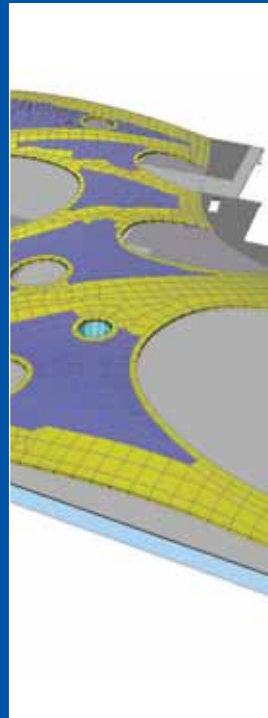
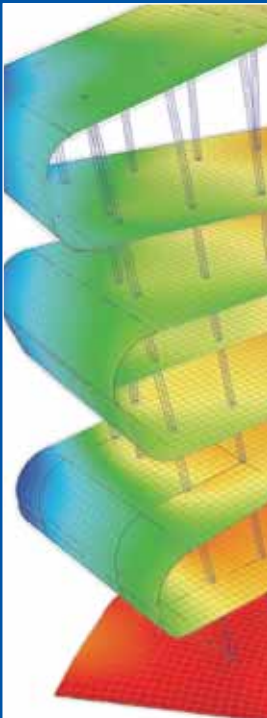
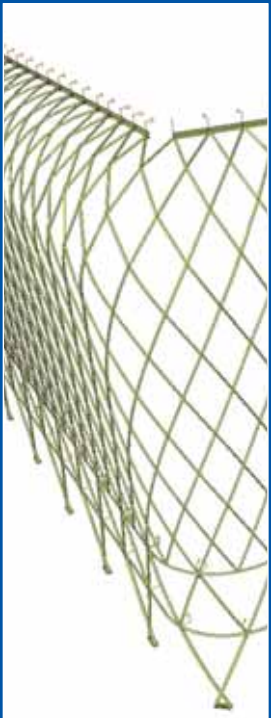


moving minds



Nemetschek Engineering User Contest 2009



Foreword - Nemetschek Engineering User Contest

The Nemetschek Engineering Contest 2009 received great feedback: more than 120 projects were submitted to the contest jury, proving their effectiveness in using one or more software solutions of the Nemetschek Engineering Group. The participants come from 14 countries all over Europe and the Middle East. The projects are built worldwide, e.g. in Australia, India, United Arab Emirates, Eastern and Western Europe.

The projects assembled in this book illustrate the great engineering skills of our customers in a large variety of fields: housing, buildings, industrial structures, infrastructure, towers, spectacular roofs and prefabricated constructions.

The engineering science is evolving rapidly: the efficiency of designing and detailing structures is increasing tremendously even though higher constraints are imposed by new building codes and safety regulations. This is also possible thanks to the help of innovative tools, that engineers, detailers and fabricators are increasingly adopting. The Nemetschek software solutions cover the whole spectrum of structural engineering design and detailing: from member design and detailing up to 3D BIM (Building Information Modelling).

The Nemetschek Engineering User Contest book illustrates the state-of-the-art, how structures are planned today. We sincerely congratulate the winners of this contest and express our gratitude to all contest participants for having shared their experiences with the Nemetschek Engineering user community.

Ernst Homolka
CEO of Nemetschek AG



Jean-Pierre Rammant, dr.ir.
CEO of Nemetschek Scia



Table of Contents

W Winner **N** Nomination **J** Special Prize of the Jury

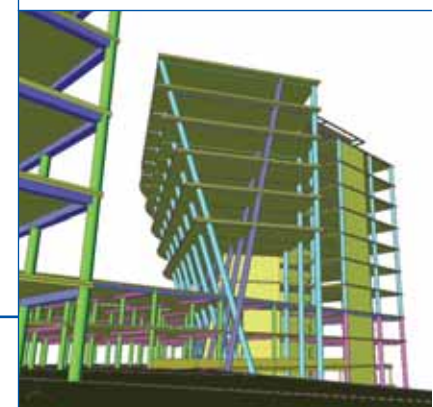
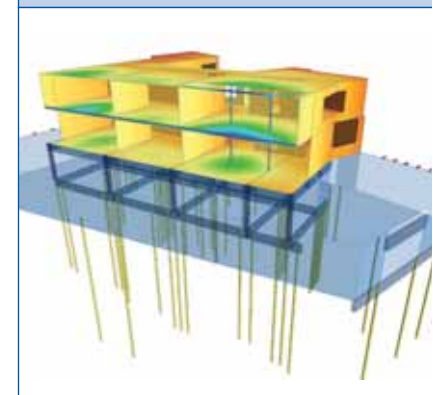
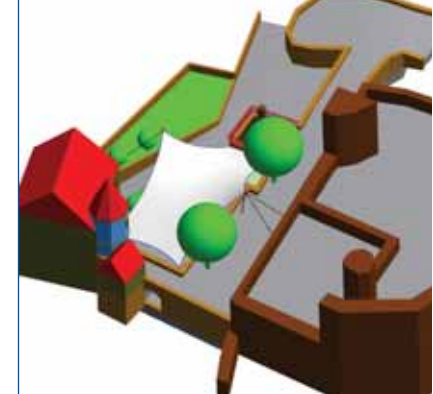
Foreword	1
Table of Contents	2
The Nemetschek Engineering Group - Engineering Freedom	6
The Product Brands of the Nemetschek Engineering Group	7
Introduction of the International Jury	8
Category 1: CAE Constructive Elements	9
Category 2: CAE Housing & Buildings	10
Category 3: CAE Civil Works	11
Category 4: CAE Industrial Buildings & Plants	12
Category 5: CAE Special Projects	13
Category 6: CAD Engineering, Buildings	14
Category 7: CAD Engineering, Engineering work and special structures	15

Category 1: CAE Constructive Elements 17

W CSM nv	Vörösmarty Tér 1, multifunctional building, Budapest	18
N Vrije Universiteit Brussel	Restoration study Winter Garden of Royal Greenhouses, Brussels	20
N Establis	Ski Hall, Terneuzen	22
N Bureau d'Etudes Lemaire	Construction d'un hall de sports à Herstal	24
Dipl.-Ing. S.Ryklin STATIK	Dilsberg Castle - 6 membrane roofs	26

Category 2: CAE Housing & Buildings 29

W Ney & Partners	Office Building 'Facelift Umicore', Hoboken	30
J BESIX	The Tornado, Qipco Office Tower	32
N Ingenieursbureau Stendess N.V.	Office buildings for Drisag	34
N Cerfontaine Constructions sprl	Bureaux Schyns 'Steel Box'	36
Adams Bouwadviesbureau bv	Nederlandse Ambassade in Canberra	38
Adams Bouwadviesbureau bv	Zorgwoningen complex Poeldijkstraat, Amsterdam	40
ARCADIS Belgium nv	The Monovolume, University of Ghent	42
ASTRON BUILDINGS S.A.	Hilton 'Hotel di Breme', Milano	44
BESIX	ZLOTA 44 - 200 m high tower in Warsaw	46
BREED Integrated Design	Villa in Ede	48
B. Simon Ing. SA	Villa Geninasca	50
BURO II	Sporthal volgens passiefhuisconcept voor de Gemeenschapsinstelling 'De Zande' in Beernem	52
Establis	Uitbreiding bioscoopcomplex Decascoop Gent	54
Etudes et Techniques Internationales	Projet de DOJO domaine universitaire de St Martin d'Hères - Grenoble	56
Faber Maunsell Ltd	The University of Hertfordshire, Student Forum	58
GIBES	Nouveau bâtiment de l'ACPC	60



Gifford	Pembury Hospital	62
Grontmij Staal Partners	Achmea office, Zwolle	64
Hale Allen Jones	Chrip Street Project, London	66
Hale Allen Jones	Long Lane Project, London	68
Ian Black Consulting Ltd	Swiss Centre, Leicester Square, London	70
IGUBA, s.r.o.	Emporia Towers, Bratislava	72
IMd	Aircraft carrier as Pon head office	74
IMd	Building complex 'De Kop van Boulevard Zuid'	76
IMd	Entrance building "De Admirant" Eindhoven	78
IMd	Office tower 'Blaaktoren', Rotterdam	80
IMd	Sculpturally shaped lecture hall	82
Ingenieurbüro Ohr	New School Otto-Seeling-Promenade in Fürth	84
Ingenieursburo IOB	Overkamp park Dordrecht	86
Ing. Milan BOBAČIC - INKOS	Tatra City Multifunctional Complex	88
Meylan Ingénieurs SA	Les Moulins de la Veveyse	90
Movares	Public Transport Terminal, Central Station, Utrecht	92
Petignat & Cordoba Ingenieurs Conseils SA	Bâtiment "Terrasses blanches"	94
S.C. ROM CARO SERVICE S.R.L.	Office building, Bucharest	96
Taylor & Boyd	Crowne Plaza Hotel and apartment complex	98
Thomasons LLP	Woodgrange Road, London E7	100
VODOTIKA a.s.	High rise building - Vodotika	102

Category 3: CAE Civil Works

W Mott MacDonald s.r.o.	Nový most přes vltavu v Praze Troji	106
N Ney & Partners	"Tweede Scheldebrug" - Second bridge over the river Scheldt	108
N SBE	Launching of a bridge in Trinidad	110
N Petignat & Cordoba Ingenieurs Conseils SA	Réconstruction de la passerelle d'Illarsaz	112
Breijn	Perrontunnel Station Breda	114
ESM Ingénieurs Associés SA	Pont de Laty	116
ESM Sarrasin Ingénieurs SA / ESM Ingénieurs Associés SA	Confortement parasismique du barrage de Chancy-Pougny	118
ESM Sarrasin Ingénieurs SA / ESM Ingénieurs Associés SA	Vérification d'ouvrages pour le trafic 40 tonnes	120
GVH St-Blaise SA	Pont de La Poya	122
Hollandia b.v.	Staalconstructie van de basculebrug in Terneuzen	124
Ingenieursbureau Stendess N.V.	Bicyclist and pedestrian bridge, Beernem	126
Ingenieursbureau Stendess N.V.	Bowstring Bridge of Bamberg, Germany	128
Ingenieursbureau Stendess N.V.	Bowstring bridge with deck for cars and pedestrians	130
Ingenieursbureau Stendess N.V.	Cable stayed bridge, Dilsen-Stokkem	132

Table of Contents

W Winner **N** Nomination

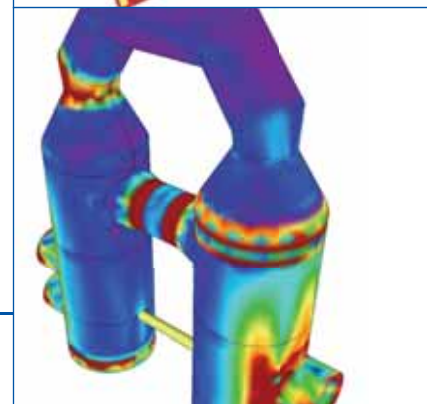
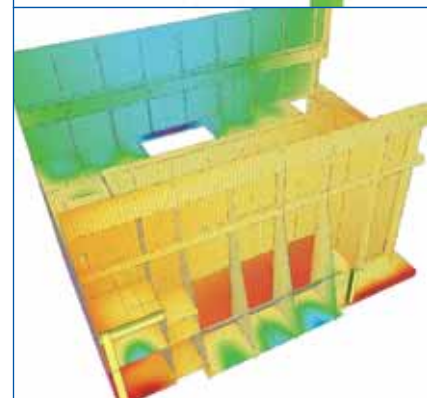
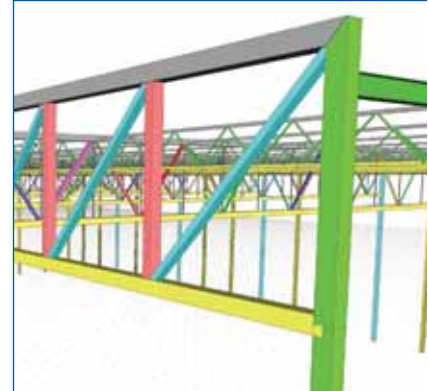
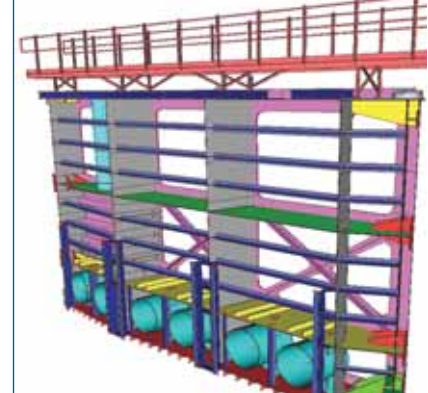
Ingenieursbureau Stendess N.V.	Lock complex, Evergem	134
Ingenieursburo IOB	Geothermiecentrale, Den Haag	136
IOA	Bateau porte	138
Mott MacDonald s.r.o.	Bridges on the grade-separated connection of the road II/468 and the industry area	140
SBE	Brug van Beek te Bree	142
SD Ingénierie Genève SA	Pont du Val d'Arve	144
University of Žilina, Faculty of Civil Engineering	Road bridge over the Váh river, Trenčín (SK)	146

Category 4: CAE Industrial Buildings & Plants 149

W Iv-Consult	Hard-coal power station, Karlsruhe Rheinhafen	150
N Baudin Chateaufneuf	La Salle des Machines de l'EPR de Flamanville	152
N Ateim	Extension de l'aciérie ArcelorMittal - Projet Rhob 2	154
N Heindl & Partner ZT GmbH	MVA-Zistersdorf - Müllbunker	156
Agro- en Industriebouw Philip Vandaele	Varkenshouderij, Heuveland	158
BGC nv / Establis	ProLogis: Warehouse and offices in Almere	160
Bureau d'Etudes Lemaire	Construction d'un entrepot de traitement de fret aérien	162
Dipl.-Ing. S.Ryklin STATIK	Extension of storage area for the Steel Trade Company Sachs&Weber	164
Establis	Vliegtuigloods, Luchthaven Brussel	166
Pieters Bouwtechniek Zwolle	Afvalbunker Reststoffen Energie Centrale Harlingen	168
Wendt SIT GmbH & Co. KG	Noise Enclosure Project - Sengkang Power Plant	170

Category 5: CAE Special Projects 173

W BG Ingénieurs Conseils	Coques du Rolex Learning Center à l'EPFL	174
N Inženirski biro dr.Saje d.o.o.	Erzurum 2011 - Ski jumping center, Turkey	176
N Etudes et Techniques Internationales	Stade des Alpes à Grenoble	178
N IMd	Health Education Museum CORPUS, Oegstgeest	180
Abicon N.V.	Anspach Center Brussel	182
ACO Industries k.s.	ACO Clara sewage treatment plant	184
ANTEA	Vérifications structurales d'échangeurs thermiques sous sollicitations sismiques	186
B.V. Ingenieursbureau M.U.C.	Traffic noise reducing barrier, Eindhoven	188
Dipl.-Ing. S.Ryklin STATIK	Formula 1 - Bridgestone Flying Stand	190
Dipl.-Ing. S.Ryklin STATIK	Shadow sail structure covering the square before the railway station Rüsselsheim	192
D.MAKOVIČKA	Statický a dynamický výpočet chladicí věže s ventilátory	194
Haverkort Voormolen B.V.	Schoorsteen MPP3 Maasvlakte	196
IMd	Container Origami, Rotterdam	198
IMd	Theatre with cantilevered steel construction	200
IOA	Bigue KINARD	202



Iv-Consult	Mechanical ships lift dock, Goa	204
Konstruktieburo Snetselaar BV	Verplaatsing van het Stationsgebouw Houten	206
Ney & Partners	Mehr Licht - Temporary sculpture in Brussels, Belgium	208
PRECI	Poste de trémies chargement camions	210
SPIE-Controlec Engineering	Tank pit for Euro Tank Terminal Amsterdam	212
Stageco Deutschland GmbH	Stage with reproduction of the Brandenburg Gate	214
VIN Consult s.r.o.	New Airport Terminal in Bratislava	216
Zeman & Co GmbH	Überdachung der Radrennbahn Erfurt	218

Category 6: CAD Engineering, Buildings 221

W Vahanen Consulting Engineers	Helsinki Music Hall	222
N Franz Oberndorfer GmbH & Co KG	Mehrfunktionsarena in Fertigteilbauweise, Salzburg	224
N MUCKINGENIEURE	Bürogebäude E.ON in Zolling	226
N Con-tura Architekten + Ingenieure GmbH	Amsterdam Symphony	228
Adams Bouwadviesbureau bv	Appartementen complex Wilhelminahof, Amsterdam	230
Artec Architekten	Parkhaus in Marburg	232
Heesakkers Beton b.v.	Kantoor en bedrijfsruimte ACSI te Zetten-Andelst	234
H. Katzenberger	Casa Cascada - Fertigteile im Dachgeschoß	236
Kirchdorfer Fertigteilholding	Industrialisiert Planen	238
MUCKINGENIEURE	Büroverwaltungsgebäude Schmidt-Seeger in Beilngries	240
PKB MERONK sc.	ALFA Shopping Centre, Bialystok, Poland	242
Prefaco n.v.	Precast production unit in Tournai	244
Van Den Berg Beton BV	Nieuwbouw 'Vrouw Kind Centrum'	246

Category 7: CAD Engineering, Engineering work and special structures 249

W Tauw	Extension and renovation 'Katwijk pumping station'	250
N Royal Haskoning	Westrandweg Amsterdam KW520	252
N DAEWOO E&C	Construction of Ship Repair Yard and Dry Dock Complex at Duqm Port, Oman	254
N Iv-Infra b.v.	Voetgangersbrug N209 Nieuwe Hoefweg	256
BubbleDeck Benelux BV	Parkeergarage Sint Antonius Ziekenhuis, Nieuwegein	258
Franz Oberndorfer GmbH & Co KG	Wendelstiege mit Brüstung aus Fertigteilen in Sichtbeton	260
Ingenieurbüro für Bauwesen Manz	Werbeturm des „Neues Schloss Diez“	262
RAUTER Fertigteilbau GmbH.	Skywalk - glass-steel bridge, Vienna	264
Systembau Eder GmbH & Co KG	100 Jahre Steyrdurchbruch; Sanierung Brücke, Austria	266
Witteveen+Bos / TCE	Railway Underpass Klinker Hoogezand-Sappemeer	268
Witteveen+Bos	Tunnel 'Ringvaart'	270

The Nemetschek Engineering Group - Engineering Freedom

With more than 20,000 customers, the **Nemetschek Engineering Group is the largest vendor of structural engineering software in Europe**. The group's software solutions cover all **structural design** and **detailing requirements**. The group is active in Europe, the Middle East and parts of Asia and offers solutions for all areas of structural engineering – from CAD and structural analysis to logistics and project management.

Engineering practice and engineering practices vary both in size and approach from country to country: from small independent consultants up to large multidisciplinary companies. Nemetschek solutions are thus specific developed **“by engineers for engineers”**. They cover a broad spectrum from small buildings and housing to high-rise buildings, industrial installations, low-energy and ecological green structures, infrastructure such as bridges and tunnels, and many more.

The group's product portfolio addresses the **design and detailing of building components**, such as beams, columns, slabs and roofs as well as the **modelling of entirely 3D structures** (steel, concrete, precast, timber, aluminium). It also covers integrated solutions for **precast concrete** and steel **frame fabrication logistics**.

Broad Spectrum of Solutions

Workflow Products	Preliminary Design	Full Structural Design	Structural Detailing	Fabrication Steering	Construction Planning & Site Mgt
Frilo Statics	✓	✓			
Scia Engineer	✓	✓	✓		
Allplan Engineering			✓		
Allplan Precast			✓	✓	
Fabricator (Scia / Nemetschek Precast)				✓	✓

Many of the group's customers use more than one product of the Nemetschek Engineering Group. This has resulted in innovations such as **“Round-Trip Engineering”**, here project data move seamlessly from one software product to another and back.

Together the group focuses on precisely those issues that are causing a stir in the structural engineering sector: **interoperability** and open interfaces to products outside the group, the use of standard exchange formats, the synchronization of data between CAD and structural analysis software and **Building Information Modelling** for engineering applications.

Besides, innovative software solutions are needed to cope with a variety of challenges: **building codes** are in a state of rapid transition (e.g. introduction of Eurocodes in Europe). There is a worldwide shortage of technically trained engineers required to automate engineering design and detailing tasks. And finally there is a shift in the construction industry from 2D to 3D intelligent modelling.

The Product Brands of the Nemetschek Engineering Group

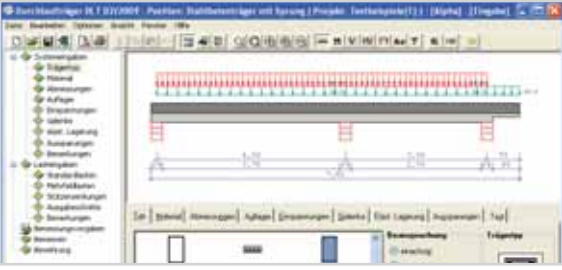
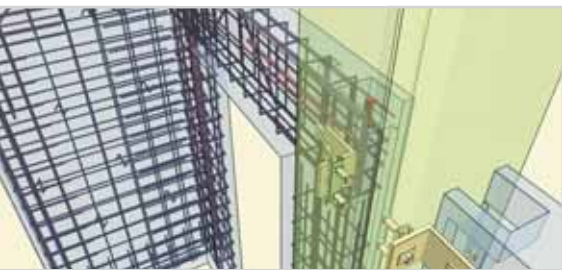
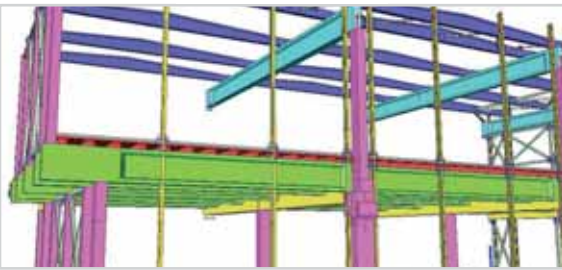
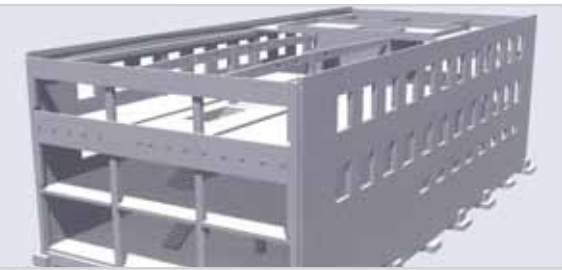
The common goal of the engineering group is international expansion with products that are perfectly adapted to the requirements of the particular market. With more than 250 people the group is bundling forces to create solutions for the future. The Nemetschek Engineering Group has one mission:

“enabling engineering freedom”



enabling engineering freedom

The Product Brands of the Nemetschek Engineering Group

	CAE - Analysis & Design	CAD - Drafting & Modelling
Building Members	Frilo  Statik 	GLASER  -isb cad- a NEMETSCHKE Company 
3D Structures	Scia  Engineer 	2009 Allplan  
Precast / Steel Fabrication including Logistics & Production Planning	Scia  Engineer 	2009 Allplan  

Introduction of the International Jury

When leafing through this book, it will quickly become clear to you that judging the entered projects has not been a simple assignment. The high technical level of these projects and the often sublime project presentations called for a competent international jury. The specialist members of the jury for the Nemetschek Engineering User Contest 2009, both from the academic and the business world, have done the job to perfection. We are very delighted to introduce them to you...



ir. Ane de Boer

Ministry of Transport, Public Works and Water Management

- **Departement:** Centre for Public Works
- **Function:** Senior Advisor / Specialist
- **Specialty:** Computational mechanics, FE modelling, Reliability



ing. Luc Carpentier

Technum-Tractebel-Engineering

- **Departement:** Building Flanders
- **Function:** Product line Director
- **Specialty:** Civil and structural engineering



Prof. ir Eric Ceuterick

Associatie Leuven, Campus De Nayer

- **Departement:** Civil Engineering
- **Function:** Professor
- **Specialty:** Steel construction, structural analysis



ing., lic. mgmt Marc Depauw

SADEF nv

- **Departement:** Building Department
- **Function:** Business unit manager Building products
- **Specialty:** Structural steel systems



Ing., Ph.D. Petr Hradil

Brno University of Technology, Faculty of Civil Engineering

- **Departement:** Institute of Metal and Timber Structures
- **Function:** Assistant Professor
- **Specialty:** Timber structures, steel structures



Prof. Ir arch. Guy Mouton

Hogeschool Sint Lucas

- **Departement:** Architecture
- **Function:** Member of the board

Studieburo Mouton

- **Departement:** Engineering
- **Function:** General Manager
- **Specialty:** Structural design



ir. Jo Naessens

infosteel

- **Departement:** General Management
- **Function:** General Manager
- **Specialty:** Steel solutions



Prof. David A Nethercot

Imperial College London

- **Departement:** Department of Civil and Environmental Engineering
- **Function:** Head of Department
- **Specialty:** Civil engineering



Prof. Rasso Steinmann

IABI - Institute of Applied Building Informatics

- **Departement:** General Management
- **Function:** Director
- **Specialty:** Applied building informatics



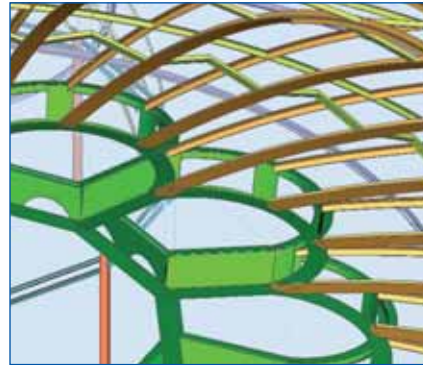
Prof. Dominique Vié

C.H.E.C.

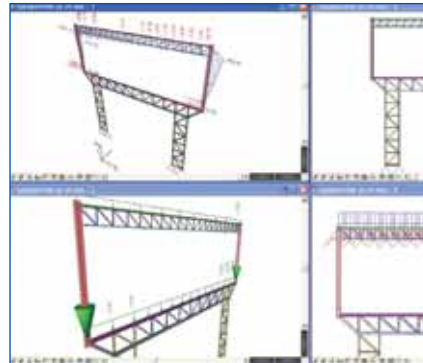
- **Function:** General Manager
- **Specialty:** Structural design

NOMINATION

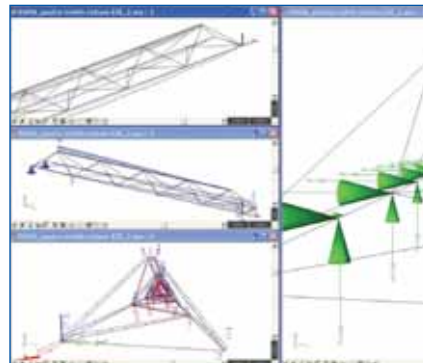
Vrije Universiteit Brussel - Restoration study Winter Garden of Royal Greenhouses, Brussels (p20)



Establis - Ski Hall, Terneuzen (p22)



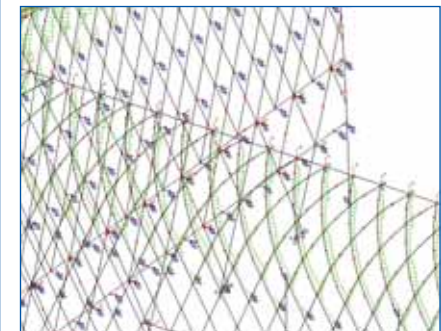
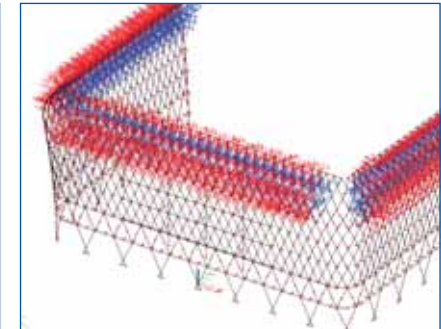
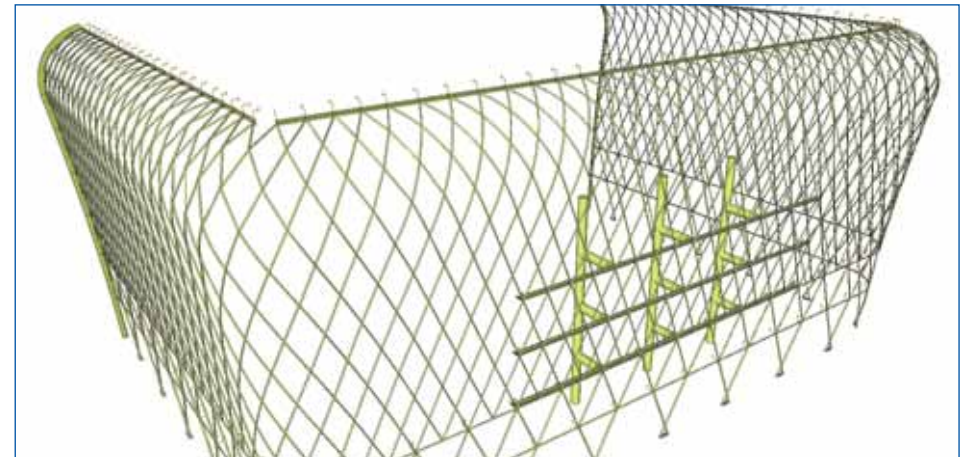
Bureau d'Etudes Lemaire - Sports Hall of Herstal (p24)



Category 1: CAE Constructive Elements

WINNER

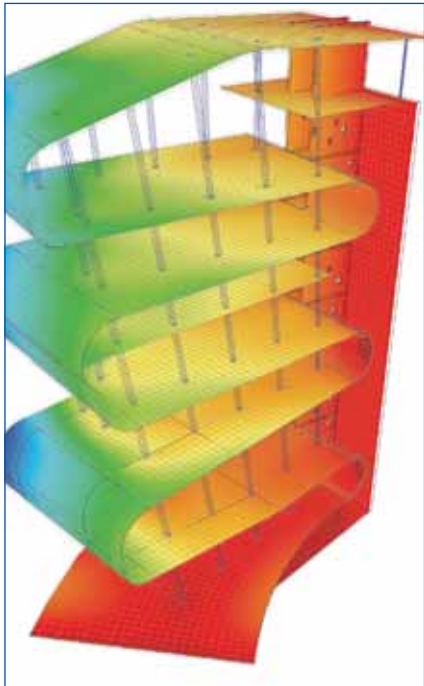
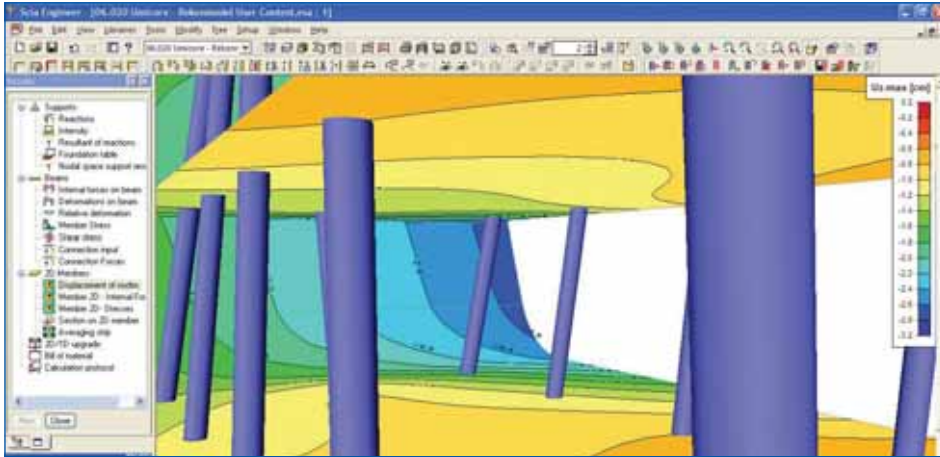
CSM nv - Vörösmarty Tér 1, multifunctional building, Budapest (p18)



Category 2: CAE Housing & Buildings

WINNER

- Ney & Partners - Office Building 'Facelift Umicore', Hoboken (p30)

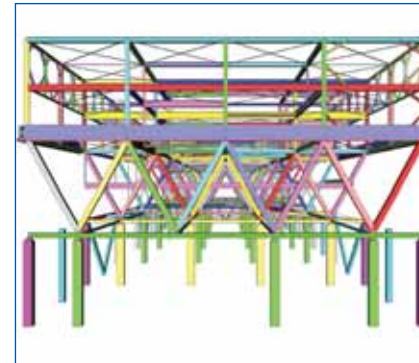


NOMINATION

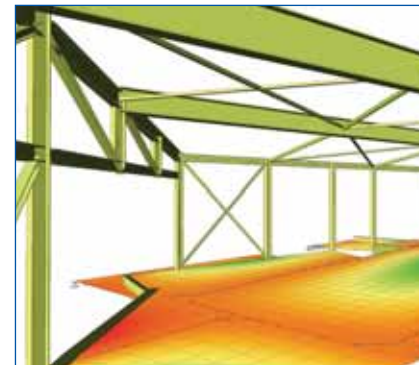
- BESIX - The Tornado, Doha (p32)



- Ingenieursbureau Stendess N.V. - Office buildings for Drisag (p34)



- Cerfontaine Constructions sprl - Steel box - Schyns' offices (p36)

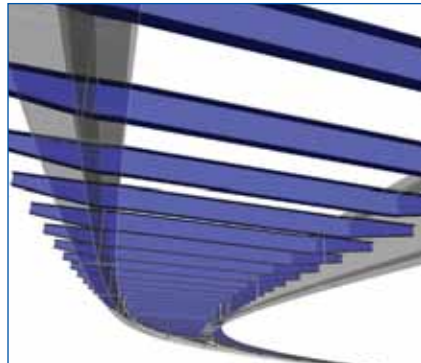


NOMINATION

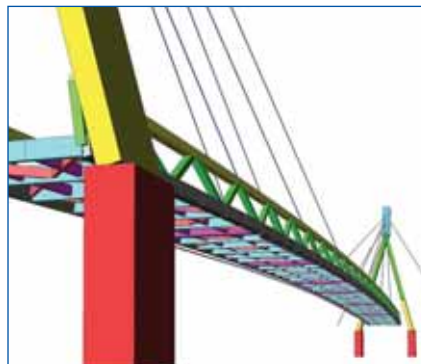
Ney & Partners - Second bridge over the river Scheldt (p108)



SBE - Launching of a bridge in Trinidad (p110)



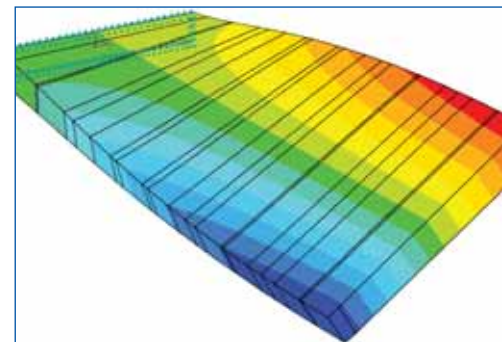
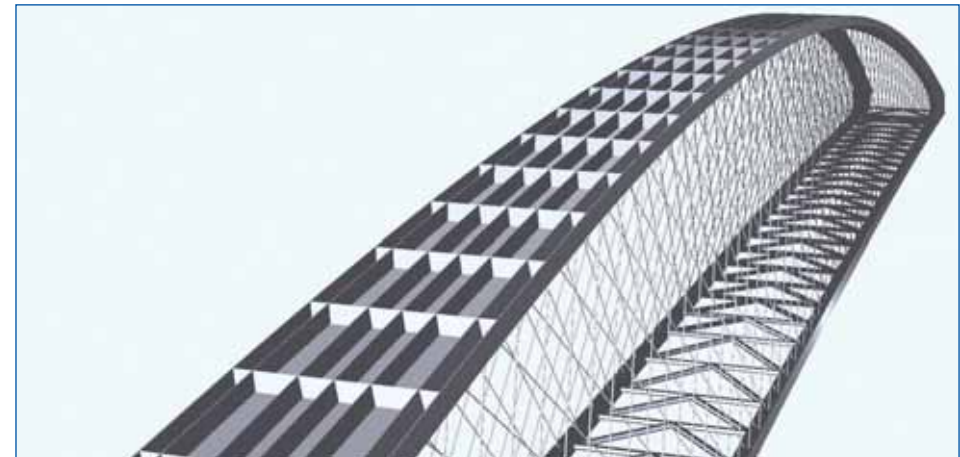
Petignat & Cordoba Ingenieurs Conseils SA - Reconstruction of the Illarsaz bridge (p112)



Category 3: CAE Civil Works

WINNER

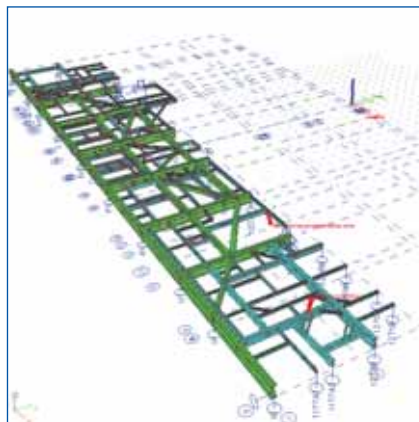
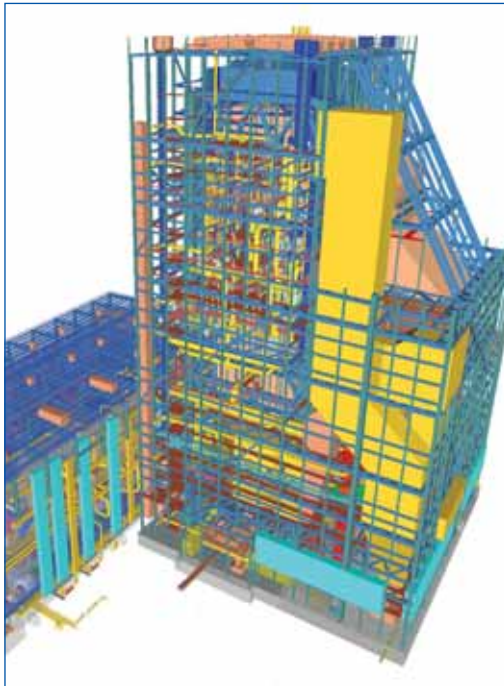
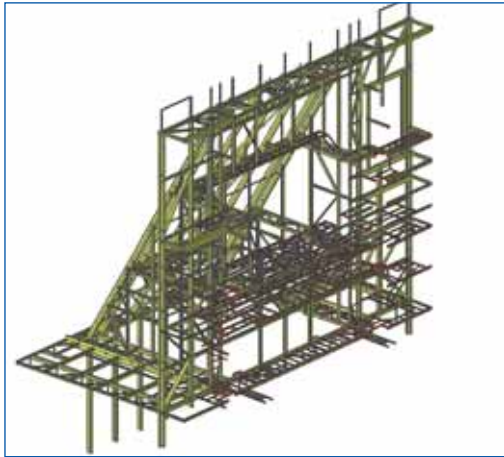
Mott MacDonald s.r.o. - Bridge over Vltava river in Prague-Troja (p106)



Category 4: CAE Industrial Buildings & Plants

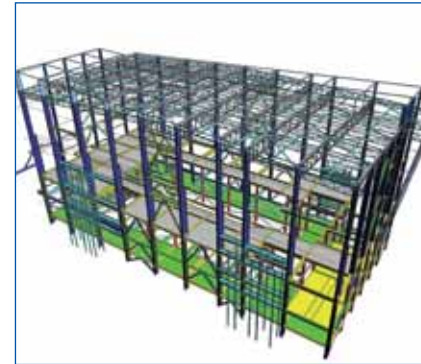
WINNER

- lv-Consult - Hard-coal power station, Karlsruhe Rheinhafen (p150)

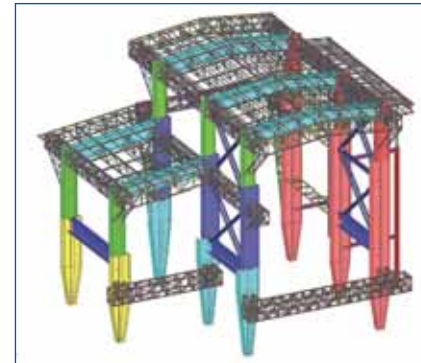


NOMINATION

- Baudin Chateauneuf - Engine room of the EPR of Flamanville (p152)



- Ateim - Extension of ArcelorMittal steel plant, Dunkerque (p154)

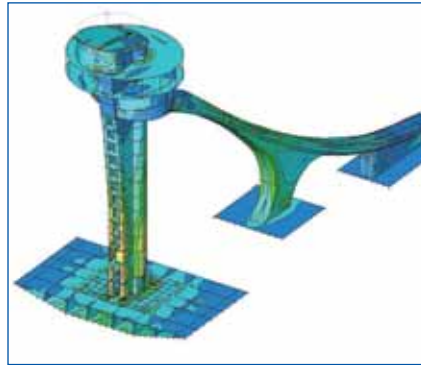


- Heindl & Partner ZT GmbH - Waste power plant, Zistersdorf (p156)

