete beams and columns.

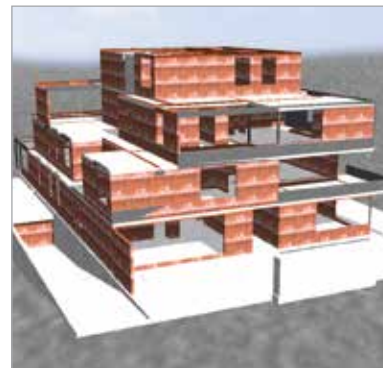
Because of the urban location of the project, we have had to contend with very strict urban regulations. This has in turn resulted in a challenging proposal in terms of the architecture and structure of the building. The main issues concerned avoiding a pyramid style building and creating a realistic and aesthetically luxurious apartment building. Each new level must decrease in surface area, regardless of ventilation and heating requirements, or comfort based additions such as patios or sunlights. Balancing all these factors proved to be a challenging task structurally.

AIV Architects & Engineers

Contact Carl Vanacker
Address Koning Albert I-laan, 35 bus 3
8800 Roeselare, Belgium
Website www.aiv.be



AIV architects & engineers is an experienced team of civil engineers, architects and building designers, founded in 1998, operating in Belgium. The office can rely on a wide experience in the realization of multi-family housing, housing projects and individual homes, both for public and private clients. We believe we can deliver sustainable buildings by designing at the same time and by the same team all different aspects of a building: architecture, structure, energy, safety. This design methodology avoids errors in the design process, to the delight of the clients. Thanks to this approach, our office benefits from a steady growth.



Owner *Grand'Rive Lac SA*
 Architect *Pierre Steiner Architectes SA*
 General Contractor *Induni & Cie SA*
 Engineering Office *Alberti Ingénieurs SA*
 Construction Period *2013 - 2017*

This project is about the enhancement of the industrial site of Corniche in Lutry by Grand'Rive Immobilien AG: dismantling of the existing buildings and construction of a new complex with apartments in the upper floors, commercial or industrial areas on the ground floor and a spacious parking space in the basement.

The site is ideally placed at the entrance of Lausanne, Vaud capital, and directly adjacent to the Lavaux site that is included on the UNESCO's world heritage list.

From the civil engineering point of view, the greatest challenge was the nature of the terrain: very heterogeneous and rather poor quality of the layers. Various studies have been conducted to determine the concept of foundation but also the type of excavation walls. Everything has become more difficult due to the presence of water. The second major problem was the architectural concept that places the housing storey without direct vertical connection to the bearing elements of the industry-trading ground floor. A distribution slab had to be foreseen to transfer the forces between the different levels. However, the structure is fairly simple with a skeleton made of cast in place slabs, columns and reinforced concrete walls. The foundation is made as a general slab with local thickenings.

Alberti Ingénieurs SA

Contact *Julien Genton*
 Address *Avenue Eugène-Rambert 1*
1005 Lausanne, Switzerland
 Website *www.alberti-ing.ch*

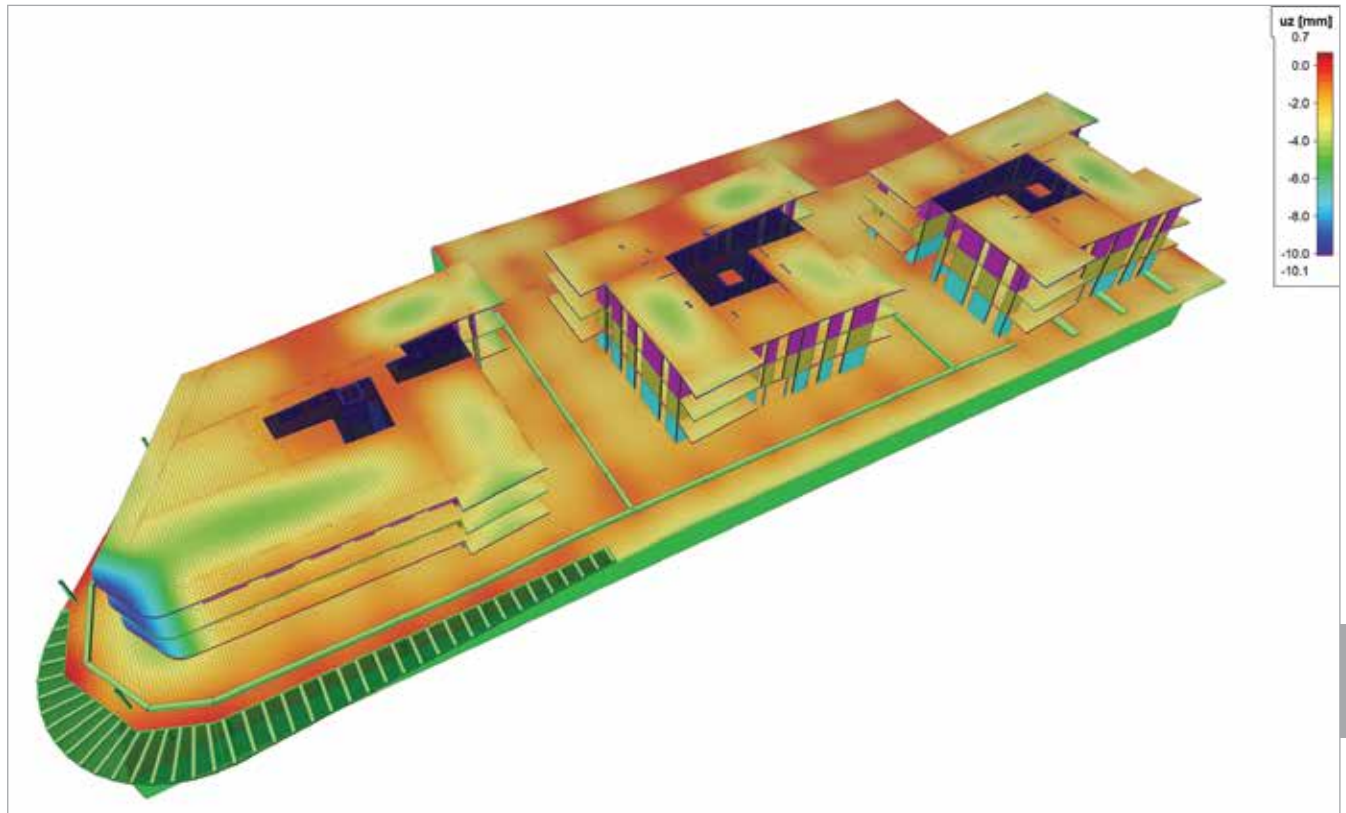
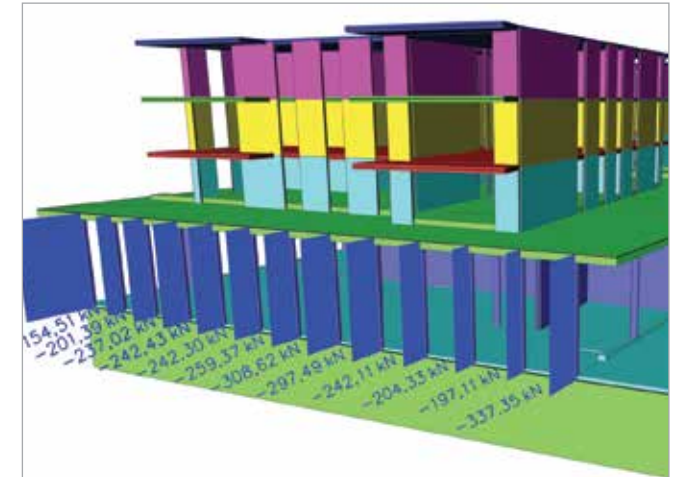


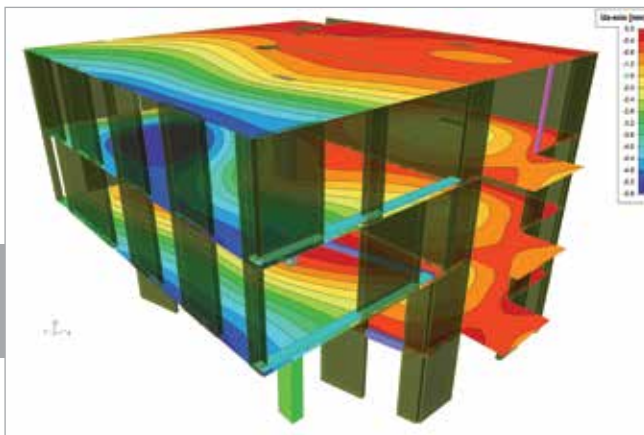
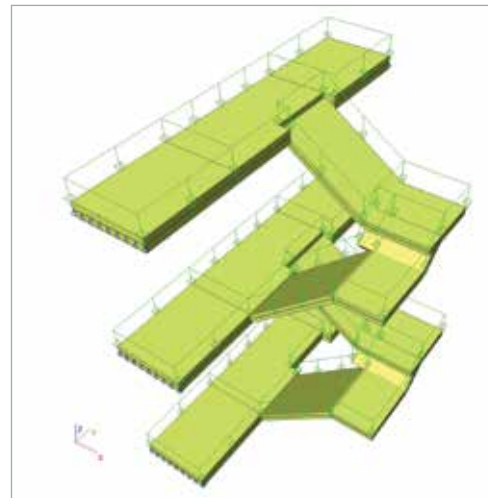
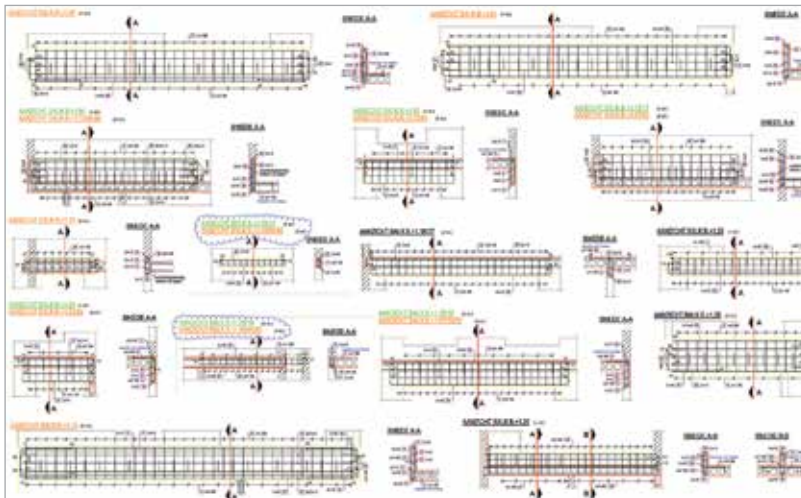
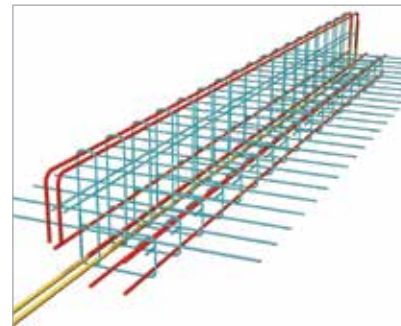
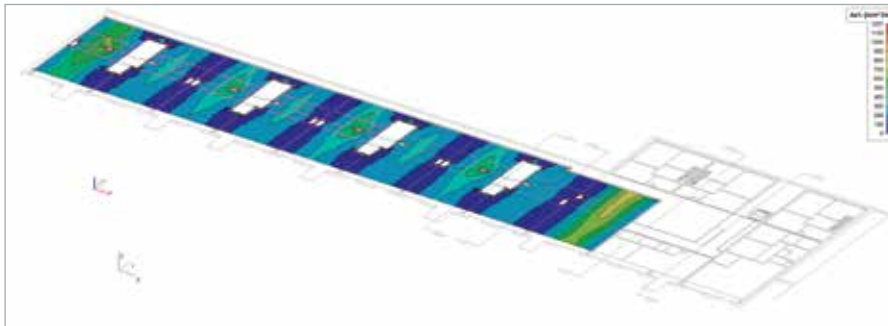
The engineering office was founded in 1959 by Justin and Jacques Alberti. Patrick Alberti joined the family company in 1987 and is managing it since 2003. The company is ISO 9001 certified since 2000.

The Alberti Ingenieurs SA team (engineers, technicians, draftsmen, accountant and secretary) shows for decades its ability to realise any type of construction project from simple to the most complex ones, being continuously listening to their clients, searching for efficiency and rationality and respecting environmental criteria such as sustainability.



© Pierre Steiner Architectes SA





Owner *Optimabank*
 Architect *Arch & Teco Architecture and Planning*
 General Contractor *Besix Vlaanderen*
 Engineering Office *Arch & Teco Engineering*
 Construction Period *2009 - 2015*

A new residential quarter was designed by Arch & Teco on the site Alsberghe Van Oost in Ghent. Cluster 1 consists of 4 buildings gathered around a central garden and founded on a common parking basement. The apartments are characterized by three substantial cantilevers, with both the slabs and the walls executed in concrete. Building P was erected within the contours of an old industrial masonry hall.

Arch & Teco used SCIA Engineer for the calculation of the foundations and the two-level high cantilevers of cluster 1 as well as the roof of building P. The footing of the foundation was modelled with a modulus of sub-grade reaction, and the reactions of the tower cranes were added to the model during execution. A control of the existing trusses was made for the roof of building P, as the trusses house an old steam turbine.

During sketch design SCIA Engineer offered the opportunity for a first-hand view of the characteristics of the cantilevering floors. While the project developed towards execution, the model could be easily adapted and detailed. Optimization of the reinforcements in the foundation slab was achieved simply by changing the modulus of sub-grade.

Arch & Teco Group

Contact *Sébastien Cools*
 Address *Coupure Links 55*
9000 Ghent, Belgium
 Website *www.arch-teco.eu*



Arch & Teco Group is an ISO 9001 certified, multidisciplinary architectural, design, and engineering company with offices in Ghent and Brussels. Our architecture services include architectural design, restoration and urban planning. Our engineering services extend to structural engineering, MEP engineering, hydraulic engineering, infrastructure, road and sewerage design, and environmental engineering. Furthermore our office is active in the field of sustainability ("EPB", "BREEAM") and facility management and for major projects we have developed an integrated BIM approach.

Owner *Nieuw Temse NV*
 Architect *Conix RDBM Architects*
 General Contractor *Cordeel NV*
 Engineering Office *Arch&Teco Engineering nv*
 Construction Period *2014 - 2015*

Aleca is a **multi-storey apartment building** with one underground floor, a basement, and 11 upper floors. Each floor is designed for 4 apartments. The building is a concrete structure, built out of more than 90% prefabricated floor and wall elements. The central core contains lifts and staircases which make up the main structural element for wind stability. The main building is founded on piles, and the underground parking floor has been founded on a 40 cm concrete slab.

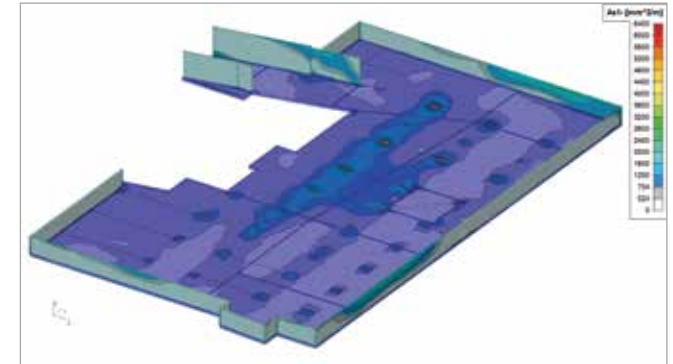
The software was used for the following studies: the detailed design of the foundation slab; pile foundation; the overall design of the concrete structure including walls, columns and slabs; precast balconies; and the detailed design of concrete walls and floors. The load bearing concrete walls have been calculated in detail, considering each wall separately over the height of the building. The outside walls needed to be calculated over the full height of the building because windows were not aligned and to allow for discrepancies in the concrete where weight was shifted to lower elements. The most important issue in the calculation model of the entire building in terms of wind study, was the connection between different elements. Different connection conditions showed immediate interaction with deformation values. 3D modelling was also very useful to simulate the deformation of the complete structure under wind loads. Concrete reinforcement could easily be deducted out of the calculation models.

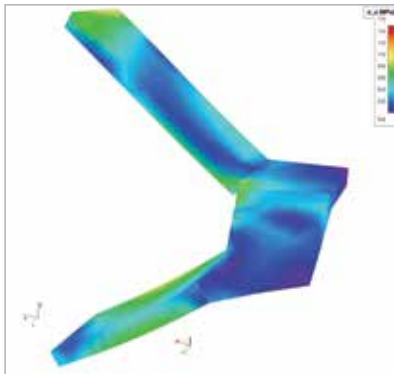
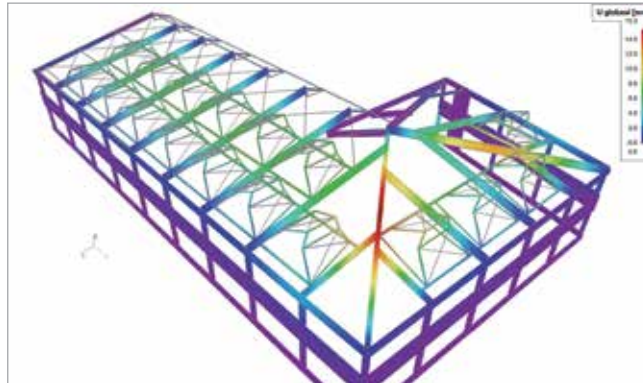
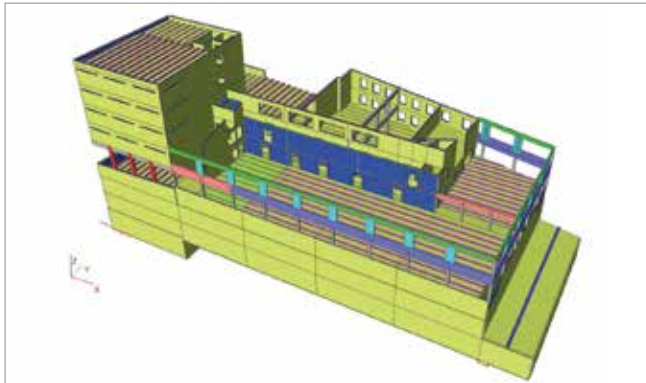
Arch & Teco Group

Contact *Sébastien Cools*
 Address *Coupure Links 55*
9000 Ghent, Belgium
 Website *www.arch-teco.eu*



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Owner
Architect

Ethias
Design: Robbrecht en Daem architecten
Implementation: Arch & Teco Architecture and Planning bv ovv cvba

General Contractor
Engineering Office
Construction Period

Interbuild NV
B.CEC nv - Arch & Teco Engineering
2010 - 2014

This building has been designed to receive archived documents and data owned by the National Government of Belgium. Large depots with a free span of up to 12 m and mobile loads of 17.5 kN/m² needed to be built with concrete walls and prestressed TT-elements. The entire building is a firm concrete structure with 3 basement floors, a ground level and 5 upper floors on the front end and 2 basement floors, a ground level and 2 upper floors with a steel structure roof on the back end.

The software was used for the following studies: the detailed design of the foundation slabs; the overall design of the concrete structure including walls, columns, and slabs; advanced non-linear static calculation of the steel structure for the main roof; and a detailed design of concrete walls and columns.

The model of the entire building was an interesting work-tool as it provided a clear view on the descent and the distribution of loads within the concrete structure. However, using this model for detailed design was practically impossible, as the design needed to be divided into several parts, as the calculation of the original model easily took several hours.



Arch & Teco Group

Contact Sébastien Cools
Address Coupure Links 55
9000 Ghent, Belgium
Website www.arch-teco.eu



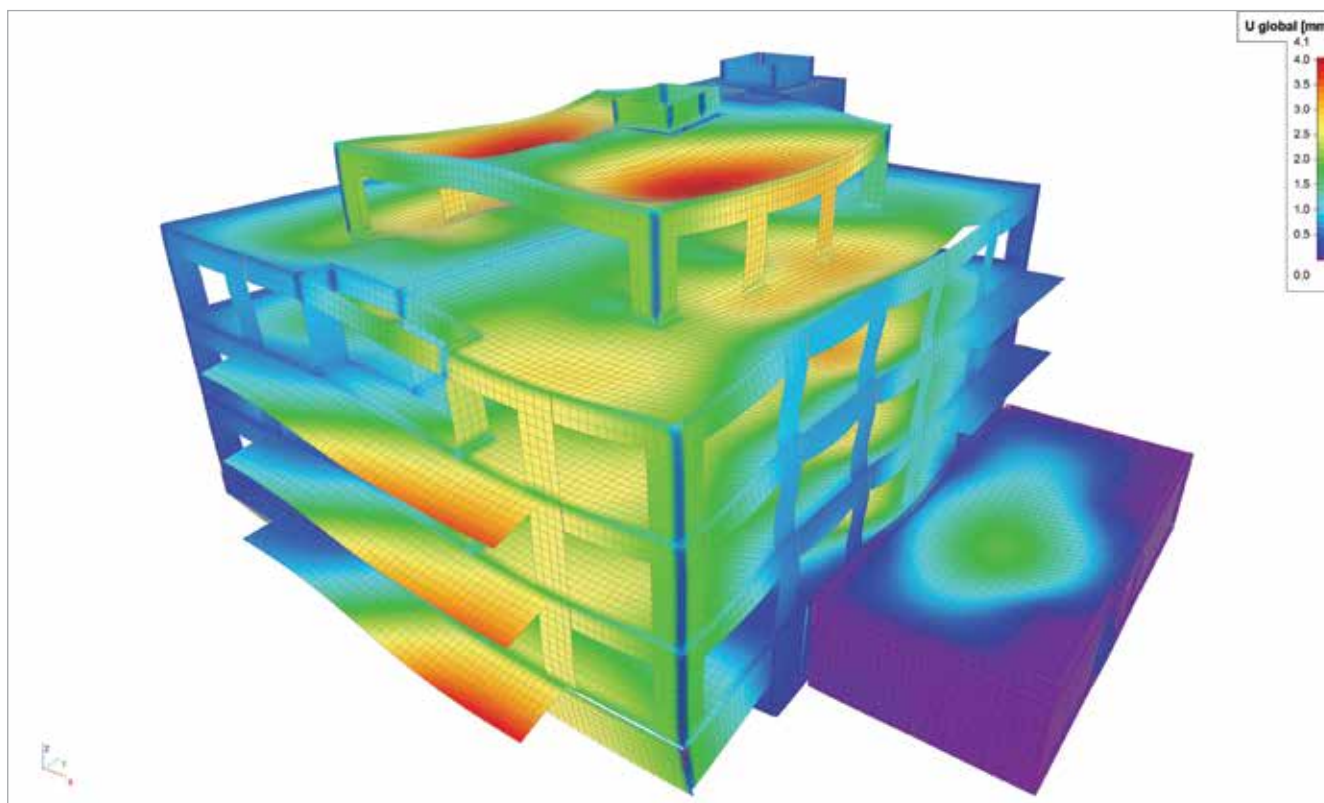
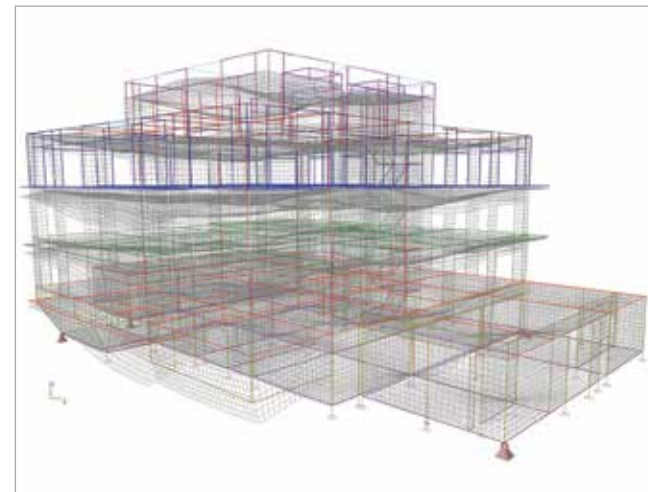
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Owner *Atelier P.H.A. Ltd.*
 Architect *Ing. arch. Ondřej Gattermayer*
 General Contractor *P.H.A. Inc.*
 Engineering Office *telier P.H.A. Ltd.*
 Construction Period *2014 - 2015*

Building geometry and structural system: The foundations combine bored piles 20 m deep embedded into the bedrock and a foundation slab. The main load bearing structure has reinforced concrete columns and cantilever walls with a 6.0 m overhang. The border walls and elevator walls were designed for maximum building rigidity. The floor slab was designed with reinforced concrete slab, locally supported by columns.

Design process: Assessing the real behaviour of a load bearing structure including its response to variable soil properties requires several successive calculations with different modifications of input data. It is not convenient to create the structural model in one step, including different properties of the load bearing structure, subsoil, materials and methods of founding. Such a solution is made possible by using an additional module, “Soil-in”, with analysis of upper structure and subsoil. The structure model is prepared for future process BIM modelling.

Conclusion: SCIA Engineer allowed the preparation of several alternatives of the structure as well. There were more designs in the work process according to client's and architect's demands. SCIA Engineer allowed for specific structure design of the cantilever building. The real deflections of the structure correspond to the calculated deflections.

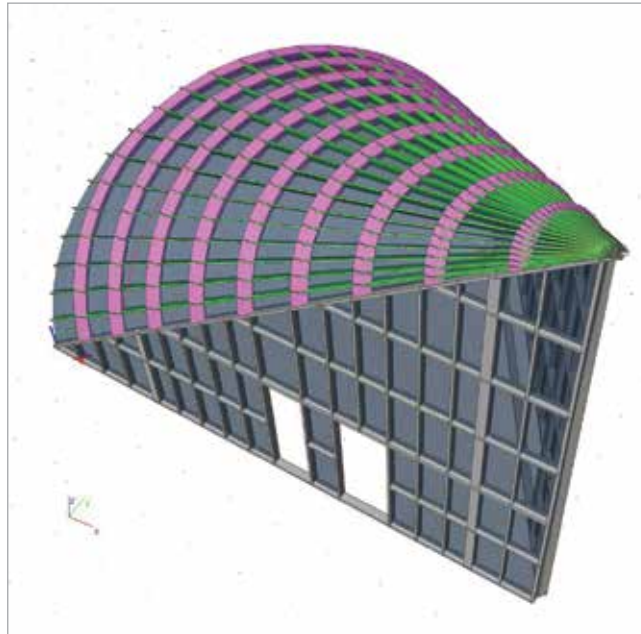
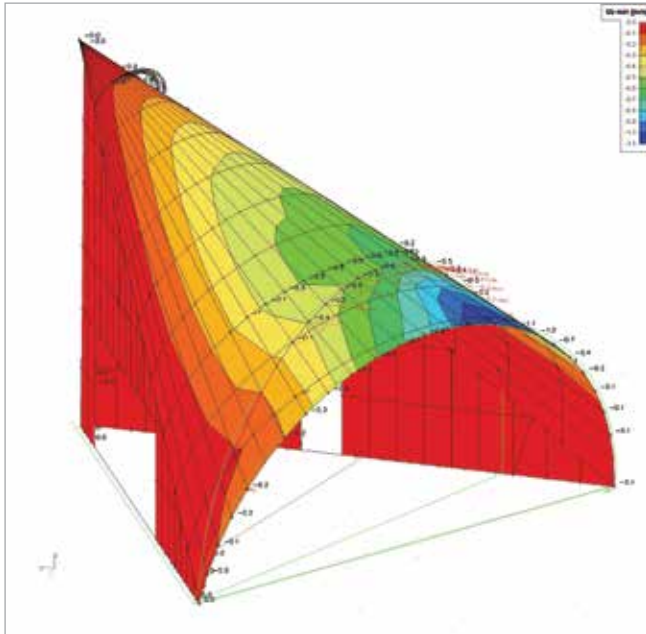


Atelier P.H.A.

Contact *Hana Gattermayerova*
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182 00 Prague, Czech Republic
 Website *www.atelierpha.cz*



Atelier P.H.A. was founded in 1990. It deals with design tasks, preparation and implementation of investment projects and engineering activities and is an expert in the field of construction and real estate investments. Participation in expert opinions on the condition and measures taken on load-bearing structures in the industrial sector, high-rise apartment buildings, apartment building regeneration, expert opinions on the impact of emergency situations like fires and flooding on load-bearing structures, building passports during reconstruction etc.



Owner Private
 Architect 51N4E
 General Contractor Memibo bvba
 Engineering Office BAS bvba
 Construction Period 01/2011 - 01/2013

The site for the building was challenging, being triangular with a three storey high wall on two of the sides. The third side offers a beautiful view of the garden. It would be a shame to block this view with structure, and therefore we needed to cover 9 m in a single span, preferably by a stiffened shell as thin as possible.

The architect's concept idea was to fold a DIN-sized piece of paper into a shell. This folded plane doesn't follow the catenary arch, moments were introduced into the shell and stiffening structure. SCIA Engineer helped to model the wooden shell and curved beams.

The variable wind loads and uneven snow loads made it difficult to derive a single direction of displacements. We placed a cutting edge at the glass window to investigate the displacements in each direction along this line. With this data, we could develop a connection detail with enough freedom between roof and glass. The shear forces between the thin-layer shell and the wooden beams were also calculated to evaluate the screw and glue connection.



BAS bvba

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 Website www.basbvba.be

BAS
 bureau voor architectuur en stabiliteit

BAS bvba is primarily known for giving advice on architectural structural engineering. From the architect's first conceptual idea onwards, interplay between spatial form and structural concept will be sought to obtain maximum coherence. In close collaboration with the architects and other advising team members, a number of design-cycles are organized to confront ideas which gradually result in a global concept of coherence wherein structure is (be it hidden) fully present.

Owner *IKEA Centres Group Germany*
 Architect *Herr Andreas Middendorf, Rohde, Kellermann,
 Wawrowsky Düsseldorf*
 Engineering Office *Bau-Consult Hermsdorf GmbH*
 Construction Period *02/2013 - 05/2014*

The shopping centre was built in conjunction with the furniture store IKEA. The one and two-storey building measures about 210 m long by 100 m wide.

The structural system consists of pre-fabricated concrete columns mounted in sleeve foundations, pre-fabricated single concrete beams, concrete slabs, and the steel construction supported by both inclined steel columns and concrete elements.

The diagonal braces, defined as tension rods, are elements essential for the structural stabilisation of the steel system. The roof's steel construction transfers only compression forces onto the roof of the adjacent building.

The software SCIA Engineer was used for the non-linear structural analysis of the reinforced concrete columns and the steel construction. For the necessary global imperfection, the buckling shape (eigen shape) of the construction was applied.

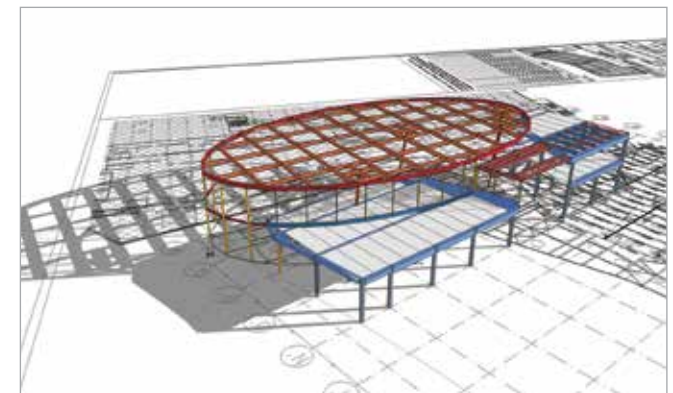
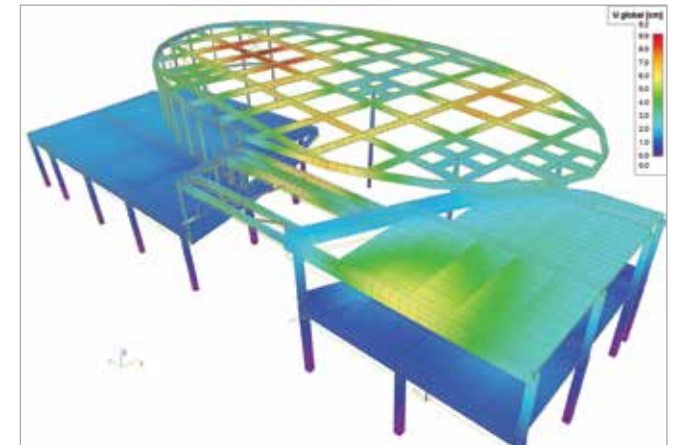
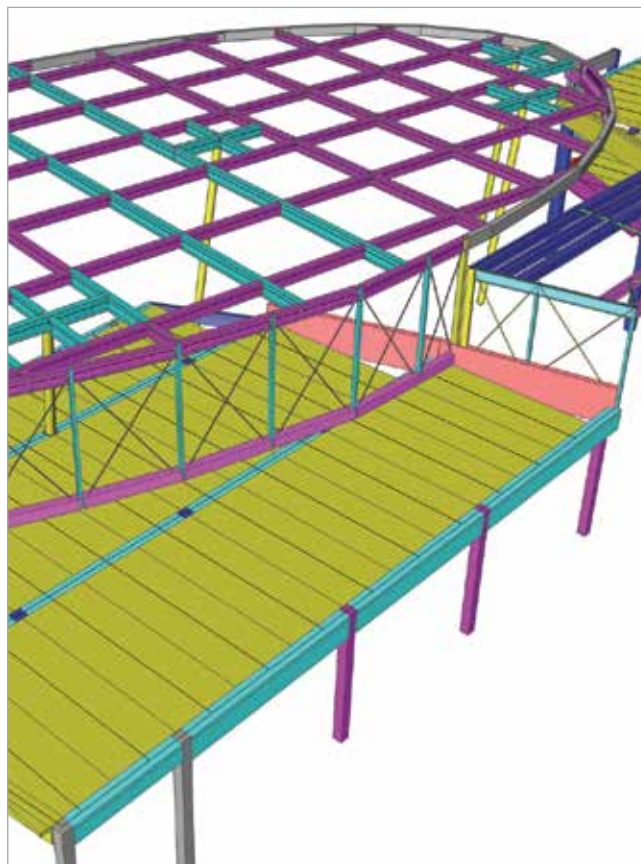
The columns were calculated in a non-linear fashion, taking into account the cracked section, the non-linear behaviour of the concrete, and the defined reinforcement according to DIN EN 1992-1-1.

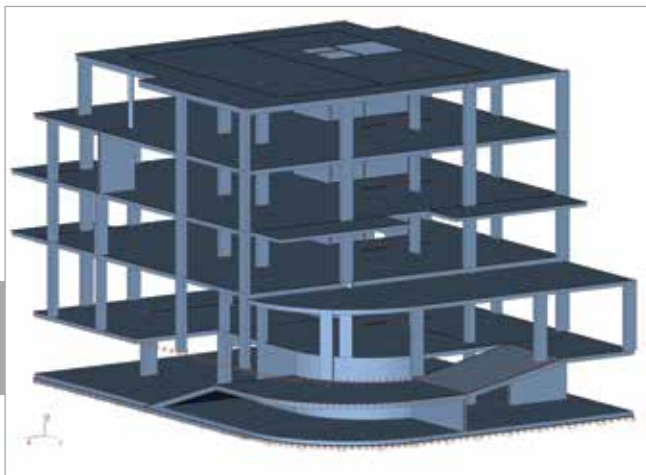
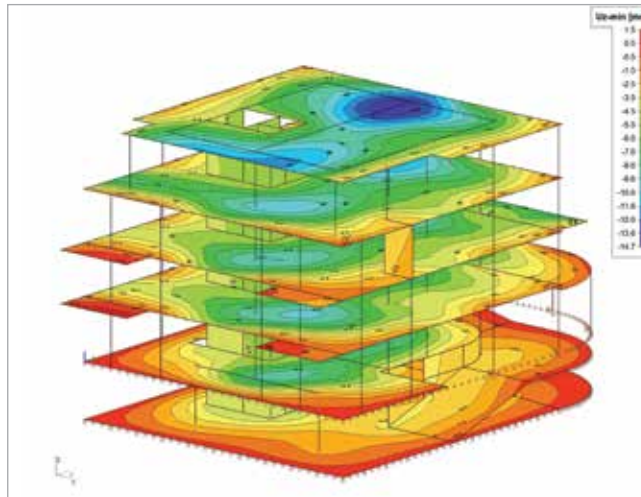
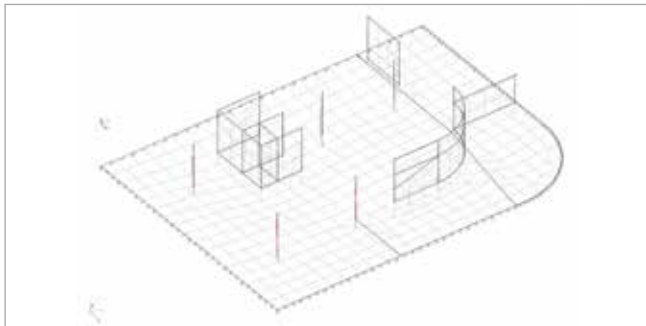
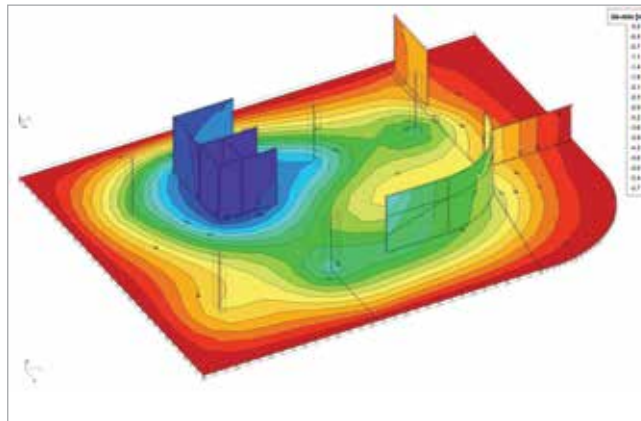
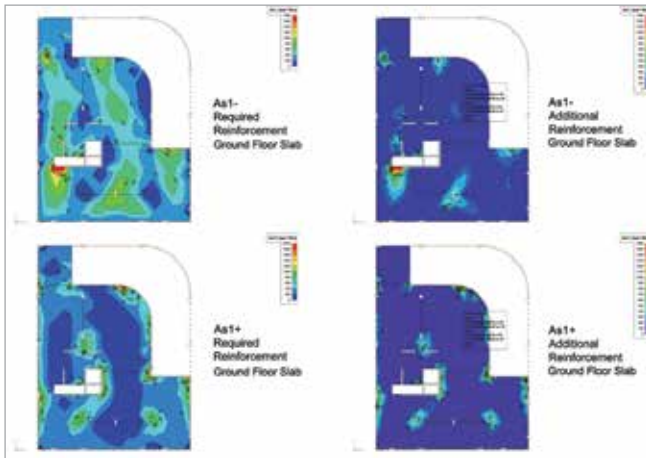
Bau-Consult Hermsdorf

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 Website *www.bauconsult-hdf.de*



The Bau-Consult Hermsdorf GmbH was founded in 1990 as an engineering office for overall project planning. It operates from its head office in Hermsdorf / Thuringia and has 62 employees (architects, structural engineers and technical designers). We plan and develop projects for both public and private owners, including residential and administration buildings, industrial and commercial constructions, civic projects for the public authorities, and the restoration and redevelopment of existing historic structures. One of our biggest strengths as a company is in the planning of pre-fabricated constructions made of reinforced and prestressed concrete elements.





Owner *Novo Construction*
 Architect *Stuart Thompson*
 General Contractor *Novo Construction*
 Engineering Office *Buxton Associates*
 Construction Period *10/2014 - 10/2015*

A six storey residential building with commercial spaces on the ground floor and a basement car-park.

The building has been designed as an in-situ reinforced concrete frame comprising: basement level, five storeys above ground over a footprint of approximately 300 m². Ground conditions at the site required the use of a continuous secant piled perimeter retaining wall. The secant piles carry permanent loads from the perimeter columns above ground, with a continuous reinforced concrete capping beam to transfer loads between the columns and piles. The set-back fourth storey and flat roof will be constructed in light-gauge steel framing, designed and installed by a specialist sub-contractor, so was modelled only as applied loads onto the fourth floor slab. These loads had to take into account a request from the client to allow for future expansion of the lightweight structure to include a fifth and a sixth level.

We used SCIA Engineer to perform a comprehensive structural analysis of the building, taking into account different situations that may occur during construction and after: soil interaction, connection with the piles, hydrostatic pressure on the raft, deflection, applied force/stresses on elements, and reinforcement design for 1D and 2D elements. The user-friendly interface and flexible structure of the program allowed us to adapt and implement the changes in a very short space of time.

Buxton Associates (Cons Engs) Ltd

Contact *Stuart Hutchinson*
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CR4 4TU Mitcham, United Kingdom
 Website *www.buxtonassociates.co.uk*



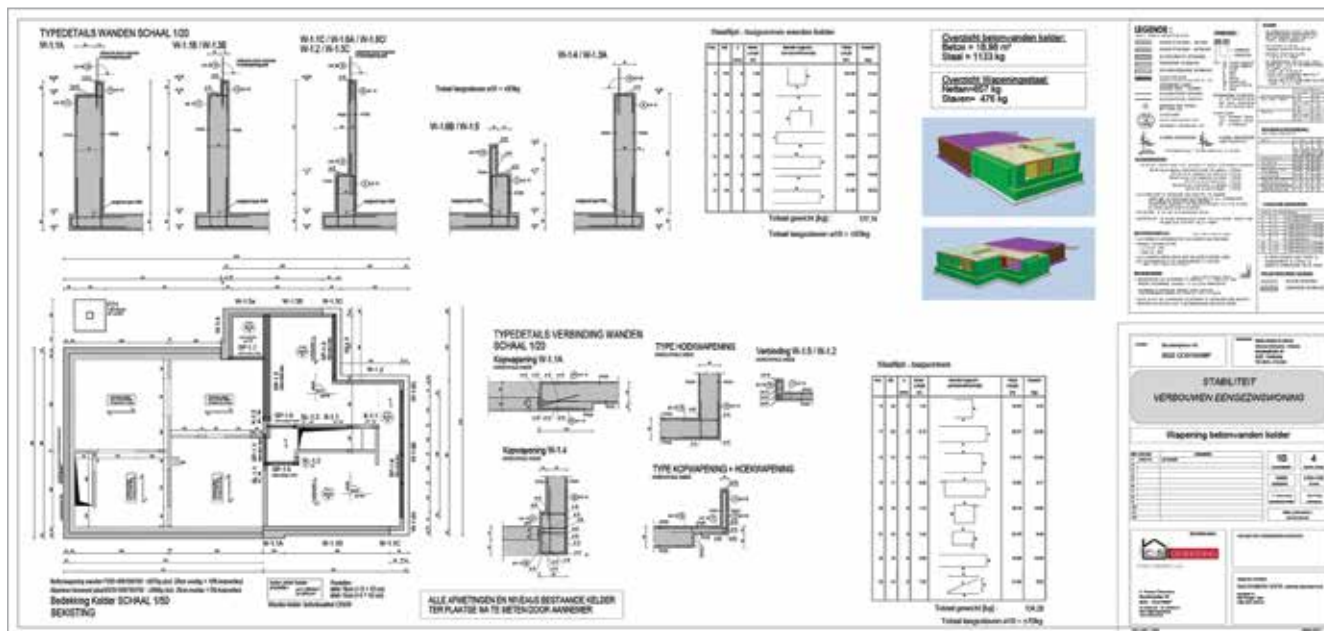
We are a specialist civil and structural engineering consultancy with a reputation for delivering high quality design solutions. Since our formation in 1972 we have been involved in over 5,000 projects across the UK and internationally for a broad base of private and public clients. Our diverse and innovative portfolio includes buildings for education, housing, retail, leisure, bridges, commercial developments and sculptures. Our knowledge of construction materials and techniques allows us to add real value in our work. Coupled with our experience and ingenuity we are proud of our ability to develop bespoke, cost-effective engineering solutions.

Owner *Emmy Streuve*
 Architect *Sofie Bleyenbergh*
 General Contractor *Verstraete*
 Engineering Office *C&S Engineering bvba*
 Construction Period *03/2014 - 06/2016*

Transforming a house into a nearly energy neutral building. A thorough renovation and extension of a 3 storey building, containing an engineering office in the newly created basement extension.

The project is an engineering design created using Allplan Engineering software.

The difficulties encountered during the execution of the building's foundation were countered using Allplan Engineering to its full extent. Many changes had to be made to the original foundation design, but the resulting design changes were made easy thanks to Allplan Engineering. Many 3D screenshots and renders of different stages of formwork, steel armament, etc., during both demolition and construction, were taken using the software and provided to the general contractor throughout the transformation process.



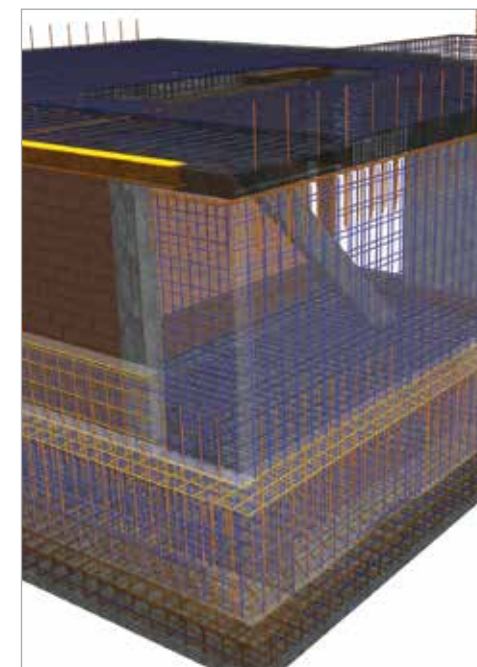
C&S Engineering

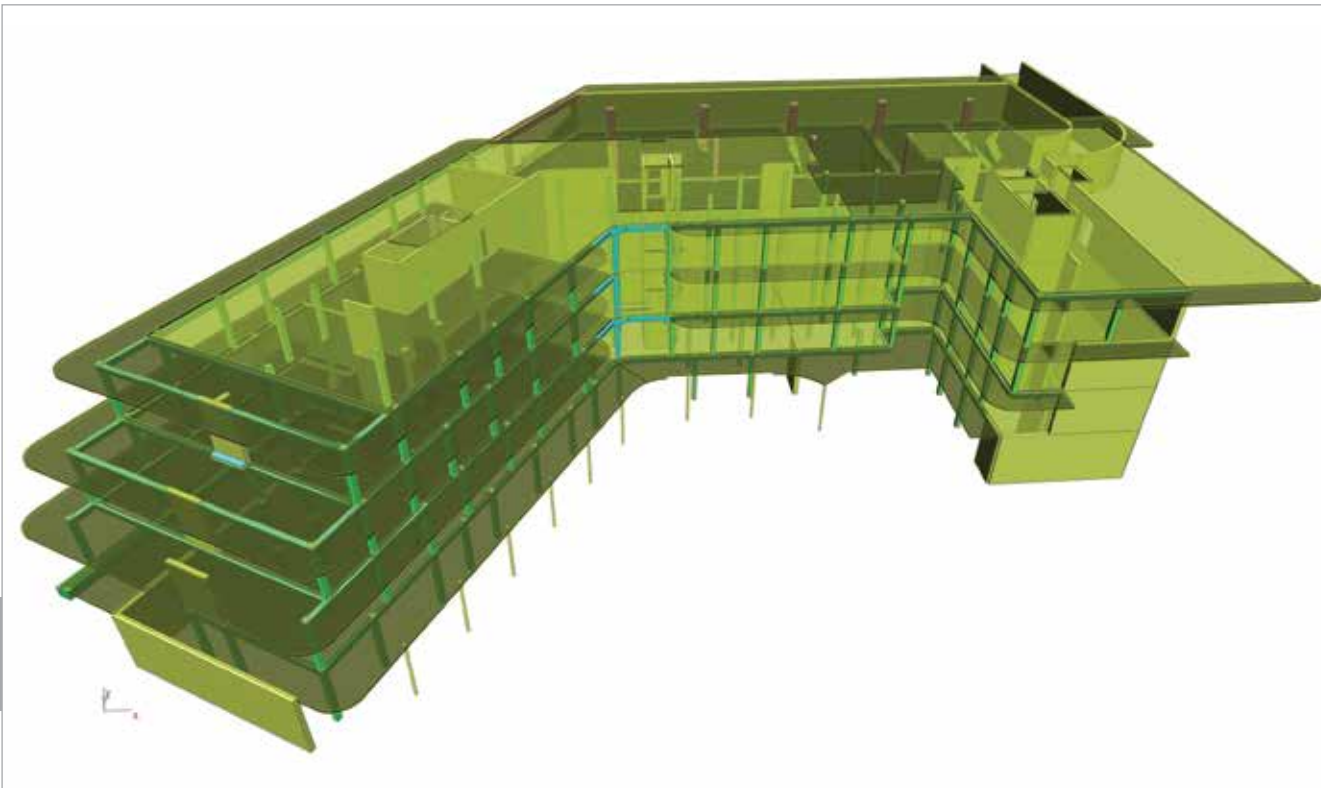
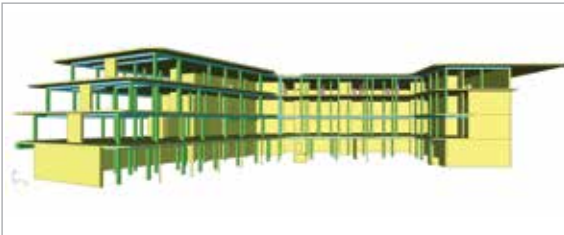
Contact *Francis Clemmens*
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 Website *www.c-s-engineering.be*



C&S Engineering bvba was founded in 2008 and specialises in engineering studies of buildings including analysing stability, energy, and safety engineering. The firm has 3 employees and operates from Oostkamp, near Bruges, with work extending throughout Flanders.

Our vision and working method is that by using state of the art software, we make engineering and subsequent construction look easy!





Owner Quantum Homes Ltd
 Architect qdp Ltd
 General Contractor Quantum Homes Ltd
 Engineering Office Calcinotto & Associates Ltd
 Construction Period 04/2015 - 12/2015

This building is 50 assisted living apartments. Accommodation is arranged over seven floors, four of which are RC flat slab and column below the entrance level and cut into the sloping site topography. The top four floors are proposed as a timber frame structure, the construction of which is to be undertaken in phase 2.

Modelling the RC flat slabs as 2D plate elements enabled us to position the column and shear walls in accordance with the architectural drawing, to achieve a barrier free building layout that respected the senior nature of residents. The 2D member component "Subregion" is used to locally thicken the slab where long span and heavy loads are required. RC walls as 2D plate elements are designed to in-plane (wind and vertical load) and out of plane moments (earth pressure). Common FEM problems such as peaks around slab column connection are tackled using the averaging strip options. Free loads enabled us to define different load magnitudes for residential and parking for parts of a slab. The DWG import option helped the structural engineer to quickly edit changes from architects. Graphical representation of the connections between members is clearer and helped us to correct the modelling issues quickly.

Calcinotto & Associates

Contact Jacob Christopher
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 BH14 0HU Poole, United Kingdom
 Website www.calcinotto.co.uk



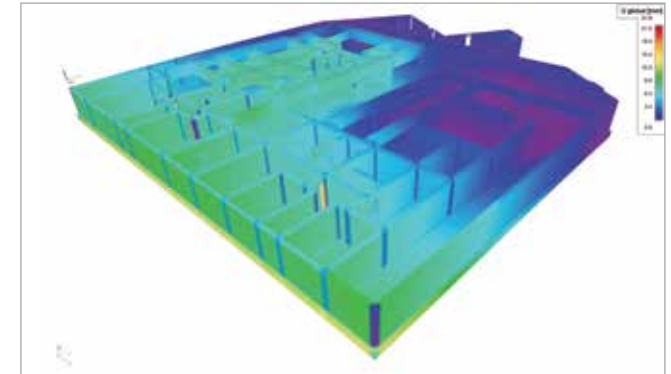
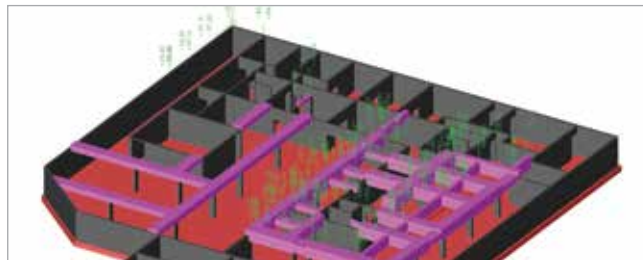
Calcinotto are a company of engineers, designers and consultants producing a varied and diverse range of services to our clients. The company prides itself on providing clients with a professional service, with the imaginative and innovative solutions that are often a feature of today's modern approach to design. Equally as important are historical, environmental and conservation designs that incorporate sensitivity towards regeneration, restoration, and preservation. Using sophisticated analytical software the company can tackle the most complicated engineering problems. Our commitment to our clients is to provide a service that realises their requirements.

Owner Dipl.-Ing. J. Gröneveld
 Architect Nöfer Gesellschaft von Architekten mbH
 General Contractor Kondor Wessels Wohnen Berlin GmbH
 Engineering Office con-tura Architekten + Ingenieure GmbH
 Construction Period 03/2015 - 10/2016

The new residential project “Metronom” consists of **12 buildings** with 6 to 8 floors containing **235 high-quality apartments**. It is situated on Hallesche Straße in Berlin. The gross floor area is about 23,500 m² and the underground car park offers 109 parking spaces with a total area of 6,000 m². We were challenged to design the buildings without any visible beams inside each apartment. To fulfill the client's wishes we worked with supporting wall constructions at the ground floor, first floor and sixth floor level.

For the whole planning process we used Allplan 2014. As a result we had a complete 3D model for producing all the technical drawings with our team. Frilo and SCIA Engineer are the two programs we use for our static calculations. Within Allplan we constructed all the elements with wizards, in combination with our set office standard. Using the building structure helped us to produce all the elevations, sections and different perspectives.

By creating specific reports for the use of concrete and reinforcement, we got a very accurate output for the material usage of our construction. We didn't use the possibility of round-trip engineering between Allplan and SCIA Engineer in one model because of the brick walls (iterative static, only pressure) and because we expect changes that will be made by the owners of the apartments.



con-tura Architekten + Ingenieure GmbH

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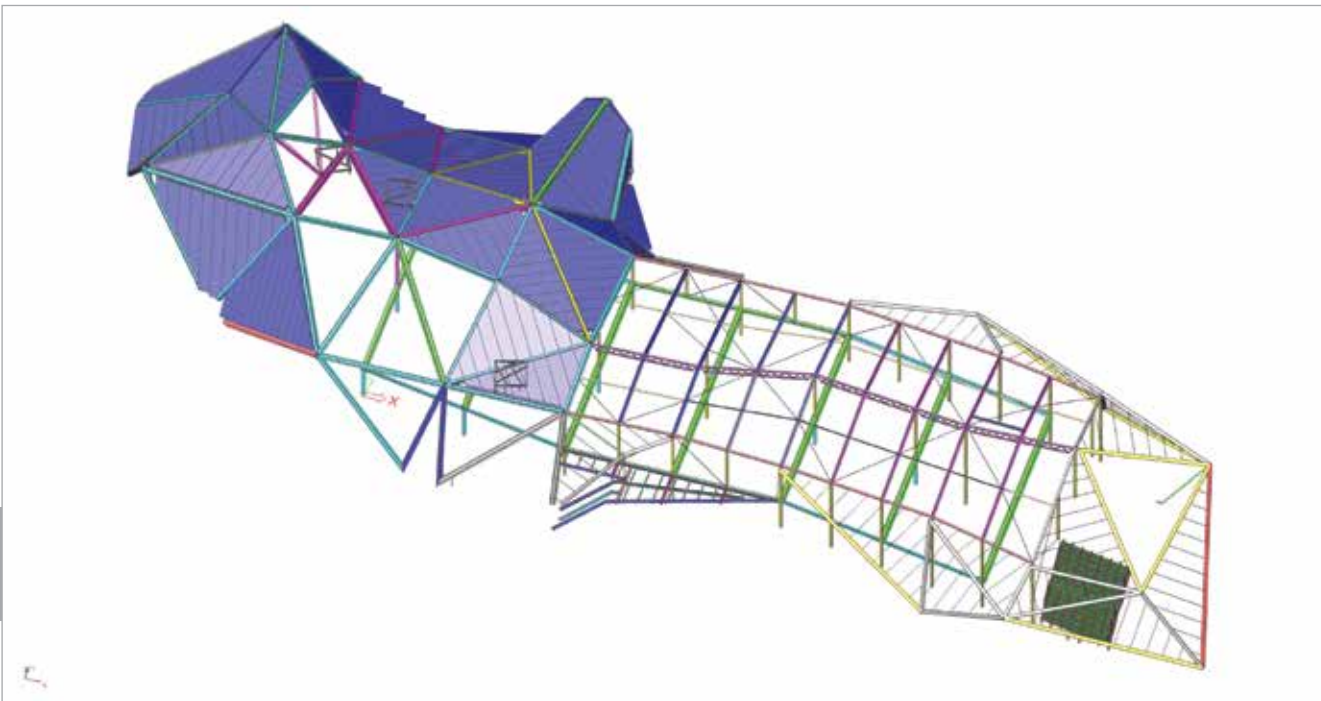
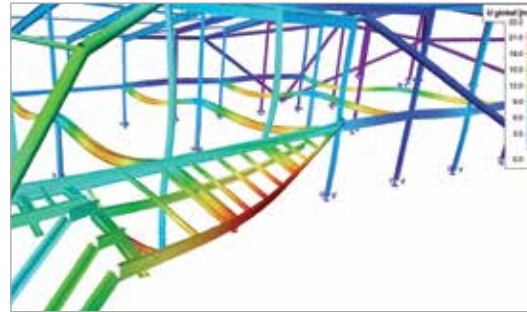


con-tura: expertise in architecture and building construction

Working together with our clients from an initial idea to develop and implement successful projects is the basis of our daily work.

As a competent partner, we see ourselves as consultants and construction services. con-tura provides these functions in all phases of urban design, architecture, construction management, structural engineering and building physics. With the experience of our offices in Germany, the Netherlands and Slovakia, we offer not only regional knowledge, but also international know-how. Challenge us.





Owner Foundation Plaswijckpark the Rotterdam/
Hillegersberg
Architect Ssael OvO associates Architects the Amsterdam
General Contractor Fraanje B.V.
Engineering Office Constructiebureau Krepidoma
Construction Period 04/2012 - 04/2013

The project is named "the hollow house in the hill", and is a 1600 m² playground for children, consisting of several different attractions inside the house. Attached to the hollow house in the hill is a greenhouse-like construction of steel and glass, where the restaurant is situated. Our engineering office designed the steel construction of the hollow hill and the greenhouse; Adviesburo Luning designed the pile foundation and the concrete floors at ground level. This steel construction is built up in triangles from steel roof beams, "HEA and HEB", (rotated 90 degrees, and on the underside of the beam there are welded plates, where the prefabricated wooden roof panels "lignatur" are placed), making the construction stable in each direction. We also designed all the difficult connections, in association with Meijers Staalbouw B.V. A part of the roof of the hollow house is also supported by a 'tree' built up from steel tubes, which gives inside of the house a very striking appearance. The connections of the steel roof beams at the foundation are made with steel dowels of HE profiles, because of the large forces in the local x-direction of the beams. At some points there are three steel beams coming together at the foundation, which led to difficulties in designing the dowel. SCIA Engineer has the option to calculate the resulting forces at that point, which made it easier to design the dowel. The roof of the hill is finished with grass and ivy.

Constructiebureau Krepidoma

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3253TB Ouddorp, The Netherlands
Website www.krepidoma.nl



Constructiebureau Krepidoma is an engineering office that has been working since 1996 in the residential and commercial construction business, on commercial buildings and on industrial plants. We work out static calculations and drawings for supporting structures in steel, concrete, wood and foundations. Our clients are architects, contractors and individuals, and indirectly we also provide lateral support to large engineering companies. We specialise in thinking through the design, specification and implementation of a project, as well as fitting in the structure as well and as cheaply as possible in accordance with the architect's design.

Owner
 Architect
 Developer
 General Contractor
 Engineering office
 Construction Period

Lease Management
 Tecro & Krea architecten
 D+A CONSULT NV
 Edibo nv
 Edibo nv
 01/2014 - 10/2014

Foundations

As we were faced with a poor ground surface, we were compelled to construct the building on pile foundations.

Steel

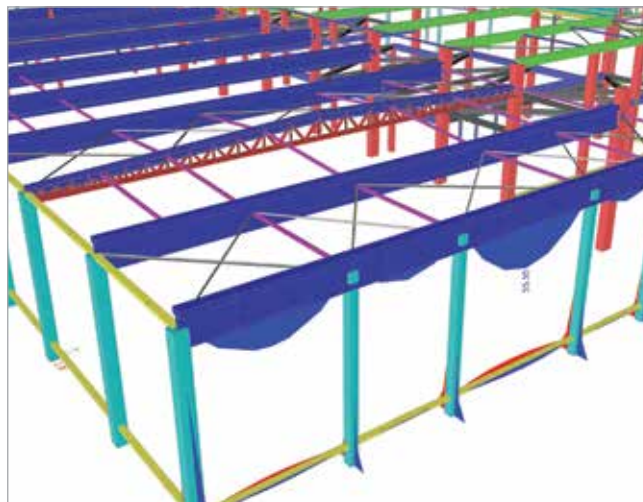
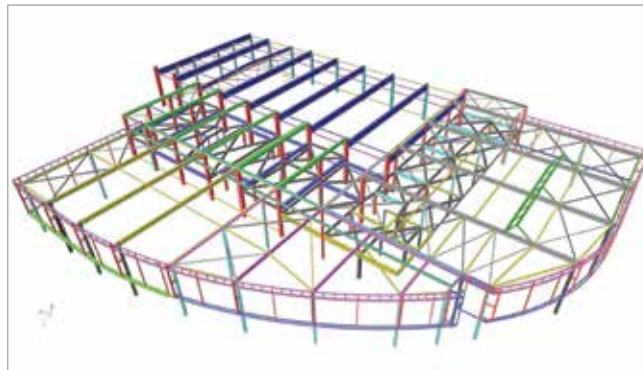
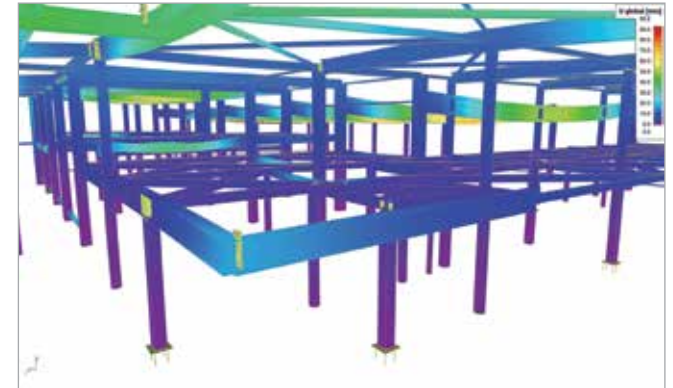
The building showroom is designed in steel. Steel was the obvious choice considering we had to design a round facade.

The difficult aspect of this project was the development of the showroom. The request was to design a structure with no wind bracing visible in the facades. This meant we had to transfer the forces to the concrete structure through the showroom roof.

There are also a number of trusses concealed in the facade. These are all incorporated into the structure so also no longer visible.

Concrete structure

The workplace and a part of the offices are designed in concrete. This was sufficient to adhere to the necessary fire-resistance requirements made by the fire service.



Edibo

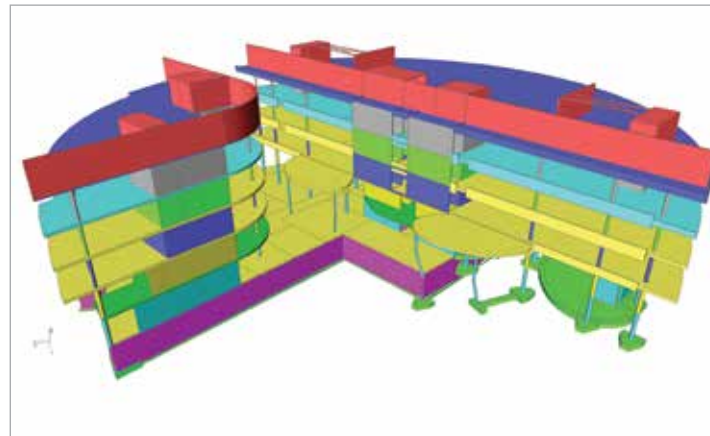
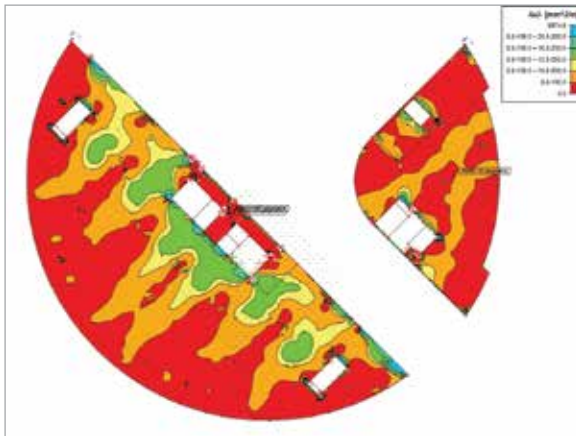
Contact
 Address
 Website

Jan Caelen
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 www.edibo.be



Edibo is a general industrial building contractor with expertise in the automotive, logistics, food, industry, production and offices sectors since 1981.

As a construction partner for your industrial building, Edibo builds "turnkey" constructions, extensions and renovation projects in steel, concrete and laminated timber. Edibo has been constructing beautiful reference projects in various sectors for more than 30 years.



Owner Barco nv
 Architect Jaspers-Eyers Architects en RDBM Architecten & Adviseurs
 General Contractor Cordeel nv.
 Engineering Office Establis
 Construction Period 07/2013 - 12/2015

A completely new office building for Barco in Kortrijk. The office is made up of two main structures, one for research & development and the other for education.

The building has a remarkable structure: it is circular and is an eye-catcher.

There are no dilatation joints in the concrete plates, so temperature loads have a great influence on the reinforcement. In reality, the greatest tensions in the plates occur around the rigid cores. The floorplates are in fact constructed with cavities measuring 35 x 35 cm. In addition, the calculation has to consider the great **temperature fluctuation** of the steel structure that is supported horizontally by the concrete structure.

For this reason, the dimensions of the concrete structure with all the possible combinations are calculated in SCIA Engineer. The **parameters** within SCIA Engineer had to be adjusted to be able to correctly interpret the results concerning the influence of cavities in the floor plate. The output in SCIA Engineer gave a realistic and clear idea about displacements and need for reinforcement.

Establis nv

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 8800 Roeselare, Belgium
 Website www.establis.eu



Establis guarantees **creative calculations** for structural engineering, finding you the best solutions for the lowest costs.

Our team in Antwerp and Roeselare consists of **30 highly qualified staff** with **diverse specialisms** in, among other fields, concrete, steel, prefab, foundation and seismic engineering. We are ready to guide your unique construction project from **start to finish**. Establis guarantees creative calculations for structural engineering, finding you the best solutions for the lowest costs.



Owner Lidl
 Architect Architeam
 General Contractor Cordeel nv
 Engineering Office Establis
 Construction Period 01/2014 - 01/2016

This project concerns the expansion of the existing distribution centre of Lidl in Genk. The site contains a food and non-food building, built in concrete and consisting of several floors. The food area has 2 compartments and is divided by a fire wall. There is also a dilatation joint foreseen next to the fire wall.

Due to the location of the building, the structure had to be checked for earthquakes. Because of the fact that the roof beams are prestressed with a great span, there is a lot of creep and shrinkage that results in a **displacement at the top of the columns**. The loads on the roof structure are not equally divided due to elements such as sprinklers, solar panels, and cooling units. Additionally, the fire walls' structural elements have to obtain 2hrs of fire resistance.

In SCIA Engineer, we induced a negative line load to analyze the effect of the roof beams. This results in a displacement which is taken into account for the 2nd order moments in the columns. Besides this static modelling, there was a dynamic modelling used to view the impact of earthquakes. Finally, the columns were calculated with the maximum internal forces, resulting from static and dynamic calculations.

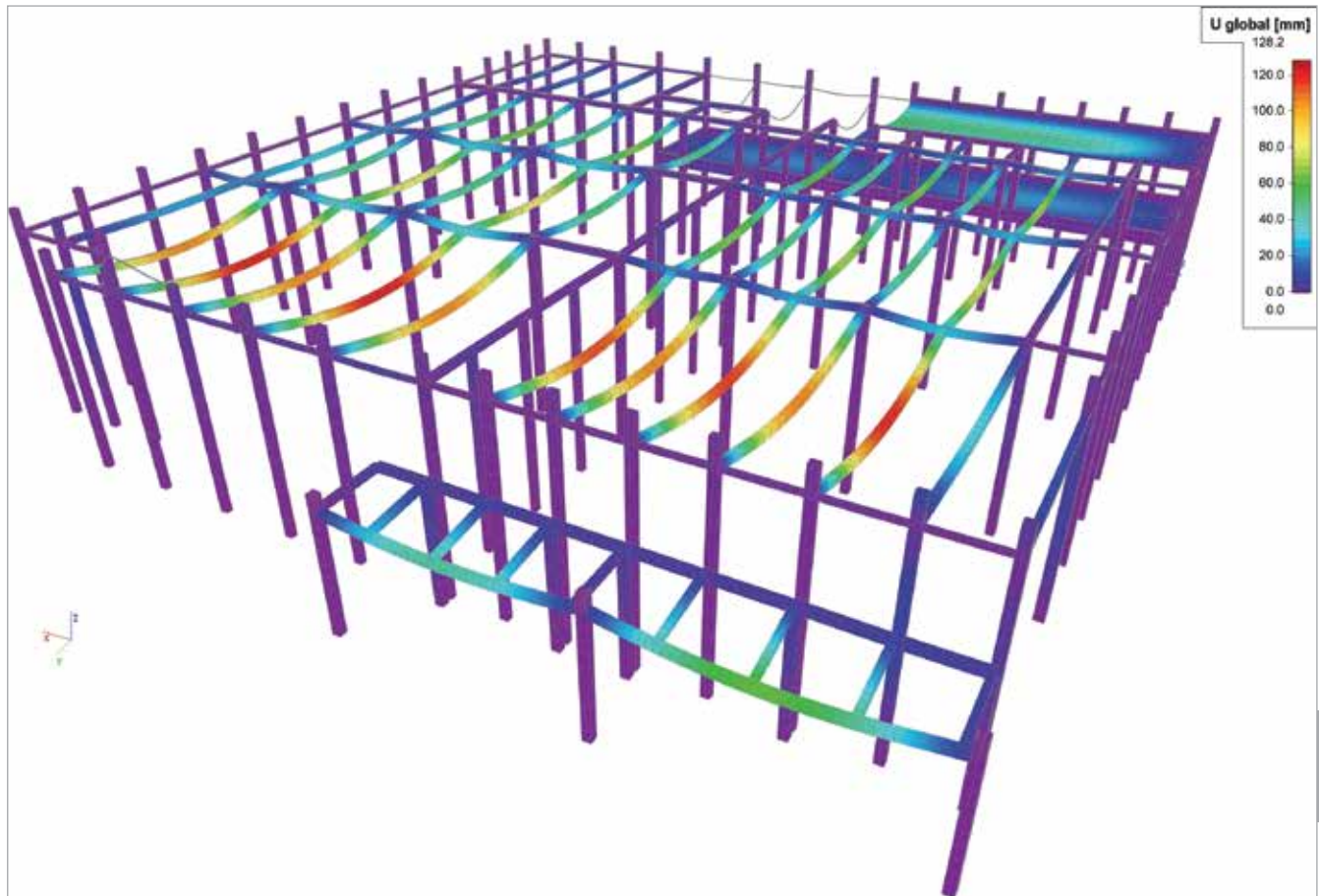
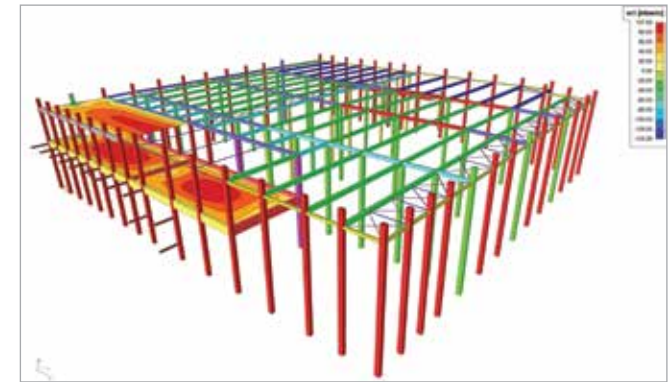
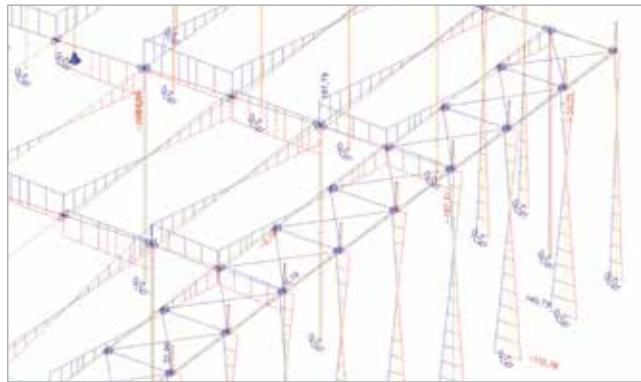
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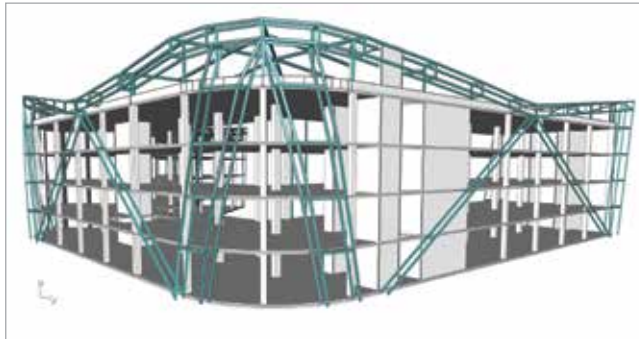
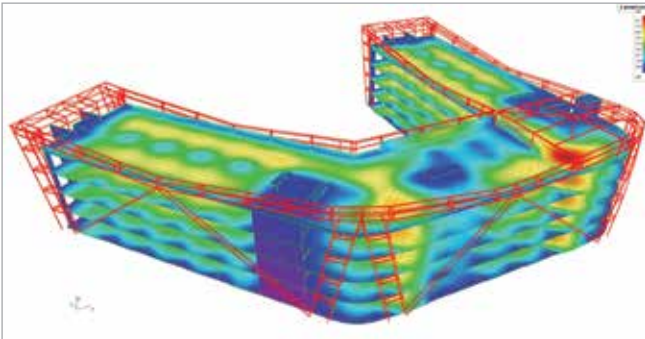
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Owner	Ayr (Jersey) Limited
Architect	pHp Architects
General Contractor	Vinci
Engineering Office	Evolve
Construction Period	01/2014 - 12/2014

Delaware Drive is a four-storey post-tensioned RC frame with an extensive steelwork surround cladding system. We used SCIA Engineer during the scheme design phase to ascertain the most appropriate structural solution. A post-tensioned RC frame was chosen due to the open-plan office space requirements. From the design model, we were able to develop the most efficient frame arrangement. The model was then developed and used for the load-takedown for pile design. Columns and shear walls were designed in SCIA Engineer. One of the main benefits was the development of the complicated steelwork cladding system that surrounds the building. Since the steelwork model was created in the software, we were able to carry out design checks as the frame progressed, and when we were happy with the steelwork frame, we were able to link this into Revit. This saved time and effort and avoided having to redraw. In parallel we modelled the concrete frame in Revit and the steelwork cladding in SCIA Engineer and analyzed and design checked the model. We then imported the SCIA Engineer model into Revit, which worked seamlessly and saved time. Construction issue drawings were then produced. There were issues on site so we re-ran the analysis and reviewed the design to amend connection details and locations.

Evolve

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 G1 5QH Glasgow, United Kingdom
 Website www.evolveuk.biz



Evolve is an established structural and civil engineering consultancy within the building and construction industry, priding itself on exceptional quality design in every commission undertaken. We apply our design flair, ingenuity and energy to ensuring that we surpass the expectations of our clients. We're at our best when challenged with projects demanding a creative and proactive approach. Our core business provides services related to structural engineering on buildings and this is often extended to site infrastructure and on-site civil engineering requirements.



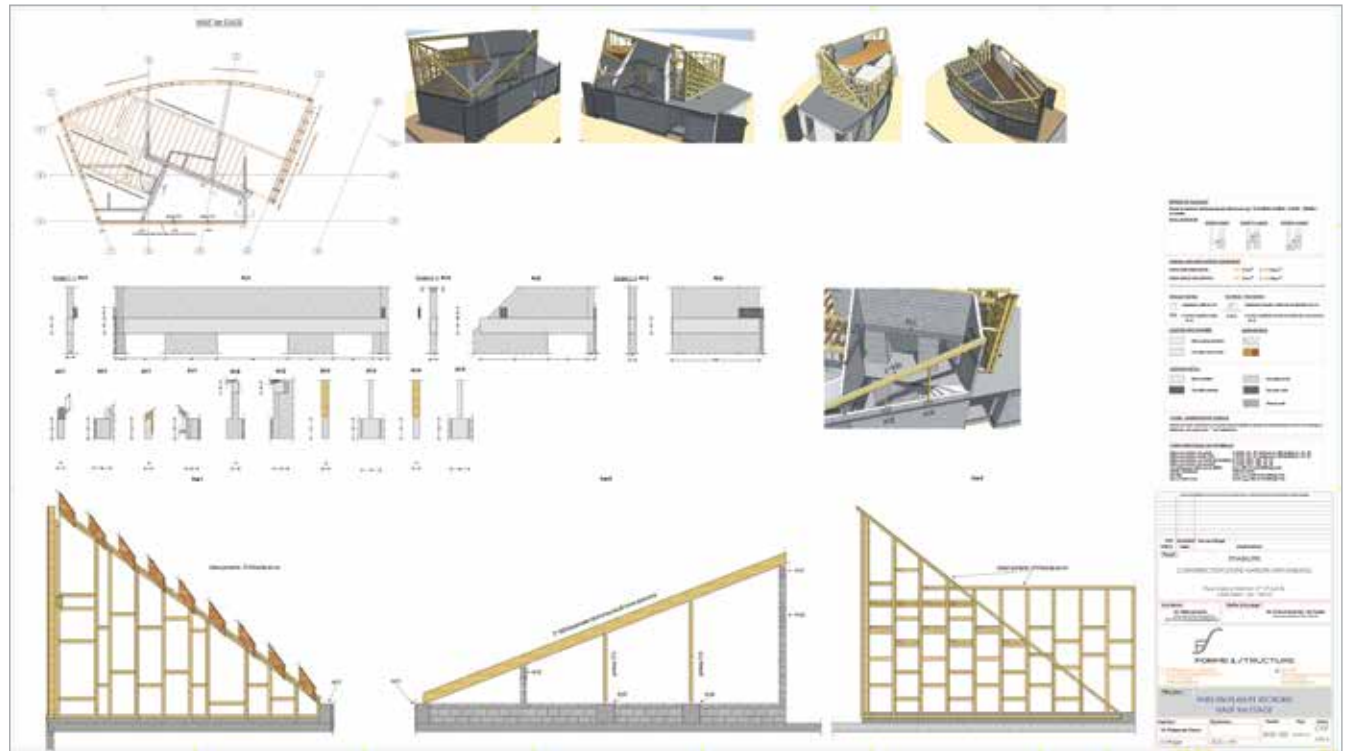
Owner M. & Mme Schretter - De Volder
 Architect M. Gilles Schretter
 Engineering Office *Forme & Structure sprl*
 Construction Period 09/2015 - 02/2016

This single-family housing project aims to combine the characteristics of the locational aspects (land, built environment, orientation, etc.) and the future occupants (family organisation, etc.).

The building marks the transition between the geometric public space and the organic private space. This transition is reflected in the organisation of the plan, the composition of the facade and the volume.

The front facade facing north is closed and geometric, and accommodates the technical functions (entrance hall, circulation, laundry, bathroom), while the rear facade facing south is open and curved, and is dedicated to life functions (living room, kitchen, dining room, bedrooms, etc.).

The construction remains part of the environment, while trying to bring sense to the spaces.