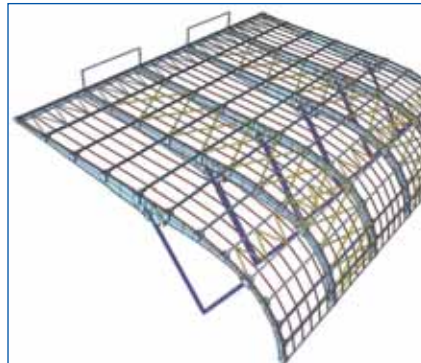


NOMINATION

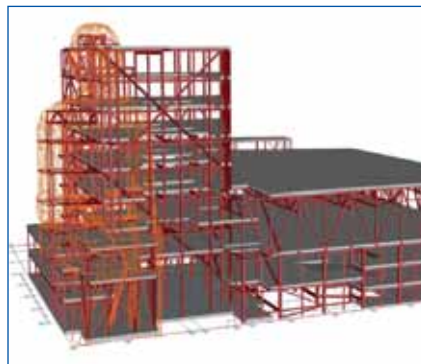
Inženirski biro dr.Saje d.o.o. - Erzurum 2011 - Ski jumping center, Turkey (p176)



Etudes et Techniques Internationales - Stadium of the Alps, Grenoble (p178)



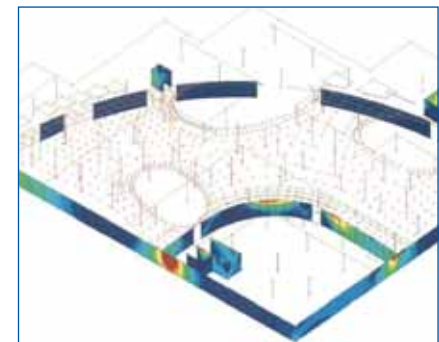
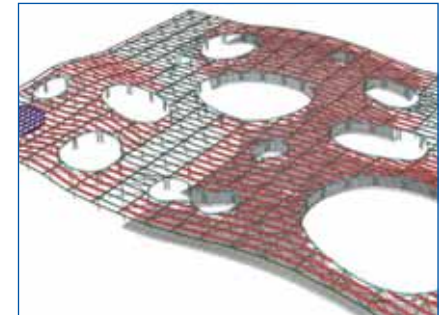
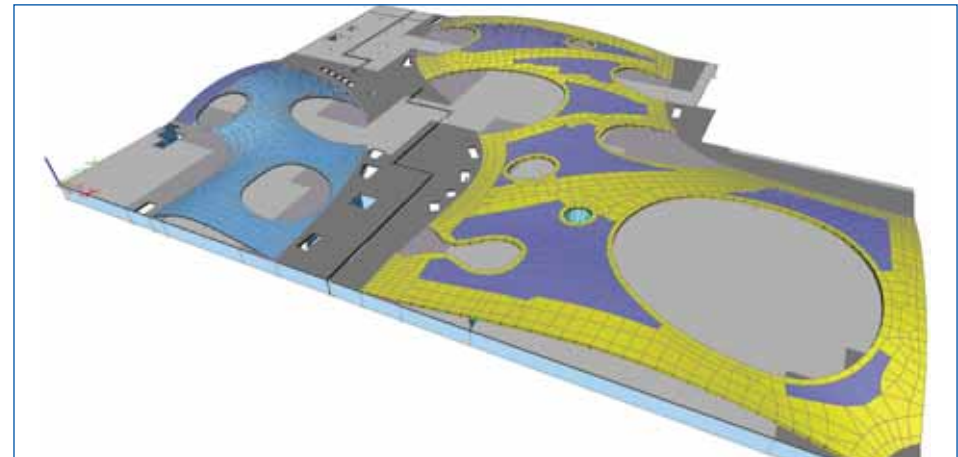
IMd - Health Education Museum CORPUS, Oegstgeest (p180)



Category 5: CAE Special Projects

WINNER

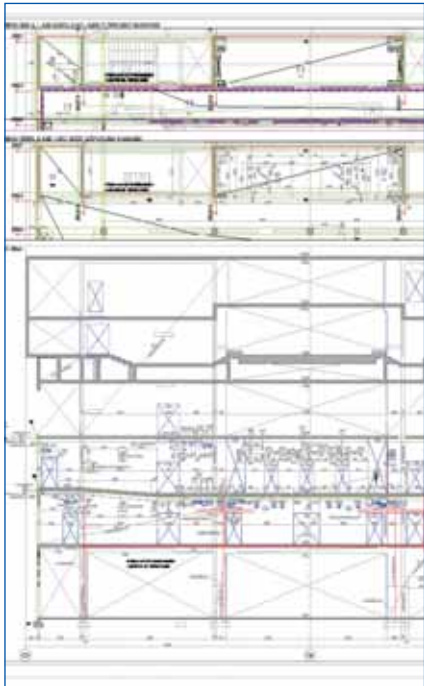
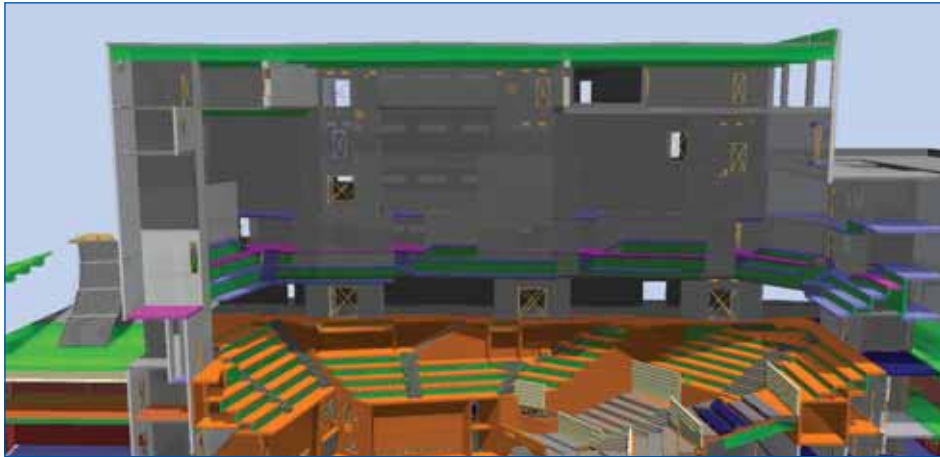
BG Ingénieurs Conseils - Shells of the Rolex Learning Centre (p174)



Category 6: CAD Engineering, Buildings

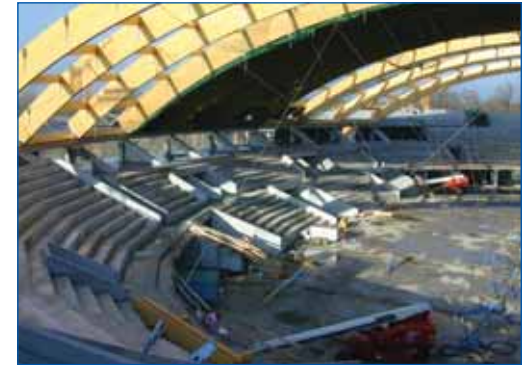
WINNER

- Vahanen Consulting Engineers - Helsinki Music Hall (p222)

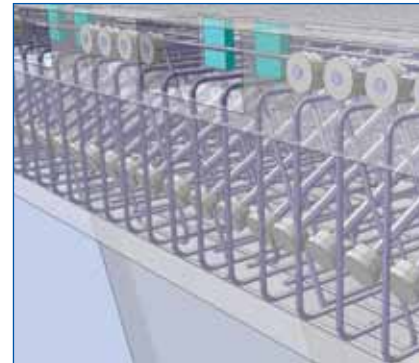


NOMINATION

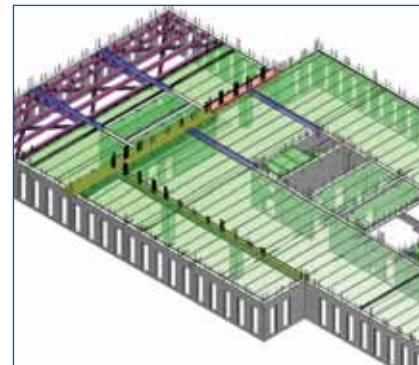
- Franz Oberndorfer GmbH & Co KG - Mehrfunktionsarena in Fertigteilbauweise, Salzburg (p224)



- MUCKINGENIEURE - Bürogebäude E.ON in Zolling (p226)

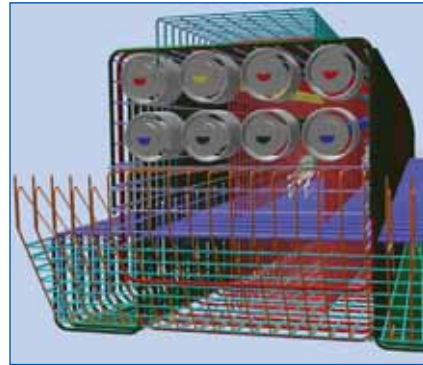


- Con-tura Architekten + Ingenieure GmbH - Amsterdam Symphony (p228)

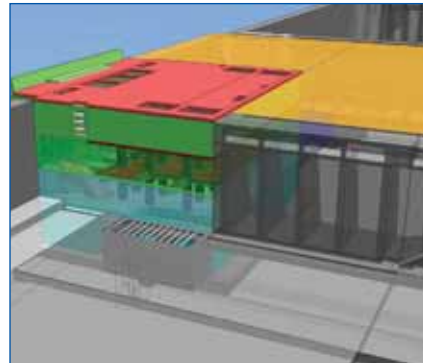


NOMINATION

Royal Haskoning - Westrandweg Amsterdam KW520 (p252)



DAEWOO E&C - Construction of Ship Repair Yard and Dry Dock Complex at Duqm Port, Oman (p254)



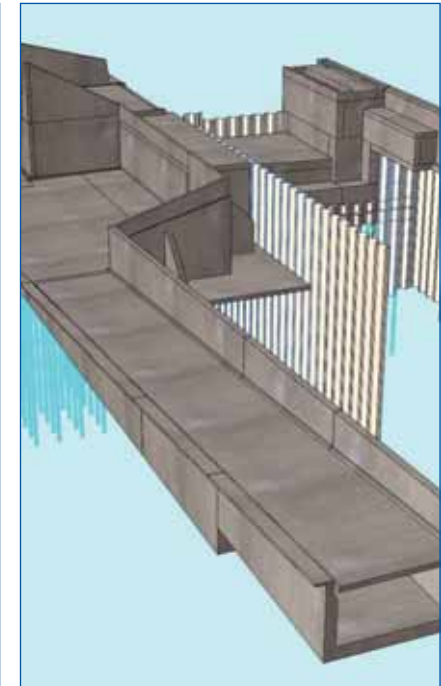
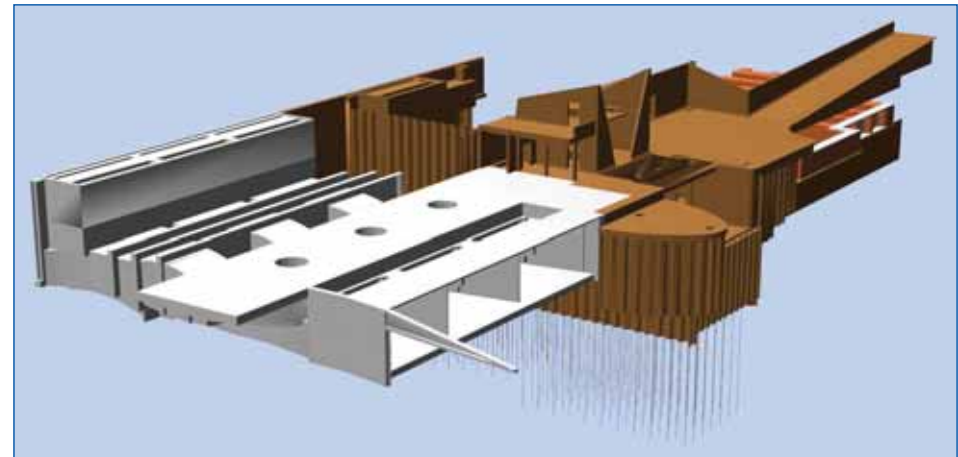
Iv-Infra b.v. - Voetgangersbrug N209 Nieuwe Hoefweg (p256)



Category 7: CAD Engineering, Engineering work and special structures

WINNER

Tauw - Extension and renovation 'Katwijk pumping station' (p250)





moving minds



Engineering Freedom.

The Nemetschek Engineering Group. Engineers develop software for engineers.
Integrated solutions for CAD and structural analysis, logistics and project management.
For more engineering freedom - from design to execution.
www.nemetschek.com/engineering

Nemetschek Engineering Group

Allplan Scia Frilo Glaser

Category 1: CAE Constructive Elements

Design of building parts with a high technical level or original geometry. It may concern specific slabs, beams, columns, stairs, connections, foundations and or sheet walls... with a level of detail which illustrates the necessity of using dedicated software for this type of structural parts.

1



CSM nv

Contact Ronny Loos
Address Hamonterweg 103
3930 Hamont-Achel, Belgium
Phone +32 11 550600
Email ronny.loos@csm.be
Website www.csm.be

WINNER



CSM nv is an engineering, fabricating, industrial painting and erecting company who provides a complete range of structural steelwork within Europe and in various parts of the world. CSM nv was founded in 1964 by Constant Schuurmans, who also gave the company its name: "Constant Schuurmans Metaalwerken", short CSM.

The first part of the plant in Achel, inaugurated in 1970, has been extended over the years with more and more new compartments (still recognizable by the range of roof constructions and colours) and with the first offices. In 1982 the first two lower parts of Hamont were built. The assembling, weld and paint activities were more and more moved from Achel to Hamont.

In 1988 the tall hall was built in Hamont. This extension was necessary for fabricating and blasting/painting heavier construction parts, and to make complex pre-assembling possible. In 1992 the offices in Achel have been enlarged and embellished.

Finally, in 1998, the second tall hall was built in Hamont, to specialize even more in roller coaster constructions. As in the beginning the scale of products was limited to the fabrication of fences, stairs and platforms in steel, the change into the design of industrial buildings and turnkey projects was quickly made.

In 1980 CSM went abroad with beautiful projects in Germany, the Netherlands and even in Colombia, Cameroon, the United Arabian Emirates...

In 1991 the first bridges were built for Belgium, Germany and Great Britain. From 1994, the fabrication of tracks for roller coasters, giant wheels,

Mad Houses... was started. The machinery park has been continually adapted and modernised to the modified scale of products. Even on the domain of quality and quality control it went fast.

In 1983 the first welders had been approved to realise the first project for the Ministry of Public Works. At that time CSM also received the "Grosser Eignungsnachweis" according to DIN18800 with qualified welders according to DIN8560. This certification is necessary in Germany to fabricate and erect welded constructions.

From 1990 quality reports of several projects have been made and stored. In 1991 the "Eignungsnachweis" has been extended with DIN 18809 for road bridges. The next extension took place in 1994 with DIN 15018 for Cranes and DS804 for railroad bridges. In the meantime, all the welders were qualified to EN 287-1 or EN 1418

In 1995, CSM got its qualification to build bridges in Belgium with the welding processes submerged arc welding and flux cored arc welding. CSM is one of the only five companies in Belgium with this qualification. Also in this year all the welders are recognised according to the European Standards (EN). In 1999 the Security, Health and Environment Assurance System in accordance with VCA** is obtained for the Transport- and Erection Department.

Finally, in 2001, the Quality Management System in accordance with EN ISO 9001: 2000 was implemented and certified.

At this moment CSM works with more than 140 employees and creates a yearly turn-over of almost 25 mio Euros.

Vörösmarty Tér 1, multifunctional building, Budapest

Short Description

ING Real Estate has developed a multifunctional block of buildings in the old centre of Budapest. Vörösmarty no. 1 is situated in the heart of Budapest, at the city's most famous square, Váci utca. The square regularly hosts cultural events and fairs, several international hotel chains are present and Duna Korzó, the pedestrian walkway along the Danube, is within walking distance. The listed monument building of the Vigadó opera House is adjacent to the building. Public transport access as well as easy car access is excellent. The façade is a multilayered structure, where the exterior skin is a decorative structure wrapping the functionally different internal layers into one homogenous building appearance. The geometrical system composed of triangular elements makes the outlook of the building's façade unique, modern and fresh. This structure is constructed from steel pipes of varying cross section climbing around the building in a triangular shape covered with clear glass. A three storey high internal atrium, starting from the 2nd floor, enhances the exclusivity of the building.

Project Information

Owner: ING Real Estate
Architect: Fazakas György Architects Ltd
General Contractor: Scheldebouw bv
Engineering Office: CSM nv

Construction Start: 21/08/2006
Construction End: 27/04/2007
Location: Budapest, Hungary



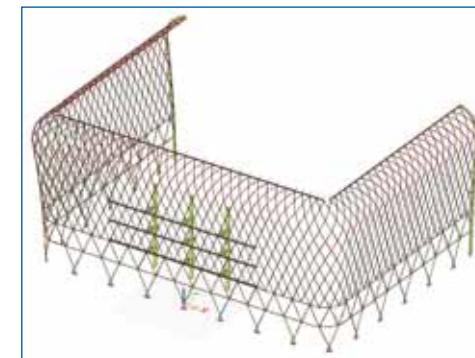
Quote of the Jury

"An imaginative concept that allows the concept of the building to be immediately recognized. The complex geometry resulted in difficult fabrication assisted by the availability of the full 3D model. Result is a spacious, eye-catching example of a modern multifunctional building."

ING Real Estate has developed a multifunctional block of buildings in the old centre of Budapest. Vörösmarty no. 1 is situated in the heart of Budapest, at the city's most famous square, which is the gateway to the main pedestrian shopping street - Váci utca. The square regularly hosts cultural events and fairs, while several international hotel chains and Duna Korzó, the pedestrian walkway along the Danube is within walking distance. The listed monument building of the Vigadó opera House is adjacent to the building. Public transport access is excellent, with Deak Sq, with the only intersection of all three Metro lines, being a few minutes' walk. There is also easy car access. On this place, an A-location near the Donau, a multifunctional building for shops, offices and apartments, with three parking levels underneath, is built. The building consists of seven levels on top of the parking levels, which are: two for shops, three for offices and two for apartments. This Vörösmarty building is named after the public square "Vörösmarty Tér" in front of the building.

In the middle of the building a five storey high atrium rises, with balcony gardens. The offices on level two, three and four, surround the atrium space in a U-shape. Double glazed façade units with glass that has a fade-away pattern up to 1100 mm. The atrium is closed at the top with a glass roof on a steel structure.

The main façades, north, east and west of the outside of the building are also double glazed units



which have an outside sunblind, silver coloured and perforated, on the offices levels. The ground floor façade is vertical, from the first floor up the façade is sloping from 93 degrees, 1 degree per floor, up to 96 degrees.

In front of the main façade a steel structure, connected to the façade and floors with steel walkways, is built, which kind off wraps the building up. To the outside of the steel structure, triangular shaped glass panes are connected with spider profiles.

So the façade is a multilayered structure, where the exterior skin is a decorative structure wrapping the functionally different internal layers into one homogenous building appearance. The geometrical system composed of triangular elements makes the outlook of the building's façade unique, modern and fresh. This structure is constructed from steel pipes

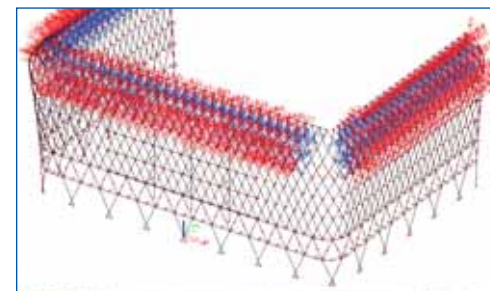
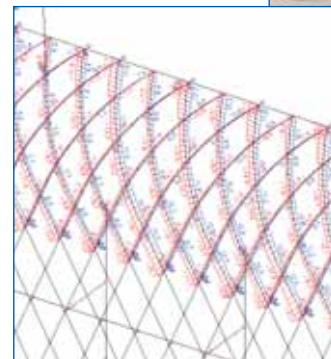
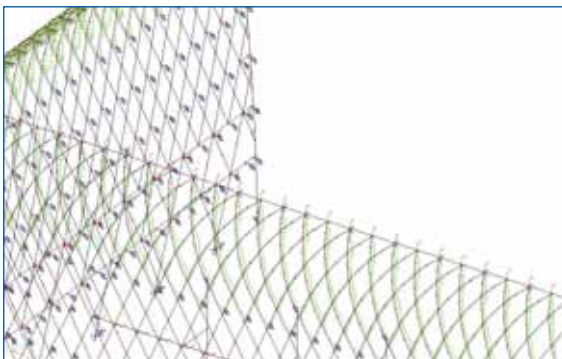
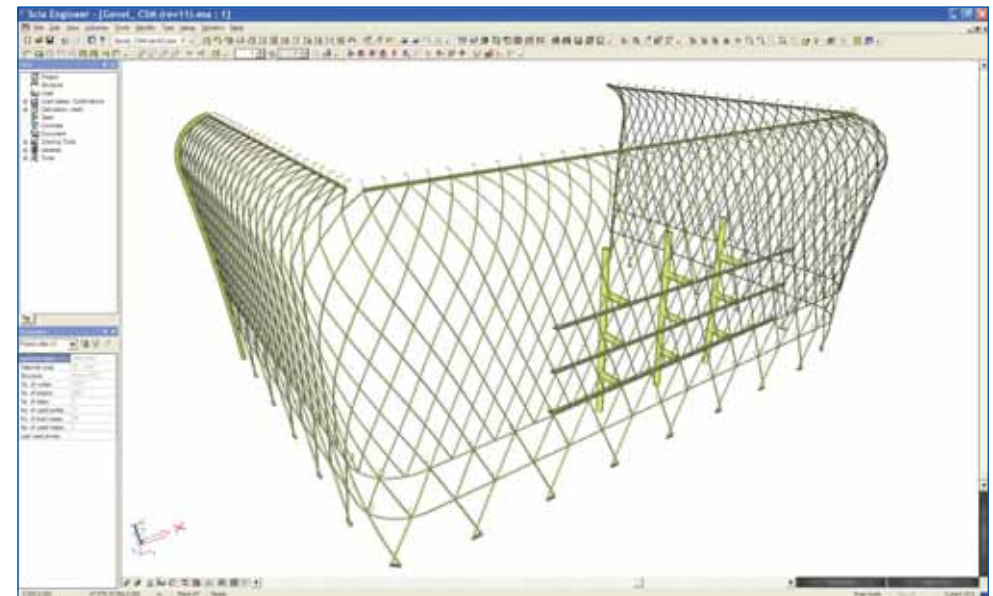
of varying cross section climbing around the building in a triangular shape covered with clear glass. A three storey high internal atrium, starting from the 2nd floor, enhances the exclusivity of the building.

This prestigious project is an example of public-private partnership between the Hungarian Foundation for Art and Free Education and ING Real Estate.

Because of the different curves in the structure, it was necessary to calculate the structure as a 3D structure. In order to obtain the curved structure, we imported a 3D wire model from Autocad into Scia Engineer. The Nemetschek Scia programs were extremely useful, having the possibility of import and 3D calculation.

The internal forces and reactions obtained from Scia Engineer were used to calculate the connections (steel-steel and steel-concrete).

Vörösmarty Tér 1, multifunctional building, Budapest



Vrije Universiteit Brussel

Contact Johan Blom
Address Pleinlaan 2
1050 Brussel, Belgium
Phone +32 2 629 29 55
Email johan.blom@vub.ac.be
Website www.tw.vub.ac.be/memc

NOMINATION



Vrije
Universiteit
Brussel

The Vrije Universiteit Brussel is a dynamic and modern university with two parkland campuses in the Brussels Capital Region: the main campus in Etterbeek is home to seven faculties. In Jette you can find the medical campus and the University Hospital.

High quality education and research are central issues. Our research teams are internationally recognised in many disciplines of fundamental and applied research.

The Vrije Universiteit Brussel is the largest Dutch-speaking employer in the Brussels Region. Centrally situated in the capital of Europe, our university takes up its role as an ambassador for Flanders and Brussels, in a spirit of active pluralism and open mindedness.

We offer a quality education to more than 9000 students. Add to that the almost 4500 students of our partner, the Erasmus Hogeschool Brussels; the 400 students at the English-speaking Vesalius College; the 5000 students at the Centre for Adult Education that shares our campus, and the more than 150 research teams working on both our campuses, and you get one of the biggest centres of knowledge in the capital of Europe. Thanks to this expertise and its strategic location, the Vrije Universiteit Brussel is your ideal

partner for prestigious research and education with an outlook on Europe and the world.

In the Department of 'Mechanics of Materials and Constructions' (MEMC) fundamental and applied research is developed on the following themes:

1. Durability - Reliability of polymer based composite systems;
2. Mixed numerical-experimental techniques or inverse methods;
3. Mineral polymers and their composites;
4. Damage mechanics on material and structural levels;
5. Non-destructive testing and experimental mechanics;
6. Design and analysis of constructions;
7. Renovation of buildings and civil engineering constructions.

Software and hardware is available for the research on these themes. In the applications, international relations and interactions with industry are a permanent incentive for future developments.



Sam Van Mulders



Restoration study Winter Garden of Royal Greenhouses, Brussels.

Thesis of Sam Van Mulders, Promotor: Prof Dr S. Adriaenssens, Begeleiders: ir.arch L. Lauriks & ir; arch. m De Bouw.

The project concerns a structural restoration study of the Winter Garden of the Royal Greenhouses of Laeken, Belgium. The Winter Garden was built between 1874 and 1876 under the authority of de Belgian King Leopold II. This greenhouse has a high cultural and historical value due to its importance in the development of structural steelwork in Belgium and Europe. In this student thesis a 3-dimensional computational structural analysis is carried out which allows verification of the current structural state. The study includes the identification of the geometrical and material parameters of the structure, the determination of the symmetrical and asymmetrical load cases and the evaluation of efficiency under all load combinations. The complete analysis is carried out according to the actual European standards: Euro codes EN1990, EN1991 and EN1993. Based upon the results of the structural analysis, different possibilities for the restoration of the construction of the Winter Garden are presented.

Short Description

Project Information

Owner: Belgian State
Architect: Alphonse Balat
General Contractor: n/a
Engineering Office: n/a

Construction Start: 1874
Construction End: 1876
Location: Laeken Belgium



The project concerns a structural restoration study of the Winter Garden of the Royal Greenhouses of Laeken, Belgium. The Winter Garden was built between 1874 and 1876 under the authority of Belgium king Leopold II. This greenhouse has a high cultural and historical value due to its importance in development of structural steelwork in Belgium and Europe.

In this student thesis a 3-dimensional computational structural analysis is carried out which allows verification of the current structural state.

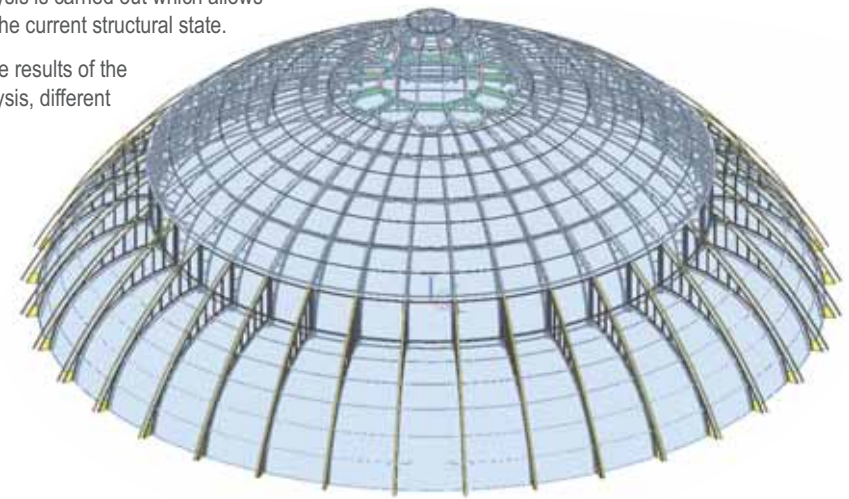
Based upon the results of the structural analysis, different

restoration possibilities of the Winter Garden structure are presented.

General information of the project

The Winter Garden was built between 1874 and 1876.

Architect: Alphonse Balat
Location: Laeken, Brussels, Belgium



Used software: Scia Engineer

Structural concept

The Winter Garden is a glass and steel dome construction. The main construction contains 36 identical arches radiantly from a central point. The structure can be divided in three parts: the walk-round, the main dome and the small dome. The total height of the construction is 25 m, the diameter is 57 m.

Project approach

The study includes the identification of the geometrical and iron parameters of the structure, the determination of the symmetrical and asymmetrical load cases and combinations and the evaluation of the structural elements.

Loading scheme

Euro code 1 determines the permanent loads:

- Self weight of iron main structure
- Self weight of the secondary structure
- Self weight of the glazing
- External permanent loads

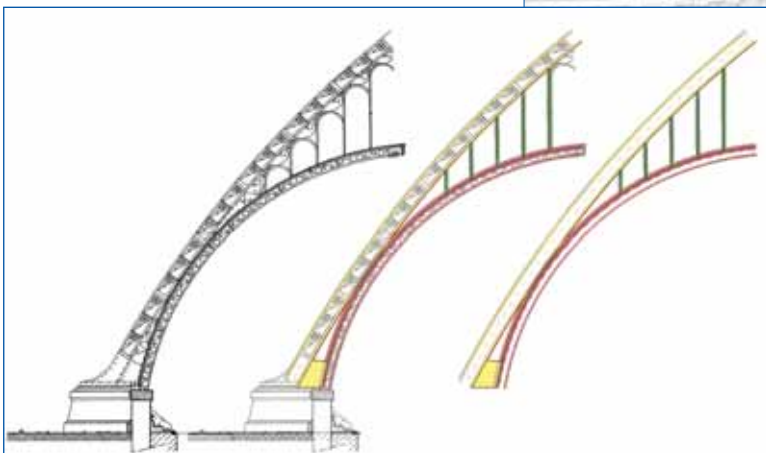
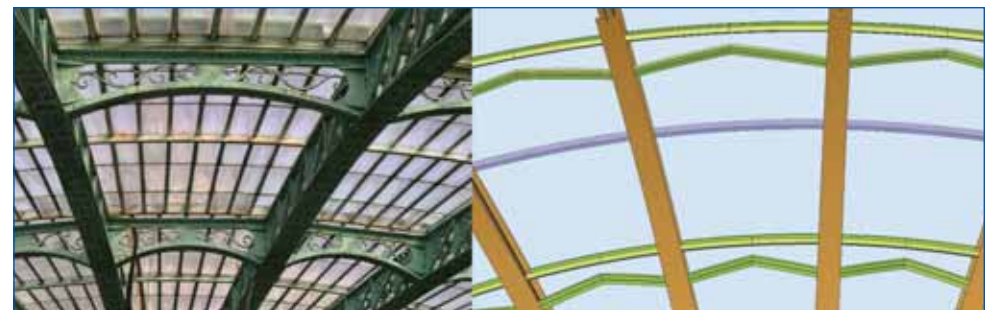
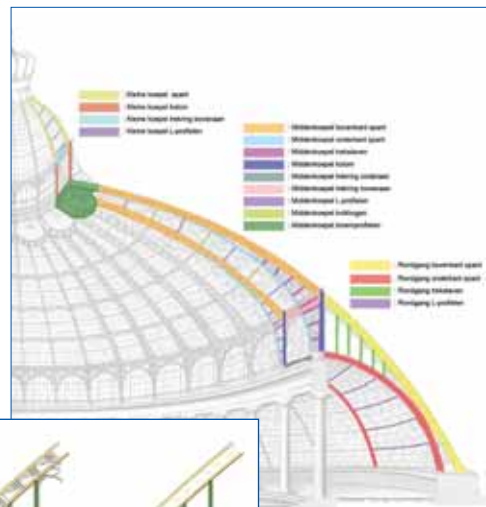
Euro code 1 was used to determine variable loads:

- Snow
- Wind
- Thermal loading
- Service loads

The complete analysis is carried out according to the actual European standards: the Euro codes EN1990, EN1991 and EN1993.



Restoration study Winter Garden of Royal Greenhouses, Brussels



Establis

Contact Bart Maerten
 Address Beversesteenweg 612
 8800 Roeselare, Belgium
 Phone +32 51 43 12 00
 Email bmaerten@establis.eu
 Website www.establis.eu

NOMINATION



Establis (voormalig TAB) werd opgericht als éénmanszaak in 1982 door Roger Moortgat, als adviesbureau voor aannemers en constructeurs. Sindsdien is het bedrijf uitgegroeid tot een bedrijf met een 13-tal medewerkers.

Establis is sinds 1995 ISO 9001 gecertificeerd en is lid van ORI, de Orde van Raadgevende Ingenieurs van België.

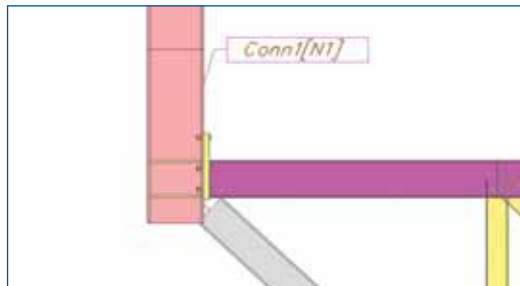
Establis is gespecialiseerd in, en heeft grote ervaring in, het ontwerpen van allerhande bouwkundige constructies. Wij kunnen een brede waaier van oplossingen aanbieden wat garant staat voor een optimale oplossing aangepast aan de specifieke eisen en omstandigheden. Nieuwe ontwikkelingen worden op de voet gevolgd door het bijhouden van gespecialiseerde vakliteratuur en het bijwonen van studiedagen en congressen in binnen- en buitenland.

- Optimalisatie
- Berekeningen gebruik makend van de laatste stand der techniek wat betreft software en rekenmethodes
- Bepalen van de meest geschikte materialen (beton, staal, hout, ...) in functie van budget en uitvoeringstermijn (ook in het buitenland)

- Coördinatie van het ontwerp en de studies
- Aanbestedingsdossier ruwbouw
- Prijsaanvraag en vergelijking
- Werfopvolging
- Berekeningen volgens buitenlandse normen
- De verbindingen van staalconstructies worden door ons ontworpen wat noodzakelijk is voor een optimaal ontwerp
- Ontwerp van houtconstructies
- Funderingen
- Ontwerpen van constructies in aardbevingsgebied
- Eindig elementen berekeningen

Onze referenties zijn zeer breed en gaan van industriebouw over kantoorbouw, naar chemische productie-eenheden, veilingen, diepvriezers en frigo's, appartementsgebouwen, skipistes, parkeergebouwen en bioscoopcomplexen.

Bovendien stelt geen enkel materiaal een probleem voor ons, zoals studie van paalfunderingen, putten, keerwanden, damwanden, staalconstructies, betonconstructies, houtconstructies, metselwerk, ...



Ski Hall, Terneuzen

Short Description

This project concerns the design of a new Leisure Centre in the outskirts of Terneuzen (The Netherlands). The main part of the centre is an indoor ski hall. Other than that, the centre is equipped with a fitness-centre, some restaurants and over 10.000 m² of shopping area. The ski hall itself is made of a steel structure (no fire resistance required considering the freezing temperature).

The rest of the centre is made of concrete, especially because the roof of the shopping area under the ski hall needed fire resistance.

Several aspects influenced the design of the steel structure: architectural image (a straight box going into the air), specific loadings (wind loads at 40 m above ground, load of the snow package, loads due to ski-lifts...)

Project Information

Owner: ELD
Architect: EBAR
General Contractor: Heijmans
Engineering Office: Establis

Construction Start: 11/2006
Construction End: 12/2007
Location: Terneuzen, Netherlands



Het betreft een volledig nieuwbouw Leisure Center in een nog onaangeroerde polder aan de rand van Terneuzen (Nederland). Het belangrijkste en meest in het oog springende deel van het Center is een indoor skipiste. Daarnaast zijn er ook horeca-activiteiten, een fitnesscentrum en meer dan 10.000 m² handelszaken.

De skipiste is volledig opgetrokken in staal. De rest is in hoofdzaak betonstructuur, omwille van de brandweerstand. De dakplaten van de winkels die zich onder de piste bevinden moesten brandwerend zijn. Op die manier kon de skipiste zelf in staal gebouwd worden, zonder brandweerstand. Er is immers geen brandgevaar in de piste zelf (geen brandlast en een temperatuur van net onder het vriespunt). Hierna zal de staalstructuur van de skipiste verder besproken worden.

Bij het ontwerp van de staalstructuur van de skipiste waren volgende randvoorwaarden de belangrijkste:

normale omstandigheden wordt deze opwaartse kracht gecompenseerd door het gewicht van het sneeuwpakket, maar tijdens constructiefase is de sneeuw nog niet aanwezig. Een tweede klimaatlast is sneeuw en regen. Door de specifieke dakvorm, één lange helling met slechts 1 brede goot onderaan, komt er bij hevige regen enorm veel water onderaan in de goot terecht. Als belasting in die goot werd 300kg/m² gerekend. Naast de klimaatlasten zijn er uiteraard de lasten eigen aan de exploitatie: last sneeuwpakket, personenbelasting, pistenbully, lasten ten gevolge van skiliften en roltapijt, ... Het sneeuwpakket is een stuk zwaarder dan de sneeuwlast die normaal gezien op daken moet gerekend worden. Gemiddeld bestaat het pakket uit ongeveer 25cm ijs met daarboven 25cm samengepakte sneeuw. Totaal ongeveer 420kg/m², plus een extra last ten gevolge van mogelijke 'jumps'.

Architecturaal ontwerp

Het ontwerp voorzag erin dat de piste als een rechte balk de lucht in schiet. De balk is volledig gesloten, onder de balk is de structuur zo open mogelijk. Om dit effect te versterken moest het uiteinde van de piste in uitkraging lopen.

De vloer van een skipiste is echter niet recht, maar parabolisch van vorm. De ruimte tussen onderrand gevel en vloer piste is variabel. Op sommige plaatsen

Specifieke overlasten

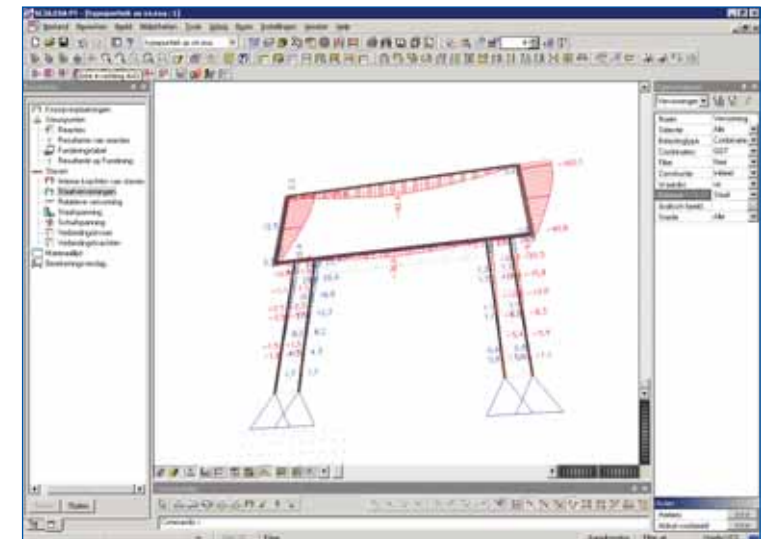
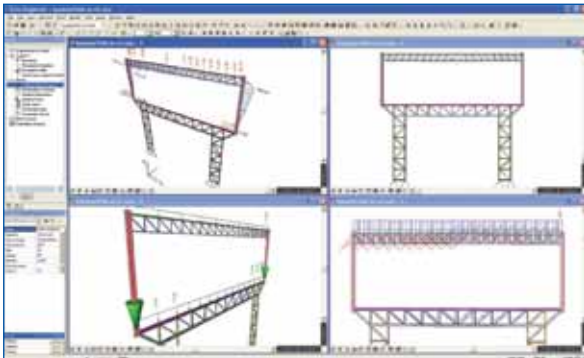
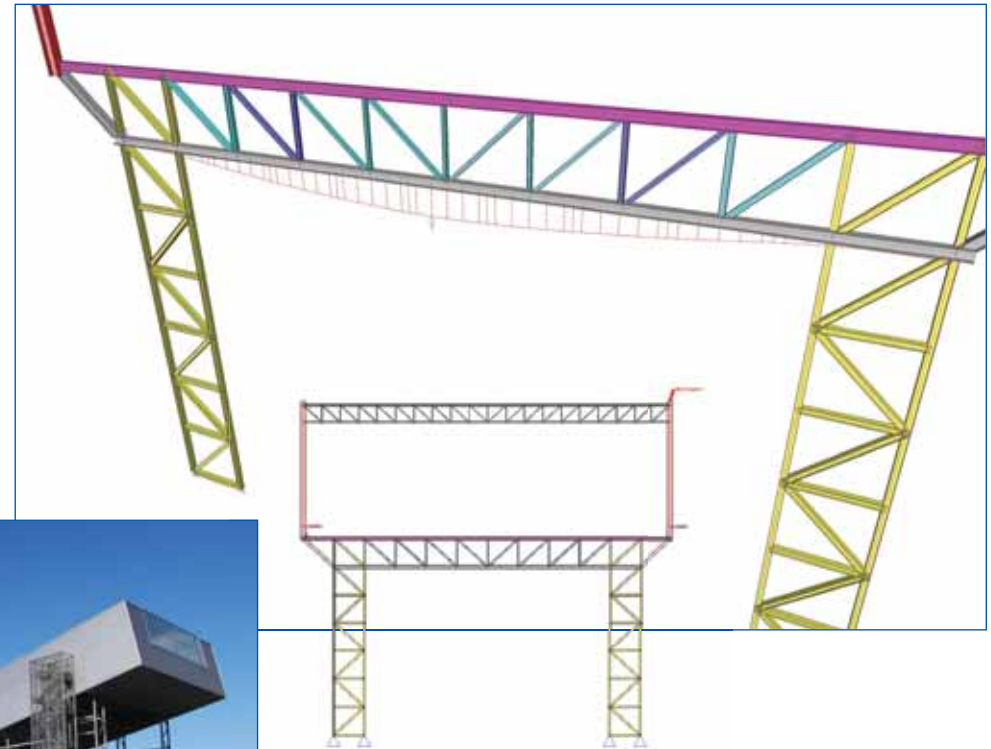
Op het hoogste punt zit het dak van de piste op ongeveer 40 m hoogte. De windlasten zijn op dergelijke hoogte allesbehalve verwaarloosbaar. Daarnaast moest ook rekening gehouden worden met het feit dat de wind onder de piste kan slaan. De ruimte onder de piste, tussen dak winkels en vloer piste, is immers volledig open. In

enkele meters, op andere plaatsen bijna niets. De structuur is opgebouwd uit 2 op elkaar gestapelde portieken alle 10 m met ertussen gordingen, zowel in vloer als in dak. De onderste portiek bestaat uit 2 vakwerkkolommen en een vakwerkligger. De bovenste portiek bestaat uit 2 gewone profielkolommen en een vakwerkligger. De kolommen van de bovenste portiek konden niet worden ingeklemd op de vakwerkligger van de onderste portiek, omdat die anders op sommige plaatsen onder de gevellijn zichtbaar zouden zijn. Eerst voorzag het ontwerp in een houten dakligger, maar dit was technisch niet haalbaar daar die niet voldoende kon worden ingeklemd op de kolom om de portiekwerking te garanderen.