Forme & Structure sprl

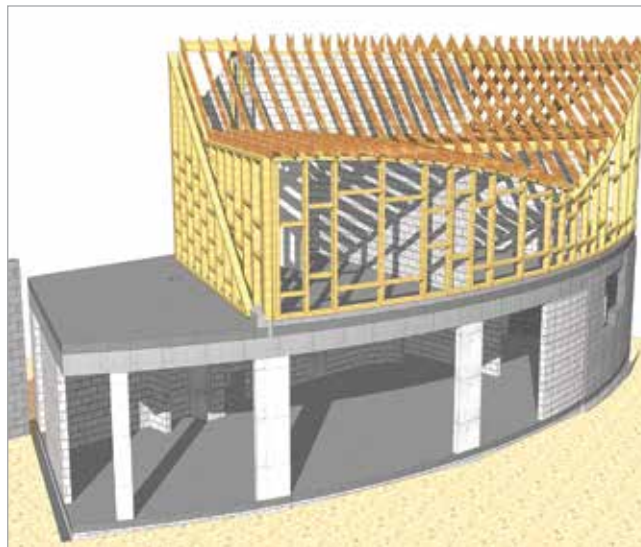
Contact Philippe de Grasse
 Address 43 rue du Pont du Christ
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 Email philippe.degrasse@formestructure.be

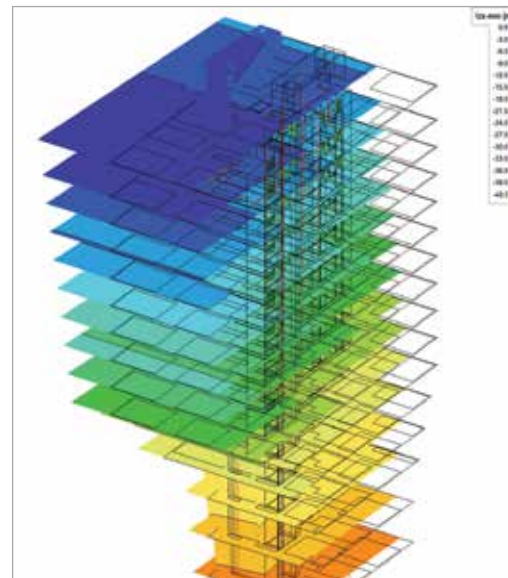
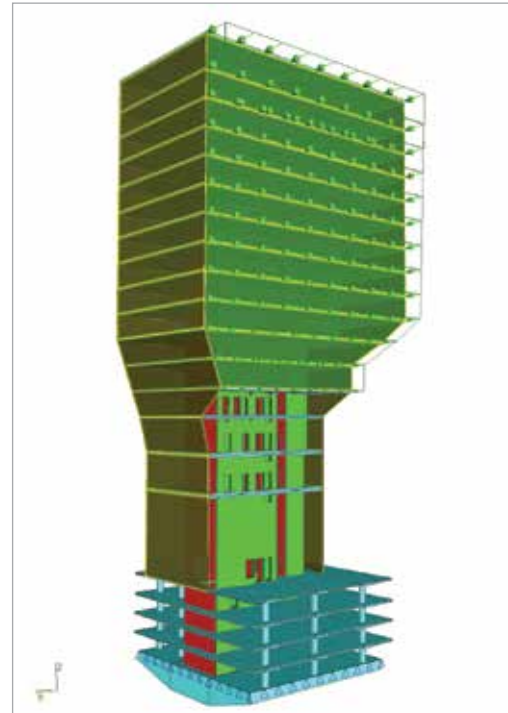


The Engineering consulting office 'Forme & Structure' is active in the field of building stability.

The office was created in 2013 by Philippe de Grasse and Nicolas Delfosse, both certified civil engineers, as a SPRL (limited liability partnership company), dealing with public and private cases for new buildings and restorations, as well as expert assignments related to stability.

To date, about 120 cases have been undertaken at a current rate of around 80 cases per year.





Owner IMEC vzw
 Architect Baumschlager & Eberle
 General Contractor Besix
 Engineering Office Ingenieursbureau Jan Van Aelst - GAMACO
 Construction Period 01/2010 - 01/2014

The IMEC Tower consists of 16 above-ground floors (12,522 m²) and 4 underground levels of car parks. The space is used as offices and laboratories. The typical floors of the tower consist of 2-way cantilevered post-tensioned plates supported by 2 cores.

SCIA Engineer was used to study and design the concrete reinforcement of the core walls. These walls are full of openings and doorways and the "integration strips" tool was useful when designing the reinforcements. The main structural difficulty of the tower was caused by the interruption of one of the cores at the 6th floor which generates high internal forces in the walls.

Furthermore, the design process had to take into account the execution methodology. In order to limit the formwork and strut costs, work proceeded in the following manner:

- The structure was built up to level 9, in a classical way (on shutterings and props), but concrete was poured in the doors placed in the second core, between levels 6 and 9.
- Shutterings were removed.
- The structure was built up to the roof. At this stage, the walls between levels 6 and 9 were acting as a cantilever.
- Finally, the walls at levels 6 to 9 were broken down in accordance with the architectural layout and the necessary doorways in the walls.

Gamaco Consultant Engineers SA

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 Website www.gamaco.eu



The design office GAMACO Consultant Engineers SA has more than 25 years of experience with construction projects, renovations, civil engineer works, industrial constructions and more generally with all building designs and structural stability.

Our search for structural optimum has, over the years, resulted in developing a thorough expertise which is today internationally recognised in the field of post-tensioned concrete, particularly in building applications.

Owner Church of the Resurrection
 Architect HGA Architects and Engineers
 General Contractor McCown Gordon
 Engineering Office HGA Architects and Engineers
 Construction Period 03/2015 - 02/2017

The first phase of the United Methodist Church of the Resurrection project involves construction of a new 140,000 sq. ft. structure. The main sanctuary is surrounded by seven "sails" and full-height glazing highlighting the 3,500 sq. ft. art glass wall. The building plan is based on **several ellipses forming the geometrical basis** for the sloped walls and structural framing.

Several SCIA Engineer models were used to analyze and design various components and structural systems. The "lateral" model contained the necessary elements and loading required to analyze the building for lateral loads. SCIA Engineer's ability to easily copy and paste data into the data tables was used extensively to input the design wind load pressures for the **many possible wind cases**. The "balcony" model contained components necessary to perform a **dynamic analysis** to verify that vibration serviceability requirements were met in addition to code-based strength limits. **Parameterizing the roof truss depth** enabled us to quickly optimize the roof truss design at early design stages.

The elliptical grid layout, sloped walls, sloped roof and overall building shape created several design challenges. SCIA Engineer's broad functionality allowed for effective analyzes and designs of a **complex structural shape**.

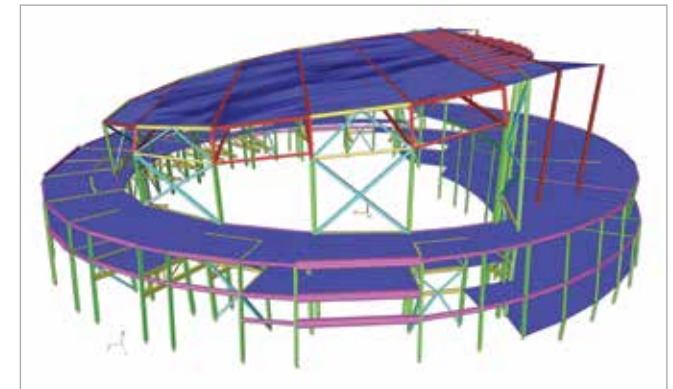
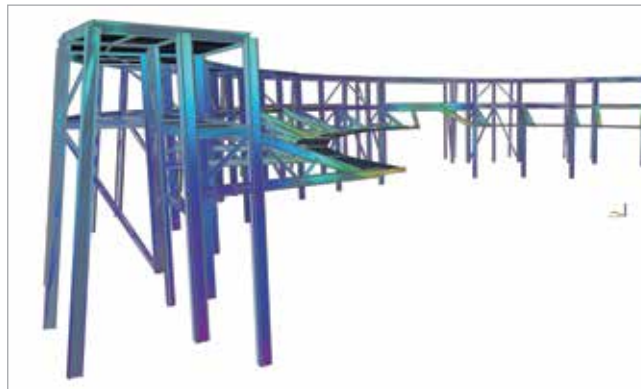
HGA Architects and Engineers

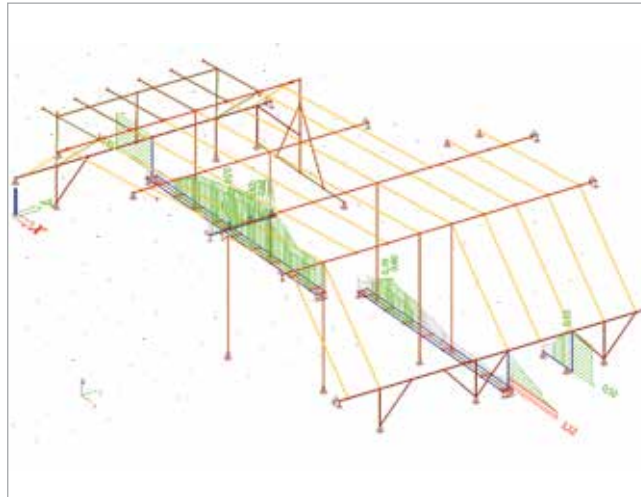
Contact Kevin Borth, Paul Asp,
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 Website www.hga.com



HGA is an **integrated** architectural, engineering and planning firm that helps clients realize their organization's vision and potential through **responsive, innovative and sustainable design** with multidisciplinary collaboration, knowledge sharing and design investigation.

Collaboration, aesthetic achievement and client service inspire HGA as architects, engineers and designers to work alongside each other throughout the entire building process. HGA's commitment to quality has been recognized with **more than 300 design awards**.

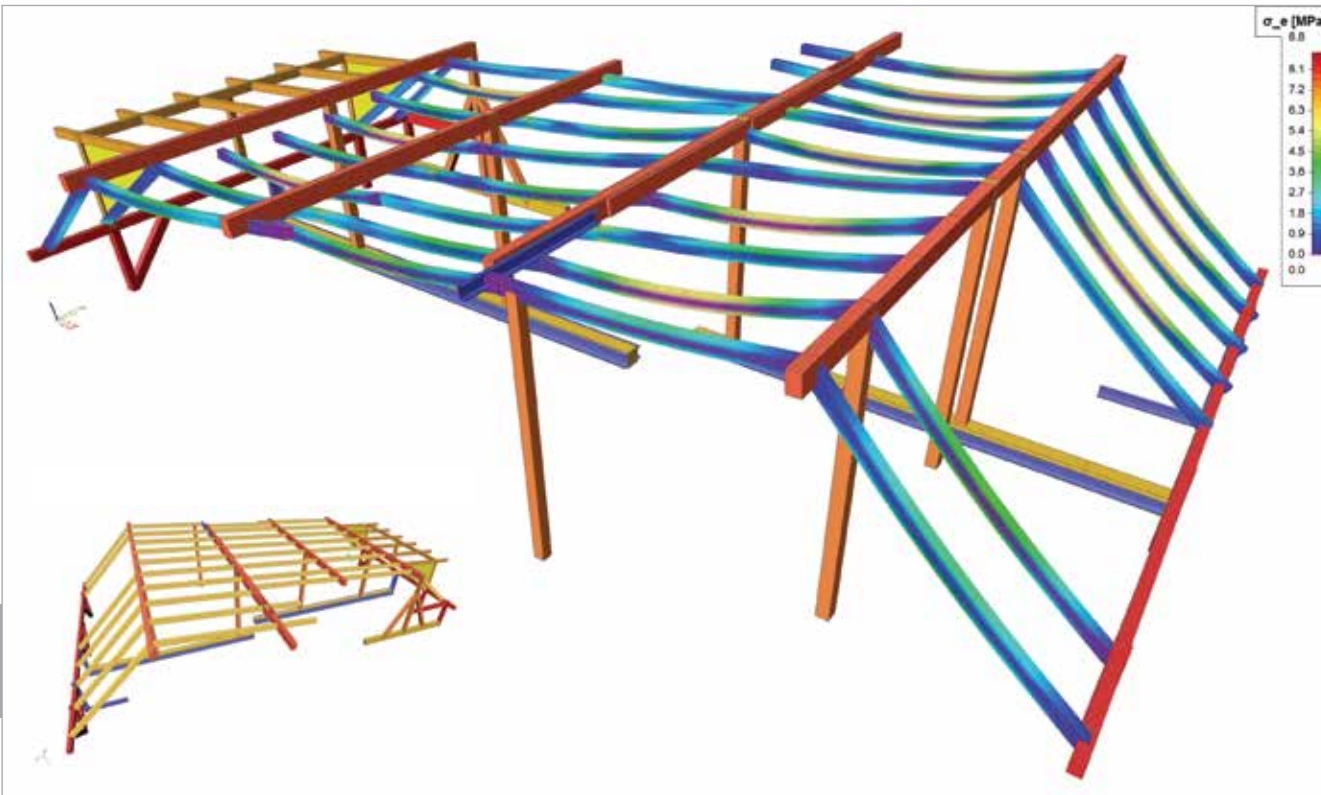




Architect *Architekt Schnabel, Berlin*
 Engineering Office *Ingenieurbüro Dr. Häfner*
 Construction Period *01/2015 - 05/2015*

The project concerns the redesign of the roof framework for new rooftop flats in Berlin. It is a typical residential building of the Wilhelmina period with a 5 storey of masonry wall construction, ceiling timber beam/joists and timber roof framework with rafters and purlins. Conceptual design was created in collaboration with architect and owner/client for layout of new flats. The timber roof structural system was changed after removal of several columns and timber bracing.

SCIA Engineer was used to build a **3D model** of the roof construction with rafter, partially strengthened purlins, stayed columns, composite ceiling beams and new steel bracing. Structural linear/nonlinear analysis was performed with self-weight, snow and wind action according to EC1 and EC2. In the next step the program was used for the design ULS/SLS check of structural elements according to EC5 timberwork, EC3 steelwork and EC6 masonry. In the end we investigated an alternative of existing solid timber ceiling as composite beam strengthened by high strength material of laminate veneer lumber (LVL). The approach used allowed for an **effective structural engineering** with 3D modelling, analysis and design for **cost-effective re-construction**, especially for various construction states. It helped to face the challenges like FE modelling of mixed materials of timber, steel and wood composite and composite beam connections by rigid coupling. Moreover, it streamlined the planning of structural details with steel elements in collaboration with architect.



Ingenieurbüro Dr.-Ing. Häfner

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IBH-SE&L&T offer engineering and consulting services in the fields of structural engineering and civil planning as well as in other fields:

- Structural engineering with 3D modelling, visualization, analysis, design with ULS /SLS check and detailing with usual and advanced technologies.
- Preliminary design and construction/supervision management.
- Experts in forensic investigation for feasibility studies, noise, wind action, causes of structural failures.
- Providing Lecturing & Training to national and international businesses and University Institutes.

Owner *Hülster Immobilien GmbH & Co. KG*
 Architect *Architekturbüro Achim Becker*
 General Contractor *Fritz Meyer GmbH*
 Engineering Office *Ingenieurbüro Mentges*
 Construction Period *06/2013 - 06/2014*

3D structural design of a residential and office building with 57 housing units and 1500 m² of commercial space in the city centre of Siegburg.

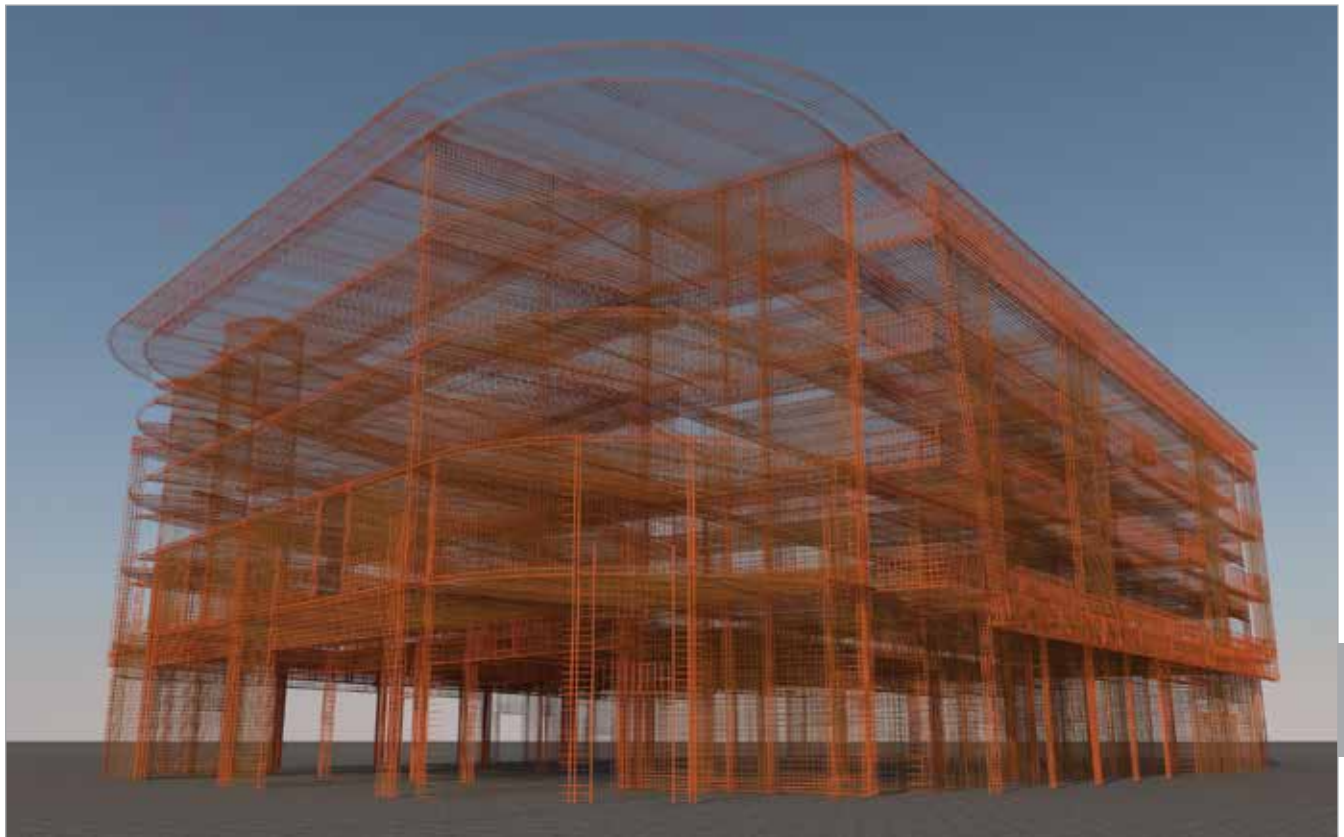
For this new building, IB Mentges optimally used 3D software tools from the Nemetschek Group. In this important regional project, the private contractor succeeded with providing 57 housing units of affordable housing for older people and a full-range food supplier in this downtown location. The challenge for IB Mentges lied in checking the earthquake loads. A simplified verification was not possible due to the geometry of the structure and stiffened elements in the ground plane. The 4 floors of the residential area were split to 4 sections on the ground plane and reconnected using a continuous structural slab. The foundation was planned outside of IB Mentges. IB Mentges transferred the 2D data from architects into a 3D data in Allplan where the structure was easily modelled. This 3D model was then transferred to SCIA Engineer through IFC and the analysis model was generated. The earthquake verification was performed in SCIA Engineer according to EC8. The checks of the floor and other supporting members under live loads were verified with the Frilo software. The reinforcement was designed in 3D, which is a common practice at IB Mentges. As a result, not only optimized planning results were obtained, but a poster made of the image of the reinforcement scheme decorated the client's office.

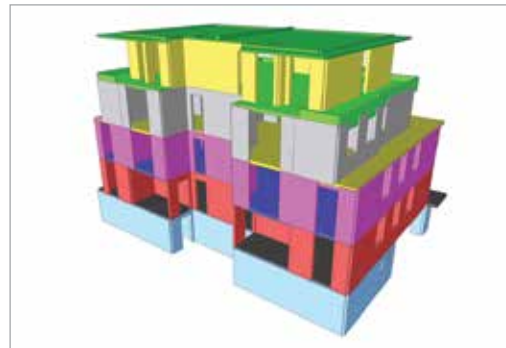
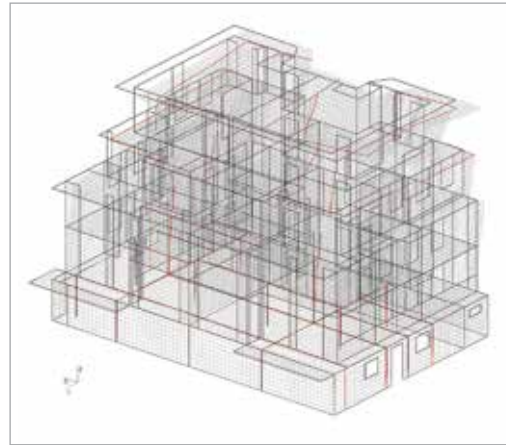
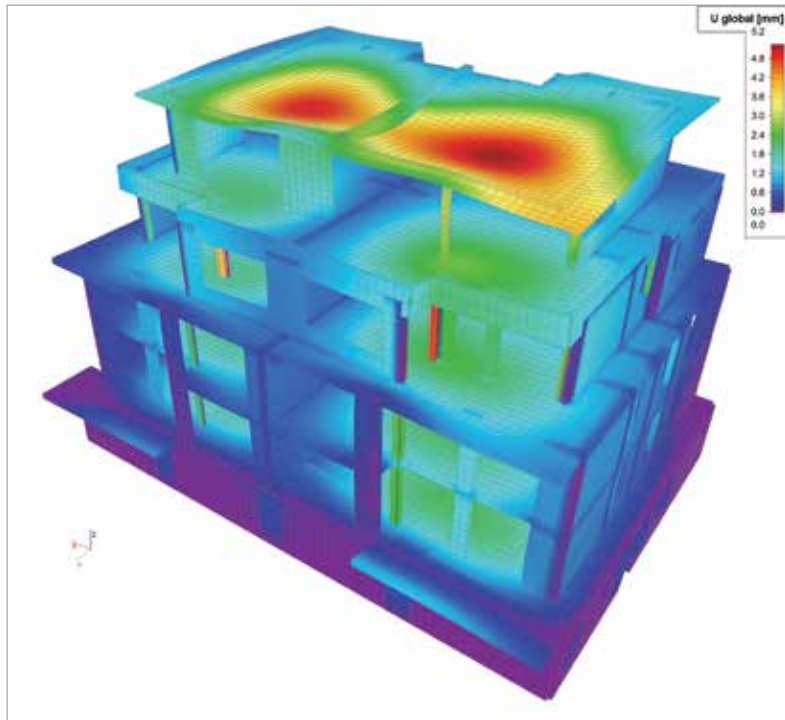
Ingenieurbüro Mentges

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53721 Siegburg, Germany
 Website *www.ib-mentges.de*



For 20 years the engineering company Mentges designs structures and buildings in concrete, steel or timber for industrial, commercial, residential and administrative purposes. The customer base today is crossing regional borders with nationwide projects. Mr. Mentges set BIM approaches in his thesis already in 1989 and therefore relies on the technology leader Nemetschek Group. Structural analysis and detailing with SCIA Engineer and Allplan is a real BIM. The consistent 3D design is not a goal in itself, but for the 3 engineers involved it represents a way to produce an optimal design with a minimised possibility of errors.





Owner *Emons Bauträger GmbH*
 Architect *Emons Architekten*
 Engineering Office *Ingenieurbüro Mentges*
 Construction Period *2015 - 2016*

The Mentges office utilised all BIM-functionalities from the Nemetschek Group during the construction of this apartment building. Overlooking the Rhine Valley and the picturesque 'Siebengebirge' a residential complex with 7 units and an underground parking will be built in Bonn. To provide adequate sound insulation and to reflect the foundation conditions, the building is divided into 2 parts, with staircases and basements separated from the living areas and the underground car park. The living area includes a penthouse, upper and ground floor and also 2 underground floors with the parking space. The staircase extends over all floors; cellars and technical rooms are located in the basement. The foundation is formed by elastically bedded plates.

As the building geometry is irregular and the slabs are at different levels, a simplified check by equivalent earthquake loads was not an option and a 3D finite element program had to be used for the calculation.

From the 3D building data prepared by architects in Allplan, Mentges has derived the structural model and generated the analytical 3D model in SCIA Engineer. The earthquake checks were performed according to EC8 using the IRS method, and the slabs were designed for the gravity loads. The results were sent to Allplan through the .asf file, so that, as always at IB Mentges, the reinforcement could be fully detailed in the original 3D building model.

Ingenieurbüro Mentges

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53721 Siegburg, Germany
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Owner *Flughafen Stuttgart GmbH*
 Architect *Hascher+ Jehle Planungsges. mbH / BFK Architekten*
 General Contractor *Ed. Züblin AG*
 Engineering Office *Ingenieurgesellschaft Gölkel IGG*
 Construction Period *01/2014 - 12/2015*

Stuttgart Airport has one of the best connected infrastructures in the state of Baden-Württemberg. In the future, the **New Office Airport Stuttgart building** complex will be the widely visible entrance to what is known as the New Airport City. The main tenant is the accounting firm Ernst&Young.

Three interlocking round structures of varying heights form the 130 m long, 100 m wide and 30 m high building. The main upper floor part of the building is shaped like an infinity symbol and is supported by a rectangular basement. From the start this **jump in geometry formed the main challenge** of the whole project. Many load-bearing structural elements are supported by enormous, partly pre-stressed girders with dimensions up to 2 m by 21 m. As a result of the subsoil, the different levels of the base plates, and the reaction forces, the building has three types of foundations: auger pile foundation, surface foundation, and standard deep foundation.

The structure was entirely calculated using SCIA Engineer. This overall analysis positively **influenced both the design and the performance**. A detailed investigation of the forces caused by temperature change and shrinkage meant that expansion joints could be spared. By identifying the natural frequencies of the 3D calculation model it could also be shown that the seismic forces are equal to the wind loads.

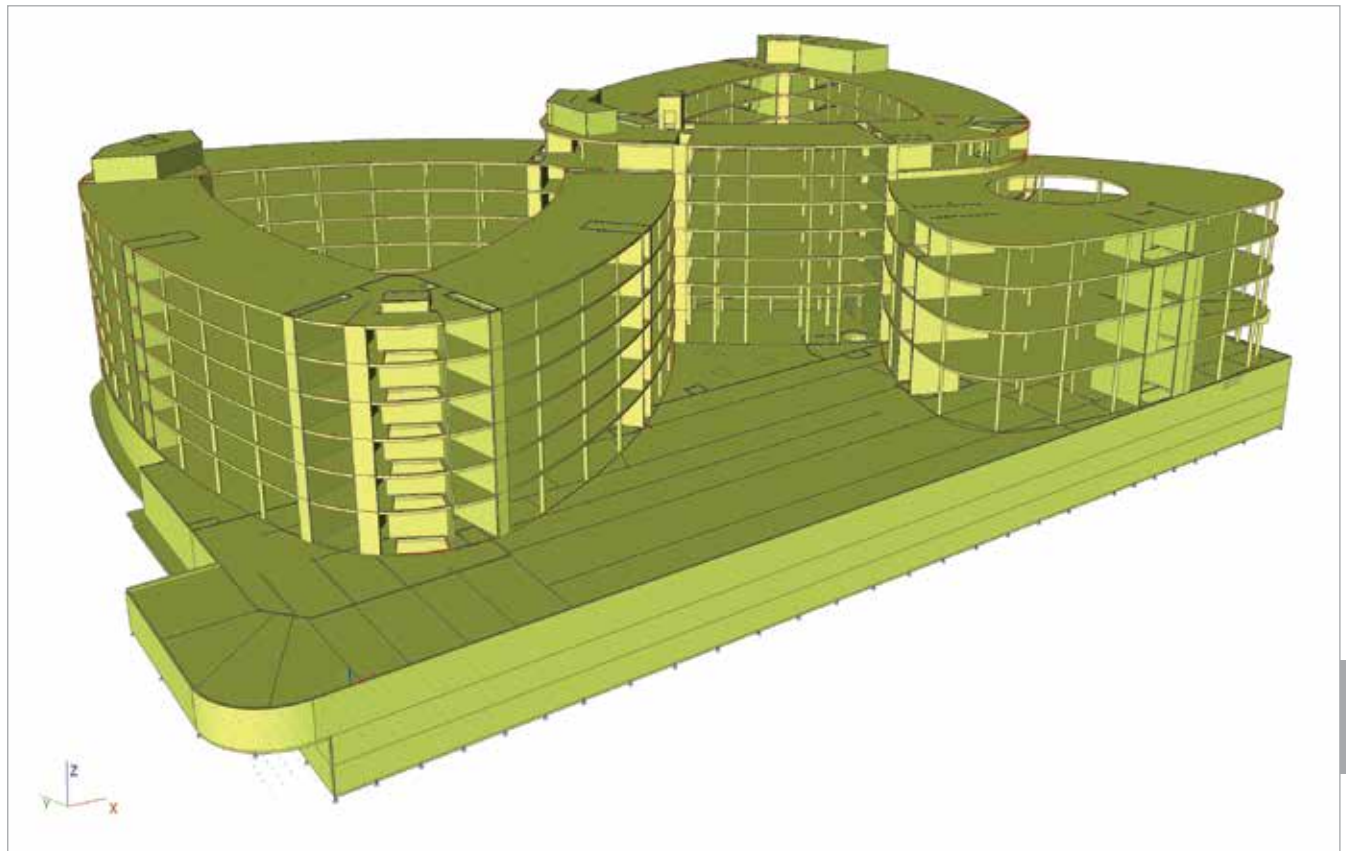
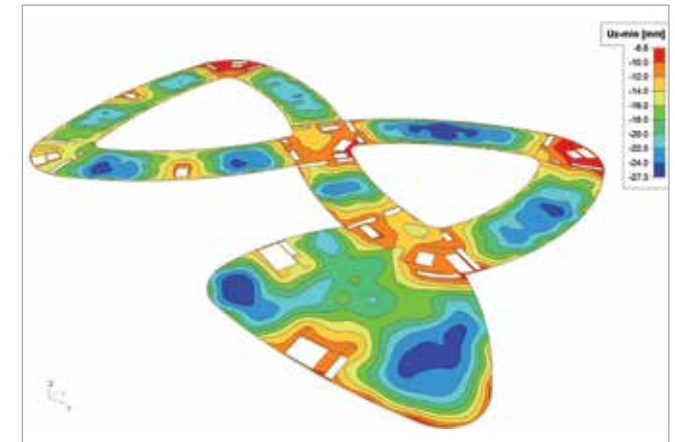
Ingenieurgesellschaft Gölkel

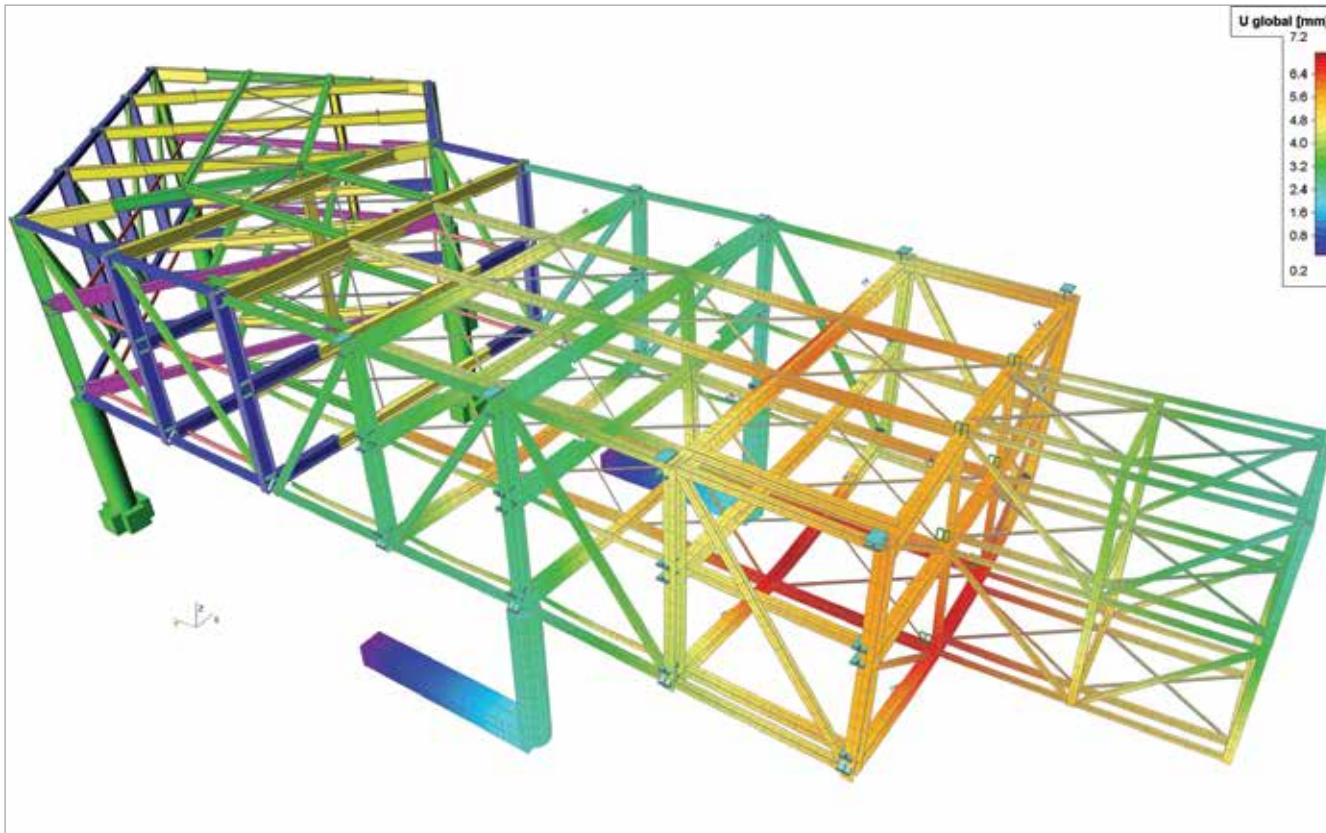
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70192 Stuttgart, Germany
 Website *www.igg-goelkel.de*

igg KONSTRUKTIVE
WERTE

The Ingenieurgesellschaft Gölkel igg was founded 50 years ago as a design consultancy for structural engineering. We consider the process of planning a value adding process for our customers. Therefore, we offer a comprehensive **service package of consulting, planning and support**.

In close cooperation with the partners of a design project, we ascertain all potential elements that form the basis of a need-based, future-oriented and efficient construction. **Optimization is our principle** and it results in innovative individual solutions.





Owner ACV Sint-Niklaas
 Architect Architectenbureau Daens-Demuynck BVBA
 General Contractor Dugardein-De Sutter
 Engineering Office Ingenieursbureau G. Derveaux nv
 Construction Period 11/2012 - 03/2013

An additional office building was built for ACV at Sint-Niklaas. It is a J-shaped steel structure on six concrete columns, allowing traffic beneath the building. The building has two storeys and a roof. Between the 11 steel frames (spanning 12.6 m), a wooden frame structure is used for floors and facades. Not all the steel frames are supported on columns, so laterally the columns are part of a lattice structure with rhs-diagonals.

The building is connected to a new concrete/masonry building and an existing building by a small corridor.

SCIA Engineer was very helpful when designing the steel connections and calculating the deflection under permanent loads because it allowed for the level of the connection to the existing building to be foreseen, meaning that only the live loads are resting on the existing building.

The complexity of the structure was a challenge. As everything is connected and interacting, changing or optimising one part would have an effect on other parts.

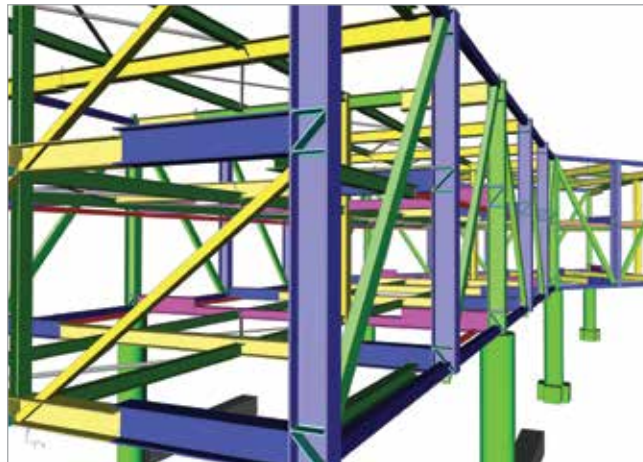
Ingenieursbureau G. Derveaux nv

Contact Paul Van Driessche
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 9000 Ghent, Belgium
 Website www.derveaux.be



Ingenieursbureau G. Derveaux nv (ID) was founded in 1958 by engineer Godfried Derveaux and became one of the most important independent engineering offices in Belgium. Today the office is directed by his son, Jan Derveaux.

ID is experienced in structural designs for all kinds of construction and in the design (both architectural and structural) of industrial projects.



Owner *Belgian Buildings Agency*
 Architect *Philippe Samyn and Partners architects & engineers (LEAD and DESIGN PARTNER), Studio Valle Progettazioni architects*
 General Contractor *Interbuild NV*
 Engineering Office *Philippe Samyn And Partners architects & engineers(LEAD and DESIGN PARTNER), Buro Happold Limited engineers, Ingenieursbureau Meijer bvba*
 Construction Period *09/2011 - 12/2015*

The project consists of a number of steel structures: the iconic lantern stabilised by 2 concrete cores; the atrium roof and double facade, which enclose the lantern; a photovoltaic support structure on top of the roof; a large Vierendeel inner facade and two gateways ("passerelles") to the neighbouring Justus lipsius building.

The complete 3D lantern structure, together with its connecting 'foyer' beams and the concrete floors of the two concrete cores were modelled as one; the atrium double facade (internal facade load carrying), roof and photovoltaic structure were modelled together.

Challenges faced:

Lantern: using concrete floors for horizontal stability of lantern via concrete diaphragms, checking stability of lantern in case of thermal dilatation due to fire, etc.

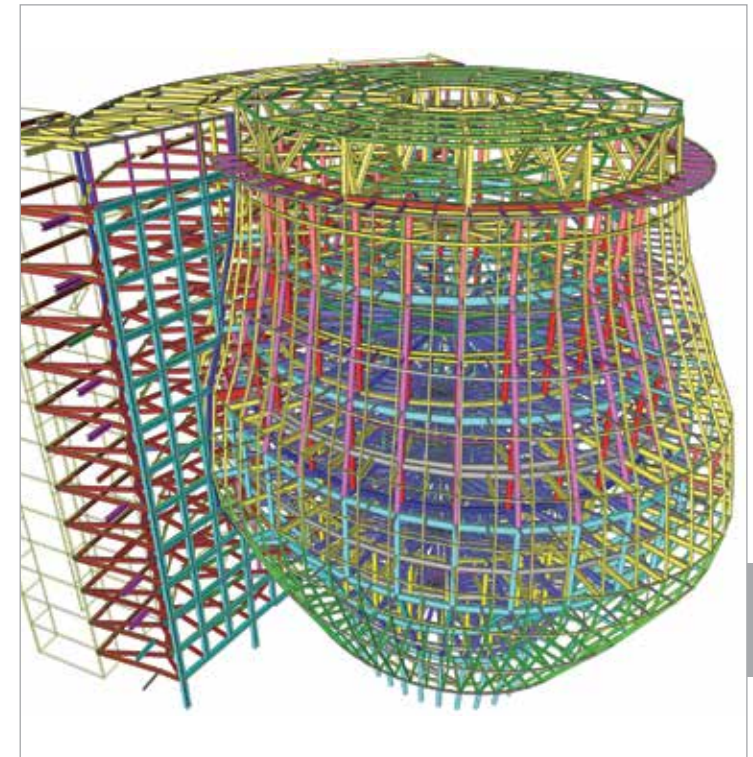
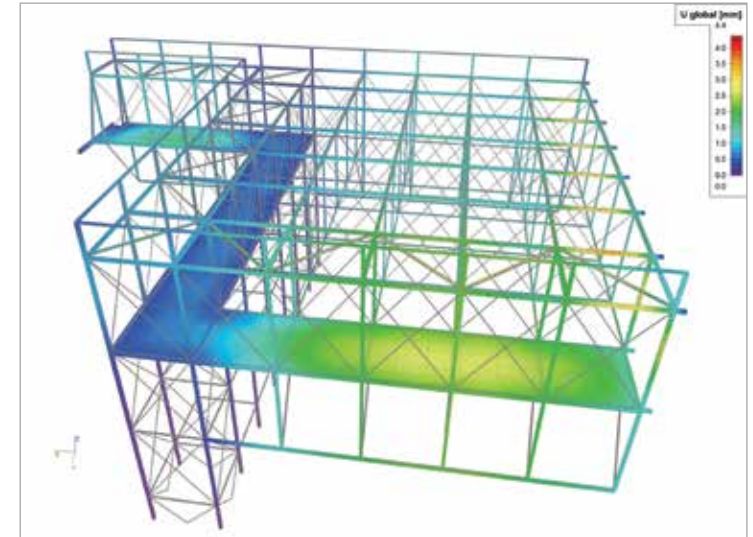
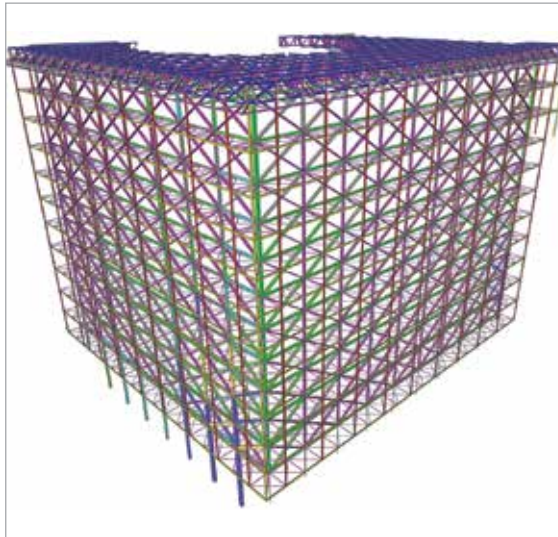
Facade: optimization, taking bomb-blast loads under consideration, etc.

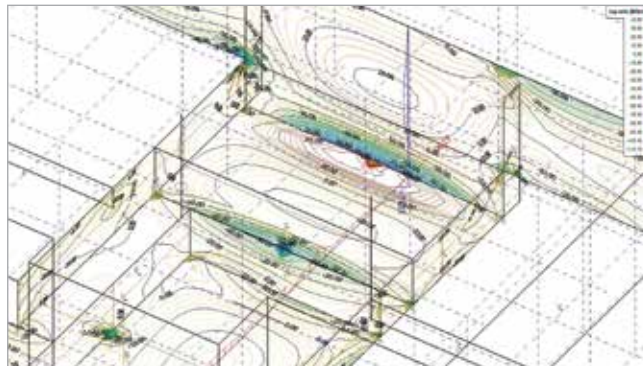
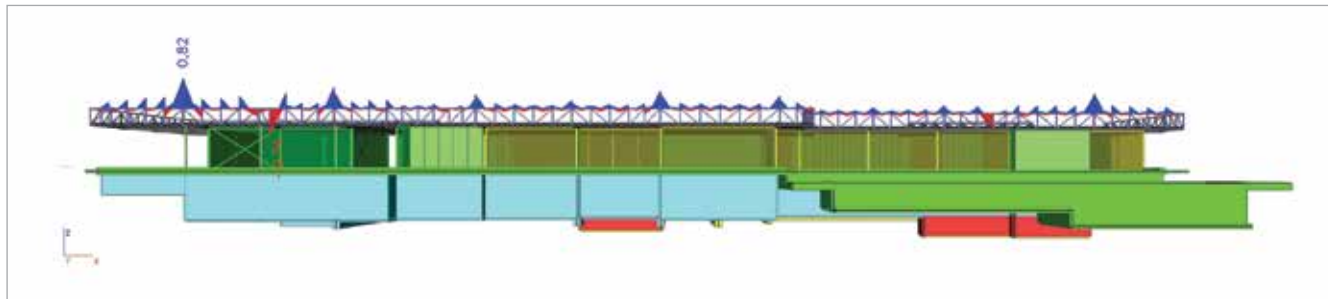
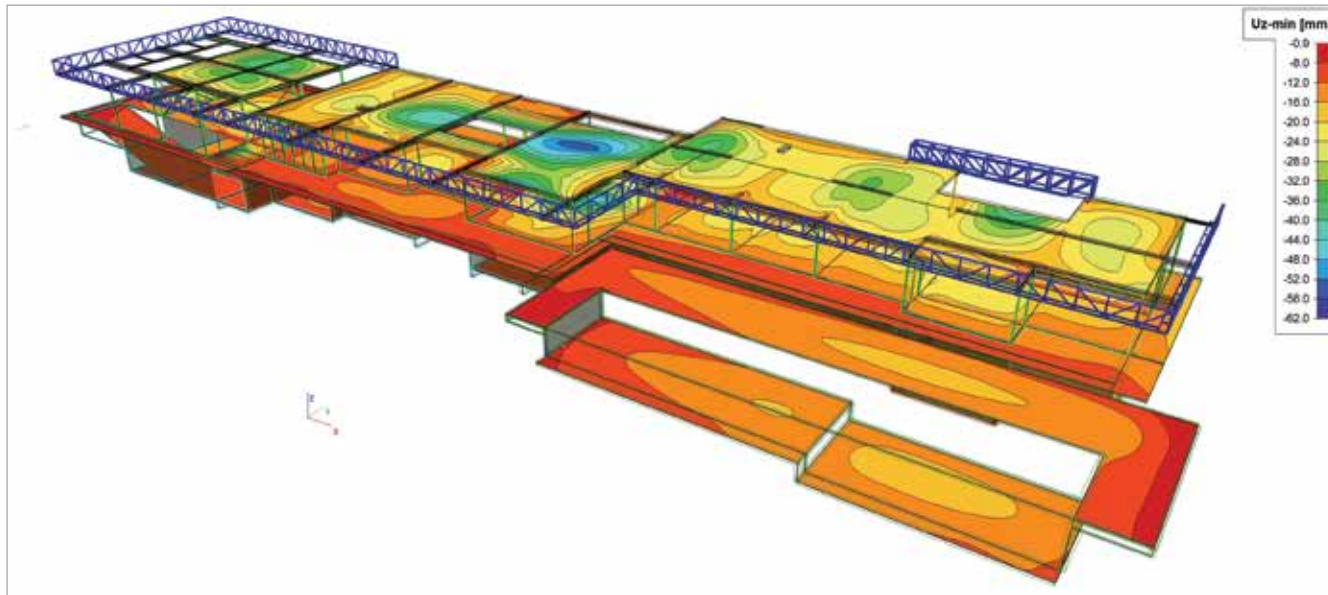
Ingenieursbureau Meijer bvba

Contact *Jan Meijer*
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 2650 Edegem, Belgium*
 Website *www.meijer.be*



Ingenieursbureau Meijer is a Belgian structural engineering company that was created in 1976. It has steadily built up a strong reputation for optimising the quality/cost ratio of **structural solutions**. This is done through the combination of 40 years of practical experience and state-of-the-art engineering tools. The company is regularly invited by leading architects to form part of the teams running for architectural contests. This collaboration style made it possible to participate in the prestigious "**Résidence Palace**" project in Brussels, which will host the European Council.





Architect *WillemsenU Eindhoven*
 General Contractor *Janssen Aannemers te Moergestel*
 Engineering Office *Ingenieursbureau Vander Weide - Van Bragt bv*
 Construction Period *01/2014 - 06/2015*

The project involves a luxury villa in an area with very high groundwater levels. The villa has been fully 3D designed, in the calculations as well as in the drawings. The layout of the building is a single storey above ground level complete with a basement. There are lowered floors in the basement for an indoor swimming pool and various indoor gardens. The basement construction is made of concrete and steel structures which are fully beneath the maximum groundwater level. The upper structure is made of concrete floors and steel structures. The whole building is supported by piles.

The building was modelled with SCIA Engineer. The high groundwater levels in the basement result in upward forces which are absorbed by tension piles. The basement with the swimming pool has been completely designed using the SCIA software.

Modelling the construction in 3D has provided great benefits. The basement with the swimming pool is set beneath the groundwater level, so groundwater creates large upwards forces in the piles. With SCIA Engineer these forces are easy to determine. By using SCIA Engineer the deflections could be accurately determined, the calculated deflections were compared with the real deflections on the building site. These deflections corresponded very well.

Ingenieursbureau Vander Weide - Van Bragt bv

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5913 AN Venlo, The Netherlands
 Email *j.jans-beken@vanbragtbv.nl*



The engineering company Vander Weide - Van Bragt is located in Venlo and Eindhoven. We are an independent engineering company, working in the fields of concrete, steel and timber structures.

Our office designs, calculates, draws and details a wide range of structures for residential and commercial constructions, industrial constructions, shops, monuments, renovations and repairing building damage.

We support the principal end design partners from the start, to reach an optimal, economical and durable design.

Owner Confidential
 Architect Intertechne / Planorcon
 General Contractor Confidential
 Engineering Office Intertechne Consultores S.A.
 Construction Period 2008 - 2015

The project is part of the extension works of the Galeão – International Airport Tom Jobim airport complex, which has the largest runway in Brazil. One of the main aims of this project is to meet passenger demand for the Olympic Games in Rio in 2016.

The new South Pier is formed of three areas and four storeys. The pre-fabricated columns have consoles to support the beams, some of them post-tensioned. The beams have a side flap to support the hollow core slabs that are topped with structural concrete. Therefore it is a structure constructed in phases.

The use of Allplan was fundamental to enabling deadlines to be met and a good quality result to be achieved. The effective generation of layouts brought about a 100% increase in productivity, optimising the team's work. This tool allowed the representation of pre-fabricated elements to be customized, guaranteeing standardization of drawings and lay outs. The biggest challenge was the many architectural alterations made throughout the project and the consequent iterations. The model also allowed for assembly to be planned and interaction with many prefabricated structures made by sub-contractors to be studied. The adoption of solutions like **SCIA Engineer** and **Allplan Engineering** raised the standard of production to a new level of competitiveness and quality.

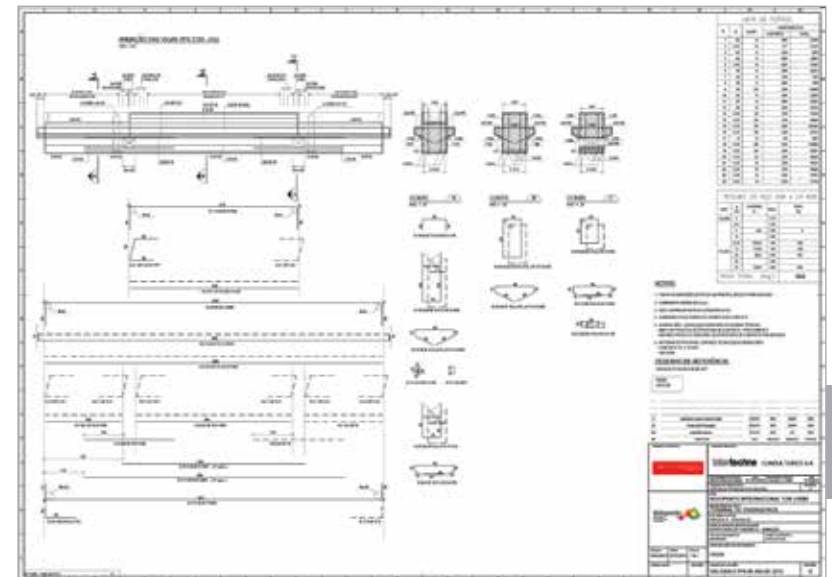
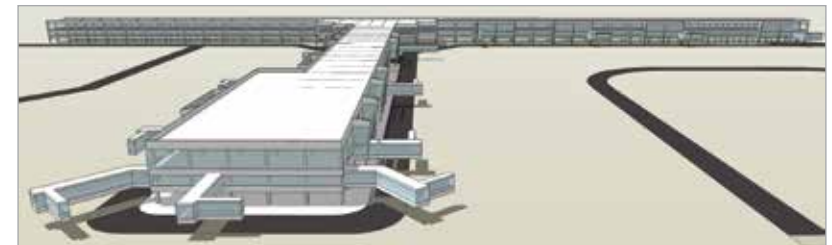
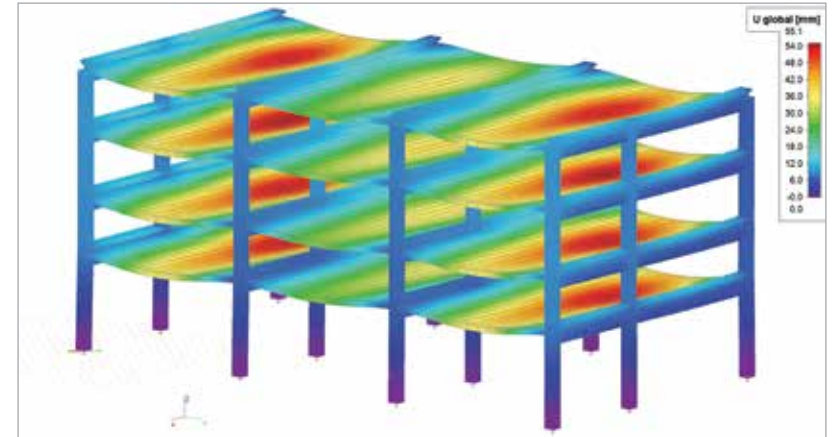
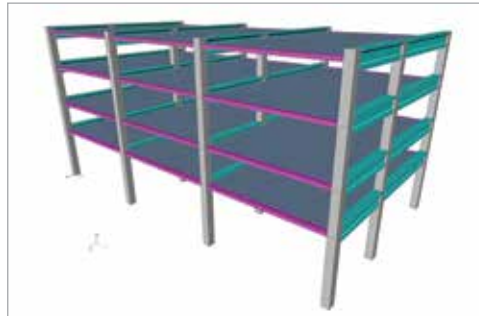
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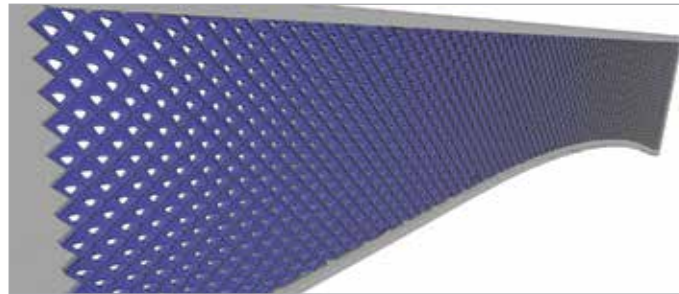
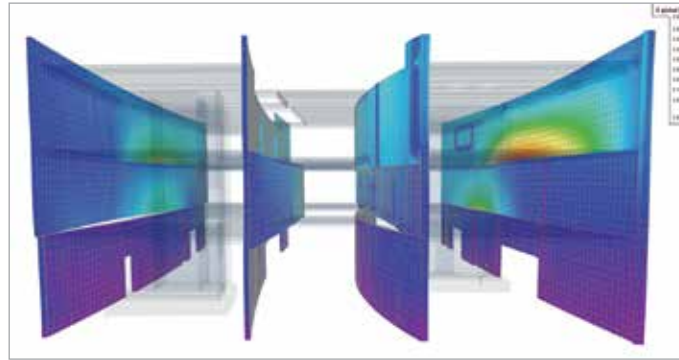
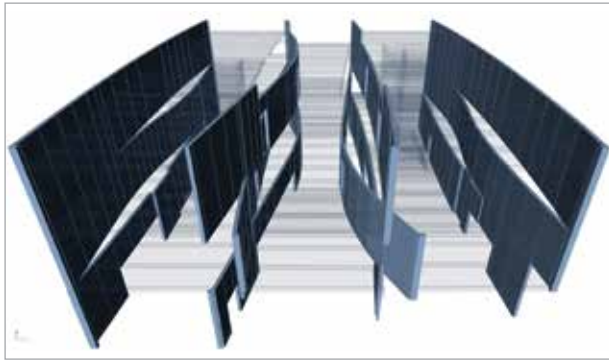
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 Website www.intertechne.com.br

Intertechne

Intertechne is a 28 year old Brazilian company specialising in engineering consultancy and management of oil and gas, energy, tubes, airports, ports, ferries and all types of infrastructure projects.

We offer a good solution in all phases of projects, from preliminary to construction. With our very experienced team of engineers, we can provide our clients with safe, creative and adequate solutions in Brazil and abroad.





Owner *Clemson University*
 Architect *Allied Works Architecture*
 General Contractor *Choate Construction*
 Engineering Office *KPFF Consulting Engineers*

The Spaulding Paolozzi Center (SPC) is a new, 3-storey, 36,000 sq. ft. building that will house classrooms, faculty offices, design studios and library facilities, as well as rooms for exhibits, lectures, community activities, garden areas and outdoor spaces for academic and public events. The conventionally reinforced cast-in-place concrete building consists of a series of curved concrete walls that are different at each level and which overlap at discrete points. Both the interior and exterior walls are perforated with a repeating series of openings.

SCIA Engineer was used for analysis of the perforated walls under in-plane and out-of-plane loading, as well as gravity and lateral loads on the overall structure. Seismic analysis was necessary due to the project being located in both a hurricane area and a high seismic zone. To reduce file sizes and simplify analysis, two separate models were developed- one for the perforated walls, and one for the full building.

A number of modelling techniques were examined for analysis of the perforated exterior walls, including cutting many holes in one large element as well as arraying a single element with a single hole in it. It was determined that FE meshing and analysis is much quicker if the latter option is used. For seismic analysis, the IRS functionality was introduced midway through the design process. This methodology was adopted quickly and used to ease analysis and design.

KPFF Consulting Engineers - Portland

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97204 Portland, United States
 Website *www.kpff.com*



KPFF Consulting Engineers is a multi-office, multi-disciplinary engineering firm that provides a wide variety of engineering services to the design and construction industry both in the United States and abroad. Services include structural engineering, civil engineering, construction management, project management, surveying and a variety of specialty engineering services. Significant broad-based experience provides us with the ability to solve the most difficult and challenging problems. We have built a reputation as creative and innovative engineers who are focused on a high level of client service and excellence in everything we undertake.

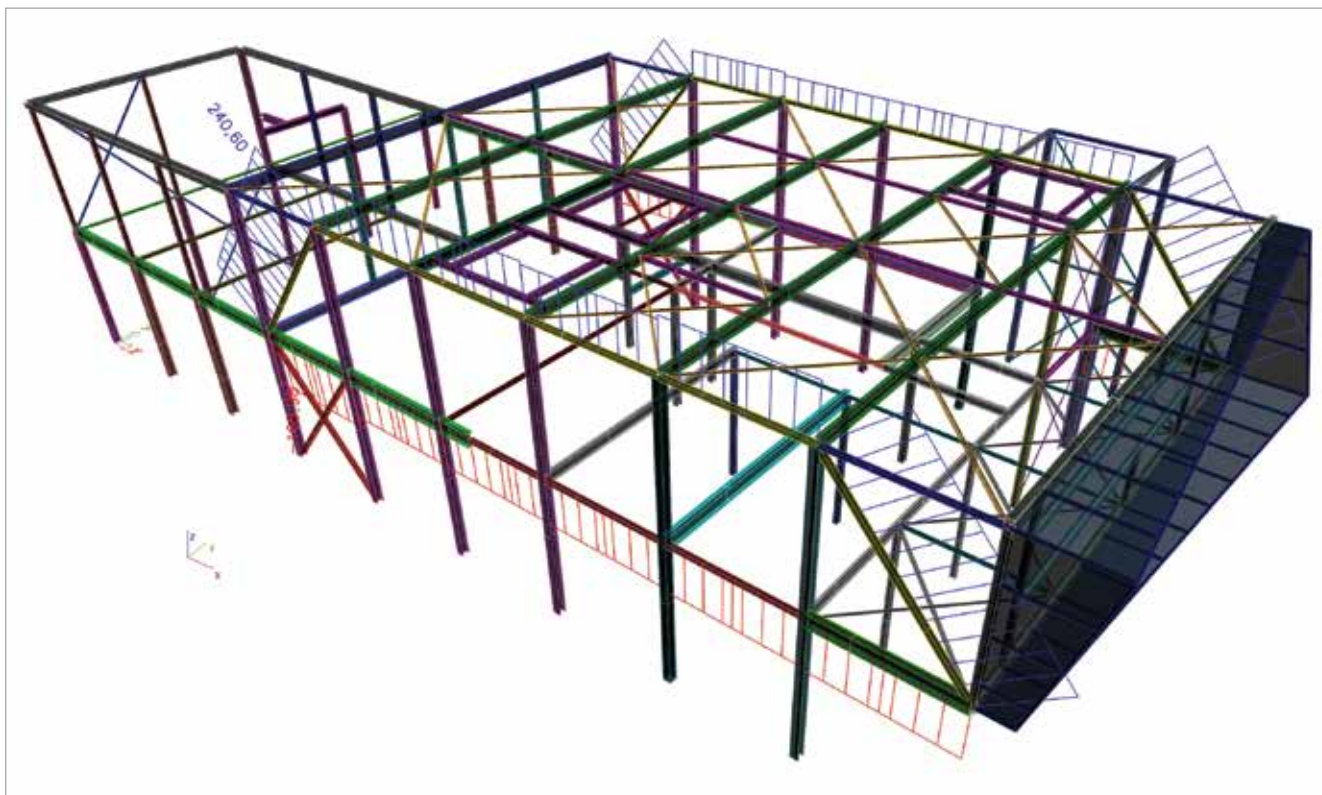


Owner Quick Restaurants SA/NV
 Architect Lahon & Partners
 General Contractor Mathieu Gijbels nv
 Engineering Office Mathieu Gijbels nv
 Construction Period 02/2012 - 06/2012

In collaboration with architecture firm Lahon & Partners as part of an expert building team, Mathieu Gijbels developed the Qubic-concept for the fast food chain Quick, supporting Quick's expansion plans. This included the use of the SCIA Engineer package to calculate stability.

The Qubic-concept is a design concept in steel that can be used throughout Belgium for all new Quick sites. It makes allowances for all different weather conditions (including wind and snow), whatever the region. During the design of the Qubic-concept, functionality and cost efficiency were a key focus.

SCIA Engineer was crucial to the construction of this project. It enabled us to calculate the internal forces in elements, to assess the lateral stability of the building and to calculate the horizontal and vertical deflection of the structure, in particular for the overhang. The software also enabled us to quickly incorporate changes proposed by the architect, see how changes would impact our design and analyze different solutions to find the most economical. Five Quick Qubic sites have been built so far already.

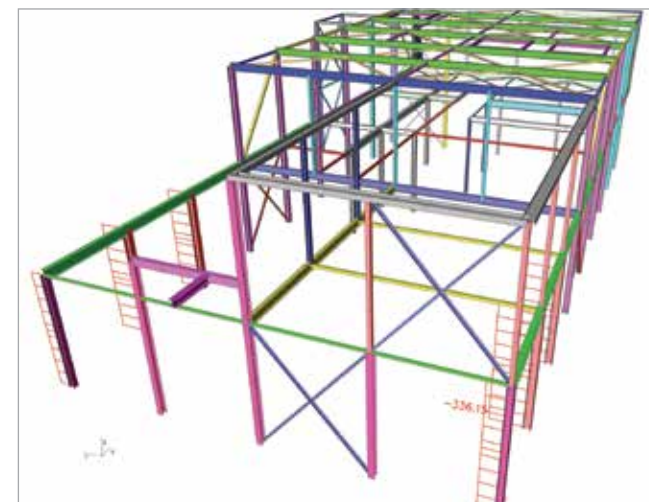


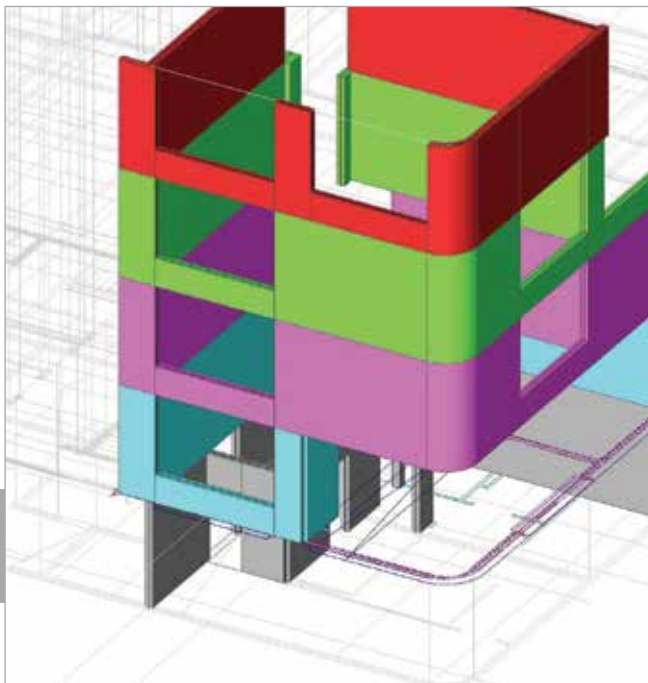
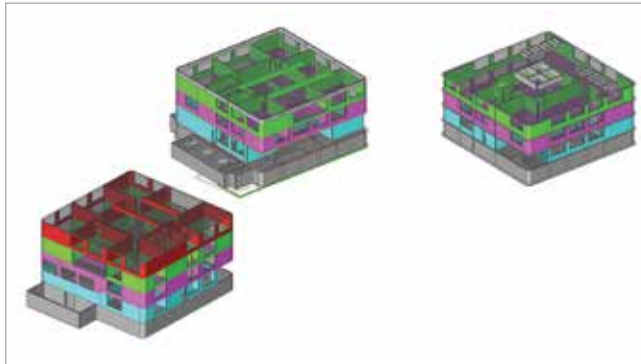
Mathieu Gijbels NV

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 Website www.gijbels.be



Mathieu Gijbels is active in company and office building and is the biggest company in the Gijbels Group. Its strategy is focused on building a lifelong relationship with customers. By offering the full package of structural services, it can help customers with all their building issues, from **new build and renovation to service & maintenance**. Mathieu Gijbels is based in Oplabbek (Belgium), has a turnover of 77 million Euros and employs around 315 people. As a construction group Mathieu Gijbels can manage the complete process itself, including the engineering, foundation work, assembly, finishing and also building maintenance.





Owner *Commune du Mont-sur-Lausanne*
 Architect *Graf & Rouault architectes Sàrl*
 General Contractor *Betholet & Mathis SA / ADV Construction SA / Induni SA*
 Engineering Office *Meylan ingénieurs SA*
 Construction Period *2012 - 2014*

The extension of the Mottier College represents three new buildings in reinforced concrete constructed in phases.
 Phase 1 includes the first pavilion with special rooms. The central area has two staircases and a large skylight roof. The 2nd phase consists of classrooms, a canteen with a kitchen and a multipurpose space. The 3rd stage contains a gym, staff room and the second half of the classrooms.

The facade is made of prefabricated UHPFRC concrete elements. Basements, being underground, are equipped with a waterproof lining. The SCIA Engineer software has allowed us to solve all the difficulties of the three projects using specific modules such as prestresss, document, Soil-in and a BIM building approach.

For each step we created several models:

- A model for the calculation of the foundation subject to the groundwater pressure studied with the Soilin module.
- A model for the 3D analysis of the concrete structure that allows us to consider the two level wall prepared for the cantilever of buildings 2 and 3.
- A specific model for the calculation of prestressed supporting beams.
- A specific model for the analysis of the behaviour of the central staircase under static load.

Meylan ingénieurs SA

Contact *Eric Molleyres*
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 Website *www.meylaningenieurs.ch*



Meylan Ingénieurs SA is a company led by Mr. Gregorin & Mr. Molleyres since January 2009. The company was founded in 1979 by Frank Meylan and gained over 35 years of experience in construction industry. The efficient and responsive structure of Meylan Ingénieurs allows us to address any construction project, renovation works as well as special projects, seismic studies and expertise. Our reputation is based on a pragmatic approach, focused on financial control and looking for economical solutions. We are committed to the human values as well as diversity. We develop collaboration with our clients as well as our team members.

Owner *Brussels Airport Company*
 Architect *CTHM (Chapman Taylor - Buro Happold - Moss)*
 General Contractor *CEI De Meyer & CIT Blaton*
 Engineering Office *MOSS*
 Construction Period *04/2013 - 03/2015*

Connector is an open, low-energy and futuristic building. It is the heart of the airport, creating an architectural bridge between the 2 different piers and the terminal building.

The saw-tooth structure of the roof has the advantage of letting in more natural light, which saves energy and creates a pleasant environment. Because it is cold northerly light, the building doesn't heat up. In addition to the challenge of creating aesthetic architectural unity, there were various practical construction challenges. For example, the existing passenger tunnel right next to the Connector site, which had to be kept fully operational. The facade of Connector slopes slightly outward, by 8 degrees in fact. This was necessary to prevent the building from reflecting radar beams or radio signals. Not only did the facades have to slope, but they were also required to withstand jet blasts. Big aircraft can produce wind speeds of up to 160 km per hour behind them when they start their engines. To prevent the many windows from causing the building to overheat, they have been fitted with sun screens and vertical fins, which have been incorporated into the facades as an aesthetic element. The screens on the west side are jagged and contain meshwork in the form of elongated hexagons. The shape and size of the meshwork has been designed to prevent the screens from reflecting radar beams and signals from aircraft and traffic control.

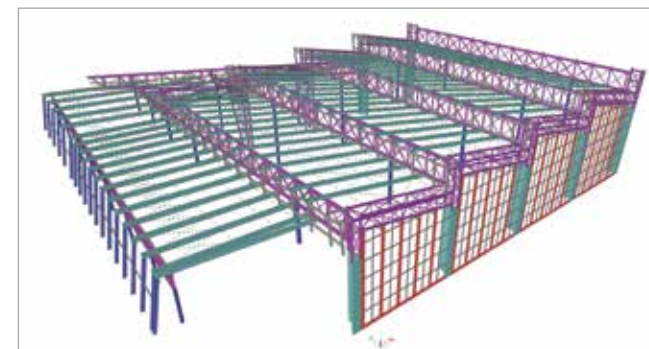
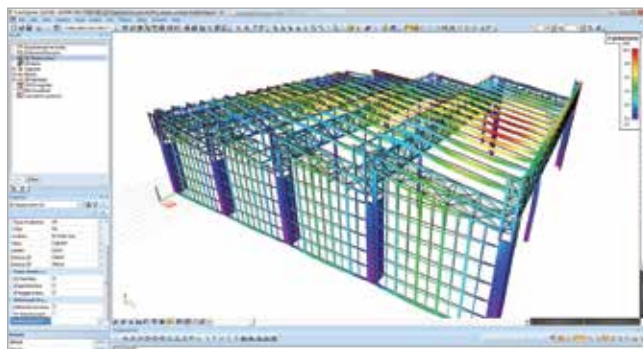
MOSS bvba

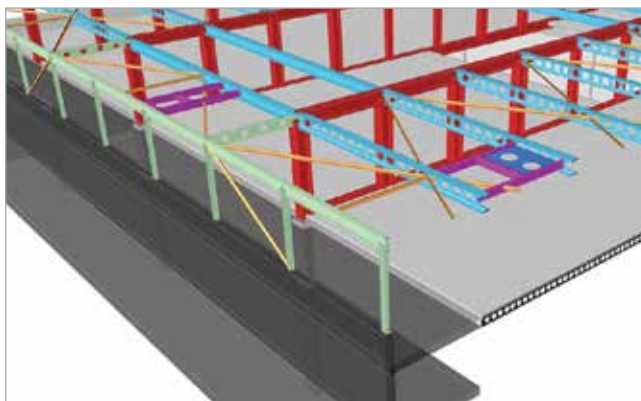
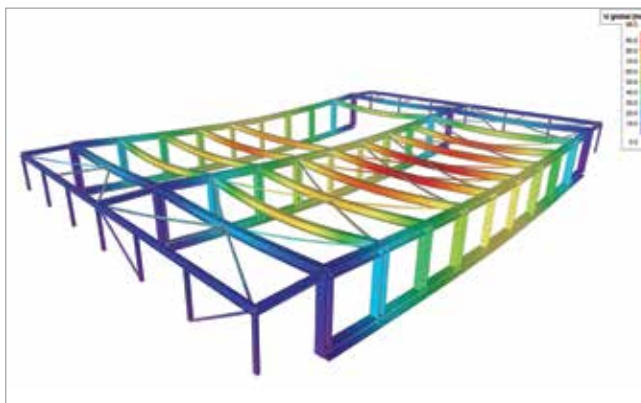
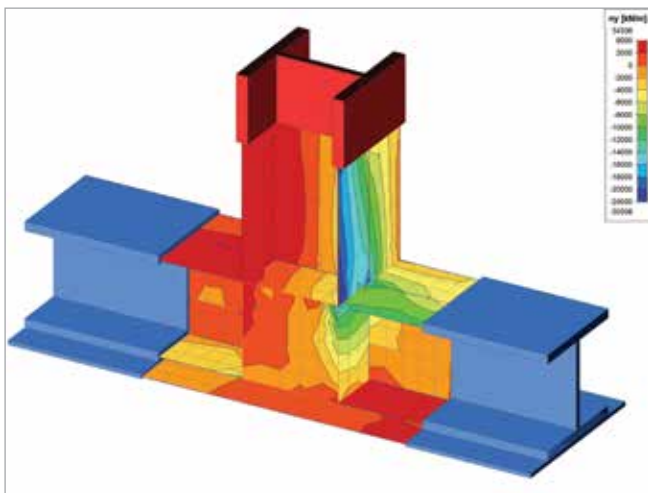
Contact *Stéphane Moran*
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1000 Brussels, Belgium
 Email *stephane.moran@moss4.be*



The design office MOSS bvba specialises in design, calculation and optimization of structural aspects of all types of construction projects: private housing, civil constructions, renovations, restorations, apartment buildings, offices and complex industrial constructions.

Our engineering office evolved within an architect studio, our engineers provide architects with proactive advice to highlight and strengthen a strong architectural concept in a coherent structure. Furthermore we analyze the structures to find the best technical solution for the best price.





Owner *Fondation Internationale De Développement Du Tir A L'arc*
 Architect *J. Pittet et B. Tardin, Architectes EPFL - SIA - FAS*
 General Contractor *FIDTA*
 Engineering Office *MP Ingénieurs Conseils SA*
 Construction Period *11/2014 - 06/2016*

Under the leadership of its former president, the FIDTA built the World Archery Centre, which includes an outdoor field of 50 x 115 m and an indoor shooting gallery of 35 x 90 m. The construction site is located in the northern part of Lausanne (Vers-chez-les-Blanc), near its headquarters. The challenge with this design was to create a free area of H. 5.00 x W. 29.80 x L. 74.50 without using any load bearing elements on the ground floor.

Both the basement and the ground floor are made of concrete. The structure of the storey has the particularity to support the roof and hold the first floor above the shooting hall. This main construction element is realized using a steel **Vierendeel girder**. The lower chord is in the plane of the floor, while the upper chord is in the plane of the roof. The raised floor is made up of a precast **cellular slab in prestressed concrete** and upper chords are connected and stabilized by ArcelorMittal Cellular Beams.

SCIA Engineer was used to create a 3D model of the steel construction as well as of the concrete walls, in order to find complex stresses and deformations. The study of the frame angle was achieved thanks to **plate modelling**. In addition, stiffeners were sized with **the steel connections pack**. The software also allowed us to model cellular beams and take into account **seismic forces**.

MP Ingénieurs Conseils SA

Contact *Patrick Besson, Cyril Chevallay*
 Address *Rue Du Centre 16*
1023 Crissier, Switzerland
 Website *www.mp-ingenieurs.ch*



Founded in 1994, our company, based in Lausanne Switzerland, operates in various domains of civil engineering. Specializing in **structural design**, we are experts in **composite steel, concrete and wood, concrete construction, cellular beams ACB, seismic design and fire engineering**. With advanced software, we are able to produce workshop drawings including site plans, construction drawings, and assembly and details with 3D rendering. Thanks to over 20 years of experience and knowledge, we can provide our clients with the most advanced solution from a technical and economical point of view, while respecting architectural constraints.

Owner R-Co Zrt.
 Architect MŰÉP Consulting Engineers Ltd.
 General Contractor STRABAG
 Engineering Office MŰÉP Consulting Engineers Ltd.
 Construction Period 05/2006 - 10/2011

KÖKI TERMINAL is a **transport hub** situated at the edge of central Budapest, a transfer point for almost 50,000 people per day, combining a transport junction and a shopping, service and leisure facility.

The **220,000 m²** total area comprises **shopping mall, offices, services, leisure facilities, bus and metro terminal, parking and P+R**. These functions resulted in huge structural diversity: complex in-situ and pre-cast reinforced concrete structures of medium and larger spans and varying headroom, closed pedestrian bridges, canopies and build-ups of steel. The complex 3D architecture and structural modelling process of **Allplan** provided **effective workflow and data exchange** for all the designers, contractors, investors and tenants.

The design process ran shortly ahead of the **strictly scheduled construction works**, changes resulting from modifications to the investment programme had to be implemented instantly into the final plans. The reinforcement drawings were, nonetheless, delivered with no errors in quantities and fit. The almost 6,800 drawings were handled in a web-based electronic database. The biggest challenges were the design of clear **multilevel pedestrian and vehicle flow paths** in harmony with adjoining functions, the **structural complexity** of the building and the tight schedule of **on-time plan deliveries**.

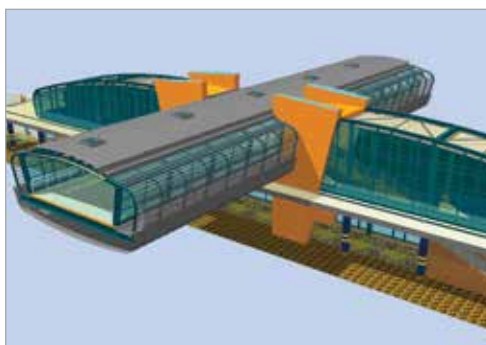
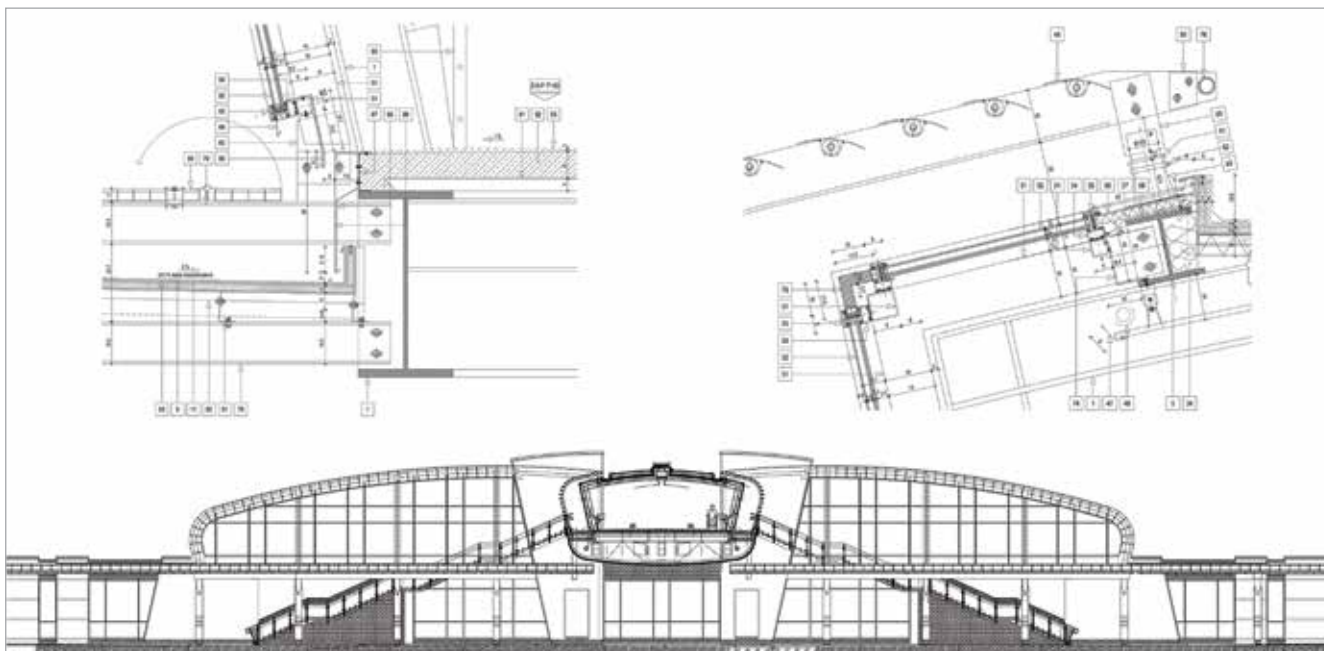
MŰÉP Consulting Engineers Ltd.

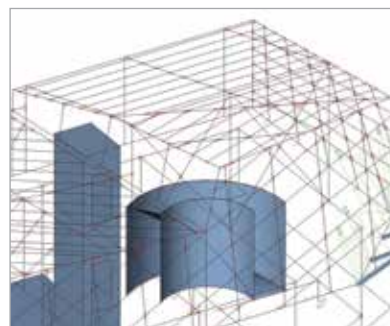
Contact László Szabó, PhD
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 H-1095 Budapest, Hungary
 Website www.mupep.hu



Founded in 1990, **MŰÉP Consulting Engineers Ltd.** is an independent architectural and engineering office providing complex services in architecture, structural and general design, designer site supervision, construction management, technical supervision, consulting and expertise.

Our projects include office buildings, commercial and service establishments, industrial buildings, public buildings, historic building refurbishments, residential buildings, petroleum industrial buildups, fuel stations, telecom stations and data centers.



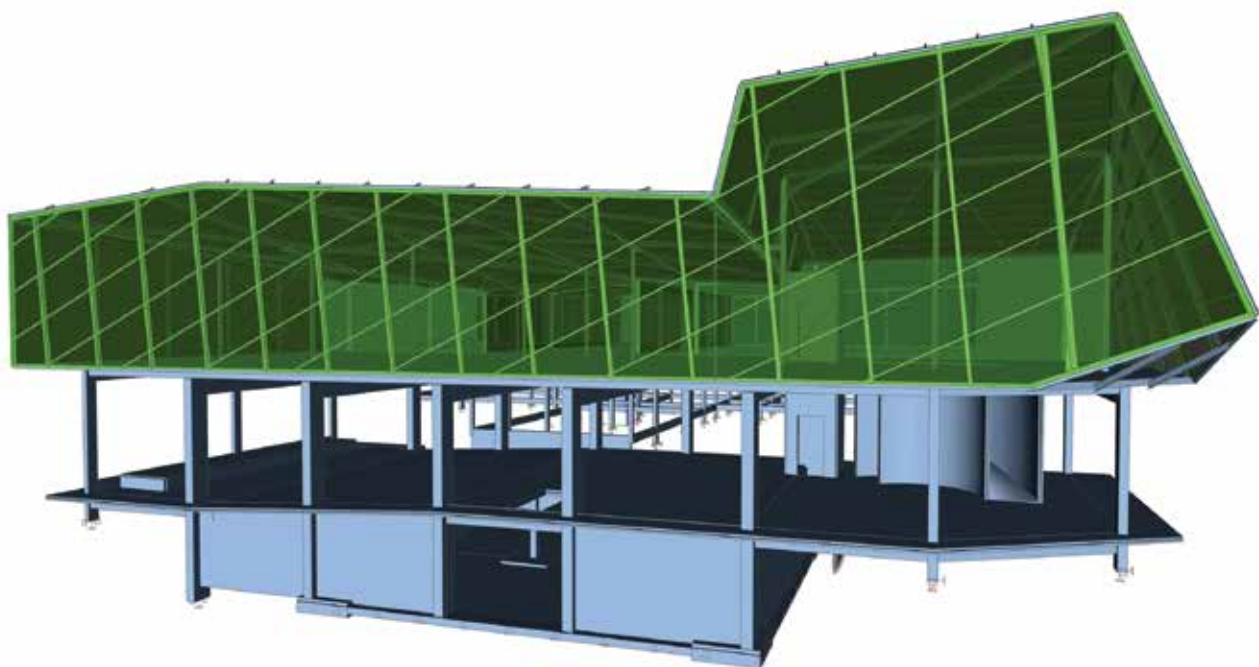


Owner *Groupe Eramet - Comilog*
 Architect *Jean Pierre Maïssa*
 General Contractor *SOCOBA - EDTPL*
 Engineering Office *OSI Gabon*
 Construction Period *03/2015 - 12/16*

In order to develop the mining sector in Gabon, the government and COMILOG Company (the Eramet Group) undertook the construction of a School of Mines and Metallurgy in Moanda in southern Gabon.