De algemene stabiliteit van de volledige structuur is vrij eenvoudig. In dwarse richting door de beide portieken op elkaar gestapeld. De portieken hebben bovenaan stijve hoekverbindingen.

In langse richting is de piste ongeveer 210 m lang. Er kan geen uitzettingsvoeg worden voorzien. Daarom moeten we er voor zorgen dat de volledige structuur in zijn geheel naar 1 kant vrij kan uitzetten. In het dak, de gevels en de vloer van de piste zitten op regelmatige afstanden windverbanden. Deze lopen niet door tot op de grond, maar stoppen op het niveau van de vloer van de piste. De horizontale krachten in langsricting worden over de volledige lengte via de vloer van de piste overgebracht naar een betonnen kuip onderaan, welke gefundeerd is op palen die deze horizontale krachten overbrengen naar de grond. Op die manier kan de volledige structuur vrij uitzetten en krimpen.

Door de symmetrie en de eenvoudige opbouw van de algemene stabiliteit werd de structuur niet als volledig 3D-model berekend, maar werd elk portiek afzonderlijk uitgerekend. Gordingen in dak en vloer werden apart beschouwd. In bijlage een voorbeeld van een typeportiek van het hogere gedeelte van de piste.



Bureau d'Etudes Lemaire

Contact Cédric Decrolière
 Address Route du Condroz, 404
 4031 ANGLEUR, Belgium
 Phone +32 4 366.60.40
 Email c.decroliere@belemaire.be
 Website www.belemaire.be

NOMINATION



Créée en 2000 sous l'impulsion d'un jeune ingénieur, le Bureau d'études Lemaire sprl réalise des études techniques dans les domaines de l'industrie, du génie civil, du bâtiment et des infrastructures. Il se distingue par son dynamisme, son savoir-faire et ses compétences.

Le Bureau d'études Lemaire sprl est composé d'une équipe solide, comprenant de jeunes ingénieurs et dessinateurs DAO hautement qualifiés, vouant une passion pour la construction et participant activement à la conception, au développement et à la réalisation des projets.

Le Bureau d'études Lemaire sprl assure la pluridisciplinarité des études. Le staff comprend 25 personnes : ingénieurs structure, électromécaniciens, hydrauliciens et dessinateurs

expérimentés. La faculté de prendre en charge la totalité des études techniques d'un projet constitue un des atouts de la société.

Dès la naissance d'un projet, le Bureau d'Etudes Lemaire sprl s'efforce de dégager des solutions techniques créatives et originales respectant la dimension architecturale souhaitée par son concepteur. Avec des outils informatiques performants et à la pointe de la technologie, le Bureau d'études Lemaire sprl offre à sa clientèle un service moderne, innovant et d'excellente qualité.

En assurant leur confiance au Bureau d'études Lemaire sprl, les clients s'associent à un partenaire fiable et soucieux de défendre leurs intérêts et objectifs.

Sports Hall of Herstal

The purpose of the town of Herstal is to give sport clubs the opportunity to use a modern and well-equipped sports hall. This place will be used for trainings as well as for national and international meetings. The building includes a main hall and several smaller rooms (for sport, administration and equipment). The structure of the main hall consists of concrete columns and steel beams. The main beams contain the heating system and allow the access to different equipments. The structure has been optimized by Scia Engineer software.

Project Information

Owner: Administration Communale de Herstal
Architect: Acte 1 Altiplan et Gérard Clotuche
General Contractor: Wust s.a.
Engineering Office: Bureau d'Etudes Lemaire sprl

Construction Start: n/a
Construction End: n/a
Location: Herstal, Belgium



Client : Administration Communale de Herstal
 Architectes : Acte 1 Altiplan & Gérard Clotuche
 Entrepreneur : Wust s.a.
 Surfaces : hall de sport : 2.200 m² - salles de sport et locaux administratifs et techniques : 2.400 m²
 Hauteur : 9 mètres sous structure

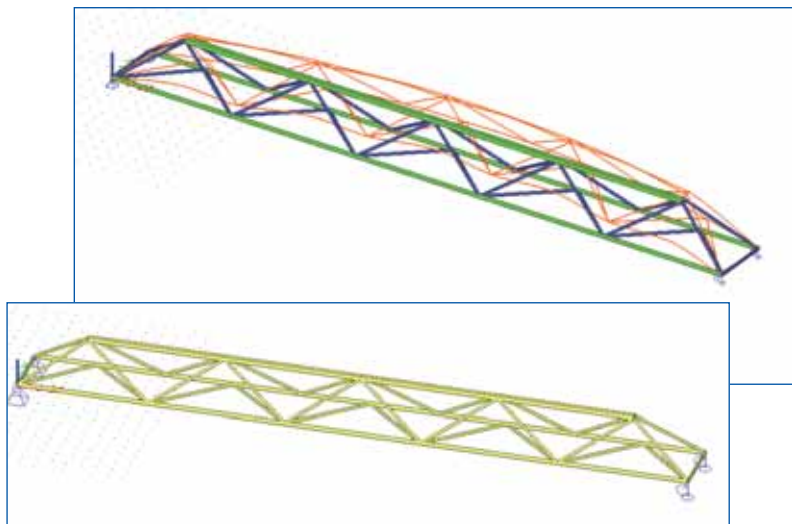
d'entraînement et de perfectionnement et un lieu d'organisation de rencontres nationales et internationales.

Design of the Structure

Le projet comprend une salle principale de dimensions (largeur x longueur x hauteur libre) 45,20 x 48,0 x 9,0 mètres, plusieurs salles secondaires (tennis de table, judo, gymnastique), un mur d'escalade, des locaux administratifs et une cafétéria. Il comporte également la construction d'un espace vestiaires cafétéria pour le stade de football tout proche ainsi que la réalisation des abords : accès et parking.

Description

La commune de Herstal compte un très grand nombre de clubs sportifs évoluant à un très bon niveau régional et national : tennis de table, judo, basket, escalade, etc... Elle souhaite mettre à la disposition de ces clubs, à la fois un outil performant



La structure des salles secondaires et des locaux administratifs et techniques est en béton afin de garantir, de manière économique, la résistance au feu de 60 minutes. La structure de la salle principale est composée des colonnes en béton armé et de poutres treillis tridimensionnelles en acier présentant une résistance au feu de 15 minutes.

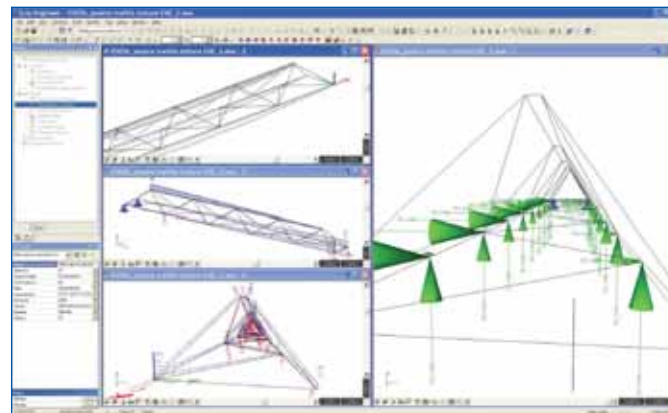
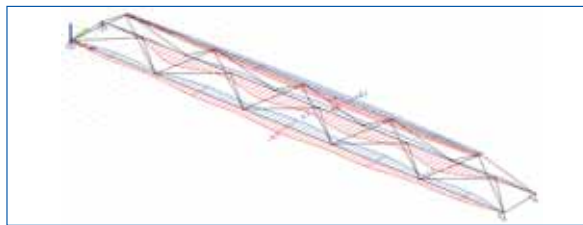
Les poutres en treillis présentent une largeur de 400cm et une hauteur de 300cm. Elles sont au nombre de 3, disposées tous les 12 m80. Des poutres IPE270 complètent la structure de toiture en reliant les poutres treillis entre elles. Outre leur caractère d'éléments porteurs, les poutres ont également des fonctions techniques : elles permettent l'intégration du système de chauffage par air pulsé ainsi que l'accès aux équipements de chauffage, d'éclairage et de sonorisation.

Des vitrages sont placés sur la face des poutres située au nord de manière à assurer un éclairage naturel toute l'année tout en évitant des inconforts thermiques durant l'été. Le niveau d'éclairage de la salle est adapté en fonction de l'apport d'éclairage naturel dans un souci d'économie d'énergie.

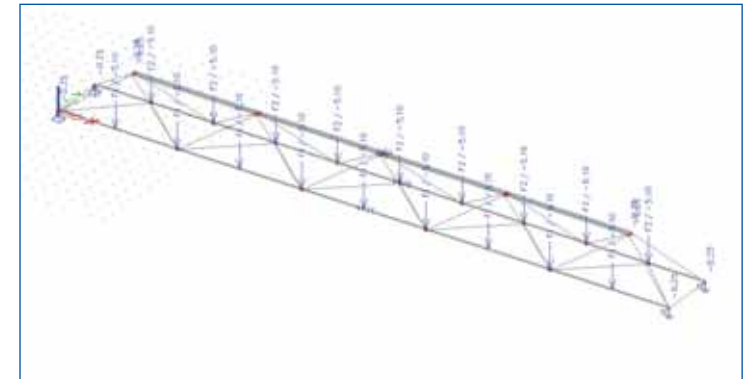
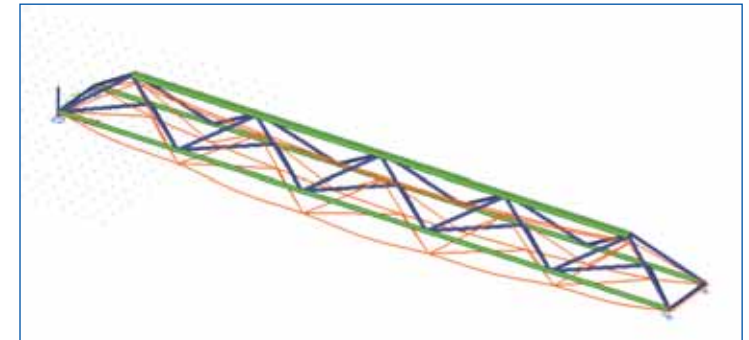
La structure a été calculée et optimisée au moyen du logiciel de calcul Scia Engineer. Le calcul de la flèche sous charges permanentes a permis de définir la contre-flèche à donner à la structure.

Design Challenge

Le logiciel Scia Engineer permet à l'aide de son module 3D d'optimiser le calcul des structures. La facilité d'utilisation du logiciel ainsi que la fiabilité des résultats fournis font du logiciel Scia Engineer un outil efficace.

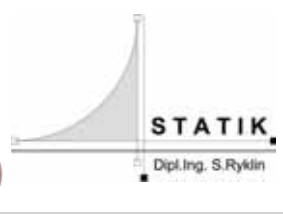


Construction d'un hall de sports à Herstal



Dipl.-Ing. S.Ryklin STATIK

Contact Sergej Ryklin
 Address Liselottestrasse 17
 69123 Heidelberg, Germany
 Phone +49 6221830673
 Email statistik@ryklin.de



Personal Information

Sergej Ryklin
 Born in 1963 Moscow

- Project consultancy;
- Building physics calculations;
- Dynamics calculations.

Philosophy

Flexibility in planning due to an integrated 3D-Design and the ability to find feasible and low-cost solutions already in the draft stage.

Experience

About 800 different projects processed - a.o. residential- and industrial buildings, park decks, pedestrian bridges, swimming pools, silos, membranes...

References

Daimler AG, John Deere AG, SAP AG, DB AG, Siemens AG, Henkel AG, Formel 1...

Equipment

2 Workstations, 2 Notebooks with following software: Scia Engineer, Nemetschek, Autocad, Dcad, Prosteel 3D, Kretz, LSS, Pcae, ForTen, Adobe.

1981-1985: Diploma Study of Civil Engineering at the Automobile and -Road Institute, Moscow; speciality "Bridges & Tunnels".

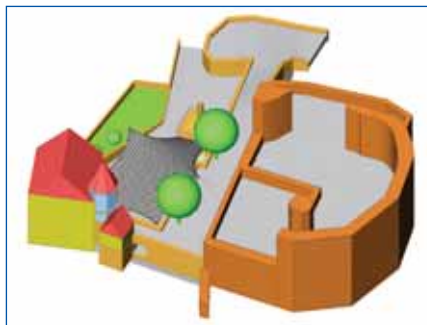
1985-1991: Repair and maintenance of automobile bridges in Moscow.

Since 1993: Structural designer and verifier by "Römhild & Hecker" Consulting Engineers in Landau, Germany.

Since 1997: Currently self-employed Structural designer.

Specialization

- Planning and optimisation of Steel-, Aluminium-, Solid-, Timber- and Membrane Structures;



Short Description

Dilsberg Castle - 6 membrane roofs

The Dilsberg Castle regularly hosts cultural events such as The Dilsberg's Arts and Crafts Market, Castle Concerts and Open Air performances "Rose of Dilsberg" and others.

To be independent of the weather conditions and to give the Open Air Place quick protection against rain the promoter has asked to develop a mobile roof solution.

A light mobile membrane structure was suggested.

The structure of the castle was built up in Scia Engineer with 3D-Free Form Modelling.

In combination with the software packages Forten and Professional Formfinder six different membrane roof structures with the corresponding supports have been designed and implemented in the Scia model.

Project Information

Owner: Dilsberg City

Architect: Dipl.-Eng. Sergej Ryklin

General Contractor: Fa. Planex Technik in Textil GmbH

Engineering Office: Dipl.-Eng. S.Ryklin STATIK

Construction Start: 2009

Construction End: 2009

Location: Dilsberg, Germany



Client

In the area of Dilsberg were already found remains of Roman settlements. Its conical shape and extensive view over the Neckar Valley and towards Kraichgau made it an obvious strategic choice.

The construction of the castle dates from 1150-1200. The importance of the Neckar as a traffic route had been recognised. In 1374 Dilsberg was granted the privilege of a town.

In the next 500 years it became an important mountain fortress, had different owners and in the 17th century it was among the most embattled fortifications during the 30-Year War.

At some time it was also used as a prison and as a residence for Heidelberg students.

With its loss of military importance after 1822 Dilsberg reduced to poverty in the 19th century. The castle which had remained undamaged until then was released for demolition.

In 1990 was started with the development of the remains of the fortress to become a modern residential community and a tourist attraction.

Cultural highlights: the Dilsberg's Arts and Crafts Market, Castle Concerts and Open Air performances such as "Rose of Dilsberg" and others.

Order

To be independent of the weather conditions and to give the Open Air Place quick protection against rain the promoter has asked to develop a mobile roof solution. The historical environment with its 1000 years' old structures has to be considered and it was forbidden to make any optical changes on the buildings, not even the required connection details.

The roof should have the ability to be mounted and dismantled in a short time and a small storage space was also required.

A light mobile membrane structure was suggested. It consists of a PVC-Plane, prestressed by light steel tension bars which are anchored to the existing structure and of masts with bracing. All steel parts can be simply assembled

Software and model

To have an idea of how it could work and to give the client the opportunity to consider which form corresponded best with his concept, different solutions had to be presented. A 3D presentation was also required.

Because there existed no plans of the Castle, surveying was also needed.

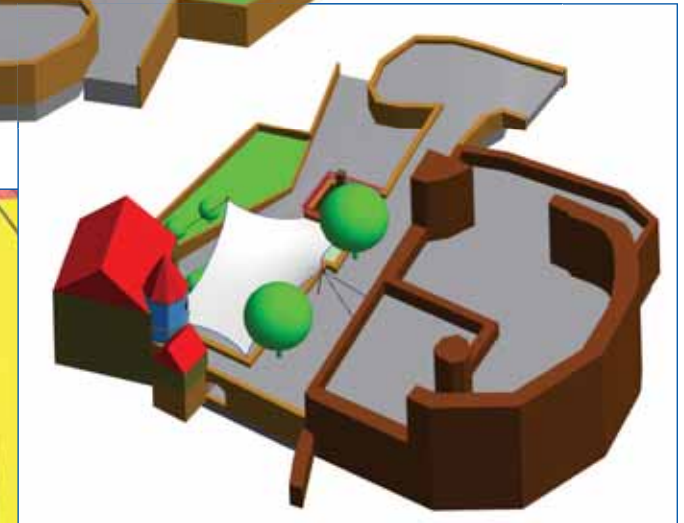
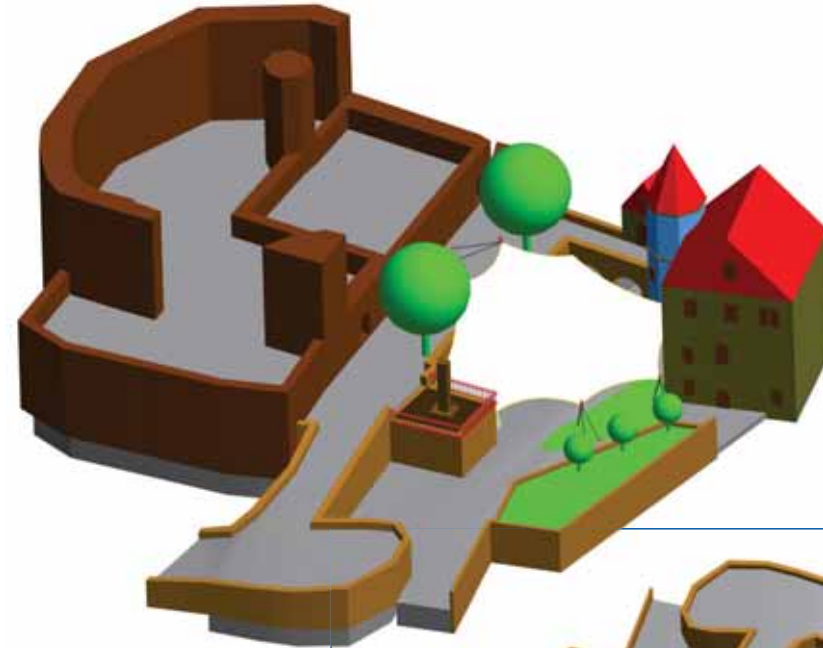
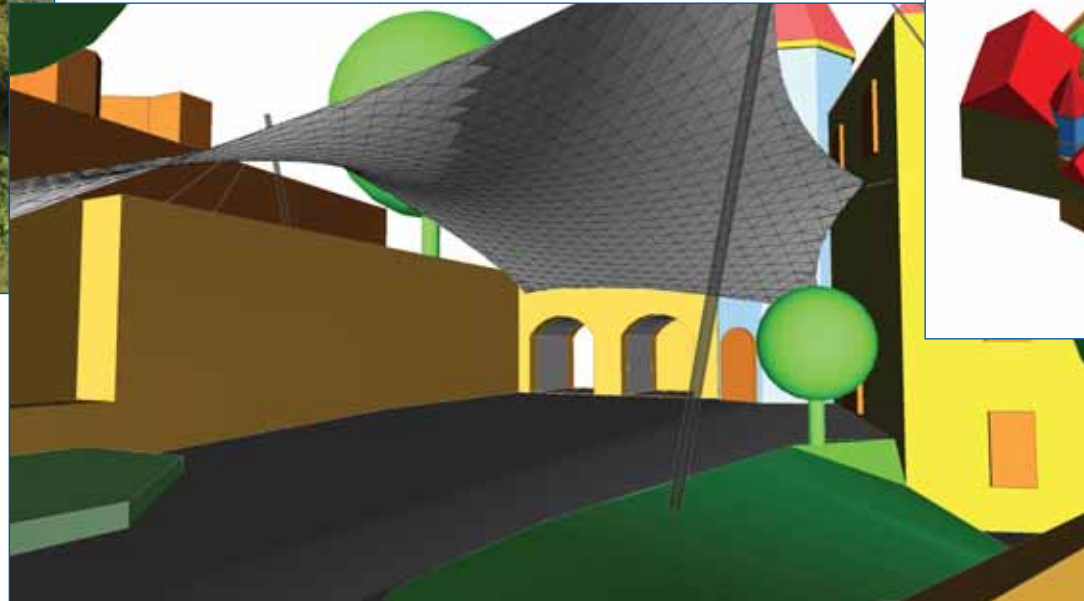
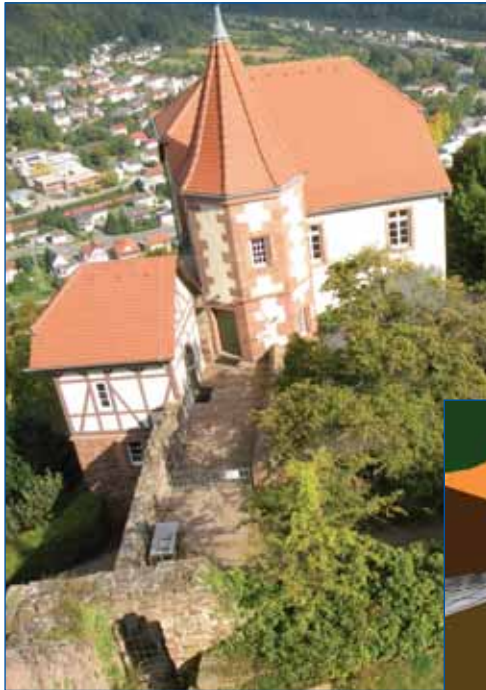
After the measurements had been taken, the structure of the Castle was built up in Scia Engineer

with 3D-Free Form Modelling. The location of the connection points for the tension bars and of the masts with the bracing was settled.

In combination with the software packages Forten and Professional Formfinder six different membrane roof structures with their supports have been designed and implemented in the Scia model .

Presentation

All six models were presented in 3D-PDF format. The realisation is planned for 2009.



Dilsberg Castle - 6 membrane roofs



VK ENGINEERING
Building Services
Civil & Structural

Avenue Clemenceaulaan 87
B - 1070 Bruxelles Brussel

T +32 2 414 07 77
F +32 2 414 04 98
E vke-bs-brl@vkgroup.be

Zevenbergenlaan 2a
B - 8200 Brugge

T +32 50 39 05 53
F +32 50 39 05 06
E vke-cs-bru@vkgroup.be

Axones Business Park
Guldensporenpark
Building A - n°3
B - 9820 Merelbeke

T +32 9 210 31 53
F +32 9 210 31 59
E vke-bs-gent@vkgroup.be
E vke-cs-gent@vkgroup.be

W www.vkgroup.be

ALWAYS LOOKING FOR GREAT ENGINEERS www.vkgroup.be/jobs

Category 2: CAE Housing & Buildings

Design of buildings, residences, apartments, roof spans for houses, including high-rise buildings... for which Frilo or Scia modelling, analysis and design software has been used. The originality of the design of the structural work fitting with the architectural design is a decisive factor.

2



Ney & Partners

Contact Jeroen Vander Beken
 Address Terhulpesteenweg 181
 1170 Brussel, Belgium
 Phone +32 2 643 21 80
 Email jeroen.vanderbeken@ney.be
 Website www.ney.be

WINNER



NEY

+PARTNERS/BXL

Ney & Partners is a structural engineering consultancy, established in Brussels. Since its foundation in 1997, the office has worked with an active view on the art of engineering through the integration of the different civil works disciplines.

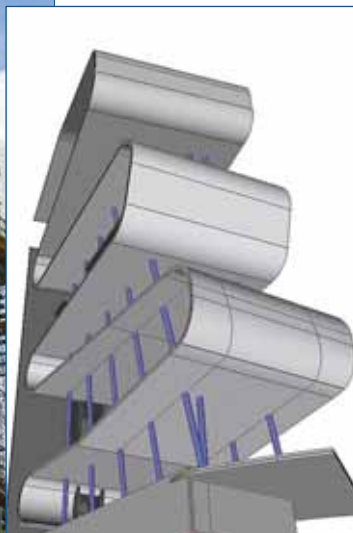
This integration and optimization of structural elements aims to overcome the classic hierarchic assembly of constructive solutions. Innovative bridges, roof structures and works of art developed by our office, express most clearly this vision.

The construction project quality lies in the synthesis of specific design constraints. The structural aspect is of primary importance to this synthesis.

From the very beginning of the design process, Ney & Partners conducts a constant research for advanced engineering integration. In doing so, our position as Engineering Consultancy overcomes the standardized dimensioning of predefined technical solutions.

An intense collaboration with the design team from an early stage on allows the development of innovative solutions, adapted to the context of the project.

Ney & Partners currently employs more than 40 civil engineers, architects, draughtsman, etc...



Office Building 'Facelift Umicore', Hoboken

Short Description

A reinforced concrete shell that slowly 'climbs' to the roof of an existing building forms this spectacular office building. The three spaces that are enclosed by the shell, which has a thickness of only 30cm, are not aligned but slightly rotate one above another. The nine-storied building, with a footprint of only 15 m by 30 m, is structurally independent from the existing building and gets its stiffness from the co-operation of the shell, 11 inclined columns and an eccentrically placed core. The foundation of the building is made from 36 screw piles with an average length of 11 m which reach to a lower stiff clay layer but which also get their strength from the friction along the shaft of the piles.

Project Information

Owner: Umicore nv
Architect: Conix Architects cvba
General Contractor: Strabag nv
Engineering Office: Ney & Partners nv

Construction Start: 01/12/2007
Construction End: 31/11/2008
Location: Hoboken, Belgium



Quote of the Jury

"The originality and prestige of this project combined with the high technical complexity and the use of the software to the limit, attractively presented, made the jury decide to have this project as number one. Especially the complex material and structural model using a mix of curved shells, inclined columns and long term analysis of creep and deflection made it a very interesting project. On site measurement proved the accuracy of the calculation."

Introduction to the project

In 2006 Umicore, one of world's largest materials technology groups, decides to modernize their 'Precious Metals Plant' in Hoboken. The project 'Facelift' includes the renovation of different buildings, the realisation of tree awnings and the construction of an eye-catching office building, which combines a spectacular reception, an auditorium, an exposition hall and several offices. The building is unrestrained in design in contrast to the monotonous and randomly selected surroundings. The design draws one's attention and counters the existing rational background. The powerful, high-tech look and feel creates an innovative image, thus modernizing the company.

Description of the project

A reinforced concrete shell that slowly 'climbs' to the roof of an existing building forms the office building. The three spaces that are enclosed by the shell, which has a thickness of only 30cm, are not aligned but slightly rotate one above another. The nine-storied building, with a footprint of only 15 m by 30 m, is

structurally independent from the existing building and gets its stiffness from the co-operation of the shell, 11 inclined columns and an eccentrically placed core. The foundation of the building is made from 36 screw piles with an average length of 11 m which reach to a lower stiff clay layer but also get their strength from the friction along the shaft of the piles.

Approach

One of the larger challenges dealt with while designing the structure of this building was formed by the geometry and especially the large eccentricity introduced by the position of the 3 boxes in combination with the inclined columns. The combination of these 2 elements introduces large horizontal forces in the shell, which result in relatively large horizontal deformations under the (vertical) self-weight.

Several solutions were modelled and analysed not only to reduce the initial deformations but also to estimate the expected final deformations caused by creep and cracking of the concrete. It was very important to determine an upper boundary for the postponed

Used software: Scia Engineer

deformations for the manufacturing of the frames of the glazed facades. In the final solution the horizontal stiffness is granted by a large 'framework' which is formed by 3 columns at the street side of the building and the core at the other side.

Due to the large horizontal displacements, it was necessary to introduce several construction stages where the supports of the formwork where removed in order to let the building move under its self-weight. In this way, the large horizontal displacements at the end of the construction were limited and the displacements were introduced in a more controlled way. Several models were made to analyse the internal forces between different construction stages. The evaluation of displacements measured on site and the values from the models were satisfying.

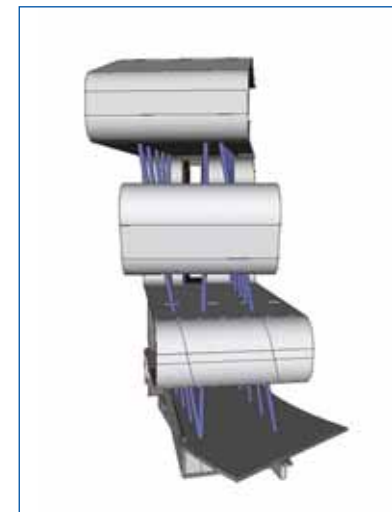
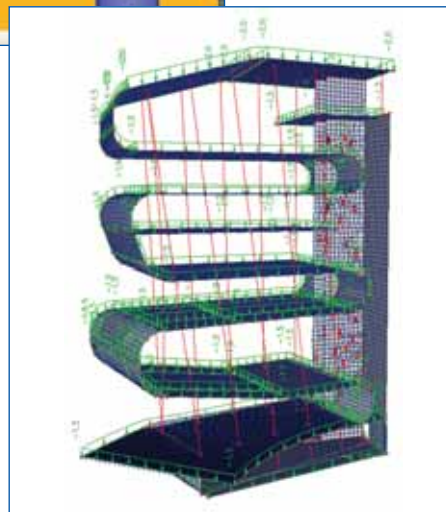
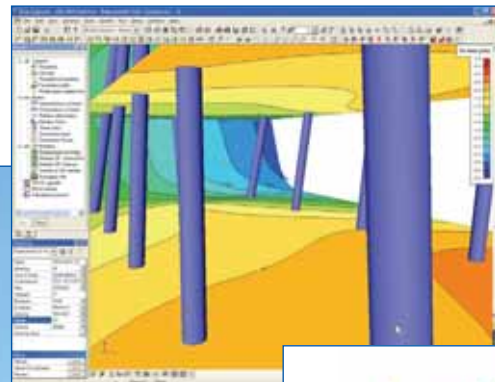
The reinforcement of the shells was optimised to an economic minimum and was transformed in prefabricated cages which were easy to place and shortened the construction time. In order to avoid beams, the reinforcement of the slabs was carefully analysed and optimised. Supplementary reinforcement was necessary to prevent punching around the mixed columns.

The use of Scia Engineer for this project

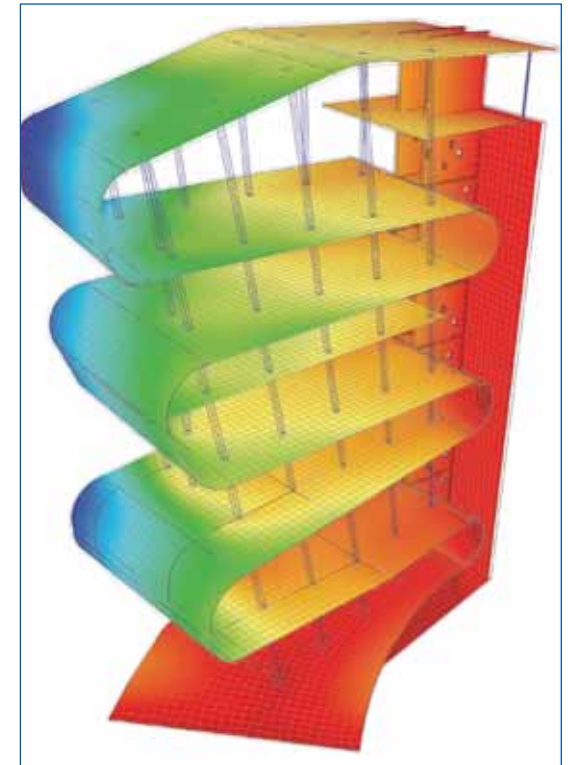
The program Scia Engineer made it possible to easily and quickly model and analyse several solutions. Because of this, it was possible to, in early designing phases, make essential decisions in consideration with the architect, which resulted in an esthetical, structural and economical justified solution.

The program Scia Engineer made it possible to easily and quickly visualise the internal forces in the shells and thereby the interpretation of the results was simplified. Also the modelling of the shells themselves was very easy and intuitive.

The program Scia Engineer made it possible to analyse the initial and final deformations in function of the real geometry, age of the concrete and theoretical necessary reinforcement. This was of great importance for the frames of the glazed facades.



Office Building 'Facelift Umicore', Hoboken



BESIX

Contact Mike Paschalis
Address Al Quoz - Street 11a
PO BOX 13055 DUBAI,
United Arab Emirates

Phone +971-4-5092500
Email mpaschalis@sixco.ae
Website www.besix.com

Prize of the Jury



BESIX Group is the largest Belgian construction group, a conglomerate of companies active in the construction, engineering, environmental, real estate and concession sectors.

In 1909, Jacques-Marie and Charles Stulemeijer see potential in prestigious construction projects in Belgium and set up the Société Belge des Bétons (SBB). They immediately earn their reward with the rebuilding of Belgian ports and canals, in the aftermath of the war and soon the activities expand in France and Spain.

In 1947 SBB recognizes the extraordinary market potential in former Belgian Congo and, together with the Belgian Group Empain, creates a common subsidiary Auxeltra-Béton.

Large projects in the Middle East demand a new organization from 1966. The six companies of the SBB Group form Six Construct. The success in this new region becomes considerable.

Since then, the group has known impressive and regular growth with the acquisition of new companies such as Entreprises Jacques Delens in Brussels, Etablissements Jean Wust in Wallonia and Vanhout in Flanders and, more recently, Van Britsom (Oostkamp), Verheye (Diksmuide), GRWestkust (Diksmuide) (50%), Socogetra (Awenne) and Cobelba (Naninne).

In the meantime, the company has entered the Egyptian and Libyan markets, it has also become an important player in France and the Netherlands.

and has realized impressive projects in India, Russia, Poland, the Czech Republic, Slovakia, Algeria, Morocco and many other countries.

In 2004, thirteen managers of BESIX and its subsidiaries, together with Orascom Construction Industries, execute a management buy-out. SBB becomes BESIX Group, firmly anchored in Belgium.

Today, BESIX and its subsidiaries cover practically all fields of the construction industry and are operating in Western Europe, in Central and Eastern Europe, North and Central Africa, in the Middle East, in Central Asia and in the Caribbean. The Group realized a turnover of approximately 1.6 billion Euros and employs over 20.000 people worldwide.

The Group intends to be a leading international player, serving Western and Central European markets from its home country Belgium, and covering the Middle-East from the United Arab Emirates.

The success of the group is the result of:

- A commitment of upholding the highest standards of quality, reliability, professionalism and performance.
- The permanent seek of innovative ways to increase its expertise and enhance its performance.
- Providing a safe work environment
- A particular care for the teamwork spirit and the respect of individuals
- Taking new challenges that will strengthen the reputation and open new horizons.

The Tornado, Doha

The QIPCO Office Tower, also known as the Tornado is since December 2008 one of the major and striking landmarks that define the ever-expanding Doha. Situated in the heart of the City behind the Corniche, it has transformed, once and for all, the skyline through its unique shape and character.

The client for this project is QIPCO Holding with Six Construct-Midmac JV appointed as General Contractor. The Tower has a height of 202 m and consists of 3 basements and 51 floors with a total office area of 83,148 m². It comes with its own private helicopter platform at the very top on level 52.

The building has a cylindrical shape with a variable radius which thins out at mid height (28.8 m / 19.3 m / 27.8 m). Its main feature is the outer diagrid arrangement of diagonal columns and beams which give the building a unique diamond shape pattern of the cladding.

Short Description

Project Information

Owner: Qipco Holding
Architect: Cico / Siat
General Contractor: Six Construct / Midmac
Engineering Office: Meinhardt Singapore

Construction Start: 20/07/2006
Construction End: 26/12/2008
Location: Doha, Qatar



Quote of the Jury

It is an impressive structure, well presented and with a lot of highly technical aspects. The steel and concrete connections were carefully designed. This project is a good example how interoperability with other software can be used. The seismic and dynamic analysis as well as accommodating the difference in settlements between the core and the adjacent structure was a great technical challenge.

Project Description

The project is located behind the Doha Corniche and consists of a 52 storey office tower and a three level basement car park. The tower is a 202 m tall circular building with a total office area of 83,148 m² and a helipad at level 52.

Challenges

The building had to be designed and constructed in a period of 30 months between July 2006 and December 2008. The challenge faced by the designers was to produce a state of the art design in a very tight schedule. The design was made that much more complicated by the fact that the perimeter and radial steel beams were subjected to significant tensile loads resulting from the shape of the building. The floor slabs were designed to act as membranes bracing the diagrid to the central core by tensile action. Connection design both between steel-to-steel and steel-to-concrete were the subject of very careful and systematic analysis of the structural models. This resulted in a very refined and detailed 3D modelling with the primary purpose of ensuring

that the final layout and geometry of the connections safeguarded the overall stability of the building without impacting on the aesthetic and visual effects projected by the architects.

Tower Geometry and structural system

The tower consists of a 23.8 m diameter central concrete core and a perimeter steel diagrid. The design was based on BS Standards. The building is cylindrical with variable radius (maximum 28.8 m at ground floor; minimum 19.3 m at level 28).

The structural system consists of the following:

- Central Core – 300 mm thick RC walls of constant thickness. Floor-to-floor height is 3.8 m.



Used software: ESA-Prima Win

- Perimeter Diagrid – Diagonal Steel columns and peripheral steel beams
 - Floor slabs – Composite radial steel beams + 180 mm thick concrete slab on metal deck.
- The building fundamental period was $T_1 = 4.2$ sec

Design Software

The structural design of the basements and tower was by Meinhardt (Singapore) using ETABS. The BESIX Engineering Department in Dubai was appointed to carry out a third party independent check. BESIX used ESA-Prima Win for full 3D modelling. CICO, the client's engineer and architect, carried out a separate check by modelling the building in STAAD PRO.

Foundations

The geology of the Qatar peninsula consists mainly of extensive carbonate sediments overlying basement rocks up to 10 km in thickness. The tower is founded on Simsim Limestone.

The foundation system consists of a 2.7 m central raft and perimeter pile caps interconnected by a series of radial ground beams 2500 W x 750 H. The raft itself is supported on bored RC piles as follows:

- 1200 mm DIA – 14 m long – 129 Nos
- 900 mm DIA – 8 m long – 20 Nos

Seismic loads

Seismic design was based on Uniform Building Code 1997 and seismic Zone 1 ($Z = 0.075$). Earthquake base shear was calculated as 8555 kN, less than 1% of the tower gravity loads.

Wind loads

Theoretical wind loads were calculated using CP3 and with $V_b = 41.67$ m and were verified by wind tunnel testing. The loads calculated from the wind tunnel results were 5% lower than the theoretical values:

- Wind Base Shear = 14,846 kN
- Base Bending Moment = 1,628,212 kN.m

Structural 3D Modelling

BESIX developed two separate 3D models of the tower for the purposes of checking the design. Model A – Core walls modeled as FE plates and beams

and columns using member properties. Slabs were introduced as dead weight to the beams. Model B – Same as model A but slabs were modeled as FE plates. Floor beams were given vertical eccentricity to replicate the actual situation on site. The geometry of the diagrid was exported from the architectural AutoCAD files in ESA in DXF format. This saved considerable time in creating the non-linear geometry of the external diagrid system. The load distribution between central core and diagrid is 75% to 25% respectively. Total gravity load is 999,000 kN.

Designing with ESA-Prima Win

Model A was used to check and verify the overall stability of the building and to confirm its natural frequency. The time required to solve the model was generally less than 10 min and this afforded the designer the possibility to test different layout arrangements in order to obtain the most optimal in terms of economy.

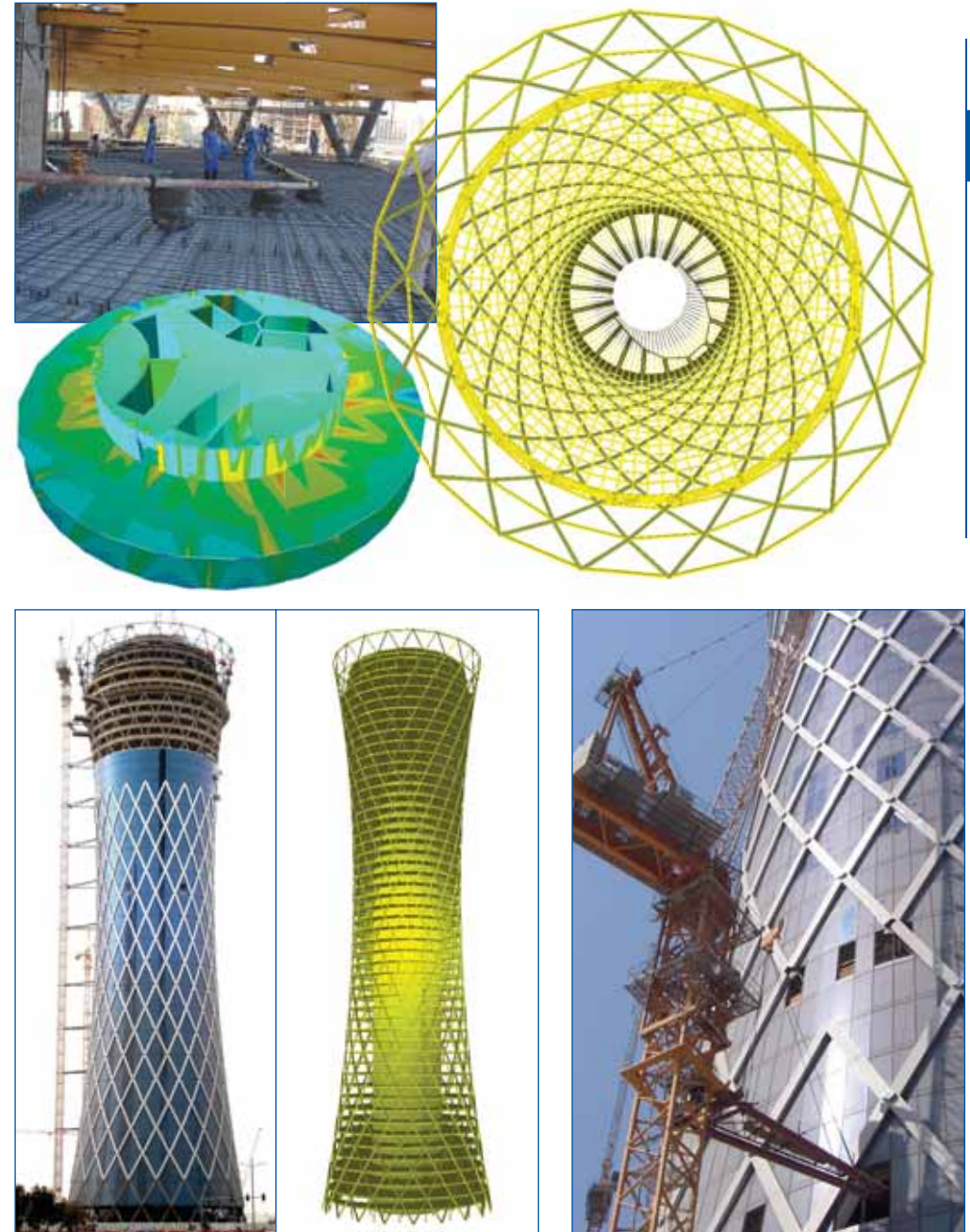
Model B was used to investigate the effects of radial in-plane forces transferred from the diagrid nodes to the core walls through the slab plates. The running time of the full dynamic model was approximately 2 hrs and was therefore used in final detailed design.

The following points are considered to represent the main advantages afforded by ESA-Prima Win to BESIX designers:

1. Relatively short time required to run the basic models when compared to other commonly used software in the Gulf.
2. Use of the dynamic module for obtaining the lowest significant Eigen frequencies of the structure
3. Ability to run quickly and effectively sensitivity studies including the influence of elastic shortening of the central core under different values of Young's Modulus, in order to determine the effect of load transfer between core walls and diagrid columns
4. Use of concrete design module to verify RC quantities
5. Use of structural steel module to verify the diagrid columns and beams

Conclusion

The Tornado has been successfully completed and has become a major landmark in the Doha Corniche. With its unique shape and character it has changed the City's skyline ones and for all.



Ingenieursbureau Stendess N.V.

Contact: Jurn De Vleeschauwer
 Address: Grote Baan 18
 9920 Lovendegem, Belgium
 Phone: +32 9 370 71 25
 Email: mail@stendess.com
 Website: www.stendess.com

NOMINATION



Ingenieursbureau Stendess N.V., a steel and concrete engineering company

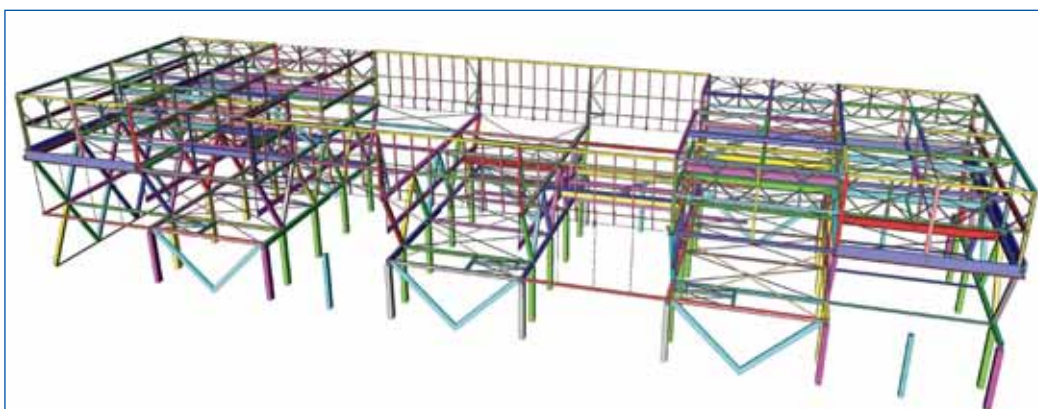
The engineering firm Stendess was founded by an experienced team specialising in the study and design of steel constructions. From its establishment Stendess has made high quality and full service provision its top priority. Thanks to this integral service, where the design of the metal superstructure 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.

Stendess can follow up on cross-border projects in accordance with most standards and codes: Eurocode, NBN, NEN, DIN, NF, AISC, British Standards and specific national codes.

Key activities

- Industrial buildings: steel factories, power plants, depots, etc,
- Other buildings: service buildings, concert halls, sport facilities, swimming pools, apartment buildings,
- Bridge constructions: arch bridges, cable –stayed bridges, suspension bridges, bascule bridges, swing bridges, orthotropic bridges, mixed steel-concrete bridges...
- Off-shore projects: lock gates, Roro, oil rigs...
- Industrial equipment: silos, cranes, crane ways, storage tanks...
- Erection engineering: longitudinal and transverse repositioning, skidding, lifting, bridge launching...

Locations of the constructions: Belgium, the Netherlands, France, Germany, United Kingdom, Spain, Sweden, Saudi Arabia, Greece, Singapore, Chile, Brazil, Cameroun, Russia, Thailand...



Office buildings for Drisag

Short Description

Along the high way E313 in Herentals an 'Office and Designpark' had to be designed and built for Drisag. Finding the balance between a low cost structure and taking into account the severe restrictions was a high creative demand in the static layout and the dimensioning of the structure. The remarkable building consists of three floors of 7 meters which have their proper function and which are connected together in one entity. The first floor in concrete is intended for the production and a 'cash and carry'. The middle transparent floor, with a big flight of stairs of 7 meters, possibly to be used as a presentation stand, acts as showroom. The third floor consists of 2 office buildings in red brick on each side, between them an outdoor sports complex and a spectacular roof garden with a tennis court on it.

Project Information

Owner: Groep Heylen
Architect: B-Architecten
General Contractor: Willy Naessens N.V.
Engineering Office: Ingenieursbureau Stendess N.V.

Construction Start: 2008
Construction End: 2008
Location: Herentals, Belgium



- Total steel weight: ± 900 tons
- Building period: 2008
- Dimensions: Height: +/- 21 m
- Overall length: +/- 104 m
- Overall width: +/- 31 m

Along the high way E313 in Herentals an Office and Designpark had to be designed and built for Drisag. The building consists of three floors of 7 meters which have their proper function and which are connected together in one entity. The first floor of concrete is intended for the production and a 'cash and carry'. The middle transparent floor, with a big flight of stairs of 7 meters, which can even be used as a

presentation stand, acts as showroom. The third floor consists of 2 office buildings in red brick on each side, between them an outdoor sports complex and a roof garden with a tennis court.

The see-through layer is build up with V-shaped white frames. The spans of 14,40 m with a minimum construction height of 400 mm were reached by using a combination of concrete floors with compact shaped steel beams. The detailing of the frames was an important aspect in the structure. An invisible connection of the bracings of the frames at the floor beams cross a challenge. To support the high glass walls, minimalistic horizontal steel boxes with a



Used software: ESA-Prima Win

minimum height of 100 mm were used. To guarantee the stability of these horizontal boxes, pretensioning with cables was needed. To support the business volume between level 14 m and 21 m, a complete framed steel structure was build.

Use of ESA-Prima Win

Description of technical questions to be solved with ESA-Prima Win

The challenge in this project was to design a low budget steel construction taking into account a minimal construction height and the severe restrictions that were to be met such as a minimal number of columns and bracings maximum free space inside the building. Finding the balance between a low cost structure and taking into account the severe restrictions was a high creative demand in the static layout and the dimensioning of the structure.

Description of our experience with ESA-Prima Win in realizing the project.

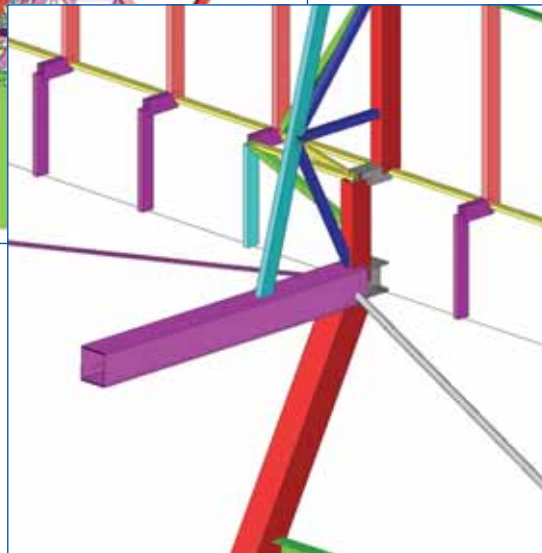
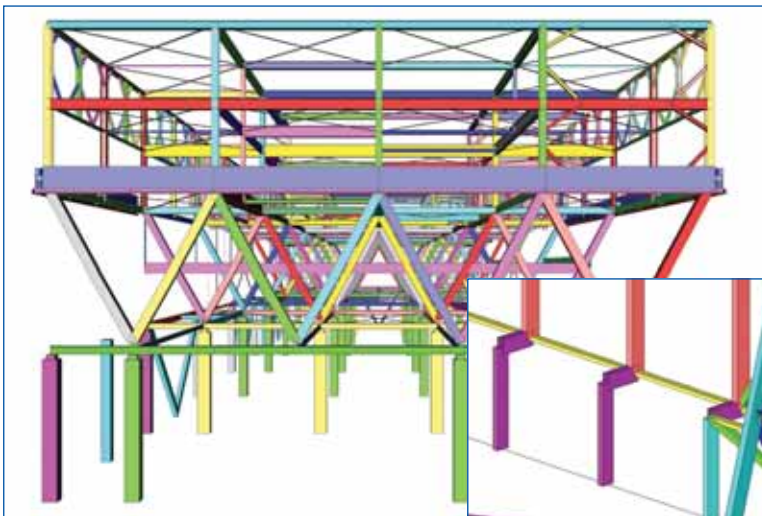
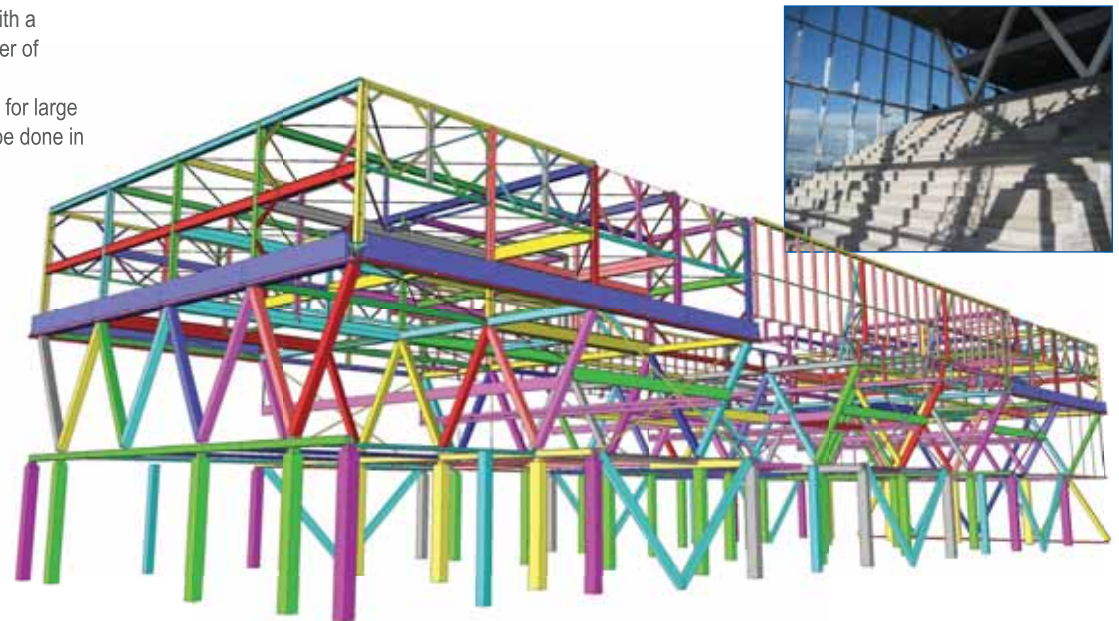
For this project ESA-Prima Win proved its power to calculate at high speed large structures with a great number of elements and a great number of combinations.

And more, ESA-Prima Win proved that even for large structures the non linear calculations could be done in an acceptable way and time.

Used modules

- Base
- 3D frame
- Non linear calculations
- Steel code check (EC3)

Office buildings for Drisag



Cerfontaine Constructions sprl

Contact Frederic Cerfontaine
 Address 250, rue de Herve
 4030 Liège, Belgium
 Phone +32 4 3444765
 Email info.cerfontaine@becs.be

NOMINATION



Après une expérience d'assistant à l'Université de Liège, Frédéric Cerfontaine a démarré ses activités d'ingénieur conseil en 2000 par l'étude de structures relativement complexes (paletier/rack non auto portant, étude de pièces de fonderie...), le développement, en sous-traitance, de logiciels de calcul et la sous-traitance à des bureaux d'études pour des projets importants.

Rapidement, il est apparu que la demande de calculs (et de plans) de stabilité pour des maisons ou des transformations de maison n'était pas bien rencontrée par les bureaux d'études présents en région liégeoise. Le développement de «niveaux» d'études adaptées au type de clientèle et à l'importance ou la difficulté des projets pour ce type d'ouvrage a permis la croissance du bureau tout en conférant la qualité nécessaire et suffisante au projet dans des budgets d'études acceptables pour les maîtres d'ouvrage ou entrepreneurs.

Cette philosophie d'un prix d'étude adapté à la demande du client s'est révélée efficace et a permis au Bureau d'Etudes Cerfontaine Constructions sprl d'élargir son secteur d'activité. Outre les maisons qui restent toujours une activité importante, le bureau étudie de nombreux dossiers de promotions immobilières, halls industriels, génie civil industriel et public, rénovation de logements sociaux, bâtiments de bureaux, bâtiments publics (hôpital, écoles, crèches, hall omnisport...), bâtiments classés, transformation de commerces...

Le Bureau d'Etudes Cerfontaine Constructions occupe actuellement 6 personnes à temps plein et son association continue depuis 2002 avec l'ingénieur civil Denis Schumer porte l'effectif global du bureau à 9 personnes.

Depuis juillet 2008, les bureaux sont installés dans de nouveaux locaux présentant un plateau libre de 200 m² outre les salles techniques, d'archivage et de réunion.

Cet outil est une des étapes dans le développement des activités visant à élargir les effectifs, la clientèle et la taille des marchés abordés.

Quelques références

- Usine Techspace-Aero à Milmort (10800 m²+2500 m² de bureau)
- Immeubles à appartements à Hermalle-sous-Argenteau, Huy, Sprimont, Remouchamps, Visé, Waremme, Warsage, Wanze, Seraing, Florenville, Loncin, Jemeppe...
- Bâtiments industriels à Vaux-sous-Chèvremont, Droixhe, Visé, Raeren, Argenteau, Harzé, Dison, Seraing...
- Siège des logements sociaux de Grâce-Hologne et de Saint-Nicolas
- Extension de l'hôpital du Petit-Bourgogne à Liège
- Logements sociaux à Remouchamps, Limont, Anthisnes, Saint-Nicolas, Seraing, Paifve
- Une vingtaine d'extensions ou de constructions de magasins Lidl
- Bâtiments tertiaires (clinique vétérinaire, banques, maison médicales, bureaux, asbl, mutualités, maisons de repos...) à Aubel, Berleur, Ans, Liège, Chaineux, Malmédy, Visé, Eupen, Battice, Bassenge, Soumagne...
- Des maisons à caractère exceptionnel (Tournai, Hermalle, Fourons, Dalhem).

Steel box - Schyns' offices

Short Description

The Schyns offices are visually divided in two distinct parts and linked up by a structural element. The first volume, covered with CorTen, is the first floor; it is constructed of a steel frame with no inner supports. The second volume, which is the ground floor, presents a much larger area than that of the "steel box". This volume, largely underground, is made up of carrying masonry and of high capacity slabs. This project presented various difficulties resulting from the architect's geometry and dimensional requirements. The main challenge was to use a slab that had a thickness only 20 cm by which important overhangs (277 and 438 cm) were made in two directions. As this slab could not simply be hung onto the metallic frame, the solution was established by analysing, with Scia Engineer, the entire structure and thus finding a way of distributing correctly the loads between the overhanging concrete slab and the overhanging metallic frame.

Project Information

Owner: Schyns Goldstein S.A.
Architect: Valentiny & Associés Liège Belgique
General Contractor: Donnay/Monami Barchon Belgique
Engineering Office: Cerfontaine Constructions sprl

Construction Start: 01/08/2006
Construction End: 15/05/2008
Location: Chaineux, Belgium



Les bureaux Schyns à Chaineux présentent deux parties distinctes principales mais finalement étroitement liées entre elles d'un point de vue structurel comme décrit ci-après.

La première partie est le premier étage qui est la partie extérieure visible revêtue de CorTen dont le corps principal est un trapèze de 18.5 m et 11.07 m de bases, 9.06 m de largeur et dont la hauteur varie de 4.8 m au niveau de la grande base (entièrement vitrée) à 3.5 m pour la petite base. D'un point de vue structurel, ce volume est une charpente métallique sans appui intérieur.

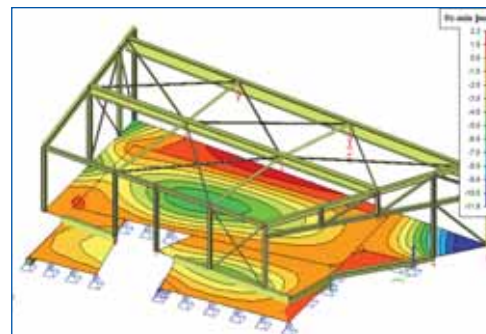
Le second volume au rez-de-chaussée rue présente une surface plus de deux fois supérieure à la "boîte métallique" du premier étage. Ce volume enterré en grande partie est constitué de maçonneries portantes,

blocs Stepoc, hourdis de grande capacité (pour supporter le poids des terres), dalle en béton armé, colonnes et poutrelles pour permettre l'exploitation la plus libre des pièces.

Un troisième volume extérieur de dimensions plus réduites assure la circulation entre les deux parties principales décrites ci-dessus.

Plusieurs "difficultés" ou particularités structurelles caractérisaient le projet architectural :

- Présence d'une baie vitrée sur toute la grande base du trapèze sans possibilité d'aménager un contreventement
- Pignon (vers terrasse et jardin) vitré partout à l'exception de la zone en porte-à-faux par rapport au mur du rez-de-chaussée sans possibilité d'aménager de contreventement



Used software: Scia Engineer

- Différences d'épaisseur de complexe et donc de niveau de dalles entre zones extérieures et intérieures
- Volume secondaire entrant et sortant par rapport à la "boîte" au niveau du pignon vers baie et jardin (avec variation des épaisseurs de complexe sol)
- Gabarits de poutrelles et colonnes limités
- Absence d'axes orthogonaux et non concordance entre volumes supérieurs et inférieurs telle que la majorité des porteurs du volume de l'étage soit en porte-à-faux par rapport aux appuis inférieurs
- Obligation d'utiliser une dalle en BA de maximum 20cm d'épaisseur alors que la dalle présentait des porte-à-faux importants principalement au niveau du pignon donnant vers la terrasse et le jardin (277 et 438 cm).

Cette dernière particularité s'est révélée la plus complexe à résoudre. La dalle en béton de 20cm étant incapable d'assurer une reprise d'un tel porte-à-faux, la première idée a été de suspendre celle-ci à la charpente métallique du pignon. Rapidement, il est apparu que cela était impossible car dans cette hypothèse, le poteau métallique en bord de baie vitrée et supportant le porte-à-faux mais lui-même en porte-à-faux par rapport à l'appui du mur créait un effort tranchant incompatible avec l'épaisseur de 20cm imposée même en disposant une poutrelle dans la dalle. De plus, les efforts dans la poutre en treillis supérieure conduisaient à des sections importantes peu compatibles avec les souhaits de l'architecte.

Il était donc nécessaire que chacun des éléments, la dalle en béton armé et la charpente métallique, supporte une partie des efforts plutôt qu'un seul d'entre eux reprenant l'ensemble des efforts.

Pour définir la répartition des efforts entre cette dalle et la charpente métallique, un calcul à l'aide d'un outil performant d'éléments finis de l'ensemble des différentes dalles en béton armée couplée à la charpente métallique était nécessaire. Ce calcul a été effectué à l'aide de Scia Engineer.

Ce calcul a tenu compte du fluage du béton pour la répartition des efforts entre la partie charpente métallique et la partie béton.

Les images reproduites ci-dessous et représentant la déformation verticale à l'état limite de service considèrent un fluage à long terme du béton caractérisé forfaitairement.

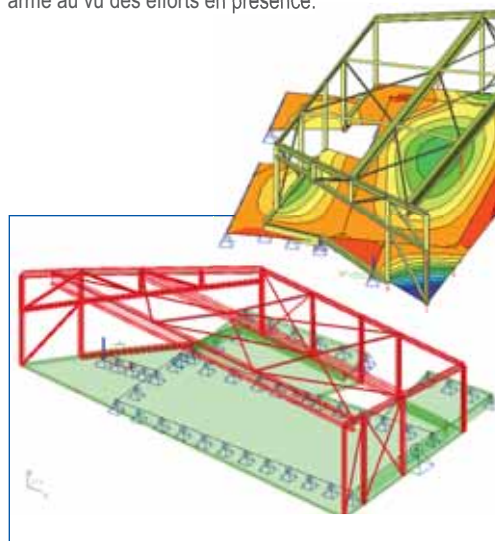
La charpente métallique est donc finalement une structure entièrement articulée et dont la stabilité est assurée par deux poutres au vent en toiture et des contreventements verticaux sur trois façades uniquement.

La charpente métallique supporte la toiture constituée d'une tôle métallique de 106 mm d'épaisseur sur 3 appuis avec porte-à-faux vers la façade vitrée. Cette tôle supporte les faux plafonds acoustiques, les techniques spéciales, l'isolation, l'étanchéité et une toiture végétale légère.

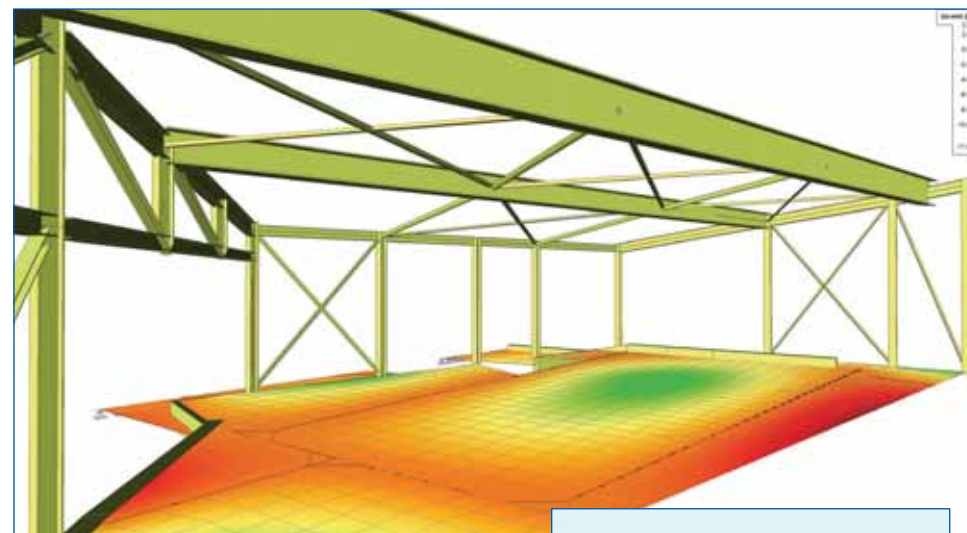
Une poutre IPE600 de 16.6 m de portée supporte le premier appui de cette tôle. Cette poutre est en fort retrait par rapport au bord extérieur du toit (183cm) afin d'assurer la finesse de rive souhaitée par l'architecte, un capot métallique assurant la transition entre ce bord de toiture et le niveau inférieur de cette IPE600. La poutre intermédiaire est une HEA400 de 13.6 m de portée.

Les poutres de rive des pignons sont des IPE270 reposant sur des HEB140 tandis que la poutre de rive de façade vers le volume de liaison est une IPE200 reposant sur des HEA120.

Les diagonales de contreventement de toiture et de façade sont assurées par des L60x60x6 mm à l'exception du pignon vers la terrasse et le jardin où des HEA100 sont utilisés tant dans la poutre treillis que dans les diagonales supportant une partie de la dalle en béton armé au vu des efforts en présence.



Bureaux Schyns 'Steel Box'



Adams Bouwadviesbureau bv

Contact Klaas-Geert Koolhout
 Address Postbus 75
 6650AB Druten, Netherlands
 Phone +31 487588280
 Email kko@adamsbouwadvies.nl
 Website www.adamsbouwadvies.nl



Adams Bouwadviesbureau BV is een raadgevend ingenieursbureau op het gebied van draagconstructies. Veiligheid, innovatie en kwaliteit staan hoog in het vaandel. Onze uitgebreide ervaring ligt op het terrein van woning- en utiliteitsbouw, uiteenlopend van individuele projecten tot grootschalige stadsvernieuwing.

Sinds de oprichting in 1995 is het bureau gegroeid tot een bedrijf van 27 medewerkers met de flexibiliteit van een klein bedrijf en het kennisniveau van een grote organisatie.

De academische en HBO+ geschoolde projectleiders, constructeurs en tekenaars zijn in staat om van complexe bouwwerken de draagstructuur te ontwerpen, berekenen en detailleren. Onze medewerkers houden hun kennis en werkwijze up-to-date met regelmatige scholing.

Door de jarenlange ervaring kent Adams Bouwadviesbureau bv het wensen- en eisenpakket van zowel opdrachtgever, architect als aannemer. De aanwezige kennis geeft in een vroeg stadium sturing aan het ontwerpproces om binnen de architectonische en kwalitatieve randvoorwaarden te komen tot een optimale constructie. Dit geldt voor de uitvoering, eenvoud, energiezuinigheid en

duurzaamheid. Dit kan in zowel bouwteamverband als traditionele manier van bouwen, waarbij de opdrachtgever met zijn adviseurs het ontwerp definieert.

Zelf ontwikkelde rekenprogramma's en de software van Scia ondersteunen het rekenwerk. Hiermee worden alle twee- en driedimensionale staaf-, plaat- en schijfconstructies berekend.

Alle tekenwerk wordt uitgewerkt met Allplan. Door het 3D-tekenprogramma kunnen wij als adviseur een extra waarde toevoegen aan het gehele bouwproces. De betrokken partijen kunnen vanaf bestekfase als het ware door het gebouw lopen.

Het dienstenpakket van Adams Bouwadviesbureau bv bestaat voornamelijk uit de constructieve advisering in opdracht van opdrachtgevers zoals, woningbouwverenigingen, projectontwikkelaars en architecten en betreft vooral:

- Ontwerpen van constructies in overleg met opdrachtgever en architect
- Berekenen en tekenen van draagconstructies
- Renovatie en herbestemmingen
- Second opinion bij (dreigend) schadegeval
- Constructieve beoordeling van bestaande constructies.



Dutch Embassy, Canberra

Short Description

In Canberra, the capital of Australia, a new Dutch embassy building is about to be built. The present embassy is over 50 years old and does not correspond anymore to present-day functional needs. A new construction project from architect Rudy Uytenhaak is on the table. He did not only incorporate functionality and sustainability but also realised a perfect integration of the impressive round building in the natural environment. The basic principle, sustainable building, had far-reaching consequences for the construction as a whole. The calculation of the laminated trusses and the steel construction was successfully done with Scia Engineer and the working out of the construction with Allplan.

Project Information

Owner: Ministerie van Buitenlandse zaken

Architect: Rudy Uytenhaak Architectenbureau bv

General Contractor: Ministerie van Buitenlandse zaken

Engineering Office: Adams Bouwadviesbureau bv

Construction Start: 2010

Construction End: 2011

Location: Canberra, Australia



Inleiding

Duurzaam bouwen wordt steeds belangrijker in een maatschappij waar klimaatsverandering hoge prioriteit geniet. Het toepassen van duurzame materialen, het gebruik van installaties met maximaal rendement en het slim ontwerpen en detailleren van gebouwen zijn enkele speerpunten voor het duurzaam bouwen. Omdat klimaatsverandering een wereldwijd probleem is, wordt ook in een land als Australië veel aandacht besteed aan de duurzaamheid van de gebouwen.

In Canberra, de hoofdstad van Australië, komt een nieuwe Nederlandse ambassade. De huidige ambassade is ruim vijftig jaar oud en voldoet niet meer aan de functionele eisen. Daarom is architect Rudy Uytenhaak aan de slag gegaan met een ontwerp voor nieuwbouw. Hierbij is niet alleen gelet op functionaliteit en duurzaamheid, maar ook gekeken naar de omgeving.

De natuurlijke omgeving waarin het plan gerealiseerd moet worden mag door het ontwerp niet verstoord worden. In het uiteindelijke ontwerp had het specifieke uitgangspunt, duurzaam bouwen, ook consequenties voor de constructie. Naast de specifieke vorm van het gebouw is ook gekeken naar de vrije indeelbaarheid van het gebouw. Er worden zo min mogelijk kolommen toegepast. De constructie bestaat uit gelamineerde houten spanten met stalen druk- en trekstaven en een houten vloer. Deze vloer werkt als schijf mee ten

behoefte van de stabiliteit. De ringbalk die in het dak de spanten koppelt is ook uitgevoerd in gelamineerd hout. Op het dak staat een zonnemolen. Deze molen draait met de zon mee om zo maximaal te profiteren van de zonnepanelen op de molen. Daarnaast fungeert de molen als parasol zodat het niet te heet wordt in de ambassade. Ook de zonnemolen is uitgevoerd in gelamineerd hout.

Voor de berekening van de gelamineerde spanten en de staalconstructie is gebruik gemaakt van Scia Engineer. De uitwerking van de constructie is gebeurd met behulp van Allplan.

Uitwerking in Allplan

Door de aparte vorm van het gebouw is het bijna noodzakelijk om een 3D model te maken van de constructie. Door de uitwerking in Allplan kan dit model redelijk eenvoudig gemaakt worden. Aan de hand van dit model worden constructieve problemen vroegtijdig gesignaleerd en opgelost door de uitwerking in 3D.

Om de bijzondere vormen in het gebouw uit te werken is gebruik gemaakt van 3D lichamen. Met behulp van de module 3D modeleren kunnen alle vormen gemaakt worden en gebruikt in het 3D model. De ronde vorm van het gebouw biedt mogelijkheden om binnen Allplan slim te werk te gaan met elementen. Omdat de plattegrond radiaal gezien steeds hetzelfde is, is gekozen voor het gebruik

van xrefs. Binnen deze xrefs is steeds 1 stramien uitgetekend. Wanneer het gebouw wijzigt hoeft er maar een element aangepast te worden en geen 12. Dit zorgt voor een hogere werksnelheid en voorkomt problemen. Verder is daar waar mogelijk gebruik gemaakt van architectuurelementen. Hierdoor wordt informatie in het model gestopt die later met behulp van lijsten wordt opgeroepen. Dit is handig bij het bepalen van de kubieke meters beton of de hoeveelheid staal die in het project verwerkt is. Deze gegevens kunnen interessant zijn voor de aannemer bij het maken van zijn begroting.

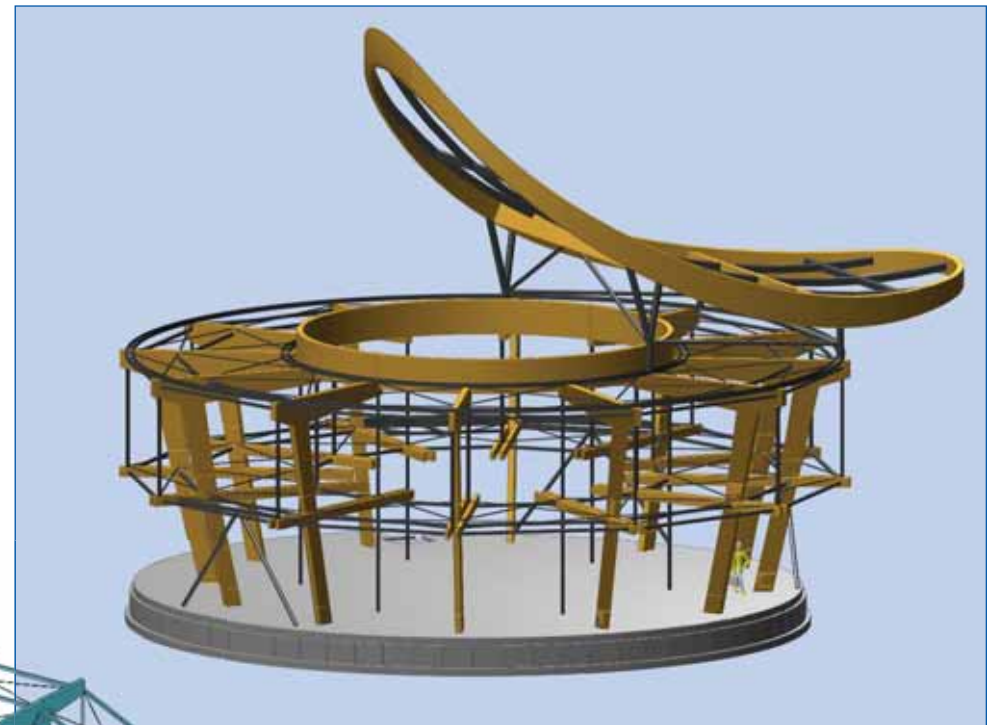
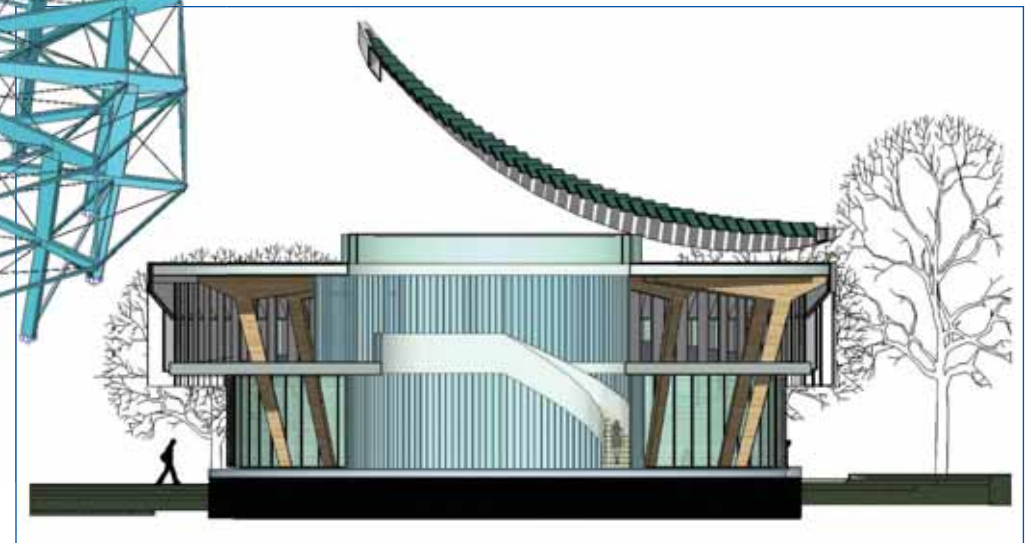
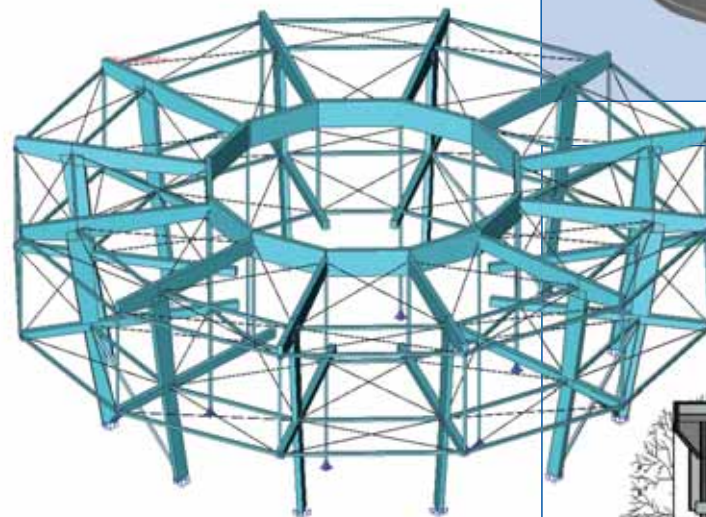
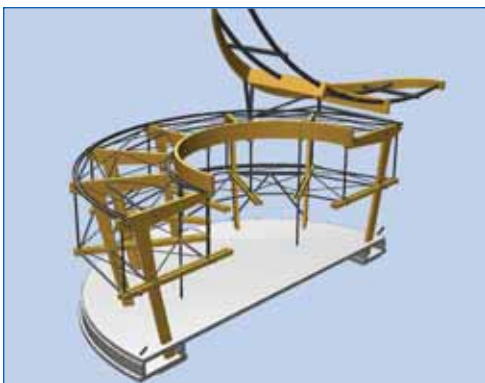
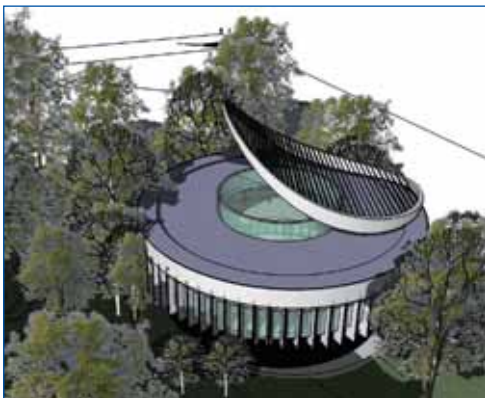
Toepassing Scia Engineer

De hoofd draagconstructie van dit gebouw is gemaakt van gelamineerde spanten. De vorm van deze spanten is niet standaard en daarom is er voor gekozen om gebruik te maken van Scia Engineer. De elementen zijn ingevoerd in Scia Engineer zodat gekeken wordt of de ontworpen elementen voldoen aan de constructieve

eisen. Daarnaast werd ook de stabiliteit bepaald uit het model. Het gebruik van dit rekenprogramma zorgt er voor dat de complexe elementen eenvoudig berekend kunnen worden. De waarden die volgen uit de berekeningen van Scia Engineer konden worden gebruikt bij de verdere berekening van de constructie.

Conclusie

In een relatief korte tijd is een volledig project opgezet waaruit alle benodigde informatie is gehaald. We denken hierbij aan wandaanzichten, onderleggers voor details en bekisting voor wapening. Dit voorkomt dubbel werk en minimaliseert de kans op fouten. Hierdoor is de werksnelheid waarmee gegevens worden verwerkt verhoogd. Doordat het project volledig in 3D is uitgewerkt krijgen alle partijen een duidelijk beeld van de constructie. Door Scia Engineer te gebruiken bij het bekijken van de complexe constructieve elementen, zijn snel en overzichtelijke berekeningen gemaakt.



Nederlandse Ambassade in Canberra

Adams Bouwadviesbureau bv

Contact Klaas-Geert Koolhout
 Address Postbus 75
 6650AB Druten, Netherlands
 Phone +31 487588280
 Email kko@adamsbouwadvies.nl
 Website www.adamsbouwadvies.nl



Adams Bouwadviesbureau BV is een raadgevend ingenieursbureau op het gebied van draagconstructies. Veiligheid, innovatie en kwaliteit staan hoog in het vaandel. Onze uitgebreide ervaring ligt op het terrein van woning- en utiliteitsbouw, uiteenlopend van individuele projecten tot grootschalige stadsvernieuwing.

Sinds de oprichting in 1995 is het bureau gegroeid tot een bedrijf van 27 medewerkers met de flexibiliteit van een klein bedrijf en het kennisniveau van een grote organisatie.