The project was entrusted to the Cabinet Architect MA.A, and includes several buildings including the administrative building, courses and amphitheatre. It is an H-shaped building with a basement and a ground floor. It is spread over a 1,000 m² floor surface area and has a structure made of steel and concrete. To highlight the many facets imposed on the shape of the roof of the building, metal framework was the preferred option for the entire floor of the building.

The main facade required the insertion of rhombic glazing. Inclining the columns of the curtain wall proved useful and ensured the harmony of the facade designed by MA.A Cabinet.



OSI Gabon

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11569 Libreville, Gabon
 Email *osi.gabon@gmail.com*



OSI is a design office established in 2005 in Cameroon. The Gabon agency was born in March 2010. The office aims to offer an efficient service specifically in the field of civil engineering, or in the computer field related to civil engineering. OSI skills are mainly based on structural design (Building and Civil Works): reinforced concrete, prestressed concrete, steel construction, wood construction ... in execution and design, new construction or renovation. The advantages of OSI are based around a team of dynamic young engineers proud to participate in the development of their country including the sub region.

Owner *Planstyle GmbH*
 Architect *Adam Architekten München*
 General Contractor *Porbat GmbH & Co. KG*
 Engineering Office *Ingenieurbüro Heubl*
 Construction Period *04/2013 - 07/2015*

The project is for a new multifunctional commercial building, which includes hotel exhibition spaces for classic cars, as well as different catering and retail spaces. These varied uses make synergy very important. The building consists of a basement (underground parking), a ground floor and four upper floors. The construction type of the building corresponds to a reinforced concrete frame. The whole construction was built without joints.

Rising costs and shorter planning times create challenges for structural engineers and structural draftsmen. We have to use all options to improve our workflows and to increase quality.

The reinforcement detailing was very difficult because of the point-supported slabs with long spans. The punching performance of the columns required large rebar diameters, which had to be anchored appropriately. With the help of the 3D reinforcement model we can guarantee a collision-free reinforcement layout.

Rather than standard solutions, we want to offer our clients something special. This requires ambition and determination, commitment and passion for the project. If you want to inspire others, you must feel confident and enthusiastic about it yourself. In spite of tight schedules, we never forget about fun and the joy of life. This is what we stand for.

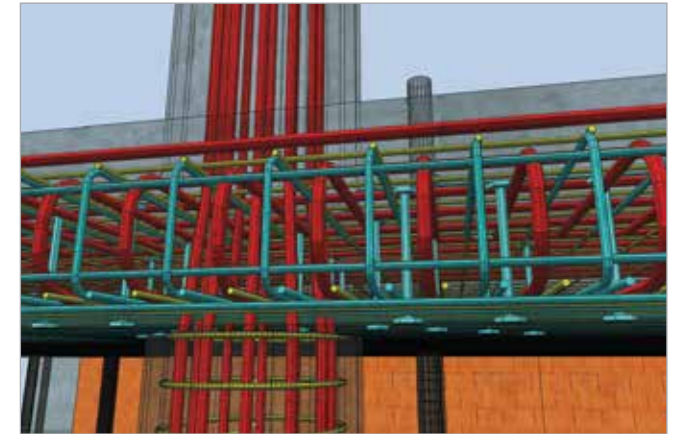
Planstyle GmbH

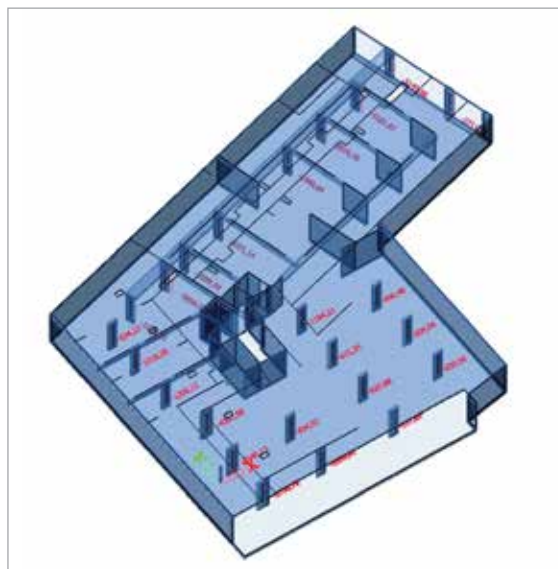
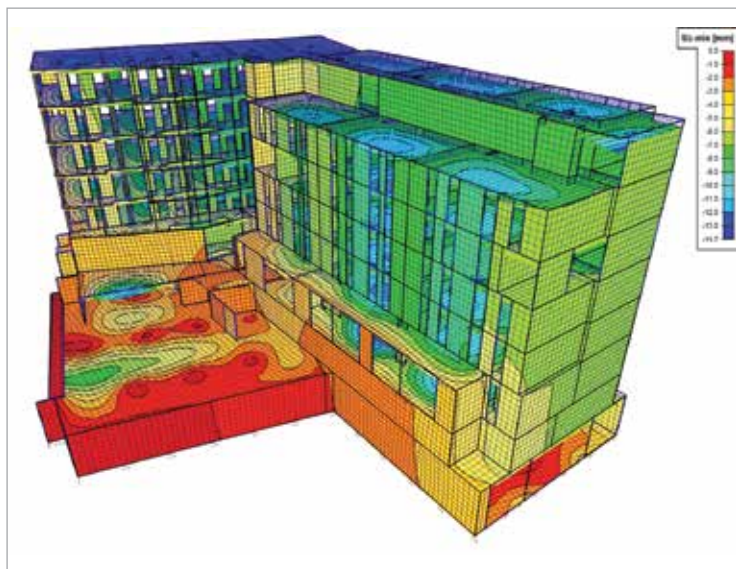
Contact *Peter Kaspar, Dietl Roland*
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86529 Schrobenhausen, Germany
 Website *www.planstyle.de*



Your partner for construction documentation.

Our objective is to create designs and construction documentation consisting of general arrangement and reinforcement drawings which are easy to understand for everybody and leave no questions unanswered! We develop a detailed 3D-model, from which we produce consistent and error-free drawings and reports. All projects are structured with the IBD content for structural and civil engineering and are built up topologically. By delivering flawless designs, we avoid delays on the building site. This not only reduces design and construction costs, it also saves valuable time.





Owner ÖSW - Österreichisches Siedlungswerk
 Architect BWM Architekten und Partner ZT GmbH,
 Albert Wimmer ZT GmbH
 General Contractor Porr Bau GmbH
 Engineering Office Porr Design & Engineering GmbH
 Construction Period 09/2016 - 09/2017

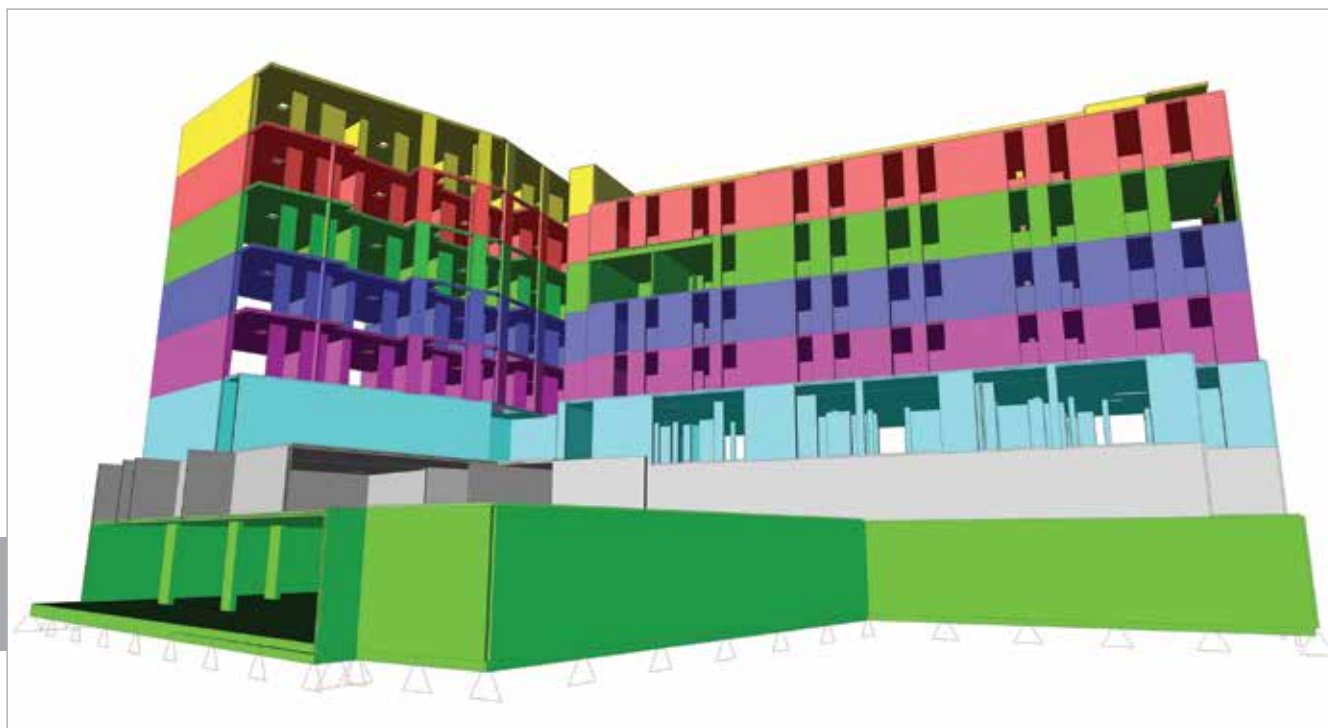
The project “Wohnhausanlage Preyersche Höfe” is located in the grounds of the former Children’s Hospital in Vienna, and will offer more public housing and living space in Vienna’s 10th district. The project consists of seven different buildings ranging from 5 to 10 floors, which are connected by a common underground parking floor. The whole building design was carried out bearing in mind the properties of reinforced concrete structures. The main reason for using SCIA Engineer was its great capabilities for 3D simulation of earthquake actions according to EC8. In addition, its user-friendly interface helped to convert the architectural plans (*.dwg) into a consistent analytical model. The 3D analytical models were used to determine the total load reactions for beams, columns, slabs and walls in the preliminary structural design stage; as well as examining the resistance behaviour against several worst case scenarios. The goal of the project was to create an accurate predesign in order to optimise the initial designs, reaching an economic solution. The 3D-analysis permitted an easy understanding of load transmission along the buildings, distinguishing the critical areas and optimising them. After this positive experience and an excellent BIM-SCIA Engineer interaction, data exchange for upcoming projects will be performed using BIM-tools integrated in SCIA Engineer.

Porr Design & Engineering GmbH

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 1100 Wien, Austria
 Email hans.humpel@porr.at



Porr Design & Engineering GmbH was founded in 2012 as a 100% part of the Porr Construction Company in Vienna. The firm’s portfolio includes general planning, project management, architecture, 3D-visualisation, static analysis, building services, sustainability – DGNB/ÖGNI-certification, construction preparation and site supervision. The majority of the projects carried out have been in Central Europe, but some have also been in South-Eastern Europe as well as in the Middle East.

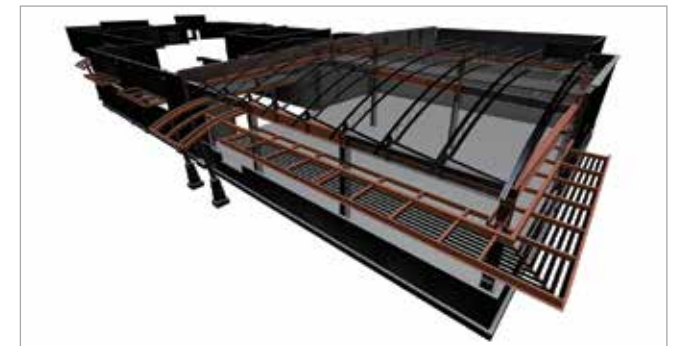
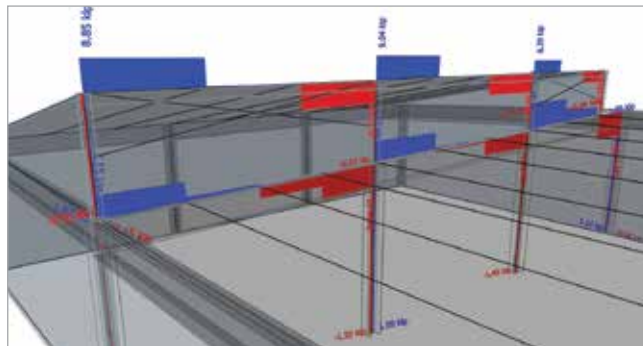
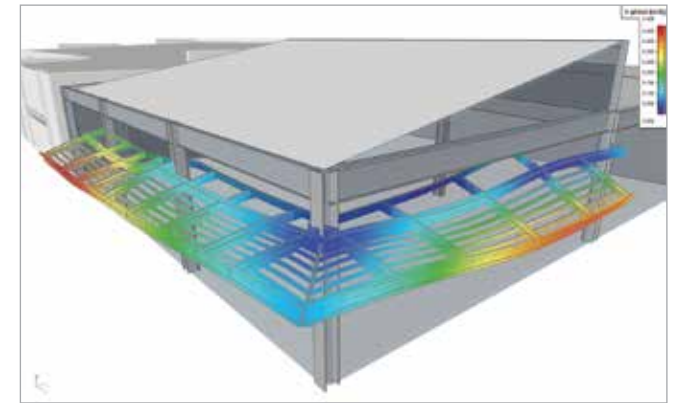
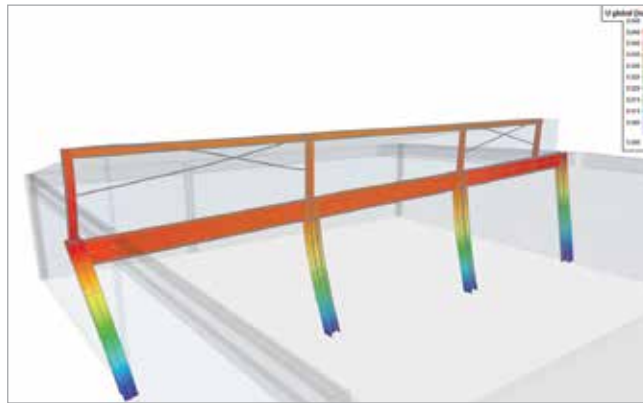


Owner The City/County of Twin Falls, Idaho
 Architect CSHQA
 Engineering Office Riverstone Structural Concepts
 Construction Period 05/2015 - 03/2016

The Magic Valley Airport Terminal Expansion and Remodel is an 8,000 ft², \$2.9 million addition to the existing Magic Valley Airport. The gravity system is steel deck over open web steel joists that are supported by steel wide flange beams. In some cases, the architecture called for the use of curved roof joists. Wide flange columns were used, which for the majority of cases doubled as the lateral resisting moment frame system.

The project utilized an OpenBIM workflow by exchanging models as IFC files. Architectural BIM models generated in Revit were exported as an IFC file to ArchiCAD where they were modified for structural use. Then the ArchiCAD file was exported via IFC to SCIA Engineer for model construction, loading and engineering analysis.

We used SCIA Engineer's 3D wind load generator to aid in the wind loading of the structure and the built-in steel deck diaphragms to accurately deliver the appropriate loads to the resisting elements. As with any self-supporting structure adjacent to an existing structure, it was required that the deflection of the new building was analyzed carefully. SCIA Engineer helped dial in on this number reducing the required gap significantly.



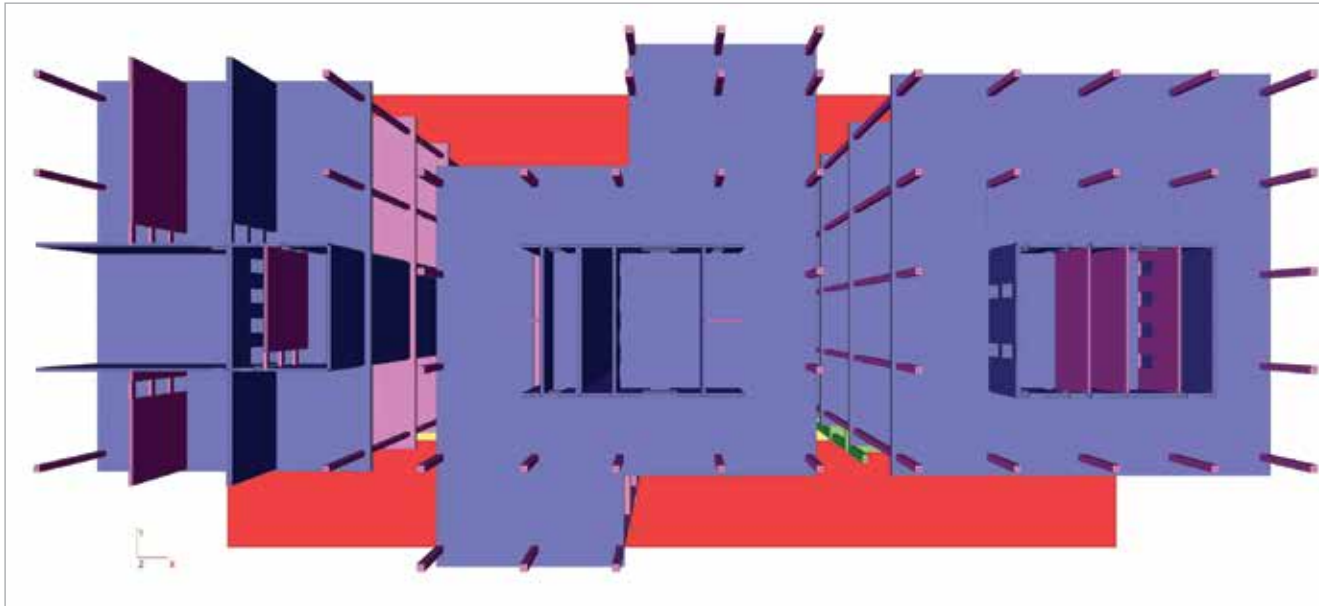
RiverStone Structural Concepts

Contact Patrick Bird
 Address 671 E. Riverpark Ln. - Suite #150
 83706 Boise, United States
 Website www.riverstonesc.com



At Riverstone, we are committed to providing our clients with unmatched customer service and high-quality drawings. Our structural engineers are creative by nature and thrive on finding effective solutions to challenging projects. We take pride in being an integral part of the design team and recognize the importance of first-rate customer service in all that we do.





Owner	De Rotterdam CV
Architect	Office of Metropolitan Architecture (OMA)
General Contractor	Strabag Züblin
Engineering Office	Royal HaskoningDHV
Construction Period	2009 - 2013

The high rise project De Rotterdam is being described as a vertical city. With three 150 m high towers, including residential, commercial, hotel and parking facilities, the building is a giant that has no equal in the Netherlands. Special design features include the large cantilevers at the midpoint of the building height and the settlements due to the clay layer present below the sandlayer which is the base of the pile foundation.

SCIA Engineer was used to investigate the soil-structure interaction and investigate deformations of soil and structures from the earlier stages of construction until 30 years after completion. Measures against excessive settlements, like using hydraulic jacks to shorten or lengthen columns, have been analyzed using SCIA Engineer.

The results from SCIA Engineer were key to discussions on the topic of settlements with all the stakeholders, including the client, subcontractors for finishing, the main contractor and the municipality. Actual measurements so far show that the predictions were accurate. SCIA Engineers ability to handle large amounts of data enabled us to model with a minimum amount of simplifications, and the wide range of options to, for example, include the effects of hydraulic jacks in the buildings were a key success factor in this project.

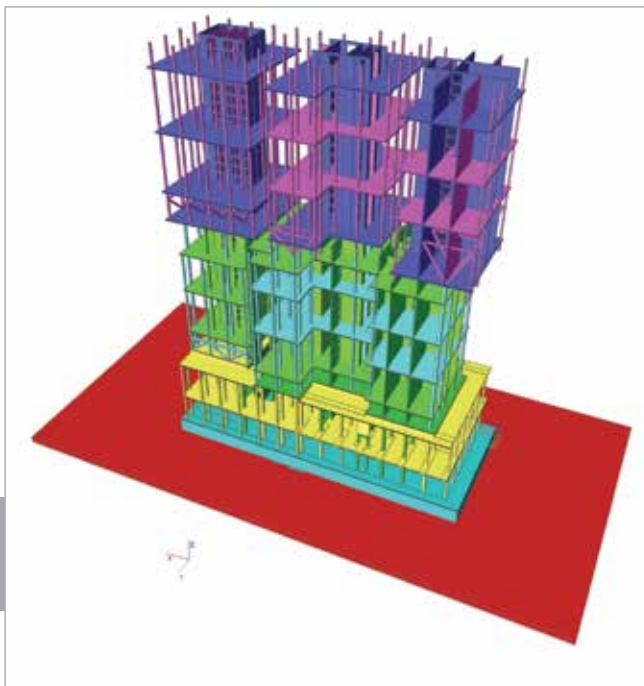


Image courtesy of OMA; photography by Ossip van Duivenbode

Royal HaskoningDHV

Contact	Dennis Snijders, Jan Font Freide
Address	George Hintzenweg 85 3068 AX Rotterdam, The Netherlands
Website	www.royalhaskoningdhv.com



Royal HaskoningDHV is an independent, international engineering and project management consultancy with over 130 years of experience. Our professionals deliver their services in the fields of asset management, aviation, buildings, energy, industry, infrastructure, maritime, mining, strategy, transport, urban and rural planning, water management and water technology.

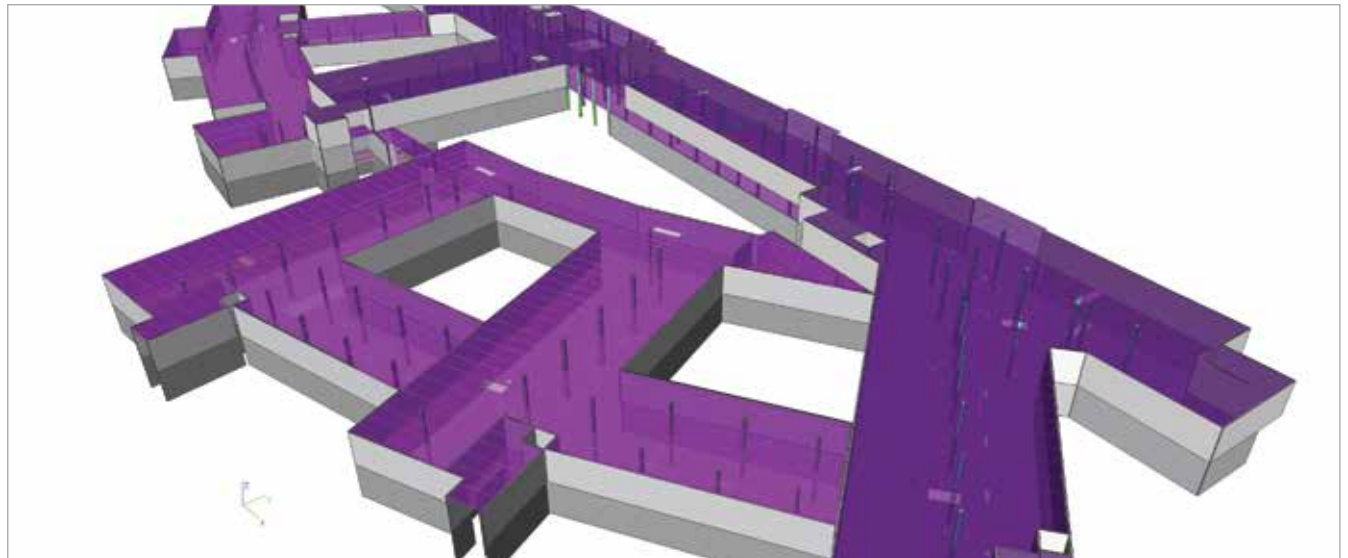
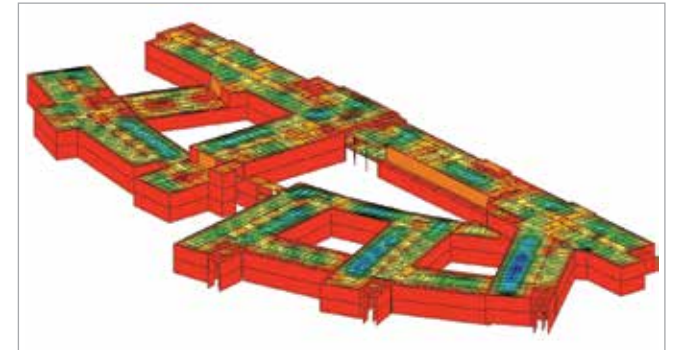
Backed by the expertise and experience of our 7,000 colleagues all over the world, our professionals provide their services locally to public and private clients from 100 offices in 35 countries.

Owner Cardiff and Vale University Board
 Architect Powell Dobson Architects
 General Contractor Laing O'Rourke
 Engineering Office RVW Consulting
 Construction Period 11/2012 - 01/2014

Llandough AMHU was a £65 m, 138 bed mental health unit. It was the first BIM level 2 scheme in Wales and formed the basis of a BIM presentation to the Welsh government by our team of "leading industry experts" and we offered "an insight into the process via a 'live' case study of BIM in practice". BREEAM very good was achieved by the design team.

The structure adopts the use of precast columns, precast walls (sandwich panels) and precast lattice floor slabs. SCIA Engineer was used to model each individual lattice plank to accurately determine the location and quantity of splice reinforcement between the precast planks as well as determining the bottom steel in every individual plank. A mixture of free and flexible hinges was used to model closely the real world effects of spliced and non-spliced joints. This enabled additional splice bars to be used where deflection was perceived to be high.

Each of the 1,500 lattice planks had to be individually modelled several times to produce the most efficient layout. Consideration also had to be made to the manufacturing constraints and optimising efficiency in the manufacturing process was key to achieving the delivery program whilst also bearing in mind delivery constraints of the lattice planks to site.



RVW Consulting Ltd

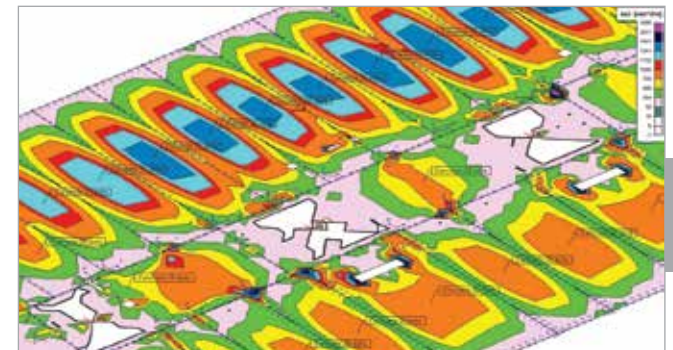
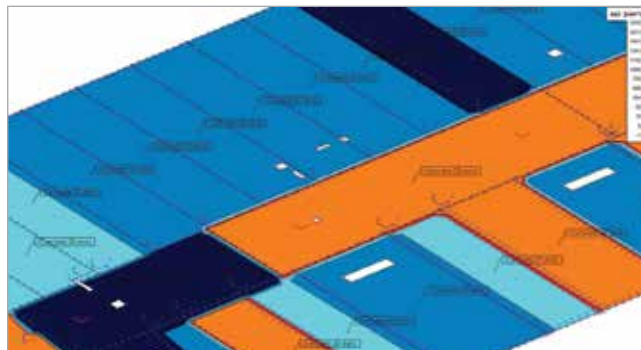
Contact Daniel James
 Address 6 Neptune Court, Vanguard Way
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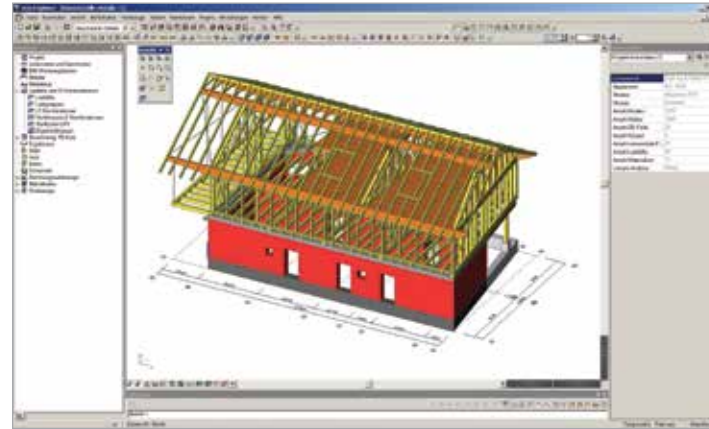


Established in 1989 RVW Consulting offers consulting services in civil, structural, geo-technical and geo-environmental engineering.

Our reputation is built on delivering economic designs, efficiently providing our clients with an end-to-end service from planning, through detail design, to construction and fit out.

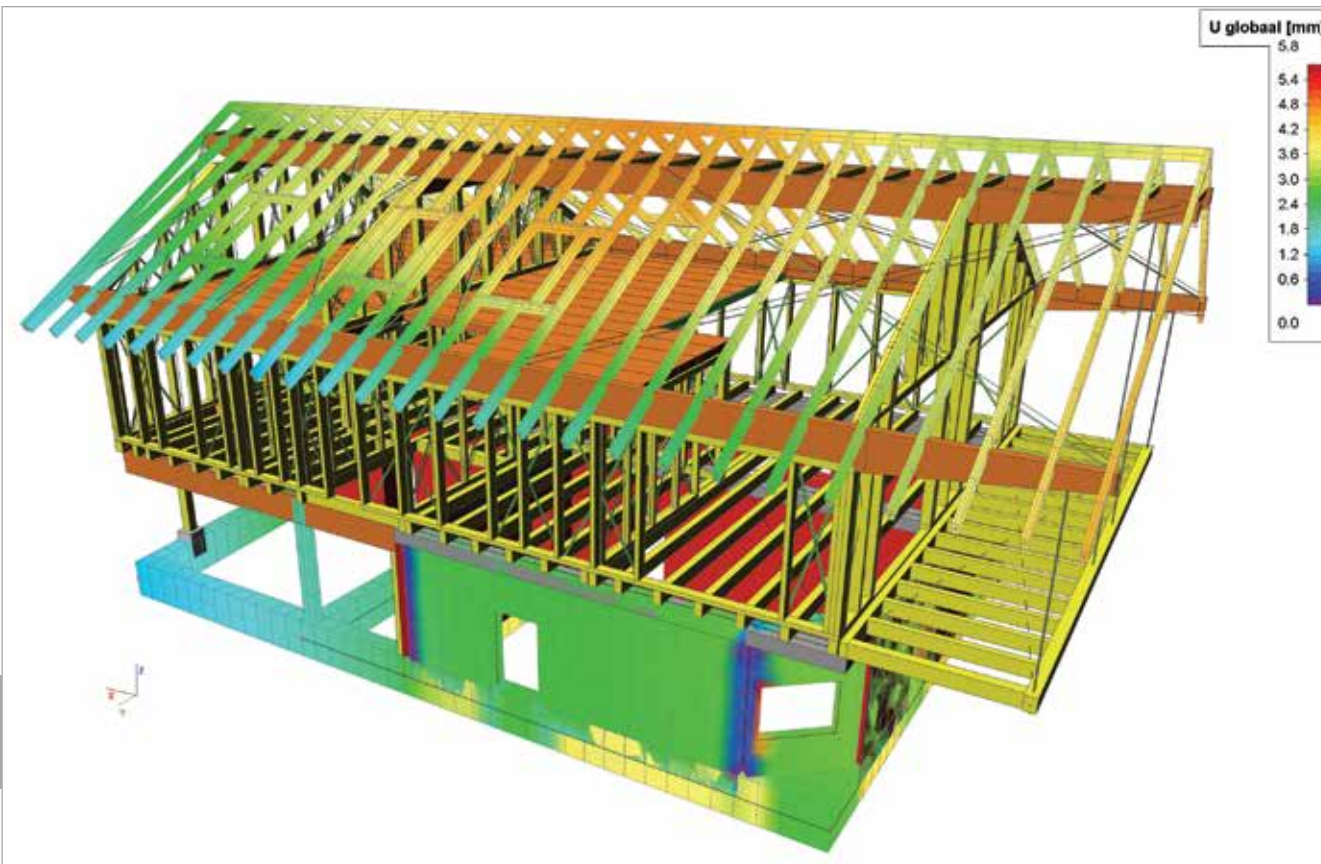
Our culture is built on integrity, we place a high value on the partnerships and long-term relationships with clients and fellow professionals.





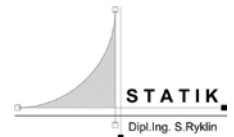
Owner Fam. Cuntz, Kapellen
 Architect Roemhild + Hecker Landau
 General Contractor Wissing GmbH Kapellen
 Engineering Office Ryklin STATIK
 Construction Period 04/2012 - 10/2012

The old family wooden barn had not been used for a long time and could not be used again due to its old age. The ground floor, however, consists of good, thick, well-preserved stone walls with deep foundations. **The owner's idea was to remodel the old barn into a residential property using the ground floor, keeping the wooden design.** After the old wooden barn structure was removed, the remaining walls were measured in detail and inspected for flaws. **The concept of the new building was developed** according to the owner's wishes in SCIA Engineer with Structure-, 3D-Free-Modelling- and Drawing tools, with all details presented and confirmed directly in the 3D-model. The calculations were processed in SCIA Engineer according to 2nd order theory. The results of the calculations provided feedback about any improvements required to the ground floor parts and possible optimization of the new structure. The production company was included in the planning process at the early stage too, so the execution has run without problems. **All the overviews, elevation, execution and detail drawings were processed and created in SCIA Engineer with appropriate modelling and drawing tools.** Production and execution of the building has been done by the company Wissing in Kapellen with casual engineering supervision. Any required improvements and the preparation of the ground floor structure were agreed with the owner.



Ryklin STATIK

Contact Sergej Ryklin
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 69123 Heidelberg, Germany
 Website www.ryklin.eu



Planning and optimization of **steel, aluminium, solid, composite, timber and membrane structures.**

More than 1,000 different projects processed including residential and industrial buildings, car park decks, pedestrian bridges, swimming pools, silos and membrane coverings for Daimler, John Deere, SAP, DB, Siemens, Henkel, BASF, Bridgestone, Roche, IKEA and a lot of private clients. The philosophy of the Company is to offer **flexibility in planning due to integral 3D-Design** with the ability to find feasible and low-cost solutions starting at draft stage.

Owner *Manhattan Loft Corporation*
 Architect *SOM*
 General Contractor *Bouygues UK*
 Engineering Office *SOM*
 Construction Period *02/2015 - 02/2017*

Manhattan Loft Gardens is located in Stratford Town Centre, London, adjacent to Stratford International Train Station. The project consists of a 42 storey tower and seven story hotel podium, with a part single storey basement. The roof of the hotel will form an outdoor amenity and recreation space.

The residential tower measures 30 m by 30 m and will project above the eastern half of the hotel structure. The massing of the tower is characterised by several diagonal **three storey high notches** that run diagonally from corner to corner across the square plan, and through which the typical tower columns are transferred out. The entire podium structure and the basement slab were modelled employing SCIA Engineer. Ground beams, isolated pile caps and piles were modelled as 2D Beam elements and were attached directly to a FE Model of the hotel podium, using SCIA Engineer.

The most challenging aspects of this project, from a design point of view, are the transfer areas at Level 10 and 28 above the notches. These are formed by 10 m long post-tensioned concrete cantilever walls that reach out from the building's core to support the perimeter steel belt trusses. These are the principal architectural and structural features, and will make this building a unique and intriguing project in the London market, an example of the powerful combination of integrated architecture and engineering, one of SOM's core values.

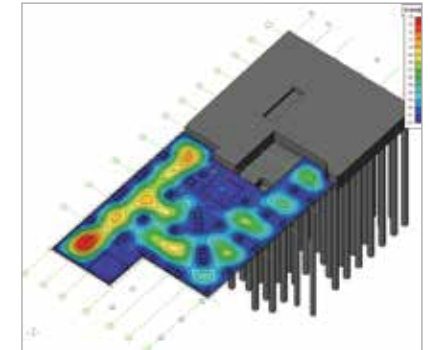
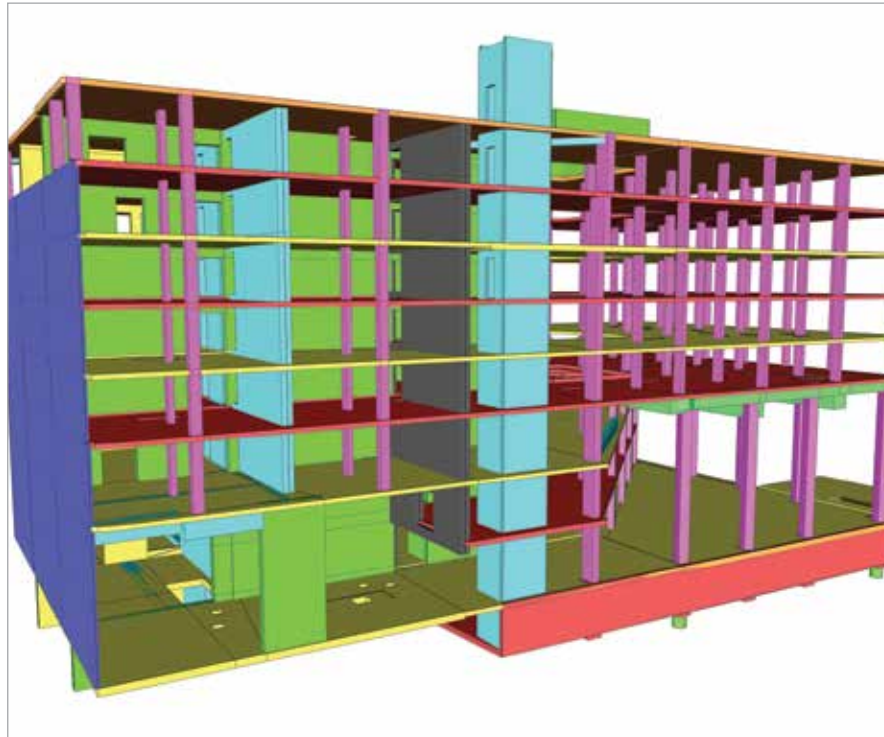
Skidmore, Owings & Merrill LLP

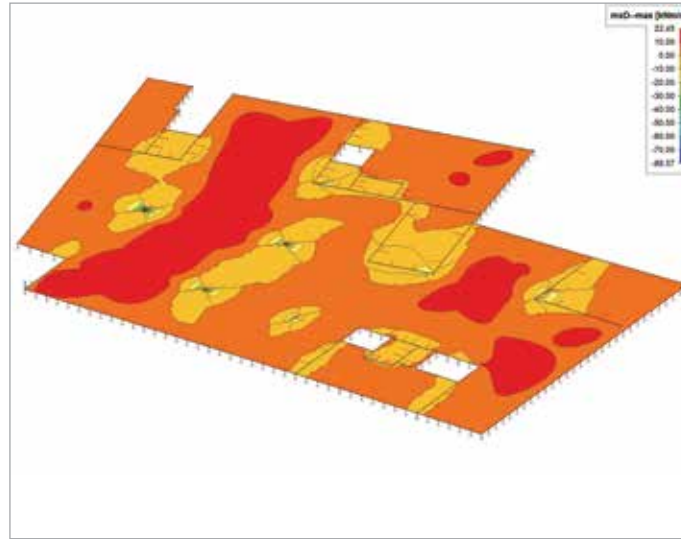
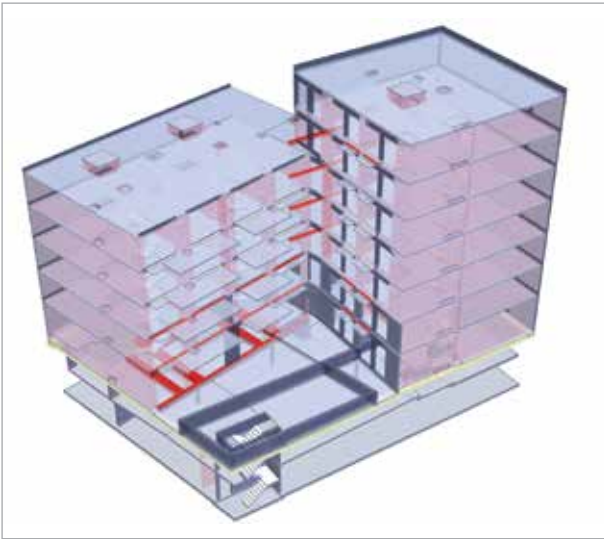
Contact *Stuart Marsh*
 Address *The Broadgate Tower, 20 Primrose Street*
EC2A 2EW London, United Kingdom
 Website *www.som.com*

SOM

Skidmore, Owings & Merrill (SOM) is one of the leading architecture, interior design, engineering, and urban planning firms in the world, with a 75-year reputation for design excellence and a portfolio that includes some of the most important architectural accomplishments of the 20th and 21st centuries.

SOM's longstanding leadership in design and building technology has been honoured with more than 1,700 international awards, with the practice twice having been named 'Firm of the Year' by the American Institute of Architects.





Owner DCA nv
 Architect m² architecten bvba
 General Contractor DCA nv
 Engineering Office Studie10 Ingenieursbureau bvba
 Construction Period 01/2015 - 01/2016

The project is situated on Tabaksvest in the city of Antwerp. On the site several existing buildings were demolished to make space for a new residential building containing 35 apartments and 3 commercial stores spread over 7 floor levels. A two-level parking basement provides 33 parking spaces. Due to the fact that the building is situated in between other existing buildings, the basement design was particularly complex.

SCIA Engineer was used to calculate all the structural elements (floor slabs, concrete and steel beams, concrete walls and columns and the foundation).

The entire building was then modelled in 3D using Allplan. This design process exposed conflicts between architectural and structural design early in the project. After making the necessary adaptations to both structure and architecture the rebar reinforcements were modelled using Allplan's Engineering module.

As a result of the sloped floor slabs and the more complex geometry of the basement we were dependant on an effective CAD program to create a correct set of plans and rebar documents. Allplan Engineering fulfilled this requirement.

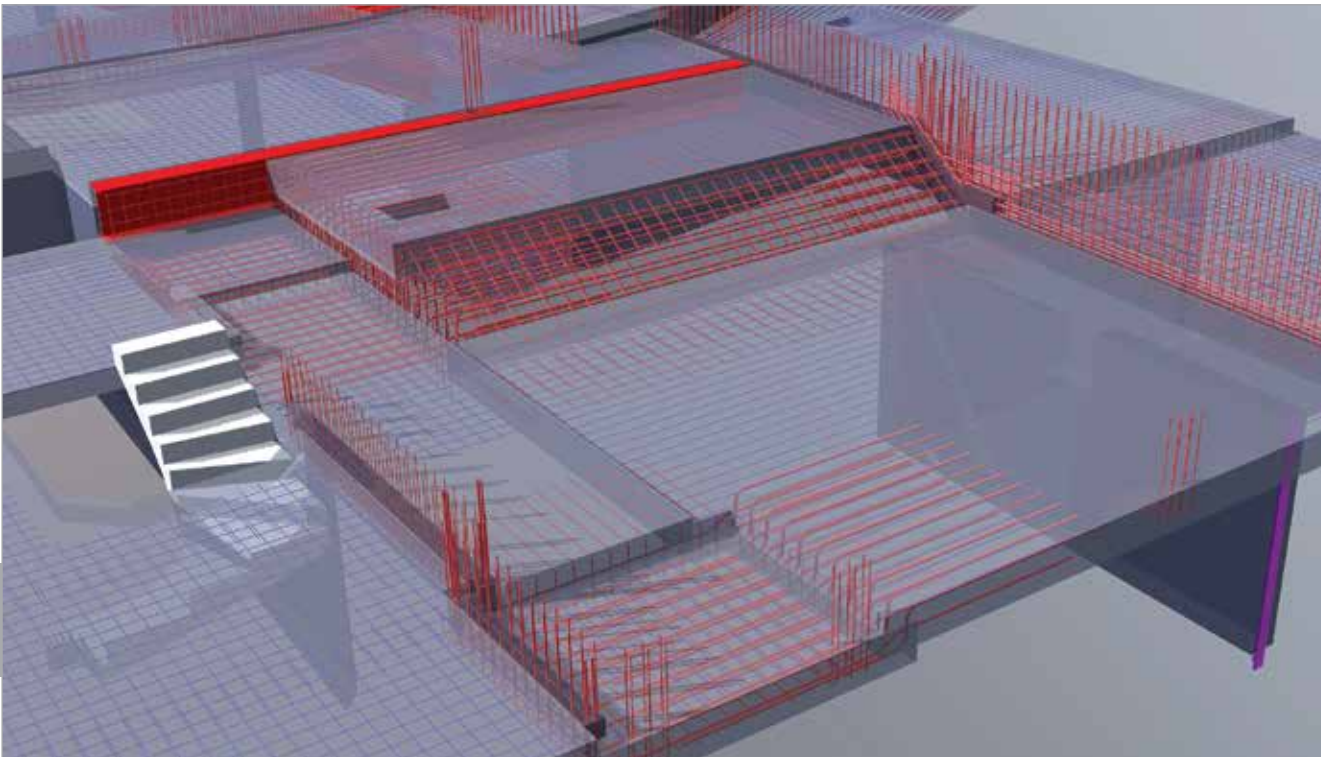
Studie10 ingenieursbureau bvba

Contact Bart Bruyns
 Address Mechelsesteenweg 193
 2500 Lier, Belgium
 Website www.studie10.be



Studie10 profiles itself as a dynamic engineering office in the construction industry with specialized services in the area of:

- Structural engineering: design of foundations, retaining walls and steel, concrete and wood constructions.
- Building services engineering: design of HVAC, sanitary, fire suppression and electrical installations.
- Infrastructural engineering: infrastructure for industrial sites.
- Safety engineering: safety co-ordination of the project.
- Energy engineering: advice on energy minimisation.



Owner *cvba Waalse Krook*
 Architect *RCR Aranda Pigem Vilalta Arquitectes +
 Coussée & Goris architecten*
 General Contractor *Antwerpse Bouwwerken + Valens*
 Engineering Office *Studieburo Mouton*
 Construction Period *09/2013 - 06/2016*

The stacked floors of the new library in Ghent follow the 'Krook' (curve) of the adjacent river Muinkschelde. The building's **steel portal frames** are positioned 320 cm apart and fan out in the curves. These strongly **influenced the architectural design**. The characteristic columns and beams are welded box sections with recessed flanges. The columns and beams are not treated with fire-resistant paint, in order to preserve the desired natural aspect of the steel. The inner space of the elements is filled with concrete, the cooling effect of which ensures a fire resistance of 45 minutes. The building's crown is **an impressive 15.5 m cantilevered** floor on the southern side above the entrance. The cantilever is made possible by three storey-high frames, which are a mixture of truss and Vierendeel girder. Horizontal stability is ensured by concrete floors and stair-cores of fair-faced concrete. The floors act as assisting compression slab for the steel beams.

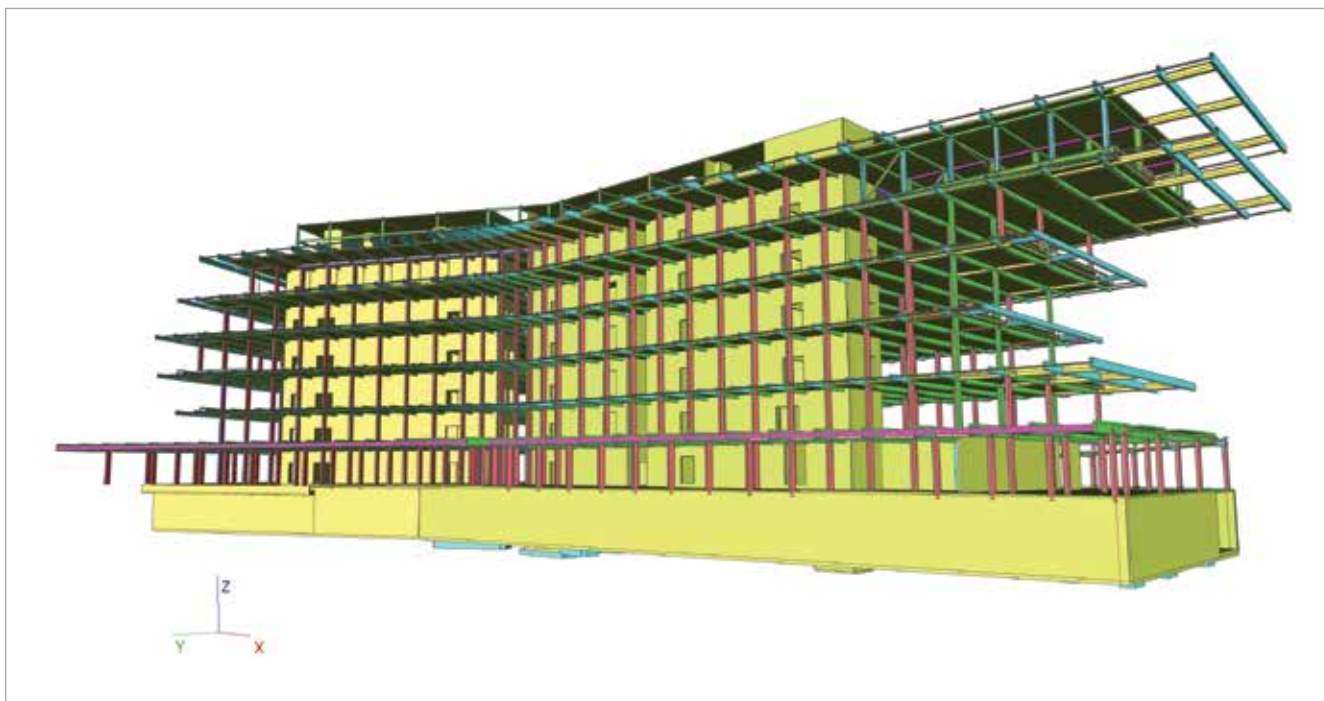
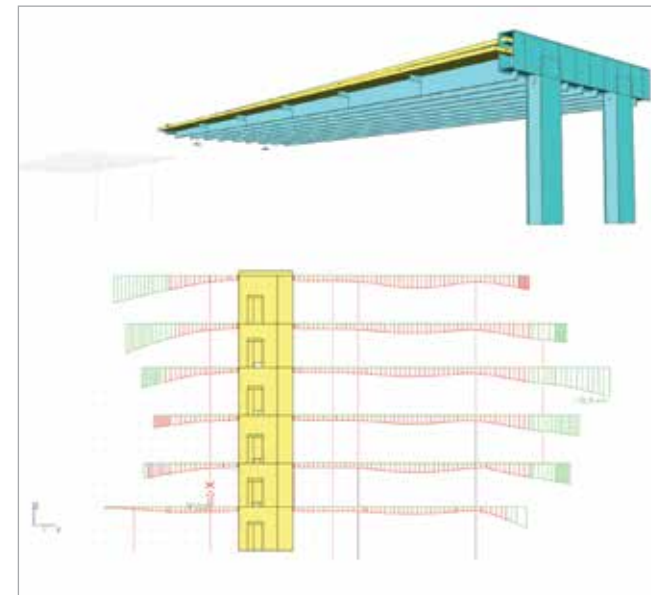
Two **bridges** will connect the raised square to the other side of the river. Both bridges are welded steel structures. SCIA Engineer was used for both the building (**global model**, extraction and processing of calculation results) and the bridges (dynamic analysis in function of comfort and a second-order calculation regarding buckling sensitivity).

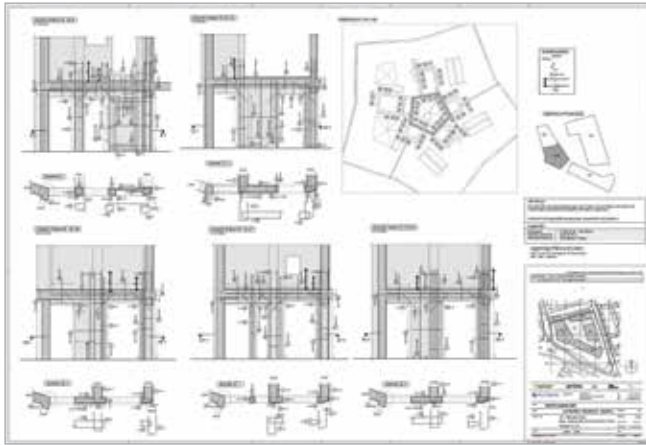
Studieburo Mouton bvba

Contact *Guy Mouton*
 Address *Koningin Astridlaan 225
 9000 Ghent, Belgium*
 Website *www.studieburomouton.be*

studieburomouton bvba

Studieburo Mouton is a **structural design office** that has acquired a special position within the Flemish architectural landscape. The office is ready to be involved in the architect's very earliest design stage. Its aim is to provide a stability study in which the interaction with the architect strengthens the design. Its main endeavour is to arrive together with the designers at **an intrinsically superior design process and structure**. Mouton envisages a powerfully expressed consolidation among partners that creates a superior final project.





Owner *Halter Entwicklungen*
 Architect *hbf huggenbergerries, Architekten AG ETH SIA BSA*
 General Contractor *Priora Generalunternehmer AG*
 Engineering Office *SYNAXIS AG Zürich*
 Construction Period *2013 - 2019*

The valley of the river Limmat (Limmattal) has a new skyscraper. By the end of January 2015 the Limmat Tower reached its final height of 80 m, ready to become the focal landmark of Dietikon or even the whole area.

The Limmat Tower is a massive skeleton construction. The bearing structure was built out of concrete columns placed along the facade and in the centre. The inner core and the flat slabs are also made of concrete. The 28 storey building stands on combined pile cap foundation. Two things were very unusual in this project: no perpendicular corners and very challenging details, with couplers in the core walls.

After modelling the whole building, the detail drawings were derived very efficiently, one storey after the other, in accordance with office and Swiss drawing standards. The model was further used in collaboration with the architect (3D PDF) and to extract quantities for tendering. The 3D reinforcement was drawn as easily as sketching it in 2D and the bending schedules were derived automatically. Karl-Heinz Hamel was the leading designer on the projects and concludes: "We can't imagine working without 3D on our projects. We model even simple projects in 3D because it definitely saves time."

Synaxis AG Zürich

Contact *Thomas Lüthi,*
Carlo Bianci (CEO, PM)
 Address *Thurgauerstrasse 56*
8050 Zürich, Switzerland
 Website *www.synaxis.ch*



"Synaxis" is Greek and means: connecting/combining. This is the central aspect of our daily planning and detailing work with and for our customers and partners. Our company's history dates back to 1928 and after various name and owner changes, three partner offices were established in 1998, in Zürich, Altdorf and Lausanne. In 2007 the group-name 'Synaxis' was established. We provide planning, detailing and management services for erecting buildings and infrastructure constructions and expert knowledge in how to maintain them.

Owner *Land Securities*
 Architect *Robin Partington Architects*
 General Contractor *To be confirmed*
 Engineering Office *Waterman Group, London*

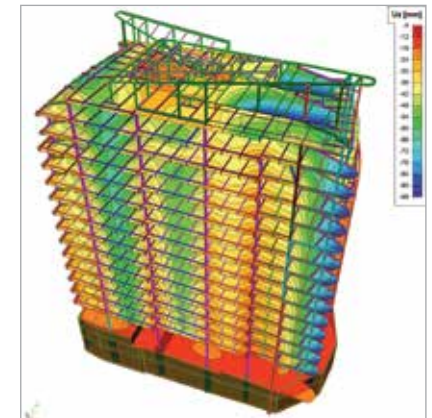
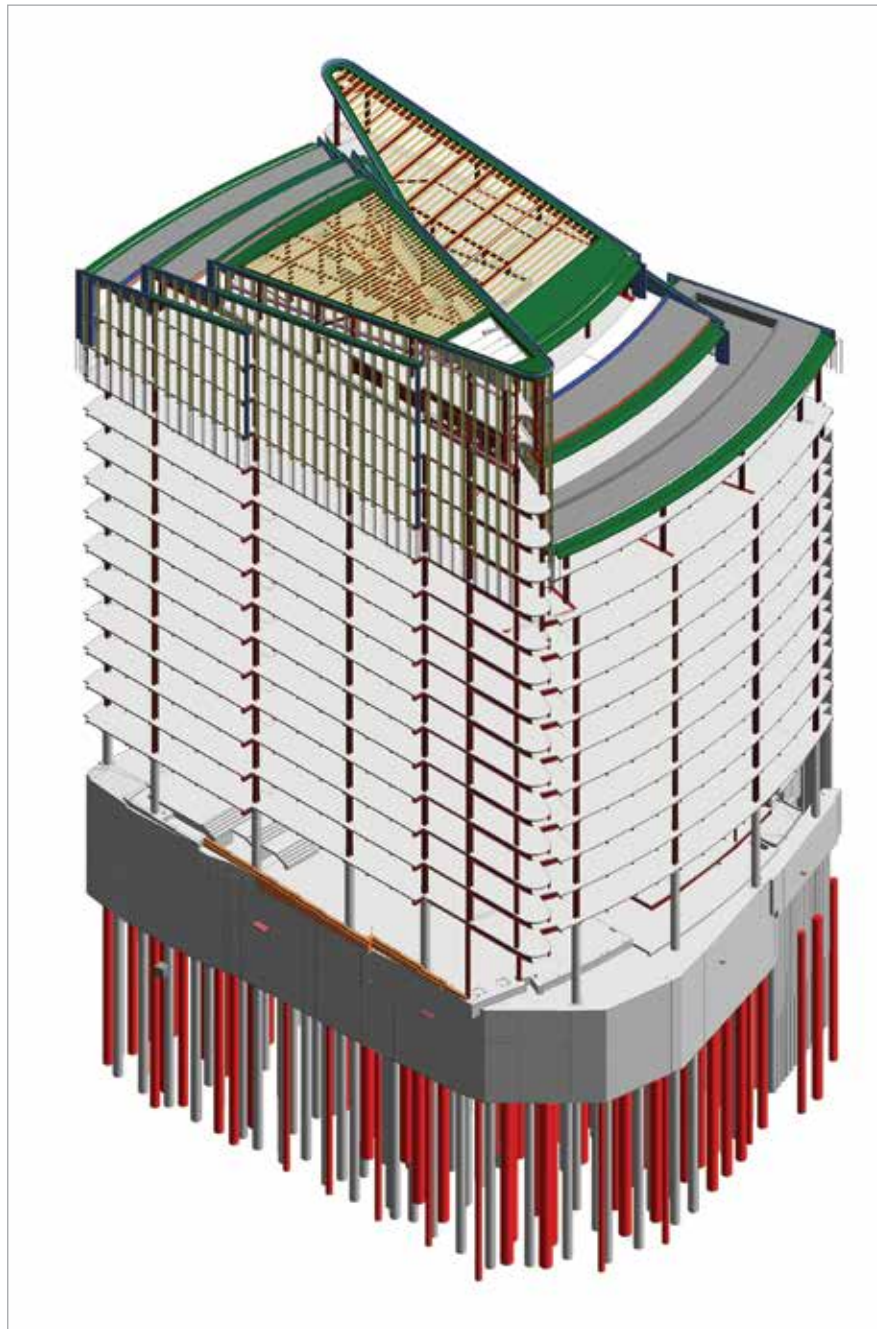
1 New Street Square is a development that will build upon the success of Land Securities' New Street Square scheme. The floor plates offer flexibility and enables panoramic views to be enjoyed. To optimise awareness floor to ceiling glazing is combined with solar shading to reduce solar gain in an effective cladding system. The arrangement of a centre core with perimeter columns is very efficient, with a floor plate providing circa 20,000 sq. ft. of office floor space. Efficiency of the clear spans from the central core to the perimeter, the height constraints imposed when working within St Paul's viewing corridors and the stepping back of the upper levels contributed to the selection of the steel structure. The global analysis was done using SCIA Engineer. The detailed design was done using the design modules and the substructure elements and the four lower levels were designed using the concrete design module. The entrance was moved to beneath the south east nose of the building and introduced a cantilevered structure. Columns that were supporting the nose of the building could not be taken to the foundations so a hung structure was introduced. A cantilevered plate girder was used at the plant room level with a 7.5 m cantilever and a 20 m back span. Structurally the design has to control deflection of the structure to avoid any impact on the cladding system such that the cladding is consistent around the whole building perimeter and no larger movement joints or special gaskets are required.

Waterman Group

Contact *Craig Beresford*
 Address *Pickfords Wharf, Clink Street*
London SE1 9DG, United Kingdom
 Website *www.watermangroup.com*



Waterman Group is a multidisciplinary consultancy providing sustainable solutions to meet the planning, engineering design and project delivery needs of the property, infrastructure, environment and energy markets worldwide. Award winning teams provide professional services throughout the complete life cycle of the asset starting from initial surveys and concept planning, through to design, delivery, project management, supervision and on-going maintenance. Our philosophy is to work closely with the client and other team members to develop the most creative, high-quality engineering solution, on time and within the specified budget.

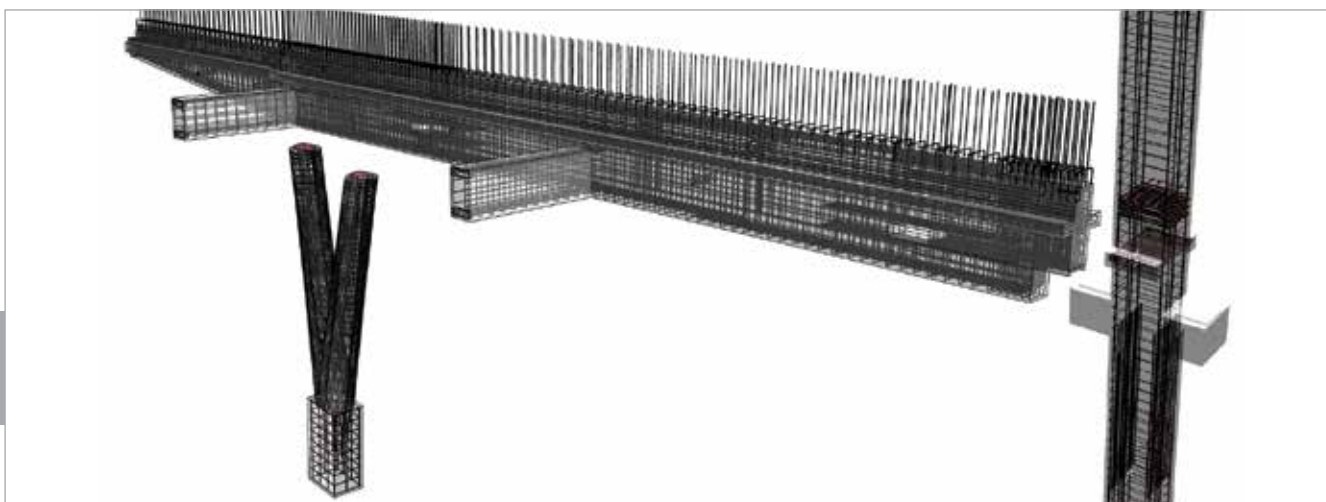
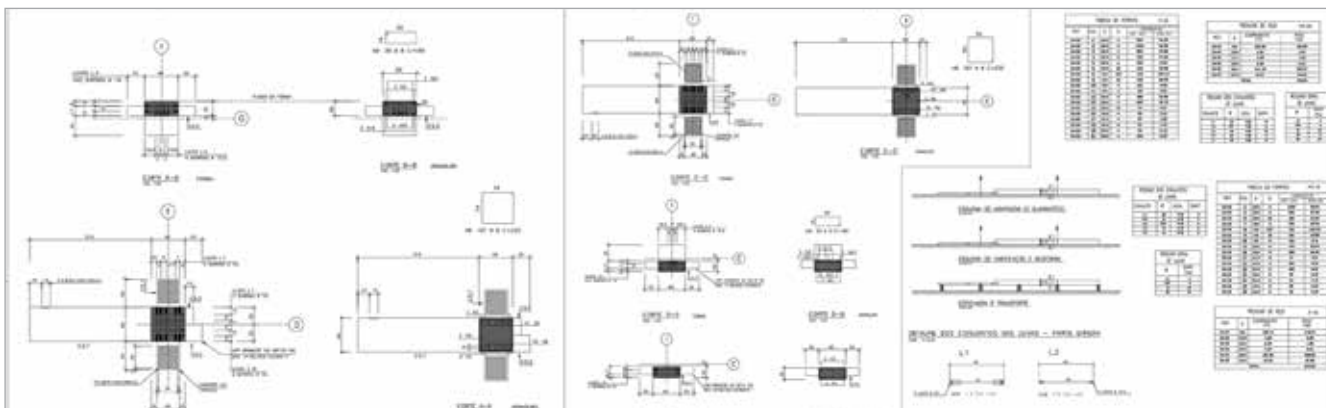




Owner *INFRAERO - (Airport Infrastructure Company)*
 Architect *Bacco Arquitetos Associados*
 General Contractor *Camargo Corrêa, Mendes Junior, Estacon*
 Engineering Office *Zamarion e Millen Consultores*
 Construction Period *12/2014 - 01/2018*

The passenger terminal for **Vitoria's new airport in Espírito Santo, Brazil**, is being built in two similar stages. It has an area of about 37,000 m², **planned with three structural systems** (steel, concrete in situ and precast structure). We were responsible for designing the **foundations**, for the **precast concrete** structure and for the **connections** between these structural systems.

We drew up the first phase in CAD (2D) and the other in Allplan with Nemetschek consultancy. Using **Allplan** we detailed the foundation elements, generating a detailed drawing from the structure modelling. Moreover, we developed an **optimized workflow for detailing precast elements**, generating the structure using **Smart Symbols 3D** of our library of drawing elements. We input into Smart Symbols all the necessary information for management, planning, budget and execution of the project. We were pleased to **surpass customer expectations** (reduced cost and execution time) changing the basic design (concrete in situ) to precast structure despite the bold shape, large span (22 m), cantilever (7 m), low structural height (1.55 m) and high soil deformation along time. We were also pleased that after completing the two phases we concluded that despite the fact that Allplan deadline was not reduced, we had an **optimized product**, no errors, **improved precision** and also the **integration of information (BIM)**.



Zamarion e Millen Consultores S/S Ltda

Contact *José Carlos do Amaral*
 Address *Manuel da Nóbrega, 760*
Paraíso, São Paulo, Brazil
CEP:04001-002
 Website *www.zamarionemillen.com.br*



Zamarion e Millen Consultores is a civil engineering company specialized in **structural design and consultancy**. It has been operating for 34 years with strong ethics, competence and professionalism. It took part in several important works for Brazilian progress and development (airports, quays, shipyards, stadiums, subways, shopping malls and schools). It values the commitment with **quality and excellence in service**, teamwork, its employees and the **continuous improvement of knowledge** through participation in courses, seminars and technical standards committees.

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Any type of structure that fits within civil engineering, for which SCIA Engineer and/or Allplan Engineering software has been used. It regards structures including each type of bridge (beam, arch, cable-stayed, suspension bridge...), tunnels, bulkheads, locks, dams, in short general infrastructure...

Civil Structures

2

Winner Category 2

Quote of the Jury: "The architectural design of this pedestrian bridge is excellently supported by the structural solutions. The irregular shape of the structure and the combination of different materials - wood, concrete and steel - provide an eye-catching and unique artwork."



Owner *Maritieme Dienstverlening en Kust - Afdeling kust*
 Architect *West8*
 General Contractor *Westconstruct*
 Engineering Office *BAS bvba*
 Construction Period *02/2013 - 05/2014*

The pedestrian bridge is located on the Belgian coast, connecting the village with the beach and crossing both the coastal road and a double tram line. The primary structure consists of two irregular timber warren trusses supported by reinforced concrete portal frames. The trusses are 'meccano'-like, assembled in different layers which create visual interest architecturally. These layers also create great eccentricities which form important secondary moments in transversal direction. The top and bottom chords are built-up beams, held together by packers which provide sufficient lateral stability. On each concrete portal there is a steel frame in between the wooden members which provides overall lateral stability. The structure, however, is not entirely three-dimensional. The difficult geometry and eccentricities of the structure require visual and analytical high performance software. This software makes it possible to analyze and interpret the secondary effects, and allows for a link between 2-dimensional models and hand calculations.

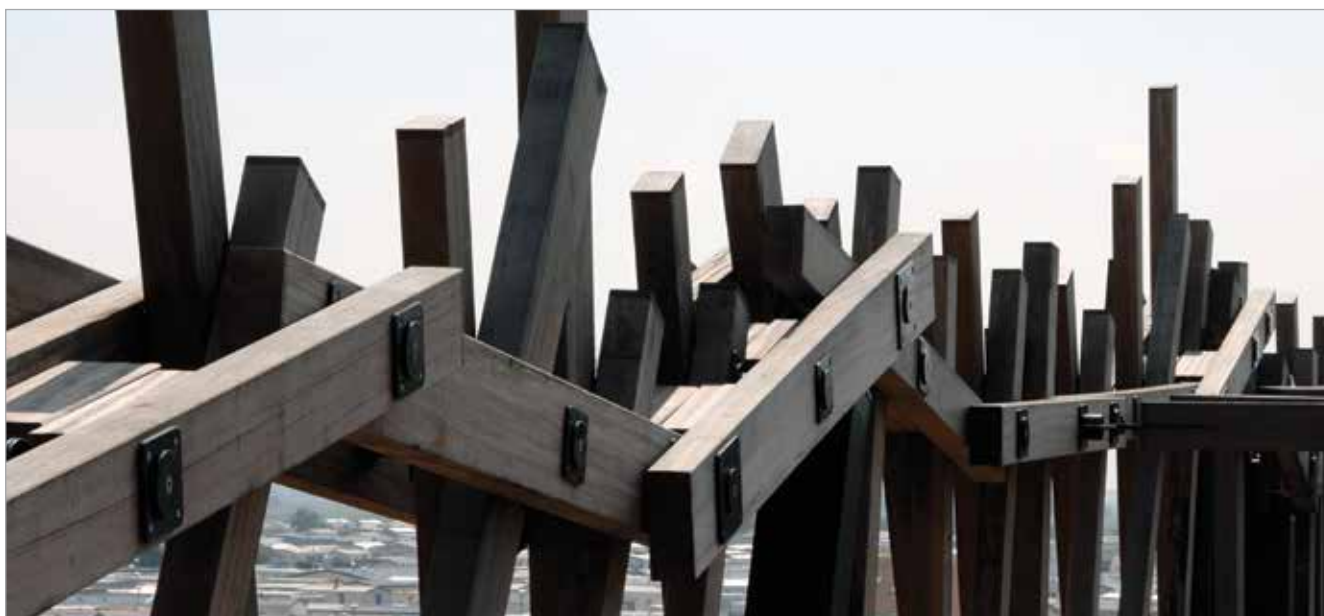
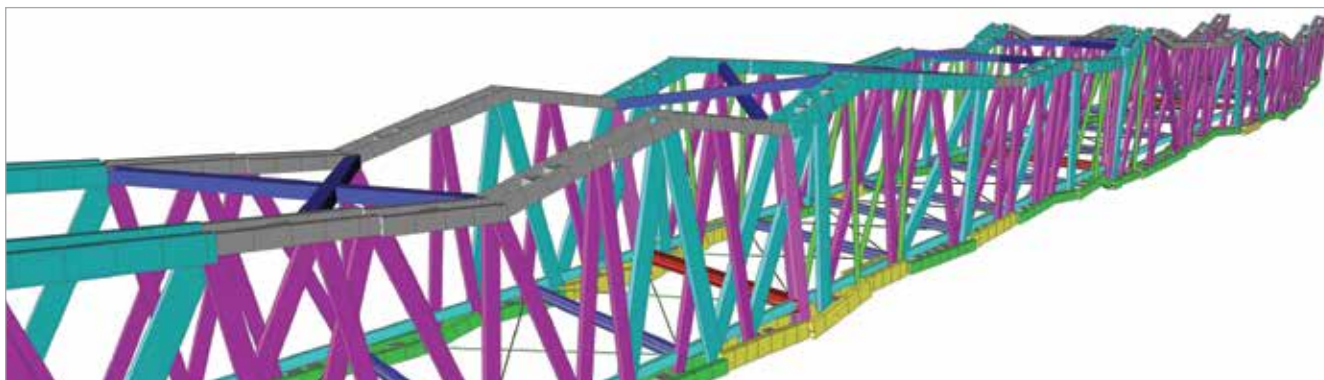
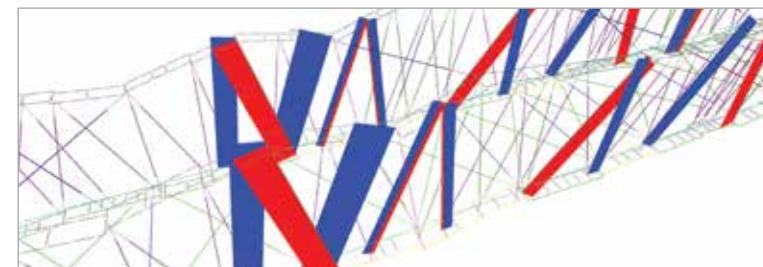
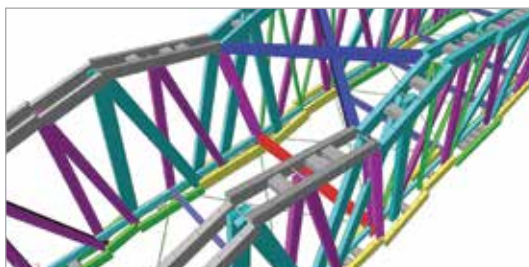
Maintaining the design of the nodes of the truss, while implementing the packers at the top and bottom chords proved to be a challenging job which involved integrating the practical experience of the contractor with engineering optimization, all the while maintaining the overall design and architectural detailing. As a result, the bridge is both highly particular, and structurally unique.

BAS bvba

Contact *Dirk Jaspaert*
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3010 Leuven, Belgium
 Website *www.basbvba.be*

BAS
 bureau voor architectuur en stabiliteit
 bvba

BAS bvba is primarily known for giving advice on architectural structural engineering. From the architect's first conceptual idea onwards, interplay between spatial form and structural concept will be sought to obtain maximum coherence. In close collaboration with the architects and other advising team members, a number of design-cycles are organized to confront ideas which gradually result in a global concept of coherence wherein structure is (be it hidden) fully present.





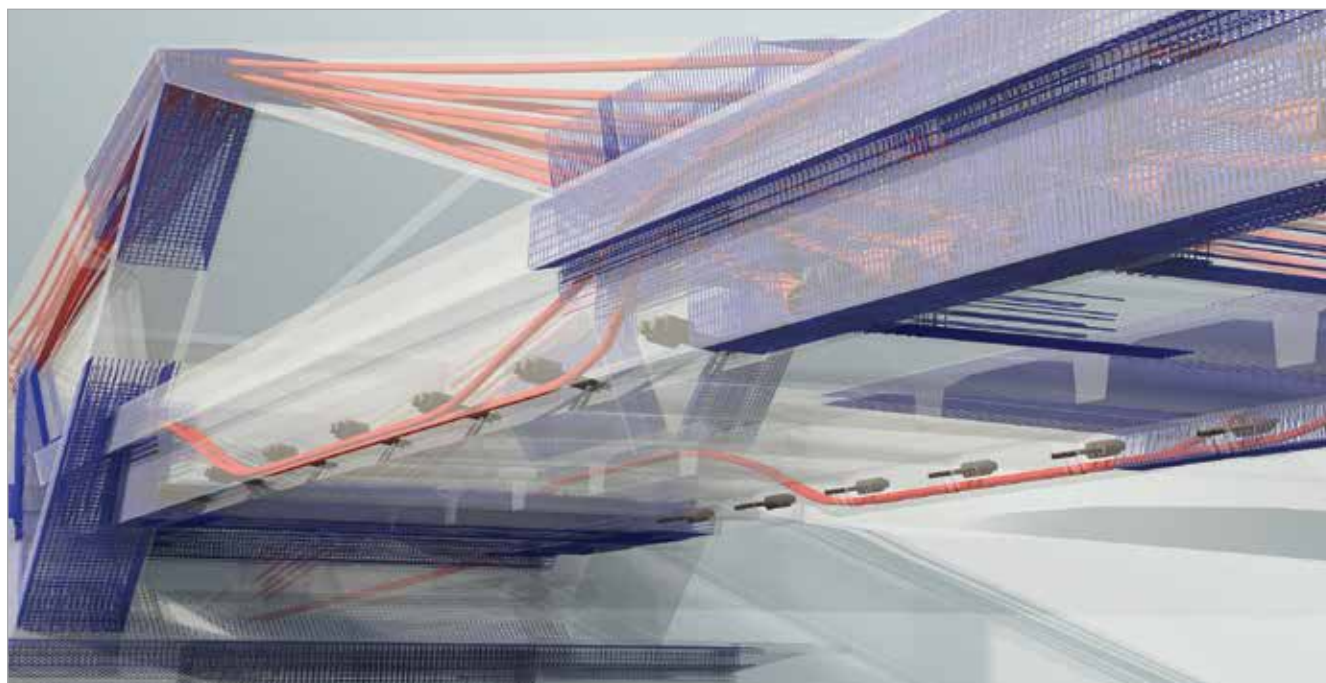
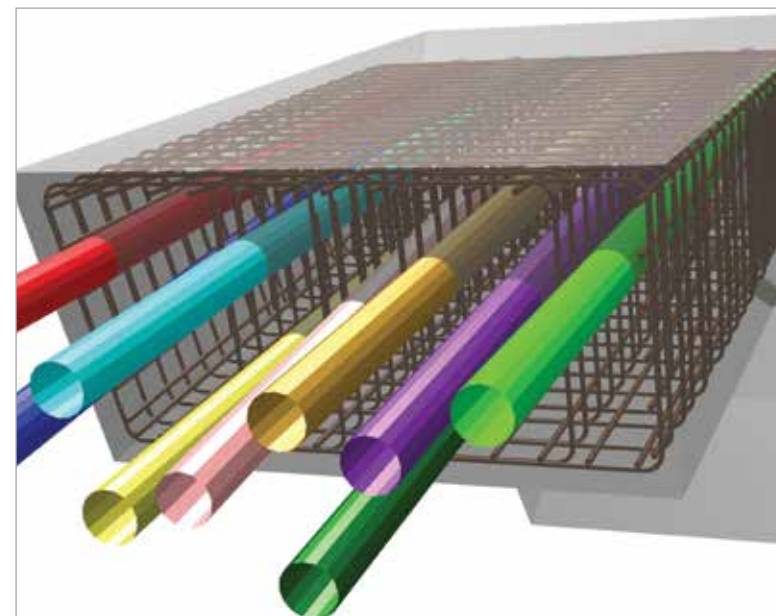
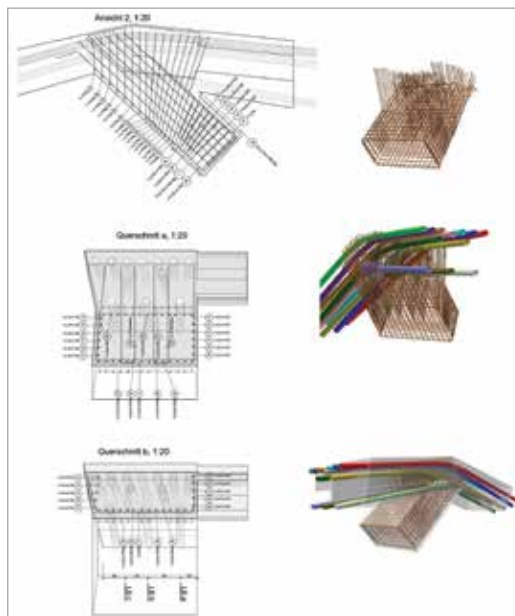
Owner *Amt für Verkehr und Tiefbau*
 Architect *Eduard Imhof Architektur*
 General Contractor *ARGE Brücken Olten: Implen Bau AG,
 Rothpletz, Lienhard + Cie, Frutiger AG,
 Thun / Meier + Jäggi AG*
 Engineering Office *Bänziger Partner AG, ACS Partner AG*
 Construction Period *2008 - 2011*

Olten's new Landmark, the Aarebridge, which is part of the project entitled "Entlastung Region Olten (ERO)" was handed over to the public in April 2013.

Thanks to the 3D model the designing/detailing-team was able to prove visually that the main nodal points of the static system will fulfil all of the requirements to place a rebar and post tensioning cables, despite its very minimalistic dimensions.

The planning-team took a bold approach for the project contest to design the new Aarebridge "maya": with a span width of approximately 104 m, the bridge connects a tunnel and a roundabout over the river Aare without any columns.

The outstanding concept won the international contest of 69 participants back in 2005 and was detailed and construction managed by the same offices: Bänziger Partner AG (Baden), ACS-Partner AG (Zürich), Architect Eduard Imhof (Luzern) and landscape architect David von Arx (Solothurn).



ACS-Partner AG

Contact *Rudolf Vogt*
 Address *Gubelstrasse 28
 8050 Zürich, Switzerland*
 Website *www.acs-partner.ch*



ACS-Partner AG is a privately owned, independent civil engineering office in Zürich. Since 1954 we have been engineering challenging and diverse constructions all over Switzerland with our 35 employees in multiple engineering disciplines.

Bänziger Partner AG is an independent engineering company owned and managed by partners. We are characterised by our experienced, powerful and future oriented services in civil engineering. Our 140 employees are flexible, innovative, competent and experienced and form the backbone of our success.