De academische en HBO+ geschoolde projectleiders, constructeurs en tekenaars zijn in staat om van complexe bouwwerken de draagstructuur te ontwerpen, berekenen en detailleren. Onze medewerkers houden hun kennis en werkwijze up-to-date met regelmatige scholing.

Door de jarenlange ervaring kent Adams Bouwadviesbureau bv het wensen- en eisenpakket van zowel opdrachtgever, architect als aannemer. De aanwezige kennis geeft in een vroeg stadium sturing aan het ontwerpproces om binnen de architectonische en kwalitatieve randvoorwaarden te komen tot een optimale constructie. Dit geldt voor de uitvoering, eenvoud, energiezuinigheid en

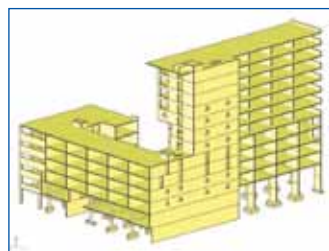
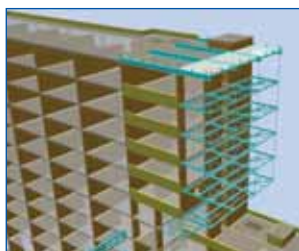
duurzaamheid. Dit kan in zowel bouwteamverband als traditionele manier van bouwen, waarbij de opdrachtgever met zijn adviseurs het ontwerp definieert.

Zelf ontwikkelde rekenprogramma's en de software van Scia ondersteunen het rekenwerk. Hiermee worden alle twee- en driedimensionale staaf-, plaat- en schijfconstructies berekend.

Alle tekenwerk wordt uitgewerkt met Allplan. Door het 3D-tekenprogramma kunnen wij als adviseur een extra waarde toevoegen aan het gehele bouwproces. De betrokken partijen kunnen vanaf bestekfase als het ware door het gebouw lopen.

Het dienstenpakket van Adams Bouwadviesbureau bv bestaat voornamelijk uit de constructieve advisering in opdracht van opdrachtgevers zoals, woningbouwverenigingen, projectontwikkelaars en architecten en betreft vooral:

- Ontwerpen van constructies in overleg met opdrachtgever en architect
- Berekenen en tekenen van draagconstructies
- Renovatie en herbestemmingen
- Second opinion bij (dreigend) schadegeval
- Constructieve beoordeling van bestaande constructies.



Service flat complex Poeldijkstraat, Amsterdam

Short Description

An old office building near the A10 near the Rembrandt Park has to make way for new service flats. The project includes 85 two-room flats for transients, students, social living and independent housing. In the building are also 1000 m² of office space available as well as 15 parking places. The building is composed of two parts; one block of apartments of 6 and one of 13 floors. The whole complex is carried out in solid concrete walls and floors; the foundation is a grid of columns with piles. An interesting feature of this project is the slenderness of the tower; as a consequence it was very important to devote a lot of attention to the wind load. Scia-engineer was a great help in solving this problem. With regard to the constructive elements, Allplan provided us with the right solutions.

Project Information

Owner: Delta Forte
Architect: Heren 5 architecten bv bna
General Contractor: n/a
Engineering Office: Adams Bouwadviesbureau

Construction Start: 01/11/2008
Construction End: 2010
Location: Amsterdam, Netherlands



Introductie

Een grote stad als Amsterdam heeft een groot aantal inwoners. Voor een grote groep mensen is het niet mogelijk om zelfstandig te wonen. Begeleid wonen is hiervoor een oplossing.

Een oud kantoorgebouw naast de A10 in de buurt van het Rembrandt Park moet wijken voor het nieuwe zorgwoningen complex Poeldijkstraat. Dit project bestaat uit 85 twee kamerwoningen voor passanten, internaat, groepswonen en zelfstandig wonen. Passanten zijn mensen die een onderdak nodig hebben voor een of enkele dagen, hierbij kan gedacht worden aan dak- en thuislozen. Het internaat huisvest mensen die volledig zorgbehoevend zijn, deze groep bestaat uit bijvoorbeeld ouderen en chronisch zieken. Groepswonen betekend dat mensen zelfstandig wonen, maar wel begeleiding krijgen en daar waar nodig verzorgd. Hierbij kan worden gedacht aan gehandicapte en bejaarden.

Zelfstandig wonen spreekt voor zich. Studenten nemen hier onder andere hun intrek. Verder bevindt zich in het gebouw 1000 m² kantoor ruimte en zijn er een 15-tal parkeerplaatsen aanwezig. Het gebouw bestaat uit twee delen van respectievelijk 6 en 13 bouwlagen. Het gebouw wordt uitgevoerd in massieve betonwanden en vloeren. De fundering bestaat uit een balkenrooster met palen. Interessant aan dit project is de slankheid van de

toren. Hierdoor dient de constructeur extra goed te kijken naar de windbelasting. Het gebruik van Scia Engineer heeft hierbij uitkomst geboden. Verder zitten er een aantal constructieve elementen in die met behulp van Allplan verduidelijkt zijn. Constructieve problemen zijn vroegtijdig gesignaleerd en opgelost door de uitwerking in 3D.

Uitwerking in Allplan

Binnen het project komen een aantal specifieke elementen voor. Deze zorgen voor problemen bij de uitwerking.

Het eerste probleem is dat de palen van het gesloopte kantoorgebouw nog aanwezig zijn. Omdat de plaats van de nieuwe palen al bekend moet zijn voordat de bestaande bebouwing gesloopt is, is uitgegaan van de paalposities zoals die in het ontwerp van de oude bebouwing staan aangegeven. Zo snel als het bestaande gebouw gesloopt is, zijn de werkelijke posities van de bestaande palen ingemeten. Door binnen Allplan slim gebruik te maken van de layer structuur, kan er snel gewisseld worden tussen deze gegevens en kunnen ze over elkaar worden gelegd. Zo worden conflicten snel gesignaleerd en kan er naar oplossingen gezocht worden.

Door de hoogte van het gebouw komen er grote krachten naar beneden in de fundering. Om deze

krachten in de palen te krijgen zijn er poeren toegepast. Door de vorm van het gebouw en het hoogteverschil hebben de poeren verschillende vormen. Per poer kijken we naar de wapening. Doordat we een volledig 3D model hebben getekend in Allplan hebben we een duidelijk inzicht in de vorm ervan. Dit levert voordelen op bij het uitwerken van de wapening.

In het project zijn ook een aantal grote balkons aanwezig die worden opgehangen aan liggers in het dak. Deze balkons zijn uitgevoerd in staal. De uitwerking van het staal van deze balkons is, net als de rest van het gebouw, gedaan met behulp van constructieve elementen. Door het gebruik van constructieve elementen kan door gebruik te maken van lijsten snel een raming worden gemaakt van bijvoorbeeld de hoeveelheid staal of beton in het gebouw. Deze gegevens kunnen interessant zijn voor de aannemer bij het maken van zijn begroting.

Toepassing Scia Engineer

Hoge gebouwen hebben te maken met wind. Om deze wind op te kunnen nemen moet het gebouw stabiel zijn en moeten de krachten worden overgebracht naar de palen. Omdat het gebouw geen standaard blok is en het lastig is om te voorspellen hoe het gebouw omgaat met de krachten veroorzaakt door de wind hebben we ervoor gekozen het gemaakte Allplan model om te zetten naar Scia Engineer. In dit model zijn vervolgens de belastingen ten gevolge van de wind ingevoerd. Door de berekeningen met Scia Engineer worden reacties ten gevolge van de windbelasting in kaart gebracht. De druk en trekbelasting op de palen zijn bepaald door deze reacties mee te nemen in de gewichtsberekening.

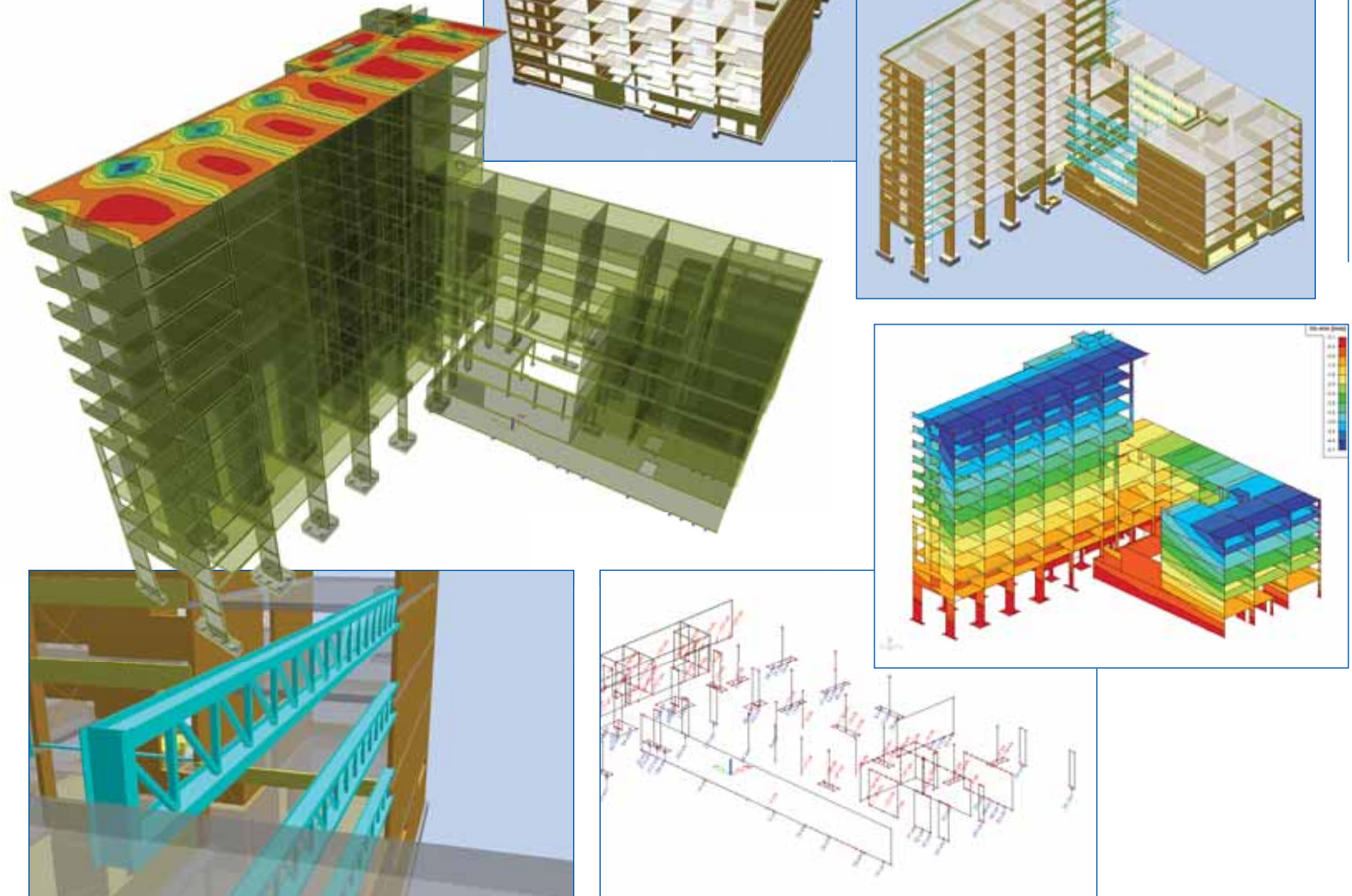
Uit deze berekening is ook gebleken dat de stalen vakwerkliggers die zijn opgenomen in het ontwerp ten behoeve van het opvangen van de windbelasting niet nodig zijn. Deze liggers zijn dus niet meer structureel nodig en zijn veel lichter uitgevoerd. Een kleiner staal profiel of uitvoering in hout is een mogelijkheid.

Conclusie

In een relatief korte tijd is een volledig project opgezet waaruit alle benodigde informatie is gehaald. We denken hierbij aan wandaanzichten, onderleggers voor

details en bekisting voor wapening. Dit voorkomt dubbel werk en minimaliseert de kans op fouten. Hierdoor is de werksnelheid waarmee gegevens worden verwerkt verhoogd. Doordat het project volledig in 3D is uitgewerkt krijgen alle partijen een duidelijk beeld van de constructie.

Door het 3D model te gebruiken in Scia Engineer zijn snel en overzichtelijk complexe berekeningen gemaakt. De krachten in een afzonderlijk element kunnen worden bekeken. Zo is vastgesteld hoe zwaar een element moet zijn, of dat het element helemaal niet nodig is. Dit kan zorgen voor grote bezuinigen.



ARCADIS Belgium nv

Contact Koen Feyaerts
 Address Kortrijksesteenweg 302
 9000 Gent, Belgium
 Phone +32 9 333 84 84, Mobile +32 499 66 71 42
 Email kfeyaerts@arcadisbelgium.be
 Website www.arcadisbelgium.be



ARCADIS – Re-shaping the future

ARCADIS delivers consulting, design, engineering, urban planning and project management services for infrastructure, environment and buildings. Our experts are focused on improving mobility, enhancing sustainability and raising the quality of life around the world. We define our success by both surpassing our clients' expectations and making a positive and lasting impact on the environments, people and places we touch. From feasibility studies through implementation and maintenance, ARCADIS is all about balance: of the creative and the functional, of possibility and reality, of the local and the global, of present needs and future legacy. ARCADIS imagines the results and re-shapes the future.

ARCADIS worldwide

With 13.500 employees, ARCADIS ranks third in Europe and ninth in the world. Because of our home market positions in Europe, the United States and South America, we combine a deep knowledge of the local conditions where we work with fresh global perspectives for unique, integrated solutions.

ARCADIS Belgium

With more than 750 employees and an annual turnover of € 73 million in Belgium, ARCADIS has earned a leading position in its field. This evolution is the result of innovation, flexibility and agility. Facts and figures not only highlight our financial success, but tell quite a bit about our reputation and our solid client relationships.

Brief overview of company activities

At ARCADIS, we divide our services into three distinct segments in an effort to distinguish our lines of busi-

ness. That said, in today's complex world, we are increasingly exploring the benefits of working across these segments and across geographies to improve the human condition by establishing a balance between the natural and built environment.

Infrastructure

Consultancy, engineering, follow-up and project management for the sustainable development of:

- Transport infrastructure and ports
- Utilities, sewerage and water treatment infrastructure
- Urban zone development and company premises
- Open space and mining

Environment

- Strategic environmental consultancy for private companies and authorities
- Environmental Impact Assessment (EIA)
- Global product stewardship – REACH consultancy
- Remediation of contaminated soil and groundwater
- Waste management and reduction of energy and water consumption
- Ecology and nature development

Buildings

- Engineering and project management of plants and utilities in the industrial market
- Engineering and project management of offices and data centres for the workplace market
- Consultancy, design and supervision of building projects in the public and commercial market

And including Project Sourcing

- On site staff members for the optimization of the clients' engineering- or facility engineering department: project managers, project and site team leaders, project engineers, designers and draftsmen...

The Monovolume, University of Ghent

The Monovolume, designed by SBXDG and engineered by Arcadis, features a contemporary and clean combination of steel, concrete and glass to create a modern landmark in the heart of the University of Ghent. The building - comprised of concrete floors, beams, walls and stairs, steel columns and roof structure - houses offices, classrooms, patios, parking and a large auditorium. The auditorium can accommodate a total of 1000 people or be subdivided into two classroom spaces by lowering a giant "guillotine-wall" from the ceiling to accommodate 600 and 400 people respectively. Because of the complexities of the design, several 3D-models were made to accurately evaluate forces, displacements, mutual influences of different construction elements. The Scia Engineer software provided optimal results and was essential for the success of the project.

Short Description

Project Information

Owner: UGent (University of Ghent)
Architect: S. Beel - X.De Geyter
General Contractor: Antwerpse Bouwwerken
Engineering Office: ARCADIS Belgium nv

Construction Start: 03/2007
Construction End: 09/2009
Location: Gent, Belgium



University Design Competition

The University of Ghent is a rapidly growing university of high international status. Realizing the need for more auditoria, classrooms, offices, parking spots... UGent issued a design competition for two multifunctional buildings in the heart of the campus, adjacent to the Vice-Chancellor's Office. Architects Beel & De Geyter, in association with the engineers of ARCADIS, have won this competition and commenced design and development for the project's two landmark structures. The construction of the larger building, the Monovolume, started in 2007 and is scheduled to reach completion in fall 2009.

The Monovolume

The building's jewel-box design is contemporary and clean, featuring a combination of steel, concrete and glass. Housing offices, meeting rooms, classrooms, outdoor patio space and a large auditorium, the Monovolume not only meets the functional needs of the university but also serves as dynamic addition to the campus fabric, creating an active student-oriented space for work and leisure. The building's main auditorium can accommodate a total of 1000 people or be subdivided into two classrooms of 600 and 400 people by lowering the giant 30 ton "guillotine-wall" hanging on top of the building. A massive 380-SM glass-mosaic screen wall enables students from

the adjacent "student square" to view movies and presentations being projected large-scale. Beneath the auditorium and offices, a 3,000-SM foyer welcomes visitors. Below, two underground floors house parking spaces and mechanical functions. The team's use of Scia Engineer, a software program enabling 1-, 2- and 3-dimensional modeling capabilities, proved crucial to the success of the project. The program provides analysis, design and detailing for any type of structure.

Scia Engineer-calculations

The calculations were partly 1D or 2D concrete calculations in Scia Engineer for the design of typical beams, floor slabs and walls and steel calculations for the columns of the building. However, because of the complex design, elaborate 3D-models were developed to evaluate the influence of individual elements on the structure and improve the accuracy of the results.

Auditorium

One aspect of the project modeled in 3D was the auditorium. The space is partly supported by a mushroom floor and partly by traditional floor beams. This auditorium has to resist by example the wind acting on the 400-SM double exterior walls, as well as the 3 m-wide cantilever stairwells hanging on the

Used software: Scia Engineer

interior walls. Also, the forces of the 'Guillotine Wall' had to be taken into account. To calculate the horizontal displacements of the walls and the bending moments of the hybrid floor, the team created a 3D model, offering the most accurate evaluation.

The decision to add big box floor lights to the auditorium late in the development process, created additional challenges for the team. Scia Engineer software enabled them to evaluate and adjust their design with minimal disruption to the rest of the space.

The roof of the auditorium was designed with steel 3D framework in order to house and maneuver the large 30ton 'Guillotine Wall'. ARCADIS used the 3D modeling capabilities to make accurate first estimations of the profiles.

Displacement

Throughout the design process, the team confronted several structural and architectural challenges. The special glasswork used around the building allows little room for movement, only about 3 to 4 mm, between floors. To correctly evaluate this fluctuation, the design team created one model to show the elastic connections between columns and beams, and a second model for the stiff core. Because hinges would be too flabby and movements too overestimated (and too big for the glass) as measured in other analysis tools, the stiff connection was evaluated using the 'ESASD.02 Raamwerken – star'-module of Scia Engineer and put into another 3D-model.

Also the stiff core itself required a more complex design solution, because it doesn't run up in one movement. A strengthened zone of 10 HEM-550 beams placed close to each other supports the part of the core not running down to the foundation.

Other design challenges

In addition to the obstacles listed above, the Monovolume faced other design and structural challenges. For example:

1. The auditorium floor and entrance stair were constructed in two phases, requiring the team to reinforce the area with additional concrete to ensure proper connectivity between phases.
2. The concrete delivered for the columns in the parking structure proved to be of lesser quality (fck 25 mpa

for a requested C35/45) than anticipated, requiring the team to recalculate the integrity of the structure and reevaluate potential consequences. The use of 3D models enabled precise determination of these acting forces, ensuring more accurate design.

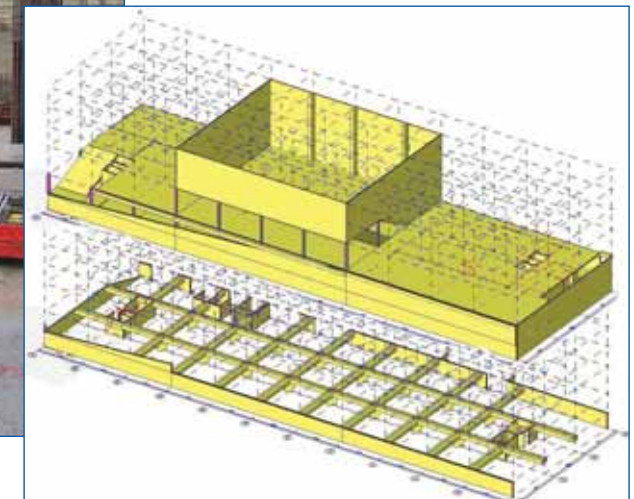
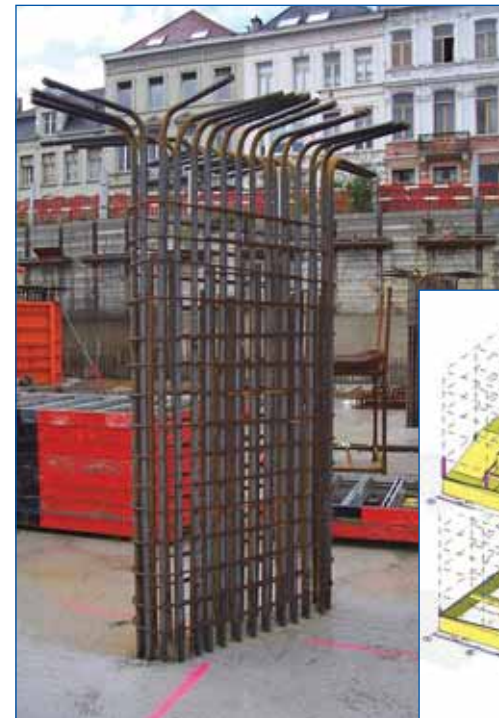
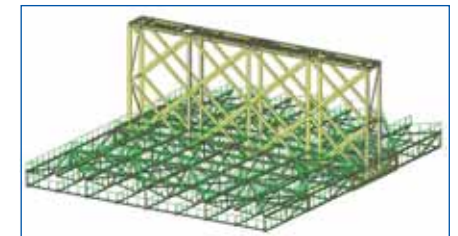
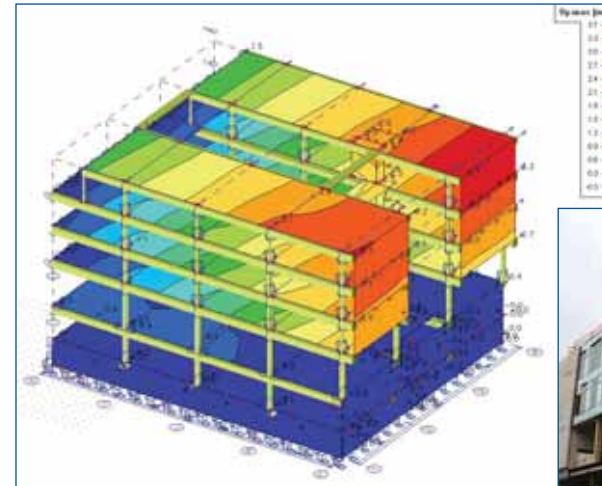
3. The steel columns on the second and third floor, which are HD 400, needed special calculations for their connections to the rest of the structure. For example, the team calculated the stiffness of the provided connection using the esasd.02-module.
4. One of the building's floor plates 'hangs' on the floor plate above it by a single steel tube. To ensure the integrity of the connection, the team created a 3D model in Scia Engineer to provide a more accurate estimation of the acting forces, allowing for more accurate calculations and evaluations.
5. Scia Engineer was also used to calculate the behavior of the featured waffle and mushroom flooring.
6. On the south wall, a double wall is hung onto the two adjacent walls. On these walls, wind loads are acting together with temperature loads and loads coming from the different connected floors. Using a 3D Scia Engineer model with temperature loads, the influence of all these acting loads could be accurately calculated.

The Grand Opening

At this time (end 2008) the construction work is almost finished as the steel roof structure of the auditorium and the housing of the Guillotine Wall are being installed. Technical installations, inner wooden walls and furniture are arriving and will continue to arrive the first half of 2009. The goal is set to have a Grand Opening in September 2009, at the start of a new academic year.

Technical data

- Width: 30.5 m
- Length: 99.15 m
- Height: 24.15 m (roof) – 30.12 m (housing 'Guillotine Wall')
- Total Floor Area: +- 13.500 m²
- Reinforcement: +- 1.200.000kg
- Concrete: +- 11.000 m³
- Steel Columns and beams: +- 480.000kg



ASTRON BUILDINGS S.A.

Contact Jean-Louis Lecomte
 Address Route d'Ettelbruck
 B.P. 152
 9202 Diekirch, Luxembourg
 Phone +352 802911
 Email s.linster@astron.biz
 Website www.astron.biz



ASTRON, since 2005 a member of the LINDAB Group, is Europe's largest manufacturer of steel buildings with over four decades of experience in supplying more than 40 million m² of single and multi-storey buildings all over Europe. The yearly turnover exceeds 150 m Euro. ASTRON serves the needs of local and international companies planning to construct major new facilities in Western and Eastern Europe, such as manufacturing plants, logistics and distribution centres, trade and retail outlets, tailor made multi-storey buildings for offices, sales and storage, car parks, industrial buildings and structures.

Extensive experience and capacity

ASTRON is staffed with more than 1,000 multilingual personnel. The company has extensive worldwide experience of constructing large buildings ranging from 500 m² to more than 100,000 m².

ASTRON has 12 sales, engineering and support offices in Luxembourg, France, Italy, Germany, Czech Republic, Poland, Russia, Hungary, Romania and Croatia.

The steel structures are all pre-fabricated in 3 factories: Luxembourg, Czech Republic and Hungary. The capacity lies up to 15 buildings per day.

One source supply

ASTRON designs and fabricates all the main components of the building: structure, roof system, wall systems, accessories and thermal insulation. This "one source supply" approach reduces site coordination.

Guaranteed quality and speed – wherever it is built

ASTRON's presence throughout Western and Eastern Europe offers investors the benefits of

working with one company for multiple construction projects in different countries.

ASTRON's key benefits

- One source supply
- A complete "design-and-build" service plus turnkey project construction through 360 authorized ASTRON builders
- Imaginative and appealing architectural design reflecting the customer's image
- A multitude of façade options
- Flexibility of layouts and dimensioning to suit customer requirements
- Optimum use of space, with no or fewer interior columns allowing high flexibility for the actual and future inside layout
- Early completion compared to traditional construction due to efficient erection concept
- Quick return on invest
- Research of a global economical solution
- Low maintenance costs constructions
- Environmentally friendly, recyclable
- The reliability of a long standing European group with a track record of over 30,000 buildings
- 40 years experience in single story building
- 15 years experience in multi-storey building
- A long lasting quality product with ISO 9001:2000 quality certification



Hilton 'Hotel di Breme', Milano

Short Description

This project regards a hotel and congress complex situated next to the FieraMilano and the future Expo2015 area. The new Hilton offers 240 guestrooms, complemented by a 225-seat restaurant and a covered terrace that can hold 250 people, with a lobby bar and fitness area. It also has extensive meeting facilities, with over 450 m² of flexible meeting room space.

The architect's vision of a sober building and his idea to use natural materials of the region like timber wood and terracotta were fully realized.

The galvanised steel elements in the façade together with the timber wood panels and the glazing perfectly dress the 225 tons steel skeleton.

Project Information

Owner: Hilton - Double tree
Architect: FGS/PLG GORING & STRAJA Architects
General Contractor: Teorema studio s.r.l.
Engineering Office: ASTRON BUILDINGS S.A.

Construction Start: 20/01/2007
Construction End: 31/08/2008
Location: Milano, Italy



Located in the heart of Viale Certosa, northern Milan's main business district close to one of the major gateways to the city, the newly built Doubletree by Hilton offers 240 guestrooms, complemented by a 225-seat restaurant and a covered terrace that can hold 250 people, with a lobby bar and fitness area. It also has extensive meeting facilities, with over 450 m² of flexible meeting room space.

The client was looking for both a fast completion and a cost-efficient construction of a reliable, attractive and flexible building. They chose the Astron Multi-Storey Building system, along with the Monodek mezzanine system. The customer wanted to preserve the concrete sub-structure, while on the other hand increase the floor space of the rooms on the different levels. The curtain wall is suspended from the mezzanine and coated with wood and glass elements. The Italian Astron builder Teorema was responsible for the construction of the steel structure of this 2,700 m² six-floor hotel.

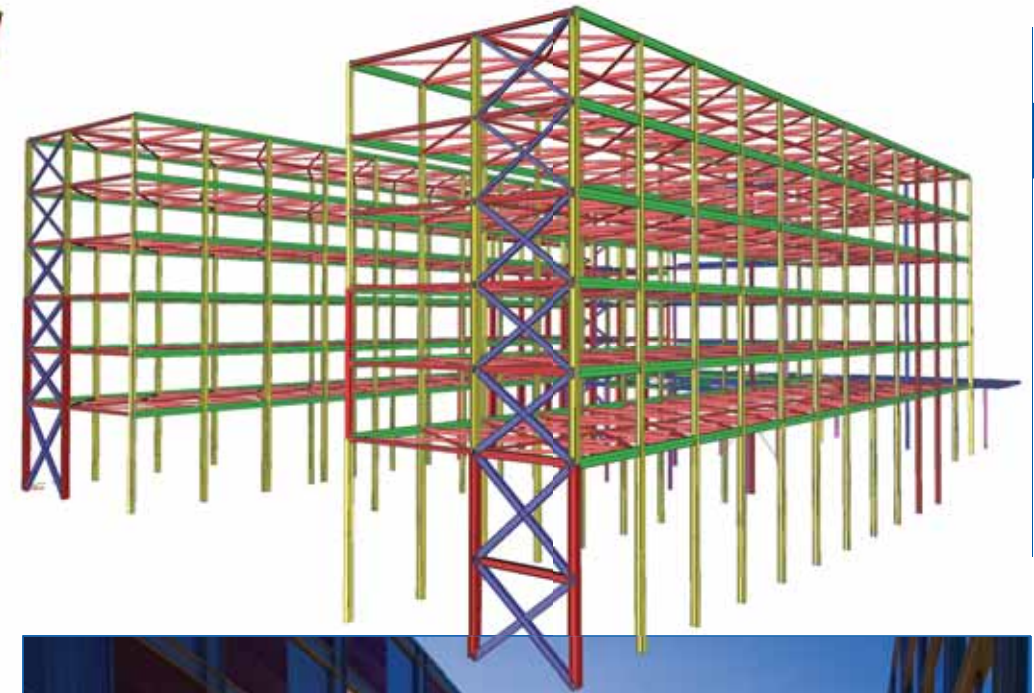
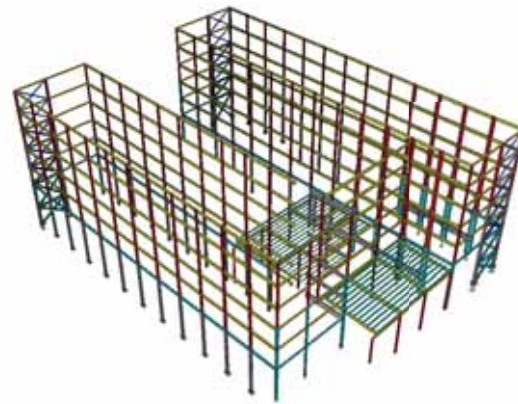
A free span of 12.5 metres between the external column supports significantly reduced the number of foundations required and provided maximum flexibility for the inside layout. The Astron Multi-Storey engineering department quickly established the best solution, taking into account the seismic loads of this area (Zone 4). In January 2007, only 12 weeks after work started on site, the structure was erected. The



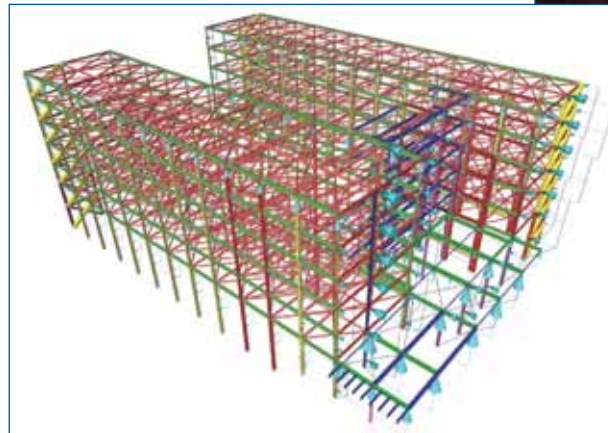
Used software: Scia Engineer

concrete floor elements were laid soon afterwards. To the delight of the client, he achieved his target programme completion date of August 2008!

The architect, FGS, appreciated the architectural freedom of the Multi-Storey Building system to determine the appearance of the building and provide a contemporary style and elegant design that enhances the corporate brand image of this upmarket hotel chain. The hotel's architecture combines Milan's influence with its contemporary flair for style and innovation. The "H" shape of the hotel, along with the generous utilization of glass and wood and the use of clean lines and airy spaces, creates an atmosphere that is both comfortable and engaging.



2



BESIX

Contact Jean-Marie De Bel
Address Av des Communautés 100
1200 Brussels, Belgium
Phone +32 2 402 62 11
Email jmdebel@besix.com
Website www.besix.com



BESIX Group is the largest Belgian construction group, a conglomerate of companies active in the construction, engineering, environmental, real estate and concession sectors.

In 1909, Jacques-Marie and Charles Stulemeijer see potential in prestigious construction projects in Belgium and set up the Société Belge des Bétons (SBB). They immediately earn their reward with the rebuilding of Belgian ports and canals, in the aftermath of the war and soon the activities expand in France and Spain.

In 1947 SBB recognizes the extraordinary market potential in former Belgian Congo and, together with the Belgian Group Empain, creates a common subsidiary Auxeltra-Béton.

Large projects in the Middle East demand a new organization from 1966. The six companies of the SBB Group form Six Construct. The success in this new region becomes considerable.

Since then, the group has known impressive and regular growth with the acquisition of new companies such as Entreprises Jacques Delens in Brussels, Etablissements Jean Wust in Wallonia and Vanhout in Flanders and, more recently, Van Britsom (Oostkamp), Verheye (Diksmuide), GRWestkust (Diksmuide) (50%), Socogetra (Awenne) and Cobelba (Naninne).

In the meantime, the company has entered the Egyptian and Libyan markets, it has also become an important player in France and the Netherlands

and has realized impressive projects in India, Russia, Poland, the Czech Republic, Slovakia, Algeria, Morocco and many other countries.

In 2004, thirteen managers of BESIX and its subsidiaries, together with Orascom Construction Industries, execute a management buy-out. SBB becomes BESIX Group, firmly anchored in Belgium.

Today, BESIX and its subsidiaries cover practically all fields of the construction industry and are operating in Western Europe, in Central and Eastern Europe, North and Central Africa, in the Middle East, in Central Asia and in the Caribbean. The Group realized a turnover of approximately 1.6 billion Euros and employs over 20.000 people worldwide.

The Group intends to be a leading international player, serving Western and Central European markets from its home country Belgium, and covering the Middle-East from the United Arab Emirates.

The success of the group is the result of:

- A commitment of upholding the highest standards of quality, reliability, professionalism and performance.
- The permanent seek of innovative ways to increase its expertise and enhance its performance.
- Providing a safe work environment
- A particular care for the teamwork spirit and the respect of individuals
- Taking new challenges that will strengthen the reputation and open new horizons.

ZLOTA 44 - 200 m high tower in Warsaw

Short Description

Besix was proud to be awarded the contract in 2007 for the design and build of the Zlota tower that will emerge from the very heart of Warsaw like a shining sculpture culminating at 192 m. Designed by Daniel Libeskind for ORCO Property group, the tower accommodates 251 luxury apartments and sits on the side of a podium having 9 levels above ground and 2 below. The podium incorporates a retail area, an amenity floor, plant rooms and secured parking. Wrapped in curtain wall, the structure is essentially made of cast in situ reinforced concrete braced with a central concrete core stiffened with fin walls projecting up to the façade. It also includes a load transfer zone between the tower and the podium and is founded on a piled raft.

The building was entirely calculated with ESA-Prima Win using a general model counting 54000 nodes of which local models were extracted when necessary.

Project Information

Owner: ORCO Property Group
Architect: Architekt Daniel Libeskind Ag
General Contractor: Besix SA
Engineering Office: Besix Engineering Department

Construction Start: 15/01/2008
Construction End: 31/10/2010
Location: Warsaw, Poland



Project general description and structural concept

Architecture

The Tower Zlota 44 will emerge from the very centre of Warsaw like a shining sculpture culminating at 192 m above ground. The building consists of an elegantly curved tower sitting eccentrically on top of a 54x36 m podium with two 67x51 m basement levels. Going from top to bottom, the project is organised as follows:

- 45 levels of residential apartments
- 1 level of amenities including a 25 m swimming pool, fitness centre, spa and hammam
- 1 level of mechanical equipment
- 6 levels above grade car park
- 1 ground floor level with a main lobby, retail space and a restaurant
- 2 basement levels dedicated to technical rooms and car park

Structural concept and particularities

The structure is essentially made of cast in situ reinforced concrete. A central concrete core stiffened with fin walls projecting up to the façade provides the horizontal bracing and is completed with internal and façade columns to give the vertical support to the

slabs. The fin walls and perimeter columns follow the curves of the building in gently varying slopes.

The typical floor system consists of a 220 mm thick RC flat slab spanning 7 to 8.25 m in two ways between the walls and the columns. An 800 mm deep downstand beam runs around the perimeter of the building and is required for both structural and fire protection reasons.

At the interface between the tower and the podium, a transfer zone consisting of inclined columns and transfer beams is designed to accommodate the geometrical requirements dictated by each identity. The horizontal force component resulting from the inclined elements is tied back with Macalloy bars or cables that are post tensioned in phases as the construction progresses.

At the roof, steel structure is used to support the large parapet walls and the complex roof shapes.

The part of the building located under the tower is founded on a 2 m thick raft and barrettes acting together to transfer the load to the ground. Under the part of the podium adjacent to the tower, the building is founded on a 1.5 m thick raft without barrettes.

Numbers

- Height above ground: 192 m
- Total built up area: 71600 m²
- Mean area of one typical tower floor: 1200 m²
- Quantity of concrete (excluding piles): 34500 m³
- Quantity of steel reinforcement: 6950T
- Quantity of steel structure: 50T
- Completion time: 33 months (demolition of existing buildings not included)

Structural design

Model development

A complete 3D model of the tower including all slabs, beams, walls, columns, piles and the raft was made with ESA-Prima Win. The details of the model incorporates also all openings in the walls, lintels and slabs with the different type of concrete grades, and the bi-linear springs simulating the soil-structure interaction.

Due to the shape of the building, every single floor is different from one another. The construction of the model was made by creating a typical floor corresponding to the envelope of all levels. Then, by representing the façades with shell surfaces and using the intersection tool, the parts falling outside the shells were trimmed off.

The size of the general mesh is about 2 m which involves 54000 nodes and is sufficient to simulate the general behaviour of the structure. When detailing the calculating of one level, the mesh is locally refined over this level and the adjacent ones.

The graphical representation combined with the various members selection tools of the program were used to verify efficiently the geometry, the loads, the material characteristics of each element and the general behaviour of the model.

Particularities of the structural calculation

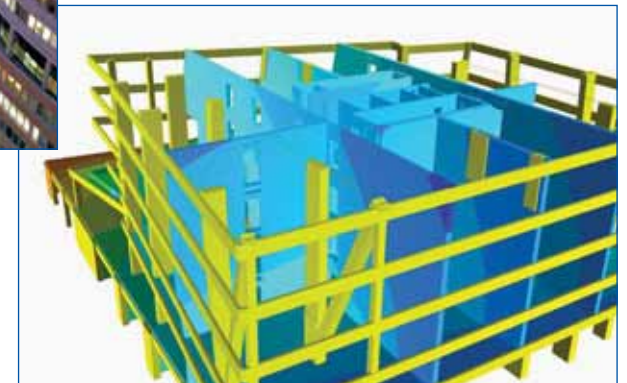
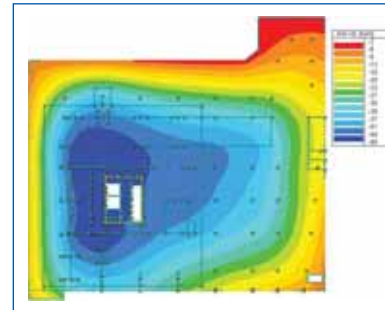
- Calculation of the foundation
As mentioned earlier, the soil structure interaction is modelled with bilinear springs applied on the soffit of the raft, along the barrette shafts and on the barrette toes. The results obtained with this modelling were compared with those obtained from a 3D volumetric model and they appeared to be satisfactorily consistent.

- General building movement
The foundation settlement and the difference of means compression stress between the core walls and the columns implied significant differential vertical displacement between the core of the tower and the perimeter. These movements are reduced, to some extent, by consideration of the construction phasing and creep
To ensure that all situations are covered by the calculation, the slabs are calculated considering the envelope of the forces obtained from the general 3D model and from a partial model on fixed supports that can easily be extracted from the general one.
- Down load path and load transfer
In the lower levels of the building, the architectural arrangement required complex load transfer that are also affected by the general building deformation. Graphical views of the principal stresses were used to better understand the down load path and find structural solutions.
- Calculation of the lintels:
The lintels above the doors of the bracing walls are modelled as small wall elements including the details of all the openings. The reinforcement is calculated by using the possibility offered by the program to give the resultant forces in sections.
In some cases the amount of openings required for the ducting is such that the lintels can not withstand the forces linking the parts of the bracing walls. In these cases, we included steel profiles in the concrete. These profiles could be better modelled with Scia Engineer that we started using during the project design. Therefore, we made local model of the lintels with this last program and applied the displacement obtained from the general model to calculate the profiles.