2

Nominee



Owner Administration des Ponts et Chaussées,
Division des Ouvrages d'Art Luxembourg

Architect INCA S à r.l. Niederanven

General Contractor CDCL SA Luxembourg /
Ateliers Roger Poncin Ocquier

Engineering Office Schroeder & Associés SA Luxembourg

Construction Period 06/2012 - 10/2013

The bridge is designed for road traffic and pedestrian use and crosses the river Moselle between Luxembourg and Germany. The bridge is executed in a straight line in plan view and has a slight longitudinal inclination over the whole length of 212.50 m and a variable width. The construction consists of main box girders, arch and suspension elements, transversal welded T-girders and orthotropic deck. The centre part of the bridge was assembled in the port of Mertert and transported to the final site by ship over the river Moselle, where the centre bay and the 2 approach bays were welded together.

Several models in SCIA Engineer are established to analyze the structure. The main part of the bridge, consisting of the longitudinal box girders, the transversal beams and the arch with the suspension elements, is introduced as beam elements in a 3D model. The junction node of arch and girders is analyzed by finite elements. One challenge in the modelling was to take into account the different construction stages. This was made easy by SCIA Engineer as it allows all the construction stages to be seen in one model. The deformations for the different construction stages and the final stage from the SCIA Engineer models corresponded to the measured deformations on site.

Schroeder & Associés

Contact Patrick Beicht

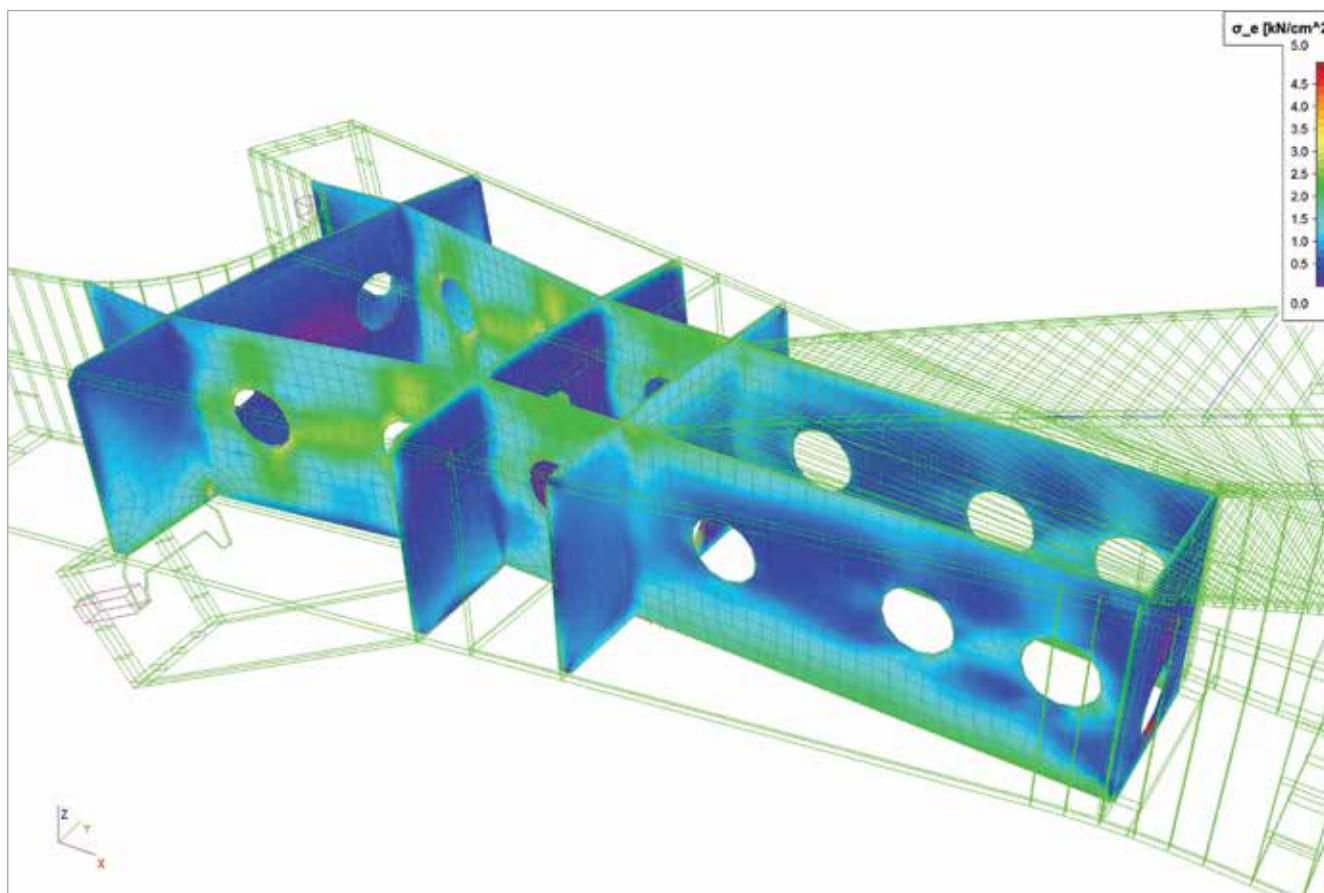
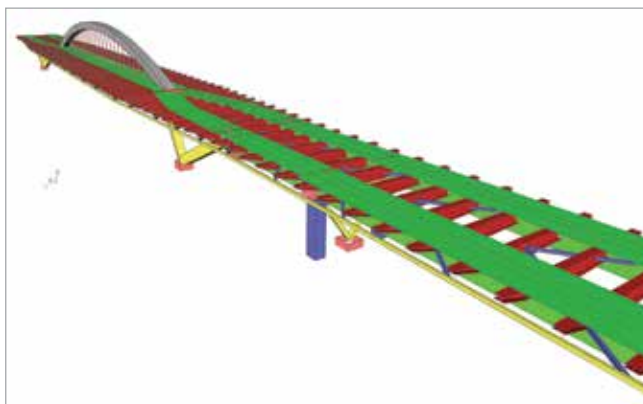
Address 8, rue des Girondins
1626 Luxembourg, Luxembourg

Website www.schroeder.lu



The engineering office Schroeder & Associés, founded in 1961, operates in four fundamental departments: building engineering, structural engineering, road system, networks and urban and landscape design. Relying on its 50 years of experience and 250 employees, as well as on specialized foreign partners, the office offers its services, experience and know-how to its customers.

The challenge lies in proposing solutions that fulfil customer demands and in increasing their satisfaction by completing the projects in an effective way.





Owner Gemeente Nijmegen
 Architect Zwarts en Jansma
 General Contractor i-Lent
 Engineering Office Witteveen+Bos
 Construction Period 07/2013 - 12/2015

The “Verlengde Waalbrug” is an in-situ post-tensioned concrete bridge with a total length of 275 m. With its spectacular double curved lower shell and hybrid foundation, several challenging problems had to be solved.

The project succeeded by combining the strengths of Allplan Engineering and SCIA Engineer in a BIM environment. Slices of the Allplan 3D organic model were transported to SCIA Engineer where the complex geometry of the structure was generated with 3,200 shell elements. SCIA Engineer offers the option to combine advanced geometric modelling with all kind of loads, powerful post-processing tools and transparent reporting capabilities all in one model.

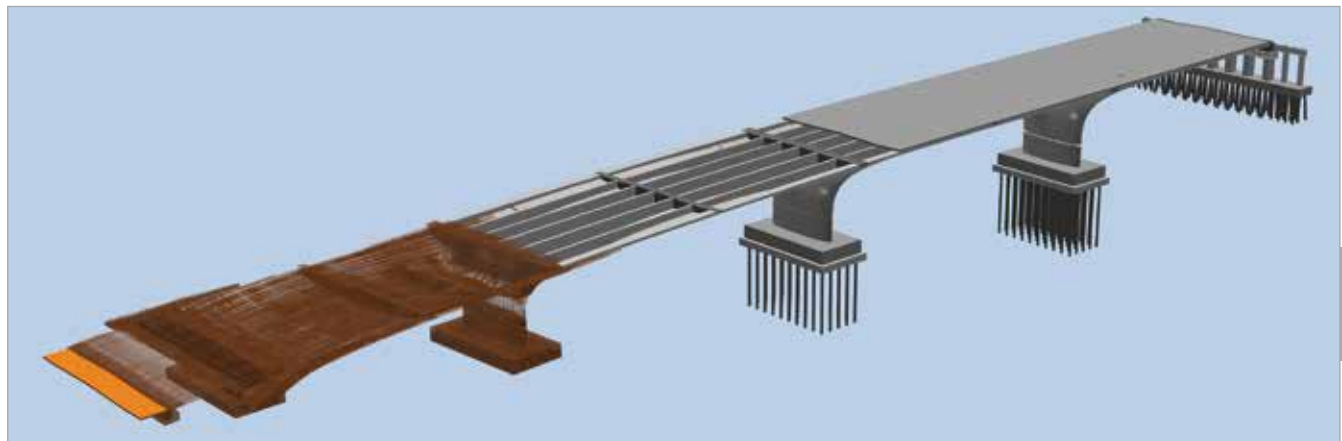
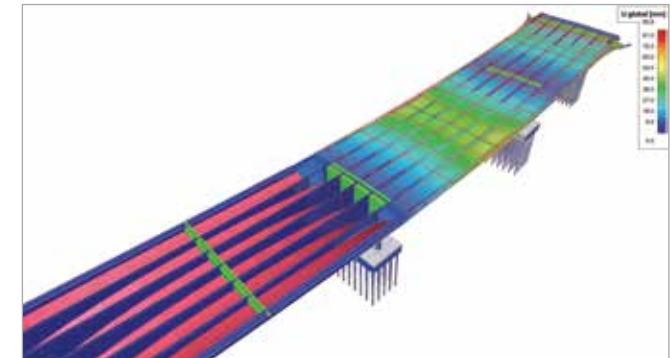
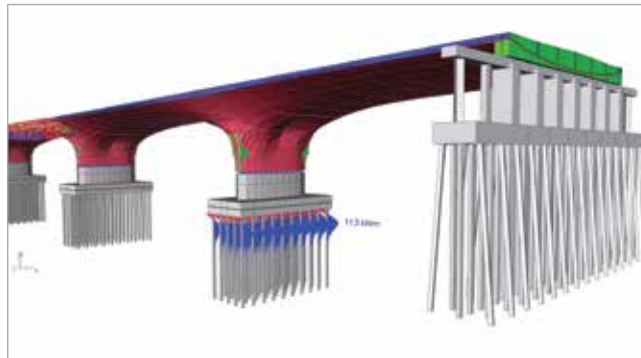
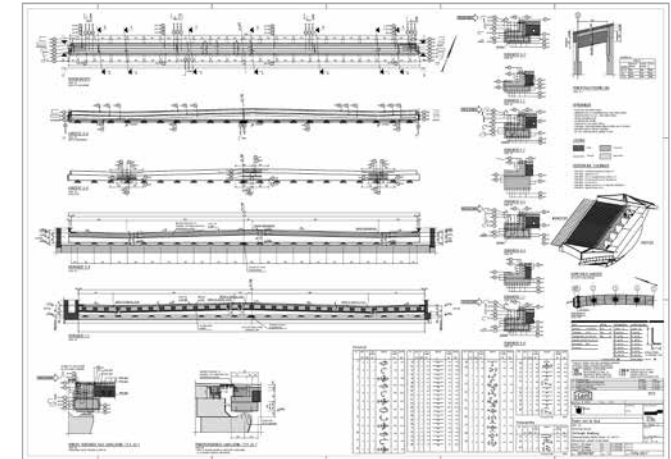
With SCIA Engineer the interaction between the hybrid foundation and the bridge was investigated, resulting in optimal dimensions. By using the integration function in SCIA Engineer the forces in the longitudinal direction were extracted such that simple cross-sectional checks could be performed, leading to a transparent and verifiable calculation. The dimensions could be quickly tuned with the acting loads. By modelling the bridge deck with shell elements, the beneficial effect of the lower shell acting as a compression arc is taken into account, reducing the amount of reinforcement required. The designed reinforcement in Allplan was used directly, shortening the production path.

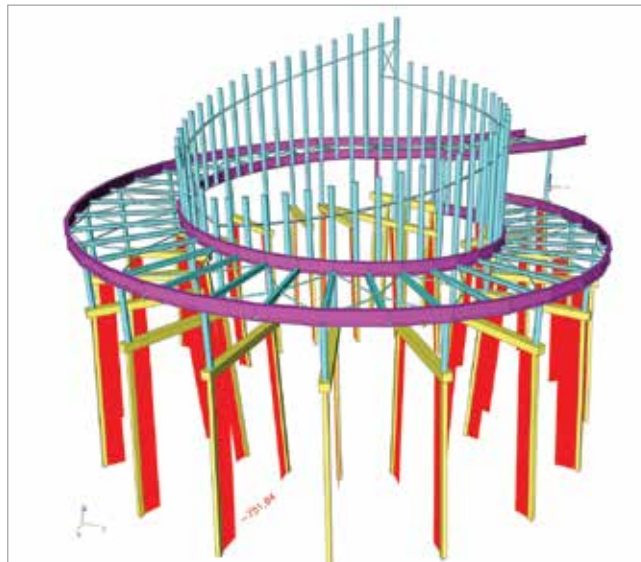
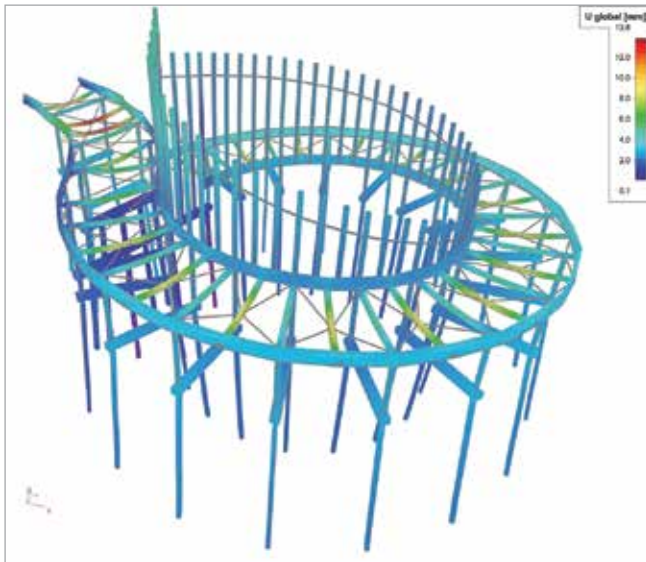
Witteveen+Bos

Contact Wouter Claassen, Arjan Lutikholt,
 Tim Neurink
 Address Leeuwenbrug 27
 7411 TE Deventer, The Netherlands
 Website www.witteveenbos.nl



Witteveen+Bos offers its clients value-added consultancy and top-quality designs. Over the years, road, rail and hydraulic engineering have created infrastructures characterized by both their large scale and their sophistication. In contrast with these huge projects there are many smaller ones that tend to be invisible to the user. What large and small have in common, however, is the combining of existing and new technologies under highly differing local conditions. At numerous levels Witteveen+Bos has contributed to this development.





Owner Gemeente Houten
 Architect ipv Delft & Arc2 architecten
 General Contractor Gebr. De Koning
 Engineering Office Adams Bouwadviesbureau
 Construction Period 09/2013 - 05/2014

Streektransferium Linielanding has multiple functions. It is a resting place, landmark, viewing platform and local market. The helical road bridge takes the passenger directly from the A27 into the nature of de Nieuwe Hollandse Waterlinie. The concept of this subsidy project was to generate interest in the countryside. The landmark consists of 53 steel columns of which 23 also support the roadway. Expansion joints were only used at the land abutments. The steel-concrete deck is integrated with steel cross beams. The edge beams are massive HEA1000 that are bent in their weak axis and function as a safety barrier.

SCIA Engineer was used for a 3D-model. Only a 2D-dwg was available to import. A 3D-model was necessary to optimize the construction. Innovation was required to realise the design with its total budget of €1.7 million. The modules that used were steel code check and dynamics.

The challenges presented by this project are the stability of the construction and the influence of temperature. The stability of the structure is guaranteed due to the rigid joints between the columns and the cross beams and the rigid joints between the columns and the foundations. No wind bracings were allowed between the columns. The influence of temperature was examined because of the length of the radial floor plan. The total length of the deck is 130 m without dilatations.

Adams Bouwadviesbureau

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 Address Van Heemstraweg 123f
 6650 AB Druten, The Netherlands
 Website www.adamsbouwadvies.nl



Adams Bouwadviesbureau is an engineering office with over 15 consulting engineers with a passion for technique. Adams provides consultancy services in the area of civil and structural engineering and building management. Adams is revolutionary in the area of BIM. We bring value to your BIM projects. It's all about cooperation, communication and coordination.

We are widely experienced in the field of bridges, retaining walls, offices, housing, underground structures and schools. We primarily use SCIA Engineer and Allplan for our projects.



Owner Waterwegen en Zeekanaal - Afdeling Zeeschelde
 General Contractor Hye
 Engineering Office Antea Group
 Construction Period 11/2013 - 09/2014

On the shore of the Rupel, near the concrete factory of Coeck N.V., a new quay was built. The quay consists of a concrete superstructure on steel piles which is built over a slope. At the back of the slope there is a combined wall. The total length of the quay is 135 m and it consists of 7 sections. In the first 2 sections a loading platform is incorporated which is situated 2.3 m lower than the quay level. The quay was built using prefabricated beams and plates.

In total 4 different sections were modelled in SCIA Engineer. The piles, beams and plates were inputted in the program together with the various load cases. The sections were supported in the horizontal plane by inputting **non-linear spring supports** on the piles. These non-linear supports represent the **passive resistance of the soil**. The non-linear supports were placed at an interval of 1 to 2 m. Based on the soil characteristics, the group effect of the piles and the effect of the slope, the non-linear supports for each pile row and each depth were different.

The modelling of the non-linear spring in combination with the high number of load cases resulted in more than 1,000 non-linear combinations. This made the whole project challenging and required us to test the boundaries of the program and the engineer.

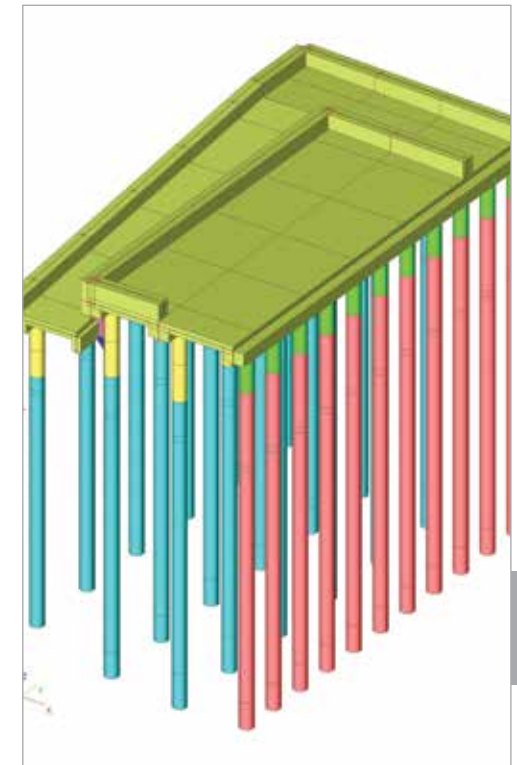
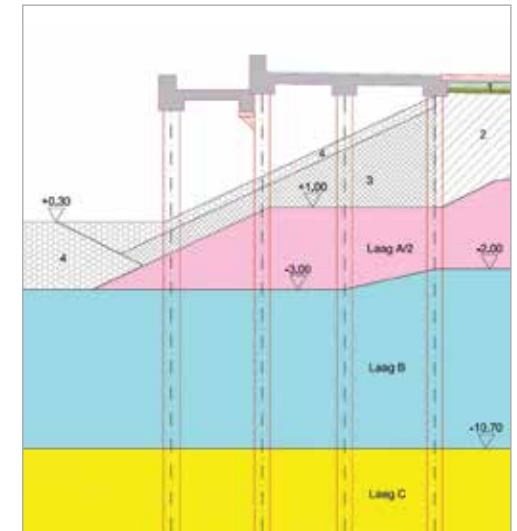
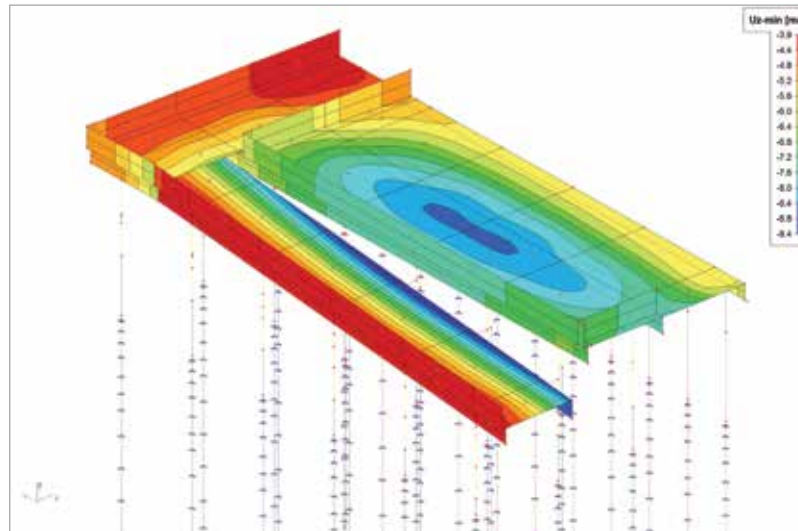
Antea Group

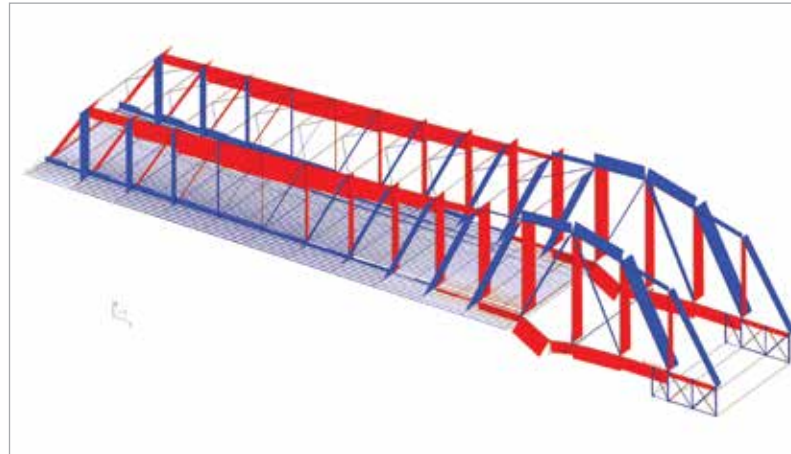
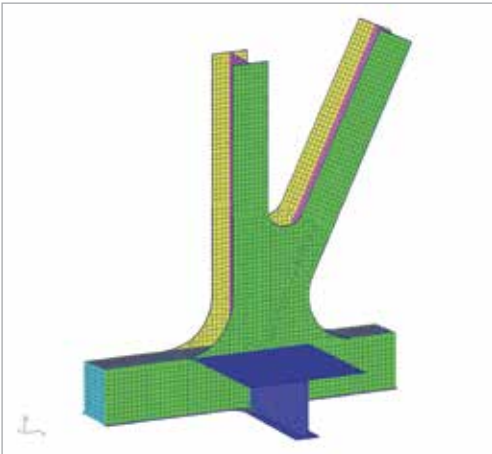
Contact Evert De Groote
 Address Roderveldlaan 1
 2600 Antwerpen, Belgium
 Website www.anteagroup.be



Antea Group is an international design, engineering and consultancy firm working for governments, organisations and companies. Its operations are in the field of engineering, environment, urban planning, infrastructure and water.

The civil engineering department focuses on the strength and stability of buildings and civil construction including quay walls and water related structures. During the design process, every aspect is considered, starting with the geotechnical calculations and ending with the detailed design.





Owner *Deurganckdocks-luis nv*
 General Contractor *THV Waaslandsluis*
 Engineering Office *ARCADIS Belgium nv*
 Construction Period *2011 - 2016*

The second lock of the Waaslandhaven includes a bascule bridge at each end. These bridges combine road, railway, pedestrian and cyclist crossings, ensuring that traffic can constantly flow over the lock and that companies on the left bank are easily accessible.

The bascule bridge is a steel truss bridge with a width of 20.5 m, a length of 97.6 m and a weight of about 3,600 tons, while the lock itself measures 500 m long and 68 m wide. The bridge has two lanes for car traffic, a railway and a separate bike lane.

The deck includes an orthotropic plate which is finished with a thin layer of epoxy. The bicycle and footpaths are in cantilever and are attached to the bottom edge of the bridge structure. The rear of the bridge is provided with a caisson which acts as a counterweight. The bridge is also balanced so that the structure is in equilibrium at the level of the rotation axis. The axis is connected to the walls of the basement of the bridge via a casting provided by roller bearings.

A substantial part of the structural calculations consists of a fatigue analysis. The stress ranges were calculated using a 3D beam model of the bridge, as well as by using detailed models of the connections between the orthotropic deck and the casting.

ARCADIS Belgium nv

Contact *Gunther Pauwels, Benoît Ressler*
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2600 Antwerpen-Berchem, Belgium
 Website *www.arcadisbelgium.be*



ARCADIS is the leading global design and consultancy firm for natural and built asset designs. It works in partnership with clients to deliver exceptional and sustainable outcomes through the application of design, consultancy, engineering, project and management services. ARCADIS differentiates itself from other firms through market sector insights and the ability to integrate health, safety, and sustainability into their design and delivery of solutions across the globe. ARCADIS is a firm of 28,000 people that generate €3 billion in revenues.

Owner PlatOO / Community of Son en Breugel
 Architect Frank Havermans
 General Contractor Frank Havermans
 Engineering Office Archimedes Bouwadvies BV
 Construction Period 04/2015 - 08/2015

The new primary school De Ruimte is a part of the Sonniuspark development, an expansion of the village of Son en Breugel. In order to create a safe connection for pedestrians between the Sonniuspark and the school, the village and the school launched a design contest. The challenge was to create a pedestrian bridge over an existing bicycle road. The contest was won by international award winning sculptural artist Frank Havermans. In their search for ways to make the 14 m span, the artist and the engineer joined forces, resulting in a sculptural web of corten steel strips landing on two different spots in the Sonniuspark. The only way to gain an idea of stress and deflection was to model this structure in SCIA Engineer. The bridge consists of corten steel strips with varying dimensions. The strips used have a thickness of between 12 and 20 mm. The height of the strips varies from 250 mm at the landing to 600 mm at the centre of the bridge. The bridge is shaped like a tripod, built up as a web of welded steel strips. The web is covered by oak flooring. SCIA Engineer proved its value by giving insight into the stress of the steel strips and the overall deflections of the bridge. At an early stage we started using SCIA Engineer more or less as a sculptural tool. The results of the calculations were used in the dialogues with the artist, after which we modified and optimized positions and dimensions of strips in the web. Eventually this resulted in a clear and logical structure, which stayed within budget.

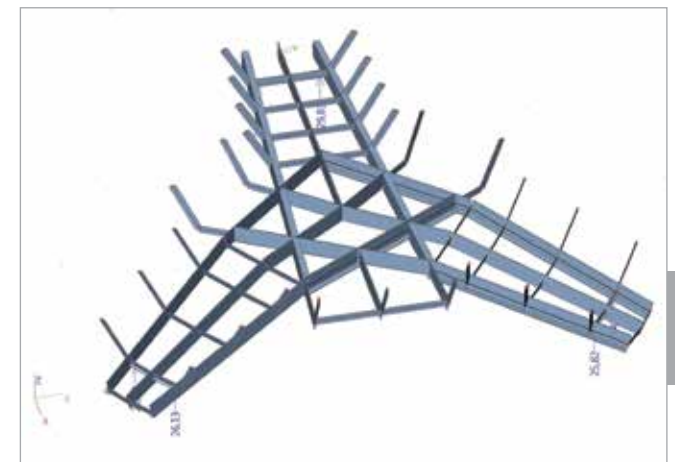
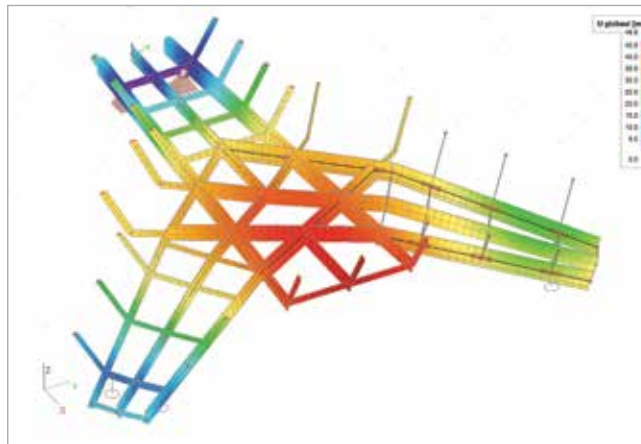
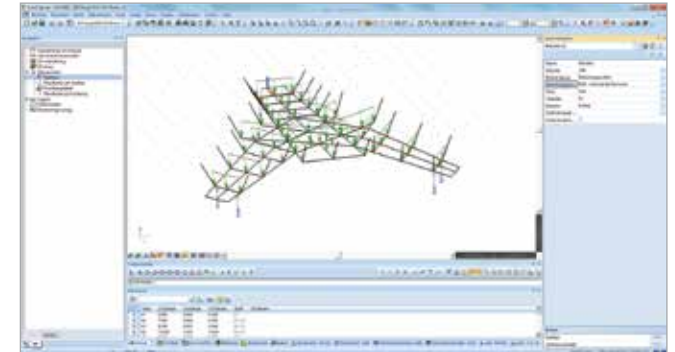
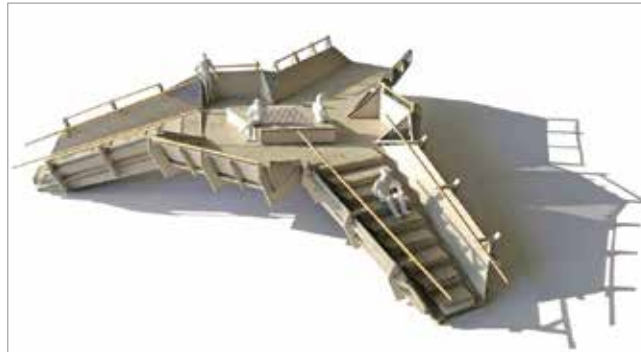
Archimedes Bouwadvies BV

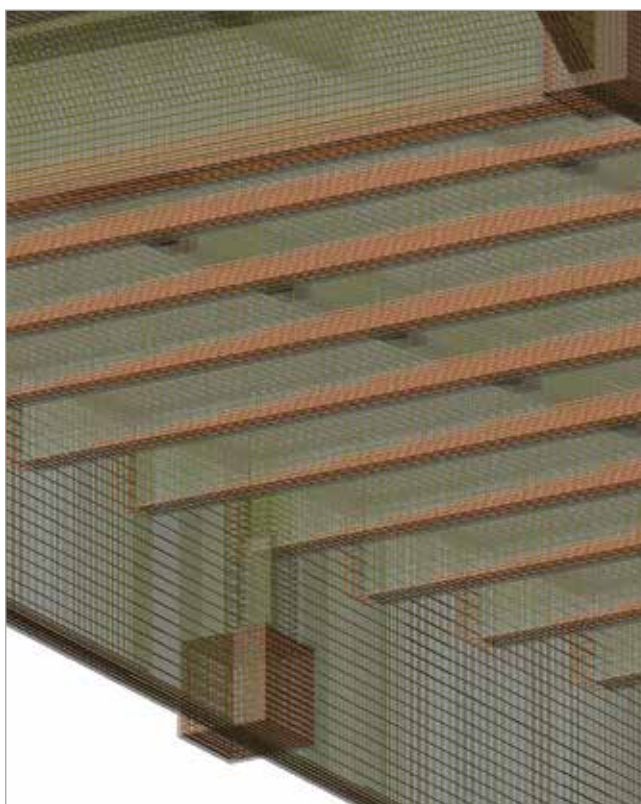
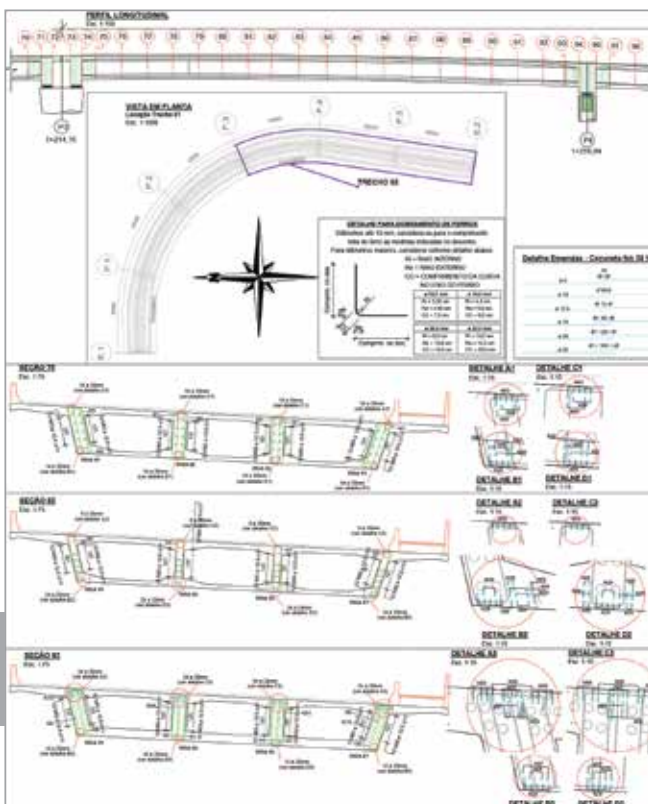
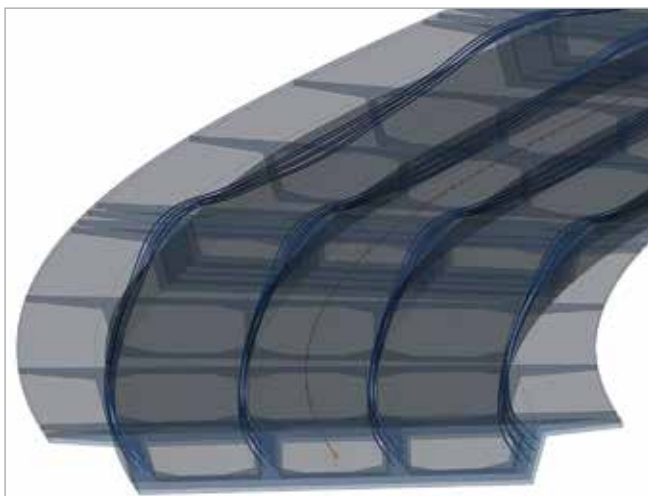
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 5615BM Eindhoven, The Netherlands
 Website www.archimedes-bouwadvies.nl



Archimedes Bouwadvies BV is a structural engineering office located in Eindhoven, The Netherlands. Projects range from civil engineering to structural engineering for new and existing buildings for educational, industrial, residential, retail, leisure and office purposes.

After having created the structural design of the school building, Archimedes also participated in the pedestrian bridge project team, being responsible for the structural design of the bridge.





Owner: DNIT - Departamento Nacional de Infraestrutura de Transportes
 Architect: Azambuja Engenharia e Geotecnia Ltda.
 General Contractor: Confidential
 Engineering Office: Azambuja Engenharia e Geotecnia Ltda.

This is a project of a road flyover above a railway. The structure is divided basically in three main parts: two abutments in reinforced concrete and the flyover made of prestressed concrete. The total length of the project is 365.80 m. The project is formed by two hyperstatic sections with three spans of 45 m each.

SCIA Engineer was used for calculation of the structure. This software has a user-friendly interface and fulfills our main challenges for hyperstatic precast flyovers. **Allplan Engineering** was used to produce drawings of the project, and we obtained fast results of detailing and precision in calculating material quantities.

The main challenges faced were the interferences found on site. As the flyover is above a railway, interferences of electrical grids had to be considered, imposing a small template for construction and less expropriation area. Another challenge was that the railway could not be stopped for construction of the flyover, so it was necessary to calculate steel shorings.

The project was finalized on time, and by using Nemetschek Group software we had great productivity in detailing and calculation.

Azambuja Engenharia e Geotecnia Ltda.

Contact: Patricia Souza
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 90050170 Porto Alegre, Brazil
 Website: www.azambuja.com.br



Azambuja Engenharia e Geotecnia constitutes a consulting firm, projects and supervision of engineering works.

We work since 1994 in the infrastructure area, special structures and environmental projects and themes where geotechnical, our main specialty, is ruler.

Accumulating more than 1,000 projects in our portfolio, we offer the work of experienced and skilled professionals, able to solve the most complex projects.

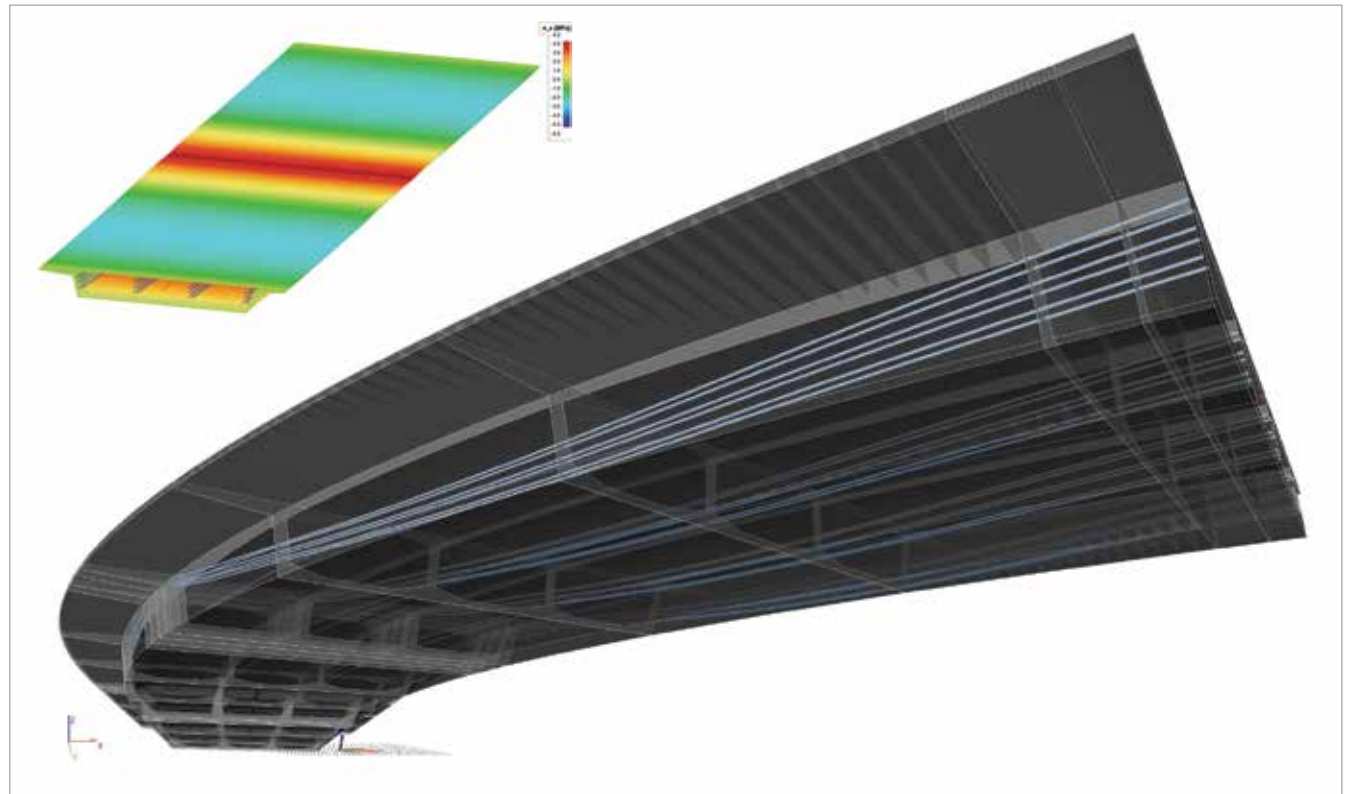
Owner DNIT - Departamento Nacional de Infraestrutura de Transportes
 Architect Azambuja Engenharia e Geotecnia Ltda.
 General Contractor Confidential
 Engineering Office Azambuja Engenharia e Geotecnia Ltda.

This is a project of a road flyover above a railway. The structure is divided in three main parts: two abutments in reinforced concrete and the flyover made of prestressed concrete. The total length of the project is 397.30 m. The project is formed by three hyperstatic sections. The first section is composed by three spans of 35 m. The second section by three spans of 44.8 m, 48 m and 44 m. The third section is smaller and formed by two spans of 30 m.

SCIA Engineer was used for calculation of the structure. This software has a user-friendly interface and fulfills our main challenges for hyperstatics precast flyovers. **Allplan Engineering** was used to produce drawings of the project, and we obtained fast results of detailing and precision in calculating material quantities.

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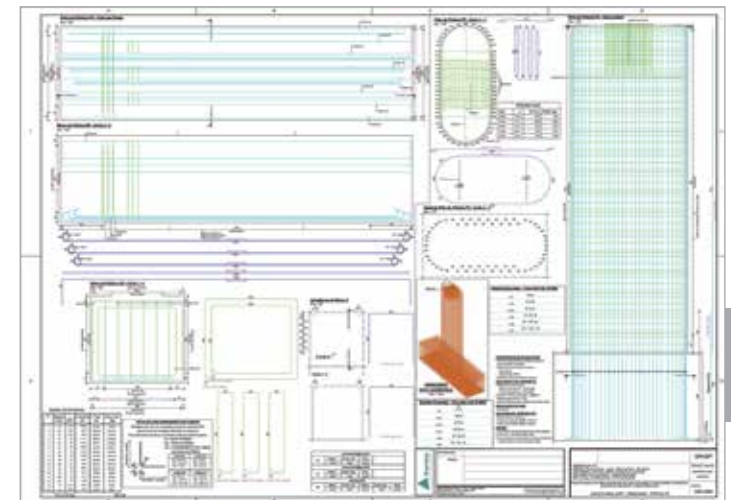
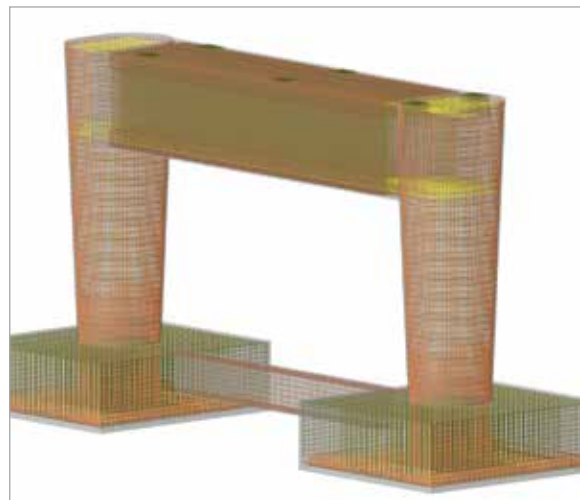
Contact Patricia Souza
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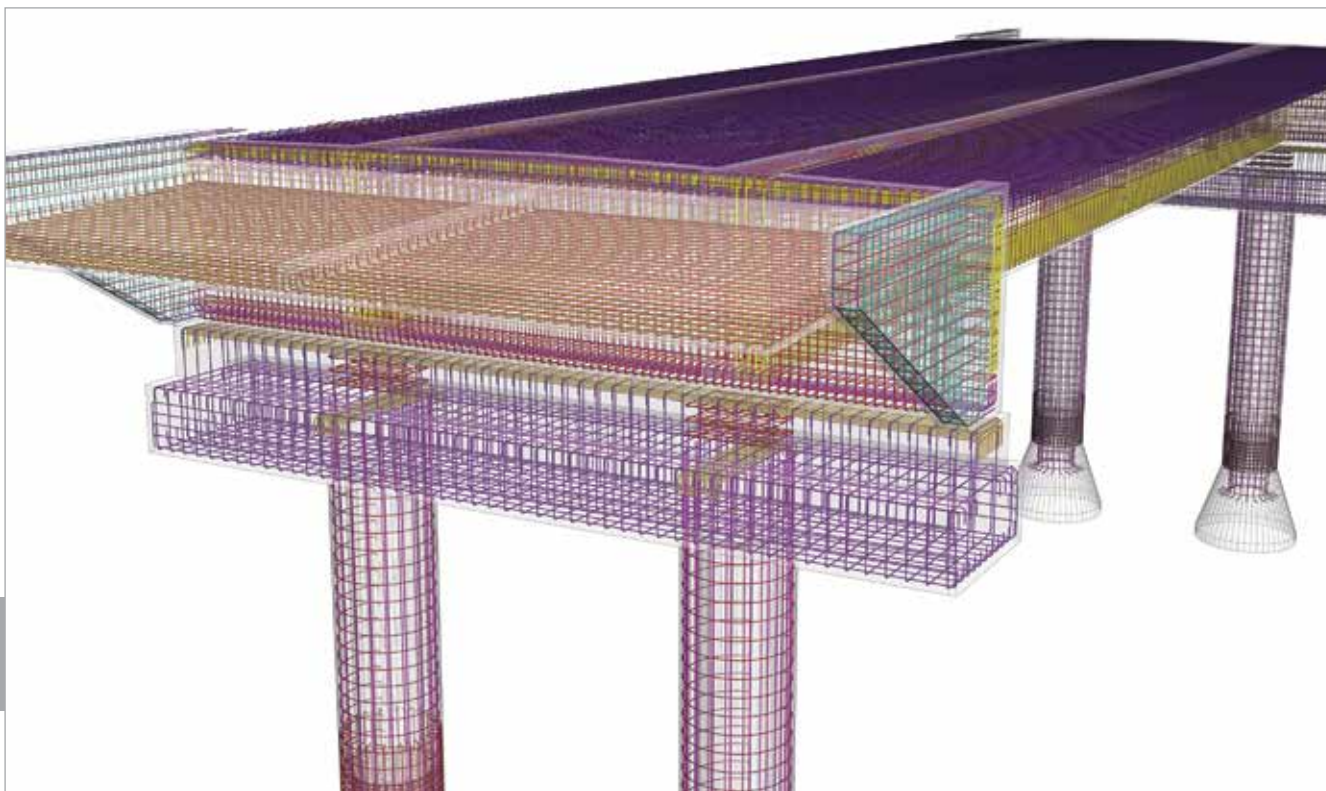
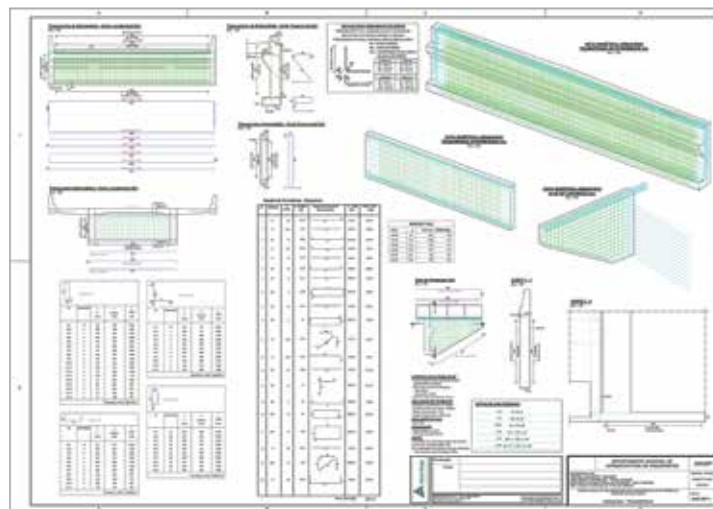
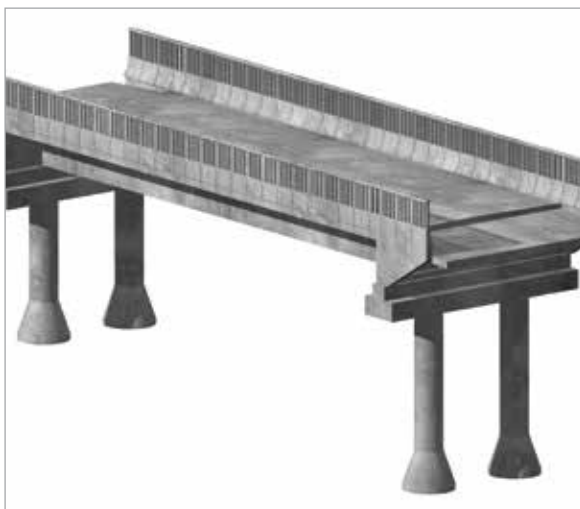


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Owner *DNIT - Departamento Nacional de Infraestrutura de Transportes*
 Architect *Azambuja Engenharia e Geotecnia Ltda.*
 General Contractor *Confidential*
 Engineering Office *Azambuja Engenharia e Geotecnia Ltda.*

The structure will go above the ferry line EF-265 given to A.L.L. (América Latina Logistics).

The road flyover will help with the flow of agriculture, mineral and livestock along with helping approximately 500 families of Conchas city and 283 plots of neighborhood da Gama.

It is a 26 m span structure supported on both sides with 9.80 m thick cross section.

The road flyover is above a railway and because it has a bigger distance between the flyover and railway and smaller length of its cross-section, there were less interferences on site than other flyover projects designed by Azambuja Engenharia e Geotecnia.

The main challenge was to design the retaining walls needed on the sides of the railway.

Allplan Engineering was used to generate the detailed project and allowed us to be faster and precise.

The project was finalized within the deadline and we clearly achieved a greater productivity regarding reinforced detailing and quantities using **Allplan Engineering**.

Azambuja Engenharia e Geotecnia Ltda.

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 Website *www.azambuja.com.br*



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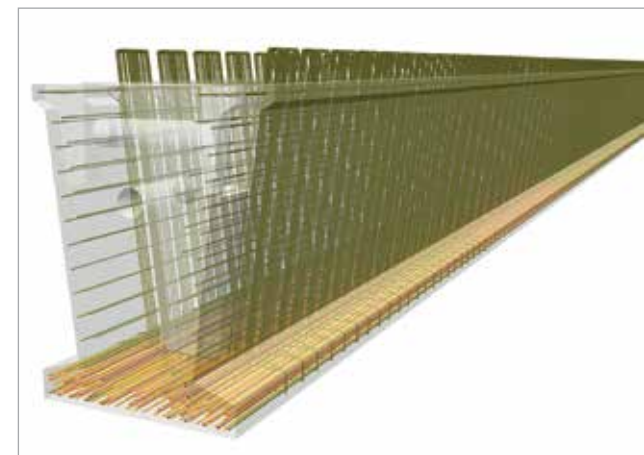
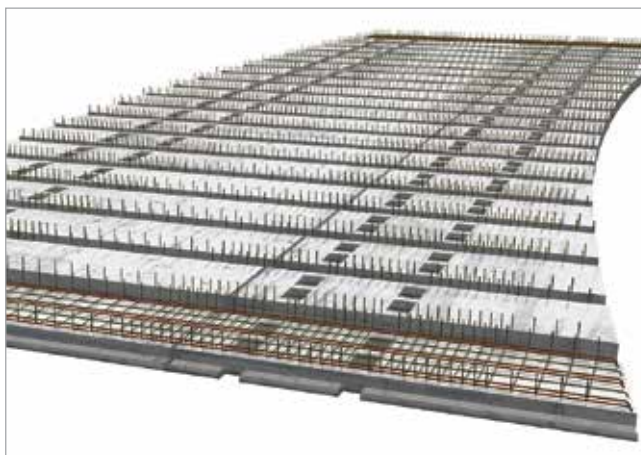
Owner *Confidential*
 General Contractor *Confidential*
 Engineering Office *Gheller Engenharia*

This project is composed of several spans of precast concrete beams, adding up to a total length of 3,500 m, along with stretches of vertical curve, horizontal variables, radius and stretches in tangent.

The biggest challenge was the conception of the project that resulted in 48 different types of concrete beams amongst 223 beams in total. Additionally, the geometry of the prefabricated slabs which have variable radiuses and different span lengths generated countless reinforcement and formwork drawings.

The use of SmartParts technology improved the detailing process of these elements, which usually have many details. The most important factor in this process was ensuring a reliable design which theoretically did not require any subsequent correction. The gain in productivity and the reliability of the process was a strong advantage when using SmartParts. Any revision of the geometry during the construction would generate an unthinkable rework in the elements already detailed, but with SmartParts it was possible to solve these issues with just a few “clicks”.

We used automated 3D modelling by programming two SmartParts: one for beams and one for prefabricated-slabs. Each SmartPart was modelled with parameters for formwork and reinforcement, with 2D representation for each element. After the modelling, beams and slabs were pre-assembled in a standard layout allowing analysis of all elements (beam + pre-slabs) in 3D.

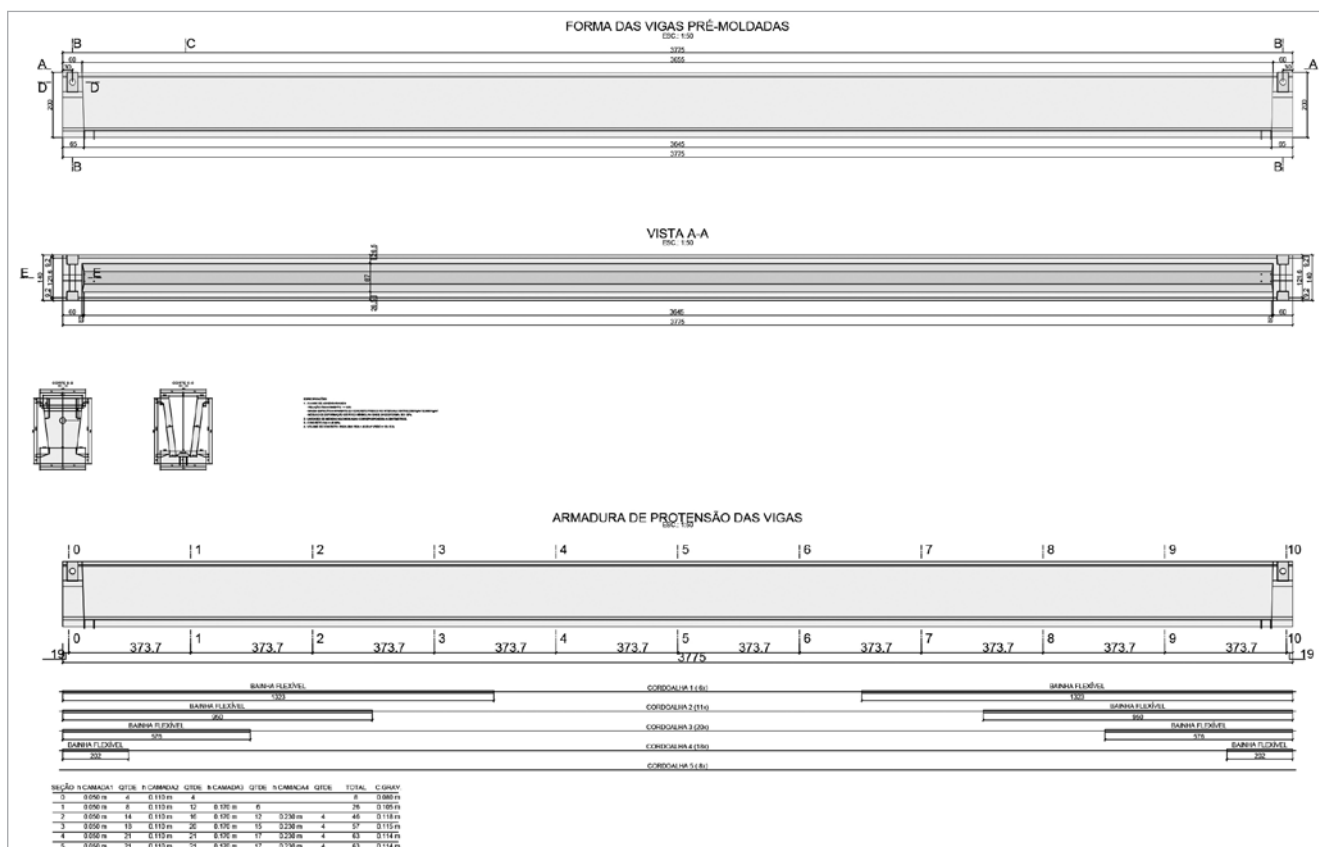


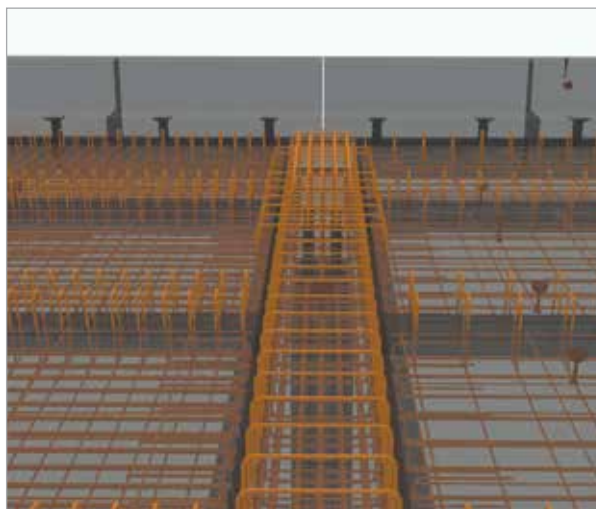
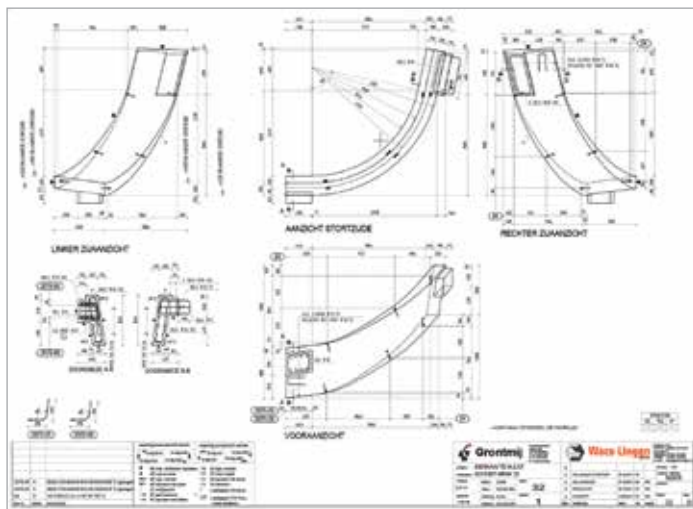
Gheller Engenharia

Contact *Gilberto Gheller*
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RS 90850-000 Porto Alegre, Brazil
 Website *www.ghellerengenharia.com.br*



Throughout the years, **Gheller Engenharia** has kept up to date with technology and aesthetic advances, searching for the technical and harmonic perfection of its work in the environment. With over 40 years' experience in special civil engineering construction, the company has developed more than 1000 projects for a variety of construction companies, consultants and concession road companies, showcasing Gheller Engenharia's remarkable experience. The guarantee of security and quality on all the projects, the development of optimistic works, and above all easy and economic execution are prime objectives of this company.





Owner Gemeente Hulst
Architect Op ten Noort Blijdenstein Architecten & Adviseurs
General Contractor ARCADIS Nederland BV
Engineering Office Grontmij Nederland BV
Construction Period 06/2011 - 06/2012

General project data

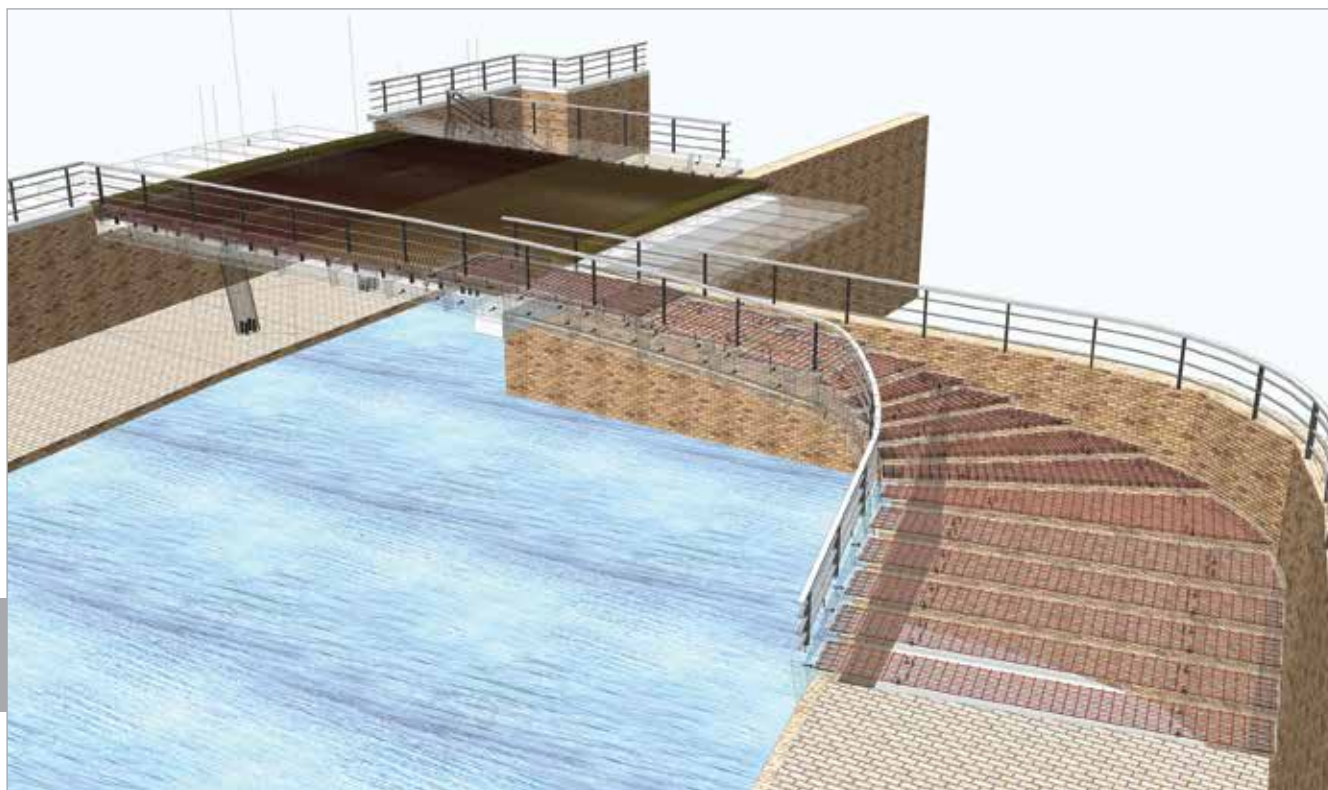
As part of the redevelopment of the city centre of Hulst (Zeeuws Vlaanderen) a design of a concrete bridge with skirts and Spanish stairs was made for a precast concrete supplier.

Allplan Engineering

The challenging part of modelling the skirt was following the contour of the stairs while securing a correct connection to the bridge. In order to manufacture the skirt, it had to be divided into elements. Another challenge was fitting the steps between the skirts and the masonry quay wall, resulting in unique steps each with a different width and length and with different angled sides.

Production Drawings

By designing in 3D it was clear from the start that all elements joined nicely. All the elements (bridge girders, approach slab, stair steps, and skirts) were generated into 2D production drawings. By using Allplan, views and sections of the elements could be easily generated from the model and dimensions could be added to more complex parts in order to make the formwork for the prefabrication.



Grontmij Nederland BV

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Website www.grontmij.com



Grontmij provides consultancy, design & engineering and management services in a broad range of market sectors related to the built and natural environment.

Within our range of expertise, and with approximately 7,000 professionals around the world, we aim for European leadership in five Group growth activities: Energy, Highways & Roads, Light Rail, Sustainable Buildings and Water.

Our guiding principle is sustainability by design which is a leading value proposition for our customers.

Owner Vlaamse Overheid, Wegen en Verkeer, Hasselt
 Architect Vlaamse Overheid, Expertise beton en staal (primary design)
 General Contractor Anmeco N.V.
 Engineering Office Ingenieursbureau Stendess N.V.
 Construction Period 09/2013 - 12/2013

The bridge over the N75 was built to eliminate dangerous crossings for cyclists and pedestrians. The bridge consists of a straight 60 m long access bridge (with four supports) and a curved cable-stayed bridge with a length of 90 m supported by 12 cables with two pylons with a height of 20 m. The bridge deck consists of a main tube (Ø 864) and an orthotropic bridge deck plate with transversal and longitudinal reinforcements. The bridge was transported to the site in pieces (27 m), positioned on temporary supports and welded on site. After the erection of the pylon and bridge deck, the cables were tensioned according a precise tensioning programme. After the tensioning, the main tube was filled with concrete as a counterweight (to avoid traction in the supports).

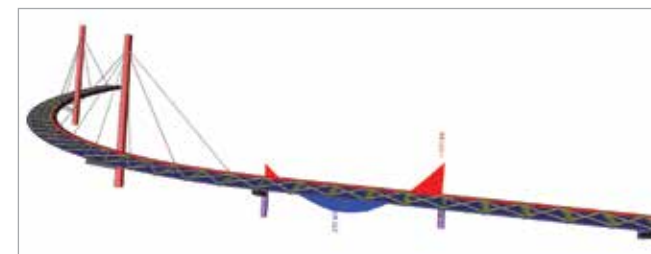
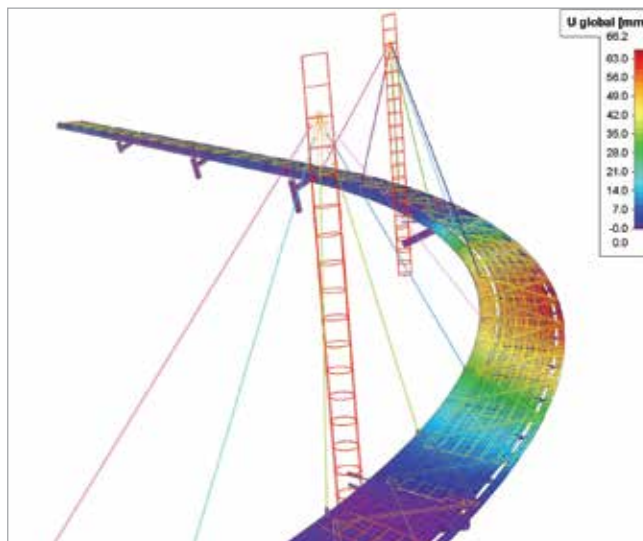
The possibility of input and the use of graphical section was a big advantage because of the curved and continuously changing cross-sections of the pylons. There was the limitation of the reactions on the bridge end supports and the simulation of the realistic behaviour of the cables. Because the linear calculations resulted in compression in the tension bars, a non-linear calculation was needed. A second order calculation was used to check the pylons based on a stability calculation. For the erection engineering, the different construction stages had to be examined. The dynamic behaviour of the bridge also had to be checked.

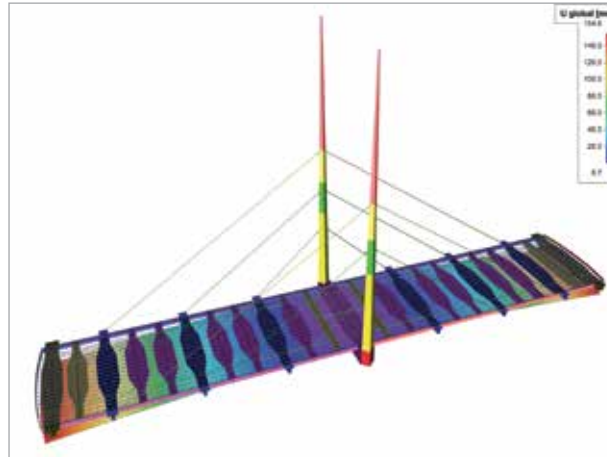
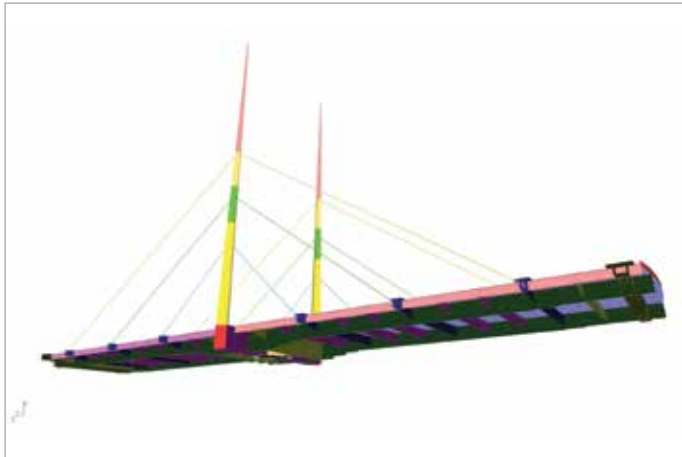
Ingenieursbureau Stendess N.V.

Contact Jurn De Vleeschauwer
 Address Grote Baan 18
 9920 Lovendegem, Belgium
 Website www.stendess.com



Stendess calculates and draws complex steel constructions in a high quality and efficient manner while seeking economically responsible and substantial solutions for specific technical stability issues. Thanks to the integral service, where the design of the metal superstructure and the concrete substructure are calculated and drawn by experts in the same office, the building owner and principal contractor retain 100% control over the complete structure. References demonstrate the **multidisciplinary knowledge** and ability of our engineers and designers in the market of bridges, industry, utility and other projects located **worldwide**.





Owner	Simpson Bay Lagoon Authority Corporation
Architect	Hollandia Infra BV
General Contractor	Volker Construction International
Engineering Office	Ingenieursbureau Stendess N.V.
Construction Period	01/2013 - 12/2013

The St-Maarten swing bridge is a part of the 726 m long Causeway road bridge crossing the Simpson Bay in the Caribbean. This bridge was built to improve access to the airport and Cole Bay.

The steel swing cable bridge has a span of 68 m, a width of 12.2 m and a weight of 450 tons. The bridge has two 35 m high pylons. The pivot point is in the centre of the bridge. The bridge was completely built up in the Hollandia Infra workshop in the Netherlands and shipped to the Caribbean.

Determining the pretension in the stays was an important aspect in the design of the bridge. This force had to be determined for the different positions of the bridge. When the bridge was in the closed position, there was always a minimal pressure necessary at the end bearings, although in this position the deformation of the stays had to be limited by realizing a minimal pretension force in the stays. In the open position, the force in the last stays becomes a determinant and a check of the strength of the stays was necessary. The interaction between the above mentioned phenomena determined the position, type and pretension force of the stays.

A second order calculation was needed for the check of the pylon based on a stability calculation. For the erection engineering, the different construction stages had to be examined. The dynamic behaviour of the bridge also needed to be checked.

Ingenieursbureau Stendess N.V.

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9920 Lovendegem, Belgium
Website www.stendess.com



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Owner *Confidential*
 Architect *Tetra Arquitetura e Projetos*
 General Contractor *Confidential*
 Engineering Office *Intertechne Consultores S.A.*
 Construction Period *2014 - 2020*

Located in central São Paulo, **the station** has an important role to play in complementing the bus system in the region. When completed, in 2020, the station is expected to receive 280,000 passengers a day. It is a circular concrete structure with a diameter of 37 m and a depth of 50 m below ground, with commercial buildings from the ground up. The entrance to the internal platform is made of pre-fabricated beams and columns. The station platform is 132 m long and is intersected by two tunnels that will be built using the NATM (New Austrian Tunneling Method).

The concrete structure was modelled in Allplan Engineering, which helped to verify the collisions, assess compatibility with other disciplines and extract quantities as well as helping with the integration with SCIA Engineer. SCIA Engineer was very important for verifying critical phases during the construction stages. Drawing productivity was increased greatly by the use of **SmartParts** for the prefabricated structures. The standardisation of modelling in Allplan enabled users who had never used the solution before to adapt quickly. Intertechne Consultores S.A. stands for excellence in high complexity engineering projects. The adoption of solutions like **SCIA Engineer** and **Allplan Engineering** has raised the standard of production to a new level of competitiveness and quality, reaching productivity gains of more than 100%.

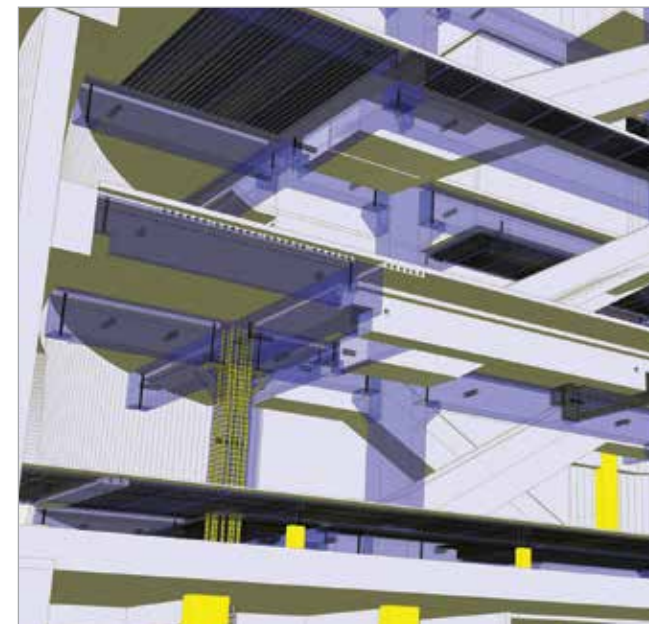
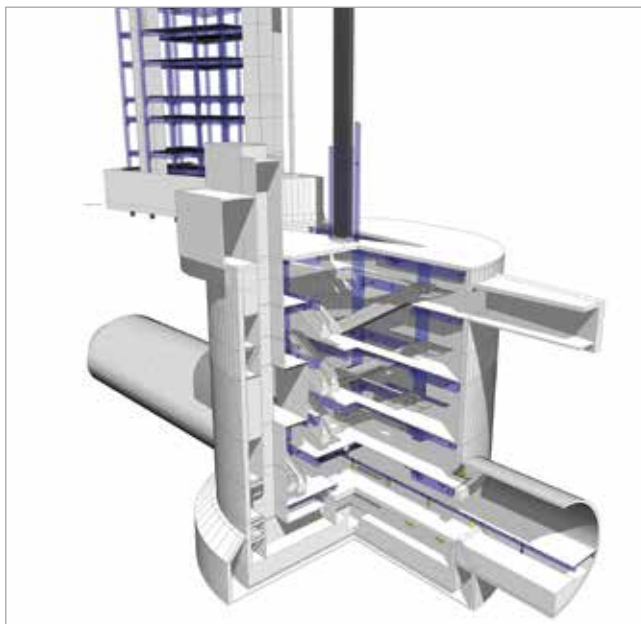
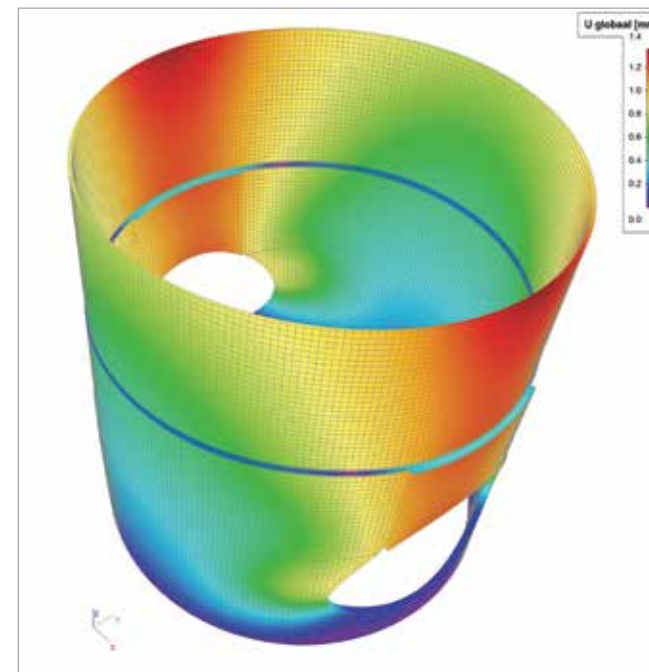
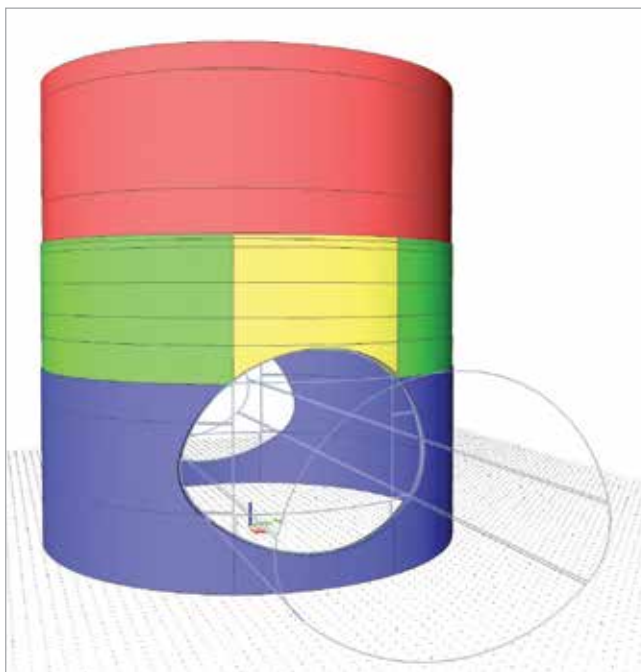
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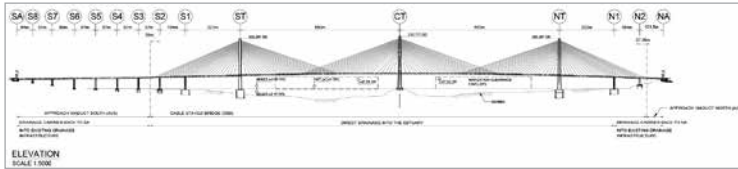
Contact *Kleber Tomazetti*
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Bloco E - 7º andar
05804900 São Paulo, Brazil
 Website *www.intertechne.com.br*

Intertechne

Intertechne is a 28 year old Brazilian company specialising in engineering consultancy and management of oil and gas, energy, tubes, airports, ports, ferries and all types of infrastructure projects.

We offer a good solution in all phases of projects, from preliminary to construction. With our very experienced team of engineers, we can provide our clients with safe, creative and adequate solutions in Brazil and abroad.





Owner *Transport Scotland*
 Architect *Transport Scotland, Jacobs / Arup*
 General Contractor *FCBC (HOCHTIEF / Dragados / American Bridge / Morrison)*
 Engineering Office *Leonhardt Andrä und Partner / Rambøll / Grontmij*
 Construction Period *2011 - 2016*

The Queensferry Crossing over the Firth of Forth near Edinburgh is the **largest bridge project in Northern Europe** currently under construction. Including approach viaducts, the bridge has a length of 2,638 m. **Three towers** up to 210 m high and two main spans of over 650 m provide clearance for the two navigation channels and make it the world's longest three tower cable-stayed bridge. A unique and instantly recognisable engineering innovation is the 146 m overlap of stay-cables at mid-span, providing extra stiffness for the windy location and enabling the towers and decks to be more slender than on a traditional design.

Allplan has been used for the tender design and the reinforced concrete detailing of the three towers and two tie-down piers. Unusually for a bridge of this scale, a fully detailed 3D reinforcement model has been created. Despite technical and design challenges resulting from the tapered towers and high reinforcement ratios, especially at the power joint between main deck and the central tower, the complete reinforcement detailing has been delivered with precise dimensions and collision-free to the construction site on time. The **smart design** with the central tower sitting on the conveniently located Beamer Rock island and highly optimized construction allowed the contracting consortium to bid for £790 million, a price £260 million below its nearest competitor.

Leonhardt, Andrä und Partner AG

Contact *Peter Walser*
 Address *Heilbronner Straße 362*
70469 Stuttgart, Germany
 Website *www.lap-consult.com*



Leonhardt, Andrä und Partner consultancy was founded in 1939 by the famous master builder Fritz Leonhardt. The consultancy focuses on tunnels, buildings and challenging bridges in all design and construction stages, from first brainstorming and feasibility studies through preliminary and detailed design, construction engineering, site supervision, technical expertise and independent checking.

CHP Constructions specializes in providing structural detailing services for reinforced concrete, steel and timber structures to other engineering consultancies. See www.chp-con.de for more information.



Owner Provincie Zuid Holland
 Architect A&E Architecten
 General Contractor Heijmans BV
 Engineering Office Movares Nederland BV
 Construction Period 01/2015 - 2/2016

The **Parallelstructuur Gouda** consists of two new regional roads, built to decrease traffic intensity on the main A12 and A20 highways near Gouda. One of these roads crosses the river Gouwe with a **new bascule movable bridge**. The bridge has a width of about 22 m and the main girder has a span length of 30 m. Therefore it is one of the **largest** bascule bridges in the Netherlands.

The design is an **orthotropic steel deck** with steel main girders. The process of designing of a bridge with a steel bridge deck is dominated by the **fatigue** testing. This means a very detailed model in SCIA Engineer was required, with a fine mesh, and a model made with only plate elements. From this model, influence lines could be exported and a fatigue test carried out. The **strength and stability** verification is also done using this model, as well as determining the counterweight for **balancing** the bridge.