Conclusion

The different tools offered by the software contributed to achieve this very large and complex model swiftly, to control and operate it and to make the best use of the calculation results.

ZLOTA 44 - 200 m high tower in Warsaw



BREED Integrated Design

Contact Gilbert Van der Lee
 Address Korte Molenstraat 12
 2513 BM Den Haag, Netherlands
 Phone +31 70-7852944
 Email info@breedid.nl
 Website www.breedid.nl



BREED Integrated Design started as a company that wanted to work differently.

Or better, in a way that used to be the standard in the old days of constructing. We think that designing buildings is a beautiful thing to do. Designing buildings has become too much a business instead of a profession of passion. We care about the projects we do.

We think that a better integration, with real interest in the other professions in the field, make better buildings. We want to be part of the design team as early as possible, before a stroke has been put on paper. We would like to hear the concept of the building, so we can make a structural concept that is part of the complete picture. Not squeezing in some columns and beams in the end and destroying the general idea with it. The structure can be a big part of the architecture and it should be used in whatever way. Even lack of structure is an architectural statement. If the structure is ignored in the design process, it will most certainly be a dissonant in the design as a whole.

BREED Integrated Design is founded by Gilbert van der Lee. At the university he studied to be a structural engineer as well as an architect. Not

to practice architecture, but to understand it and become a better structural engineer. We think the structure of buildings has been ignored too long, it is not used enough to express the buildings' architecture. Structure gives rhythm, shelters, breaks the light, sets boundaries and encloses spaces. Lack of structure confuses, maybe scares but certainly surprises the person who visits the building. It is essential to think about it. What will the effects of the structure be? We love buildings as much as the architects do. It is essential to develop a concept of the building as a whole. An architect can design with complete freedom, but if it can't be erected, what's the use? There has to be the perfect skeleton for it. It is not only about doing the calculations right, it is about designing the right structure. By giving multiple options, the architect and the client can make decisions based on costs and architecture. This is in our opinion the only way to practice structural engineering.

And it works. We have been building and are working on beautiful buildings. Villa 1 is the first example that has been build. We are currently working on several projects with the same attitude concerning the structure. There is so much more to be build. So many structures to design.



Photo: Jeroen Musch



Short Description

Villa in Ede

The project regards a villa which has been designed upside down. All daily functions are situated above ground and all bedrooms below, but all provided with ample daylight.

The structure is really a part of the architecture. The open ground floor is placed on a concrete basement. The roof is carried by a complex steel structure put in pieces of furniture. The 'heavy' concrete basement carries an almost weightless ground floor, where structure is almost absent. The house seems to be floating in its surrounding.

Project Information

Owner: Privat
Architect: Powerhouse Company
General Contractor: Valleibouw
Engineering Office: BREED Integrated Design

Construction Start: 01/11/2006
Construction End: 20/01/2008
Location: Ede, Netherlands



Architecture

The area used to be a site for foresting. All trees were planted in the fifties for production of straight stems that could be used as beams. The trees, Douglas Pines, became mature in the seventies, so they could be harvested. At that time it became immoral to cut down trees, so the area became a natural forest. Now the site falls under the local "building-in-nature" regulations, which include a number of prescriptions. Local regulations only allowed a small house to be built. The special needs of the house called for at least twice the volume allowed by regulations. Powerhouse Company designed the villa upside down: all day functions above ground and all bedrooms below, but still with ample daylight.

In nature the sun is the source of life. The villa is designed optimally to the sun and to its surroundings. There are three wings in the house: one wing for working, studying and music making; one for cooking and eating, and one for living and painting. In the basement the Y-shaped plan has the same clarity. One wing for the master bedroom; one wing for cars and one wing for bedrooms, storage rooms and guestrooms. A big patio provides daylight for the guestrooms. Maximum transparency was wished for. The Y-plan offers large panoramic views on the surrounding scenery. On the south and east sides two large covered decks create sun shading in the summer. The views are really important in the house. That's why all mass is concentrated in one big piece of furniture in each wing. The furniture contains all

needed services and the structural elements. They shape the plan and create different rooms within the glass space.

Thinking of Structure

Such an open plan asks for a structure suitable to the needs of the architecture. We made in cooperation with the architects, an extensive study of the structure. The furniture should be the location for the structure. Because two plans are placed on top of each other, the structure needed to be aligned on the two floors. We used ESA-Prima Win as a design tool, rather than a piece of calculation software. It was not about strength of the structure but about deformations. The trick is not about the result of the structure but the way the concept was conceived in structure. 'The road to a perfectly suitable structure'. That's why the roof has its distinctive structure. It was about putting stiffness in the structure on the right places. ESA-Prima Win is a good tool to only do the final calculations. But without ESA-Prima Win we couldn't have designed this house in this way. It gave us good insight in the structure's forces and deformations, so we knew what to do to make the right design. We really used it as a design tool and later as a calculation tool.

The dichotomy in the villa's architecture; 'closed' basement and 'open' ground floor, is reflected in the structure. The villa is like a stack of different building techniques. The basement is cast in concrete and the roof with extreme cantilevers is like a big umbrella put

Used software: ESA-Prima Win

on top, made in a complex steel structure with wooden beams.

Furniture

The furniture has been placed on the two levels, except for the kitchen, off course. The garage is placed underneath the kitchen, so we couldn't stack the structure there. All the studies led to a design, that embodied all the wishes of the architect and the client. The structure is almost absent on the ground floor, only a few columns can be seen. All the rest is put in the furniture. There was one daring area. The facade of the study-wing. The architect didn't want to put any structure there, but Newtons laws could be bend, but not ignored. The outcome was as ingenious as it was clear to the design team, we had to put a piece of structural furniture there. Where all the other structure was hidden in the furniture, this structure would be in plain sight. But the structure

was not allowed to present itself as 'structure'. A structural bookshelf was introduced, made entirely of steel plates. A big Vierendeel frame stabilizing the structure of the roof and carrying it. The result is alienating, the bookshelf is sturdy, but doesn't look like structure as we know it.

Miesian Gimp

The other big trick, that was pulled by the design team, was introducing a huge sliding wall, made in marble. The door is as high as the ground floor and 4 meters wide. One column is put inside the sliding door, so it never can be seen. The sliding wall wraps around a cross-shaped column clad with black rubber skin. The architects baptized it the 'Miesian Gimp'. A cross-over between the "Gimp", the cynical and mysterious character in tight-fitting black leather in the film Pulp Fiction by Quentin Tarantino and a homage to Ludwig Mies van der Rohe. Cross-shaped columns were also used in the Barcelona Pavilion. Now we could introduce two columns, but more importantly, we could introduce a very important feature in the house. It's the only big opening and lets nature inside the house.

The result is a building like we want them to be build. Everything is integrated, nothing stands alone. The structure really 'carries' the architecture and is totally absolved in the architecture. They become one.

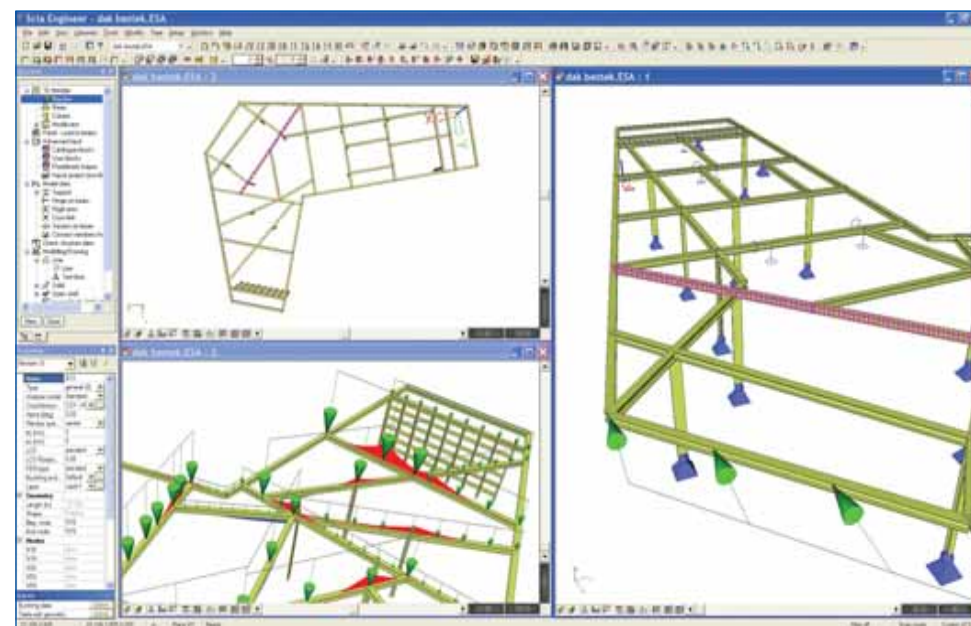
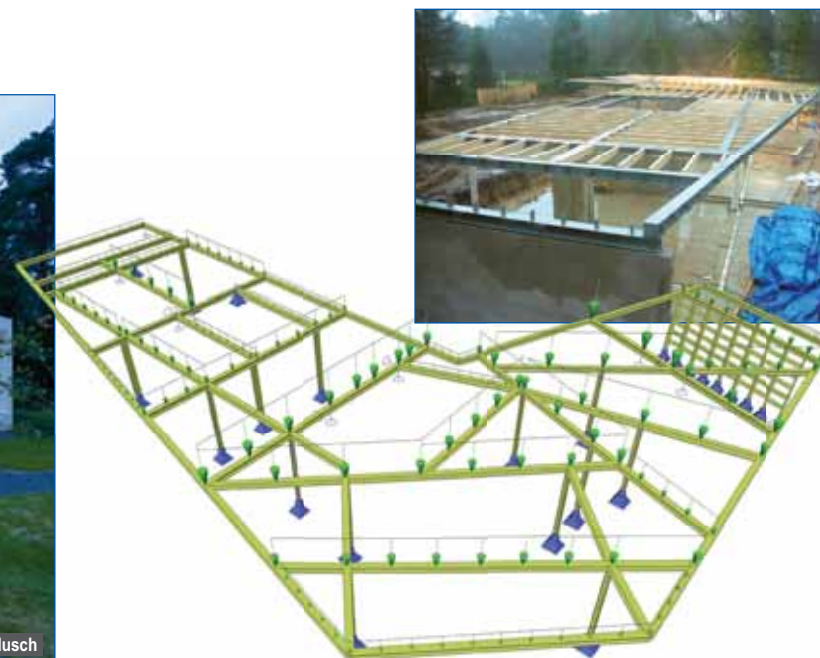


Photo: Jeroen Musch



B. Simon Ing. SA

Contact Bernard Simon
 Address rue de Neuchâtel 8
 2034 Peseux, Switzerland
 Phone +41 32 730 60 70
 Email b.simon@bluewin.ch



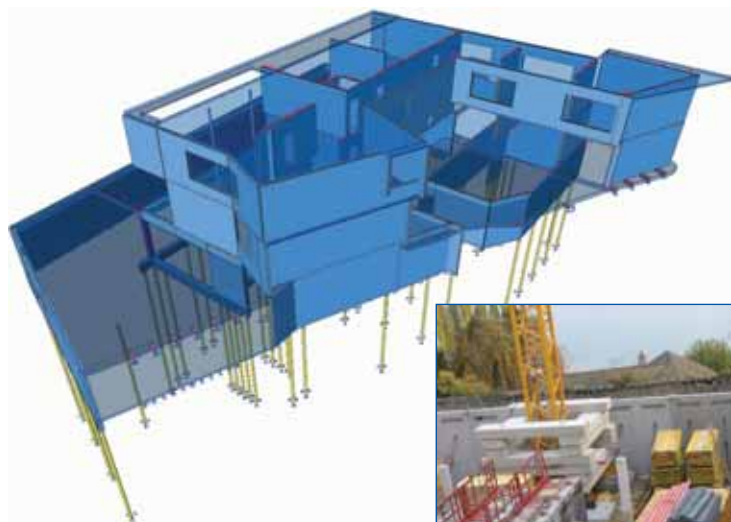
B. Simon Ing. SA

Petit bureau de service, spécialisé dans la recherche de solutions économiques aux problèmes complexes des constructions.

Fribourgeois, diplômé des écoles de mécanique et d'ingénieurs civils de Fribourg en 1966, Bernard SIMON ouvre son propre bureau à Neuchâtel en 1969.

Depuis, les mandats affluent sans discontinuité et sans en avoir sollicité un seul. Il a souvent laissé

à d'autres les affaires faciles et choisi celles où il pouvait apporter des solutions originales. Avec une petite équipe de 4 à 8 collaborateurs, il a réalisé plus de 1'200 chantiers dans la région de Neuchâtel, plus de 800 autres en Romandie, ainsi que des ouvrages de génie civil et bâtiments en France, au Maroc et au Canada. Il a calculé la statique de toutes ses affaires lui-même. Il utilise les logiciels de Scia depuis sa diffusion en suisse en 2003. Il souhaite actuellement trouver un repreneur de son bureau.



Short Description

Villa Geninasca

The complex geometry of the structure in itself is already a real challenge. Moreover, the building site is located on a former landfill, which implies a poor quality of the foundation soil and consequently requires the use of micro-piles.

The 3D modelisation allowed using every single element of the structure at its full capacity, in such a way that dimensions and reinforcement remained reasonable. Accounting for the real conditions of the foundation was a key point of the study, in order to avoid differential displacements and unacceptable solicitations. Scia Engineer allowed a smooth integration of all required parameters. The alarming issues showing up at the beginning of the study could be solved efficiently.

Project Information

Owner: Laurent Geninasca et Raymond Voillat

Architect: Geninasca Delefortrie SA, Neuchâtel

General Contractor: F. Bernasconi & Cie SA,
Les Geneveys-sur-Coffrane

Engineering Office: B. Simon Ing. SA, Peseux

Construction Start: 20/8/2008

Construction End: 28/2/2009

Location: Neuchâtel, Switzerland



La forme trapézoïdale du projet, adossé aux parois de rocher d'une ancienne carrière avec un patio ouvert au nord et de grandes baies vitrées au sud, constitue en soi un problème statique intéressant.

Difficultés supplémentaires

- Les murs porteurs des étages ne tombent sur ceux du parking qu'en quelques points.
- Les parois de rocher dans le parking et le cellier doivent rester apparentes.
- Les appuis des dalles sur parking et cellier contre le rocher ne doivent pas être apparents,
- Le rocher est très fracturé et les couches de rocher sont inclinées de 30° vers le chantier,
- Les murs porteurs des étages contre le rocher ne peuvent pas être coffrés, ils sont prévus en prémurs et doivent servir de voiles malgré les joints,
- La façade Est forme un angle dans les fenêtres qui, de surcroît, ne sont pas superposées,
- La plupart des murs des étages, qui devraient travailler en voiles, ne trouvent pas ou peu de compensation pour équilibrer leur renversement.

La solution

4 petits sommiers sont prévus au plafond du parking sous les murs porteurs. Afin de porter la charge théorique de ces murs, ils deviendraient énormes ou

armés de poutrelles métalliques coûteuses. Le logiciel, qui calcule l'ensemble du bâtiment en 3D, tient compte de tous les encastremements, cadres, voiles ou coques possibles avec leur souplesse respective sur les 3 niveaux. Il a permis de réduire les sommiers au strict nécessaire pour résister aux efforts que les autres éléments statiques ne pouvaient pas prendre. Les autres logiciels que nous connaissons ne permettent pas cette performance.

La surprise

Le sol, qui paraissait être le fond de l'ancienne carrière, était une ancienne décharge d'ordures. Les sondages au pénétromètre ont déterminé une profondeur du rocher entre 4 et 11 m'. Les accès ne permettaient pas de construire des parkings en profondeur. Après l'étude de quelques variantes on choisit 71 micropieux Ø 88/10 mm et les appuis des dalles et murs dans des saignées profondes dans le rocher fracturé avec ancrages.

L'introduction des micropieux dans le logiciel est alarmante, les tassements jusqu'à 10 mm dus à leur élasticité provoquent des déformations de la structure et des efforts dans les murs et dalles inadmissibles. Par approximations successives, on déplace les micropieux et les appuis dans la roche en fonction

des charges et des tassements, on ajoute quelques longrines pour répartir les charges concentrées sur plusieurs pieux et porter le radier. Certains calculs sont effectués en non-linéaire avec prise en compte de la plastification des goujons de liaison avec le rocher. La structure hétéroclite très peu rigide subit des déformations étonnantes à chaque moindre modification des porteurs.

Finalement, la 22e variante aboutit aux porteurs suivants

- Aucun appui fixe dans le rocher, l'ensemble repose uniquement sur les appuis souples suivants :
- 68 micropieux qui portent des charges très différentes comparées au poids de l'immeuble,
- 37 goujons, flexibles ou non
- 14 profilés métalliques encastrés dans le rocher, de longueurs variables, avec différentes variantes de liaison au bâtiment, parfois partiellement isolés pour réduire leur rigidité et ainsi éviter de créer des points durs.

Grâce à l'optimisation de la structure par calcul en 3D le tassement de tous les porteurs est compris entre 3 et 4 mm

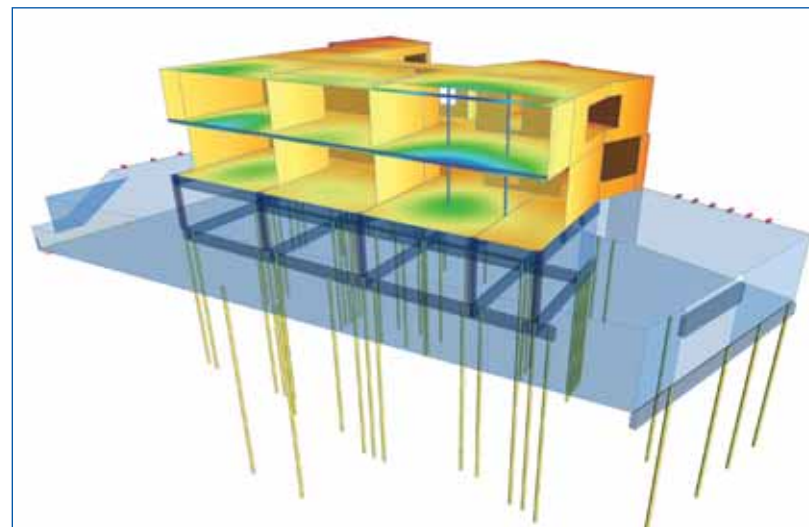
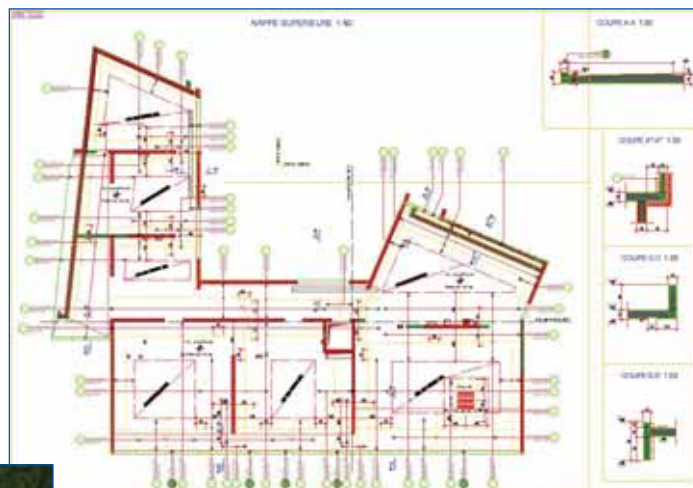
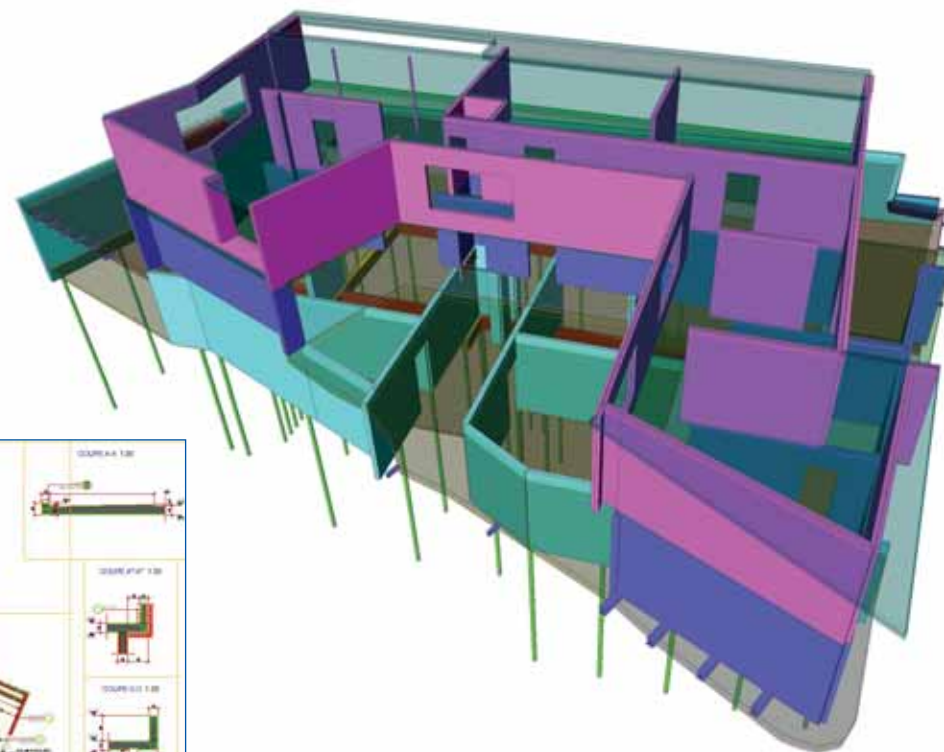
Le travail statique principal consiste à introduire toutes les formes de l'ouvrage dans le logiciel. Ensuite les modifications pour les variantes sont relativement faciles, surtout en regard des résultats obtenus, à savoir principalement :

- Des déformations prévisibles maîtrisées, inimaginables jusqu'ici.

- Des solutions différentes plus économiques et plus sûres (forages profonds dans roche saine à la place de longues saignées aléatoires dans une roche fracturée et ancrages).
- Un dimensionnement très économique des armatures dans le béton grâce à la vision en couleurs des cas de charges dus aux tassements, même pour une structure déséquilibrée et non rigide qui ne pardonnerait aucune erreur.
- L'interprétation des résultats est aisée pour tous les éléments d'ouvrage et prend peu de temps.

Au moment de la rédaction de ce texte, le chantier est arrêté pour l'hiver. Il ne reste que la dalle de toiture à bétonner. Il n'y a aucune fissure.

Je suis particulièrement satisfait et peux recommander ce précieux logiciel Scia Engineer.



BURO II

Contact Wim Denis
 Address Hoogleedsesteenweg 415
 8800 Roeselare, Belgium
 Phone +32 51 21 11 05
 Email info@buro2.be
 Website www.buro2.be



B U R O



BURO II gives you space

BURO II's methodology, in which a process approach is key, sets itself apart from the rest. The process is a joint process: the client is involved, invited and challenged. And if necessary, experts from other disciplines are consulted: historians, sustainability experts, economists and others, both from Belgium and abroad. A result is the team approach that typifies the firm.

BURO II from A to Z

BURO II applies this process approach to a wide range of projects in the fields of architecture, interior and urban planning: from housing projects, public and commercial buildings to mixed projects. A strict business organization and the in-house availability of key competencies contribute to an integrated design.

BURO II was established in 1978 in Roeselare by Hendrik Vermoortel and Rita Huys. In 1983 BURO Interior saw the light of day, and in 2000 the Urban Planning division was added. Since that time the architect's office has developed into a solid group with approximately 100 associates, spread over offices in Roeselare, Ghent, Brussels and Guangzhou (China).

In 2009, BURO II merges with ARCHI+I.



Community institution De Zande 'Phase 2': Sports hall

The community institution 'De Zande' is responsible for receiving and supporting some 40 girls who have been entrusted to the institution by the juvenile court. The sports infrastructure has a double use: for both the juvenile institution and the public communal sports activities. The Flemish Government has had the ambition to build in an energy-conscious way. The sports hall has been interpreted as a passive building. The building embodies a 'bridge' between the temporary accommodation in the juvenile institution and the return to public and daily life. An energetic added value is achieved by advanced thermal insulation in combination with a well-conceived orientation of surfaces and shape of the building. By designing the sports hall partly underground, the energy-saving characteristics are further optimised.

Short Description

Project Information

Owner: Ministerie van de Vlaamse overheid
Architect: BURO II
General Contractor: Strabag n.v.
Engineering Office: BURO II

Construction Start: 01/02/2009
Construction End: 31/05/2010
Location: Beernem, Belgium



Gemeenschapsinstelling De Zande 'Fase 2'

De gemeenschapsinstelling 'De Zande' staat in voor de opvang en begeleiding van een 40-tal meisjes die door de jeugdrechter aan de instelling worden toevertrouwd.

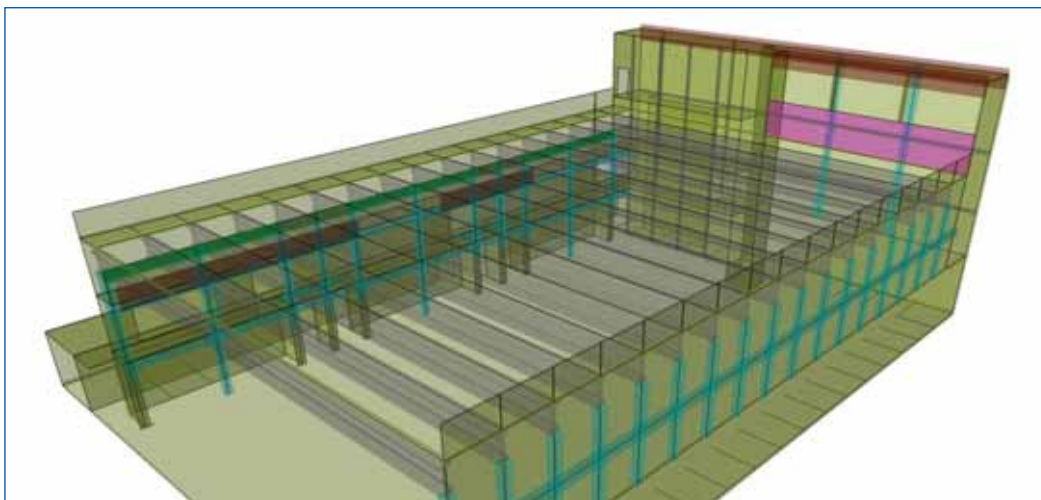
De sporthal is de tweede fase van het masterplan. In nauw overleg met de gemeente werd besloten om de sportinfrastructuur een dubbel gebruik te geven: zowel voor de jeugdinstitelling zelf als voor de openbare gemeentelijke sportactiviteiten. Tijdens de schooluren maken de meisjes gebruik van de sportaccommodatie, terwijl de sporthal voornamelijk 's avonds en in het weekend publiek opengesteld wordt voor de inwoners van de gemeente.

De Vlaamse Overheid, die voor het volledige project initiatiefnemer is, heeft van bij het begin de ambitie gehad om energiezuinig te bouwen en hiermee een voorbeeldfunctie te geven aan het ruime publiek. Net als de school is de sporthal opgevat als een passiefgebouw. Naast specifieke technieken zoals nachtventilatie en warmterecuperatie zorgen doorgedreven thermische isolatie in wanden, vloeren en daken, samen met een doordachte oriëntatie van gevelvlakken en glaspartijen, voor een significante energetische meerwaarde. Door het gebouw deels ondergronds uit te voeren, worden de energiezuinige eigenschappen

nog versterkt. Bovendien zorgt de vorm van het gebouw voor een natuurlijke ventilatie. Waar een deel van het gebouw hoger komt omwille van de klimmuur, zorgt een 'schouweffect' voor de aanvoer van verse lucht.

De sporthal heeft twee ingangen: een publieke inkom aan de straatkant en een beschermde toegang - dichtbij de school - die voor een nauwe verbinding zorgt tussen de lessen en de sportactiviteiten. Sporttechnisch worden alle voorzieningen getroffen. De vrije hoogte van 8 meter laat het uitoefenen van verschillende sporten toe zoals badminton, tennis, volleybal, handbal, zaalvoetbal, ... Een cafetaria biedt zicht op de sportzaal. Aan de achterzijde van het gebouw worden ruimtes voorzien voor fitness, squash en dans; palend aan een binnenpatio. Vooraan aan de straatkant is er extra hoogte voor een klimmuur. Het dak kan in een later stadium dienen als buitensportveld en zal omheind worden door transparante metalen schermen. De dakstructuur wordt voorzien met voorgespannen betonliggers die op een afwisselende asafstand worden geplaatst. Deze asafstanden worden bepaald door de visueel aanwezige inplanting van de betonnen kolommen.

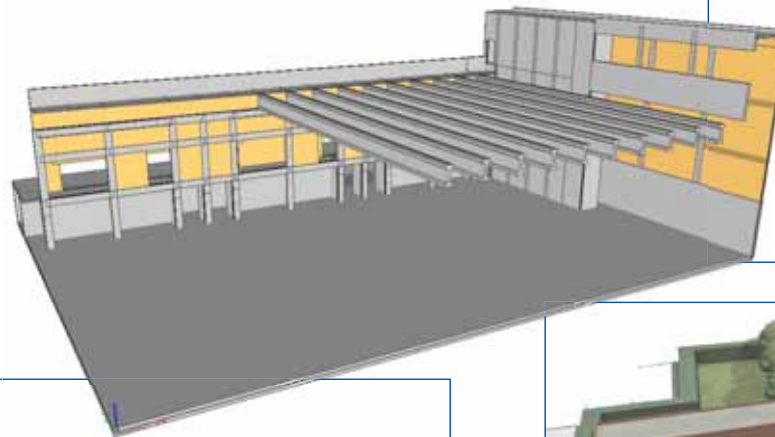
Het gebouw neemt een belangrijke plaats in binnen de stedelijke omgeving. De verhoudingen zijn gebaseerd op deze van de naastgelegen schuur,



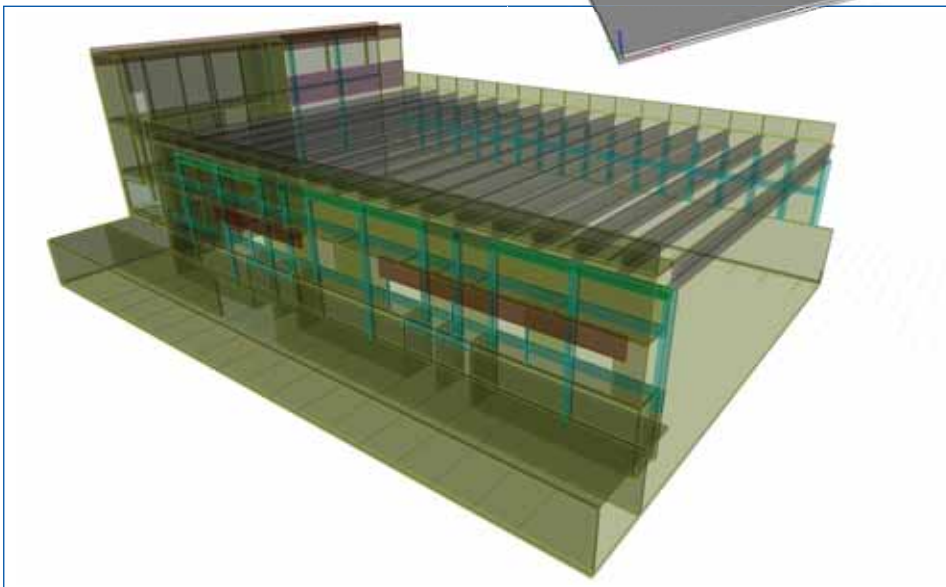
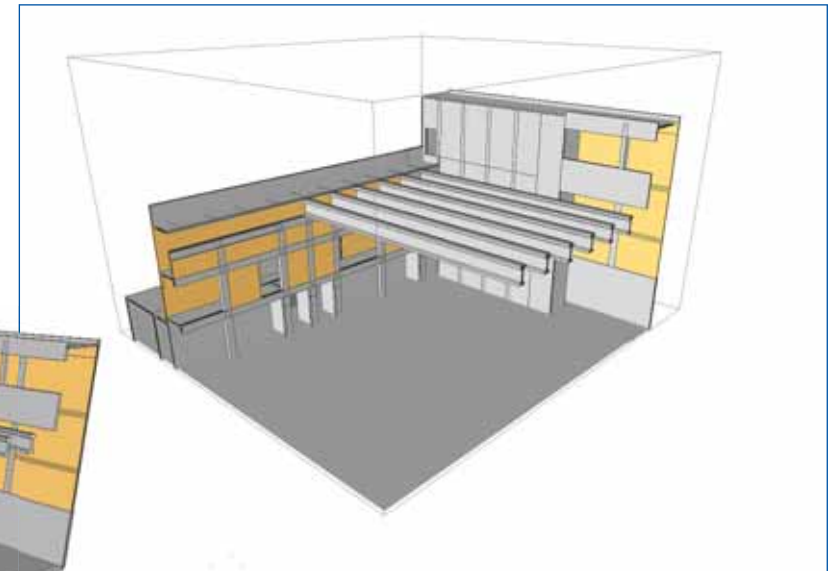
die in de derde fase van het masterplan grondig gerenoveerd wordt. De specifieke ligging van de sporthal - tussen de drukke St.-Andreaslaan en het 'rechte pad' op de site van de jeugdinstelling - is zowel symbolisch als fysisch een belangrijk gegeven. Het gebouw belichaamt namelijk een 'brug' of overgang tussen het tijdelijke verblijf binnen de jeugdinstelling en de terugkeer naar het publieke en dagelijkse leven. Sportieve activiteiten zijn een noodzakelijk onderdeel binnen de begeleidingsprogramma's van de jongeren. Sport is een katalysator om de stressfactoren te reduceren en een overgang naar een leven buiten de instelling geleidelijk te helpen verlopen.

Het draagvermogen van de bodem ter plaatse is uitstekend. Een dikke dichtgepakte zandlaag zorgt voor een homogeen terrein met een grote draagkracht op geringe diepte. Het grondwater, dat zich bevindt op een diepte van +/- 1,5 m, wordt in dit verhaal echter de bepalende factor voor de funderingswijze.

Daar de onderzijde van de funderingsplaat van het speelveld zich op een diepte bevindt van 4,35 m onder het maaiveld, komt er een niet te verwaarlozen opwaartse kracht op deze funderingsplaat. De uitvoering van een raster trekpalen voorkomt het opdrijven van deze plaat. In definitieve toestand worden de delen waar de neerwaartse kracht groter is dan het opdrijvend vermogen, gefundeerd op de zeer draagkrachtige en dichtgepakte zandlaag. De grondbemaling wordt na het uitvoeren van de open kelder stopgezet. Voor het bepalen van de tijdelijke en definitieve opwaartse trekkrachten, wordt gebruik gemaakt van Scia Engineer. Dit laat ons toe om met een 3D-model de juiste afdracht van deze opwaartse kracht te bepalen.



Sporthal volgens passiefhuisconcept voor de Gemeenschapsinstelling 'De Zande' in Beernem



Establis

Contact Bart Maerten
 Address Beversesteenweg 612
 8800 Roeselare, Belgium
 Phone +32 51 43 12 00
 Email bmaerten@establis.eu
 Website www.establis.eu



establis
 STABLE & CREATIVE SOLUTIONS

Establis (voormalig TAB) werd opgericht als éénmanszaak in 1982 door Roger Moortgat, als adviesbureau voor aannemers en constructeurs. Sindsdien is het bedrijf uitgegroeid tot een bedrijf met een 13-tal medewerkers.

Establis is sinds 1995 ISO 9001 gecertificeerd en is lid van ORI, de Orde van Raadgevende Ingenieurs van België.

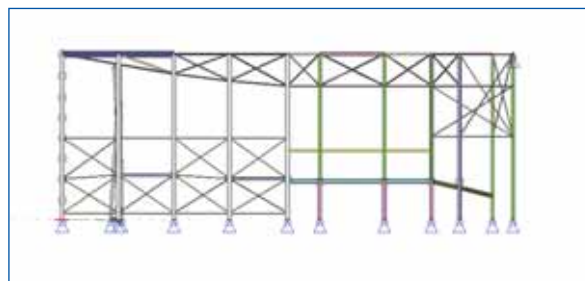
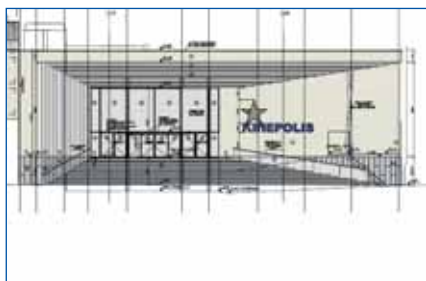
Establis is gespecialiseerd in, en heeft grote ervaring in, het ontwerpen van allerhande bouwkundige constructies. Wij kunnen een brede waaier van oplossingen aanbieden wat garant staat voor een optimale oplossing aangepast aan de specifieke eisen en omstandigheden. Nieuwe ontwikkelingen worden op de voet gevolgd door het bijhouden van gespecialiseerde vakliteratuur en het bijwonen van studiedagen en congressen in binnen- en buitenland.

- Optimalisatie
- Berekeningen gebruik makend van de laatste stand der techniek wat betreft software en rekenmethodes
- Bepalen van de meest geschikte materialen (beton, staal, hout, ...) in functie van budget en uitvoeringstermijn (ook in het buitenland)

- Coördinatie van het ontwerp en de studies
- Aanbestedingsdossier ruwbouw
- Prijsaanvraag en vergelijking
- Werfopvolging
- Berekeningen volgens buitenlandse normen
- De verbindingen van staalconstructies worden door ons ontworpen wat noodzakelijk is voor een optimaal ontwerp
- Ontwerp van houtconstructies
- Funderingen
- Ontwerpen van constructies in aardbevingsgebied
- Eindig elementen berekeningen

Onze referenties zijn zeer breed en gaan van industriebouw over kantoorbouw, naar chemische productie-eenheden, veilingen, diepvriezers en frigo's, appartementsgebouwen, skipistes, parkeergebouwen en bioscoopcomplexen.

Bovendien stelt geen enkel materiaal een probleem voor ons, zoals studie van paalfunderingen, putten, keerwanden, damwanden, staalconstructies, betonconstructies, houtconstructies, metselwerk, ...



Shed structure entrance Decascoop Ghent

Short Description

The project concerns the design of an extension to the movie complex Decascoop Ghent, more in particular the shed structure for a new entrance. The complex with its 12 theatres is the biggest in the region. As some new projects are planned in the surrounding area it became time to give the main entrance a new appearance. The basis of the shed structure is steel. The roof has slopes in two directions. Not one part of the structure is the same. The position of the columns is fixed by the structure of the existing building and the structure of an underground parking.

The total structure is designed as a 3D-model, just because every part is unique. At the end of the design process, the esa-file was transformed to a revit-file. This was the base for the cad drawings.

Project Information

Owner: KINEPOLIS
Architect: Este
General Contractor: n/a
Engineering Office: Establis

Construction Start: 03/2009
Construction End: n/a
Location: Ghent, Belgium



Het betreft het ontwerp voor een uitbreiding aan het bioscoopcomplex Decascoop Gent, meer bepaald de staalstructuur van de luifel die boven de nieuwe inkompartij komt. Het bioscoopcomplex Decascoop is het grootste in de Gentse regio en heeft 12 zalen. Er worden een aantal nieuwe projecten gepland in en rond het gebouw. Dit is meteen de aanleiding om ook de hoofdkom een nieuwe uitstraling te geven.

Aan beide kanten van het gebouw komen nieuwe appartementsgebouwen. Deze worden verbonden via een ondergrondse parking die onder de nieuwe inkom doorloopt en meteen dient als fundering voor de inkom. Het is de bedoeling om de inkom van de bioscoop duidelijker zichtbaar te maken tussen de omliggende gebouwen. Daartoe heeft de architect de inkom ontworpen als een soort cameraleis. De trappen vormen het onderste deel. De zijwand in trapvorm en de luifel in trapvorm vormen de andere delen. Op die manier wordt je als bezoeker binnengezogen in de film.

De basisstructuur is volledig opgebouwd uit staal. Op het hoogste niveau bevindt zich een luifelstructuur. Op de onderliggende niveaus rusten betonvloeren op stalen liggers. Deze liggers zijn eveneens in het model opgenomen.

De luifel heeft in twee richtingen een verloop qua hoogte. Dit betekent dat geen enkel identiek vakwerk kon toegepast worden. Belangrijke randvoorwaarden

die de positie van de kolommen bepalen zijn het naastliggend gebouw Kinepolis Decascoop en de ondergrondse kelder onder deze te bouwen luifel.

De windlasten werden volgens eurocode handmatig bepaald en op deze structuur geplaatst. Aan de zijkanen en aan het dak van de luifel werd er rekening gehouden met verhoogde drukcoëfficiënten (onder- en overdruk), inherent aan een luifelstructuur.

De structuur wordt vastgezet aan het bestaande gebouw. Dit teneinde de horizontale windlasten op te kunnen nemen. Aan de achterzijde tegen het bestaande gebouw steunt de structuur op kolommen. Aan de zijkanen is er enerzijds een kolommenstructuur, anderzijds een draaiende 3-ledige kolom. Gezien deze diversifiëring van steunpunten, alsook het gebrek aan een mogelijke modulering, werkt elk vakwerk op iedere as op een andere manier. De onderregel kan zowel als trekstaaf, alsook als drukstaaf optreden.

Tussen de hoofdvakwerken zijn een aantal secundaire vakwerken verweven die de hoofdstructuren onderling verbinden en/of ondersteunen. Het geheel is niet-lineair uitgerekend teneinde de trekstaven als L-profiel te kunnen optimaliseren.

De volledige structuur werd als 3D-model uitgewerkt met Scia Engineer, net omwille van die stabiliteit in

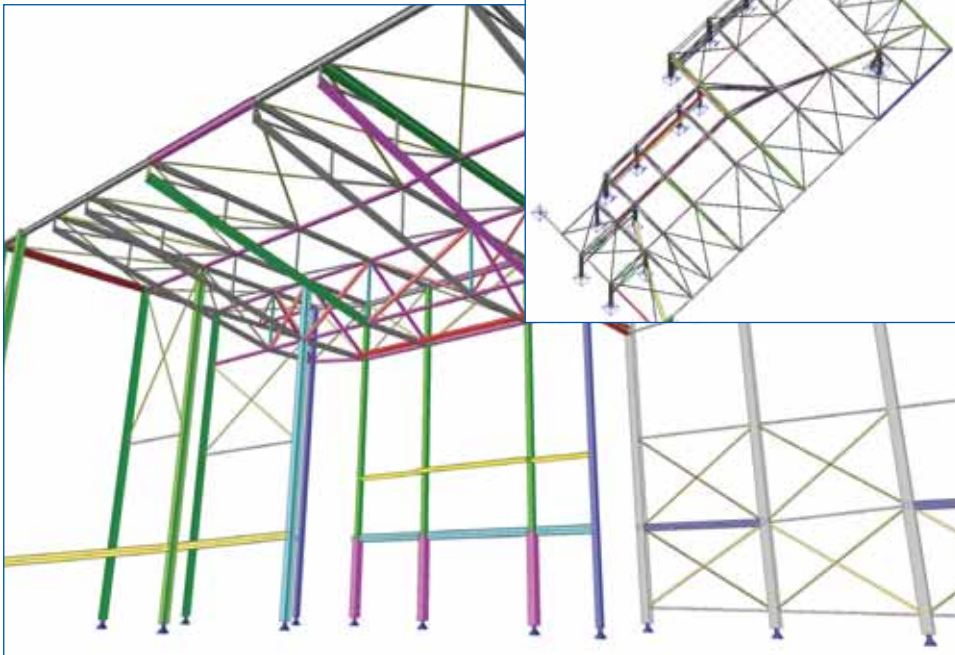
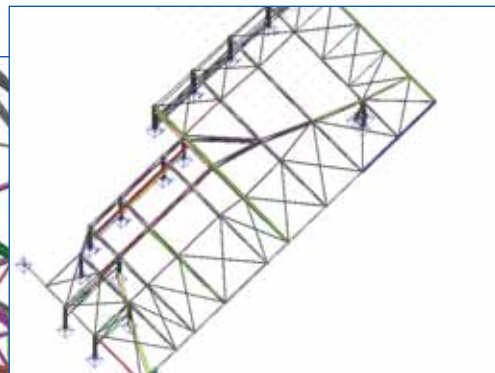
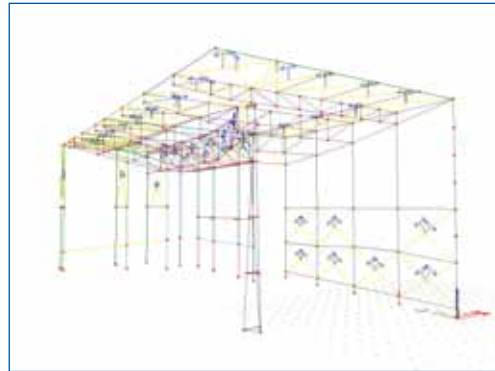
beide richtingen en het correct kunnen bepalen van de vervormingen en krachten in de verbindingen.

Elk vakwerk werd in een andere laag ingegeven. Zoals ook de kolommen en de gewelvenliggers, evenals de horizontale en verticale windverbanden. Op deze manier werd een optimalisatie, alsook het doorvoeren van ontwerpwijzigingen handelbaar.

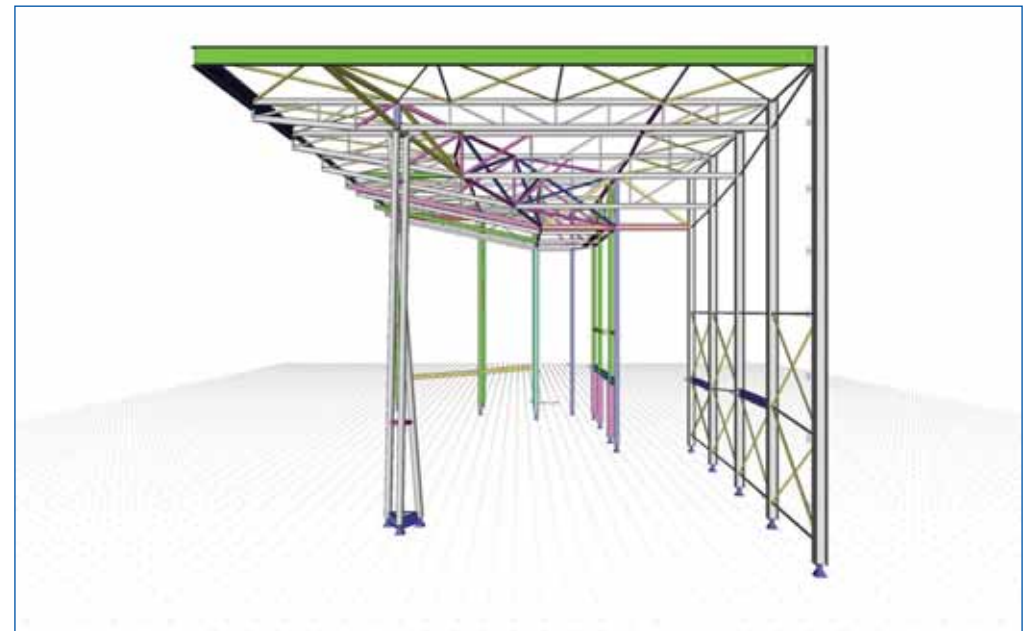
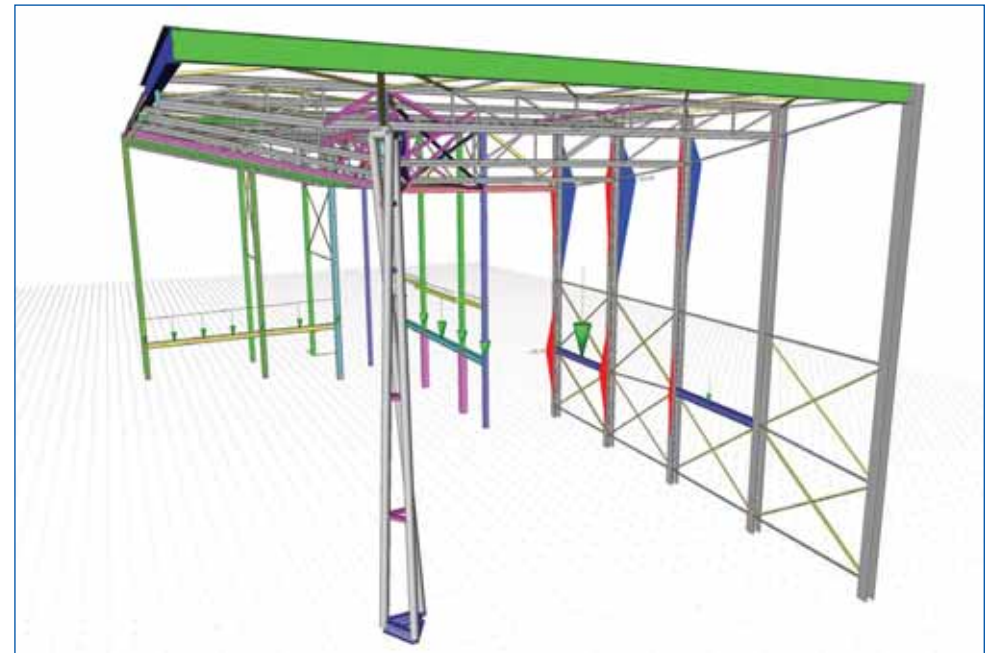
Aan de windverbanden werd de niet-lineariteit "enkel trek" toegekend. De driedelig draaiende kolom werd in Scia Engineer als architecturale ontwerptool uitgewerkt. De excentrisch geplaatste ronde kokers ter opvang van banners voor het Kinopolis-gebeuren werden eveneens in het programma gemodelleerd en geoptimaliseerd.

Tijdens het 'navigeren' en voor de uitvoer werd zoveel mogelijk gebruik gemaakt van functionaliteiten als: layers, activiteiten (door laag, door werkvlak, ...), verplaatsen van coördinatenoorsprong, ...

Bij het opmaken van de plannen werd deze rekenfile omgezet naar Revit. Dit Revit-formaat vormde een basis voor het opmaken van de acad-tekening.



Uitbreiding bioscoopcomplex Decascoop Gent



Études et Techniques Internationales

Contact Fabrice Grisot
Address 9 rue du 19 mars 1962
BP 285 ZA du rondeau
38434 Echirolles Cedex, France

Phone +33 4.76.33.38.21
Email eti38.dir@wanadoo.fr



La société ETI, Études et Techniques Internationales est un bureau d'études techniques qui a été créé en 1982. Effectif de 11 personnes avec chiffre d'affaires en fort développement.

Son siège social est basé à Echirolles dans l'agglomération grenobloise

Elle poursuit son développement dans les régions sud ouest et Grand Est dans les secteurs du bois, des structures métalliques et de la chaudronnerie. Depuis plus de 20 ans son équipe d'ingénieurs et de dessinateurs projeteurs s'adapte aux projets les plus complexes en matière de calculs et de dessins de structure. Ses capacités d'adaptation aux règlements étrangers l'amènent à être présente sur des projets dans le monde entier.

Ses Missions sont les suivantes :

- Études de faisabilité
- Conception et design
- Assistance technique au maître d'ouvrage
- Maîtrise d'œuvre (études de conception, Dossier de Consultation des Entreprises, études techniques et suivi de réalisation)
- Études d'exécution pour bureau d'études générales, d'ingénierie ou société de charpentes métalliques
- Audits techniques et diagnostics

- Conseils et expertises techniques
- Réhabilitation de bâtiments
- Installation générale

Le Type d'étude réalisé s'oriente sur les :

- Structures métalliques, bois, câbles
- Structures mixtes acier-béton
- Ouvrages spéciaux et complexes
- Façades et verrières (acier-verre)
- Couverture bardage
- Calculs en fatigue
- Structures parasismiques
- Renforcement de structures métalliques
- Matériel de manutention, levage
- Chaudronnerie (trémies, silos, gaines)

Ses Domaines d'activités sont les :

- Bâtiments et équipements collectifs : halles d'exposition, centres commerciaux, établissements scolaires, salles de sport ou de loisirs, hôpitaux, murs d'escalade
- Bâtiments professionnels : bureaux, entrepôts, hangars
- Industries : cimenteries, fours à verre, centrales thermiques, usines d'incinération, pétrochimie, trémies, gaines, structures support de process, tour de préchauffage



Sports Center - Dojo University Domain, Grenoble

Short Description

The "DOJO" project of St Martin d'Hères shows several architectural and structural particularities:

- Integration of 3 "star" materials of the building industry: concrete, steel and timber; all 3 independent and contributing to each other's stability
- Reinforced concrete main structure, including walls, grandstand, stairs, curved walls, front overhang, columns, slabs, multiple openings (750 m³ - 1800 tons)
- Braced roof (1600 m², 41x38 m) without intermediate support, with translucent shed, made of 60 m³ of glued-laminated timber (rafters 24 m), 45 m³ of plain timber, 15 tons of 36.5 m span steel beams. Stabilization of the main concrete walls
- Fine 3D modelisation with plates and beams, static and seismic analysis

Project Information

Owner: Conseil Général de l'Isère

Architect: Cabinet Chabal -Grenoble

General Contractor: Conseil Général de l'Isère

Engineering Office: Bureau d'études ETI et bureau d'étude IBSE

Construction Start: 2009

Construction End: 2010

Location: St Martin D'heres (38) - France



Complexe de sport de grande ampleur dédié à la pratique du judo en enseignement et compétition.

Bâtiment principal recevant du public (417 places en gradins) de 43 m x 41 m au sol (1763 m²) et de 7 à 10 m de hauteur.

Ce bâtiment comprend au rez-de-chaussée la zone de pratique compétition 40 m x 25.6 m (6 zones de combat), l'accueil, de nombreux vestiaires et sanitaires, l'infirmerie, des locaux techniques et à l'étage plusieurs bureaux, une salle de réunion et des sanitaires

Un bâtiment secondaire avec salle d'échauffement de 200 m², salle de musculation-gymnastique et locaux techniques est accolé.

Le bâtiment principal a fait l'objet d'un model de calcul global béton-bois-métal, les éléments des trois matériaux étant stabilisant les uns envers les autres :

Les murs, refends, dalles r+1 et r+2, gradins, piliers, escaliers sont en BA épaisseur de 16 à 32 cm.

La toiture d'un seul tenant sans appuis intermédiaires est réalisée en lamellé-collé et bois massif sur 38 x 41 m en 2 zones de 24 x 41 m et 14 x 41 m reliées par un shed translucide. Elle assure le contreventement des voiles béton latéraux de 32cm d'épaisseur.

La couverture est une étanchéité multi-couche auto-protégée sur bac acier acoustique.

Les arbalétriers de la zone de toiture principale sont en lamellé-collé de section 1400*20cm avec extrémités à inertie variable.

Le shed entre les deux parties de toiture est constitué par une poutre treillis métallique porteuse de 36.5 m de portée et 2.5 m de hauteur. Membrures en HEB, montants et diagonales en HEA.

La poutre est bloquée à une extrémité sur un pilier béton encastré au sol. Traitement de stabilité au feu 1H par flocage. Intégration d'un capotage en placo-plâtre avec passage des gaines de ventilations - chauffage.

La stabilité générale est assurée d'un coté par des palées en croix et de l'autre par l'ouvrage béton.

L'ensemble des ouvrages BA a été scrupuleusement modélisé en plaques, avec dalles suspendues, nervures, piliers, murs courbes, gradins avec toutes les ouvertures, charges, surcharges et les relâchements nécessaires.

Caractéristiques du model coque et barres :

- 1420 nœuds de base ; 14500 nœuds de maillage
- 947 barres, 281 macros 1D, 95 macros 2D, 1056 lignes

- 28 sections (béton, métal, lamellé-collé GL24h, bois massif C24)
- 17 cas de charges, 168 combinaisons ELU, 92 ELS.

Les matériaux mis en œuvre sont :

- 750 m³ de béton
- 60 m³ de lamellé-collé GL24 (arbalétriers section max 140*20 cm portée 24 m, poteaux)
- 45 m³ de bois massif C24 (pannes, ossatures secondaires)
- 15 tonnes de poutre treillis métallique.

Calculs linéaires sous actions climatiques (8 cas de vent; 2 cas de neige)

Calcul dynamique sous 300 modes suivant PS92.

Bâtiment classe C, zone sismique 1B.

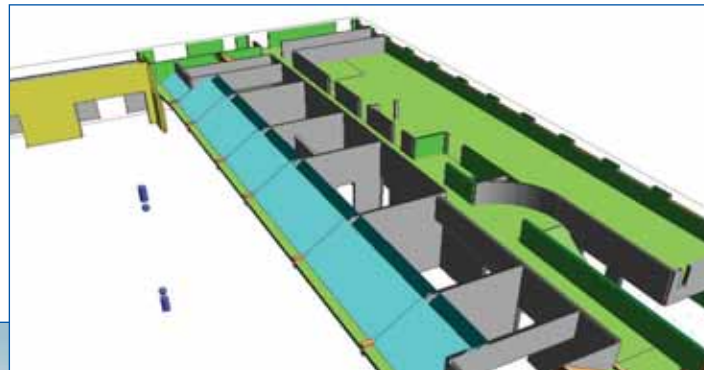
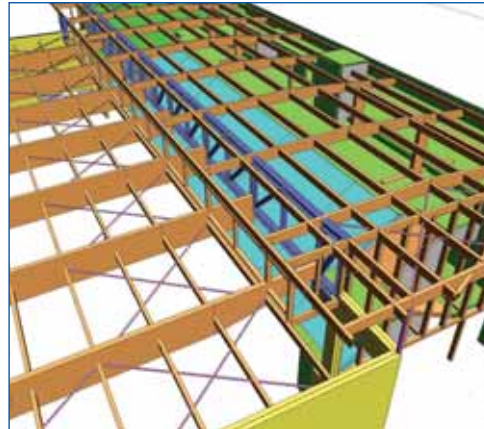
Dimensionnement direct du métal sous norme CM66.

Extraction des efforts pour dimensionnement du bois sous CB71 et du béton sous BAEL.

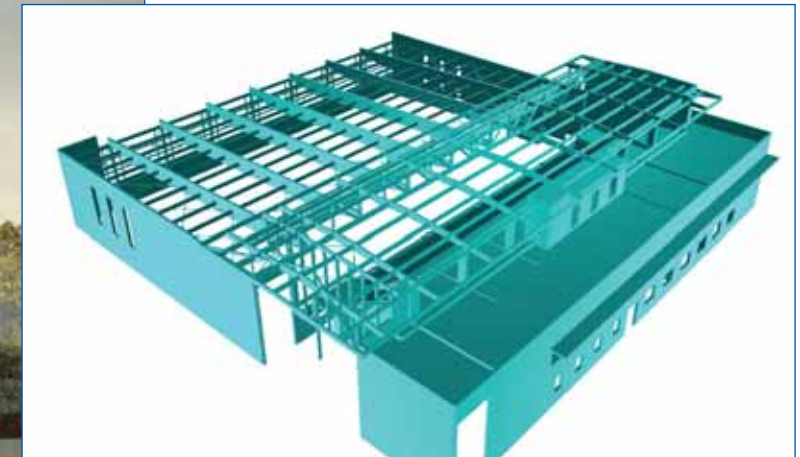
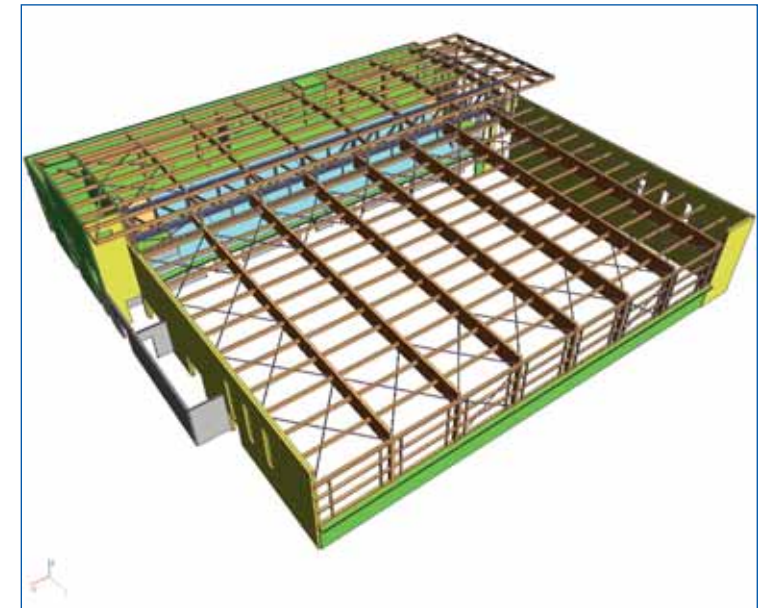
Détermination des descentes de charges pour définition des fondations.

Vérification de la stabilité et des déformations générales.

Modélisation et calcul: Patrick Gisle - chargé d'affaire - calculateur



Projet de DOJO domaine universitaire de St Martin d'Hères - Grenoble



Faber Maunsell Ltd

Contact Julian King
 Address Marlborough House, Upper Marlborough Road
 St Albans, AL1 3UT, Hertfordshire, United Kingdom
 Phone +44 2087845784
 Email julian.king@fabermaunsell.com
 Website www.fabermaunsell.com



FABER MAUNSELL | AECOM

Faber Maunsell operates throughout the United Kingdom and in many countries overseas.

The firm provides a comprehensive service to clients over the broad range of building engineering skills. The services provided by the firm include:

- Feasibility Studies
- Concept Designs
- Detailed Engineering Designs
- Security Assessments and Strategies
- Project Management
- Technical Audits
- Asset Management/Building Aftercare

The firm engages approximately 3,000 staff who undertake projects within small teams of highly experienced engineers under the control of a project director and working with the latest design aids to produce innovative solutions to the complex problems of modern building construction. The firm has specialists in the following:

- Mechanical and Electrical Engineering
- Civil/Structural Engineering
- Public Health Engineering
- Geotechnical Engineering
- Applied Research and Advanced Technology
- Environmental, Sustainability and BREEAM
- Health and Safety and CDM Coordination
- Software Development
- IT/Telecommunications
- Advanced Security
- Specialist Lighting
- Facilities Consultancy
- Fire Protection
- Geotechnical
- Acoustics
- Water Engineering

Over the years the firm has gained experience in a wide variety of projects that currently fall into the following categories:

- Universities, Colleges and Schools
- Laboratories and Research Facilities
- Hospitals
- Offices and Corporate Headquarters
- Shopping Centres, Flagship Stores and Retail Parks
- Residential
- Hotels
- Museums, Entertainment Venues and Performing Arts
- Factories and Storage Facilities
- Telecommunications Centres
- Airports
- Prisons, Courts and Defence Establishments
- Media and Broadcasting Studios
- Leisure Centres, Arenas and Stadia

The wide range of work undertaken by Faber Maunsell enables staff to bring to each new project the skills derived from a variety of sources. The company encourages staff to think of themselves as problem solvers, to fully use their skills, experience and imagination, to be innovative and to maintain a real enthusiasm for the building process. Regional offices are located in Aberdeen, Beckenham, Belfast, Birkenhead, Birmingham, Bristol, Cambridge, Cardiff, Coventry, Darlington, Dublin, Durham, East Malling, Edinburgh, Exeter, Glasgow, Leeds, Leicester, Liverpool, London, Manchester, Newcastle, Norwich, Nottingham, Peterborough, Plymouth, Redhill, St Albans, Witham and York.

The University of Hertfordshire Student Forum

Short Description

Faber Maunsell AECOM were appointed by 'The University of Hertfordshire Student Forum' project to help create the campus' primary entertainment hub and meeting place for up to 2000 people. The facilities include two acoustically isolated nightclubs and a main auditorium for staging visiting music bands.

The building comprises a 3 storey RC flat slab structure. There are 24 m long Westok cellular beams with a 160 mm composite deck over the main auditorium to minimise noise leakage. Architecturally expressed glulam beams and columns are utilised with the main foyer and restaurants spaces. Ground conditions comprise of highly weathered chalk which had been subject to historical shallow mine workings.

Project Information

Owner: University of Hertfordshire
Architect: RMJM
General Contractor: Willmott Dixon Construction
Engineering Office: Faber Maunsell AECOM

Construction Start: 09/2007
Construction End: 09/2009
Location: Hatfield, Hertfordshire, United Kingdom



Faber Maunsell AECOM has worked for the University of Hertfordshire on a number of occasions in collaboration with RMJM Architects. The University had an existing Student Union facility which was housed within a relatively small masonry building. A separate building was used for the hosting of visiting music bands and their nightclub.

The key drivers for the project are:

- The existing infrastructure is inadequate to deal with the growing student base
- A growing demand for 'high street' feel by student market
- The changing demographics of the student market population
- Competitive pressure from other universities
- To maintain standards in line with other physical developments on the University's campuses.

The University, in order to address the issues listed above, has set the following strategic objectives:

- The Student Forum will create critical mass on campus and with the ability to accommodate 2,000 attendees at any one time
- The Student Forum will appeal to students from the deHavilland and College Lane campuses as the primary entertainment hub and meeting place
- This development will enable the University to compete for students and enhance its offering in relation to the quality of life for students.

The entire Student Forum Project comprises the following:

- The Student Forum building comprising a range of catering and entertainment venues
- Day nursery
- Multi storey car park
- New vehicular entrance to the campus
- Bus interchange
- New pedestrian square
- Facilities for the University of Hertfordshire's Student Union
- Landscaping works

The ground floor of the building houses the entrance foyer space, coffee bar, restaurant and retail area.

The spaces over the foyer and restaurant are double height voids framed in exposed glulam columns and beams. The first floor then provides the main auditorium, an acoustically isolated nightclub and box office. The second floor houses an upper auditorium, overlooking the main auditorium, and also provides a second acoustically isolated nightclub. The third floor is for the provision of a plant room.

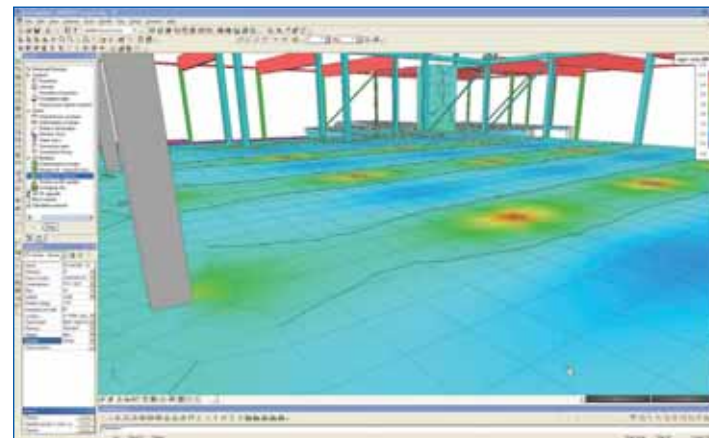
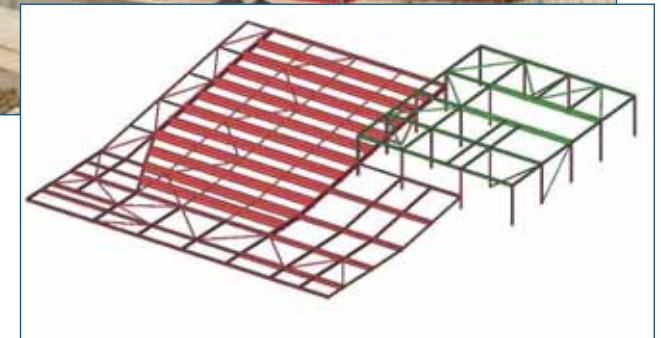
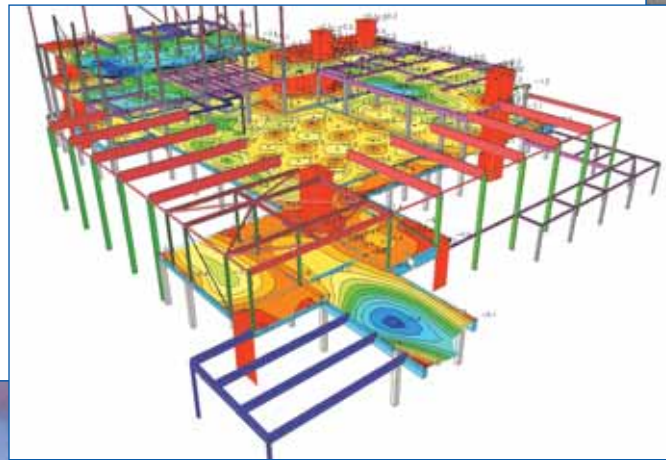
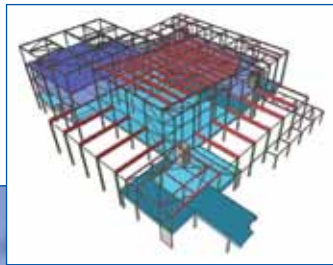
The central portion of the Forum building comprises a 3 storey RC flat slab with in-situ RC lift shafts and stair cores. The front elevation of the building cantilevers 3 m from the last column line at both first and second floor level. Due to the use of the building there are numerous changes within the levels of the slabs that necessitate the introduction of RC beams.

As the building can accommodate 2000 students this is a relatively highly serviced building. This required the introduction of a 50 tonne water tank within the second floor plant room.

The first floor nightclub needed to be a column free space. Additionally there is an acoustic requirement to limit the noise leakage from the building which is achieved by a 160 mm thick RC composite slab. To support the roof slab twelve 24 m long Westok cellular beams, spaced at 3 m centres, were provided over the main auditorium. These in turn are supported by columns varying in height from 9.5 m to 12.5 m. The variation in column height is required to form the sloping roof profile as defined by the Architect. Due to the stepped nature of the roofs, the main contractor actually has to build the steelwork which springs from the third floor slab first and then work down the building.

Within Scia Engineer the RC slabs and cores were designed using the FE package for both gravity and lateral loads. The steelwork was designed utilising the steelwork module.

The ground conditions within the site comprise highly weathered chalk. Typically the chalk head was 2-3 m below existing ground level. There was evidence of historical shallow mining within the chalk. Chalk had been mined in the local area for agricultural reasons. A thorough investigation of the site was performed by the use of cone penetration tests located at every column location. This showed two areas where the depth to the chalk suddenly dropped to around 9 m below ground level. Further cone penetration tests were performed at these locations to enhance our knowledge of the chalk profile and enable a contour plot to be produced. Being able to extract accurate foundation loads from Scia Engineer enabled the pile lengths at each pile cap to be optimised.



GIBES

Contact Eric Gysin
 Address c/o SYNAXIS SA Lausanne
 Avenue Dapples 54
 1006 Lausanne, Switzerland
 Phone +41 21 617 01 75
 Email e.gysin@synaxis.ch



GIBES

Groupe d'Ingénieurs Civils
 pour bâtiments d'enseignement et sportifs

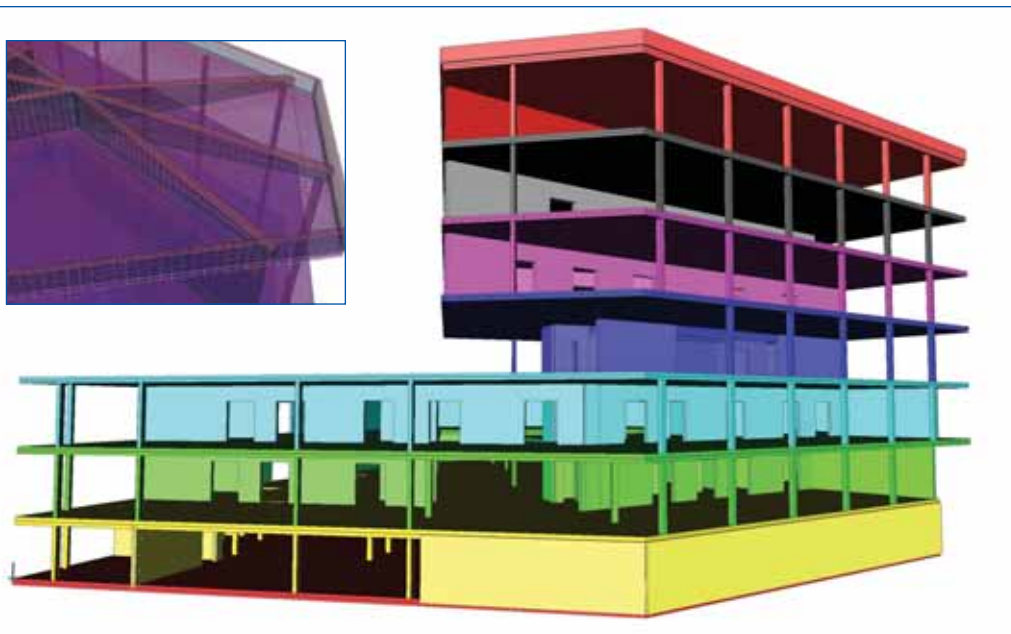
Le groupement GIBES (Groupement d'Ingénieurs Civils pour Bâtiments d'Enseignement et Sportifs) est une association de bureaux d'ingénieurs civils, fondée en 2001, permettant de réunir plusieurs compétences principales, qui sont notamment :

- Structures et ouvrages d'art
- Constructions industrielles et administratives
- Rénovations et transformations
- Diagnostics et assainissement d'ouvrages d'art
- Constructions routières
- Assainissement EC/EU
- Plans directeurs communaux
- Constats et expertises

Le groupement est composé de 3 entités, réunissant environ 35 collaborateurs. Ces 3 entités sont :

- Crisinel & Favez et Associés Ingénieurs Conseils SA (CFA) à Payerne depuis 1987
- Synaxis SA Lausanne depuis 1973
- ETEC Ingénieurs civils SA à Villaz-St-Pierre depuis 1988

Les bureaux associés sont à même de fournir toutes les prestations de projet et de direction de travaux dans les domaines mentionnés. Les administrateurs des bureaux respectifs collaborent ensemble depuis une quinzaine d'années.



New ACPC building

This project regards the new building of the ACPC, it is a reinforced concrete 7-storeyed building and it includes class rooms, a library, a cafeteria, an auditorium as well as a parking space. Several slabs, as well as the roof ribs, include post-tensioning in order to reduce deflections. Because of the complex geometry of the structure, a 3D model was used for specific studies regarding the seismic design of the building and the long-term deflection (including creep and cracking) of the large cantilevers or the upper part of the building.

Short Description

Project Information

Owner: Association du Centre Professionnel Cantonal

Architect: Butikofer De Oliveira Vernay Sàrl, Lausanne & Tekhne SA, Fribourg

General Contractor: G. Brodard & Fils SA, La Roche

Engineering Office: GIBES

Construction Start: 03/2008

Construction End: 07/2009

Location: Fribourg, Switzerland



Description du bâtiment

Le bâtiment E comporte de nouvelles salles de cours, une bibliothèque, une cafétéria, un auditoire et un parking.

Ce programme se répartit sur 7 niveaux. L'ensemble de la structure est en béton armé et plusieurs dalles comportent de la précontrainte afin de diminuer les déformations. La dénivellation du terrain est telle que 3 niveaux sont enterrés côté Ouest alors que le côté Est est au niveau du terrain naturel. Le tout repose sur un radier général avec surprofondeurs.

L'épaisseur des dalles varie de 30 à 40 cm, celle des murs de 25 à 35 cm. La dimension des piliers est variable en fonction des étages.

Une partie des 3 niveaux supérieurs est en porte-à-faux, d'une longueur allant jusqu'à 9 m. Les efforts sont repris par deux murs de 35 cm d'épaisseur

traversant tout le bâtiment et par des sommiers situés en toiture et reprenant les efforts des piliers de bord qui sont en fait des suspentes en béton précontraint par des barres Dywidag. Ces sommiers comportent également deux câbles de 12 torons de 150 mm² chacun.

Deux problèmes ont demandé une étude particulière :

- Le dimensionnement sismique
- Les déformations dans la zone en porte-à-faux en relation avec la pose d'une façade vitrée.

Dimensionnement sismique

La géométrie du bâtiment particulièrement complexe ne permet pas d'appliquer la méthode des forces de remplacement pour le calcul sismique. Il a donc été décidé de modéliser la structure émergente (niveau 0 à +3) à l'aide du logiciel Scia Engineer



Used software: Scia Engineer

et de calculer les efforts internes par la méthode du spectre de réponse. La partie semi-enterrée comportant suffisamment de refends, la stabilité inférieure du bâtiment est largement assurée. Cette partie a néanmoins été modélisée, d'une part pour tenir compte des conditions d'appuis totalement asymétriques de la partie supérieure du bâtiment sur les niveaux semi-enterrés, lesquelles ont une influence non négligeable sur le comportement dynamique de la partie supérieure, et d'autre part pour disposer des résultats de descente des efforts sismiques de la partie supérieure jusqu'au fondations. Les masses de la partie semi-enterrée n'ont toutefois pas été prises en compte, ce qui a permis d'alléger considérablement l'analyse modale.

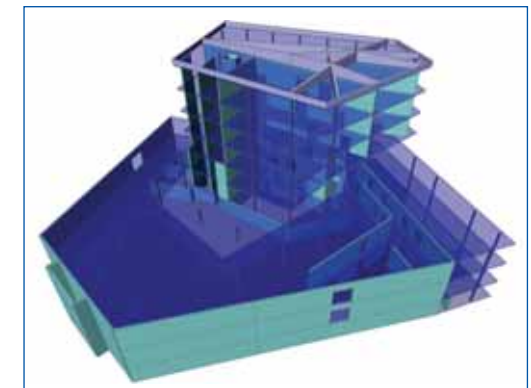
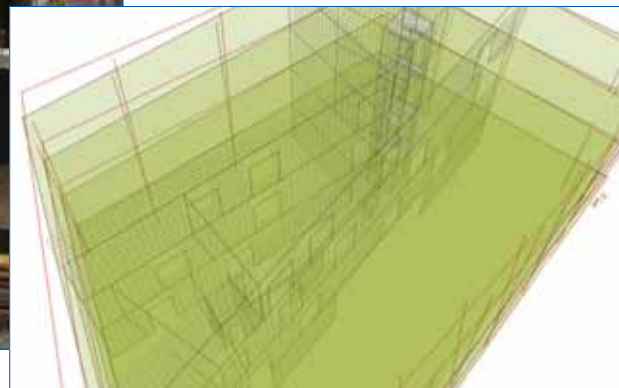
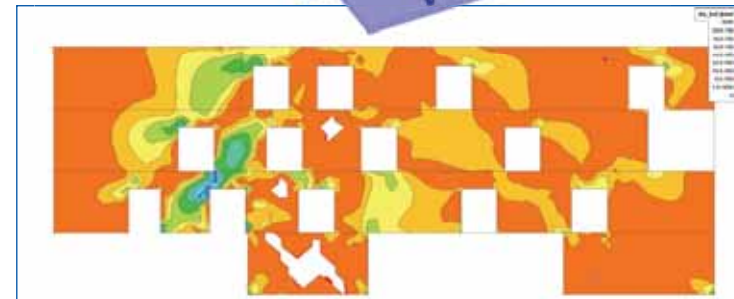
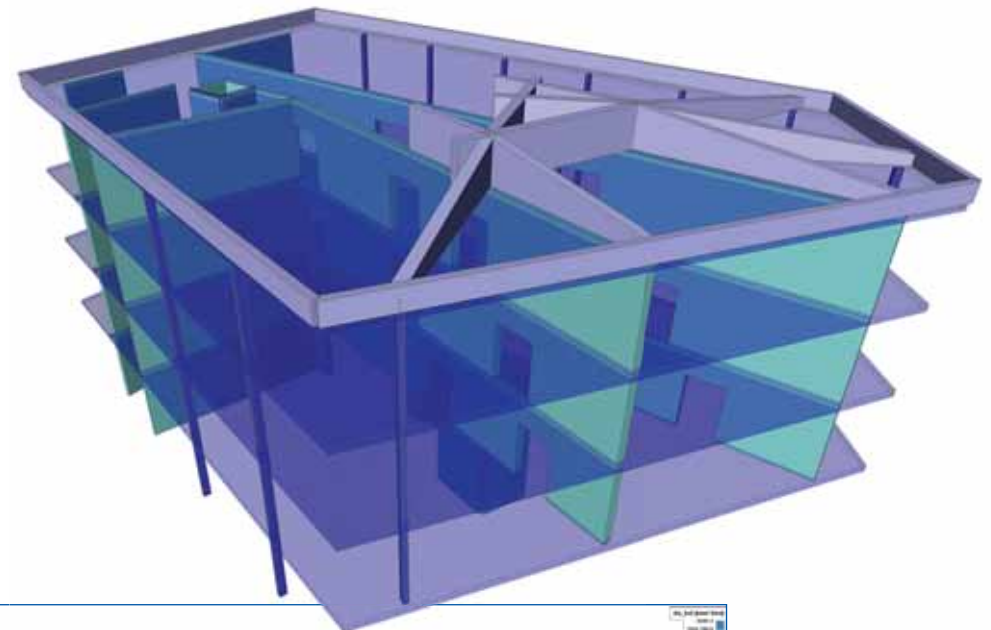
Les hypothèses admises pour ce calcul sont les suivantes :

- Zone de risque sismique : Z1
- Classe du sol de fondation : C
- Classe d'ouvrage : CO II
- Coefficient de comportement : $q = 2$
- Les masses des étages inférieurs ont été admises à zéro, leur influence étant très faible.
- La rigidité des murs a été admise à 70 % de leur rigidité statique.

Le choix d'un coefficient $q = 2$ a été dicté par la comparaison des efforts statiques et des efforts sismiques. Le cas statique est souvent déterminant et il n'est de ce fait pas nécessaire de réduire les efforts sismiques avec un calcul ductile de la structure. L'utilisation de Scia Engineer a permis de détecter ou de confirmer les points sensibles de la structure, mais également d'optimiser l'épaisseur, la qualité du béton et la quantité d'armature des refends.

Contrôle des déformations

La modélisation de la partie supérieure du bâtiment E comprenant le porte-à-faux a également permis de calculer les déformations des bords de dalles en tenant compte du fluage et de la fissuration des dalles. Cette vérification s'est avérée nécessaire, car la pose de la façade entièrement vitrée nécessite la prise en compte de tolérances relativement faibles. Il a donc fallu s'assurer que le système des façades était compatible avec les déformations de la structure. Pour ce faire, une précontrainte en toiture par sommiers renversés, introduite dans le modèle par charges équivalentes, assure une déformation quasi-nulle sous le poids propre de la structure au droit des piliers suspendus.