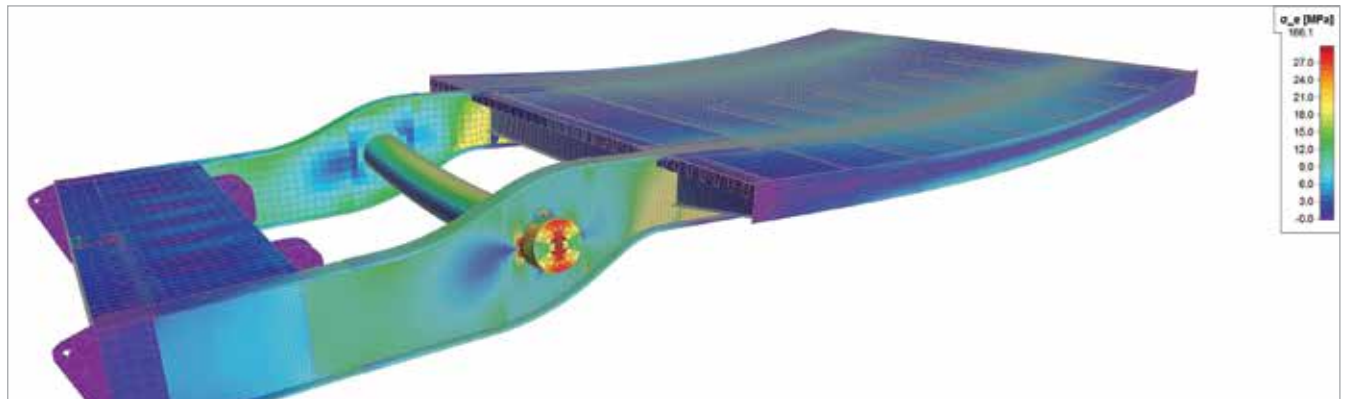
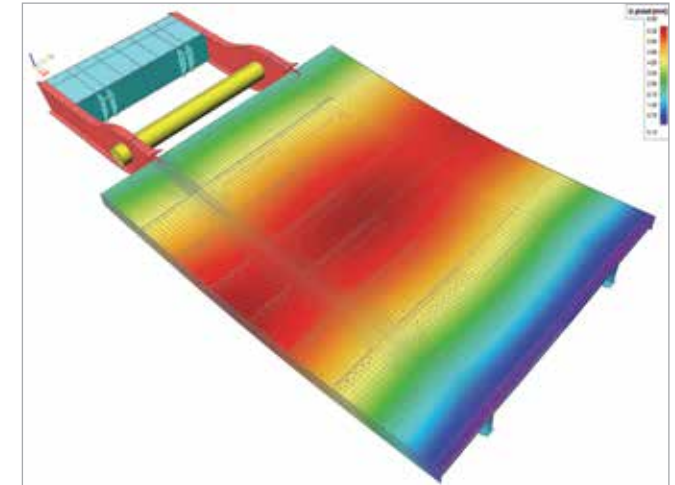
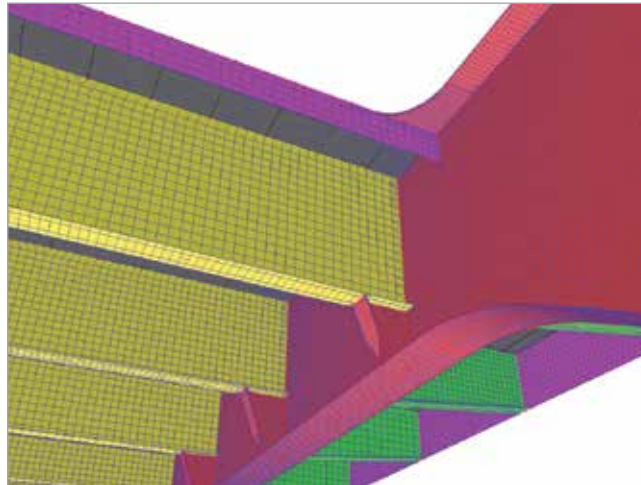
Special attention was paid to the **stability of the web plate** around the main centre of rotation. A specific demand was that this plate could not have stiffeners. Consequently a combination of **plate buckling** and **global buckling** can occur. Since the plate is not rectangular, no proper Eurocode calculation was possible, so a **non-linear calculation** was done using SCIA Engineer.

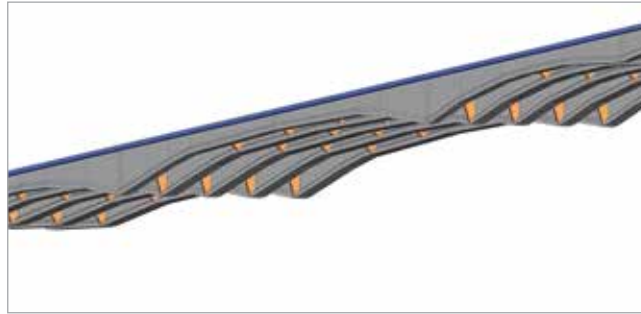
Movares Nederland BV

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 Postbus 2855
 3500 GW Utrecht, The Netherlands
 Website www.movares.nl



Movares is an engineering consultancy providing solutions in the fields of mobility, infrastructure, building and spatial planning. Usability, future value and sustainability play a major role in the designs we produce. We contribute to accessibility through our unique combination of expertise. Infrastructure is the backbone of development, both for society and the economy. Movares plays an active role throughout the entire consulting and engineering process. Our combination of knowledge, expertise and innovativeness is summed up in our motto: **'Giving shape to mobility'**.





Owner Province Zuid Holland
 Architect Unknown
 General Contractor Nebest B.V.
 Engineering Office Nebest B.V.
 Construction Period 1951 - 1952

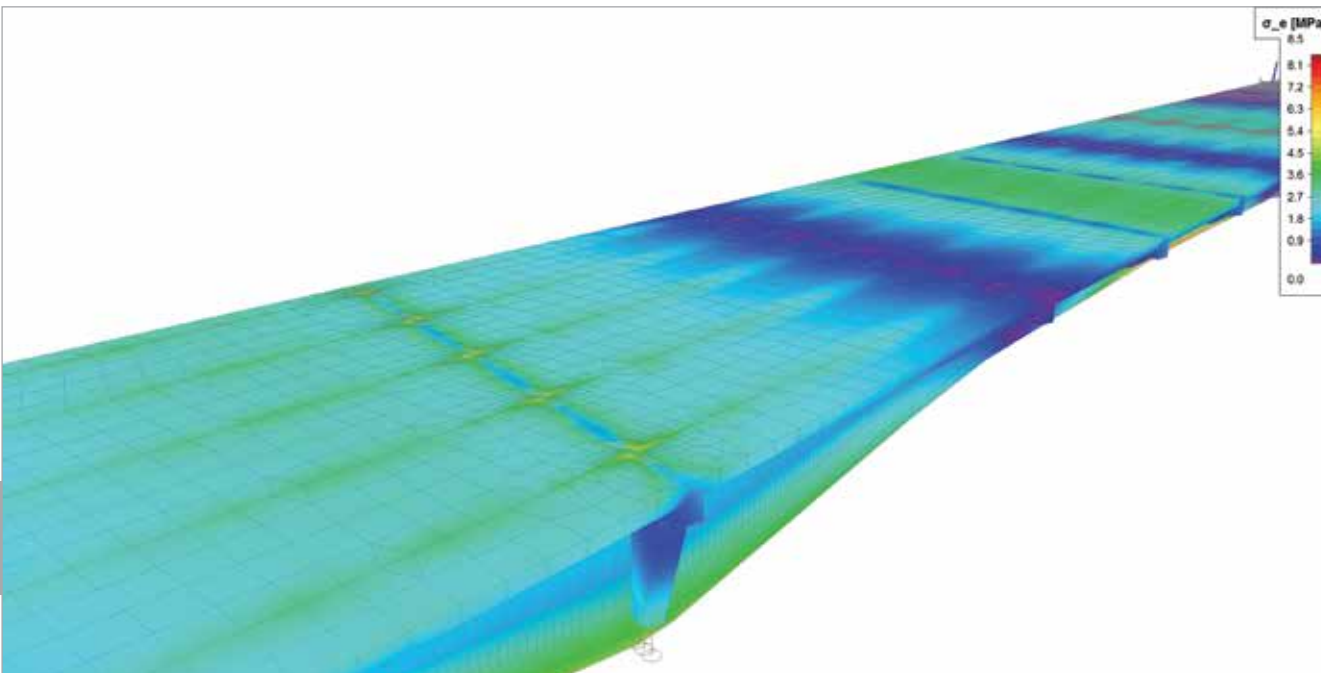
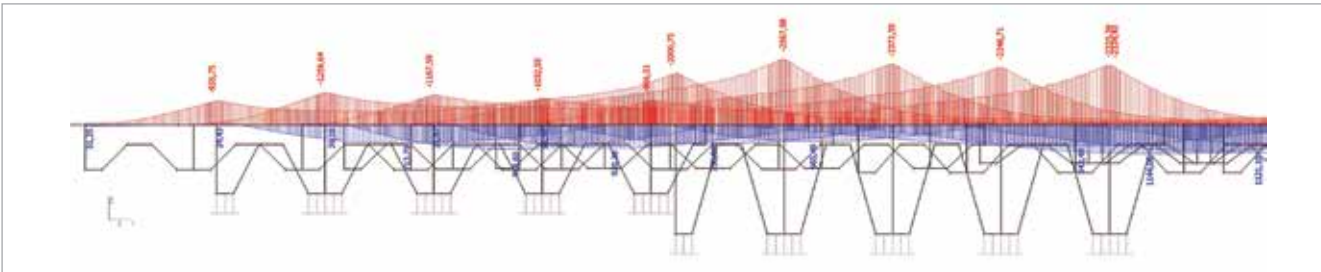
The bridge was built in 1951/1952 near Leimuiden in Holland over the river De Drecht. The bridge has a total length of 80 m.

Due to the increase of traffic loads in the Eurocode, the bridge needs to be replaced by a new bridge in the near future.

As part of the building process of a new bridge, the old bridge will be half demolished in the direction of the main girders. The remainder of the old bridge will be used to enable traffic to continue to cross while the new bridge is being built in the same location as the old bridge.

SCIA Engineer is used to calculate the forces in the remaining half of the old bridge. For this a 3D model is used. The girders are modelled as ribs with a lot of variable cross sections along the bridge. SCIA Engineer automatically calculates the rigidity of all the cross sections and calculates the forces in all the different load combinations.

The main challenge was to recalculate the old bridge based on drawings, data on prestressed girders, model data and calculation results in SCIA Engineer to find out the load capacity of the old bridge.



Nebest B.V.

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 Website www.nebest.nl



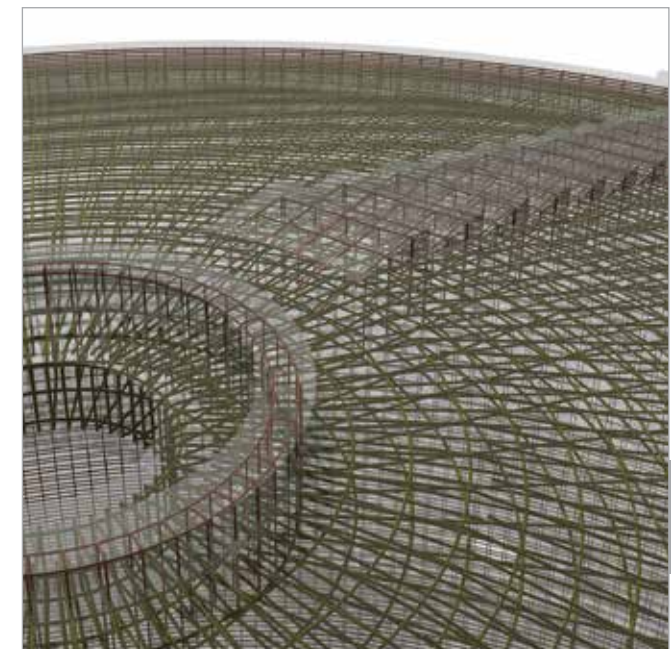
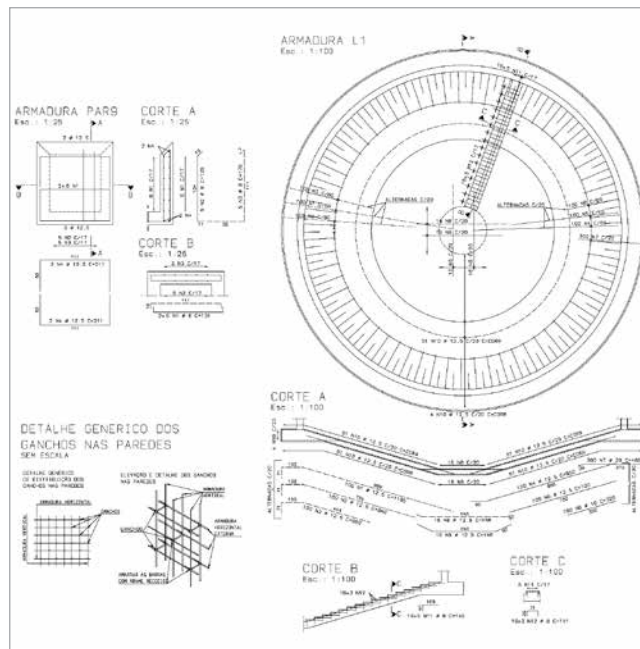
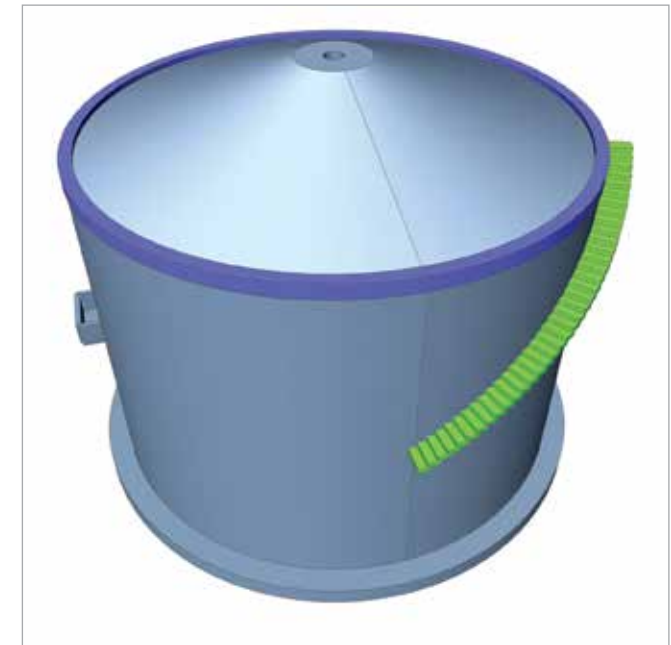
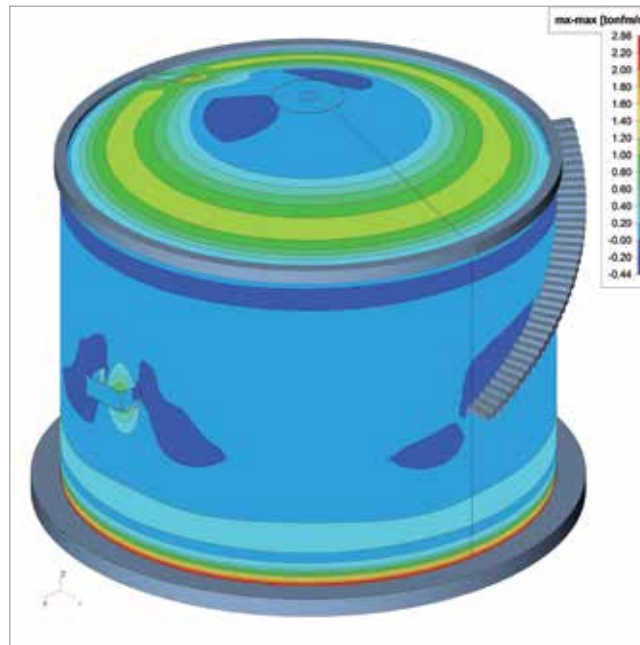
Nebest B.V. is an engineering office, specializing in inspections, technical advice and project management of infrastructure, electrical and civil projects. Nebest B.V. has many years of experience and knowledge of inspections and maintenance of concrete, steel and wood constructions. In collaboration with premium foreign institutions, Nebest B.V. has gained exclusive knowledge and experience in the development and practice of new research methods. Nebest B.V. specialises on advice in: visual inspections, laboratory research, specialized technical inspections and maintenance advice. The calculations for this project were made in collaboration with Tauf B.V.

Owner Companhia de Saneamento do Paraná SANEPAR
 General Contractor Companhia de Saneamento do Paraná SANEPAR
 Engineering Office Proensi Projeto e Engenharia de Sistemas

The **Digester** is a semi-buried structure. The underside of the bottom slab is found at 9.5 m below ground. The internal diameter is 20 m and it has a height of 19.1 m. The bottom slab is 40 cm thick and has a conical shape. Alongside the external circular wall, the bottom slab has its thickness enhanced to 80 cm, forming a 100 cm cantilever projection over the face of the wall. This cantilever reduces the contact pressure between structure and ground underneath the walls. The external walls are 40 cm thick and 14.50 m high. There are circular stairs, 20 cm thick, cantilevering from the wall. The whole structure has been designed in reinforced concrete.

The structure was modelled in **SCIA Engineer** and the results (stresses, areas of steel reinforcement and tensions) were taken from this model. After some iteration, we found the definite model that gave us the parameters for designing and detailing of the structure. According to the diagrams the maximum stress on the ground was 2.20 kgf/cm².

From the analysis information obtained in SCIA Engineer, the design was created using Eurocodes along with the application of some criteria given by NBR 6118. The critical elements were verified in both codes. The software **Allplan Engineering** was used to produce the 3D model and drawings of all concrete elements of the structure, including reinforcement drawings.

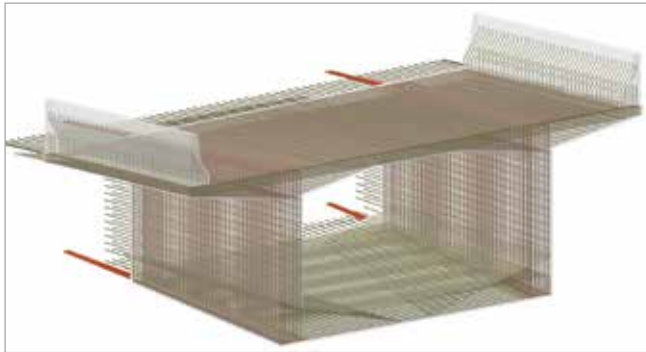


Procalc

Contact Jorge Silka
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 81200-200 Curitiba, Brazil
 Website www.procalc.com.br



Procalc was founded in August 1989 in Curitiba-PR, Brazil. The company develops projects in many fields such as: residential and commercial buildings, industry, public sector projects for environmental sanitation and structural strengthening projects. **Procalc** benefits from vast professional experience, which it applies as well as the best technological resources available to create precise structural solutions combining best technique, economy and buildability. We have already designed more than 2,500,000 m² of building structures, more than 400,000 m³ of concrete tanks and more than 500,000 m² of industrial structures.



Owner *Confidential*
 Architect *Confidential*
 General Contractor *Projenog Engenharia de Projetos Ltda*
 Construction Period *12/2014 - 06/2015*

This flyover has a total length of 214 m, spanning 18, 34 and 55 m, and a total width of 9.56 m. Currently, the foundation is being executed on site and the executive project is almost finished.

Allplan Engineering software was used to generate formwork and reinforcement drawings. The 3D model was made using the Bridge/Civil Engineering Component tool, defining horizontal and vertical curves and variable sections of the entire flyover. Columns and foundations were also modelled. Finally, all elements were reinforced and detailed.

Because this was the first time Projenog had used Allplan Engineering for a real project, many challenges had to be overcome, such as the team adapting to a new tool and the changes that the new tool can bring to optimise the reinforcement detailing while maintaining the standard quality of drawings. Projenog didn't see any increased productivity in this initial project compared to similar projects done with 2D CAD software, but can see from the results that using Allplan brought about an improvement in terms of quality and presentation precision.

In conclusion, with the combination of the Projenog team's ability and the great potential of the Allplan Engineering software, Projenog will develop all future projects using Allplan Engineering with even more confidence and mastery.

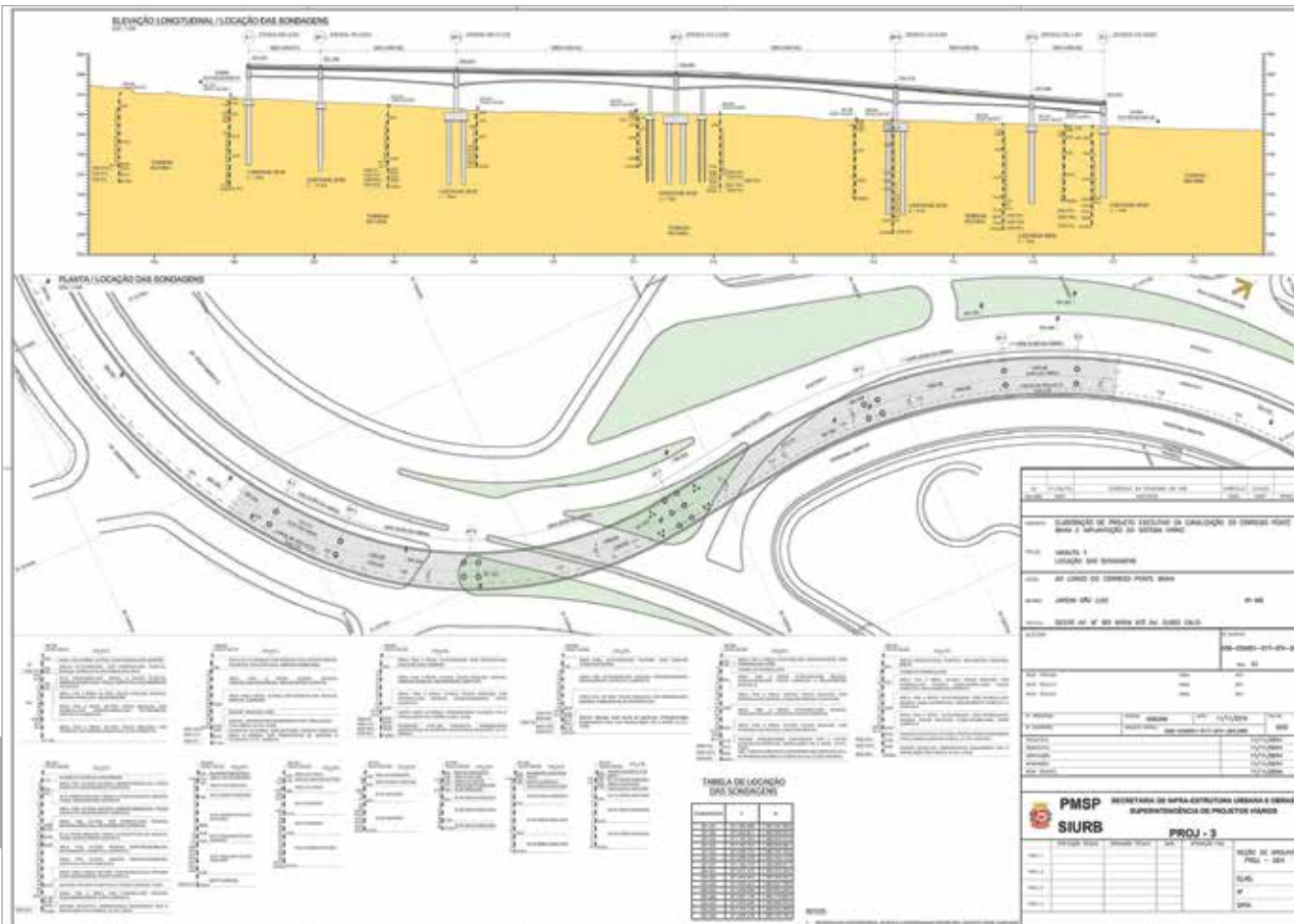
Projenog Engenharia de Projetos Ltda

Contact *Heitor Afonso Nogueira Neto*
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09750-730 São Bernardo do Campo, Brazil
 Email *hnogueira@projenog.com.br*



Projenog Engenharia de Projetos was founded in May 2012 and specialises in the art of structural projects. Projenog was born to meet the high demand for infrastructure projects in Brazil. Composed of a young and experienced team Projenog is a visionary company focused on two main values: reliability and quality.

Creating **civil structure projects**, with the most varied typologies as precast, post tensioned, shored structures, successive spans, etc., Projenog mixes private and governmental clients.



Owner Town Doetinchem
Architect Aveco de Bondt
General Contractor Van Boekel Zeeland bv
Engineering Office Roxeler Ingenieurgesellschaft mbH
Construction Period 05/2013 - 10/2013

The newly built bicycle underbridge passes under a busy main street in the town of Doetinchem in the province of Gelderland. The tunnel was formed using precast elements, weighing up to 50 t each. Geometrically, these elements are trapezoids with bore dimensions of 750 x 275 cm. The approach elements on both sides were also built using precast elements. All elements were sealed by grouting the joints. The soil had very low bearing capacity, which is why the elements were prestressed to make the tunnel less sensitive to different ground water levels or soil movement. Inside the passway, colour-variable lighting was installed, giving it the nickname of the "disco tunnel" in Dutch media.

All precast reinforced concrete elements were designed using SCIA Engineer. They were individually calculated as frames. The design checks for the longitudinal prestressing within the highly loaded middle part were calculated by modelling the entire system in one finite element calculation.

Construction / delivery:

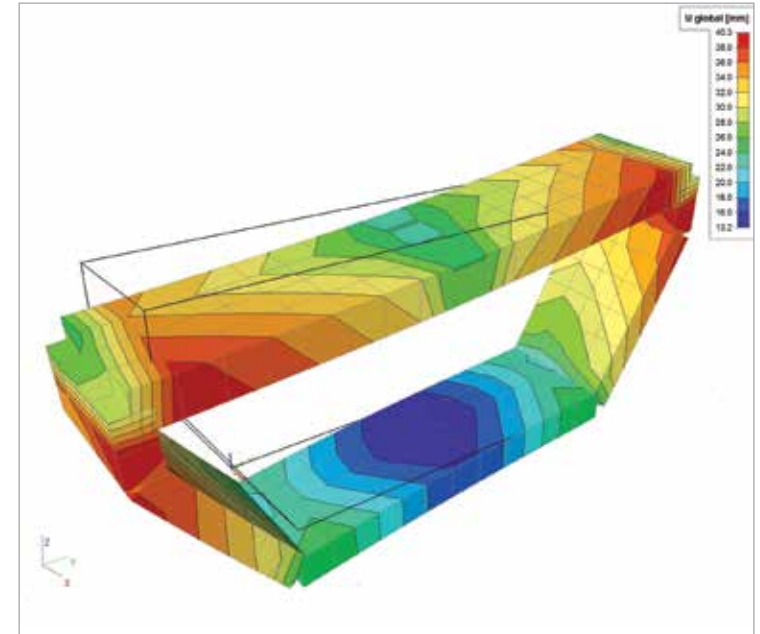
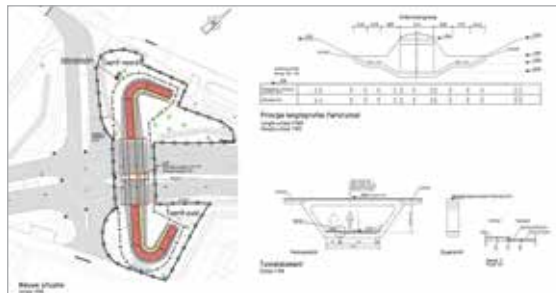
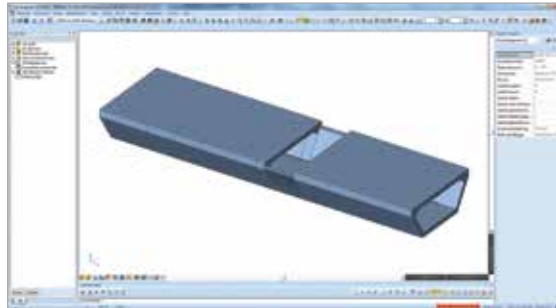
- Kleihues Betonbauteile GmbH & Co. KG (Germany)
- Van der Linden Beton bv (the Netherlands)

Roxeler Ingenieurgesellschaft

Contact Dipl.-Ing. André Henning
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 48161 Münster, Germany
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The Roxeler Ingenieurgesellschaft (Roxeler Engineering Society) has been successfully working in engineering for more than 40 years. Our competences include designing civil, building, environmental and soil constructions. In order to create economic, aesthetic and sustainable solutions, we use complex finite element models and intelligent algorithms. Realistic discretisation of building design taking non-linear and time-dependent material laws into consideration provides scope for architectural design beyond normal limitations.



DDS-CAD: Open BIM for MEP engineers



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W www.dds-cad.com

Data Design System is a member of the Open BIM initiative **OPEN BIM**



DATA DESIGN SYSTEM
A NEMETSCHEK COMPANY

Design of general steel or concrete structures, power plants, frame structures, large span halls and hangars, pre-engineered buildings...
for which SCIA Engineer and/or Allplan Engineering software has been used.

Industrial Buildings and Plants

3

Winner Category 3

Quote of the Jury: "The way different complex technical aspects of this project have been mastered makes this project quite unique. A variety of calculation types were performed by combining a large number of features available in a single software program - SCIA Engineer. Furthermore, this engineering effort contributes to the provision of sustainable energy."

Owner Nant de Drance SA
Architect Nunatak sàrl
General Contractor GMI (Groupement Marti – Implénia)
Engineering Office BG Consulting Engineers SA
Construction Period 2011 - 2017

The Nant de Drance pumped storage project is a hydroelectric power facility in Switzerland with a capacity of 900 MW. By 2019, it is forecast that this facility will produce 2500 GWh of peak energy per year. At 184 m long, 32 m wide and 52 m high, the main transformer cavern is a reinforced concrete structure, excavated in the rock.

The first challenge was to identify the risk scenarios and the limit states, by analysing the cavern stability and the surrounding rock mass.

The second was to reproduce the complex electromechanical forces in the model and apply them to the structure.

The third was to respect the very strict deformation and stiffness criteria, which were imposed by the manufacturer.

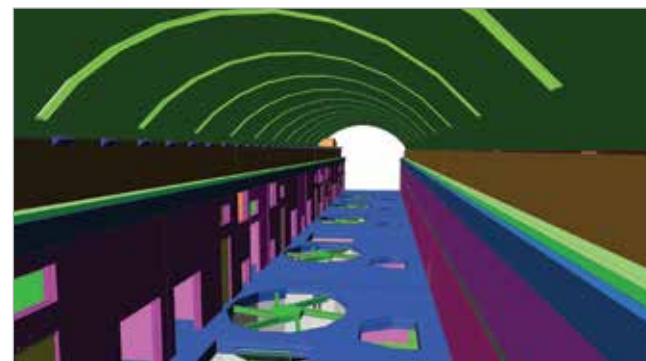
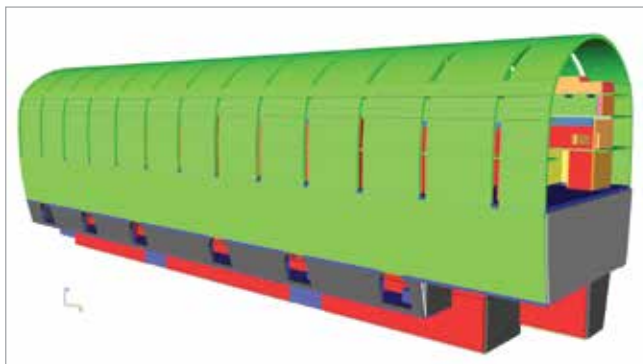
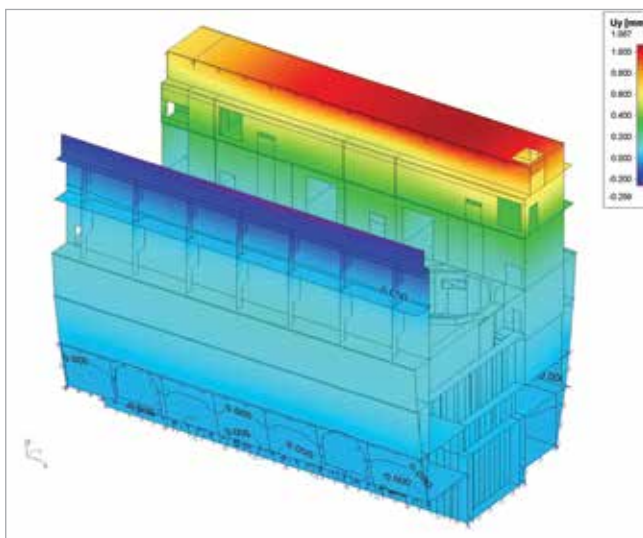
It was necessary to create several calculation models to analyze all these constraints. The 3D model provides an indication of the general behaviour of the structure and its reinforcement. Nonlinear calculation allows the cavern walls to be designed and reinforced. Multimodal calculation and time domain dynamic analysis allow us to understand the overall behaviour of the structure with regard to risks linked to operation of the machines. This publication addresses the analysis and design of the underground cavern structure in Nant de Drance project, by taking full advantage of the potential of SCIA Engineer numerical tool.

BG Ingénieurs Conseils

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 Patrick Heck
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Website www.bg-21.com



BG is a Swiss engineering consulting company with an international outlook, which focusses on providing its clients with cutting-edge solutions for the development of a sustainable world. Its expertise covers various areas ranging from infrastructure, environment, and construction to energy, with particular focus on water and transportation. The BG Group currently employs over 600 people in Switzerland, France and Algeria. Founded in 1954, the BG Group celebrated its 60th anniversary last year with a new visual identity.





Owner Nike Europe Holding BV
 Architect Jaspers-Eyers Architects
 General Contractor BPC
 Engineering Office Arcadis Belgium nv office Ghent
 Construction Period 07/2014 - 03/2016

E-commerce is a booming business and has inspired Nike to build a new, highly automated, distribution centre, being built next to the existing Nike-site at Laakdal and will be in production starting from March 2016.

The complex of 150.000 m² consists of several different blocks. The goods are stored in two fully automated high-bays, with a store capability of 18 million pairs of shoes. The main dimensions per high-bay are 81 m width, 100 m length and 41 m height. The steel structure of the 41 m high racks also serves as the main structure of the building, known as clad racking.

Shipping, receiving and processing of goods happens in the low-bay on 4 levels. Dimensions here are 240 m by 72 m and 26 m height.

The structure is in precast concrete-elements. In between low-bay and high-bay there is a conveyor zone mainly of steel (162 m by 21 m by 26 m height). Next to the low-bay we have an office building. And next to that there is a two level carpark building of 36 m by 285 m that is also constructed in precast concrete-elements.

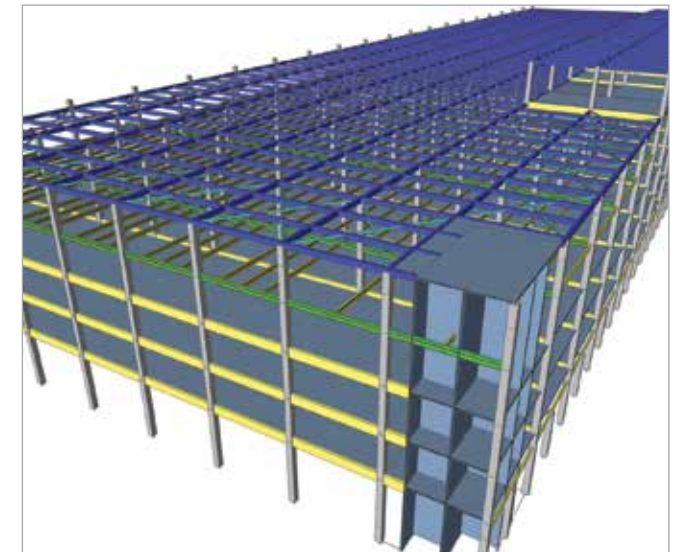
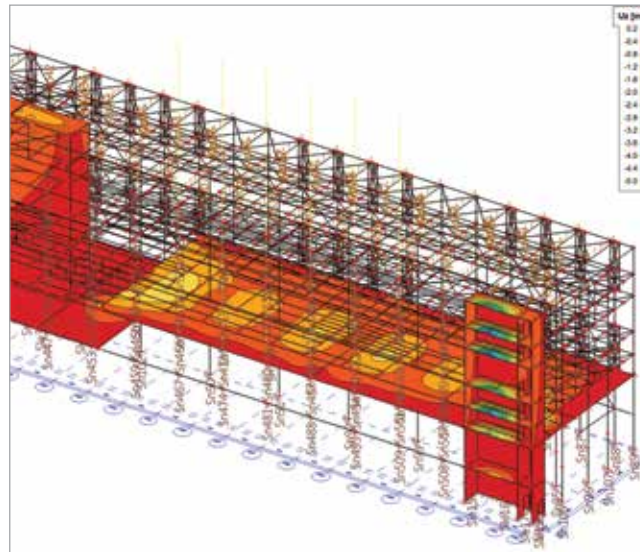
SCIA Engineer was used to make FEM models of each different block, steel or concrete. The great advantage was the possibility to model all the load cases the structure is subject to, which finally led to obtaining internal forces in the stabilising cores. That would not be possible without SCIA Engineer due to the large dimensions and complex thermal joints.

ARCADIS Belgium nv

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ARCADIS is the leading global design and consultancy firm for natural and built asset designs. It works in partnership with clients to deliver exceptional and sustainable outcomes through the application of design, consultancy, engineering, project and management services. ARCADIS differentiates itself from other firms through market sector insights and the ability to integrate health, safety, and sustainability into their design and delivery of solutions across the globe. ARCADIS is a firm of 28,000 people that generate €3 billion in revenues.

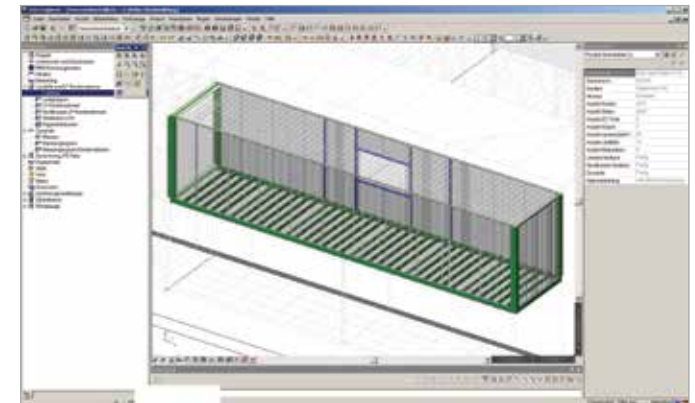
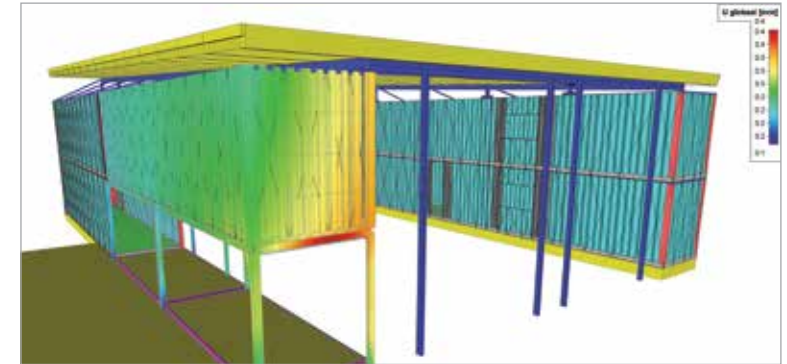
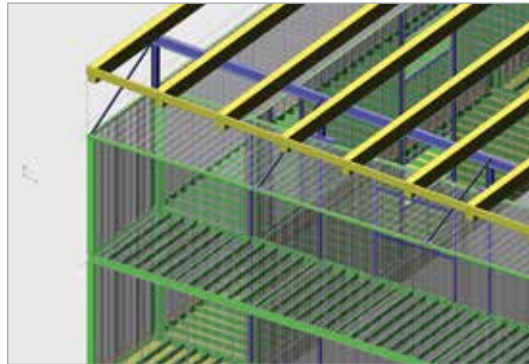




Owner GTS Mannheim
 Architect Peter Epp Mannheim
 General Contractor GTS Mannheim
 Engineering Office Ryklin STATIK
 Construction Period 12/2012 - 02/2013

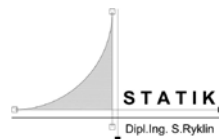
A new weather-protected space was urgently needed for truck maintenance on the new GTS-Mannheim production site. It needed to be a low-cost solution that was quick to build.

The client idea was to **use old recycled containers** as the wall parts with a light roof above. This would make it possible to **create the storage and maintenance spaces at once** and the execution could be processed very quickly and easily. The hall has an outer size of approx. 24 m x 17 m x 7 m. The covered area measures approx. 430 m² and provides about 320 m³ for storage and 1,700 m³ for truck maintenance. The designed container walls including required openings and steel-wooden beam roof were built up in **SCIA Engineer with Structure, 3D-Free-Modelling and Drawing tools**. The calculations were processed in SCIA Engineer according to **2nd order theory under EC loading including earthquake**. The results of the calculations gave feedback about roof-container connections and wall reinforcement required. All the overviews, elevation, execution and detail drawings were processed and created in SCIA Engineer with appropriate modelling- and drawing tools. The main planning challenge was to combine different given types of the old sea and office containers with the **new roof structure**. **Different openings for the required windows, doors and interconnections had to be created and adapted/reinforced due to the roof loads.**



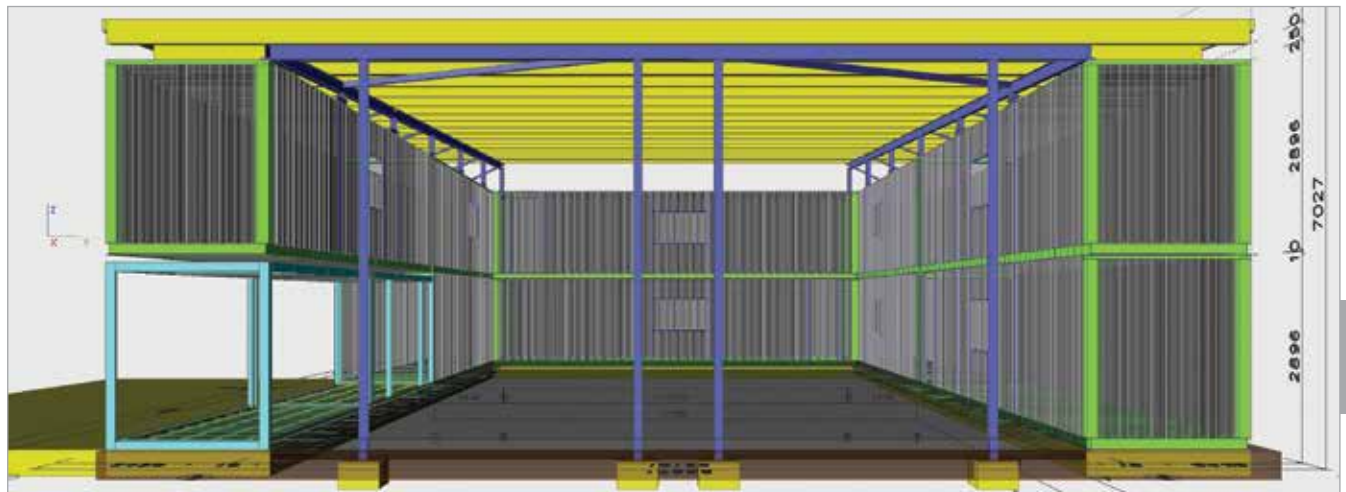
Ryklin STATIK

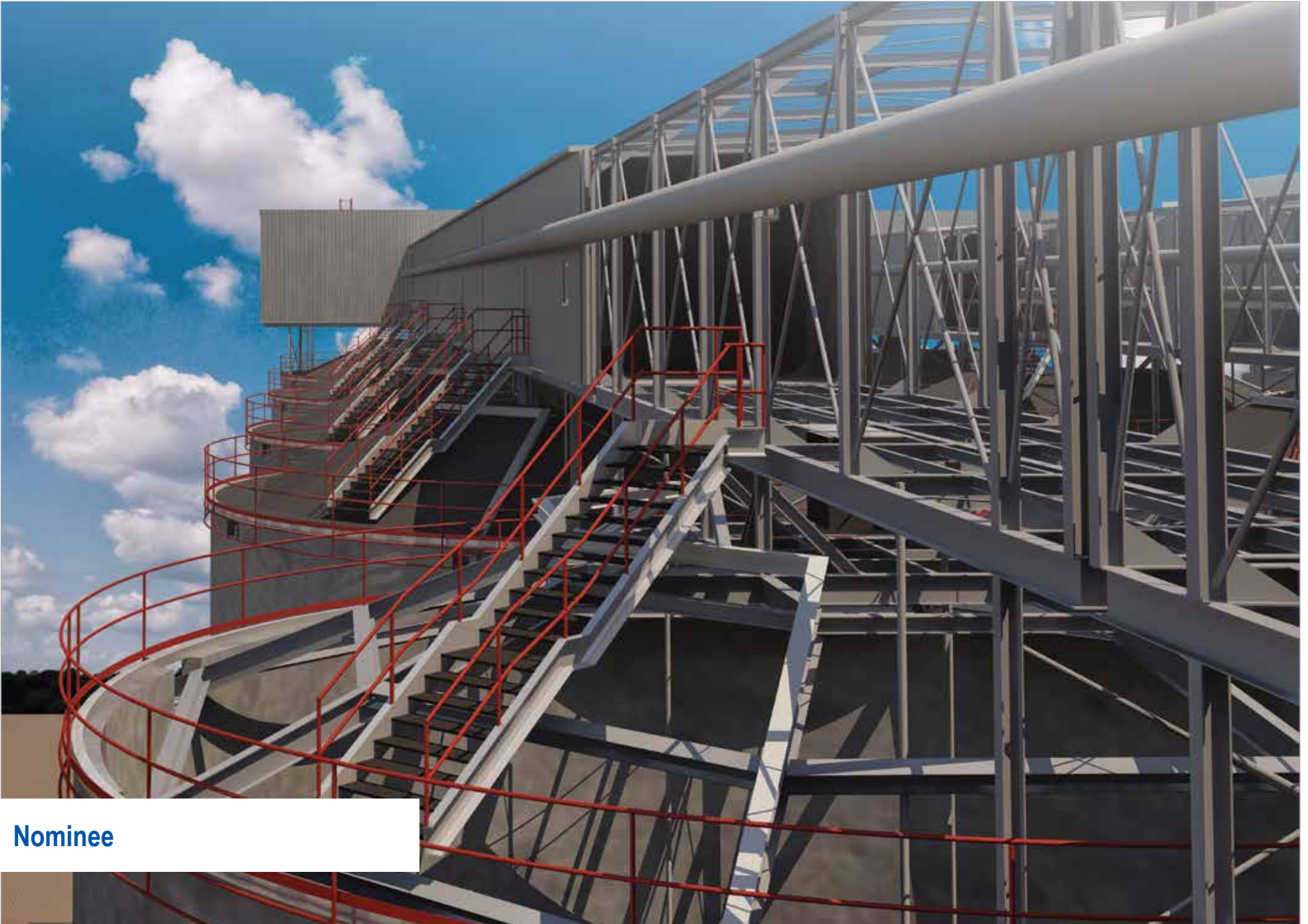
Contact *Sergej Ryklin*
 Address *Liselottestrasse 17*
69123 Heidelberg, Germany
 Website *www.ryklin.eu*



Planning and optimization of **steel, aluminium, solid, composite, timber and membrane structures**.

More than 1,000 different projects processed including residential and industrial buildings, car park decks, pedestrian bridges, swimming pools, silos and membrane coverings for Daimler, John Deere, SAP, DB, Siemens, Henkel, BASF, Bridgestone, Roche, IKEA and a lot of private clients. The philosophy of the Company is to offer **flexibility in planning due to integral 3D-Design** with the ability to find feasible and low-cost solutions starting at draft stage.





Owner Eurosilo
 Architect VK Engineering nv
 Engineering Office VK Engineering nv
 Construction Period 10/2015 - 07/2016

Euro-Silo is a distribution centre for grain and derivatives in the port of Ghent. Currently, VK is working on **16 new vertical grain silos (Ø18 m) with a filling height of up to 40 m**. Special attention had to be paid to the differential deformation of the conveyors on top of the silos due to deviating filling grades and the corresponding settlements. The entire project involves 750 tons of steel S355 and 20.000 m³ of concrete C40/50.

In this project, SCIA Engineer was used to carry out several analyzes: the **global stability**, the **interaction of the subsoil** with the foundation slab and the silo walls, the impact of extreme **temperature differences** of up to 71°C, peak pressures of up to 900 kN/m² due to **dust explosion** and the efficiency of the silo. Also the **Revit-link** was used for fast modelling and drawings. To reduce the execution time and the flexibility of the connections of the steel structures, a **modular structure** was designed to be easily assembled. In the first stage, the different components of the structure were modelled separately to make a first estimation of the internal forces and the reactions. Afterwards, a complete 3D model was composed to optimise the structure, to determine the reinforcement and to evaluate overall differential deformations.

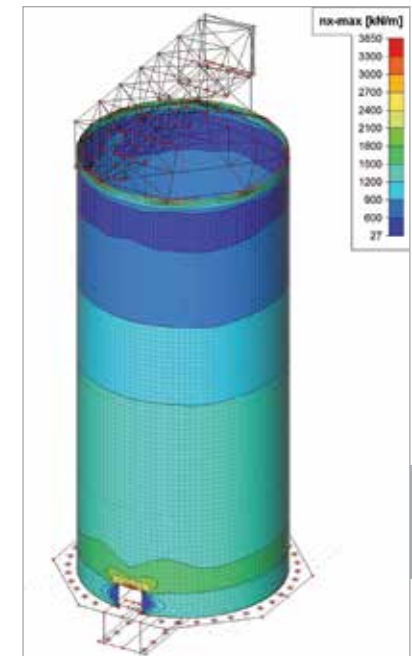
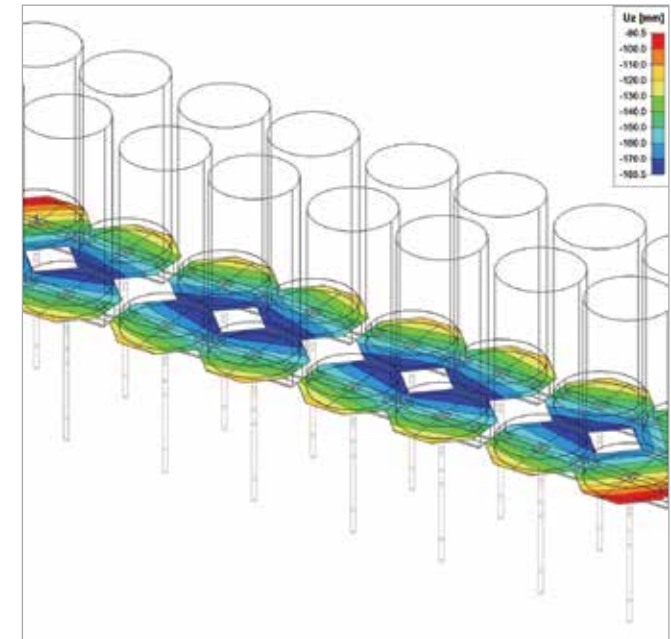
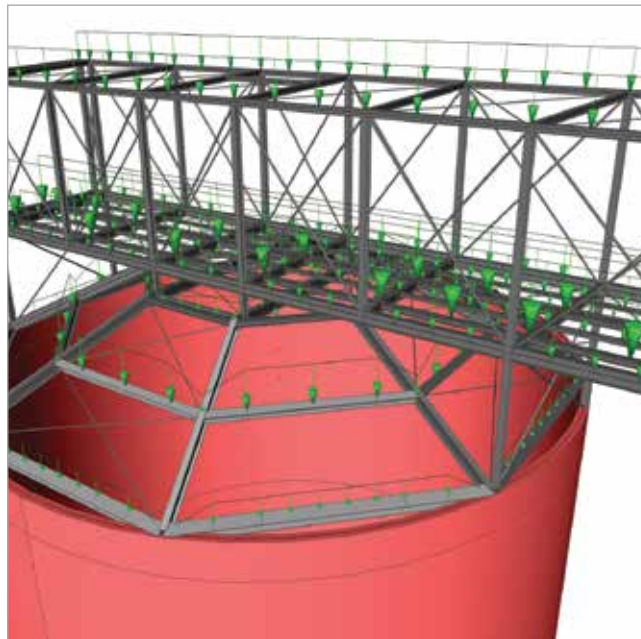
The silo walls are designed as thin as possible, to reduce the impact of the extreme temperature differences. **Joints** are created in the foundation slab to reduce the internal forces due to settlements.

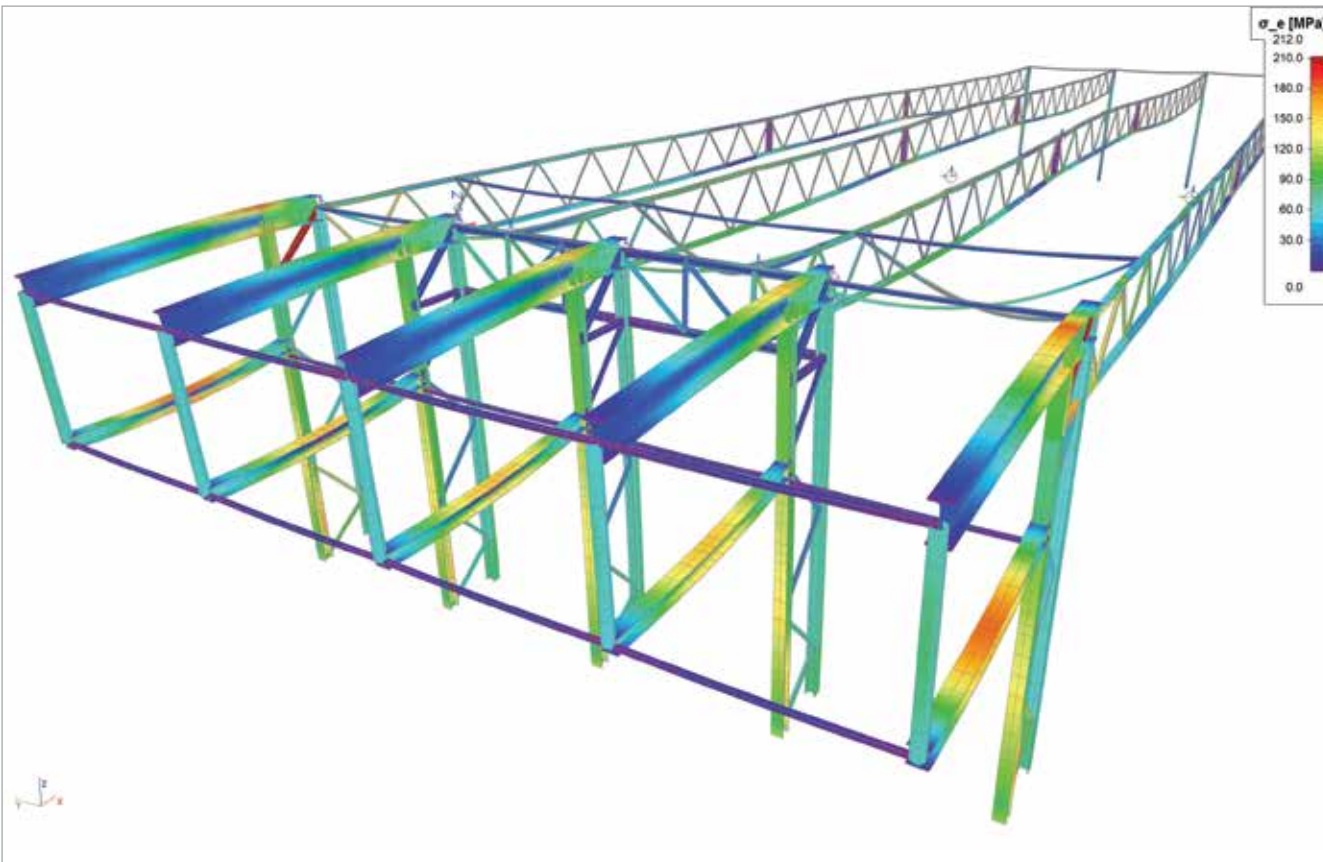
VK Engineering

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VK Architects & Engineers offers its services in healthcare, buildings, industry and public space. Our multi-disciplinary engineering building services and civil & structural engineering have a proven track record with renowned architects. VK's portfolio features many challenging and large-scale projects, new constructions, as well as renovations, expert assessments and management. The new NATO headquarters, the Antwerp law courts and the Ghent Ghelamco Arena are but a few examples.





Owner *Loda*
 Architect *AID Architecten*
 General Contractor *ASK-Romein Malle*
 Engineering Office *ASK-Romein Malle*
 Construction Period *06/2013 - 05/2014*

The project involves a new building for Loda, producer of bleach and demineralized water. ASK Romein proposed using coated steel construction to meet the strict fire requirements.

The building consists of a large storage hall and multiple compartments for production, water treatment and machine rooms, each separated by fireproof walls. The outside facade is built up with horizontal sandwich panels. The office space, with a cantilever span of 5 m, is suspended above the loading bay.

Thanks to SCIA Engineer, the entire construction could be modelled, both in 2D and 3D. The introduction of loads and generation of load combinations is done in an efficient way.

The specific problem of the cantilever in the facade was solved with rigid lattice columns. The software provided an easy insight into the effects of internal forces and stresses.

In this project it was of high importance to accurately calculate the deflections and deformations. SCIA Engineer has proven to be a powerful tool for the successful completion of the project.

ASK-Romein Malle NV

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2390 Malle, Belgium
 Website *www.ask-romein.com*



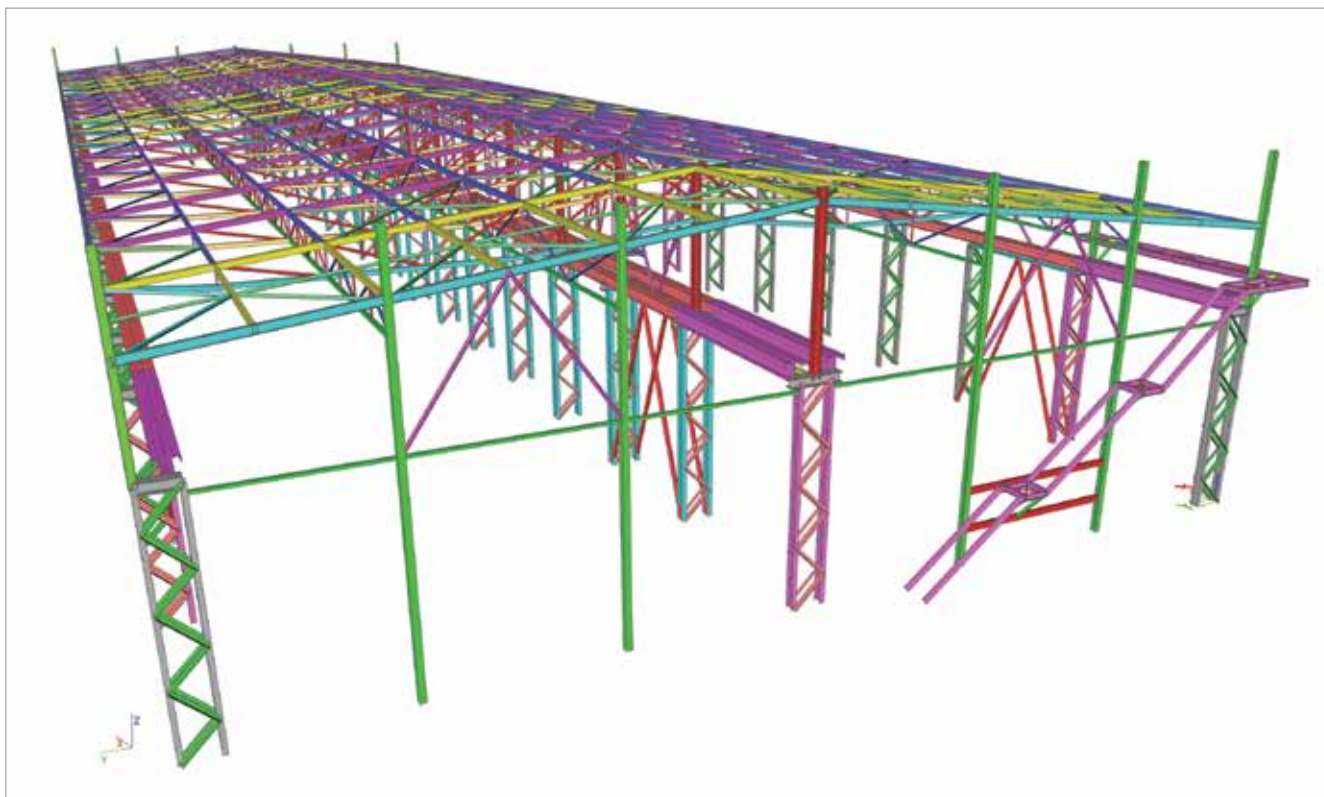
Since the merger of the ASK companies and Romein Staalbouw B.V. in 2002, ASK Romein has successfully grown into one of the leading steel construction and general building companies in Western Europe. By combining our strength we are able to execute larger and more ambitious projects. We operate from three locations in Roosendaal and Vlissingen (The Netherlands), and in Malle (Belgium). From feasibility and concept development our employees design, engineer and realise projects for various segments like industry, offices, distribution centres, offshore, high rise buildings, leisure, food etc.

Owner *Ostroj Ltd.*
 Architect *Ing. arch. P. Gottwald*
 General Contractor *Femont Ltd.*
 Engineering Office *Atelier P.H.A. Ltd.*
 Construction Period *2014*

Building geometry and structural system: The design for the foundations uses raked Franki piles. The main load bearing structure consists of double wing steel frames with a span of 17.0 m and a 10.0 m eave height. Truss columns are anchored into foundation pads. The secondary structure consists of roof beams and stability beams with diagonal cross bracings. The contractor required four 25 t cranes.

Design process: The training module was calculated in the SCIA Engineer program and exported to the Tekla program with Module SCIA 2 Tekla. The designer used this perfect combination of programs for design and fabrication of steel constructions. For fast feedback, the designer used a 3D export from Tekla to the browser.

Conclusion: The whole structure was calculated using a complete 3D-model. In this way the total influence of all external loads could be considered and the global stability calculated, with the accompanying deformations, as well as the details of connections. The designer made use of programs for collaboration between contractor, designer and different software.

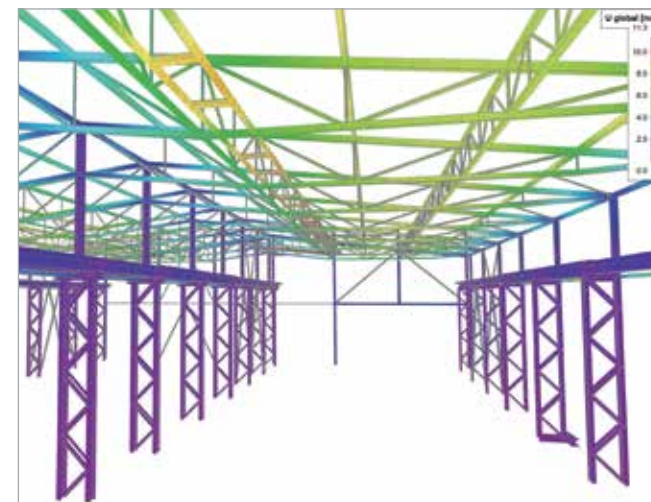


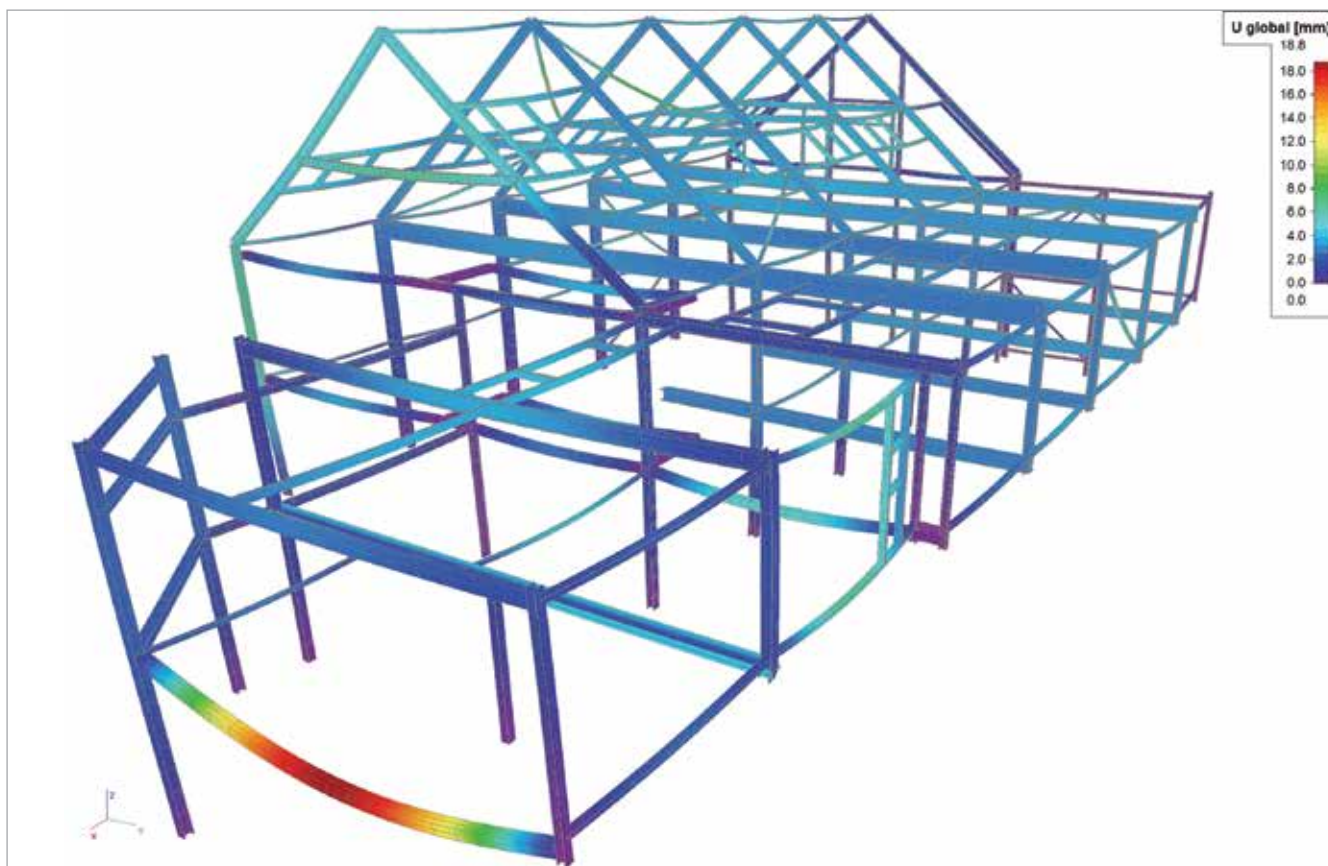
Atelier P.H.A.

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 Website *www.atelierpha.cz*



Atelier P.H.A. was founded in 1990. It deals with design tasks, preparation and implementation of investment projects and engineering activities and is an expert in the field of construction and real estate investments. Participation in expert opinions on the condition and measures taken on load-bearing structures in industrial sector, high-rise apartment buildings, apartment building regeneration, expert opinions on the impact of emergency situations like fires and flooding on load-bearing structures, building passports during reconstruction etc.





Owner LLM Mecasport
 Architect Nicolas Halleux
 General Contractor Serbi
 Engineering Office Ateliers Mersch
 Construction Period 03/2014

The project involves the **construction of a car showroom** with facilities to repair Porsche and other luxury cars.

The new garage is located at the entrance to the Formula 1 circuit of Spa Francorchamps.

In collaboration with the architect and general contractor, we designed a steel support structure.

The building consists of a 480 m² workshop on the ground floor of with a 235 m² mezzanine accessible via a freight elevator for storage of spare parts, a small 107 m² showroom for displaying some prestige vehicles, an office upstairs from the showroom and finally a 312 m² apartment. The apartment on the first floor has a covered terrace with direct views of the Spa-Francorchamps circuit.

Following consultation with the fire department and the study of various technical solutions, amongst which the possible oversizing of the structure - studied with the SCIA Engineer software - the chosen solution has been a non fire resisting structure together with a 1-hour intumescent paint.

The metal structure details were calculated using the SCIA Engineer program in accordance with Eurocode 3. Specific use loads applied as a jacuzzi on the terrace had to be taken into account.

Ateliers Mersch s.a.

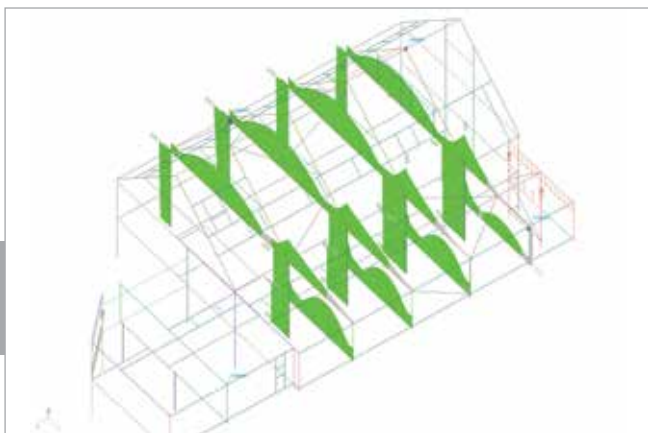
Contact Thierry Mersch
 Address ZI des Plénesses - Rue du Tiège, 7
 4890 Thimister, Belgium
 Website www.ateliersmersch.be



Our workshops specialize in the manufacture and assembly of steel structures.

We are a family business of about twenty employees, our company develops structures ranging from a few tons to hundreds of tons for clientele of industrial and construction companies.

Based in the Verviétoise area for almost 50 years, our company continues a tradition of expertise and integrity and is popular in Belgium and abroad. It is their attention to detail, high-quality work, sense of responsibility, and respect for our commitments that characterize our dynamic SMEs.



Owner *Mertens Plastique*
 Architect *Atelier Concept*
 General Contractor *Ateliers Mersch*
 Engineering Office *Ateliers Mersch*
 Construction Period *04/2014 - 05/2014*

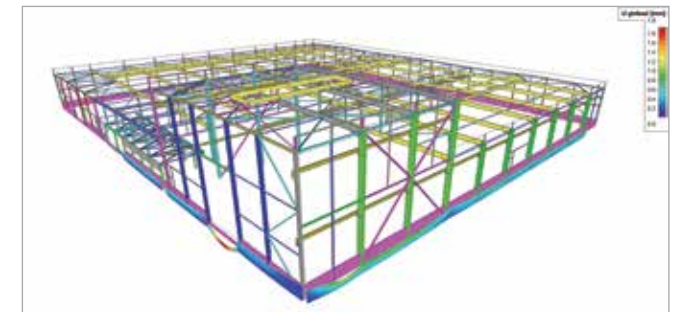
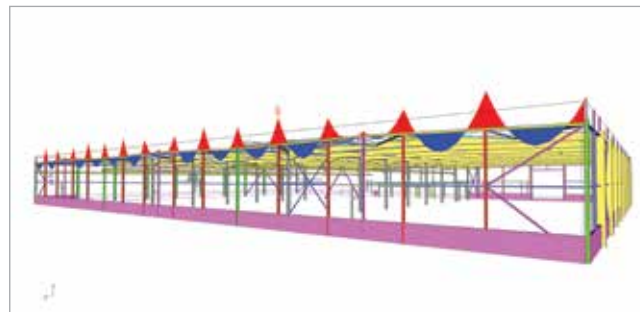
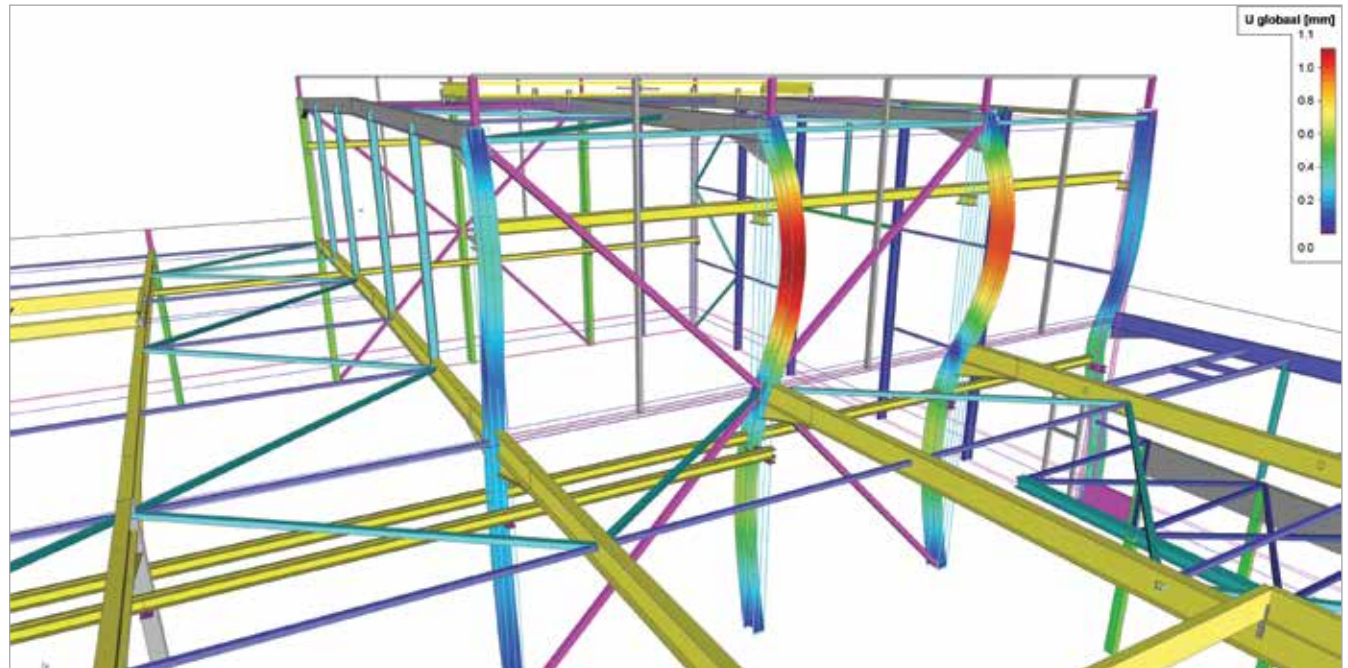
The project involves the construction of a plastic-parts manufacturing plant for the company Mertens Plastic.

In collaboration with the architect, we designed a steel support structure for the whole workshop.

The building has a total area of 4300 m² and includes a part with a raised roof at a height of 12 m to allow for the mounting of plastic tanks of large dimensions.

The structure consists of three contiguous sections of 24 m. A 3.2 ton crane extends over two of them. There is a second upper crane in the tower section for handling large workpieces.

The metal structure was calculated using the SCIA Engineer program in accordance with Eurocode 3. Specific charges for the use of solar panels had to be taken into account.



Ateliers Mersch s.a.

Contact *Thierry Mersch*
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4890 Thimister, Belgium
 Website *www.ateliersmersch.be*

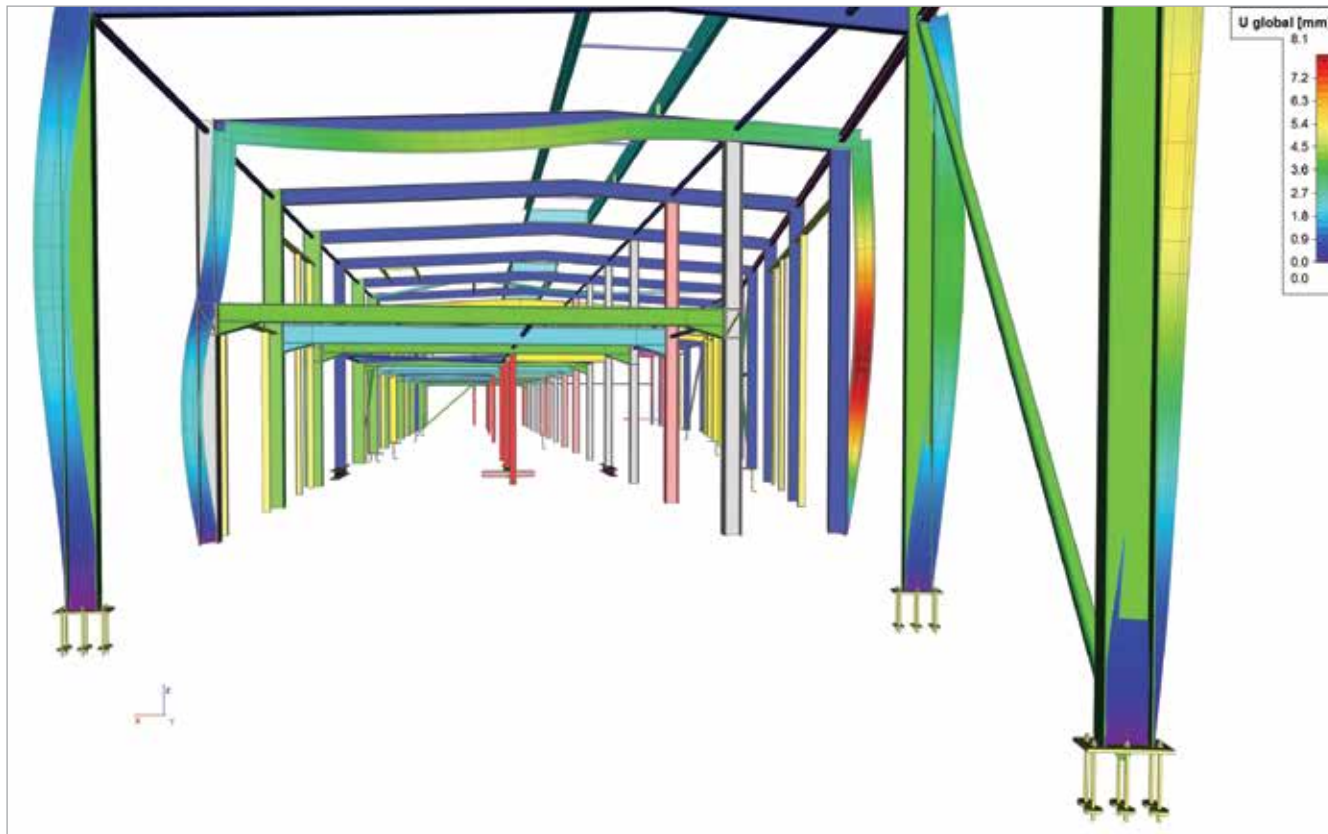


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Owner Wandhaff
 Architect Pawlowski D / Project
 General Contractor C Jans
 Engineering Office Ateliers Mersch
 Construction Period 03/2013 - 04/2013

The project involves the construction of a manufacturing plant in Luxemburg in the zoning Windhof.

In collaboration with the contractor and the architect, we designed a steel support structure for the whole workshop.

The building has an area of 1850 m². It has a beveled form to account for the locations of existing roads.

In part of the structure there is a mezzanine floor which can take a working load of 300 kg/m².

The frame was oversized to allow for 30 minutes of fire resistance. An additional paint was applied on site to increase the fire resistance to 60 minutes.

The metal structure was calculated using the SCIA Engineer program in accordance with Eurocode 3.

Ateliers Mersch s.a.

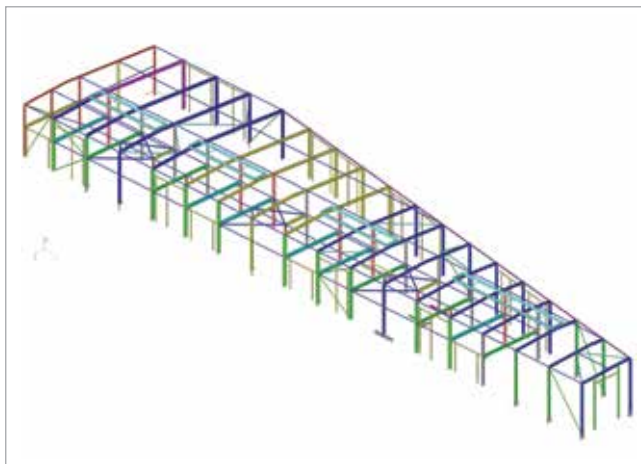
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Owner Alcom nv
 Architect Frank Joosen
 General Contractor Bolckmans nv
 Engineering Office Bolckmans nv
 Construction Period 08/2014 - 07/2015

The project consists of a production hall measuring 246 x 78 m, an office building and a building for technical equipment and a sprinkler tank.

The steel construction of the production hall consists of symmetrical portal frames with 2 trusses supported by a row of trusses and columns in the middle of the span and columns at the facades. All columns have hinged connections with the foundations. The height under the trusses is 8 m and the total height of the building is 10 m, so the trusses of portal frames are slender. The maximal length of the trusses in the middle is 18 m.

Because of the large length of the building an expansion joint in the middle of the length allows the structure to expand in case of thermal working, so that stress is limited.

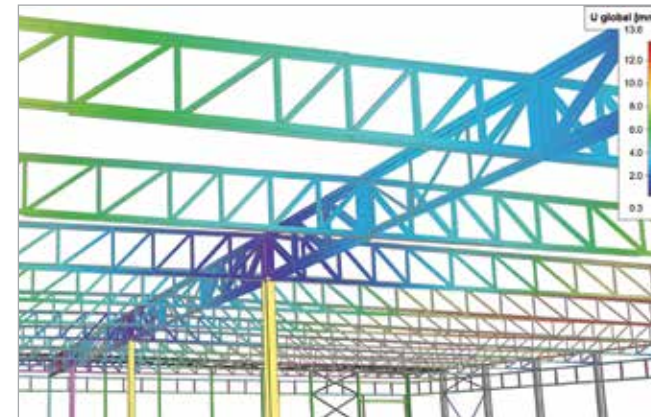
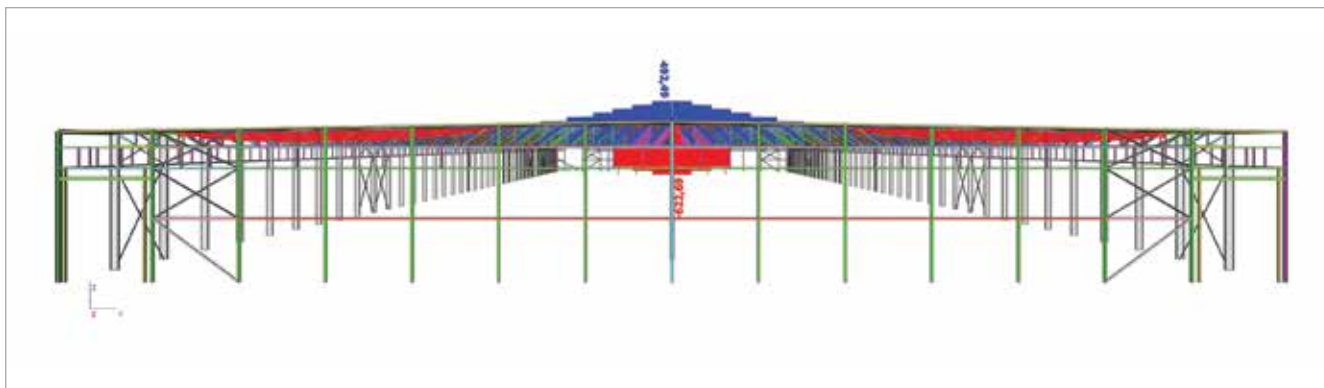
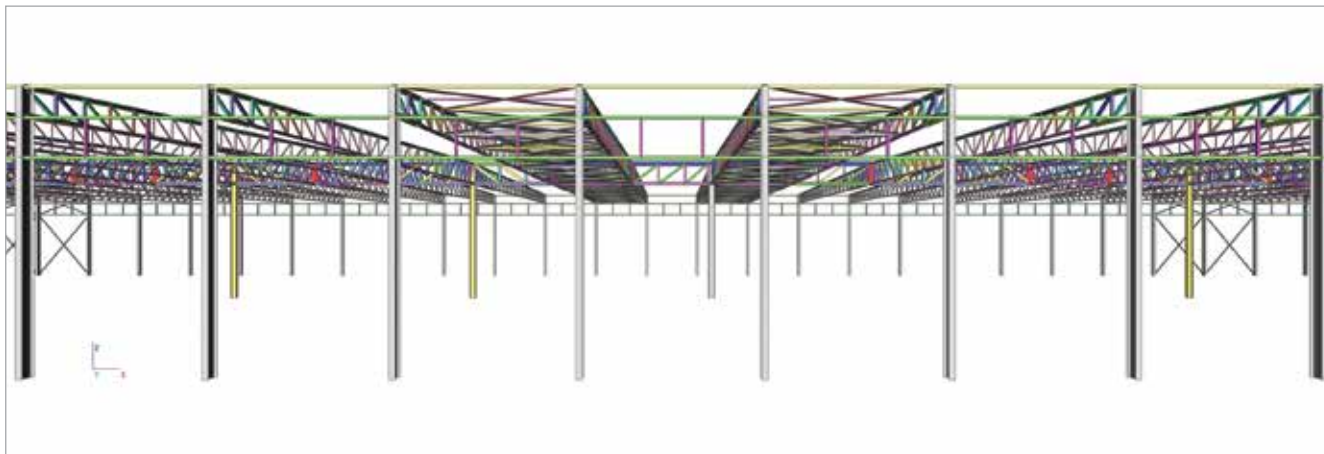
The structure has a fire resistance of 30 minutes. In order to obtain the necessary and thus most economical thickness of protection paint (for steel columns and trusses) the critical temperature per profile and per item is calculated in SCIA Engineer. Therefore a non-linear calculation is carried out (because of tension bars in bracing systems) and load combinations for fire situation are used. The fire resistance is checked in temperature domain and as result the critical temperature is given.

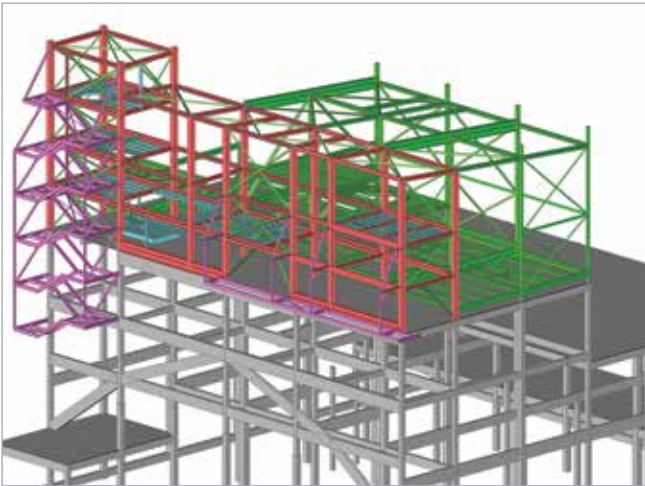
Bolckmans nv

Contact Herman Meeuws
 Address Industrieweg 4
 2320 Hoogstraten, Belgium
 Email hme@bolckmans.be



Bolckmans is an established player in its field, with experience across various sectors and with different types of industrial buildings, such as showrooms, offices, production halls and warehouses. As a modern contractor we're not merely a performer, but a one-stop-shop for our customers. We have a great way of thinking in terms of solutions, delivering projects within budget and on time, relying on a solid construction team with 850 years of building experience and we are proud to mention that 65% of our order income is generated by existing clients.





Owner	Taminco
Architect	Bureau PARTNERS - Architecten & Ingenieurs nv
General Contractor	Cordeel
Engineering Office	Bureau PARTNERS - Architecten & Ingenieurs nv
Construction Period	09/2013 - 02/2014

To expand a production line, additional floors were needed on top of the existing concrete building. The new steel structure consists of a closed building and a covered space. The total height of the building was raised from 14 m to 25 m, and an additional 650 m² production space was created.

The new building was designed to comply with the new equipment, keeping in mind that the structure should provide enough flexibility for later adaptations to the production line. To minimize the impact on the existing building, the hinged footings of the steel structure were placed in the centre of the existing concrete columns, thereby transferring only normal forces.

Because the thin concrete roof under the covered space wasn't strong enough to support new equipment, a raised floor was created. This also provided extra room for the piping and cables without disturbing the safe circulation and operation of the equipment.

To minimize the total project time, the building of the structure and the placing of the new equipment were done simultaneously. Due to intensive pre-study and impeccable cooperation between the designer, the building contractor and Taminco, all deadlines were achieved, and the end result surpassed expectation.

Bureau PARTNERS - Architecten & Ingenieurs nv

Contact Tim Neels
Address Meulesteedsesteenweg 396
9000 Ghent, Belgium
Website www.bureaupartners.be



Bureau PARTNERS - Architecten & Ingenieurs sa, founded in 1987, is a multidisciplinary study team of architects and engineers working in the public and industrial sector.

Due to this complementarity, Bureau PARTNERS is able to approach any problem from a wide variety of angles. This process results in a sophisticated design and in a better balance between quality and cost for each discipline.

Owner Stad Ghent
 Architect Bureau PARTNERS - Architecten & Ingenieurs nv
 General Contractor Depret NV
 Engineering Office Bureau PARTNERS - Architecten & Ingenieurs nv
 Construction Period 05/2011 - 04/2013

The new site for the city services contains offices, social facilities, warehouses, workplaces, outside storage, parking spaces, green zones and a parking building. The building is designed as a low energy building. The specific shape of the building and the concept of the inner street is the result of the energetic analysis, making optimal use of solar heat.

Due to the length of the building (280 m), it is divided into 3 separate parts. The first is offices, social facilities and warehouses; the second is workplaces and warehouses, and the remaining section is the parking building. The layout of all parts is similar, and is constructed with 3 large spans, respectively 16 m - 12 m - 15.5 m. The main roof beams and the central columns of the inner street are made of tapered lamellar wood. For the intermediate floor of the offices, a 14.5 m span was needed, made of prestressed hollow core slabs with a total thickness of 46 cm.

The shape and orientation of the building, combined with the use of slender concrete columns and large tapered wooden beams and columns, results in a building where stability, architecture, functionality and durability go hand in hand.

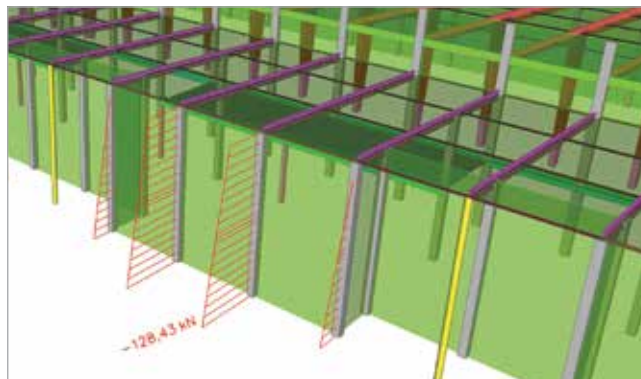
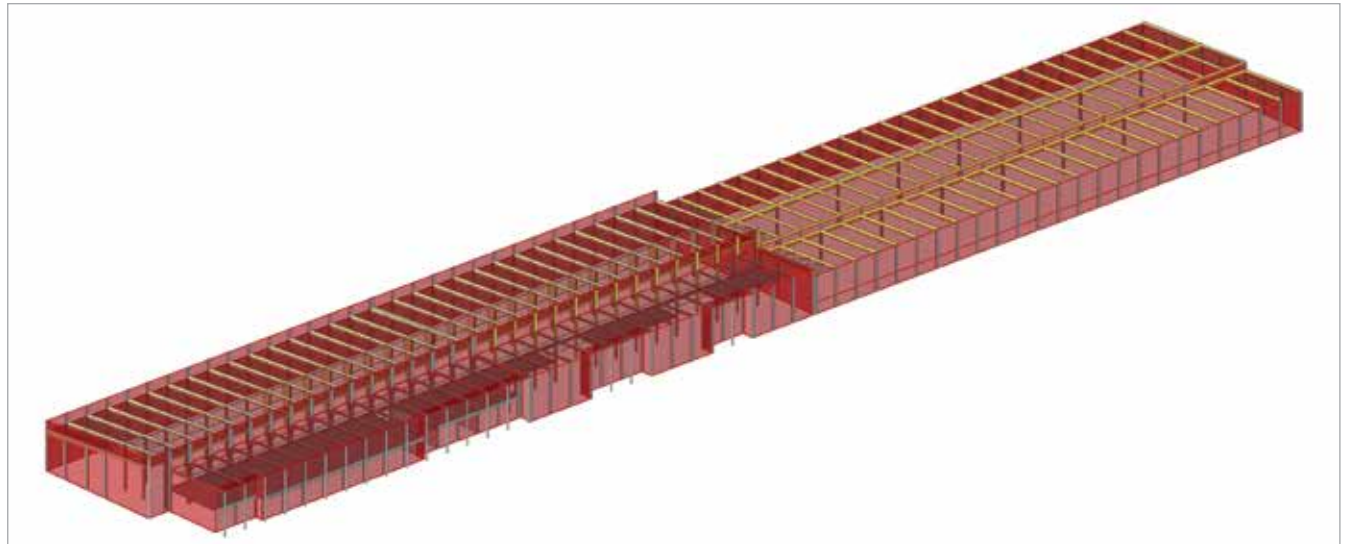
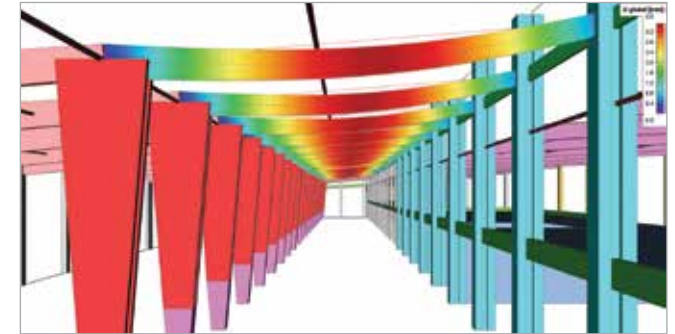
Bureau PARTNERS - Architecten & Ingenieurs nv

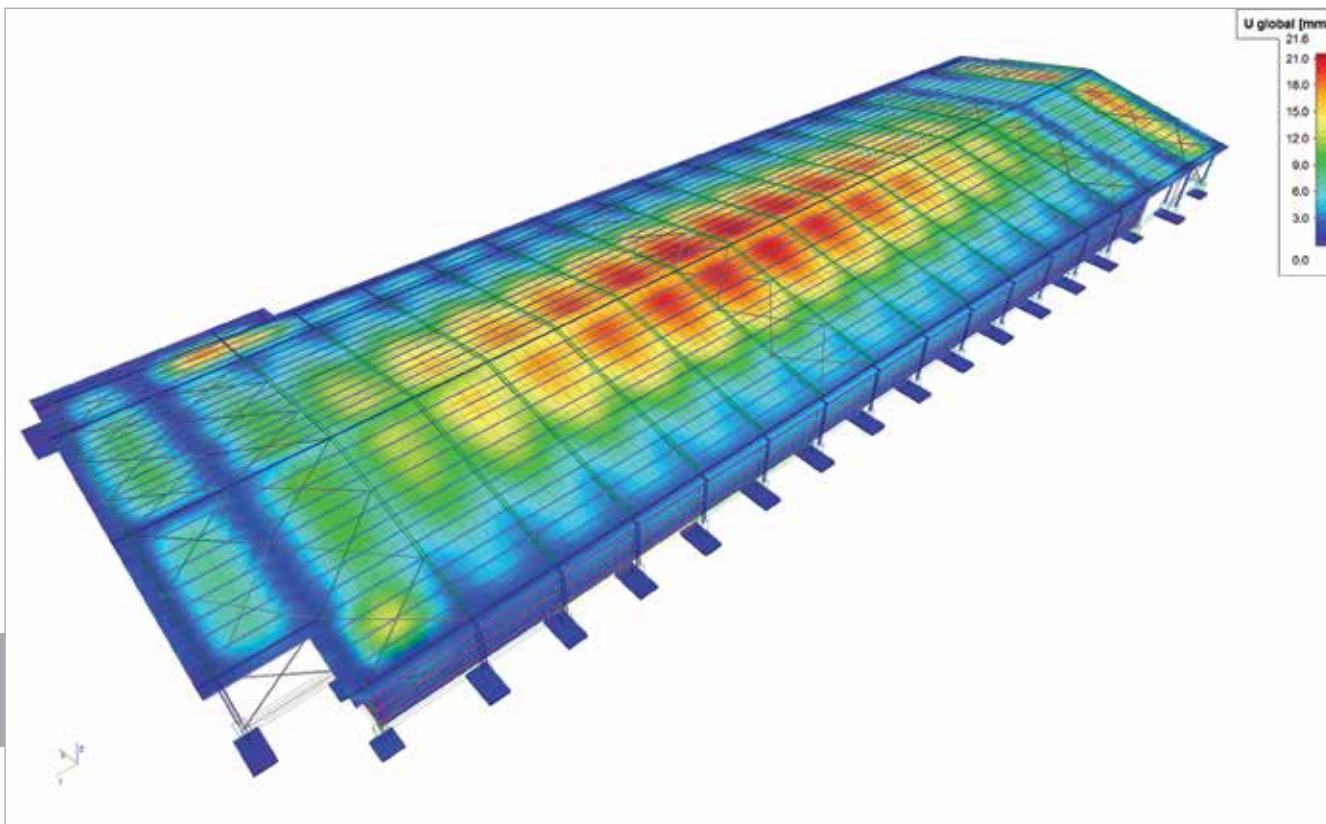
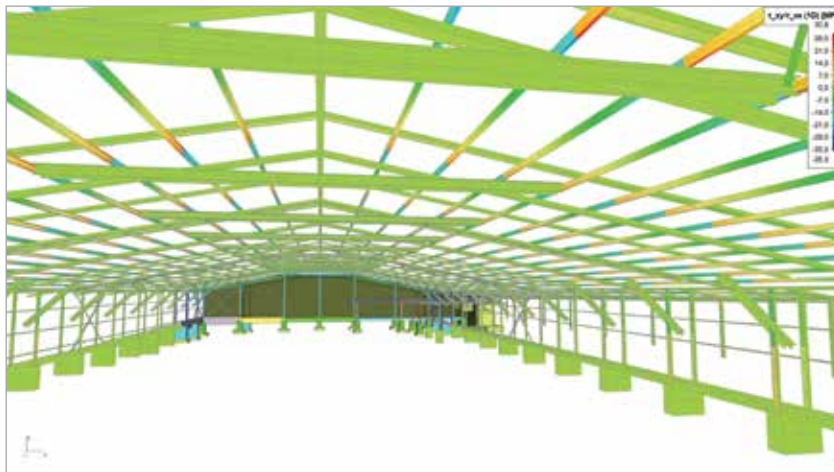
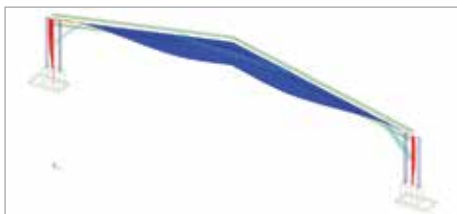
Contact Tim Neels
 Address Meulesteedsesteenweg 396
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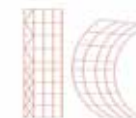


Owner MLPS Ltd
 Architect arch. Jivka Buchukovska
 General Contractor Constructa Ltd
 Engineering Office Constructa Ltd
 Construction Period 09/2014 - 03/2015

The structure is located in Bulgaria and provides a large area for melting and moulding steel furnaces. The dimensions of the structure are 85.5 x 33-39 m, with an area of 3,100 m², and height of 7.88 m, with two additional canopies. The hall is trapezoidal in plan because of an existing road and a concrete retaining wall. The main steel frames have a span of 32 m with columns paired 2UPE240 x 1,100 mm and beams 2UPE240 x 850 mm. The medium structure which comprises the staff area, is composed of steel columns and beams, a composite slab, and roofing and walls made of PVC panels. Two 3D models were created in SCIA Engineer for general and seismic actions. We have imported the BG seismic spectrums, and in this case Vrancea, spectrum type 3. It was impossible to have a 90% effective modal mass in eigenmodes, because the substructure with its significant mass moves with the soil and was therefore eliminated from calculations. The seismic deformations were exclusively observed in the relatively thin shells (roof and facade panels modeled as 6mm thick steel sheets): trembling and forming "waves", torsional effects also. Despite SCIA Engineer's representation of 3D seismic behaviour, low wide structures require a specific theoretical and experimental investigation. Paired cross sections, which were quite common in the recent past, are now a challenge for all programs based on Eurocode, and are not covered at all. The design was performed using former BG code.

Constructa Ltd

Contact Vihrena Gardeva
 Address Tsurkovna nezavisimost str. 16, fl.13
 7000 Ruse, Bulgaria
 Email konstrukta@abv.bg



Constructa Ltd is a structural design agency, established in Bulgaria in 2001. We value our experience in chemical industry, having learned about various processes and technologies and developed an untraditional approach towards structural decisions. We start every project with the desire to make it extraordinary and unique by **interweaving methods, technologies and materials**. With the help of SCIA we are able to model specific actions such as surcharge drift snow loads, thermal loads, explosions and water pressure on river banks, etc. Our general policy is to study a structure's work and then model its behaviour as closely to reality as possible.

Owner *Ethiopia Sugar Corporation*
 Architect *De Smet Engineers & Contractors*
 General Contractor *OIA (India)*
 Engineering Office *De Smet Engineers & Contractors*
 Construction Period *01/2012 - 07/2014*

De Smet Engineers & Contractors has recently supplied a 13,000 T per day cane diffuser to one of the largest Ethiopian sugar mills. The **De Smet TN 115C type** diffuser is composed of a long metallic conveyor made of **98 articulated frames** moving inside the diffuser casing and returning underneath it. Each frame is composed of **ribbed perforated plates** linked to a **steel cylinder** by means of vertical stiffeners equally distributed on the frame length. Frames inside the diffuser are loaded with a 2 m high shredded cane bed coming from milling to undergo the diffusion process. Water is added at the discharge end of the conveyor to extract the sugar by percolating through the bed before being evacuated through the perforated plates and collected in dedicated hoppers. The juice is pumped from the hoppers to the previous extraction stage and the process is repeated until it reaches a maximum sugar concentration at the feed end of the diffuser.

The diffuser is **62 m long and 11.5 m wide**.

A model was created of the frames using 1D and 2D elements for perforated plate ribs and plates as well as shell elements for the cylinders. The major constraint to deal with was the vertical deformation: **only 1/800 of the 11.5 m span** was allowed so as to limit efforts at the conveyor rollers. By selecting the right thickness of the cylinder a **maximal deflection of 10.1 mm** was obtained.

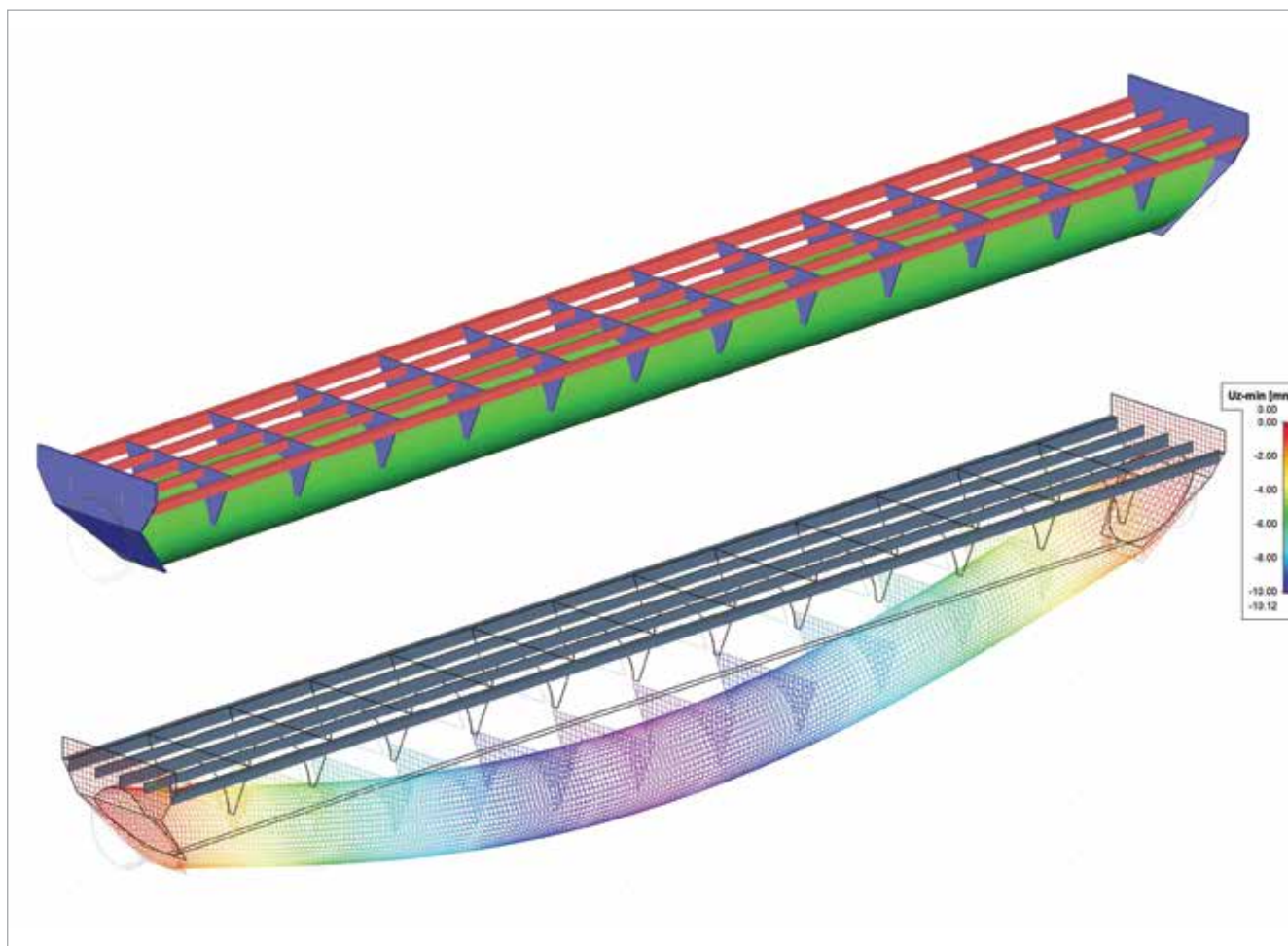
De Smet Engineers & Contractors

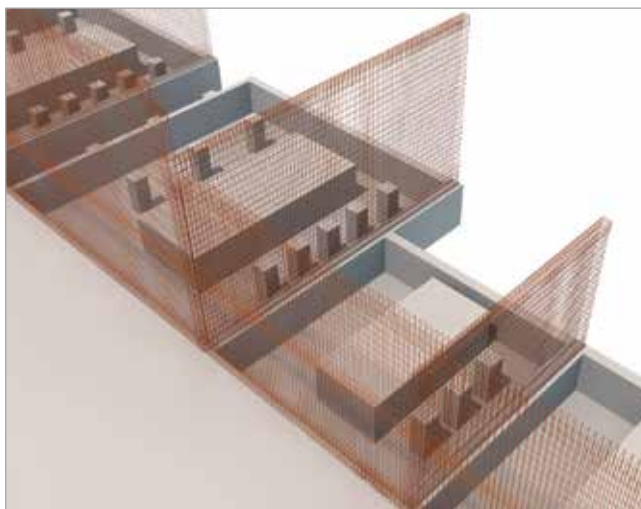
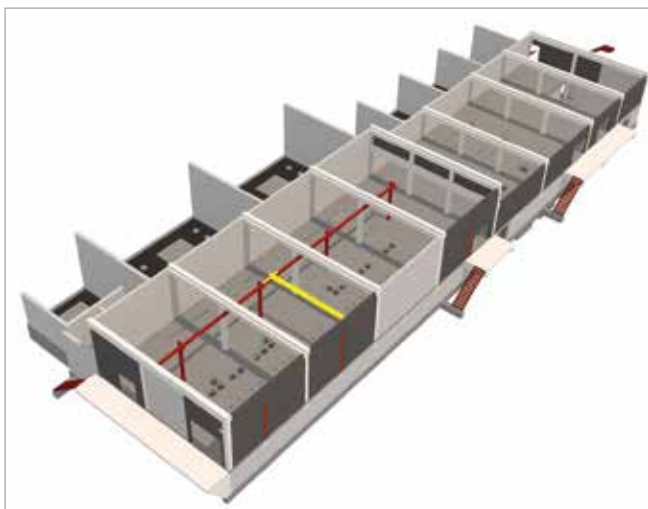
Contact *Corentin Dehem*
 Address *Drève Richelle 161*
1410 Waterloo, Belgium
 Website *www.dsengineers.com/fr*



De Smet Engineers & Contractors (DSEC) has an established reputation as agro-industrial integrator, specialising in **agro-industrial** fields such as **sugar, edible oil, biofuels and biochemicals**. It is a world class provider of engineering, procurement and construction services under a single point responsibility.

DSEC has a compelling business offering, built on many years of experience that combines excellence in execution, safety, cost containment and reliability with a particular focus on **energy saving** initiatives and **sustainability**.





Owner Zeeland Refinery
General Contractor Aannemingsbedrijf Fraanje B.V.
Engineering Office Grontmij Nederland BV
Construction Period 05/2012 - 06/2013

A new transformer station (72 x 28 m) including different medium and high voltage installations and sufficient capacity has been built for Zeeland Refinery.

The building consists of:

- Cable cellar (ground level).
- Transformer position and fuel storage, including the necessary foundations.
- Switchroom above the cable cellar.

The structural model was created using Allplan Engineering and included in-situ concrete foundations, cellar floor and concrete walls. The superstructure consisted of a prefabricated concrete column/beam structure with wide slab floors and a hollow core slab roof.

All constructive layout drawings of the building were made in Allplan. Furthermore all in-situ floors, walls and foundations were generated into 2D line drawings. After that all in-situ components were reinforced in the 3D model and generated into 2D drawings, which were released for production. The biggest advantage of reinforcing the concrete in the 3D model was immediate insight into difficult cable entry points.

Grontmij Nederland BV

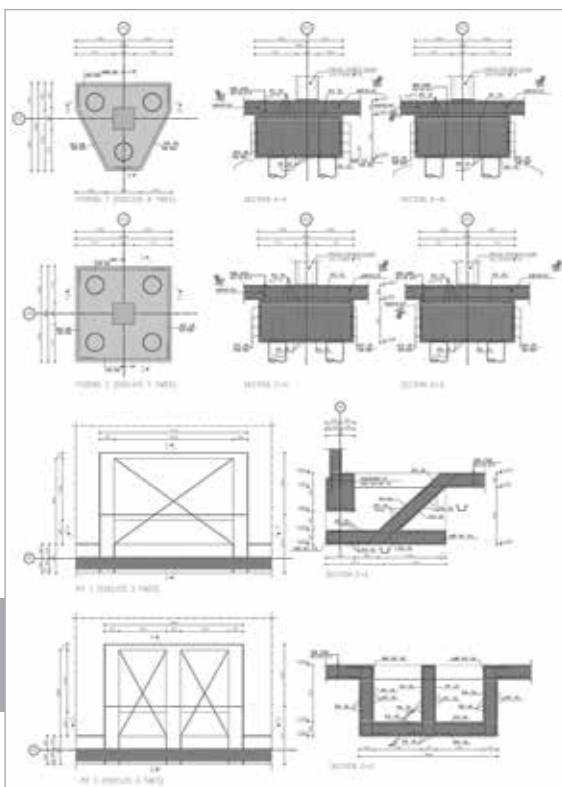
Contact Edwin Fraanje
Address Segeersingel 6
4337LG Middelburg, The Netherlands
Website www.grontmij.com



Grontmij provides consultancy, design & engineering and management services in a broad range of market sectors related to the built and natural environment.

Within our range of expertise, and with approximately 7,000 professionals around the world, we aim for European leadership in five Group growth activities: Energy, Highways & Roads, Light Rail, Sustainable Buildings and Water.

Our guiding principle is sustainability by design which is a leading value proposition for our customers.



Owner NAJPI a.s.
 Architect HESCON s.r.o.
 General Contractor UNIPID TRADE spol. s r.o.
 Engineering Office HESCON s.r.o.
 Construction Period 11/2013 - 04/2015

Situated near the largest bearing of foundry and glass sand in Slovakia, in the industrial park Senica, is a plant for editing, converting, refining and dispatching glass sand. The sand is transported to the editing plant after mining, where it is cleaned of impurities and undesirable additives, dried, and then separated into desired fractions. Due to the complex nature of the sand processing, separate divisions and buildings were constructed for each step in the process. Connections between these buildings were essential in order that sand move freely between the buildings. Technology needed to transport the sand between buildings was also needed, and had to be factored into the design including workshop documentation of steel structures. The plant is an extensive technological building, made up of about 950 tons of steel. The building is divided into the following main building structures:

- SO 101 Sand receiving and transporting.
- SO 102 Wet treatment of the sand and SO 103 Water management.
- SO 104 Sand drying.
- SO 105 Separation of the sand and SO 106 Storage of the sand.
- SO 107 to SO109 Packing and storage.

Each process directly follows one after the other, and these structures are connected with technological equipment, especially with regard to essential transport routes.

HESCON s.r.o.

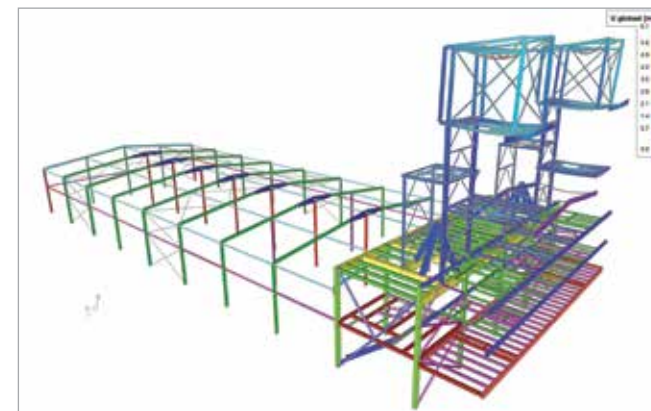
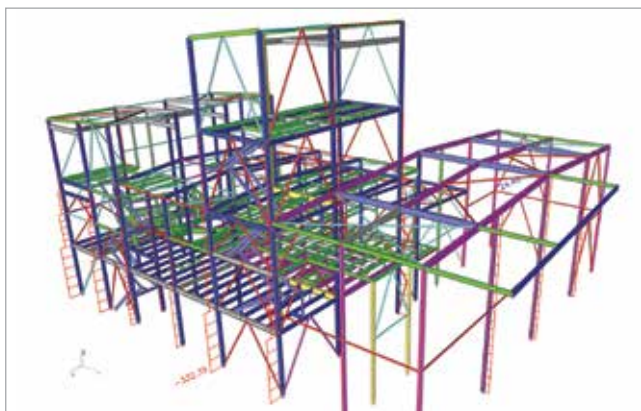
Contact Erik Hrnčiar
 Address Námestie sv. Anny 20C/7269
 91101 Trenčín, Slovakia
 Website www.hescon.sk

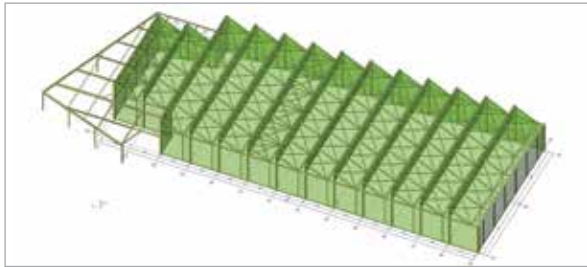


HESCON Ltd.
 the design
 and engineering office

HESCON, Ltd., is a design and static office, and was established in 2008 by the authorised civil engineer Erik Hrnčiar. After his long-term experience in the field of design management, as well as vast experience designing and building load-bearing structures, the idea to gather a strong team of designers and structural engineers came naturally to him. This team was actualised in what is now HESCON, Ltd.

HESCON, Ltd. specialises in the statics of structures and offers its clients services in consulting, design and engineering from the initial study all the way up to the workshop drawing.



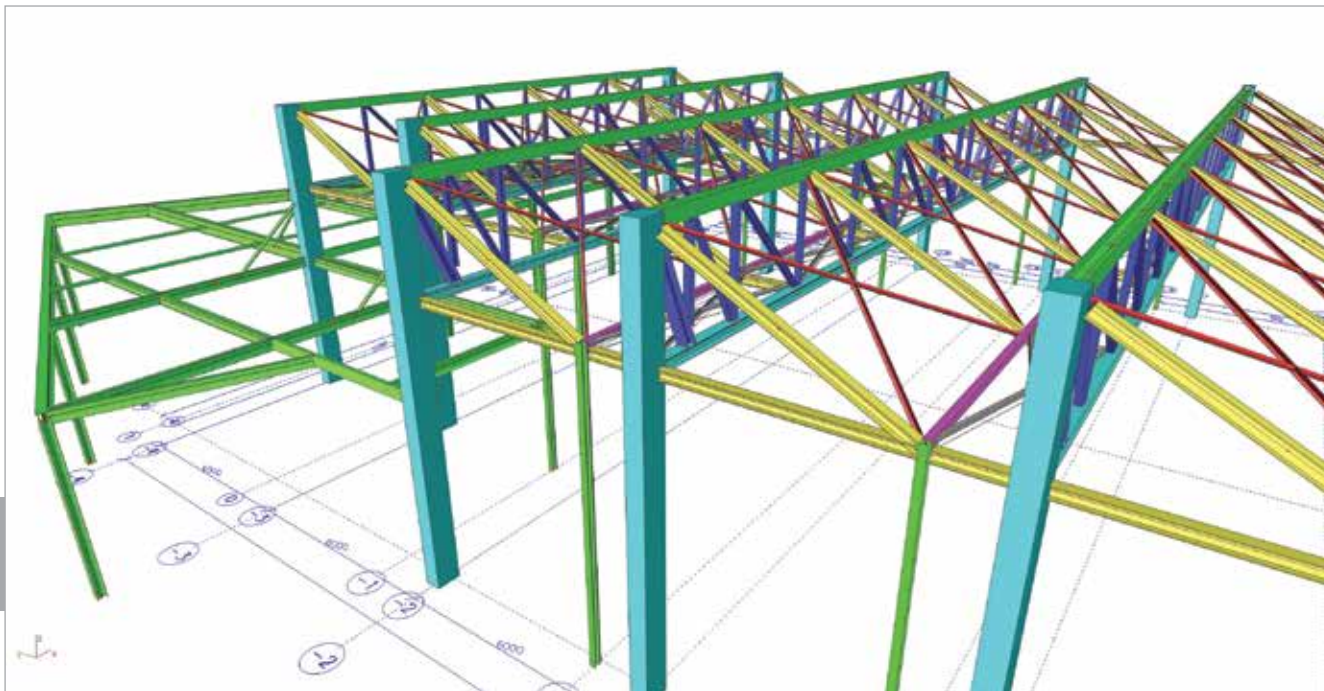


Owner Schöck AG
 Architect Dipl.-Ing. Thomas Herzog
 Engineering Office Ing.-Büro Stefan Zachmann GmbH
 Construction Period 09/2014 - 03/2015

The company Schöck Bauteile GmbH has planned a new building of a production hall on its work area in Baden-Baden-Steinbach. The new production building measures approximately 78 x 31 x 10 m. The roof structure is a shed roof in a steel construction. The hall pillars are designed as reinforced concrete columns. The entire construction was calculated using SCIA Engineer.

By using the SCIA Engineer, the project could be analyzed as one piece. The 3D generator greatly simplified the normally complicated wind load determination.

The reinforced concrete columns could also be calculated in the overall system and, thanks to SCIA Engineer, no separate calculations were required using other programs.



Ing.-Büro Stefan Zachmann GmbH

Contact Hans Grossmann
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 77815 Bühl/Baden, Germany
 Website www.zachmann-ing.de



The engineering office Stefan Zachmann GmbH has been working on projects for the automotive industry and pharmaceutical, chemical, electrical and mechanical engineering industries for over 50 years.

We also provide structural design services for the public sector, and for hotels and hospitals in the area.

Next to the CEO, the office currently employs six engineers, two constructors and two administrative staff.

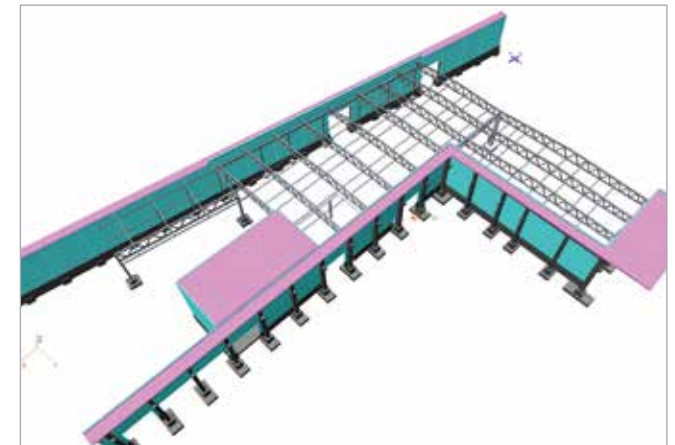
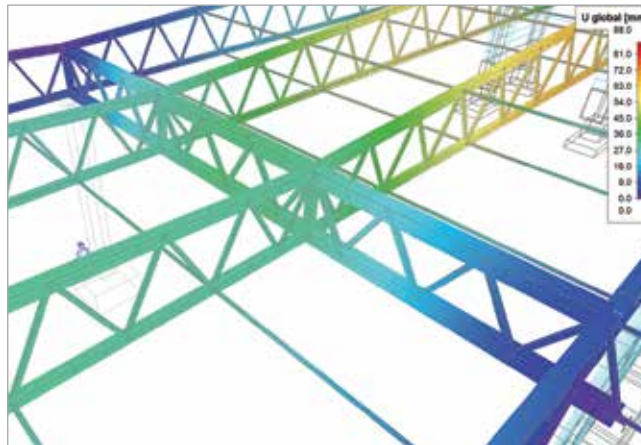
Owner PERI Artur Schwörer GmbH & Co. KG
Architect Ingenieurbüro Degen und Partner
General Contractor H. Brandner Stahlbau e.K.
Engineering Office Ingenieurbüro Degen & Partner und Ingenieurbüro für Stahlbau Dipl.-Ing. (FH) SFI Jürgen Mark
Construction Period 2012 - 2013

An approximately 1,600 m² L-shaped roof was built between two pre-existing industrial buildings in the loading area of a concrete manufacturing plant.

With main dimensions of approx. 51 x 46 m, a span of up to 30 m needed to be bridged. The dimensions and connection points of the steel structure had to meet the requirements of a hot-dip galvanised steel design.

Moreover, construction was impacted by limitations such as utilising the pre-existing buildings as support, as well as the demand for a large roofed area accessible to trucks, without structural supports being in the way.

The already existing building and the new construction were visualized in 3D-CAD and were afterwards imported via the import function into SCIA Engineer.



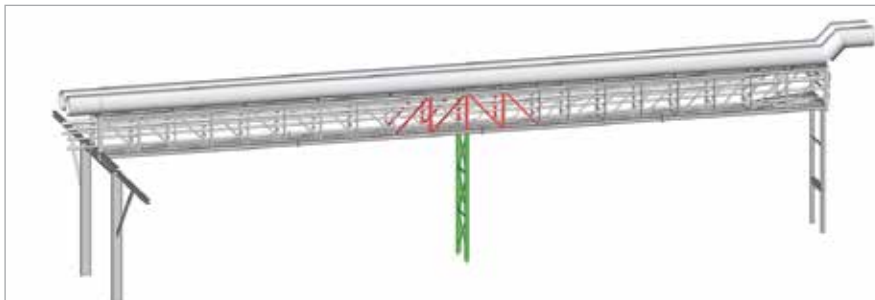
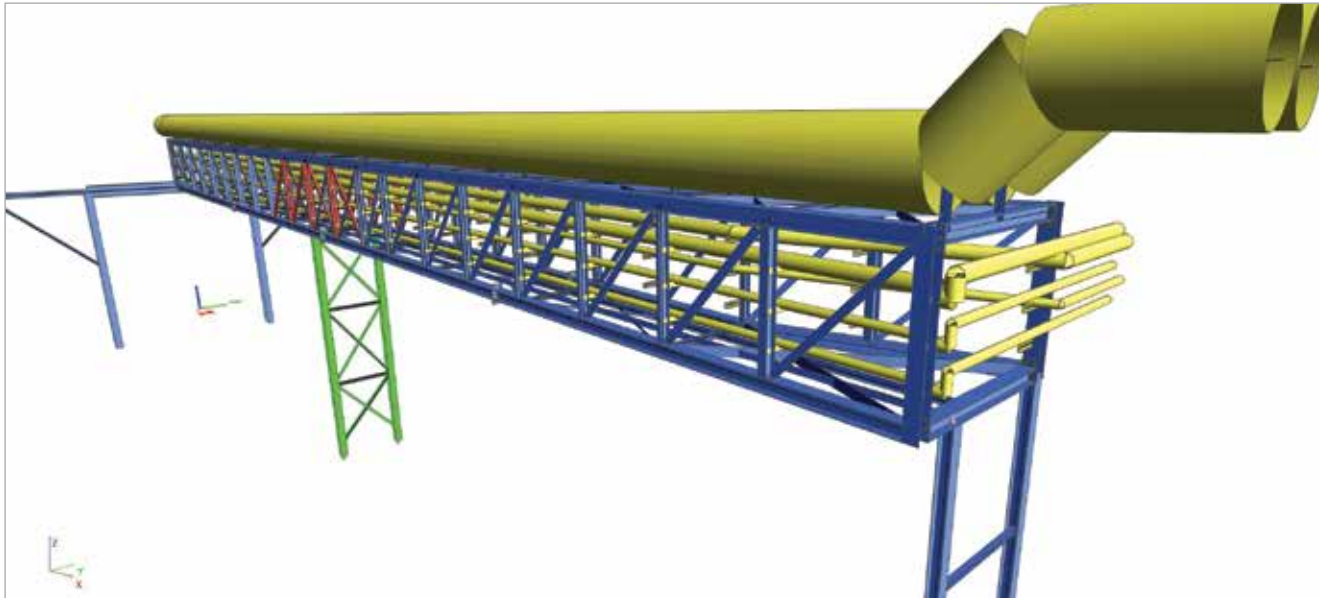
Ingenieurbüro für Stahlbau Dipl.-Ing. (FH) Jürgen Mark

Contact Jürgen Mark
Address Gräfin-Euphemia-Str. 5a
 89264 Weißenhorn, Germany
Website www.ib-mark@email.de



Since 2003 we have been capturing and designing various constructions from the areas of steel construction, steel lightweight construction, facades, aluminium and glass construction in 3D-CAD.

Through innovative and problem solving oriented project handling, effective use of the newest technologies and participation in constant advanced training, our company has developed a competitive advantage and is able to provide the client with economic benefits.



Owner Siegwerk Druckfarben AG, Siegburg
Engineering Office Ingenieurbüro Mentges
Construction Period 03/2015 - 05/2015

At Siegwerk Druckfarben AG in Siegburg they discovered that the actual load of a 45 m long pipe bridge exceeds the load considered in the original analysis. IB Mentges was appointed to study the stability in the current situation and confront it with the additional expected loads. The main objective thus was to apply additional loads with minimal effort and without any interruption in the operation. The solution proposed by IB Mentges, to reinforce the existing single-span truss bridge by an additional support, met with an approval. To assess the current as well as the planned states, the structure was calculated in SCIA Engineer as a 3D system. It was found out that the existing loads can be taken by the structure with a sufficient level of safety. The 3D calculation of the original 2D model showed that an additional capacity is available.

For the final, economically optimized, state the applied loads were gradually increased. The existing bridge structures were only slightly modified: a new intermediate support and some stiffeners were added, primarily to avoid an increase of the existing support loads. The modification resulted in a fivefold increase in the applied load. At this state the geometrical limitations were reached. The stiffeners were installed only on 7 vertical and diagonal members. The planning of the realisation of the steel structure and foundation was done in Allplan Engineering where the 3D model also facilitated the construction work.

Ingenieurbüro Mentges

Contact Oliver Mentges
Address Aulgasse 176
53721 Siegburg, Germany
Website www.ib-mentges.de



For 20 years the engineering company Mentges designs structures and buildings in concrete, steel or timber for industrial, commercial, residential and administrative purposes. The customer base today is crossing regional borders with nationwide projects. Mr. Mentges set BIM approaches in his thesis already in 1989 and therefore relies on the technology leader Nemetschek Group. Structural analysis and detailing with SCIA Engineer and Allplan is a real BIM. The consistent 3D design is not a goal in itself, but for the 3 engineers involved it represents a way to produce an optimal design with a minimised possibility of errors.

Owner BMW AG
 Architect Kohlbecker Architekten & Ingenieure
 General Contractor Stahl- und Anlagenbau Schädlich GmbH
 Engineering Office Planungsgruppe IngenieurInG Dr.Ing.L.Greiner
 gemeinsam mit Ingenieurgesellschaft Gölkel IGG
 Construction Period 03/2013 - 07/2013

The steel bridge is used to transport car bodies and containers between the old and the new production plant complexes of the BMW factory in Dingolfing. It contains eight conveyor lines distributed over two floors. Altogether, seven railway lines, one small river, one road bridge and three roads had to be bridged over. Hence, the bridge had to be designed with the **impressive dimensions** of 100 m length, 17 m width and 21 m height. The most challenging area to construct was the edge of the bridge where the **structure cantilevers up to 16 m** and the field next to it spans over 40 m. The bracing is mainly constructed by frames. Additional struts are added to the columns below the superstructure.

In order to meet fire protection standards and to avoid the necessity of a fireproof coating on the exterior components, several columns are oversized at fire rating level R30.

In addition to the challenging spatial conditions, the BMW production process couldn't be influenced. Because of the narrow time slot for installation, large parts of the steel structure had to be prefabricated. Therefore, the 3D bridge model was calculated for all individual assembly states. To guarantee a smooth operation of the conveyor technology elements, an **exact prediction of the building movements** was required and accomplished using SCIA Engineer.

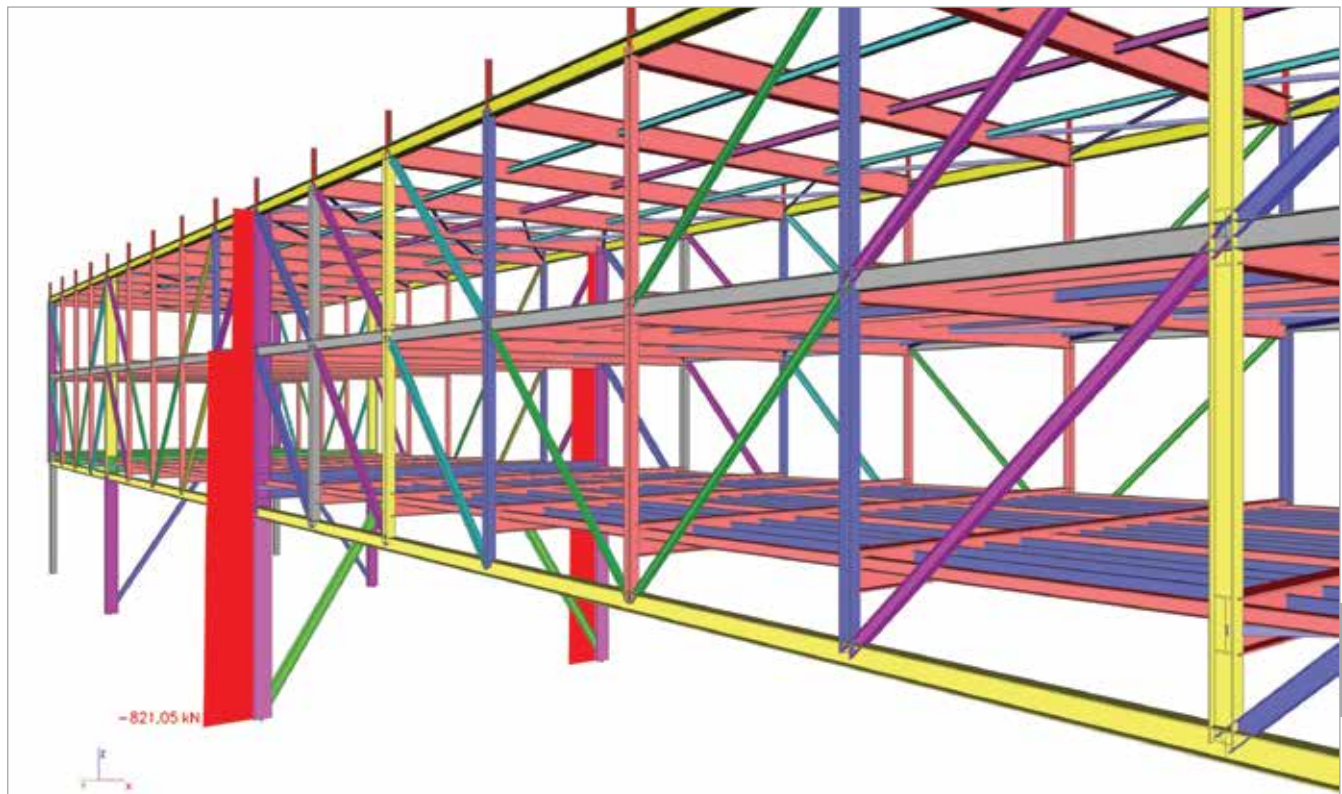
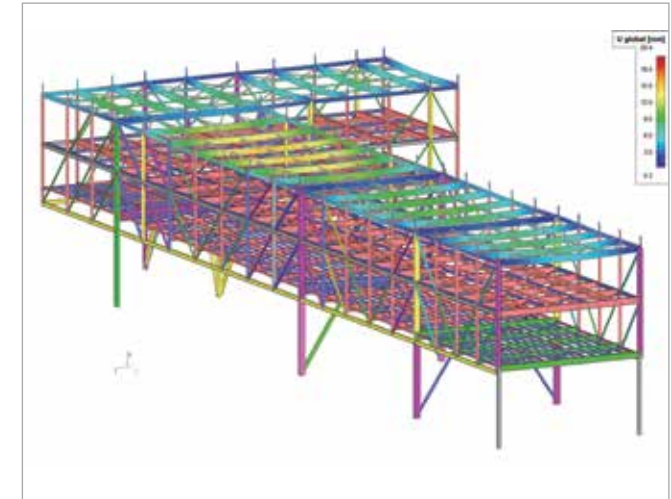
Ingenieurgesellschaft Gölkel

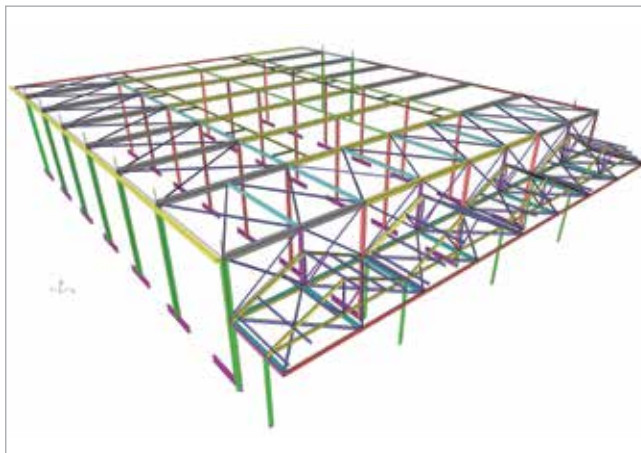
Contact Max Gölkel / Hubert Kunz
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 70192 Stuttgart, Germany
 Website www.igg-goelkel.de

igg KONSTRUKTIVE
WERTE

The Ingenieurgesellschaft Gölkel igg was founded 50 years ago as a design consultancy for structural engineering. We consider the process of planning a value adding process for our customers. Therefore, we offer a comprehensive **service package of consulting, planning and support**.

In close cooperation with the partners of a design project, we ascertain all potential elements that form the basis of a need-based, future-oriented and efficient construction. **Optimization is our principle** and it results in innovative individual solutions.





Owner *Weba*
 Architect *Ingenieursbureau G. Derveaux nv*
 General Contractor *Juri nv*
 Engineering Office *Ingenieursbureau G. Derveaux nv*
 Construction Period *03/2015 - 07/2015*

Weba's industrial hall needed to be heightened to add additional storage capacity. The hall measures 37 m by 47 m and had a useful height of 4.6 m. The original steel lattice spans were at a distance of 3.2 m apart. The new structure is a steel section structure, with a useful height of 7.6 m. The roof beams are at a distance of 6.4 m apart (twice the existing steel lattice span separation).

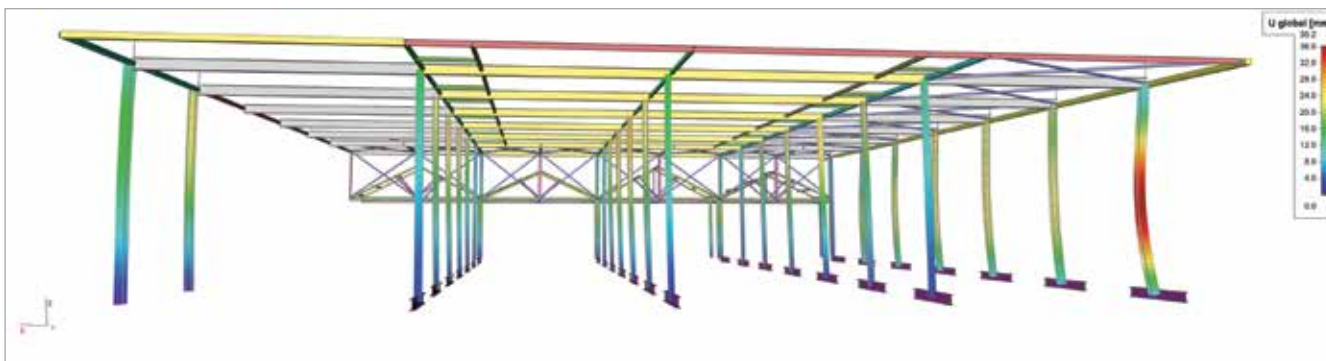
Structurally, the masonry walls, like the existing structure, are subjected to horizontal wind forces. The masonry walls were heightened.

The vertical loads of the new columns (each 6.4 m) are spread with beams to the existing underlying concrete columns (each 3.2 m).

SCIA Engineer was used to model the new steel structure (Steel EC3 checks, deflection, steel connection).

To preserve the **industrial heritage**, 2 spans on the street facade needed to be preserved. This presented the following challenges:

- This connection and interaction between the old and new structure.
- Transferring lateral loads under the existing spans, to the street facade masonry.



Ingenieursbureau G. Derveaux nv

Contact *Paul Van Driessche*
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9000 Ghent, Belgium
 Website *www.derveaux.be*



Ingenieursbureau G. Derveaux nv (ID) was founded in 1958 by engineer Godfried Derveaux and became one of the most important independent engineering offices in Belgium. Today the office is directed by his son, Jan Derveaux.

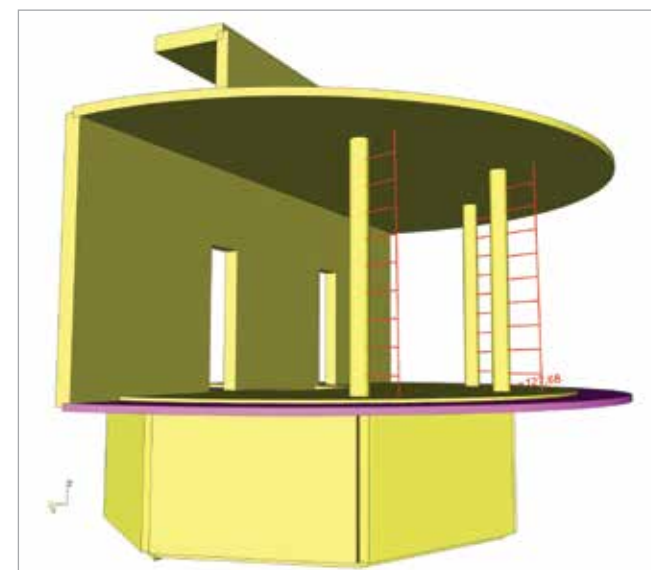
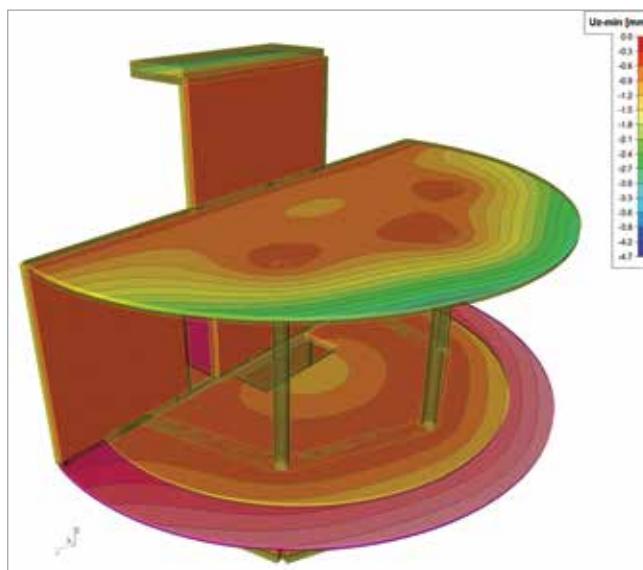
ID is experienced in structural designs for all kinds of construction and in the design (both architectural and structural) of industrial projects.

Owner Vlaamse Maatschappij voor
Watervoorziening (VMW)
Architect VMW
General Contractor De Raedt Ivan NV, Zele
Engineering Office Ingenieursbureau G. Derveaux nv
Construction Period 09/2011 - 12/2011

The construction of a technical room on an existing tower for water intake, located in an open water reservoir. The plan of the little building is designed as a half circle (diameter 11.2 m) and it is positioned upon a regular heptagon.

The calculation model was built up as a 3D model with slabs, walls and columns in reinforced concrete. A part of the existing tower, in reinforced concrete, was also modelled.

The specific complex shape of the building necessitated a 3D model, on which all loads could be modelled accurately. The calculation of the reinforcement according to Eurocode 2 in all concrete elements, that is the walls, slabs, and columns, was executed by the SCIA Engineer modules.



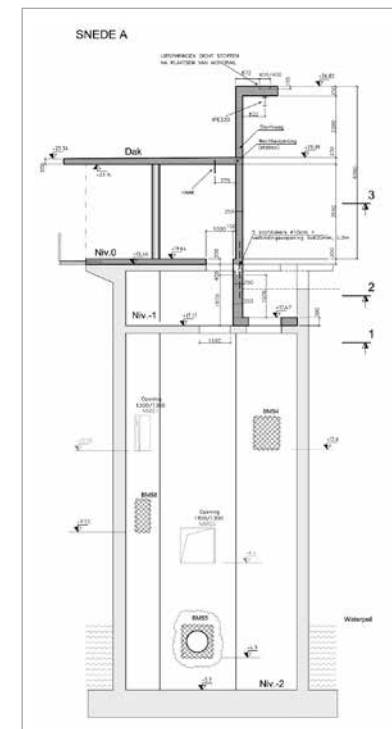
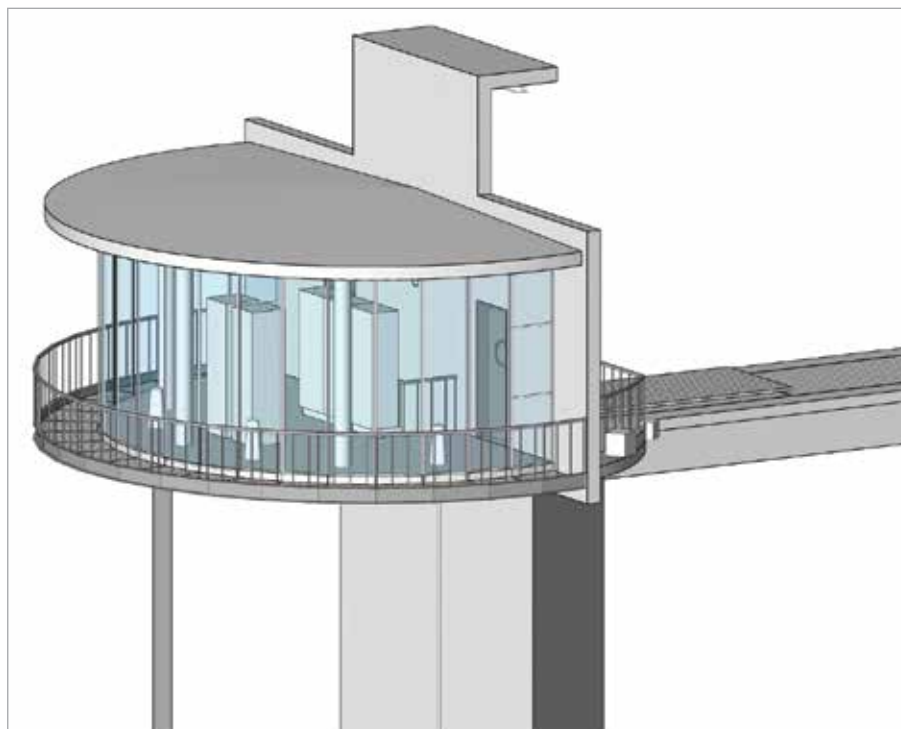
Ingenieursbureau G. Derveaux nv

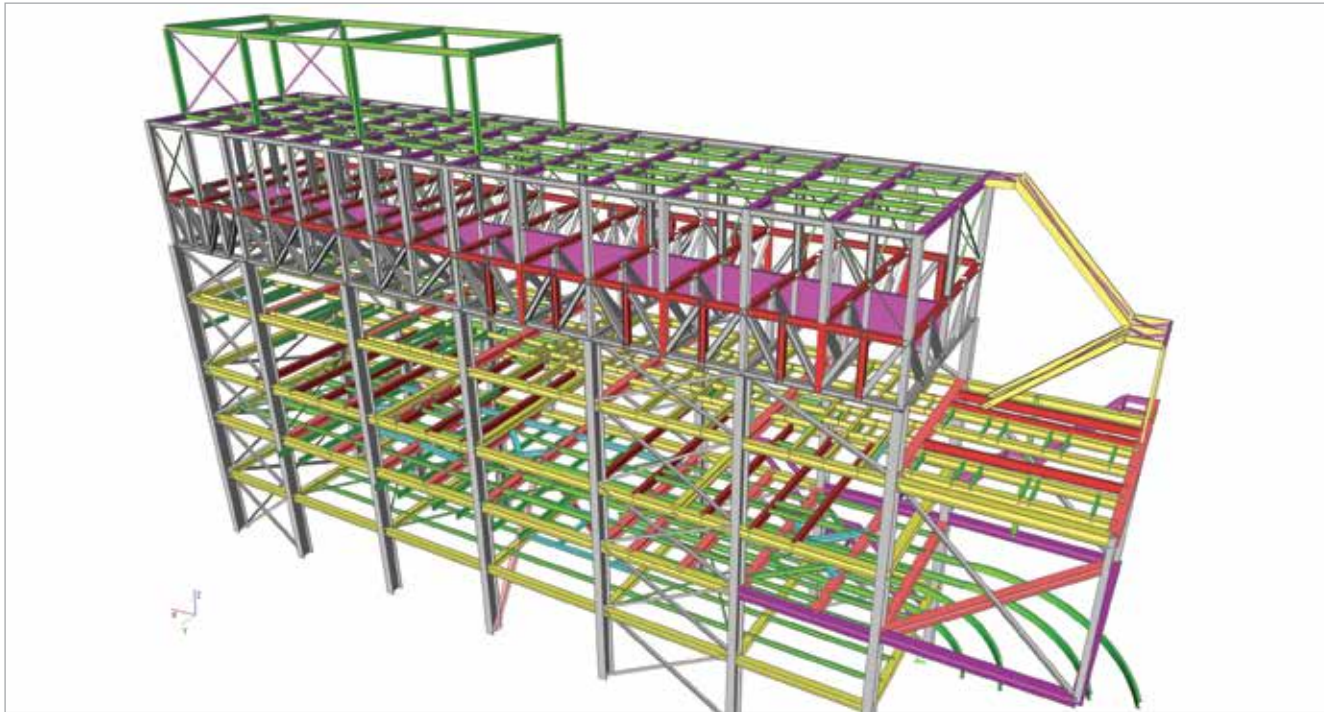
Contact Paul Van Driessche
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Website www.derveaux.be



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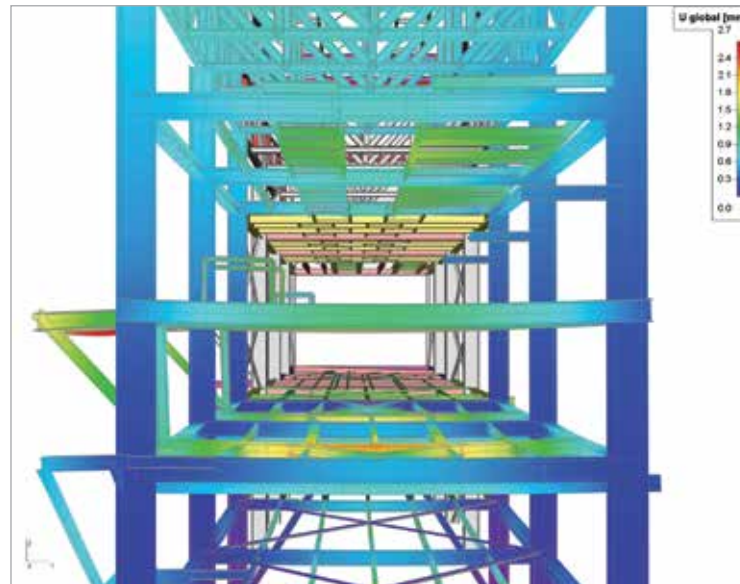


Owner *Struyk Verwo Infra*
 Architect *UBO Engineering BV*
 General Contractor *Nelissen van Gerwen BV*
 Engineering Office *Konstruktieburo Snetselaar BV*
 Construction Period *05/2014 - 12/2014*

The structure we engineered is a concrete mixing installation inside a building. The structure is designed to withstand the vertical load of the bunkers on top of it. The bunkers weigh approximately 40 t each. This weight puts an extra horizontal load on the structure.

For the design of the structure I used an **IFC model** drawn by one of our draftsman. This simplified the modelling of the structure in SCIA Engineer. When I had connected all the elements, I could start engineering the structure, placing hinges and changing materials. The diagonal beams are non-linear so they can't take compression forces.

The challenge of this project was the complexity of the **lattice frameworks** underneath the storage units. There are frameworks in both directions with a lot of force on top of them. Another problem we needed to tackle was the stability of the structure. Because of its relatively small base the structure is sensitive to displacements. We solved this by strengthening the connections between the columns and the beams.



Konstruktieburo Snetselaar BV

Contact *Michel Garssen, René van Renswoud*
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6716 BP Ede, The Netherlands
 Website *www.snetselaar.nl*



Konstruktieburo Snetselaar BV is an international, independently-operating consultancy for construction. Our activities include the designing, engineering and drawing of architectural and civil constructions of reinforced (prestressed) concrete, steel and wood. With our team of over 20 engineers and draftsman, (registered) engineers and engineering draftsman, we offer a complete engineering and drafting service for building construction (full 3D BIM). Our agency is characterized by the direct link it offers between the client and the engineer.

Owner Mogador s.r.o.
 Architect Ing. Arch. Štěpánka Jordánová
 General Contractor Navláčil stavební firma s.r.o.
 Engineering Office Navláčil stavební firma s.r.o.
 Construction Period 09/2015 - 10/2016

The factory hall for producing cereal food will be in part a reconstruction and in part a new building. The new building is designed as a three-aisled hall on one level. This part is divided into the two dilatation parts. The ground dimensions are approximately 80 x 63 m. The load bearing structure is made from precast columns with binders and girders. The reconstruction includes the gable of the existing hall. The other parts of the existing hall will be demolished.

For this project we used a linear static analysis and the modules for dimensioning steel and concrete. Autodesign module concrete reinforcement was particularly useful.

The biggest challenge in this project was how to calculate and predict the behaviour of the joint between the reconstructed gable new girders. All elements were designed in SCIA Engineer and BIM format was used (IFC) for further collaboration with other engineers.

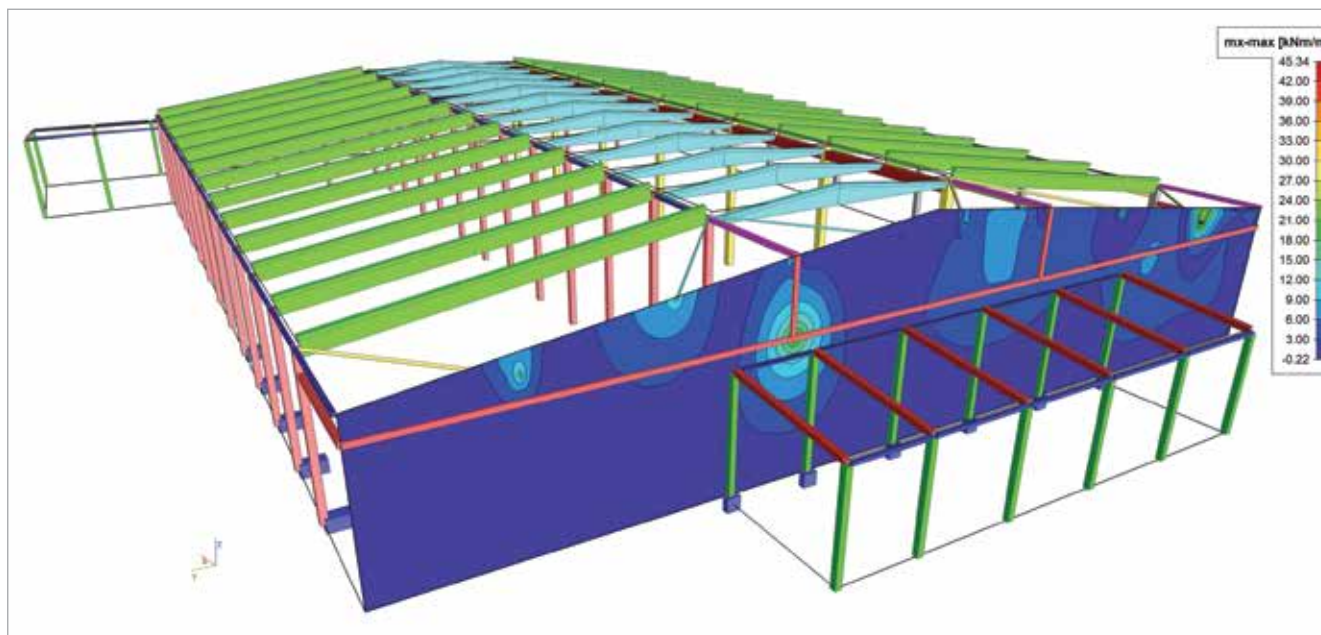
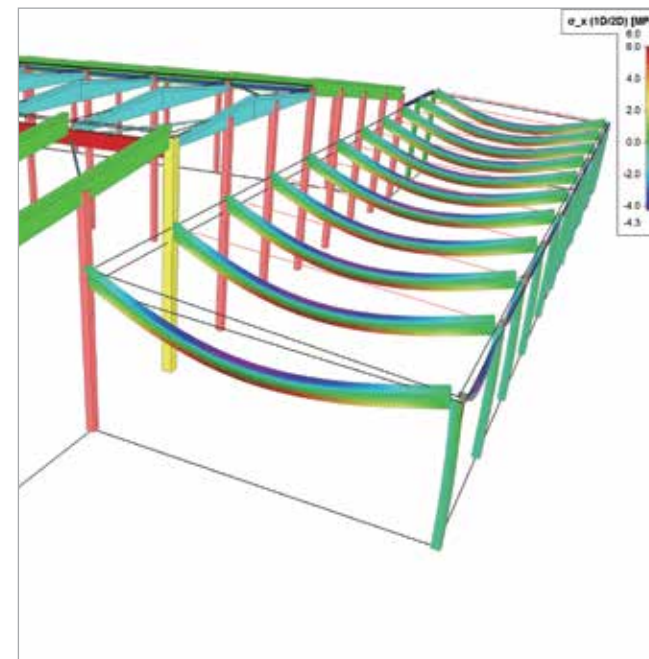
Navláčil Stavební Firma, s.r.o.

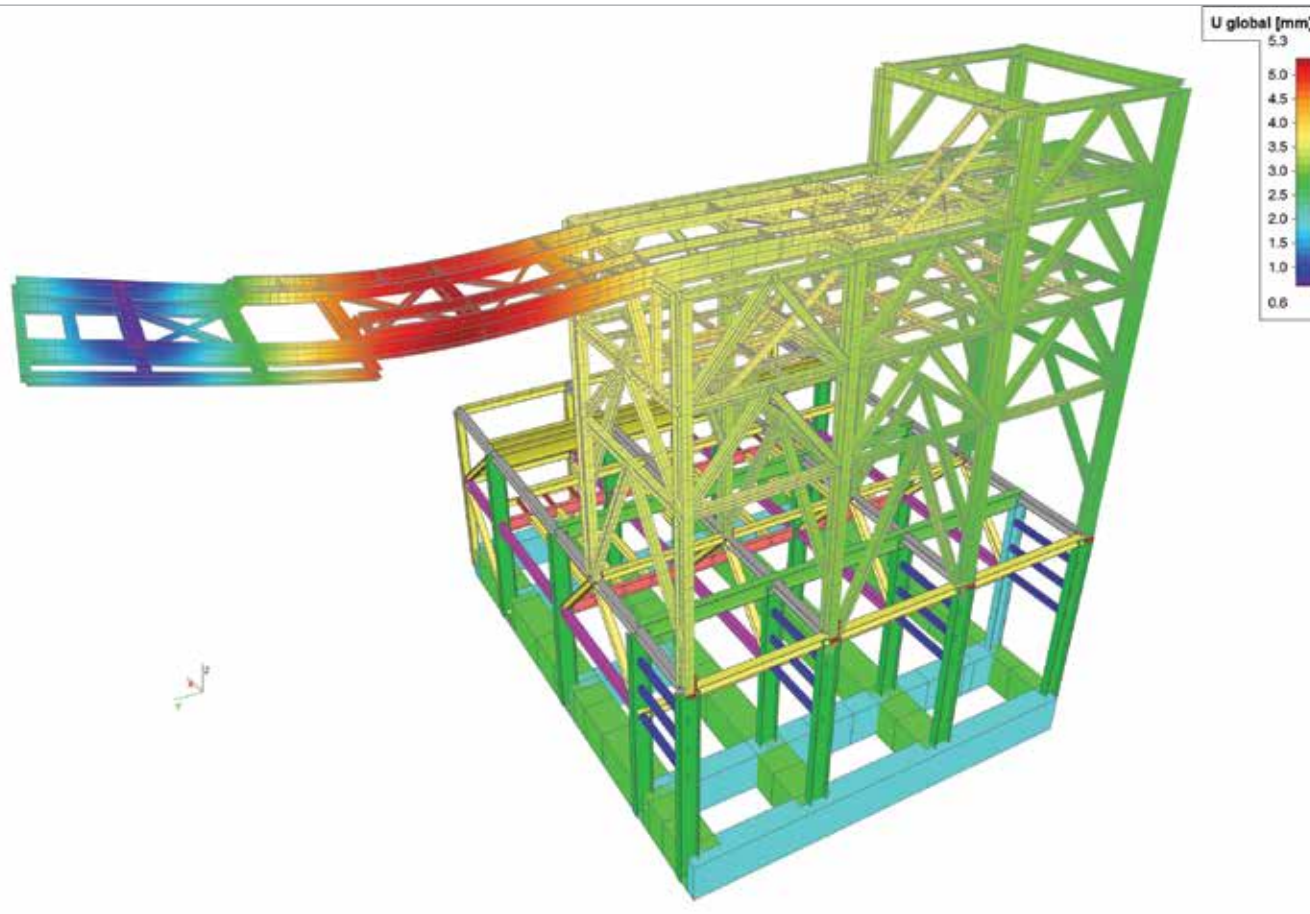
Contact Michal Bezruč
 Address Bartošova 5532
 76001 Zlín, Czech Republic
 Website www.navlacil.cz



The Building Company Navláčil Ltd. was founded in 1992 by Mr. Martin Navláčil senior. Now there are more than 200 employees. The company focuses on the construction and reconstruction of structures for business. This includes industrial buildings like a production hall with office block. We also construct housing developments and residential houses. Recently we have begun to provide drafting of the structures.

Our primary aim is to provide high-quality work. Because of this we keep up our motto: "build on references".





Owner	Suikerunie
Architect	SPIE Controlec Engineering
General Contractor	Suikerunie
Engineering Office	SPIE Controlec Engineering
Construction Period	02/2014 - 08/2014

This project involves the construction of a steel and concrete structure consisting of three Pulp Press machines. These machines will press the sugar juice out of the sugar beet shreds. This construction consists of three floors; the ground floor, the first floor, the top floor and an additional structure to support a conveyor. The Pulp Press machines are located on the top floor. The Pulp Press machine has a weight of 140 tons with some dynamic impact/loading, and the conveyor has a weight of 20 tons at a height of 24 m.

The task was to design a structure for three Pulp Press machines and a support for a conveyor. The result of the design has to be input for the building permit and for the construction phase of the structure. The new structure is built in a brown field situation. The time schedule was very important; the structure has to be built in the sugar beet harvest off-season. The ground floor has to be accessible for trucks and lorries. The design of the process has been worked out in SCIA Engineer. The structure has been completely modeled with 1D beam elements in 3D.

The project has been successfully completed and will become operational in September 2014, before the harvest of the new sugar beet.

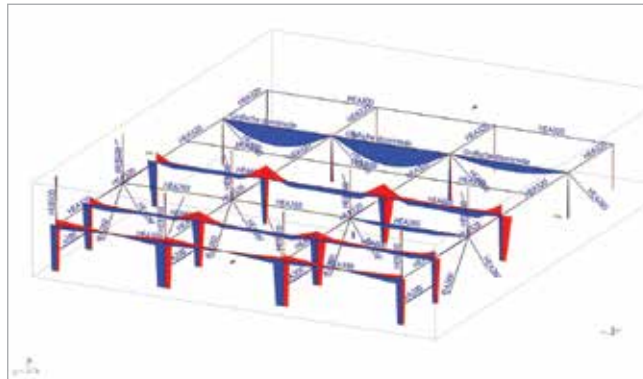
SPIE Controlec Engineering

Contact Geert D'Hollander
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4538 BN Terneuzen, The Netherlands
Website www.spie-nl.com



SPIE Controlec Engineering is a multidisciplinary engineering and consultancy office and member of the SPIE group. Throughout the years the company has developed as partner for the process and energy industry. We support our clients' implementation of their projects by applying state-of-the-art know-how and a flexible approach to projects with specialized engineers in process, piping, mechanical, civil/structural, E&I.

With our SPIE divisions, we can provide the complete trajectory from conceptual design to building and maintenance of E&I and automation.



Owner Avery Dennison - Roll Material Europe
 General Contractor CTI Systems - Storax
 Construction Period 08/2014 - 12/2014

Structure

Racking structure - dimensions L x W x H = 35.8 m x 7.74 m x 20.5 m as a self-supporting structure composed entirely of cold formed sections:

- Top guiding rail: +/- 35.8 m in one aisle.
- Racking class: Class 100B according to FEM 9.831.
- Racking composed of 10 frame axes.
- 6 levels for paper rolls, diameter from 300 to 700 mm.
- 6 levels for paper rolls, diameter from 700 to 1,200 mm.

Stability and modelling

Generally, the study of this kind of repetitive structure is made using several 2D models. For this project, we used a 3D model which was used to study the structure more rapidly in its entirety and quickly indicate loads on foundations. Eccentricities in the cold-formed components and assemblies have a significant impact on their stability. These effects were controlled in another 3D model in which each type of cross section was controlled with extreme ULS loading resulting from the first general 3D model. Using IFC export to Tekla Structures, we were also able to make the first general drawings within the short deadlines imposed by the client. The use of SCIA Engineer gave us the opportunity to provide a complete study, quickly and safely.

Steel Engineering

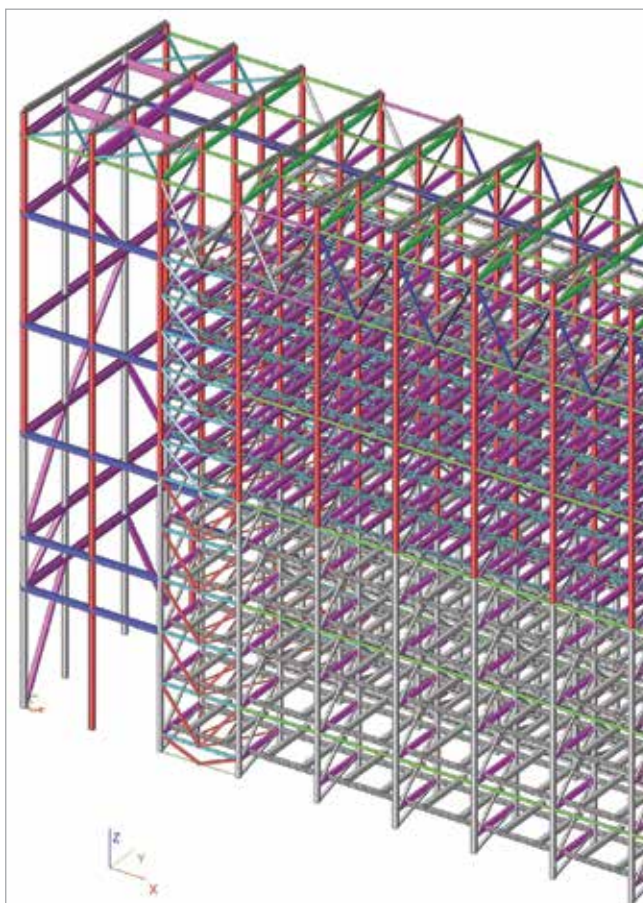
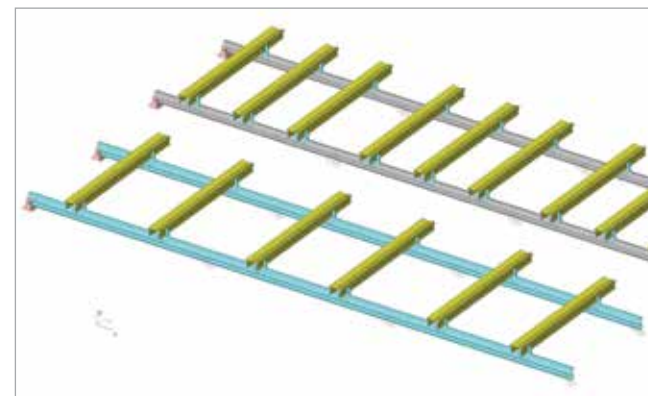
Contact Olivier Debusschere
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 5020 Temploux, Belgium
 Email ode@steeleng.be



Created in 2005, Steel Engineering is a study office that is distinguished by its know-how and expertise in the calculation and detailing of steel structures (steel, stainless steel and aluminum).

Types of studies: Design and optimization of structures, checking existing structures, fire studies, seismic, fatigue, etc.

Types of structures studied: Industrial structures, bridges, cranes, racks, scaffolding, pylons, etc. Using powerful software tools, Steel Engineering offers its customers a modern innovative service and excellent quality.





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MODELLING, ANALYSIS AND
DESIGN IN **ONE PROGRAM.****



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Specialty structures – Sustainable, Ecological and Green Structures – Scaffolding – Works of art – Mechanical equipment...
Larger projects (storage tanks, conveyer belts, cold storage installations, supporting structures), playground equipment, cranes, tubular connections...
for which SCIA Engineer and/or Allplan Engineering software has been used. To this category also belong stadiums, spectacular roofs.

Special Projects

4

Winner Category 4

Quote of the Jury: "This project is technically very interesting because the whole building has been modelled in 3D including the cable-net facade, supporting perforated structure and its foundations. The presentation showed the structural model and the completed building, demonstrating the use of SCIA Engineer to optimize the final design solution."

Owner Provast
 Architect MVRDV
 General Contractor Mobilis+Martens & Van Oort (substructure) /
 JP van Eesteren (superstructure)
 Engineering Office Royal HaskoningDHV
 Construction Period 2010 - 2014

The Markthal in the centre of Rotterdam is a unique project in many ways. It's the first covered market hall in the Netherlands, enveloped in apartments and enclosed by cable net facades at the front and back. The top apartments form the keystone of the market hall, spanning 36 m and carried by concrete walls. The project has a footprint of ~120 x 90 m and stands 40 m tall. Underneath the building a 4 storey deep underground carpark has been created. The building's foundations are a sand layer on top of a soft clay layer at a depth of around 30 m.

We used SCIA Engineer to investigate and engineer the complete structure with cost optimization as the driving force for project feasibility: the stability of the superstructure, the interaction between soil, foundations, substructure, superstructure and the behaviour of the cable net facades.

The lowest floor of the substructure was optimized to be as thin as possible, while retaining up to 12 m of water pressure and withstanding settlement due to the soft clay layer. The superstructure was monolithically integrated in order to avoid vulnerable dilatations. The cable net facades were designed taking into account the non-linear behaviour of both concrete structure and cables (deformation determined forces) to reduce construction time and costs.

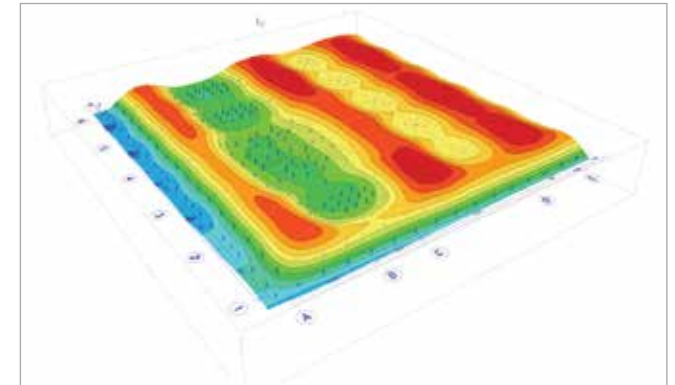
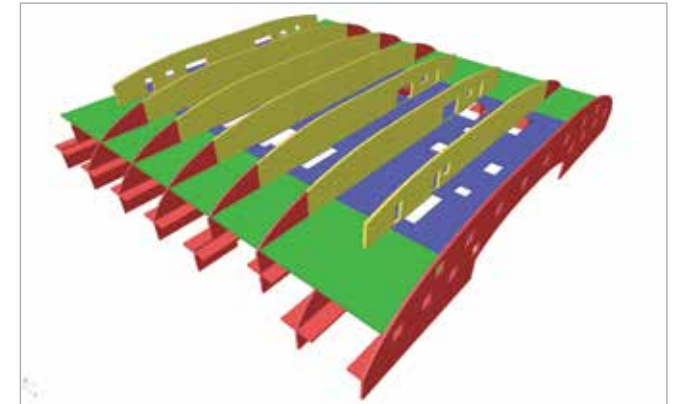
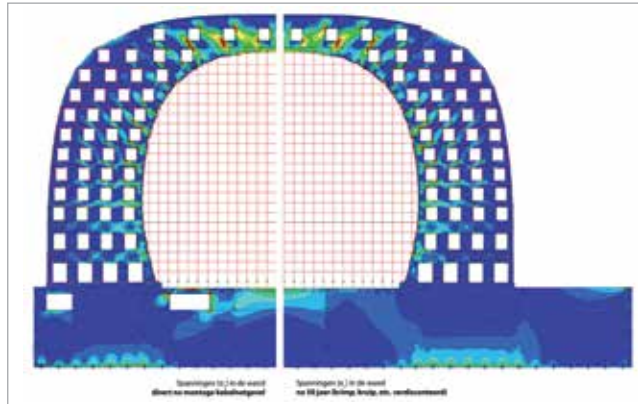
Royal HaskoningDHV

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 3068 AX Rotterdam, The Netherlands
 Website www.royalhaskoningdhv.com



Royal HaskoningDHV is an independent, international engineering and project management consultancy with over 130 years of experience. Our professionals deliver their services in the fields of asset management, aviation, buildings, energy, industry, infrastructure, maritime, mining, strategy, transport, urban and rural planning, water management and water technology.

Backed by the expertise and experience of our 7,000 colleagues all over the world, our professionals provide their services locally to public and private clients from 100 offices in 35 countries.



Source: Ossip van Duivenbode





Owner *Serpentine Gallery Trust*
 Architect *Smiljan Radic*
 General Contractor *Stage One*
 Engineering Office *AECOM, London*
 Construction Period *05/2014 - 06/2014*

Serpentine Gallery Pavilion 2014 has been designed by Chilean architect Smiljan Radic with AECOM providing structural design from concept through to construction. This Pavilion exemplifies the history of small romantic constructions seen in parks or large gardens, the so-called follies of the 16th to 19th century. The design is based on two sculptures created by the architect. The goal of the project was to replicate the brittle fragility of papier-mâché whilst achieving the juxtaposition of dark and light through the skin of the build.

Key to the design was to incorporate a thin (13 mm) semi-transparent glass reinforced plastic shell (GRP) with a visible steel frame which would merge the architectural intent of the ruined follies with the functionality of the frame. The aesthetic of sitting the shell directly on sandstone rocks was realized by designing fixed frames within SCIA Engineer and controlling deflections to allow steel columns to be hidden within the sandstone.

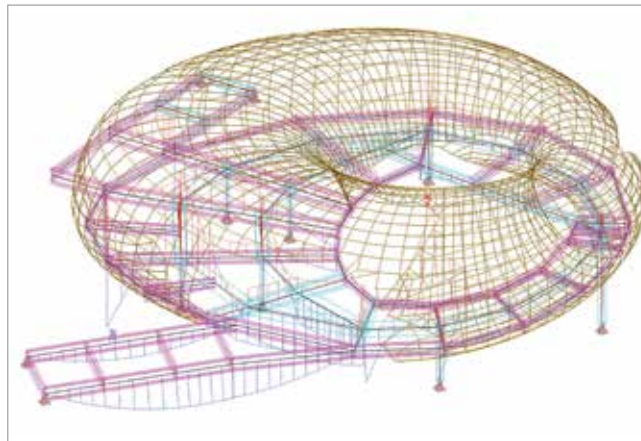
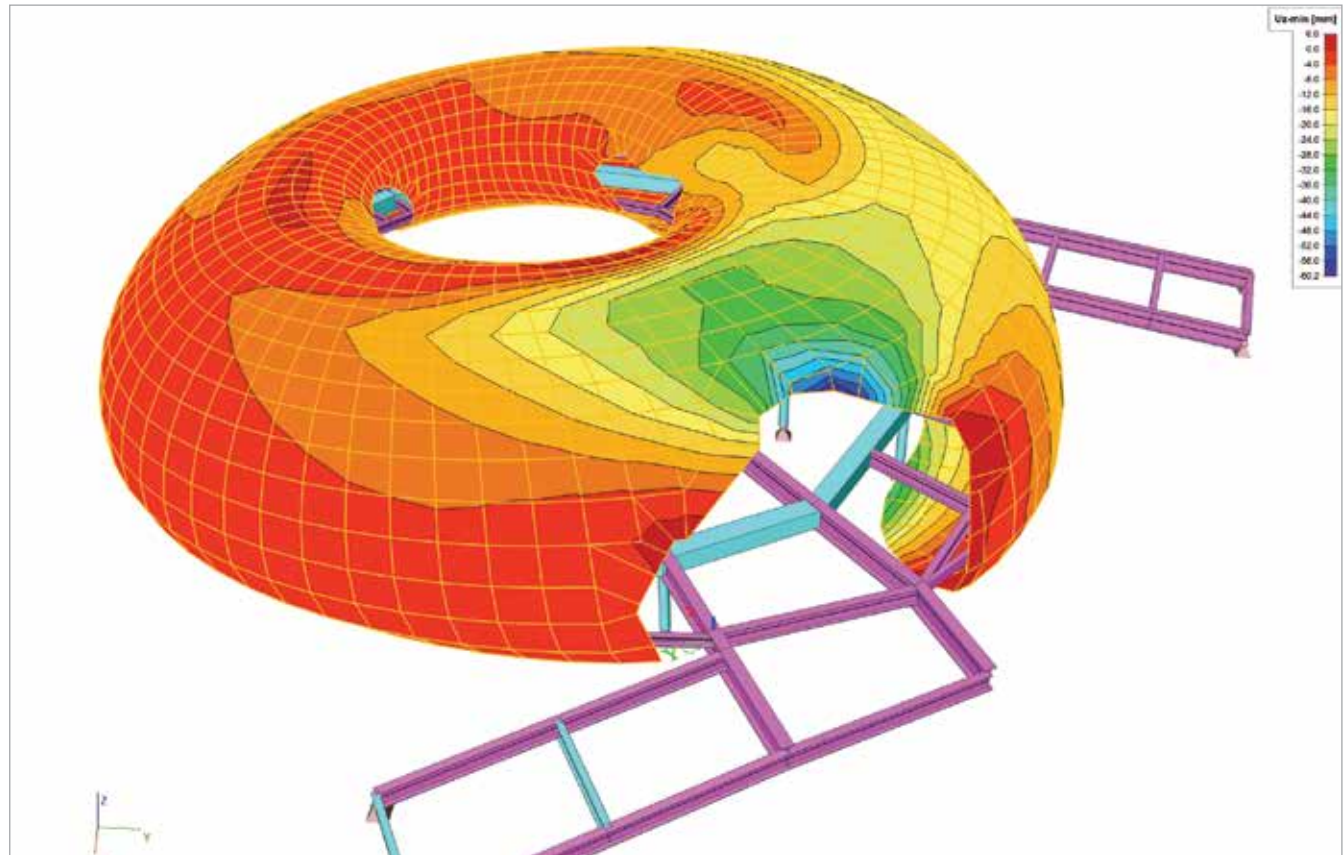
Design challenges were faced when evaluating the behaviour of the fibre glass shell and its impact upon the frame. The Pavilion series has a history of utilising unusual structural materials. The GRP was imported as a shell structure to SCIA Engineer using a bespoke panelisation script and analyzed. This was then taken by specialist GRP contractor Optima to produce final construction information.

AECOM

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WC1v 6QS London, United Kingdom*
 Website *www.aecom.com*



AECOM is a global provider of professional, technical and management support services to a broad range of construction and infrastructure markets. With approximately 90,000 employees around the world, our teams of award-winning engineers, designers, planners and project managers ensure that AECOM is a leader in all of the key markets that it serves, providing a blend of global reach, local knowledge, innovation and technical excellence in delivering solutions that create, enhance and sustain the world's built, natural and social environments.



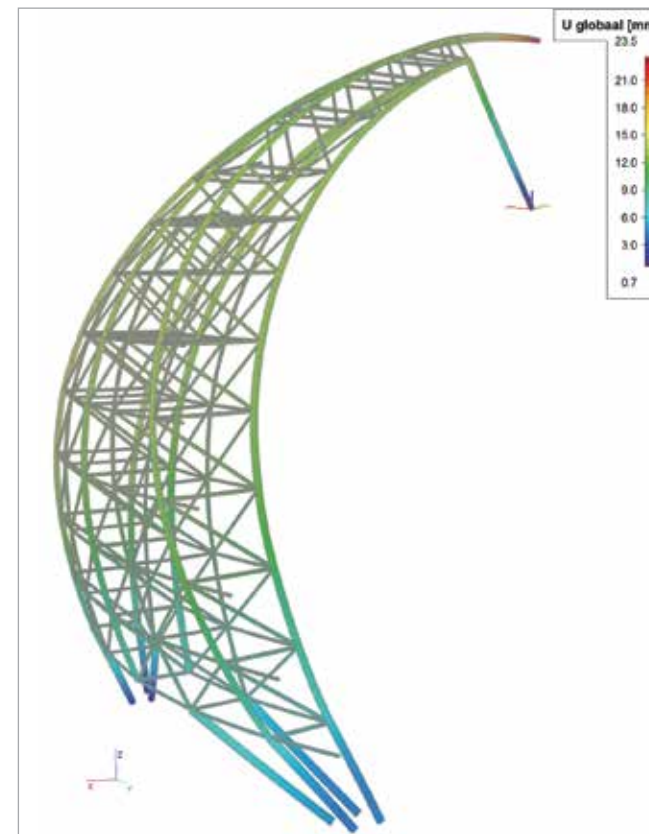


Owner *Conseil Général 92*
 Architect *Shigeru Ban Architects Europe*
 General Contractor *Bouygues Bâtiment*
 Engineering Office *RFR*
 Construction Period *09/2014 - 06/2016*

As a part of the building of the Cité Musicale in Boulogne-Billancourt near Paris, Baudin is responsible for this special project. These are two symmetrical three-dimensional truss structures composed of tubular connections. Each one is 18 m long and more than 40 m high. These structures support 880 m² of photovoltaic panels. The crucial aspect is the motorization, which enables the structure to follow the path of the sun.

The first difficulty encountered was due to the complex shape of the structure. The model was designed in SCIA Engineer on the basis of the CAD file of the architect. The DWG file was transferred to SCIA Engineer. The intensities of wind loads on the photovoltaic panels were determined by wind tunnel tests. It represents 146 wind load cases for 302 photovoltaic panels. The wind, excluding all other cases of loads, represents 132276 point-loads. This data was imported into the design model using the Table Input tool.

The possibility to input files was a big advantage, as it enabled the 3D structure to be formed quickly, easily and exactly in SCIA Engineer. Production will start in spring and will be followed by the assembly on the site in September 2015. In this way Baudin will demonstrate its multidisciplinary competence in carrying out a new "above-standards" construction work.

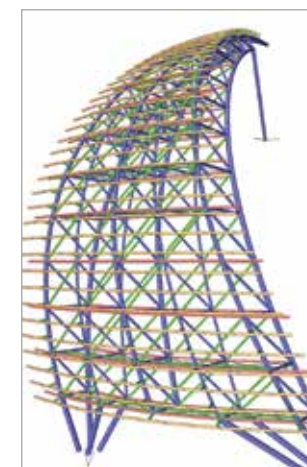
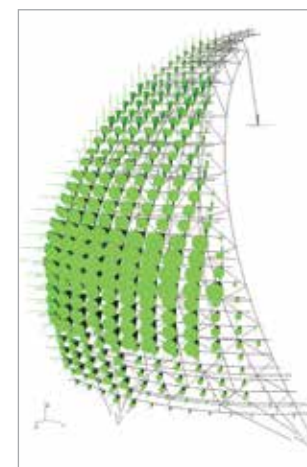
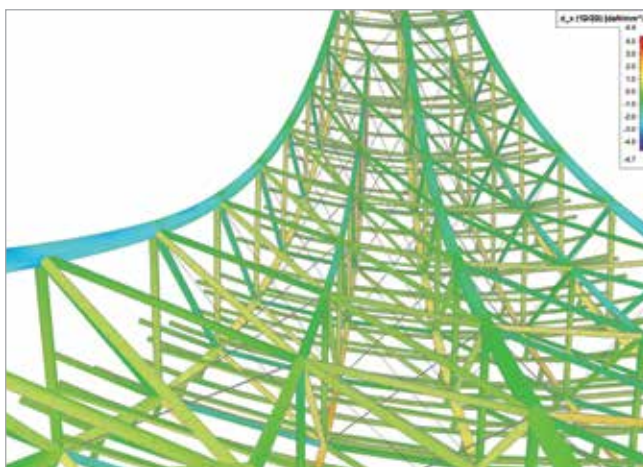


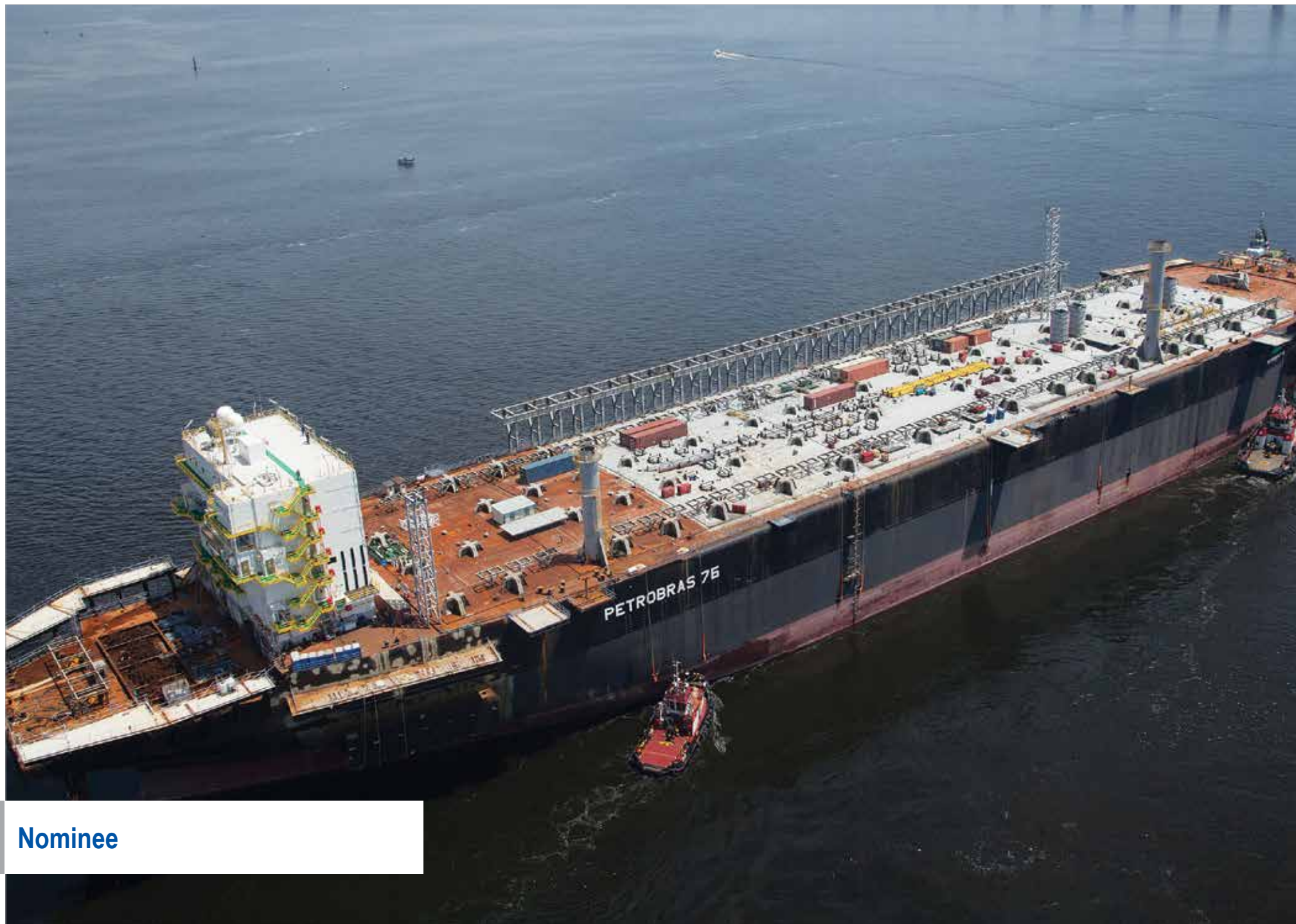
Baudin Châteauneuf

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 Website *www.baudinchateauneuf.com*



Baudin Châteauneuf was founded in 1919. From its beginnings in the production of electrical towers and farm sheds, the company moved into the construction of steel bridges. In 1954, the company sought to diversify its activity. Its mastery of metal logically led Baudin into the field of metal frames. Nowadays Baudin offers a full range of services at the highest technological level in a lot of business areas: construction and renovation of civil engineering work, steel structures, mechanical engineering and as a general contractor.



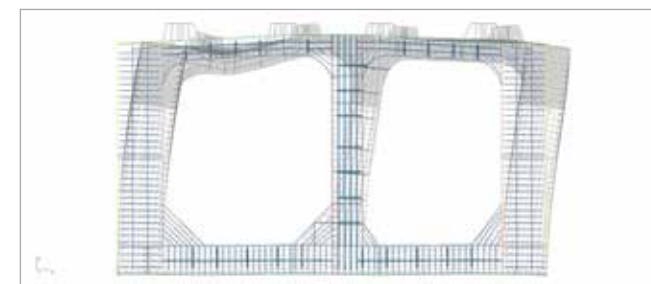
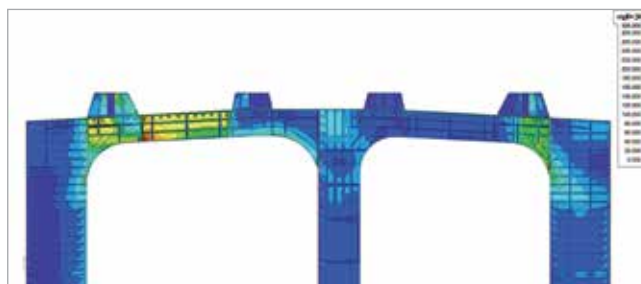
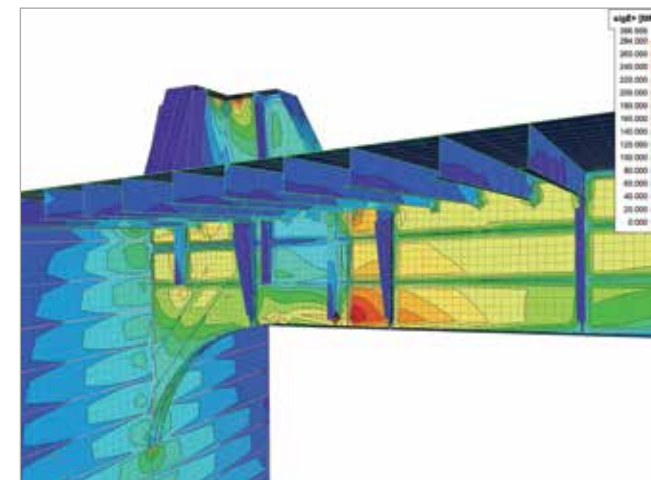
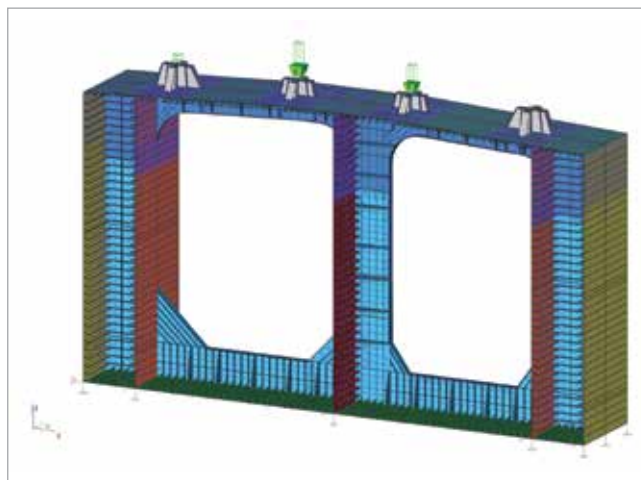


Owner Enseada Industria Naval S.A.
Architect PROJEMAR
General Contractor Construtora Norberto Odebrecht S.A.
Engineering Office Odebrecht Engenharia Industrial
Period 08/2013 - 10/2013

Inhaúma Unit is working on the conversion of four VLCC (Very Large Crude Carriers) ships into FPSO (Floating Production, Storage and Offloading), of the future Platforms P-74, P-75, P-76 and P-77. Intended for the Cessão Onerosa areas, in the pre-salt deposits of Santos Basin, the platforms will produce up to 150 thousand barrels of oil, and compress up to 7 million cubic meters of natural gas per day.

From a structural point of view, the conversion involves two main stages: (i) replace the corroded plates of the ship's hull and (ii) reinforce the structure of the VLCC to receive the FPSO modules and equipment. The Fast Track project aimed to design the main reinforcements in a record time for the P-76. The intention was to execute these reinforcements in China, at the same time as completing the hull repair. This resulted in significant savings for the contract.

A Finite Element model performed in SCIA Engineer was built to evaluate the stresses and design the reinforcements. Seven frames were modelled with their adjacent frames: aft and fwd. A beam model was built to determine the frames' behaviour and to generalize the reinforcements to the remaining frames.



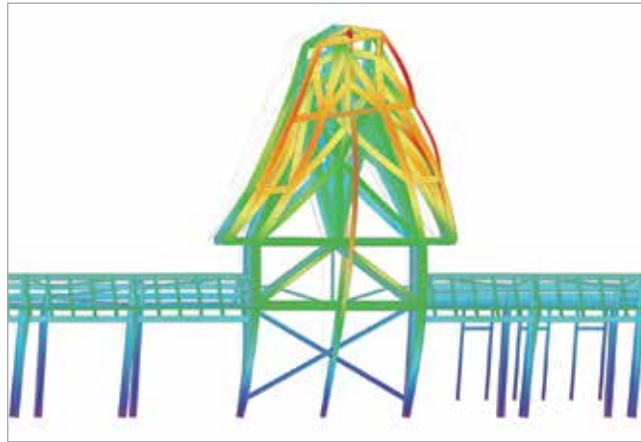
Construtora Norberto Odebrecht

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 Flavio Rubin
Address Rua Lemos Monteiro, 120
 12th floor
 Butantã, São Paulo, Brazil
Website www.odebrecht.com



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Owner	North of England Zoological Society
Architect	Dan Pearlman
General Contractor	Read Construction
Engineering Office	AECOM, Manchester
Construction Period	01/2013 - 06/2015

Chester Zoo is undertaking one of the largest zoo developments in Europe, known as "Islands", which covers 50,000 square metres and will recreate the habitats of six South East Asian islands. One of the most iconic buildings, for which AECOM has provided the structural design, will be the restaurant – a **braced steel-framed structure with a distinctive boat-shaped saddleback timber feature roof**, typical of the traditional "tongkonan" houses found on the island of Sulawesi.

At the conceptual design stage SCIA Engineer was used to establish a viable structural form to suit the **complex 3D geometry** of the feature roof, and to determine preliminary steel and timber section sizes using the EC3 and EC5 design modules. The ability to rapidly analyze and check the strength, stability and deformation of structural members in multiple materials within a single global model was of considerable benefit as the design evolved.

Later in the project, the **final analysis** of the complete structure and **detailed design** of the steel elements were both undertaken in SCIA Engineer. The **Engineering Report** module was used to produce up-to-date calculations and documentation automatically as the design progressed, whilst the new **Table Results** feature allowed member connection forces and foundation loads to be easily extracted from the software for use in **external calculations**.

AECOM

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AECOM

AECOM is a global provider of professional, technical and management support services to a broad range of construction and infrastructure markets. With approximately 90,000 employees around the world, our teams of award-winning engineers, designers, planners and project managers ensure that AECOM is a leader in all of the key markets that it serves, providing a blend of global reach, local knowledge, innovation and technical excellence in delivering solutions that create, enhance and sustain the world's built, natural and social environments.

Owner *Dong Energy*
 General Contractor *Heerema Fabrication Group*
 Engineering Office *Altrad Balliauw*
 Construction Period *06/2013 - 03/2014*

The Hejre jacket construction was assembled on the Heerema yard and was 93 m long, 60 m wide and 45 m high. In order that **work could be carried out safely at a height** and to give protection against wind and rain, scaffolds had to be erected. Due to the complexity of the scaffolds (height, cladding and several clashes with the jacket), the project lead time and the fabrication sequence, it was necessary to **design each complex scaffold** in advance.

The jacket construction (dwg file) was **imported into SCIA Engineer**, enabling us to design the scaffolds in detail. Furthermore, after joining the first pair of rows, this box structure, including 10 scaffolds, had to be moved. Consequently, we had to design and carry out a **2nd order calculation** for 38 complex scaffolds with SCIA Engineer using the **scaffolding module**. Because we designed the scaffolds in advance and due to the complexity of the structure, the builders had to erect the scaffolding using a detailed plan. These were made in SCIA Engineer **"paperspace"**, with the positions set by a surveyor.

After our **detailed design and calculation**, we proposed some adjustments to the fabrication sequence and added some temporary steel for the stability of the scaffolds, due to the high wind loads on the cladding. Thanks to this working method the scaffolds were erected as **quickly, economically and safely as possible**.

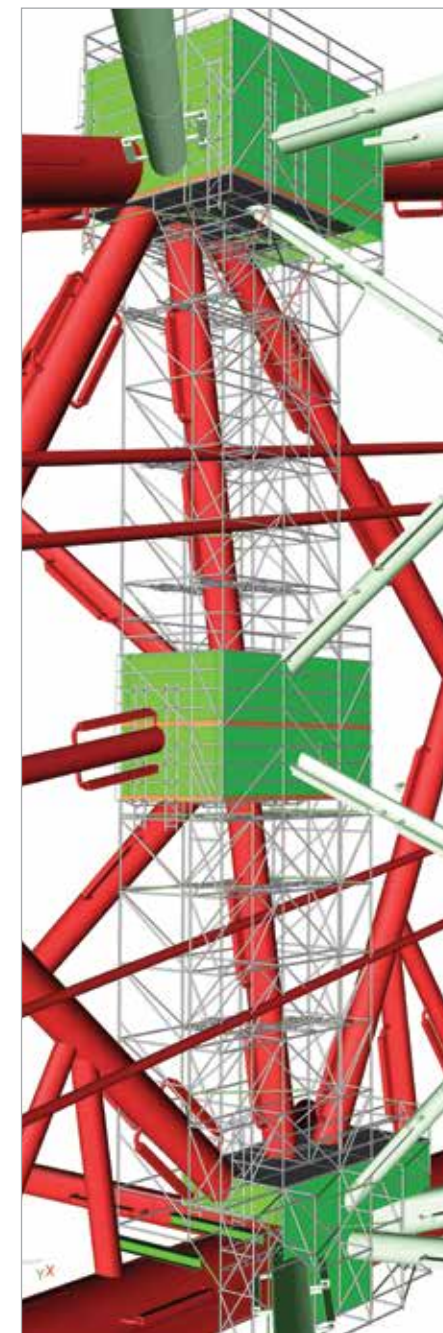
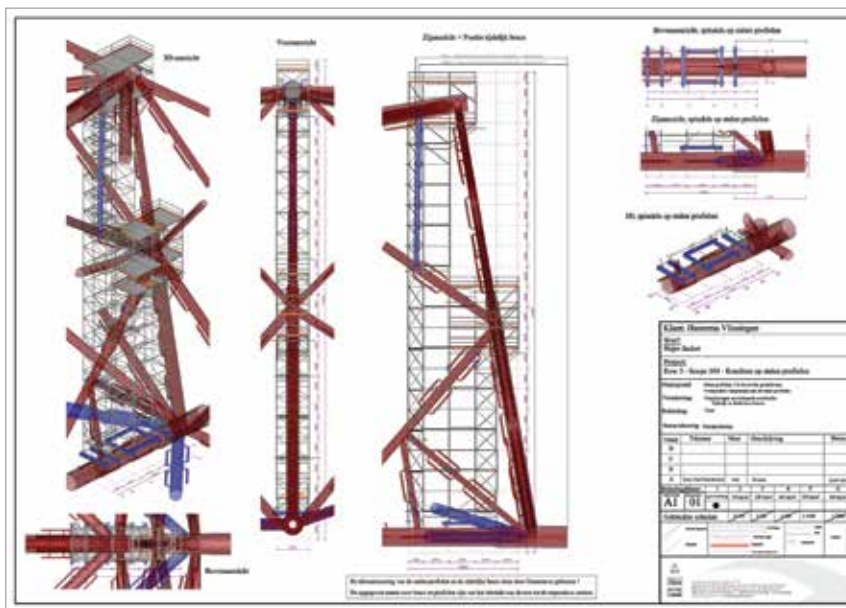
Altrad Balliauw

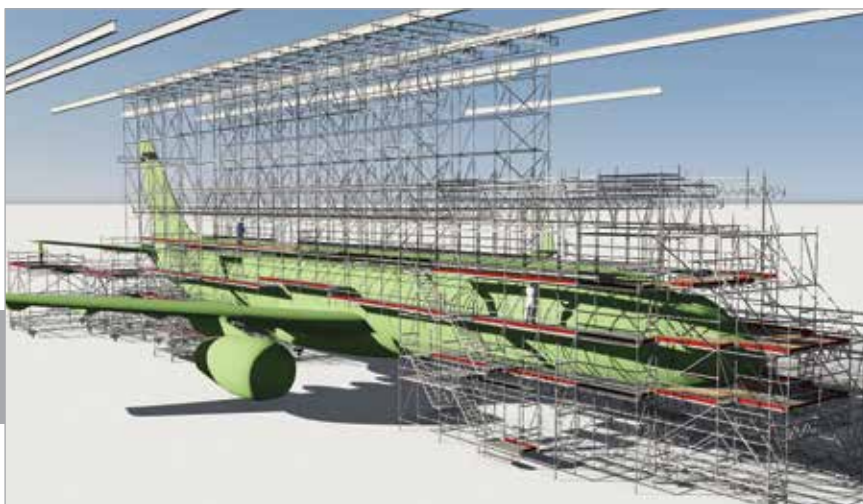
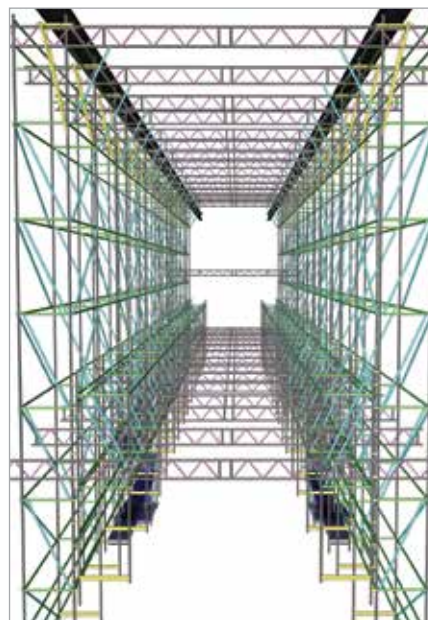
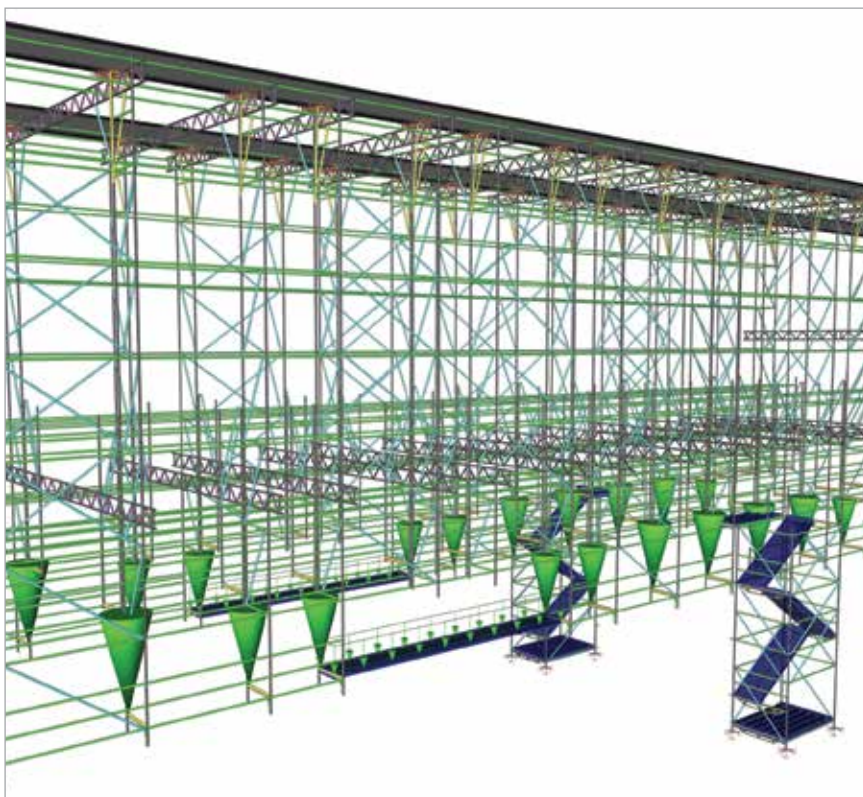
Contact *Astrid Schaut*
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9130 Verrebroek, Belgium
 Website *www.altradballiauw.com*



Altrad Balliauw, established in 1976, is a respected name in industry and in the construction sector in Benelux and is part of the large French Altrad Group. Altrad Balliauw is active in **scaffolding, industrial insulation and asbestos removal**. Its industrial activities are mainly focused on the energy sector, (petro) chemicals, metallurgy, construction, food and pharmaceuticals.

The Altrad Balliauw engineering department designs and performs the calculations for each complex scaffold in advance, for **maximum safety, stability and efficiency**.





Owner	Airbus Industrie
Architect	Comi Service
General Contractor	Airbus Industrie
Engineering Office	Comi Service
Construction Period	05/2014 - 09/2014

Project definition:

In order to apply paint to the A330, Airbus Industrie needed scaffolding that would allow them easy access to all parts of the aircraft. The resulting **structure is suspended to the framework** of the painting workshop and measures **9 m by 39 m**, with a height of **12 m** and weighs **39 tons**.

Modelling and calculation:

SCIA Engineer made it possible to design the structure according to the special scaffolding codes **NF12810**, **NF12811**, **EN74** as well as to the **Eurocodes**.

We defined the non-linear hinges for the couplers precisely and ran a non-linear analysis following the iterative **Timoshenko** method. The model consists of 7,876 nodes, 4,699 beams and 16 non-linear combinations.

Conclusion:

The challenge was to find **purely geometrical solutions** for the distribution of loads, as scaffolding elements are standard tubes with a defined resistance. It was also necessary to take into account **relative displacements** to avoid any collision risk with the aircraft. Thanks to SCIA Engineer all of this was possible and straightforward.

Comi Service

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Subsidiary of the Altrad group, Comi Service specialises in scaffolding. Its engineering office is able to handle the most technically challenging projects and its national network of seven agencies allows for wide geographical coverage.

Comi Service in figures:

- 332 full-time employees.
- €40 million revenue.
- A stock of 10,000 tons of multi-directional NF material of the Layher and Plettac brands.

Owner
 Architect
 General Contractor
 Engineering Office
 Construction Period

Wanted
 arch. Plamen Marinov
 Transstroy Ruse
 Constructa Ltd
 1994 - 1996

The „HYPAR” is inspired by its math properties – a surface, generated by two families of straight lines. The structure is 13 x 13 m in plan, height 4 - 6 m, suitable for gas stations - high above the road and low above people.

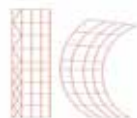
The canopy is composed by 4 inclined beams (paired U 240 x 1 m) and two cross groups of ropes – prestressing and bearing. All prestressing appliances are hidden in the contour beams, under a removable cover. The columns' cross section provides space for lights and advertisements. Water collecting pipes are inside the columns, so rainwater is not sent to the wastewater treatment facility. The roofing could be any panels – glass, plastic, etc. The ropes are rolled circular bars, tendons for larger spans. A simple double halfpipe at the crosspoints of ropes allows independent movement. The canopy was mounted on earth to make prestressing easier to control. After mounting, the upper part of the columns was poured. The structure is checked for different spans, groups of 4 or more (for sporthalls, malls, concert halls - acoustic properties not studied yet). The advantages are a small number of internal supports, separate collection of rain water, attractive lighting, relatively fast building.

In the 90's we did not have any software, later in FEAT we prestressed by “freezing” the ropes. SCIA Engineer shortens the iterational calculation.

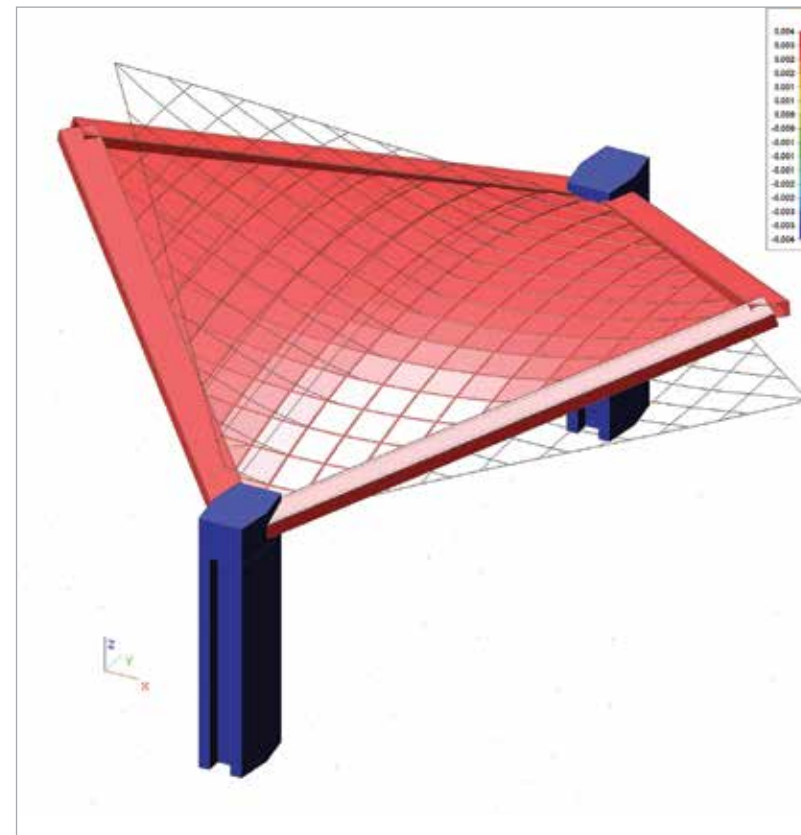
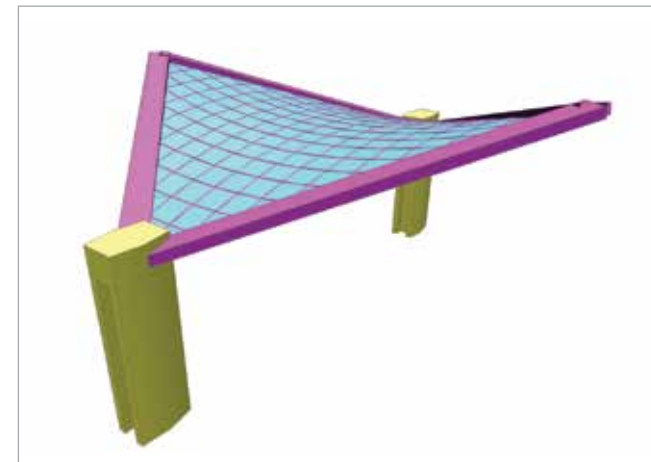
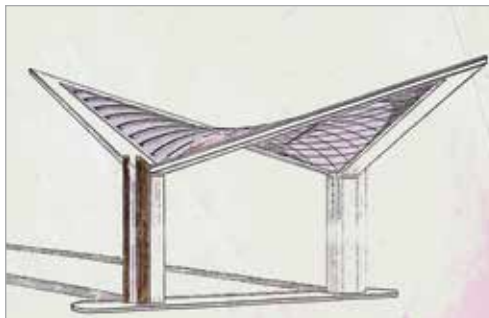
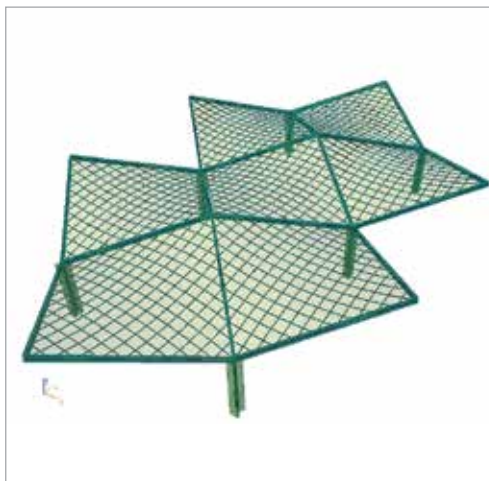
Constructa Ltd

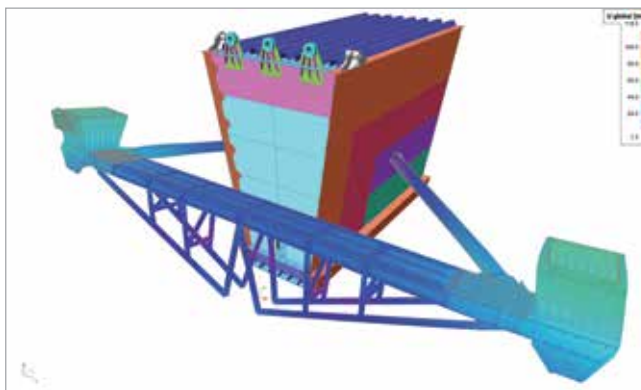
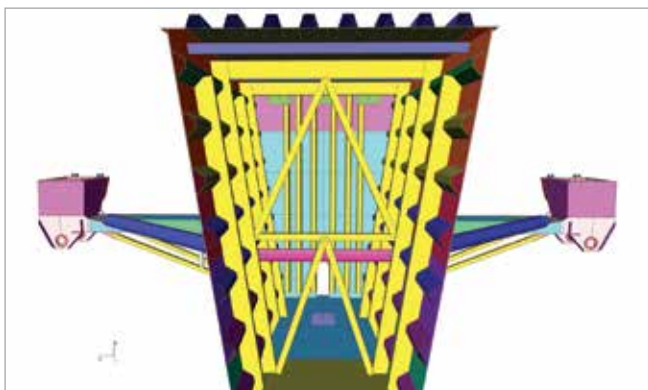
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Constructa Ltd is a structural design agency, established in Bulgaria in 2001. We value our experience in chemical industry, having learned about various processes and technologies and developed an untraditional approach towards structural decisions. We start every project with the desire to make it extraordinary and unique by **interweaving methods, technologies and materials**. With the help of SCIA we are able to model specific actions such as surcharge drift snow loads, thermal loads, explosions and water pressure on river banks, etc. Our general policy is to study a structure's work and then model its behaviour as closely to reality as possible.





Owner	Enseada Industria Naval S.A.
Architect	Konecranes
General Contractor	Construtora Norberto Odebrecht S.A.
Engineering Office	Odebrecht Engenharia Industrial
Construction Period	01/2014 - 03/2015

The Enseada's Goliath Gantry Crane is 150 m high (it is Brazil's highest equipment), has a 143 m span and capacity to lift up to 1,800 tons. In total, about 300 professionals from five different nationalities were involved in the assembly of the shipyard's main equipment. The assembly was divided into three steps: (i) erection of the Fixed Leg, (ii) erection of the Hinged Leg (or A-frame) and finally (iii) lifting of the Main Girder.

The analyzes in SCIA Engineer aimed to check Goliath's structure during the assembly stages. Specifically in this model, the temporary works and structures involved in the erection of the Hinged Leg were analyzed.

Part of the Main Girder and the Hinged Leg support structure was modeled with shell elements (2D). The boogies structure was modeled with frame elements (1D).

The loads during the erection of the Hinged Leg were given by the crane manufacturer in global analysis and applied into the model through the hinge system.

From these analyzes, local reinforcements were added, because of high stresses in the hinge system and bracing tubes. These reinforcements were developed and verified with the help of SCIA Engineer, ensuring safe operation.

Construtora Norberto Odebrecht

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Website	www.odebrecht.com



Odebrecht is a Brazilian organization composed of diverse businesses with global operations and quality standards. Through its leading companies Odebrecht serves the following industries: Engineering and Construction, Investment in Infrastructure and Energy, Industry and Auxiliary Institutions. The company generated 7,000 direct jobs through the Consórcio Estaleiro Paraguaçu (CEP) consortium, which was hired to build the Enseada's shipyard, one of the world's most modern shipyards.

Owner *Enseada Industria Naval S.A.*
 Architect *Gusto MSC / ICE - International Contract Engineering*
 General Contractor *Construtora Norberto Odebrecht S.A.*
 Engineering Office *Odebrecht Engenharia Industrial*
 Construction Period *06/2013 - 07/2016*

Paraguaçu Unit is building six drillships for Sete Brasil. The equipment will be used in the exploration of pre-salt deposits, at a depth of three thousand meters. Four of these ships - Ondina, Pituba, Boipeba and Interlagos - are being built in partnership with Odebrecht Óleo e Gás. The other two - Itapema and Comandatuba - involve another partnership: Etesco/OAS. The total value of the contract is around US\$ 4.8 billion.

Due to the upside-down construction methodology adopted, the Megablocks structure needed to be verified during the upending operation. This analysis was performed in SCIA Engineer by means of a Finite Element model. The Megablocks structure was modeled with shell elements (2D) and the cables used in the lifting arrangement were modeled with frame elements (1D).

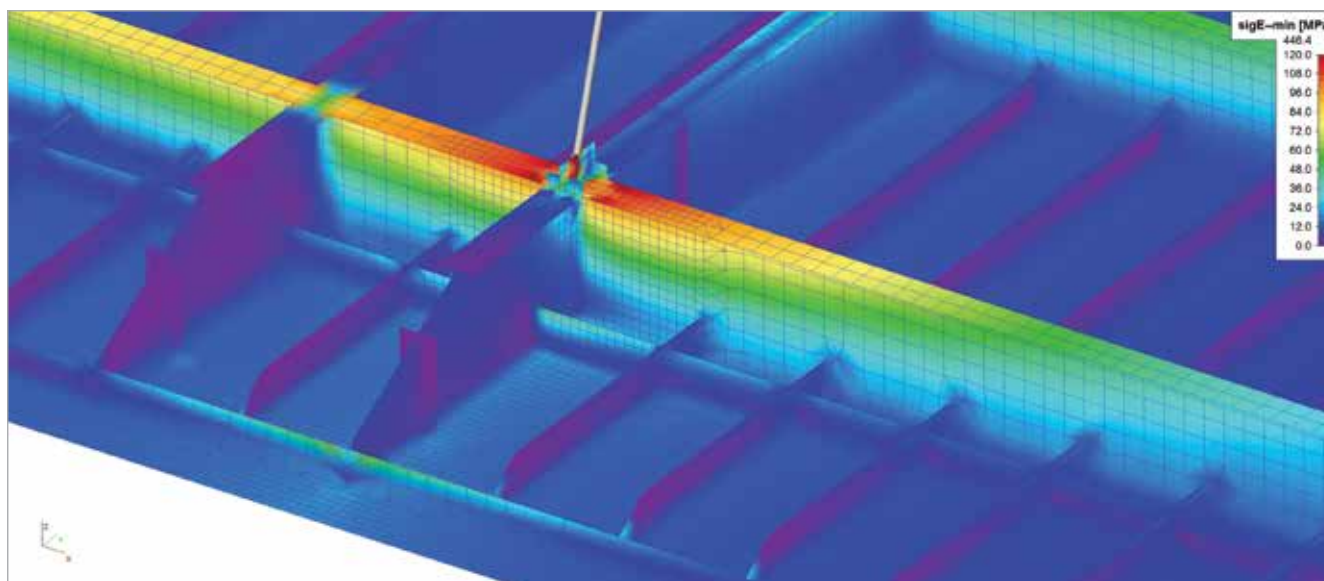
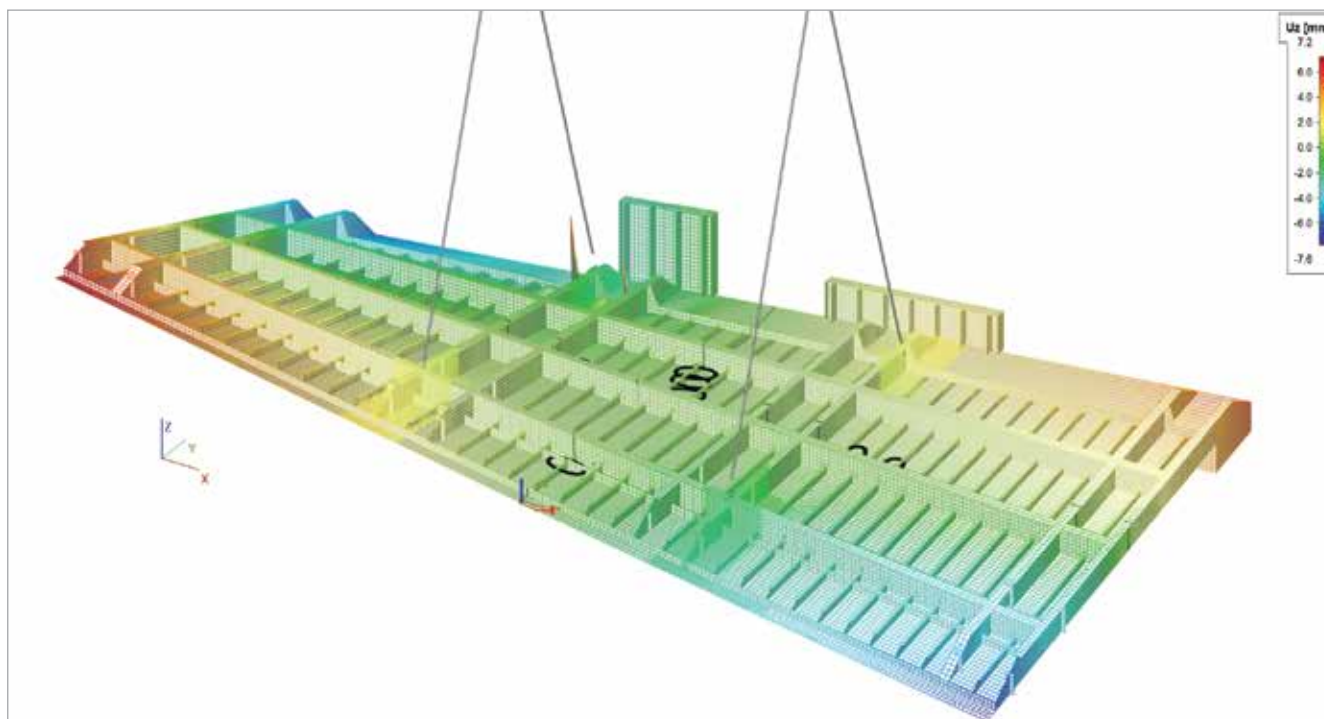
The load during the upending operation is the self-weight of Megablocks, approx. 100 tons, based on information given by the architect. Yielding and linear buckling, based on static linear elastic calculation, have been verified. From these analyzes, local reinforcements were added, because of high stresses in the lifting system. These reinforcements were developed and verified with the help of SCIA Engineer, ensuring safe operation.

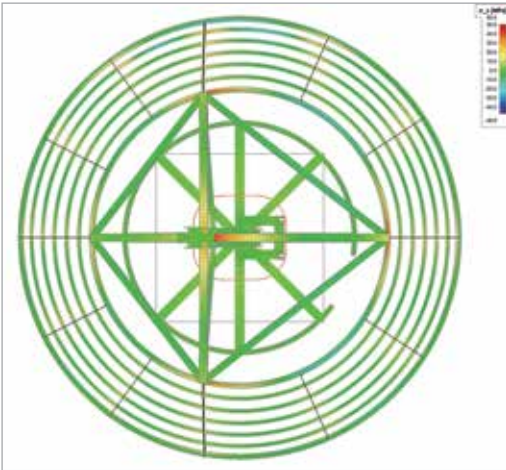
Construtora Norberto Odebrecht

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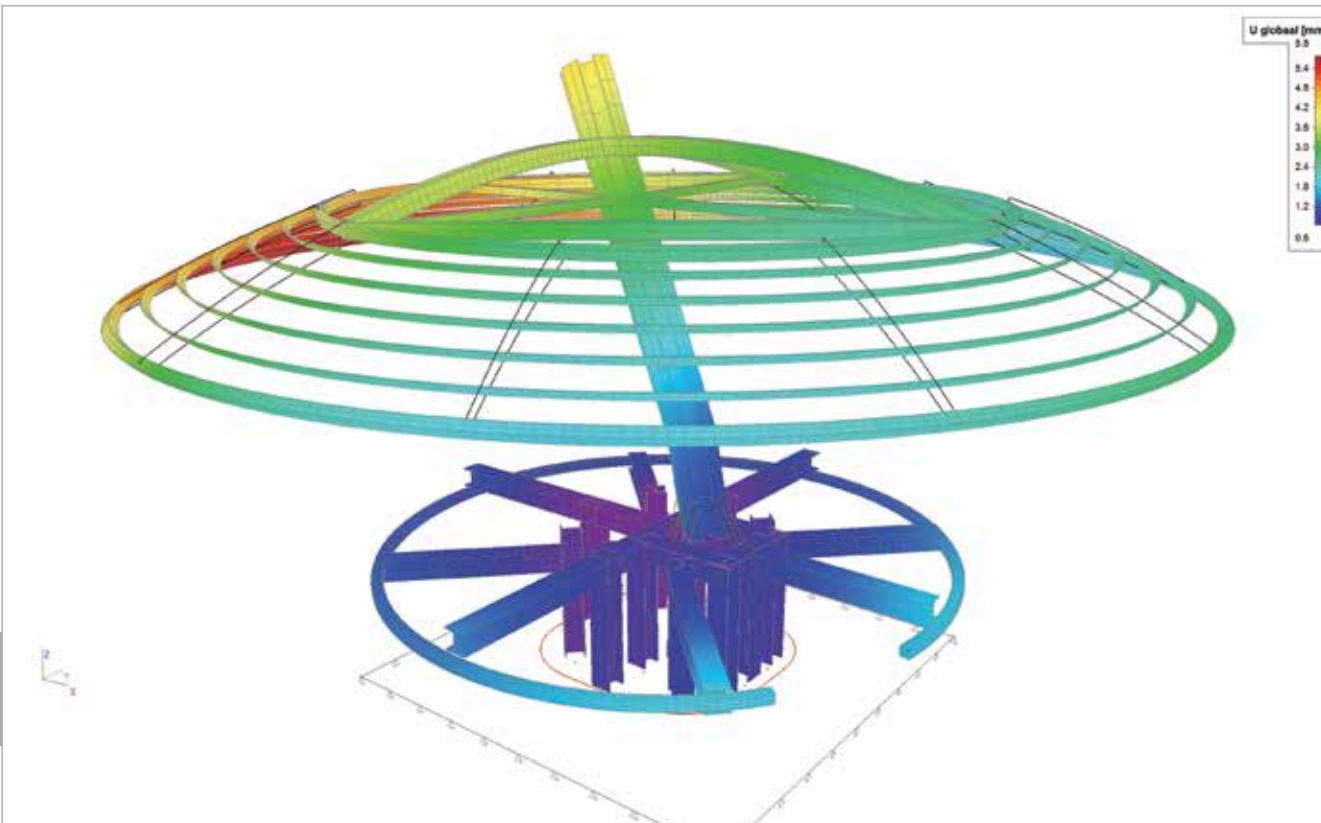
Owner Government
Architect Government
Engineering Office DENBOER CCI

Our client designed a viewpoint at a golf course in the Netherlands.

The steel construction is an increased sit/stand platform with a roof. The roof is spherical, and supported by one off-centre column. The roof has a diameter of 8.5 m and is located 5 m above the ground. The construction is partially finished with wood.

We made a model of the whole construction on a foundation plate. The model is a combination of curved 1D and 2D elements. The outside ring, composed of lamellae, is also modelled. The deformation of these components was carefully examined. The stability of the construction was also studied. Components of the column that needed closer examination were modelled as a combination of 2D elements; hereby the local effects could be presented.

The shaping of the model was a real challenge. Working in a two-directional curved plane with 1D and 2D elements is complicated. Some components, such as the lamellae, are located in this plane with an angle. These projects have certainly improved our skills in shaping a model with SCIA Engineer.



DENBOER CCI

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DENBOER CCI is an independent engineering firm composed of 15 colleagues, which provides civil, water and industrial constructions. Our projects are mainly to be found on the edges of land and water and they fulfil a variety of different functions.

We combine our practical background with knowledge and science, thereby realizing achievable and cost efficient designs. Our mission is to keep working on a safe, usable, and sustainable future for both the individual and for companies.

Owner Segno d'Arte
 Architect D+Z Architecten
 General Contractor Segno d'Arte
 Engineering Office DENBOER CCI
 Construction Period 08/2014 - 11/2014

As part of the beautification of a new office, our client requested a piece of art in the atrium of the office. The piece of art is produced by Segno d'Arte.

The construction is a twisted truss that starts as an organized structure, but ends in 'chaos'. The aluminium construction creates its own strength and stiffness; there are no additional parts inserted. The construction is 14 m long and 12 m wide. The entire construction supports itself on tension wires at 10 m high in the middle of the indoor atrium.

The building phase, transport phase, and end phase were calculated and drawn to detail. The construction was built in parts and put together on site. From there, the construction was vertically lifted to its end position. 9 tension wires make its fixation.

We made a model of the construction; the tension wires were also included as non-linear elements. Through a non-linear calculation, we found results for the building phase and end phase. After iteration, we found an optimum between deformations, internal forces, and locations of tension wires and anchor points. We also made a model to examine the anchor points and the tube wall. Local effects were considered.

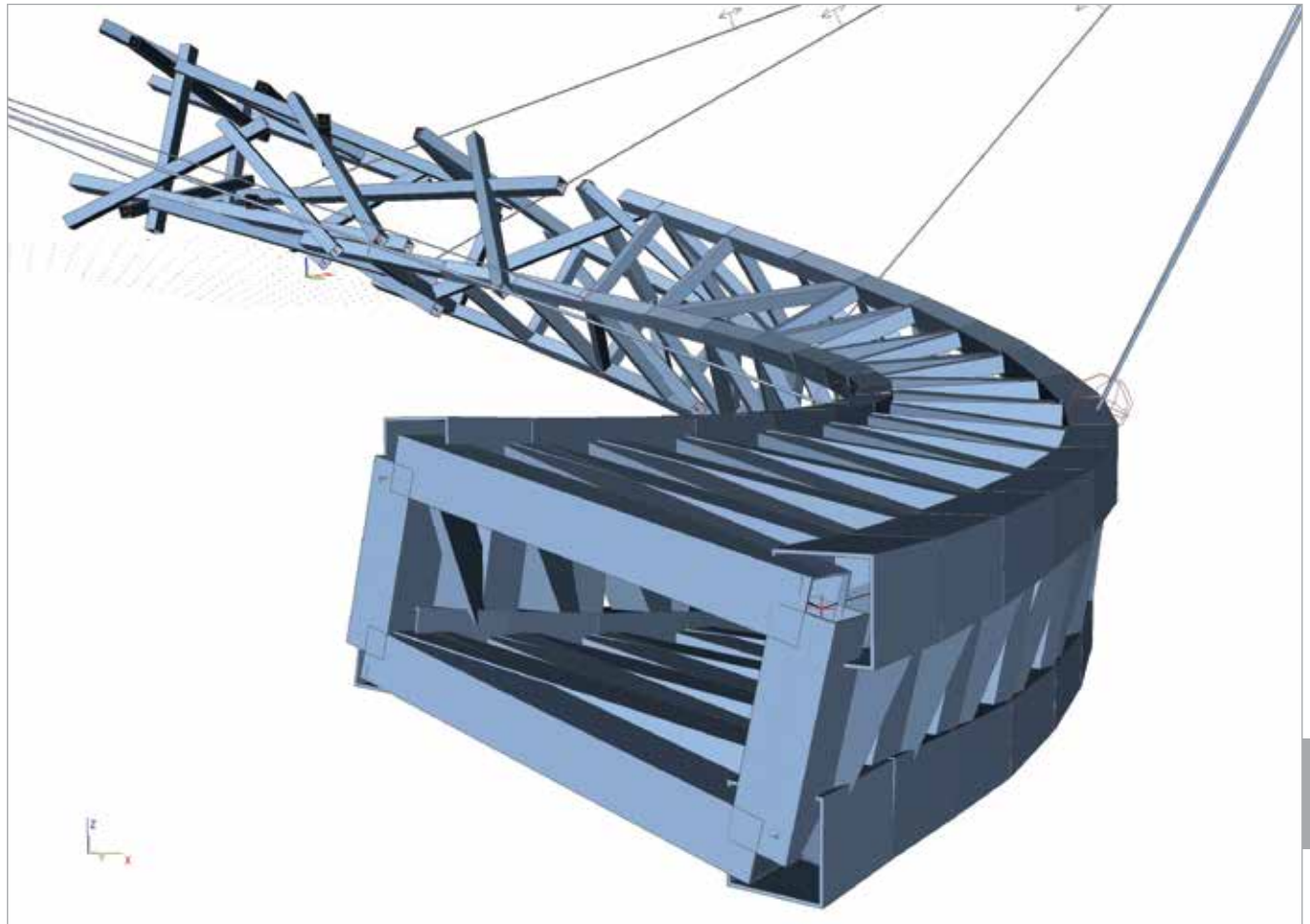
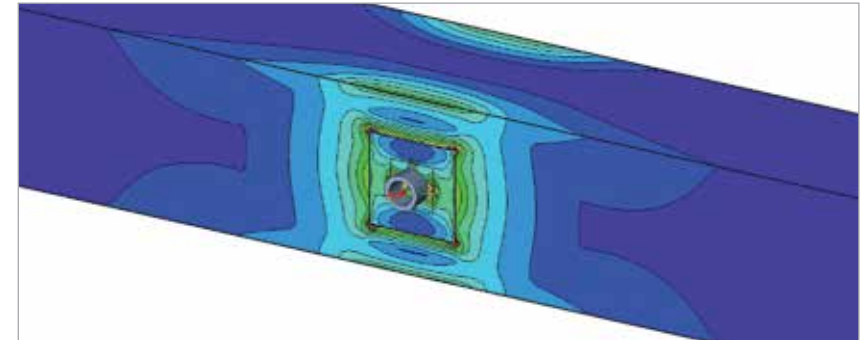
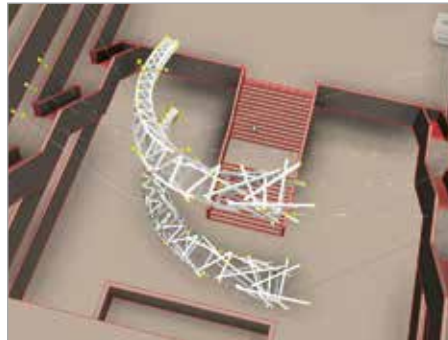
DENBOER CCI

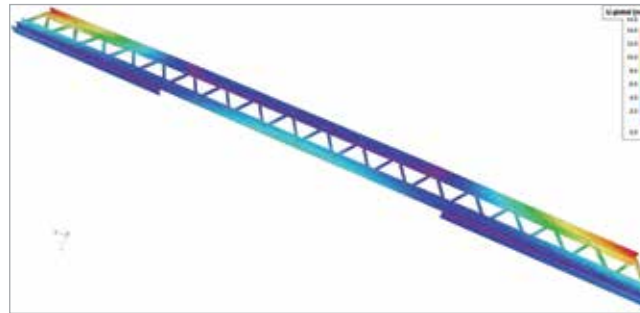
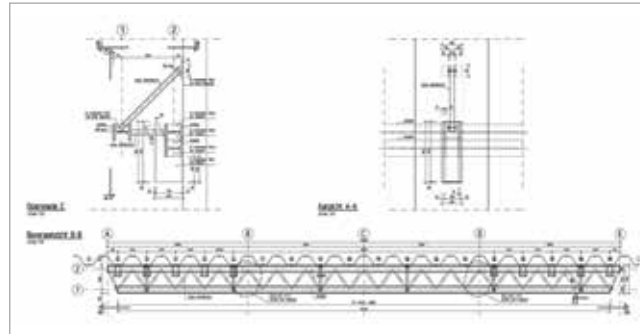
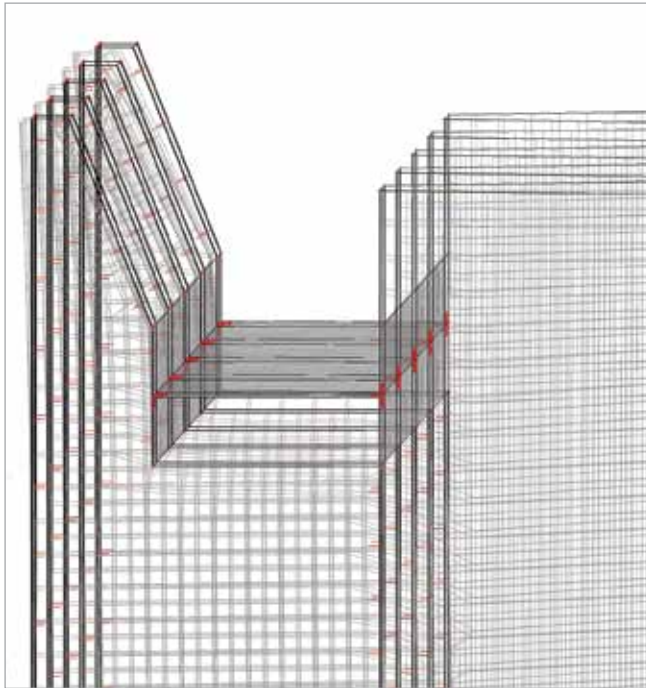
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Owner	Government
Architect	Government
General Contractor	Aannemingsbedrijf de Vries Werkendam B.V.
Engineering Office	DENBOER CCI
Construction Period	01/2014 - 12/2014

As an improvement to a waterway in the Netherlands, we have installed several kilometres of sheet pile. The sheet pile turns around 3 m of ground and has anchors. At a certain point several cables crossed the sheet pile, along a scope of 11.2 m. The sheet pile could not be installed in the fixed sand packet, so we had to develop an alternative construction. Along the scope we applied a framework at a low level. This framework receives a load of 11 tons per meter of scope and divides it to the adjacent sheet piles that could be installed in the fixed sand packet.

The framework, with a height of 1.34 m, was modelled with 1D elements. The sheet piles that were used to hold the framework were modelled with 2D elements. The reactions from the framework were modelled as loads on the sheet piles.

The challenge in the project has been the interaction between the different elements. On one side there was the deforming framework, while on the other side the deforming holding construction was an issue. Locally we accepted plastic deforming components, as long as the entire construction held. Through the model we created a complete picture of the expected effects and an efficient and practical design.

DENBOER CCI

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Owner Cimento Lafarge
 General Contractor Simi Brasil
 Engineering Office Estub Grupo João Mendes
 Construction Period 01/2015 - 02/2015

The Lafarge Cement Plant built a large duct at their site. For this project a temporary structure to support the steel duct (4 m diameter, 16 mm thickness and 420 kN approximate weight) was designed using SCIA Engineer. The duct assembly was carried out in two stages, the first stage being the construction of the 35 m high temporary shoring structure, comprising tubular steel towers with a circular cross-section of 48 mm and thickness of 3.35 mm, stiffened by space trusses, with bars of the same diameter.

For the first step of the analysis, a numerical model of the towers determined the stiffness coefficients at the top of the support structure. These coefficients were placed into the duct model (second phase), featuring the towers as a flexible support structure and determining the reactions of the supports under these conditions. Then we could return to the model of the towers, now subjected to loading from the duct. All the forces and displacements on the structure were determined by a geometric non-linear static analysis, using the Newton Raphson method to solve the equations.

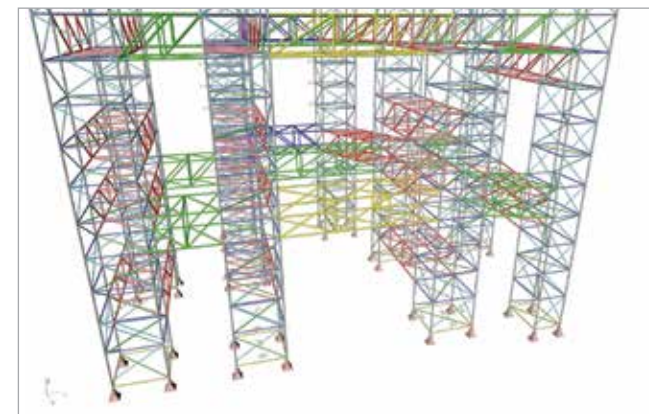
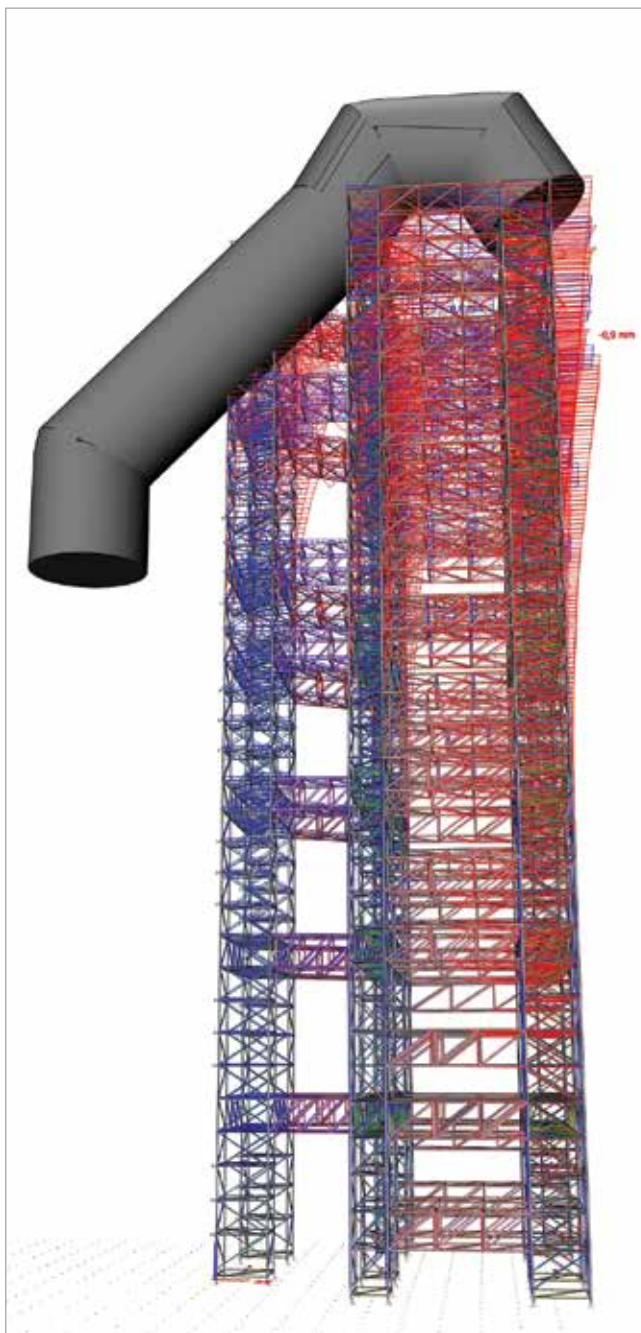
Considering the challenges faced (time and precision), SCIA Engineer Scaffolding proved to be the best solution due to its accurate results and precision, offering best engineering construction system.

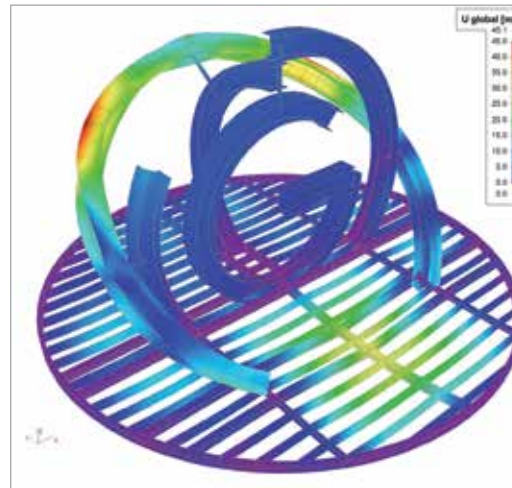
Estub Sistemas Construtivos

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 21515-001 Rio de Janeiro, Brazil
 Website www.estub.com.br



In 1969, the Engineer João Ricardo Mendes returned from France to revolutionize the way tubular structures were built and designed. The engineering concepts acquired combined with work experience were essential to transform his office into one of the most respected companies in the industry. Founded in Recife, in October 1969, Estub was a pioneer in the development of tubular structures. In 1975 a partnership with Entrepouse started, which allowed a bit of European technology to be brought to Brazil. This technology has been carefully adapted to the realities of Brazilian market.





Owner	ICON World
Architect	GD Lodge
General Contractor	JP Fabrication
Engineering Office	Evolve
Construction Period	06/2104 - 09/2014

The Glasgow 2014 Commonwealth Games were the focal point of international sport last summer, bringing together almost 5,000 athletes from all over the world into the centre of Glasgow. The affectionately named Big G was one of Glasgow's centrepieces for these games. Structurally, The Big G can be broken down into two main areas – the base and the upper element, which in total weighed almost 11 tonnes. Evolve were responsible for the complete structural design of The Big G, along with the production of over 50 fabrication drawings, which allowed the installation to be manufactured from what started life as sheets of 5 mm flat steel plate.

Process:

- Used the Architects' drawings for setting-out.
- Imported DWG directly into SCIA Engineer and set up the model.
- Analyzed and design checked the structure within SCIA Engineer.
- Revised the connection location to suit low moments in model.
- Extracted the model to 3D Autocad.
- Split the model up and produced the fabrication drawings.
- The DXF's were issued direct to the laser cutters.
- Late change to the design when only 4 mm plate could be procured rather than 5 mm.
- The pieces were fabricated together and then installed on site.

Evolve

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 G1 5QH Glasgow, United Kingdom
 Website www.evolveuk.biz

evolve
 Consulting Structure & Civil Engineers

Evolve is an established structural and civil engineering consultancy within the building and construction industry, priding itself on exceptional quality design in every commission undertaken. We apply our design flair, ingenuity and energy to ensuring that we surpass the expectations of our clients. We're at our best when challenged with projects demanding a creative and proactive approach. Our core business provides services related to structural engineering on buildings and this is often extended to site infrastructure and on-site civil engineering requirements.

Owner Austrian broadcast corporation. ORF
 Architect Wieder Design München
 General Contractor De Wilde Metaal and Unbranded Set building
 Engineering Office Ingenieursbureau J.C. Voskuil
 Construction Period 03/2015 - 04/2015

The stage of the 2015 Eurovision Song Contest consists of about 1,300 individual pillars and measures 44 m in width, 14.3 m in height and up to 22 m in depth. Each pillar has an LED at the front end and can produce a wide variety of lighting effects.

The pillars (aluminium tubes of 203 mm) are held together with steel stud ends in a smaller aluminium tube. The construction was manufactured in parts in Bilthoven (the Netherlands) and put together in the Wiener Stadthalle in Austria.

The stage was designed in a CAD program, and exported as an IFC file.

This file was imported into SCIA Engineer. After a few steps it was possible to apply loads (service weights and a small wind load) and make loading combinations. The aluminium control gave a quick view of the beams which had to be reinforced.

The construction has several supports on the floor. The top part of the stage is connected to the ceiling with steel cables.

The reaction forces from the SCIA Engineer output were sent to the stage builders.

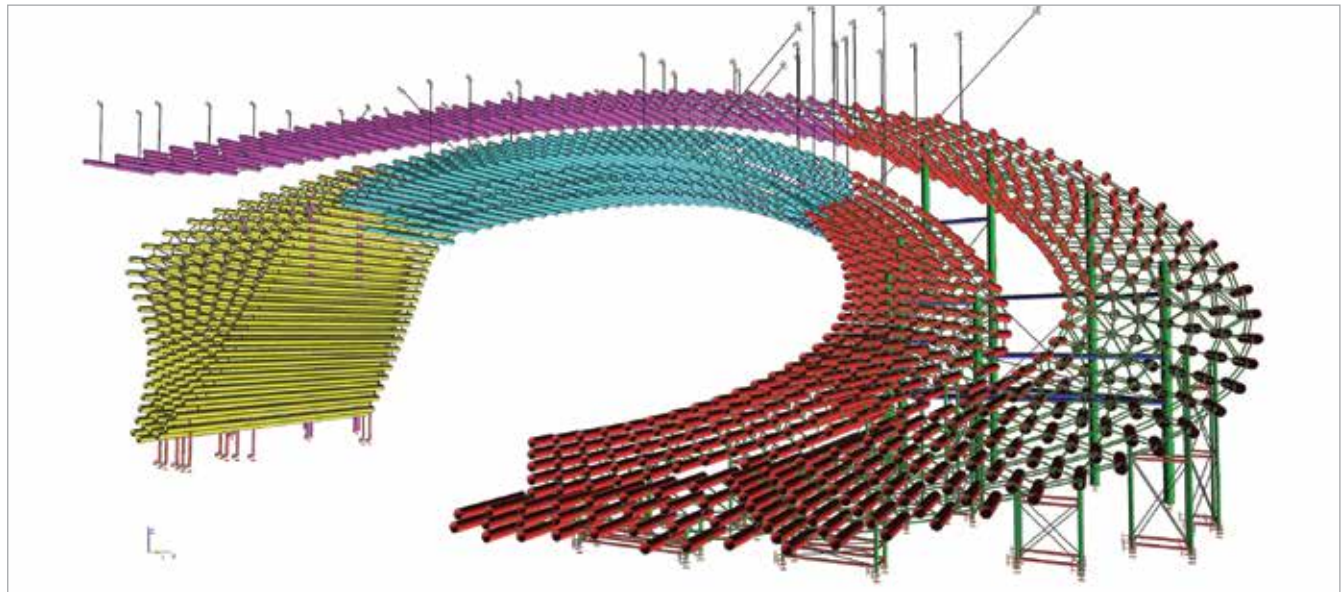
Ingenieursbureau J.C. Voskuil

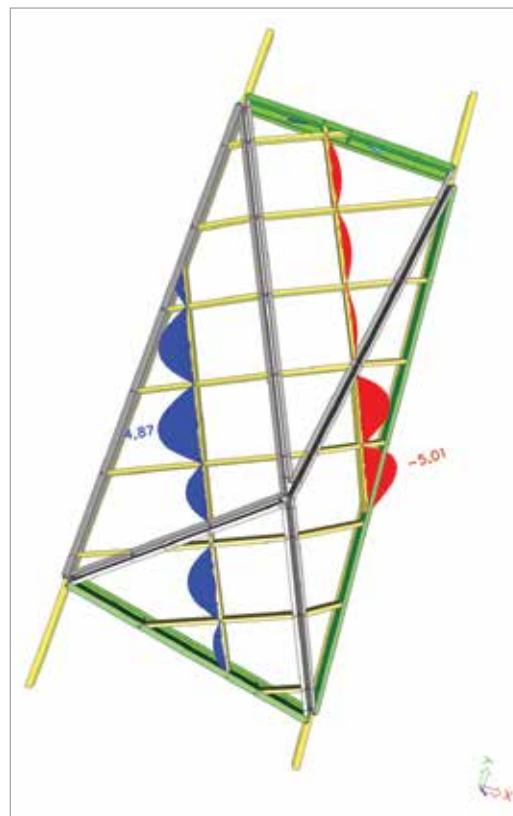
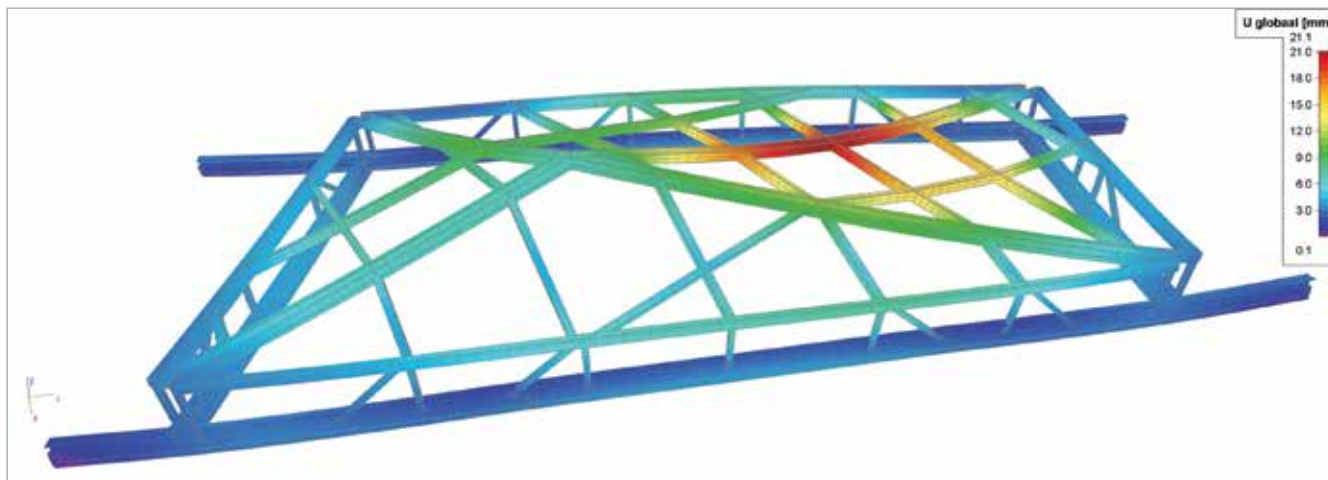
Contact Chris Voskuil
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**VOSKUIJL
BAARN**

Ingenieursbureau J.C. Voskuil and De Wilde Metaal B.V. have succeeded in working out, calculating and building the complete Eurovision stage in a very short period of time.

De Wilde Metaal is able to operate in a very wide range of steel and aluminium structures. This is achieved through the versatility of its staff and machinery. Their customer based and flexible approach allows them to advise their clients at an early stage, leading to a very high-quality end product.





Owner *Pembroke*
 Architect *Tengbom*
 General Contractor *Scheldebouw BV*
 Engineering Office *Ingenieursbureau Stendess N.V.*
 Construction Period *01/2014 - 09/2014*

This project consists of the design and calculation of a steel support structure for a skylight, spanning an area of 286 m², located on the roof of a building in Stockholm, Sweden.

The design of the skylight is conceived as a non-uniform pyramidal roof with 4 different slope angles, but when looked at from below, a pattern of parallel lines magically appears, thus fulfilling our client's desire to create a sleek and visually acceptable design.

The steel girders of the skylight (hot finished rectangular hollow sections, all aligned with each respective roof surface) are used to further support the roof, which consists of an aluminum structure and glass panels.

Because of the 4 different slope angles of each roof surface, the bottom edge beam is a welded hollow section, allowing for inner stiffeners to be provided where needed. The connection details were conceived in such a way that the maximum amount of light can shine into the building.

For this project, SCIA Engineer's load panel tool was used, allowing for the automatic division of uniformly distributed surface loads over the girders that are designated to a certain surface panel.

The project presented numerous challenges, resulting directly from the complex geometry yet we have managed to achieve a beautiful structure which summarizes the art of engineering.

Ingenieursbureau Stendess N.V.

Contact *Jurn De Vleeschauwer, Steven Nachtergaele*
 Address *Grote Baan 18*
9920 Lovendegem, Belgium
 Website *www.stendess.com*



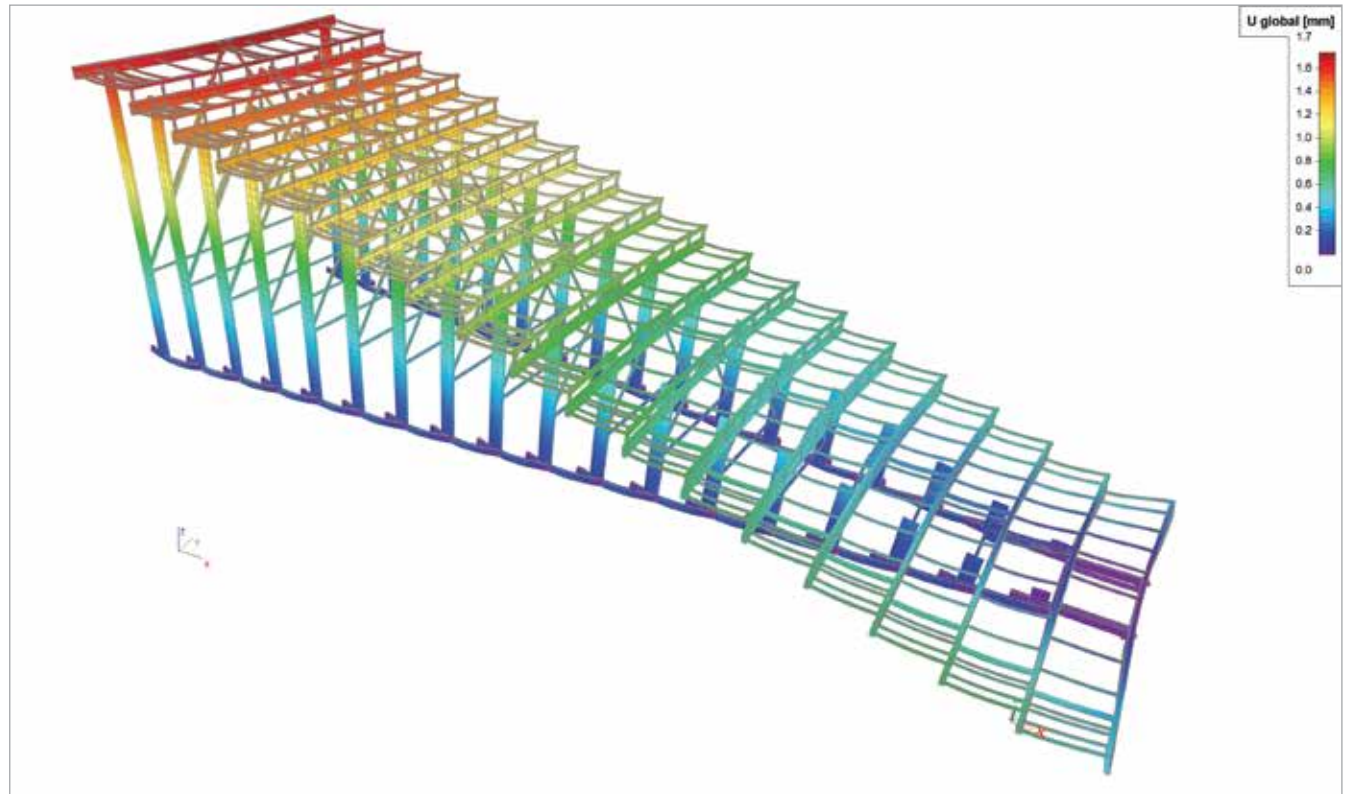
Stendess calculates and draws complex steel constructions in a high quality and efficient manner while seeking economically responsible and substantial solutions for specific technical stability issues. Thanks to the integral service, where the design of the metal superstructure and the concrete substructure are calculated and drawn by experts in the same office, the building owner and principal contractor retain 100% control over the complete structure. References demonstrate the **multidisciplinary knowledge** and ability of our engineers and designers in the market of bridges, industry, utility and other projects located **worldwide**.

Owner City Saint-Dizier
 Architect ANMA - Agence Nicolas Michelin & Associes
 General Contractor Jezet Seating
 Engineering Office Jezet Seating
 Construction Period 03/2013 - 12/2014

'Les Fuseaux' is a cultural centre in Saint-Dizier. This project included the design of seating on the balcony and a retractable seating system which consists of 18 platforms with 617 seats. The structure has a total width of 25 m and height of 6 m. Depending on the show, the system can be used in various configurations: opened, partially opened and closed.

SCIA Engineer was used to analyze the metal structure of the retractable seating. The excellent interaction between the 'table input' and Excel enabled us to build a parametric model in Excel to export different models to SCIA Engineer.

In general, moveable platforms create a huge challenge for the structural design of the stand: the movability restricts the structural design freedom and the structure needs to be stable with limited deflection in the different structural configurations. With SCIA Engineer a non-linear second order analysis could be carried out of both the opened and closed configurations to ensure a correct functioning of the retractable seating.



Jezet Seating

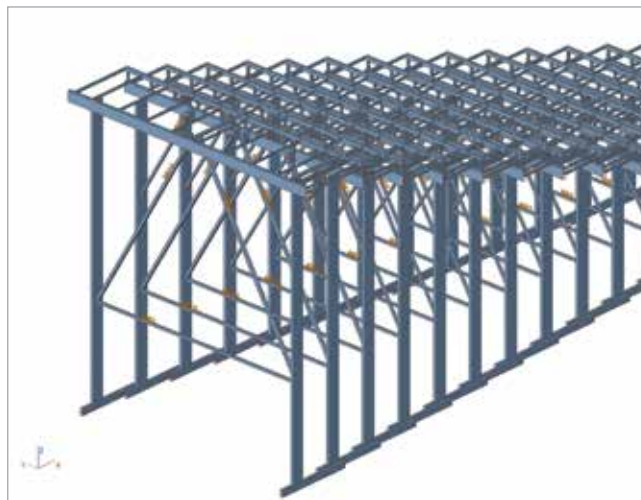
Contact Fritz Gard
 Address Siberiestraat 10
 3900 Overpelt, Belgium
 Website www.jezet.com

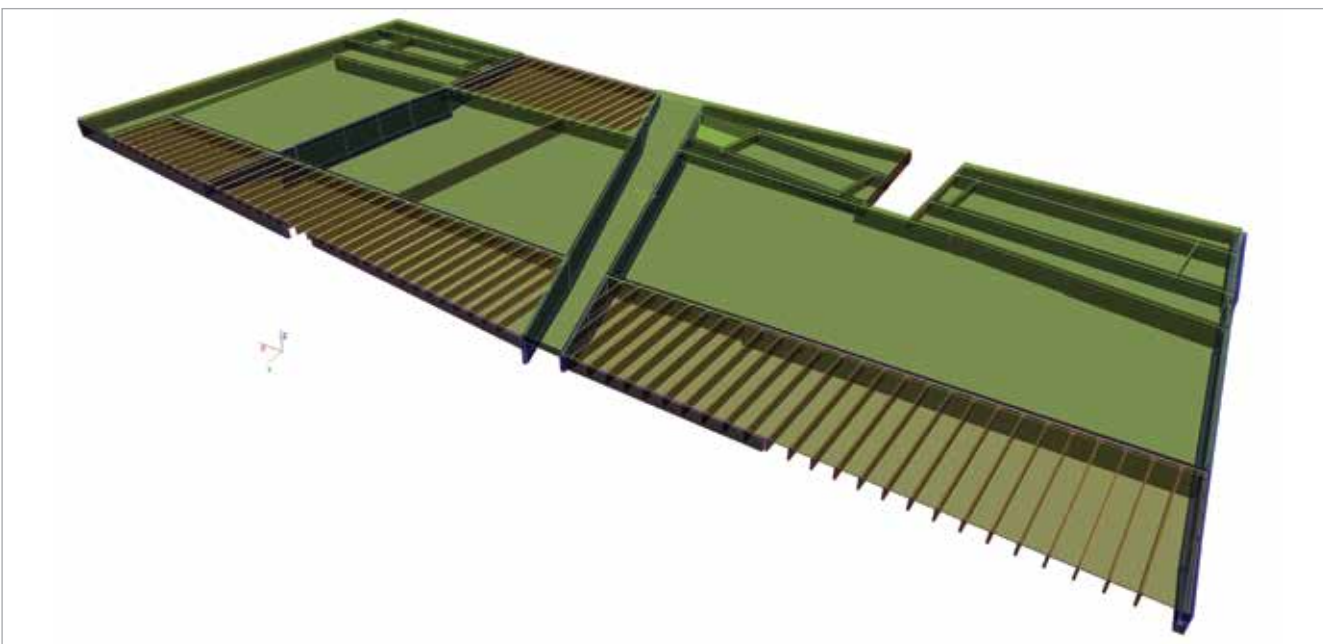
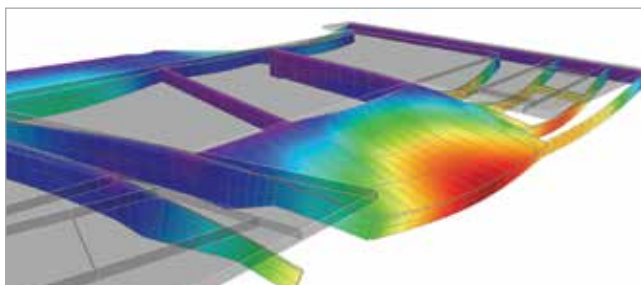
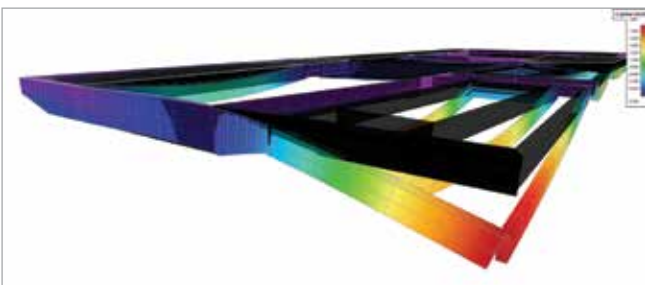
JEZET SEATING

Jezet Seating has been a supplier of retractable seating systems and seats for theatres, auditoria and sport halls for more than 35 years.

From our corporate site in Overpelt (BE), we handle the development process, engineering and production completely in house. The installation and after-sales service are also handled by our own installation teams to guarantee long term quality.

Our clients include the most prestigious theatre, conference and sport halls around the globe.





Owner Sokol Blosser Winery
 Architect Allied Works Architecture
 General Contractor R&H Construction
 Engineering Office KPFF Engineers
 Construction Period 09/2012 - 07/2013

The new 5,000-square-foot wood-framed building was created for a founder of Oregon's winemaking industry. In addition to a tasting room with wine bar and lounge, the building includes a kitchen and dining room, library, wine storage, and a sunken courtyard. The unique roof and ceiling shape were created using custom plywood box beams, with top and bottom chords shaped to follow the desired roof and ceiling lines. These beams cantilever 6 m+ (20'+) over a terrace, leaving dramatic open spaces that are not typically created with wood-framed structures.

SCIA Engineer was chosen as the analysis package for the roof to accommodate the non-orthogonal, irregular design. Engineers utilized CAD drawings generated by the architect to lay out roof framing, which was then imported directly into SCIA Engineer.

Fully modelling the plywood box beams with their varying depths created both a visual reference - useful for both the engineering and architecture teams - and a more accurate understanding of anticipated roof deflections under gravity, snow loads, and wind loading.

KPFF Consulting Engineers - Portland

Contact Andrea Hektor
 Address 111 SW Fifth Avenue, Suite 2500
 97204 Portland, United States
 Website www.kpff.com



KPFF Consulting Engineers is a multi-office, multi-disciplinary engineering firm that provides a wide variety of engineering services to the design and construction industry both in the United States and abroad. Services include structural engineering, civil engineering, construction management, project management, surveying and a variety of specialty engineering services. Significant broad-based experience provides us with the ability to solve the most difficult and challenging problems. We have built a reputation as creative and innovative engineers who are focused on a high level of client service and excellence in everything we undertake.



Owner Enovos Luxembourg SA
 Architect Atelier d'Architecture et de Design Jim Clemes sa
 General Contractor CLE SA
 Engineering Office GK Engineering SA
 Construction Period 11/2013 - 10/2014

The **new car park** of Luxembourg's main energy supplier, Enovos, is located next to their new headquarters at Esch/Alzette. To create parking spaces for about **400 vehicles over five levels**, the client specified the following criteria: **economical solution** as regards its **architecture and environmental sustainability, optimized layout of parking surfaces and execution speed**. The solution was a customized multi-storey car park made of steel. The load-bearing construction consists of columns and secondary beams of **16 m free span**, facilitating easy parking and opening of car doors. This car park will remain open and naturally ventilated, bringing an ecological and economical benefit. With their large eye-like openings, the cellular beams "Angelina" by Arcelor Mittal blend well into a contemporary and bright design. The floor system used is the additive floor Cofraplus 220, which can be quickly assembled and reinforced with concrete for composite action. The facades have timber cladding that acts as sun protection and gives the building a natural look that blends well into its environment.

The stability is provided by vertical wind bracings with angles and the horizontal diaphragm action of the concrete slabs. The primary structure was designed with SCIA Engineer; the Angelina beams were calculated with their corresponding software.

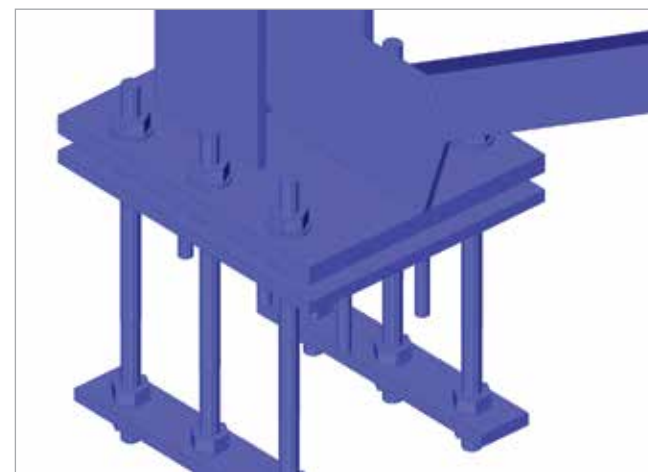
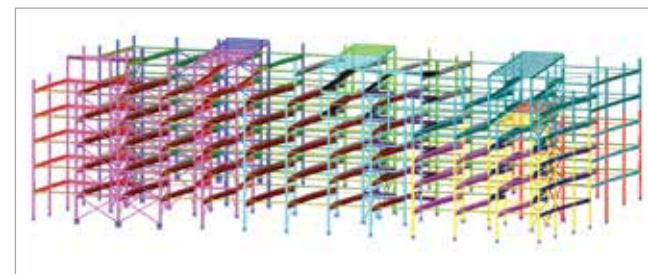
Lindab SA

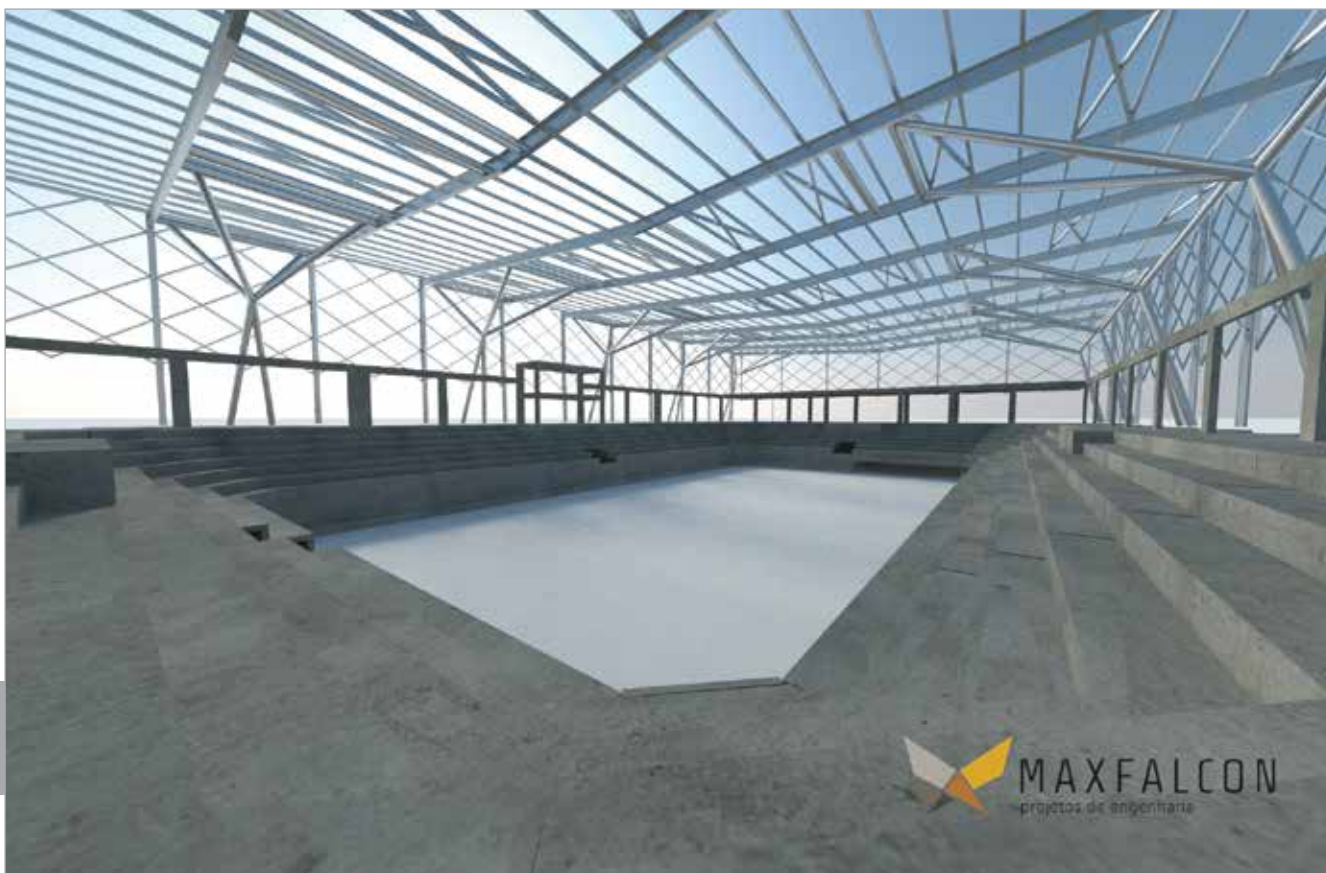
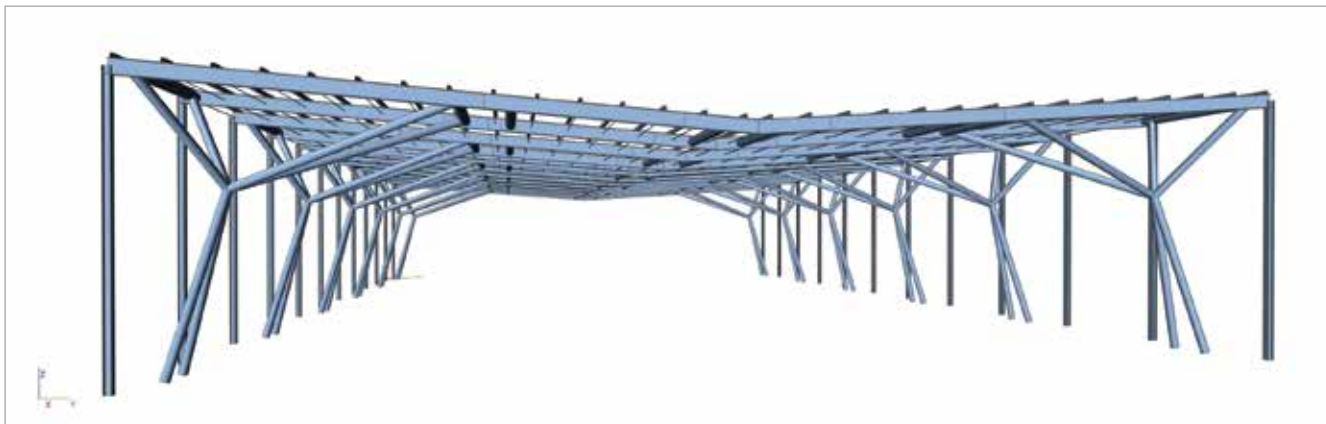
Contact Ernest Hendrickx
 Address Route d'Ettelbruck
 9230 Diekirch, Luxembourg
 Website www.astron.biz



Astron is the leading European supplier of steel building solutions, designing and producing all the main components - the primary and secondary structures, roof and wall systems, accessories and thermal insulation.

A **"one-source" approach** for fast turnkey construction of single and multi-storey buildings such as manufacturing plants, warehouses, retail spaces, sports centres, offices, garages, car parks and aircraft hangars. In the last **50 years** more than 50,000 building solutions have been sold all over Europe, through a network of 300 builders.





Owner	Governo Do Distrito Federal
Architect	ARCHITECH Consultoria & Planejamento Ltda
General Contractor	Confidential
Engineering Office	Maxfalcon Projetos de Engenharia Ltda
Construction Period	2015 - 2016

The project has a complex geometry – the steel part dimensions are 73.6 m in length, 43.7 m in width and 11.3 m in height which can generate multiple load combinations. The structure will consist of prefabricated pieces and bolted connections. SCIA Engineer was the best tool for its design.

The graphical display of results in SCIA Engineer helped better understand the behaviour of the structure. The result-tabs are very intuitive and summarize all the stresses. We also used SCIA Engineer to design all steelwork elements. To save time we imported a CAD reference into SCIA Engineer and created the analysis model from it. Connection details were finalized in a CAD tool using the SCIA Engineer model.

The design challenges of this project were the architectural limitations; the sports hall could not be higher than the neighbouring buildings. Also, the available space for columns was very limited and some restriction was also applied to the number of columns allowed in the facade. Regarding the roof, the architectural proposal did not allow for the use of conventional trusses as a very clean and light structure was required. Therefore, tubular 3D columns were adopted along with ties to balance the stresses in intermediate supports. It was also possible to use hot rolled beams to meet the height limitation. If a conventional structure was used, the height would be greater and many other restrictions could not be met.

Maxfalcon Projetos de Engenharia Ltda

Contact Mario Henrique Held
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08710160 Mogi das Cruzes, Brazil
Website www.maxfalcon.com.br



Maxfalcon is a company specializing in engineering projects of all types, from residential, commercial, and industrial to public sector projects. Our team of engineers mix youth, experience, and is always searching for new and updated expertise, allowing us to work with the majority of specialties in the market. We are very committed to our clients and do believe that our realized projects are our best presentation. Projects we can deliver: foundations and structural projects, including reinforced concrete, pre-fabricated elements, masonry, steelwork, and earthwork, drainage, technical and structural reports.

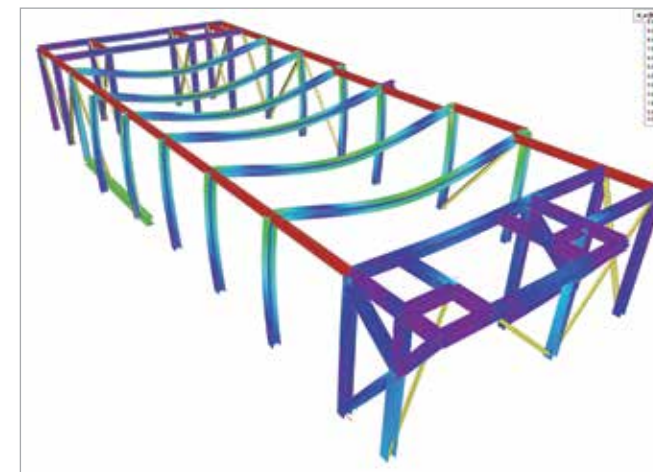
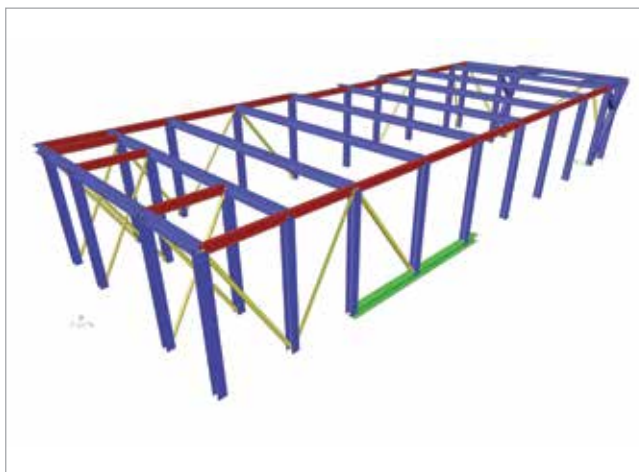
Owner Jan De Nul
 Engineering Office Multi
 Construction Period 09/2014 - 03/2015

MULTI was contacted by Jan De Nul, one of the largest Belgium dredging companies, to provide support in the engineering and delivery of production drawings of project equipment for a cable laying system that would be installed on a multipurpose vessel in their fleet.

MULTI's scope included: several pieces of equipment that would be installed on the main deck, namely foundations for conveyors and cable tensioners, guiding quadrant for the cable, a tower construction that guides the cable from the carrousel installed on the main deck to the aft deck, chutes that guide the cable once it is overboard, etc.

SCIA Engineer was used to model and engineer parts of the deck equipment that were designed for this project.

The project was very time critical for the client, putting a lot of pressure on our team to perform the necessary structural calculations in a very short time period to enable the design work to go ahead.



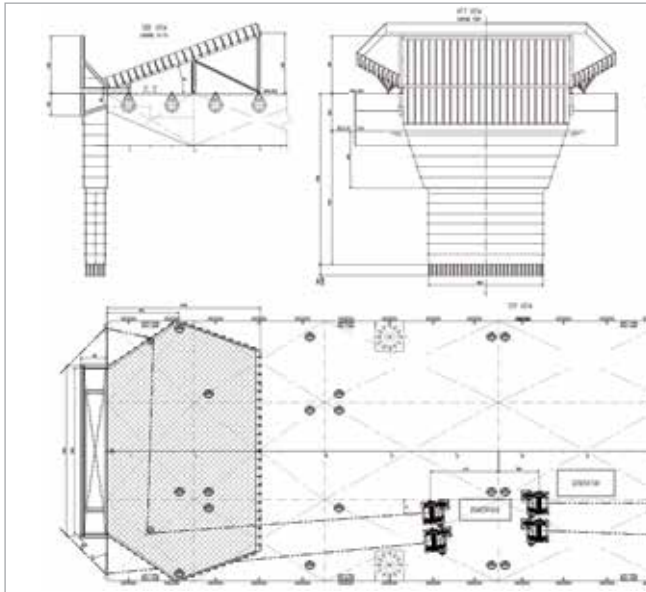
MULTI

Contact Dieter Hoeterickx
 Address Orlaylaan 10
 9140 Temse, Belgium
 Website www.multi.engineering



MULTI guides customers to success. That's why we deliver **tailor-made** engineering services and why we employ and develop highly-skilled engineers. MULTI serves three market segments: **industry, building & infrastructure and maritime & offshore**.

We have projects throughout the entire life cycle of assets, from feasibility study up to decommissioning. Our services range from **temporary staffing to full project management** for designing, building or operating your assets. We have developed competence centres in different disciplines; steel construction is one of them.



Owner *DEME*
Engineering Office *Multi*
Construction Period *09/2014 - 11/2014*

MULTI was asked by DEME, one of Belgium's largest dredging companies, to design and engineer a collector shoot with fall pipe that could be installed on a floating barge in Asia.

The sand would be delivered by barges which discharge the sand into the collector shoot by conveyor belts. With the aid of a fall pipe (with a total length of 12 m below waterline) the sand could be placed very accurately onto the seabed. The engineering of the collector shoot and fall pipe were part of the scope executed by MULTI, followed by the delivery of production drawings and material lists for this project.

SCIA Engineer was used to model and design the collector shoot and analyze the stress in different loading conditions; the environmental/ weather conditions needed to be considered during the engineering process.

As the equipment would be for a single project the client requested that we engineer a solution that would be cheap and easy to build, taking into account local restrictions on experience and materials.

MULTI

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Address *Orlaylaan 10*
9140 Temse, Belgium
Website *www.multi.engineering*



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We have projects throughout the entire life cycle of assets, from feasibility study up to decommissioning. Our services range from **temporary staffing to full project management** for designing, building or operating your assets. We have developed competence centres in different disciplines; steel construction is one of them.

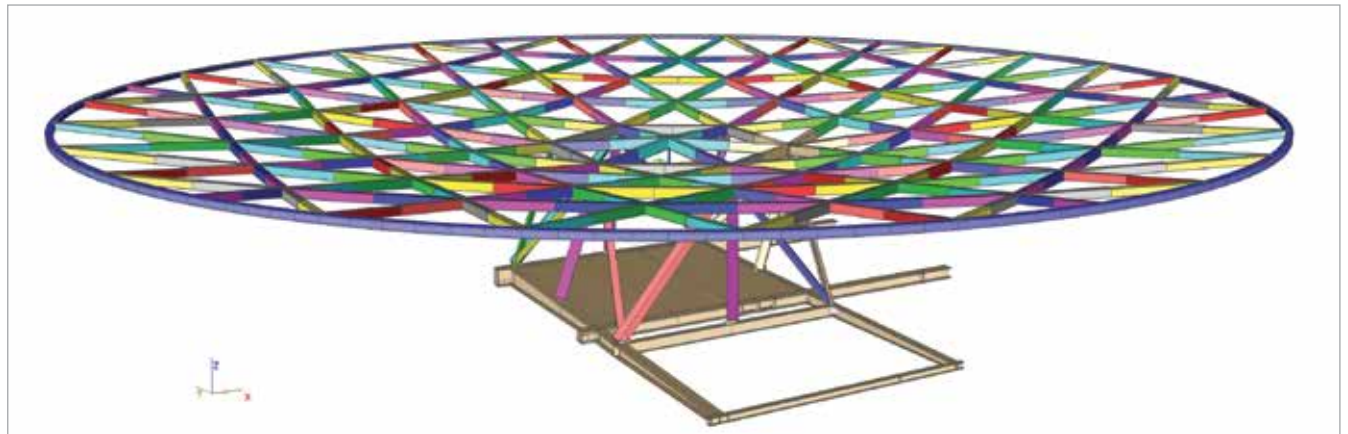
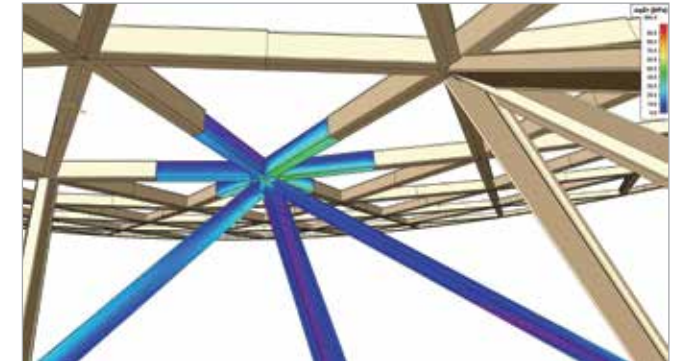
Owner *Brussel Mobiliteit*
 Architect *Xaveer De Geyter Architects*
 General Contractor *Louis Dewaele / Inadvance*
 Engineering Office *Ney & Partners*
 Construction Period *01/2015 - 04/2016*

The new **canopy** is part of the redevelopment of the Rogier Square and its surroundings. It covers the new public transportation hub beneath the square. The canopy roof has a circular form with an outer **diameter of 66 m**. This cantilevered roof consists of a triangulated structure of steel box girders and a circular tension ring on the outside.

During the **design phase** the structure was modelled in SCIA Engineer with beam elements. The cross sections were defined with the general cross section module. This allowed us to easily read and interpret its structural behaviour. The beams were optimized using an external, custom-made algorithm.

At a later stage a **more profound and detailed calculation** was run. The complex hexagonal nodes, the intersection of the columns and the connections with the foundations were precisely modelled with 2D elements and integrated into the original model. The non-linear connection of the substructure to the existing foundation was also added to the same model.

The use of the different design modules in only one structural model allowed for a fast and an easy interpretation and verification of the concrete and steel elements.



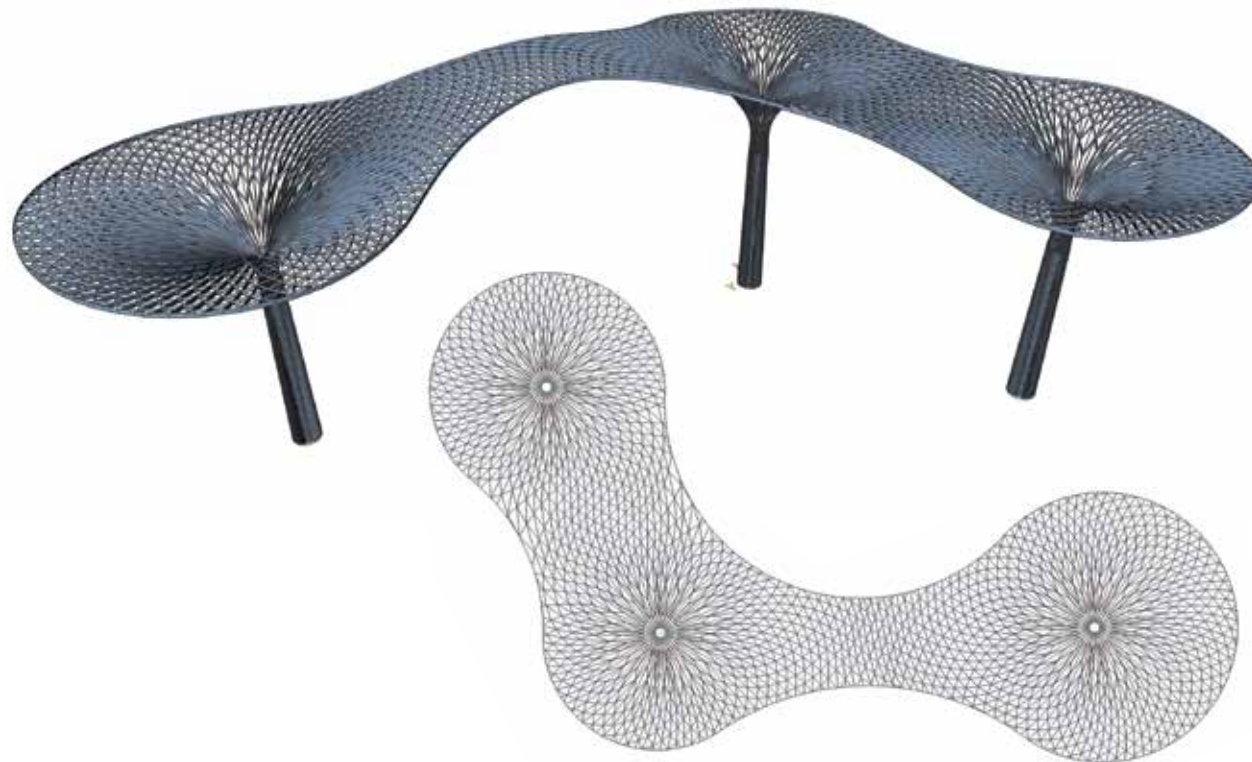
Ney & Partners

Contact *Katrien Vandermarliere*
 Address *TerHulpesteenweg 181*
1170 Brussels, Belgium
 Website *www.ney.be*



Ney & Partners is a structural engineering consultancy and architectural office. An active vision of civil engineering that integrates different disciplines is what motivates us. The foundation of a successful project is the synthesis of all contextual elements. We do not view the boundary conditions as obstacles but as fuel for our creativity. Our motto is 'high engineering' instead of 'high tech': effective engineering that adds value by eliminating the non-essential.





Owner Gemdale Dabaihui
 Architect Ney & Partners
 Engineering Office Ney & Partners
 Construction Period 01/2016 - 04/2016

The Futian District in downtown Shenzhen, South China, is undergoing a process of complete transformation. In the central plaza, the canopy has to temper the climate during hot summers, be a medium of communication, and become an iconic symbol of the new district. The structure integrates 3 technical chimneys as columns. From their 15 m high top, it develops into a continuous surface of over 1,800 m². The geometry is induced by a form-finding computation in order to optimize the stress distribution across the steel network. These structural elements are organized into a set of Fermat's spirals, divided into ladders, to be prefabricated in the workshop and connected on site. 5,000 steel leaves play with the lights.

SCIA Engineer has been used to create a 3D analytical model made out of beam elements for the entire canopy. The structure is divided into 3 parts: the columns, the cores and the roof. The geometry has been created through the use of the 'import dxf/dwg' function. The steel plates of the roof have been optimized using the 'Productivity toolbox' to export the results to a custom Excel file and then the 'Table input' functionality to update the geometry (cross-sections). Stability and dynamic analyzes have been performed to check the good holding of the structure.

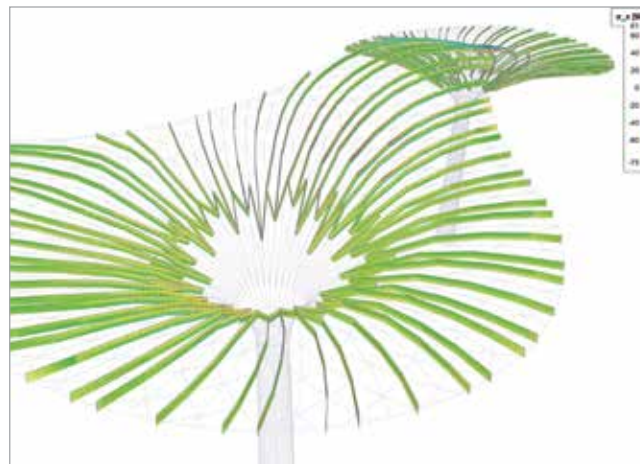
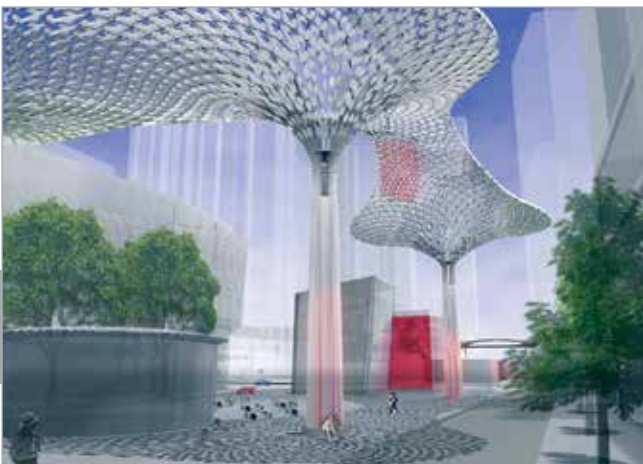
The efficiency of the computation process allowed us to compare different geometries and explore different structural solutions to reach an efficient and iconic design.

Ney & Partners

Contact Katrien Vandermarliere
 Address TerHulpesteenweg 181
 1170 Brussels, Belgium
 Website www.ney.be



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Owner City of Genk
 Architect Bel architecten bvba
 General Contractor Cordeel
 Engineering Office Ney & Partners
 Construction Period 04/2013 - 09/2015

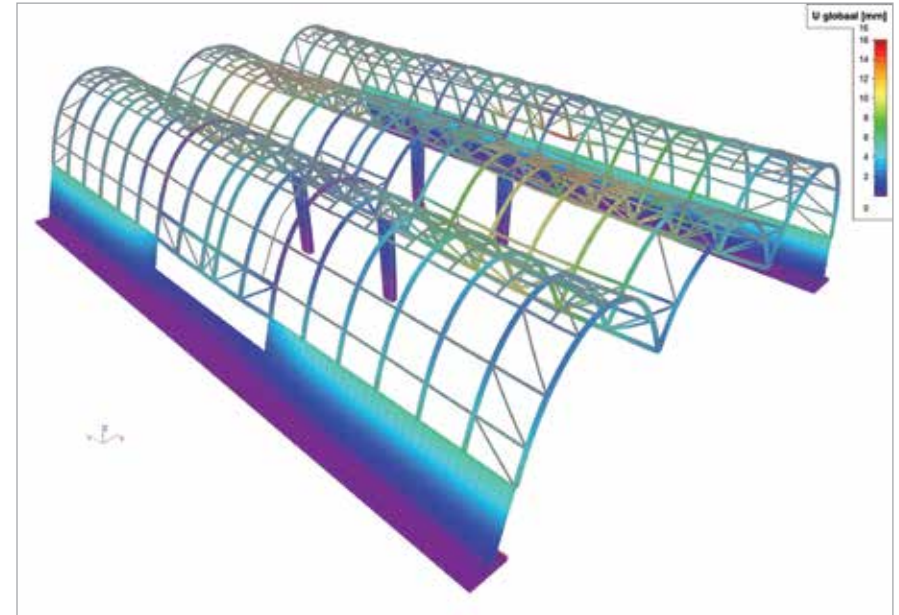
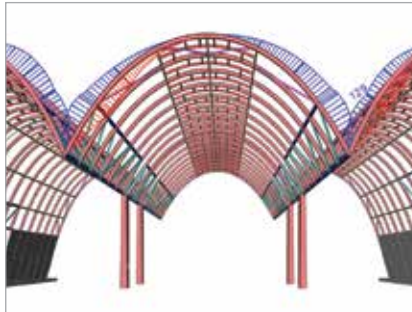
The new sports centre for the city of Genk has a non-conventional layout with two sports fields measuring 60 x 37 m² separated by a central utility zone containing the lobby, cafeteria, changing rooms, etc.

The structure of the roof, the eye-catcher of the project, consists of three vaults in which form, structure, ventilation, natural and artificial lighting, acoustics, etc. come together in one integrated element. The exceptional roof gives the building its own identity and complements the shell roof of the neighbouring swimming pool designed by Paduart.

The steel structure is formed of a series of three three-hinged arches which follow the shape of an ideal chain line. The span of 37 m crossing the sports fields is realized by the trusses placed between the arches. Special attention was paid to the fire resistance of the structure and measures to prevent progressive collapse.

The program SCIA Engineer made it possible to easily and quickly model and analyze several solutions. Because of this, it was possible, in the early design phases, to make essential decisions in collaboration with the architect, resulting in an aesthetically, structurally and economically justified solution.

The program SCIA Engineer also made it possible to easily and quickly visualize the internal forces and thereby the interpretation of the results was simplified.



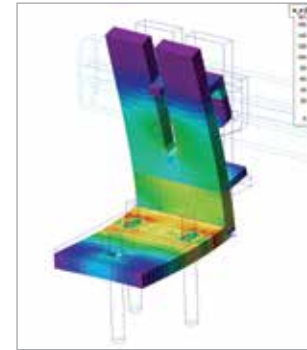
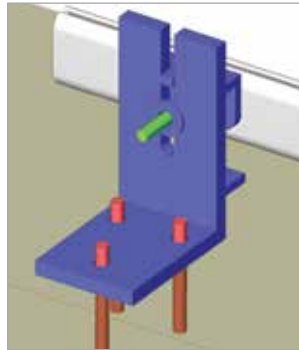
Ney & Partners

Contact Raphaël Cornelis,
 Jeroen Vander Beken
 Address TerHulpsesteenweg 181
 1170 Brussels, Belgium
 Website www.ney.be



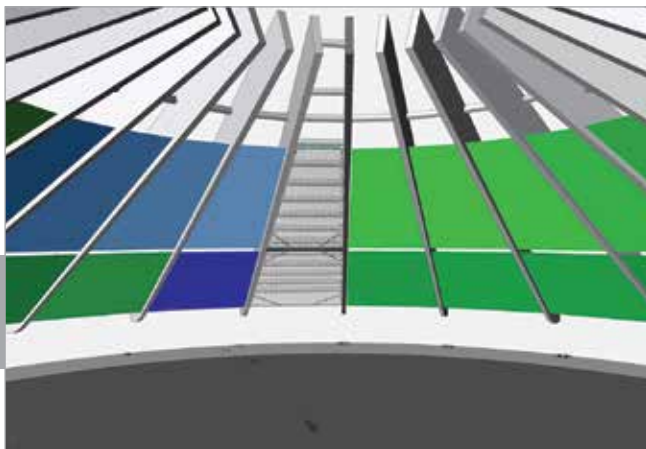
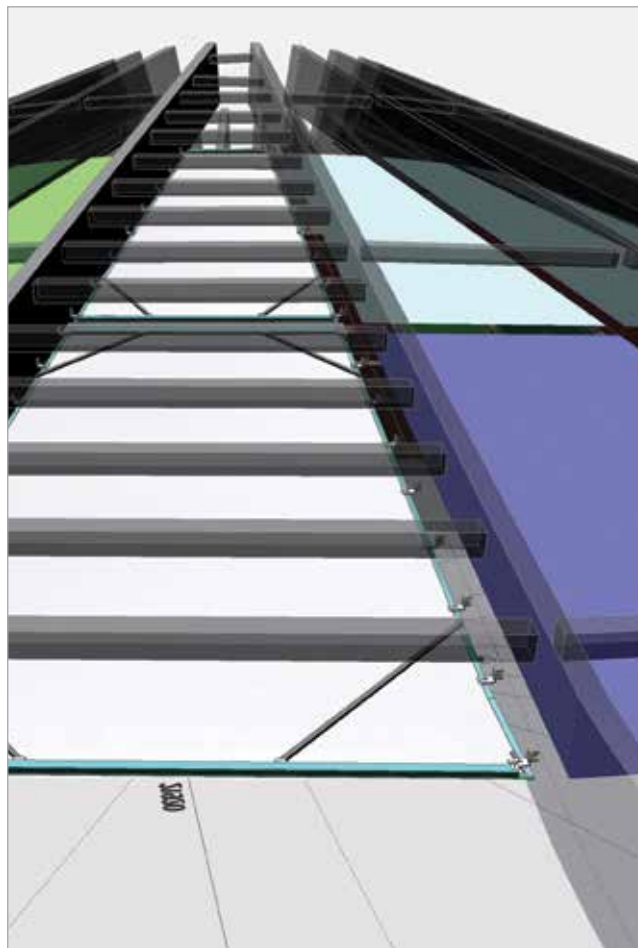
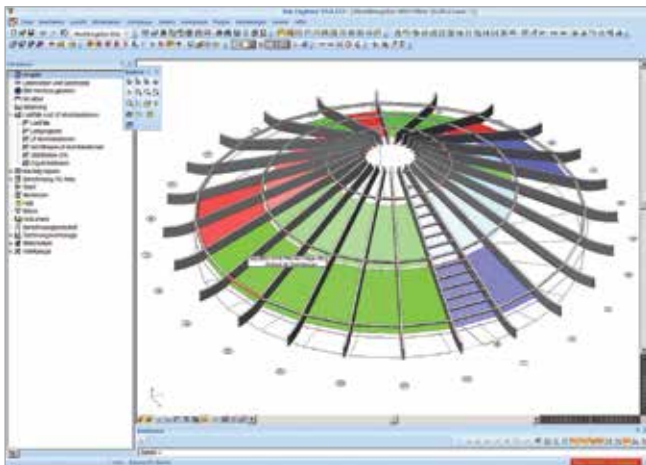
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Owner	City Schwetzingen
Architect	Richter + Rausenberger Bäderbau Gerlingen
General Contractor	Planex Technik in Textil GmbH, Ludwigshafen
Engineering Office	Ryklin STATIK
Construction Period	08/2013 - 02/2014

During the renovation of the Public Baths in 2013-2014, a reduction to the massive noise level in the indoor swimming area was requested. The old wooden roof structure needed to be kept, but it could stand only small additional loads. The solution of **a membrane covering with acoustics sails** in Silent Protect MA 680 was presented as an alternative to the appropriate acoustic plates. The client decided on the sails because of the installation and aesthetic advantages. After surveying the existing structure it was build-up detailed in SCIA Engineer with **Structure-, 3D-Free-Modelling- and Drawing tools**. The environment with the appropriate part of the site structure was exported as DWG/DXF to the Easy software to design the required form for the membrane. The results of the membrane calculations were imported back in SCIA Engineer to design the support frame structure, anchors and edge/corner details. The fully detailed structure was developed into one 3D-Model in order that each distance and height could be considered precisely in 3D-Space. All the overviews, elevation, execution and detail drawings were processed and created in SCIA Engineer with appropriate Modelling and Drawing Tools. The most difficult challenge was to find the **right level of pretension** to keep the sail even enough and at the same time to limit the anchors reactions on wooden roof beams. The **limits of the deformations** due to pretensioning during erection have to be considered too.



Ryklin STATIK

Contact [Sergej Ryklin](mailto:Sergej.Ryklin@ryklin.eu)
 Address Liselottestrasse 17
 69123 Heidelberg, Germany
 Website www.ryklin.eu



Planning and optimization of **steel, aluminium, solid, composite, timber and membrane structures**.

More than 1,000 different projects processed including residential and industrial buildings, car park decks, pedestrian bridges, swimming pools, silos and membrane coverings for Daimler, John Deere, SAP, DB, Siemens, Henkel, BASF, Bridgestone, Roche, IKEA and a lot of private clients. The philosophy of the Company is to offer **flexibility in planning due to integral 3D-Design** with the ability to find feasible and low-cost solutions starting at draft stage.

Owner Rixos Hotels
 Architect Polin Waterparks
 General Contractor Polin Waterparks
 Engineering Office SGM Project Engineering Limited Co.
 Construction Period 04/2014 - 08/2014

Our project is a main platform of an aquapark in Rixos Hotels located in Belek-Antalya, Turkey. The platform measures 6.50 m x 6.50 m and is approx. 22 m high. It is a three-storey platform and its slab material is GRP. The platform is very slender and its location is very windy. Antalya is located at the 2nd earthquake zone of the Turkish seismic hazard map. In addition to vertical dynamic loads, there is lateral loading caused by wind and earthquake. To deal with this we used portal braces.

The most difficult part of this project is the importance of water slides and starter locations. We had to locate starters and water slides at their exact locations in our modelling data. Thanks to SCIA Engineer's BIM capabilities we could import whole water slides and starters into the model. In this way 1D members were located in their exact locations and 2D openings were created around them easily.

The design and optimization of the steel structure was done according to the AISC-ASD standard. Earthquake calculation was also done taking into consideration the Turkish Earthquake Code and using modified seismic spectrums. SCIA's Engineering Report documentation tool was used for the presentation.

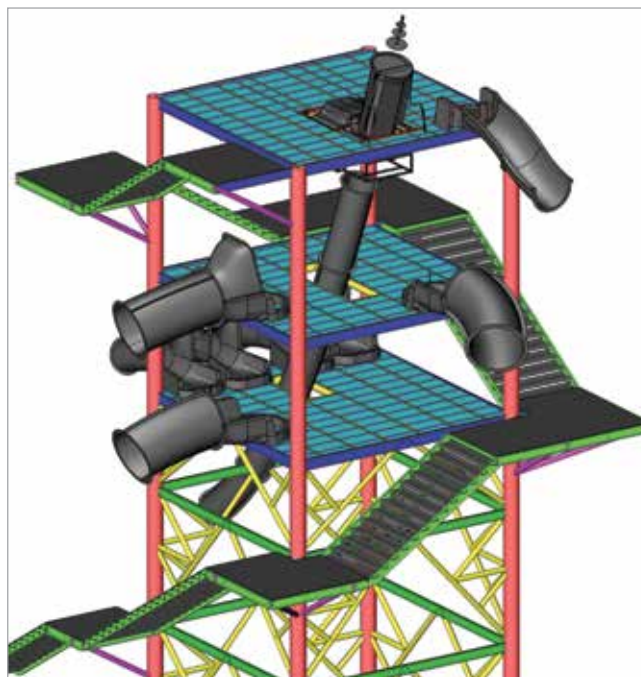
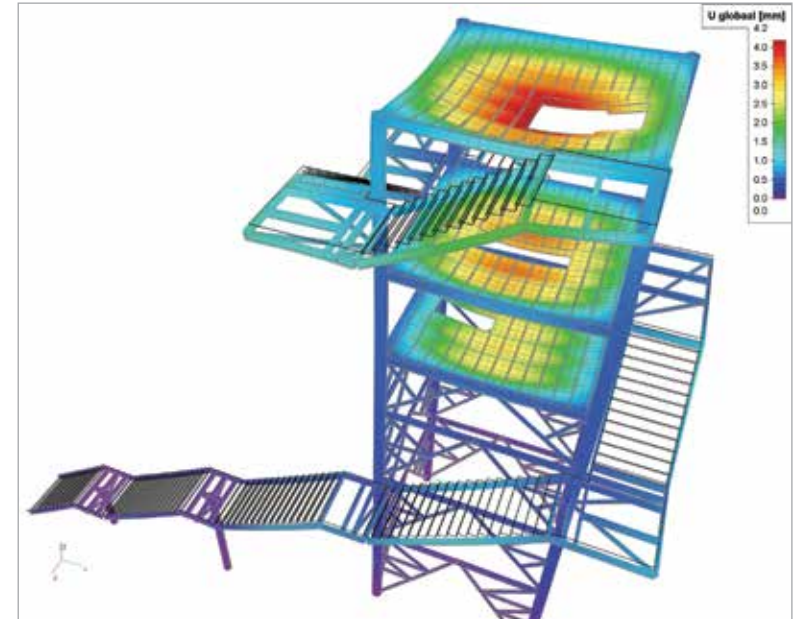
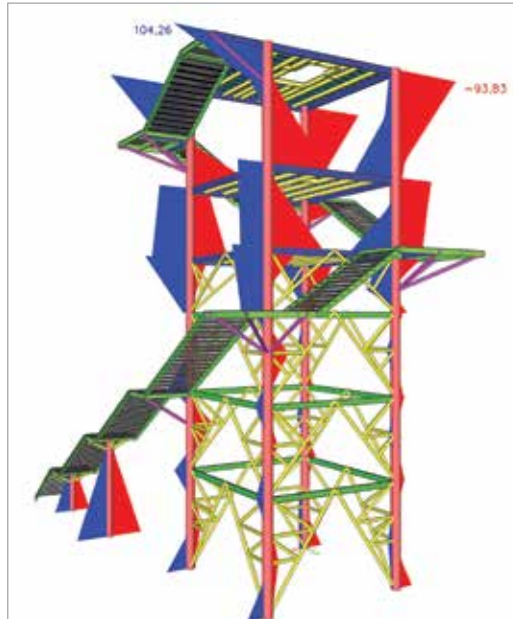
SCIA Engineer is the best "co-worker" for our daily work and signature projects.

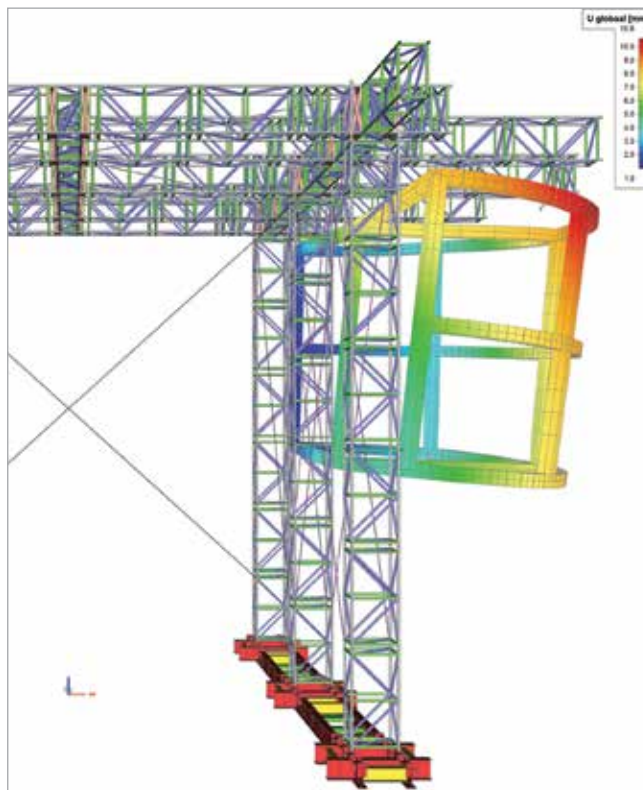
SGM Project Engineering Limited Co.

Contact Rifat Burak Alkan
 Address Karabas Mh. Asim Efendi Sk. No:8
 K:2 D:4 Izmit / 41010 Kocaeli, Turkey
 Website www.sgmproje.com



SGM Project Engineering was established by Structural Engineer (M.Sc.) Burak Alkan and Civil Engineer (B.Sc.) Ertan Danişman in 2014. SGM was founded to deal with the need for high quality industrial plant projects in Turkey and many other countries in the world. With its dynamic and young staff, SGM is an engineering and consulting firm which figures out creative, sustainable and economical solutions for any investment project. SGM Project Engineering is not only specialized for increasing demand of industrial structures, steel buildings, non-structural buildings, logistic warehouses but also civil structures like schools, hospitals and malls.





Owner Stageco Deutschland GmbH
 Architect Marcus Dittrich (Stageco Deutschland GmbH)
 General Contractor K.I.T. Group GmbH / Steel United Group
 Engineering Office Stageco Deutschland GmbH
 Construction Period 06/2012 - 07/2012

In front of the renowned Brandenburg Gate in Berlin, a grid structure had to be built for a video screen of 65 m² and sound systems for the main stage of the fan park / public viewing area for UEFA Euro 2012 and FIFA World Cup 2014.

Technical Data:

Dimension: $W \times T \times H \leq 25.9 \text{ m} \times 10.9 \text{ m} \times 14.6 \text{ m}$

System: Stageco trussing 'Meilenstein' with Prolyte aluminium trusses

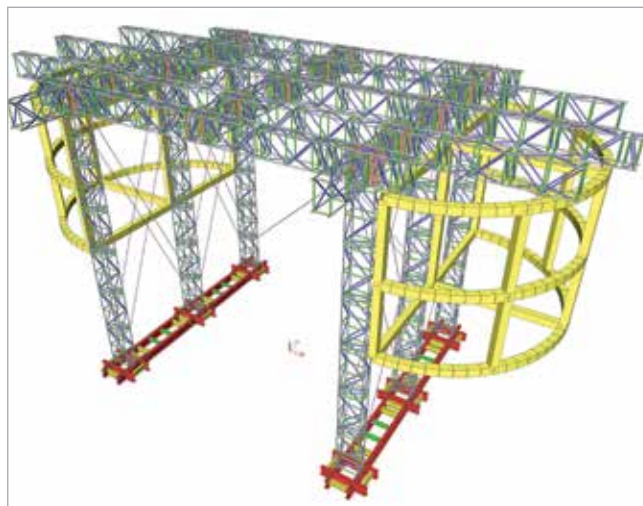
Load capacity:

Video screen ($W \times H = 10.75 \text{ m} \times 6.05 \text{ m}$): 8.00 to

Sound and light systems: 10.0 to

For this project the structure has been modelled in detail, including every beam and member of the trusses. In total more than 5,000 members and 6 load cases with their non-linear combinations had to be calculated and designed. Some special characteristics have been the pressure only supports (no fixing with the building ground), the cables with tension only and stiffening plates as 2D elements inside the crossovers.

(pictures: © by Ralph Larmann)



Stageco Deutschland GmbH

Contact Thorsten Weymar
 Address Herzbergstraße 120
 10365 Berlin, Germany
 Website www.stageco.de



Stageco is an international **staging company** which originated in 1984 from the renowned Rock Werchter Festival in Belgium. Stageco has built a worldwide network with locations in Belgium, Germany, France, the Netherlands and the USA. In recent years Stageco has been known for its delivery of amazing stages for **international tours** of The Rolling Stones, U2, Bon Jovi, Bruce Springsteen and many more.

A large number of spectacular customized constructions have been built by Stageco, as well as many structures for public viewing since the FIFA world cup 2006 in Germany.

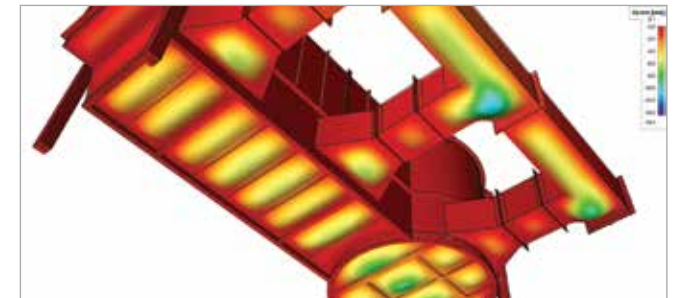
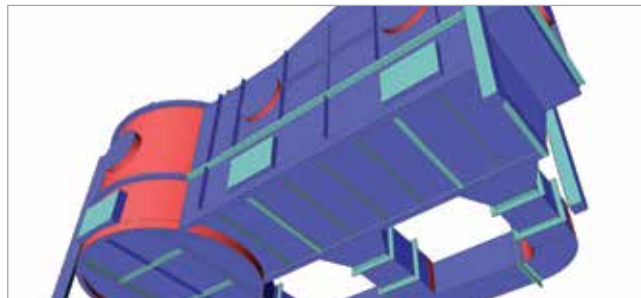
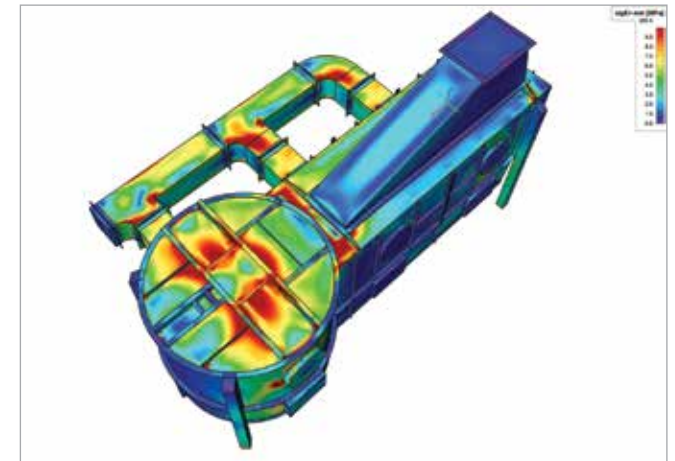
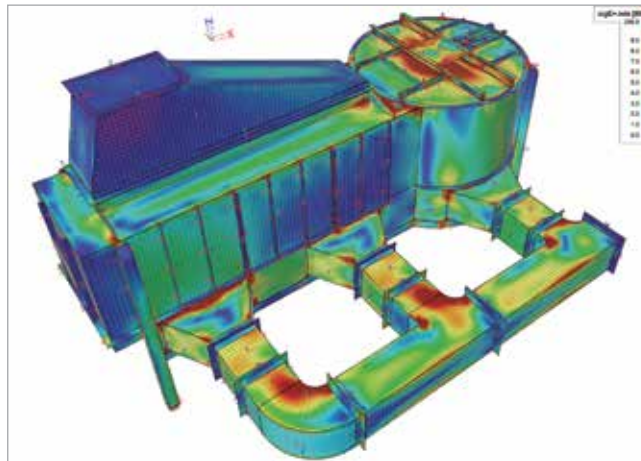
Owner BASF Ludwigshafen
 Engineering Office Voss & Kamb und Partner GmbH
 Construction Period 06/2013

In this component granulate will be dried. The nitrogen gas with an oxygen content of <4% will be transported in a circuit. In the vortex drier T900, the product will be dried to the specified water content (0.5-1.0% residual moisture). A rotating rake will distribute the humid granulate onto the sieve bottom. Gas from the bottom will be blown in to swirl the product and transport it to the back of the drier where it will be cooled.

An overflow weir is located in front of the exit. This procedure guarantees the defined layer thicknesses on the fluid bed. The exhaust gas of the vortex drier T 900 will be transported to a washer after removing the fine contents.

Specific characteristics of this calculation:

- This is an existing component made in 1969 which had to be optimized for new conditions.
- Therefore the first step was to examine whether the pressure increase could be realized without any changes or modifications.
- This wasn't possible so for the second step cost-effective improvement proposals had to be made.
- To achieve this goal, all stiffening parts such as edges, corners, flanges, etc. had to be taken into account for the FEM calculation.
- Sheet thicknesses only 2 mm.



Voss & Kamb und Partner GmbH

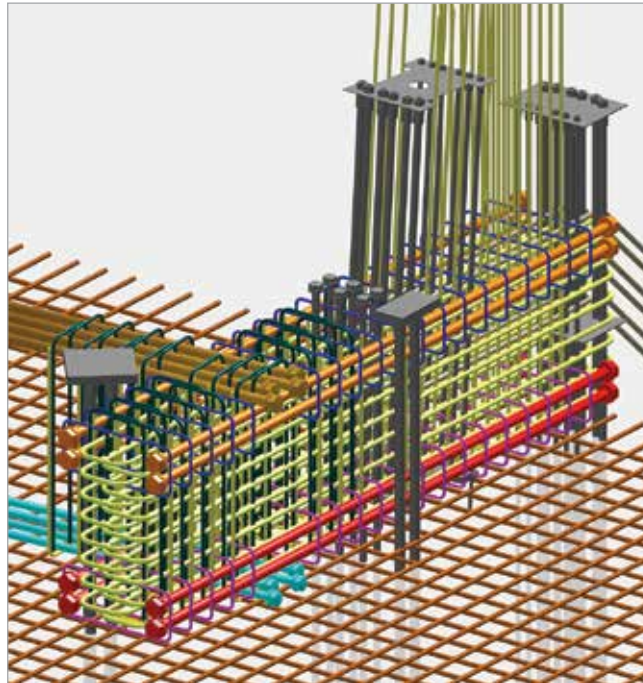
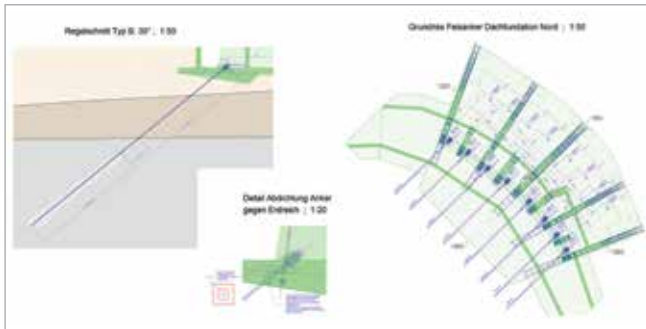
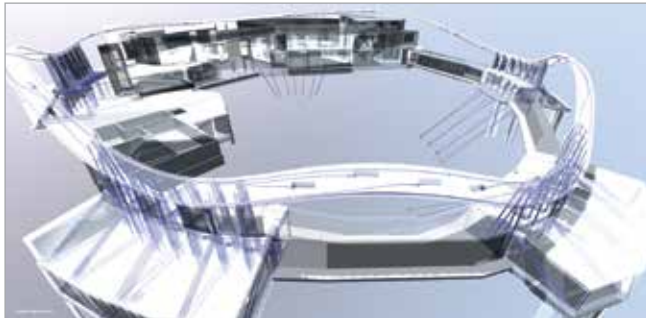
Contact Lino Caiazzo
 Address Europaallee 11-13
 67657 Kaiserslautern, Germany
 Website www.voka-kl.com

VOKA

We provide complete construction planning from start to finish for industrial buildings and plants, office buildings, civic and athletic centres and private homes. Over the last few years our company has completed projects all over the world.

We increase our competencies constantly and are now able to serve a wide variety of engineering requirements. We constantly seek new challenges and welcome projects that require us to think outside the box.





Owner Zoo Zürich AG
 Architect Markus Schietsch Architekten
 Construction Companies Implenia AG, Strabag AG, Landolt & Co.
 Engineering Office WaltGalmarini AG
 Construction Period 2012 - 2014

More freedom for the elephants and closer views for visitors: The new Kaeng Krachen Elephant park in Zürich Zoo is an iconic example of the international transformation of zoo philosophy. The new home for the 8 elephants has a surface area of over 11,000 m². That's about six times the size of the old elephant park and provides more space for the elephant families to live and exercise.

For outstanding planning results with maximum quality WaltGalmarini has for years trusted the BIM-Solution Allplan Engineering. All the sections and views are directly derived from the digital Building model.

The security of planning in the third dimension proved very useful: it allowed possible collisions to be avoided and other planning mistakes to be identified immediately. It was also possible to visualize complex geometries with ease and it helped the team to better understand the project.

WaltGalmarini AG

Contact Wolfram Kübler, Gregorij Melesko
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 Website www.waltgalmarini.ch



Our engineering office was founded in 1956. Located in Zürich, we are a team of 35 employees and concentrate on a few engineering disciplines, which allows us to provide an optimal service to our customers as a leading company. We focus on designing, detailing and project and construction management for highly stressed, wide spanned bearing structures in steel, reinforced and prestressed concrete, wood and fibre composite materials. Our activities even go underground with excavation, slope protection and specialist foundations. We know and use the newest methods and tools.



Owner Lanxess
 Architect J. Herremans
 General Contractor Xervon
 Engineering Office Xervon
 Construction Period 01/2015 - 02/2015

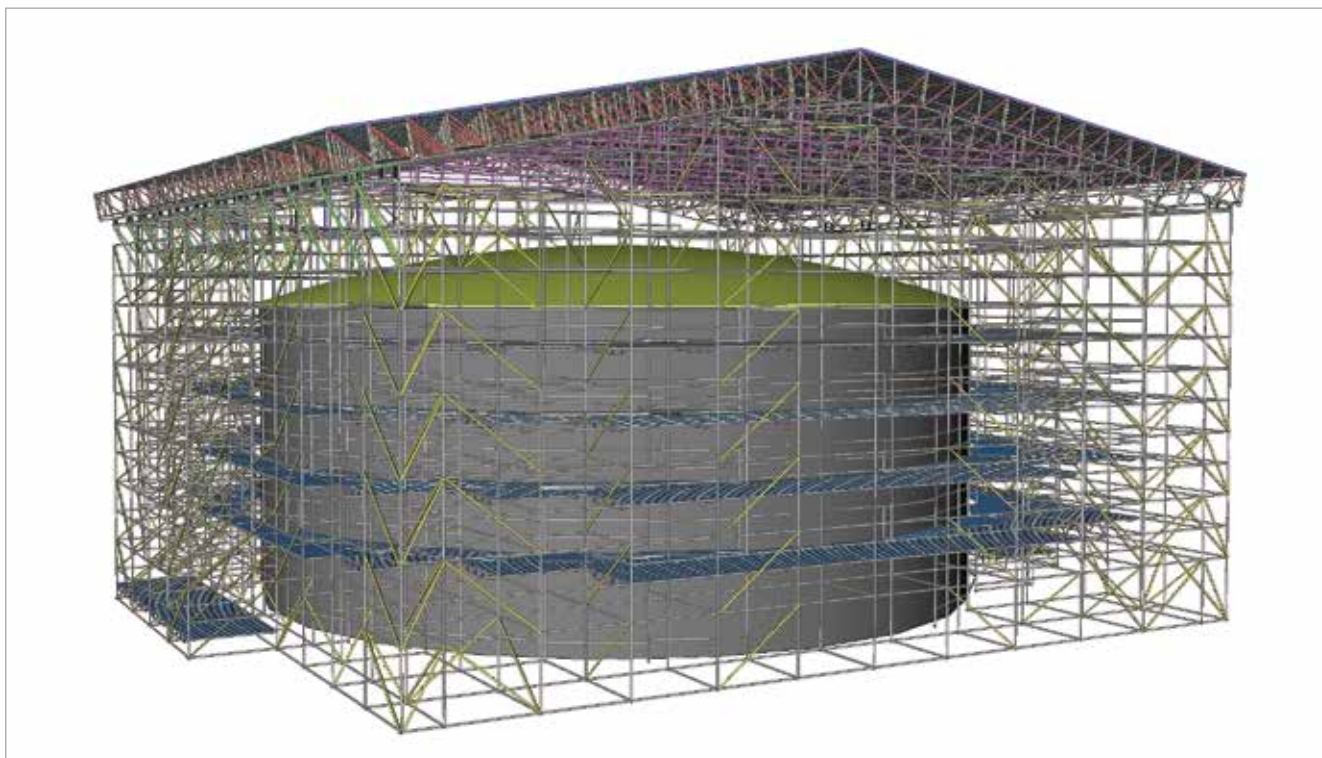
XERVON was asked to provide a scaffold including a cassette roof around a storage tank. Shrink wrap was heat shrunk around the complete scaffold in order to create the perfect working conditions to renew the coating and insulation of the tank.

Scaffold dimensions: Length/Width = 28.0 m - Height = 14.0 m - 17.0 m
 Tank Dimensions: Diameter = 20.0 m - Height = 12.0 m

Drawings and stability calculations were made using the software SCIA Engineer. Drawings of the scaffold and the cassette roof elements were used to organize the lifting works of the cassette roof elements. Because the scaffold was completely sealed with shrink wrap a maximum wind load of 8 Bft. was set in agreement with the client. Shrink wrap would be removed in case of a wind load > 8 Bft.

The most challenging aspect was the assembly of the cassette roof. The length of one cassette element measured 29.1 m. The little space that was available had to be used optimally. Lifting these elements into place and making sure they were aligned properly was crucial in order to be able to place the roof plates.

This project was successfully completed on 19/02/2015.



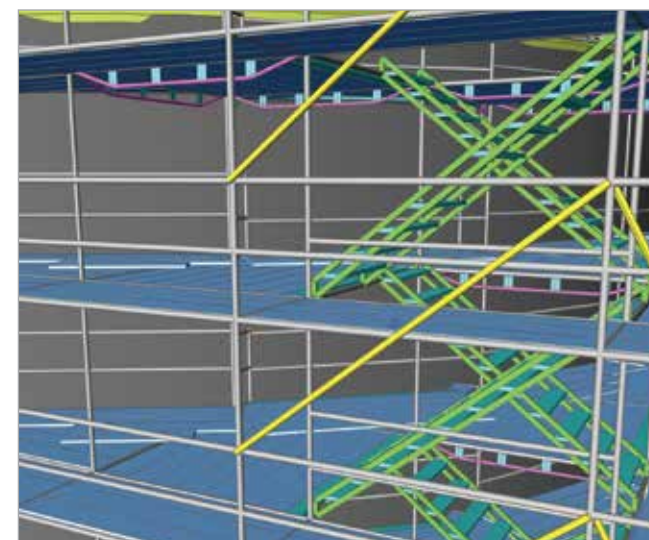
XERVON

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 B-2950 Kapellen, Belgium
 Website www.xervon.be



XERVON stands for the prompt provision of both material and personnel for individual and constructive specialist solutions with exceptional structural engineering requirements, and for a perfect implementation in terms of operational safety. With our extensive network of branch offices, we are in a position to provide the presence, flexibility and contract processing at short notice that you expect of a service provider today.

XERVON has longstanding experience in the following fields: Scaffolding, Insulation, Surface technology/corrosion protection.



We would like to thank and congratulate each participant for making this 9th edition of the User Contest the most impressive ever.

SCIA nv & Allpan GmbH

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