Gifford

Contact Gary LeCarpentier
 Address Bankside Studios, 76-80 Southwark Street
 SE1 0PN, London, United Kingdom
 Phone +44 20 79602424
 Email elena.velasco-pena@gifford.uk.com
 Website www.gifford.uk.com



Gifford

Gifford is an inter-disciplinary Consulting Engineering Practice employing some 800 staff working in the core disciplines of Civil, Structural, Mechanical, Electrical Engineering and Environmental Engineering, plus Project Management, Archaeology and many specialist disciplines.

Founded in 1951 by E W H Gifford the Partnership has consistently pursued a policy of technical excellence combined with diversity of interest which has resulted in steady growth (12% per annum over the past five years).

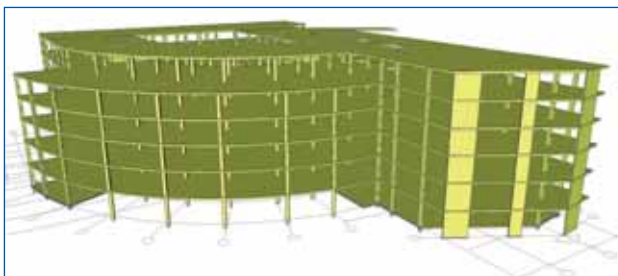
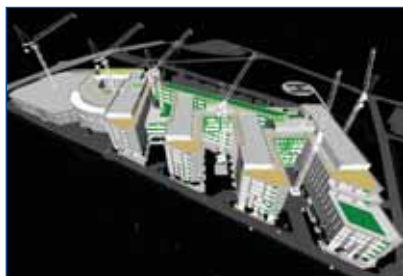
Our ten main UK offices, in Birmingham, Cardiff, Chester, Hounslow, Leeds, London, Manchester, Oxford, Southampton and York provide independent professional advice, planning, design, supervision and project management services to clients undertaking major capital, maintenance or improvement works. Advanced management systems to meet quality assurance are employed and Gifford are Quality Assured to BS EN ISO 9001:2000. The QA system underpins a culture of individual creativity and integrated team working.

Offices outside the UK include Cyprus, Gibraltar, Dubai and India.

The in-house disciplines within Gifford include:

- Building Structures and Services
- Building Sciences and Energy
- Bridges and Highways
- Infrastructure
- Transport Planning
- Marine, Coastal and Ports Engineering
- Environmental Engineering
- Public Health
- Geotechnical and Seismic
- Materials and Forensic Engineering
- Surveys
- Conservation of Historic Buildings
- Archaeology
- Cultural Heritage
- Project Management
- Rail

Where needed the practice employs sub-consultants to extend the range of service, so that a total service for all required disciplines can be provided. These collaborative arrangements can be very stimulating and create the appropriate 'bespoke' team for a particular project.



Pembury Hospital

The redevelopment consolidates Pembury Hospital and Kent & Sussex Hospital into one new, modern facility on the Pembury site. The new facility, which will include 512 bedrooms, will be the first hospital in the country to have completely single rooms. In total the new development will have 1,200 car parking spaces while it will also include a helipad to cater for air ambulances on the upper part of the site.

Short Description

Project Information

Owner: Maidstone & Tunbridge Wells NHS Trust
Architect: Anshen+Allen
General Contractor: Laing O'Rourke
Engineering Office: Gifford

Construction Start: 2008
Construction End: 2011
Location: Tunbridge Wells, Kent,
 United Kingdom



The redevelopment consolidates Pembury Hospital and Kent & Sussex Hospital into one new, modern facility on the Pembury site. The new facility, which will include 512 bedrooms, will be the first hospital in the country to have completely single rooms. In total the new development will have 1,200 car parking spaces while it will also include a helipad to cater for air ambulances on the upper part of the site.

A new primary road access will be constructed in the form of a signalised junction and a separate access will also be provided for service vehicles. Within the site there will be a new road layout, designed to minimise conflicts between cars, buses, pedestrians and ambulances. Transport will be further aided by a new plaza, incorporating set down points for buses, taxis and patient transport.

With a total floor area of approximately 66,000 m², the main hospital building will consist of an in situ concrete frame with flat post-tensioned floor slabs and traditional in situ concrete columns and retaining walls.

Existing substrata dictates a concrete pad foundation solution. Due to the weight of the structure some of these foundations are very large with core foundations totalling 16 m x 8 m x 2 m deep.

Steeply sloping site conditions presented the proposal for a stepped foundation solution.

The main building structure is braced by concrete shear walls to the stair/lift cores, while its height is squeezed between the rock line and a maximum planning restriction level. Due to the nature of the

sloping site and this restriction, the building has been designed to vary between three storeys at the top of the hill and seven storeys at the bottom. As a consequence of the sloping site, large propped retaining walls up to 11 m in height will retain the earth beneath the building. Ground floor slabs are a mixture of in situ ground bearing or suspended depending on whether they are in cut or fill condition.

The scale of the hospital dictates that the building is split into four separate structures together with a three-storey split-level 500 plus space independent car park situated at one end of the main building. Its top deck will be level with the ground on the entrance side of the building and for each floor level cut into the ground; a retaining wall will run along the full length of the building cut face. Designed to store any excess cut, this avoids the removal of material from the site.

The proposals are to construct the main building prior to commencement of the car park. The ground slab to ground floor level of the adjoining proposed building will be constructed on backfilled material, retained by walls built on the junction of the car park and the main building. The difference in levels between the bottom level of the car park and ground floor level is approximately 10 m. The foundations of these walls were placed at levels such that the excavations for the car park do not undermine the main building.

There are four portalised steel frame plant room structures situated at roof level each measuring 70 mx20 m. There is also a further steel frame plantroom located at 1st floor level and blended within

the elevation of the front of the hospital. Additional exposed plant screening and lightweight roofs are required at roof level.

Access to the hospital is via a feature canopy constructed from steelwork seamlessly integrated into the building to form a glazed atrium main entrance structure.

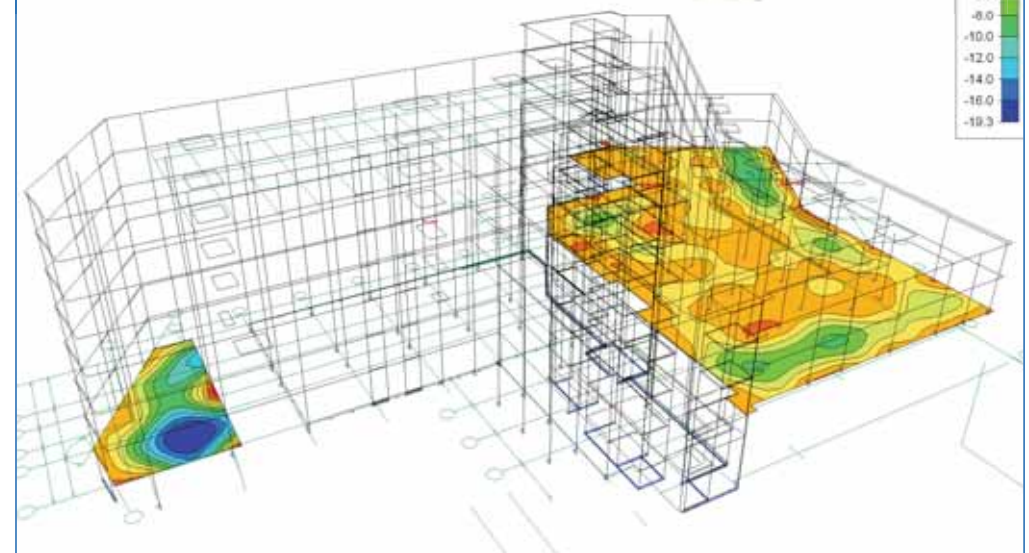
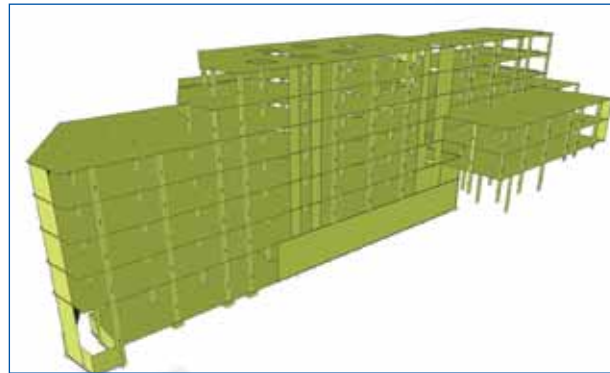
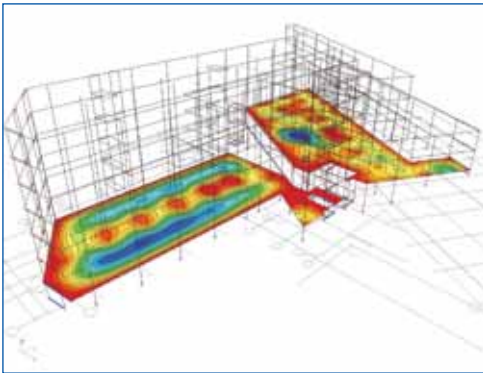
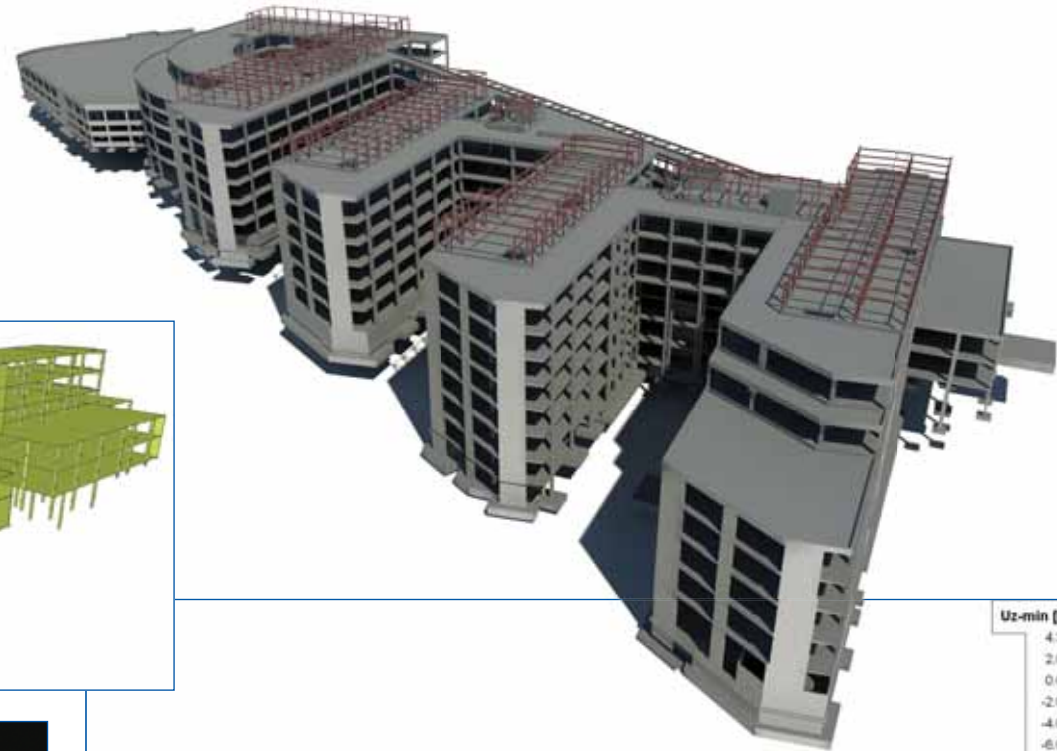
A four storey steel bridge spanning 25 m forms a corridor to link the wards in block 1.

Gifford has a total of eight Revit Structures models, built in three different offices which, when merged together, form a complete frame as shown on the image to the right.

Revit models were produced for each structure and then imported into Scia Engineer for loading and design.

Gifford responsibilities included:

- Structural Engineering
- Public Health Drainage
- Environment Development Planning
- Transport Planning
- Geotechnical Engineering
- Vibration Analysis
- Surveying
- Highways and Civil Engineering



Grontmij Steel Partners

Contact Cornelis Bergsma
 Address Haydnstraat 2
 8031ZA Zwolle, Netherlands
 Phone +31 384554600
 Email cornelis.bergsma@stoelpartners.nl
 Website www.stoelpartners.nl / www.grontmij.com



Grontmij | Steel Partners

The consulting engineering firm Grontmij Steel Partners (GSP) operates in mainly two disciplines.

Grontmij Steel Partners Building advises its clients in the field of building science. Project management, the development of drawings, specifications and calculations and monitoring on site are among its services. Clients are private companies, public agencies, architects, housing associations, project management offices and contractors.

Grontmij Steel Partners Consulting Engineers advises its clients in the field of building structures. On the basis of the design ideas of architects, Grontmij Steel Partners designs structures. For architects, Grontmij Steel Partners Consulting Engineers can act as a facilitator to complete their design.

For Grontmij Steel Partners an important principle in the design of building structures is the cooperation with the design team. GSP will support the architectural design and if possible even enhance it. The simultaneous design by architect and engineer in workshops at the start of a project has a positive influence on the outcome of the project.

The mission of Grontmij Steel Partners is: to give 'independent, professional and pleasant' advice to clients in building sector.

Grontmij Steel Partners has 31 employees.



Achmea office, Zwolle

A fascinating sea of columns, made of concrete and steel, supports this intriguing building. The outward stepping structure of the high-rise part immediately attracts ones attention. Lightweight composite steel/concrete floors supported by steel beams and columns which cross each other make this, out of the ordinary looking, structure possible. One can immediately understand that complex computer software was used to calculate the forces in the structure of this stylish building.

Short Description

Project Information

Owner: Achmea
Architect: LKSVD
General Contractor: Salverda - Trebbe
Engineering Office: Steel Partners Zwolle

Construction Start: 01/02/2006
Construction End: 27/10/2007
Location: Zwolle, Netherlands



Introduction

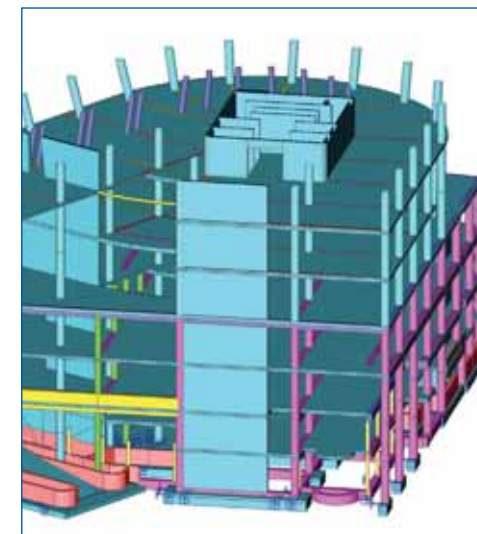
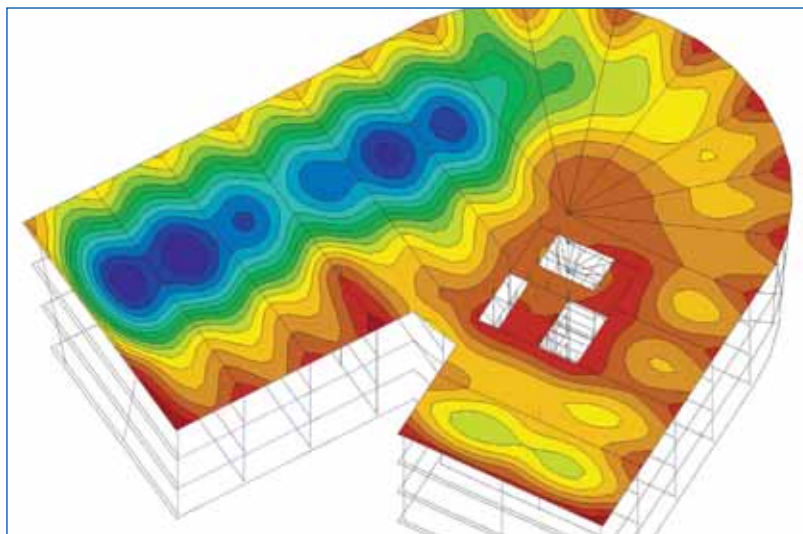
For Groene Land Achmea an office building was constructed to house 1100 employees. The building has 18.000 m² of office space and a 9.000 m² large parking garage that can keep up to 300 vehicles. In total 642.800kg of structural steel and ca. 9.100 m³ of concrete was used. The high-rise part of the building reaches 41,5 m divided over eleven storeys (including a technical installation level). The low-rise part of the building reaches 26,3 m divided over 7 storeys. The bottom four layers of the building contain a parking garage situated over two storeys and two storeys of office space.

Construction

The construction of the building consists of two separate structures: a concrete structure for the skeleton of the middle and lower part of the building and a mainly steel skeleton for the slanted tower.

The concrete skeleton consists of round prefabricated columns and beams supporting a hollow floor with an in situ concrete top.

Horizontal forces on the building are transported via the floors to the lift-shafts. These lift-shafts constructed of prefabricated concrete are situated in the high-rise and low-rise part of the building and ensure stability.



Used software: Scia Engineer

For the round outward slanting high-rise part of the building a lightweight structure consisting of steel columns and beams and composite steel/concrete floors was chosen.

Design

In his preliminary design the architect chose for a floor bearing structure consisting of a beam over three columns. One upright steel column (610 mm dia.) at the right gable and two (middle and left gable) slanting ones towards the outward slanting left gable. This would create enormous horizontal forces on the prefabricated lift-shafts. The design of the architect was slightly changed by reversing the angle of the middle columns (2 x 406,8 mm dia.). The horizontal forces resulting from the slanted columns neutralise each other largely. The outer column (610 mm dia.) slants 1200 mm outward per 3600 mm storey and by means of iteration a 600 mm slant for the middle columns (2 x 406,8 mm dia.) was determined. This was a logical choice, for the middle column carries approximately twice the load of the outer columns. The structure was modelled in Scia Engineer and an ocean of results became available. To verify the results of the 3D calculation, a 2-dimensional calculation was converted to "3-D", with utmost exertion and many hours of labour, to check the resulting horizontal forces on the prefabricated lift-shaft. The results came within 5% of each other. Designing this building using Scia Engineer was of enormous value to the project.

Interesting numbers and facts

The torsion moment on the high-rise lift shaft exceeds 39.100kN.m. The bending moment on the high-rise lift shaft exceeds 129.560kN.m in the extreme case. The shear force on the high-rise prefabricated lift shaft is ca. 4.950kN. The extreme windload on the total structure exceeds 6100kN (610.000kg).

The expected extreme horizontal deformation of the roof will not be greater than 45 mm.

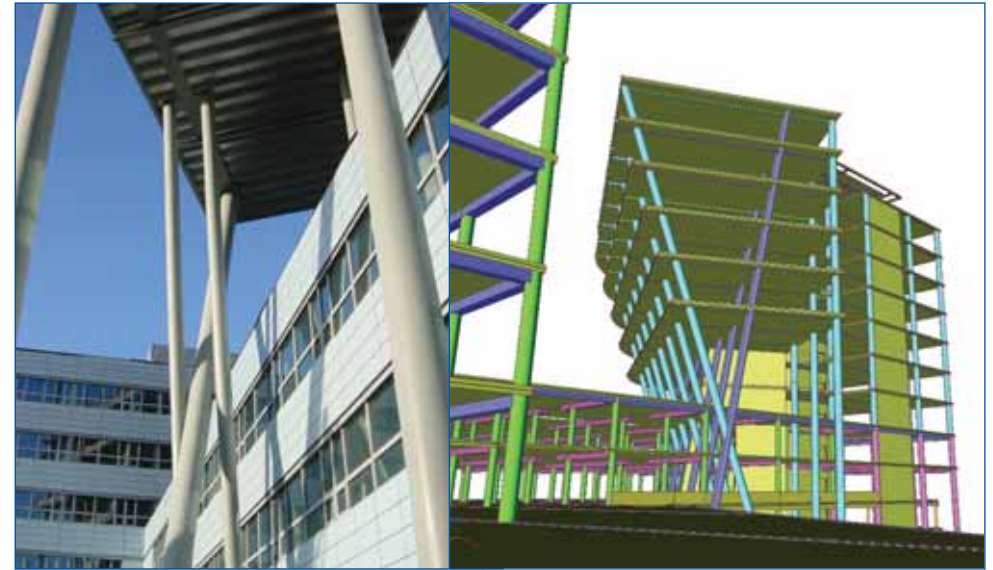
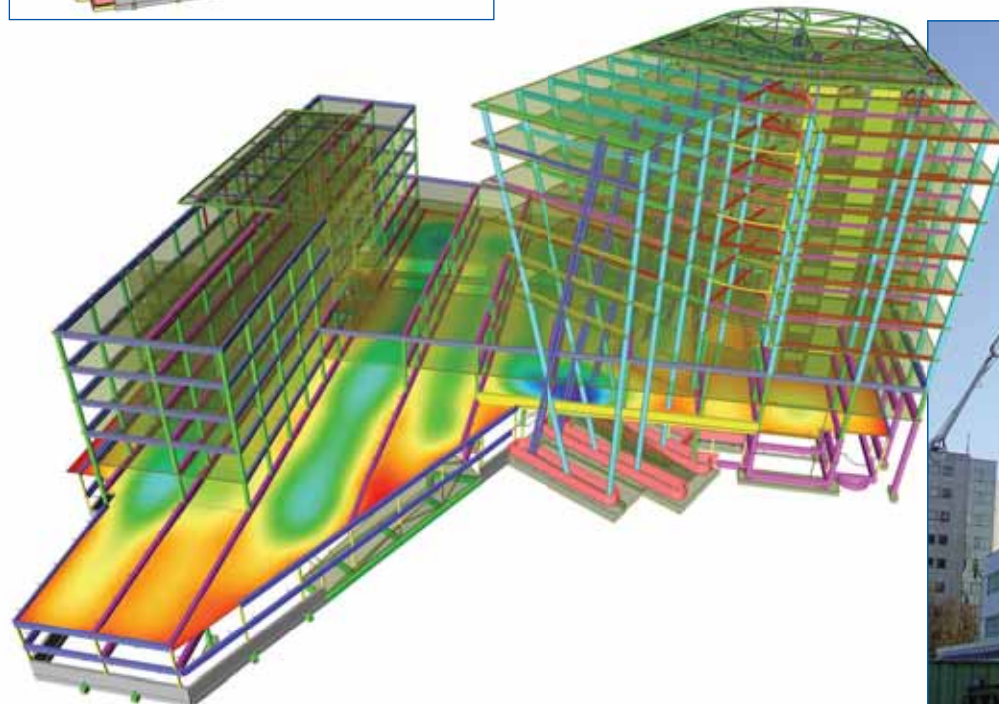
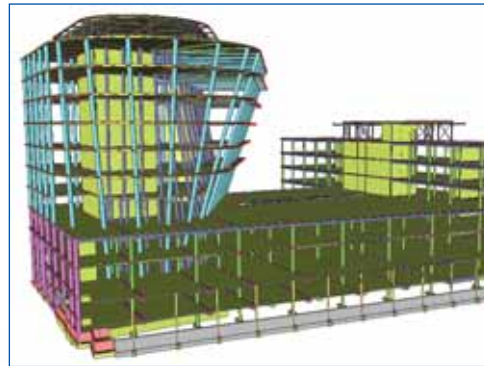
Steel columns with a diameter of 610 mm, a thickness of 12 mm and a length of 25.100 mm were used, as well as columns with a diameter of 406,8 mm, a thickness of 20 mm and a length of 24.150 mm. HEA600 steel beams with a span greater than 13.500 mm were used in the top storey floor.

For the high-rise part of the building no storey has the same size due to the slanting of the left gable and the beams have varying lengths for the eleven storeys.

More than 573 prefabricated concrete piles make up the foundation of the building.

In the high-rise part of the building it took the contractor 14 days to assemble the structure of one storey and proceed with the erection of the next one.

The building was completed within 20 months.



Hale Allen Jones

Contact Dave Chesher
Address 8 Chalk Hill House, 19 Rosary Road
 Norwich
 NR1 1SZ Norfolk, United Kingdom
Phone +44 1603 664499
Email dchesher@haleallenjones.co.uk



At Hale Allen Jones we have provided a quality engineering consultancy to the construction industry for over 35 years. Our experience and knowledge of Structural, Civil and Highway Engineering enables us to offer an excellent service to Developers, Contractors, Individual Clients, Architects and Surveyors.

The Practice originally dates back to 1968 with the current Practice being formed in 1986 by the merger of two established firms, Eagling & Allen and Hale & Associates and therefore there has been a continuous involvement in Consulting Engineering since 1968.

Over the years the Practice has gained expertise in many fields of Engineering with Partners and staff having undertaken commissions in all areas of work.

The nature of the commissions has ranged from a partial service to a complete service including design and construct works and total management of multi-disciplined Engineering contracts. Also, the Practice has been involved in emergency stabilising works and specialist advice.

As well as general work as Consulting Engineers the Practice undertakes work as Expert Witnesses, Planning Supervisors for the Health and Safety CDM Regulations and also acting as Party Wall Surveyors under the Party Wall etc Act 1996.

The Practice maintains a suite of the latest computer analysis, design and drawing programmes enabling complex structures and problems to be quickly and rapidly assessed and drawn. This includes all aspects of structural, civil, highway and drainage design.

All projects have the involvement of one or more of the Partners or Associate and they are involved in the day to day Engineering and administration of the projects. Technical staff are allocated to an individual project as required.

There is a regular appraisal of work in the office and we have our own Engineering and Management Control Systems.

To comply with the CDM Regulations full Designer Risk Assessments are carried out on every project with a system for carrying out the necessary checks.



Chrisp Street Project, London

Short Description

This project regards the design of a landmark building that would integrate with the plans for the future development of the area. The structure is 15 storeys high but is comprised of a stepped design and has three roof terraces at 5th, 11th and potentially at 15th floor levels.

There is a commercial restaurant area proposed at ground floor with separate private and affordable flats above the first floor. The internal wall construction is to be of lightweight stud partitions of robust construction as required by the present Building Regulations and there is some scope for later flexibility in the final layouts of the rooms, with options available for the number of bedrooms that can be accommodated in the flat layouts.

Project Information

Owner: Vasthouse Ltd
Architect: BUJ
General Contractor: Bell Projects Ltd
Engineering Office: Hale Allen Jones

Construction Start: 05/2007
Construction End: 08/2009
Location: London, United Kingdom



An RC framed structure in central London to accommodate social and private housing accommodation together with commercial use at ground floor level.

Scia software was used to model the structure from the Architects planning drawings to initially assess the preliminary pile loads and provisionally assess reinforcement requirements.

Background

The site occupies approximately 0.1165 hectares and is located to the south side of Carmen Street, immediately alongside the Docklands Light Railway. The site development was intricately linked with the development of a new DLR Station known as Langdon Park (now open) and required close liaison with the DLR and some exchange of land was negotiated with the DLR to achieve the developments. A new footbridge over the DLR is situated at the end of Carmen Street, and will be clearly defined in the gateway between 120 - 132 Christ Street and an adjoining future development scheduled for construction to the north of Carmen Street. The prestige development of the site was considered instrumental in the proposed redevelopment of the area from the Canary Wharf Development four stations away on the DLR and this building is intended to encourage and be a potential catalyst in the development of this sector of the Borough.

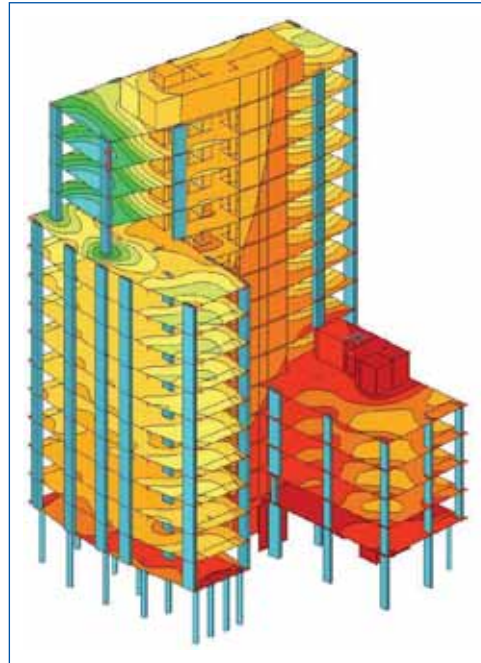
BUJ Architects therefore embarked upon the design of a landmark building that would integrate with the plans for the future development of the area. The structure is 15 storeys high but is comprised of a stepped design and has three roof terraces at 5th, 11th and potentially at 15th floor levels. The columns did not always line through and areas of heavily reinforced stiffened edge beam were introduced along perimeter edges to support intermediate column positions following a decision by the Architects to deduce the number of columns at ground floor level during the construction stages.

There is a commercial restaurant area proposed at ground floor with separate Private and Affordable flats above first floor. The internal wall construction is to be of lightweight stud partitions of robust construction as required by the present Building Regulations and there is some scope for later flexibility in the final layouts of the rooms, with options available for the number of bedrooms that can be accommodated in the flat layouts.

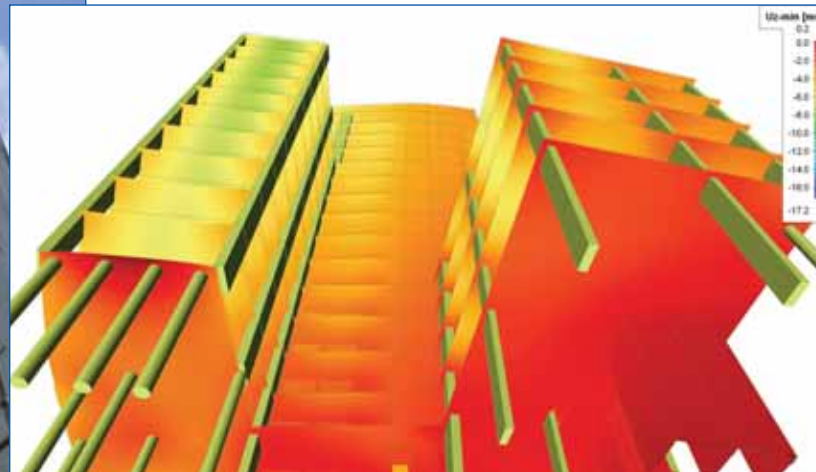
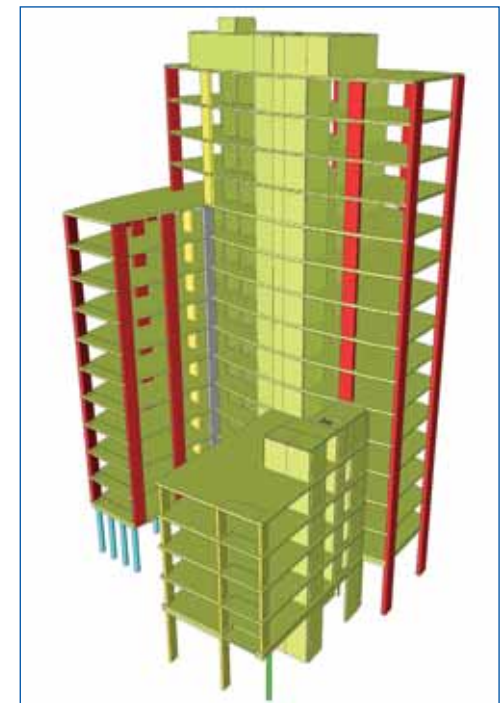
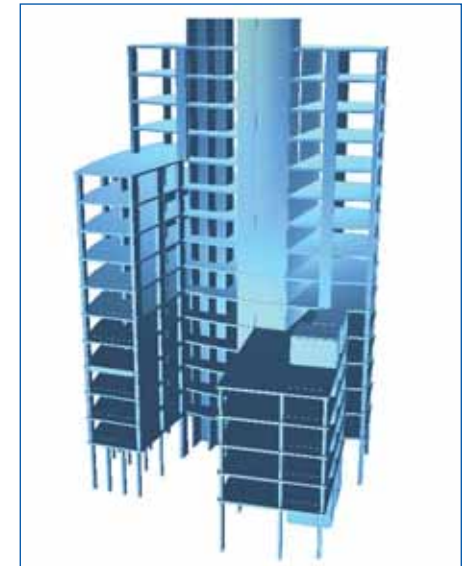
Scia Software was used to model the structure from the Architects planning drawings to initially assess the preliminary pile loads and provisionally assess reinforcement requirements. The structure consists of reinforced concrete pile caps supporting the lift and stair core walls together with the column loads. The structure is primarily of concrete flat slab construction with three transition floor structures, supported by an

assortment of circular square and rectangular columns. The wind shear was the subject of a separate analysis with all columns input as being pin ended to ensure the full wind forces were transferred directly into the stair and lift core walls.

Detailed punching shear checks were carried out at essential locations using a variety of hand calculations in combination with proprietary manufacturers programs which were then compared during a checking evaluation. Final detailed design and detailing followed in accordance with a tight productivity program. The results were effective in achieving a compact and economic analysis and design. Various revisions to the design were easily accommodated within the tight construction program as the design continued to evolve and the construction progressed. There were the usual last minute requests for additional ducts in the floor plate. The output was clear and easily interpreted by the detailers. Scia Software enabled these requests to be fully analysed, and revised details issued, prior to the concrete pour. Once again this program has proved to be essential in the evaluation of the structure and enabled issue of information dead lines to be met.



Crisp Street Project, London



Hale Allen Jones

Contact Dave Chesher
Address 8 Chalk Hill House, 19 Rosary Road
Norwich
NR1 1SZ Norfolk, United Kingdom

Phone +44 1603 664499
Email dchesher@haleallenjones.co.uk



HALE ALLEN JONES

At Hale Allen Jones we have provided a quality engineering consultancy to the construction industry for over 35 years. Our experience and knowledge of Structural, Civil and Highway Engineering enables us to offer an excellent service to Developers, Contractors, Individual Clients, Architects and Surveyors.

The Practice originally dates back to 1968 with the current Practice being formed in 1986 by the merger of two established firms, Eagling & Allen and Hale & Associates and therefore there has been a continuous involvement in Consulting Engineering since 1968.

Over the years the Practice has gained expertise in many fields of Engineering with Partners and staff having undertaken commissions in all areas of work.

The nature of the commissions has ranged from a partial service to a complete service including design and construct works and total management of multi-disciplined Engineering contracts. Also, the Practice has been involved in emergency stabilising works and specialist advice.

As well as general work as Consulting Engineers the Practice undertakes work as Expert Witnesses, Planning Supervisors for the Health and Safety CDM Regulations and also acting as Party Wall Surveyors under the Party Wall etc Act 1996.

The Practice maintains a suite of the latest computer analysis, design and drawing programmes enabling complex structures and problems to be quickly and rapidly assessed and drawn. This includes all aspects of structural, civil, highway and drainage design.

All projects have the involvement of one or more of the Partners or Associate and they are involved in the day to day Engineering and administration of the projects. Technical staff are allocated to an individual project as required.

There is a regular appraisal of work in the office and we have our own Engineering and Management Control Systems.

To comply with the CDM Regulations full Designer Risk Assessments are carried out on every project with a system for carrying out the necessary checks.

Long Lane Project, London

Short Description

The development in Central London is a mixture of commercial, residential and affordable housing with naturally ventilated car park accommodation in the basement.

The ground floor is a mixture of glass and dark masonry which is set back behind the lines of the upper floors which are cantilevered out. The upper floors have a mixture of offset rendered panels and timber cladding which form balconies which reduces the mass of the 8 storey structure and breaks it up into distinct elements. The top floor penthouse is set back from the floor below but at this level is metal clad.

Project Information

Owner: Galliard Homes Ltd

Architect: GLAS Ltd & Galliard Homes Ltd

General Contractor: Galliard Construction Ltd

Engineering Office: Hale Allen Jones

Construction Start: 01/2005

Construction End: 09/2007

Location: 193-197 Long Lane,
Bermondsey, London, United Kingdom



An RC framed structure in Central London to provide Private and Affordable Housing with Commercial accommodation at Ground Floor and Mezzanine floor level, with a naturally ventilated Basement Car Park facility. Scia software was eventually sourced and appealed as being the most suitable design suite for the design of this project.

Background

The site was formally occupied by a warehouse that was demolished to make way for the new development on Long Lane which is generally undergoing a period of unprecedented redevelopment. The development is a mixture of commercial, residential and affordable housing with car park accommodation in the basement.

The Planners were keen to reintroduce a frontage to the road and the building therefore abuts the street. The site is essentially rectangular with non parallel

sides with the narrow end nearest to the street. The building is 'L' shaped with the base of the 'L' forming the edge of the street and the tail extending full depth into the site.

The ground floor is a mixture of glass and dark masonry which is set back behind the lines of the upper floors which are cantilevered out. The upper floors have a mixture of offset rendered panels and timber cladding which form balconies which reduces the mass of the 8 storey structure and breaks it up into distinct elements. The top floor penthouse is set back from the floor below but at this level is metal clad.

Scia software was eventually sourced and appealed as being the most suitable design suite for the design of this project. The structure was supported on 450 diameter piles 25m long taken into the London Clay beds. From these pile caps where designed to support the stair and lift core walls at ground floor



level and the RC columns at basement level. The main structure is of reinforced concrete framed construction with flat slab transition structures at ground floor above the basement car park and at first floor supported by RC cross walls. Circular columns are built off the ground floor flat slab which were then checked using Scia Engineer for punching shear and again the upper flat slab floors are supported on rectangular columns which were also subject to punching shear checks.

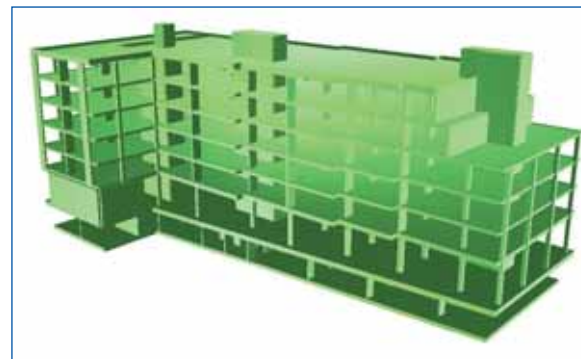
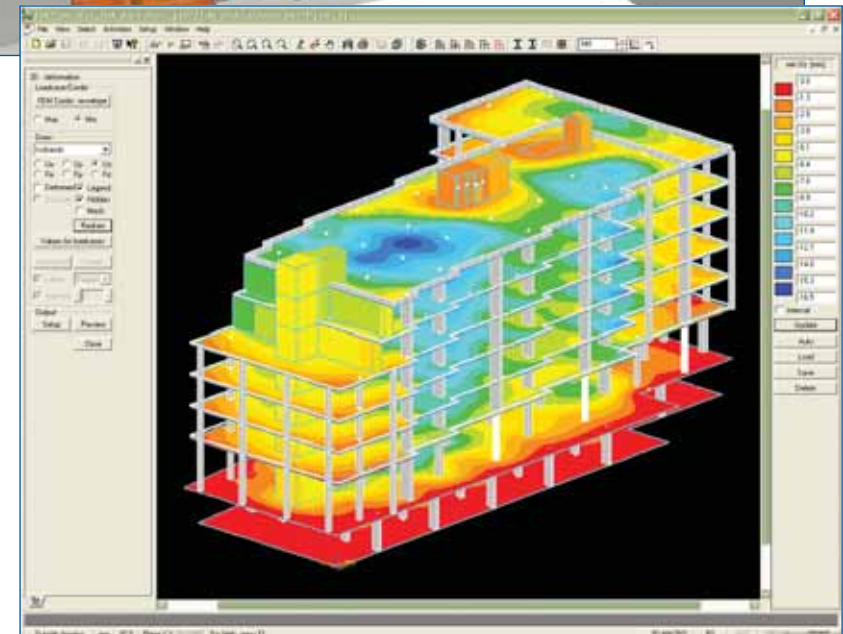
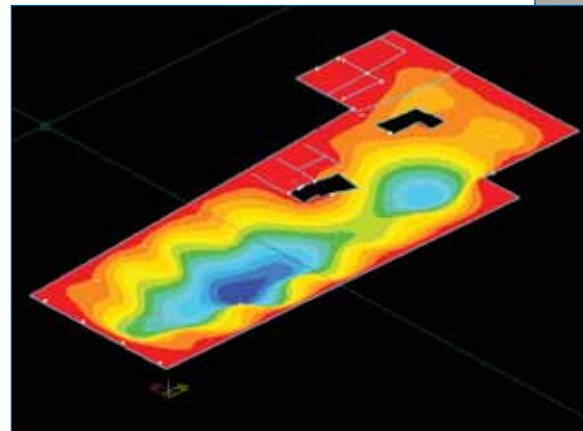
The lateral loads from wind forces are designed in a separate analysis to be carried entirely by three stair and lift cores with the columns designated as pin ended for this exercise to ensure they attract no wind moment which is then all taken by the shear walls of the main stair cores. The stair and lift cores are evenly distributed throughout the length of the structure which allows reasonable distribution of the wind and shear forces that result around the plan area of the structure.

The basement has a perimeter contiguous piled wall which is internally faced with a retaining wall designed to keep out ground water but is drained of any rainwater via a sump. The external access opening for vehicles prevents protection of the basement to a serious flood but is considered to offer a reasonable defence for all but the most extreme flood conditions.

The original reinforcement estimates from the early analysis, given at tender stage gave a reasonable indication of reinforcement weights at tender stage and were acceptable for use in a design and construct project, subject to variation during the construction stages.

It was found that last minute requests for addition duct capacity for services could be responded to efficiently and their implications could be fully checked out at short notice prior to the concrete pours proceeding. Such requests are not normally easily accommodated at short notice but the software was able to deal with these requests efficiently and it did not create too much of an issue.

Schedules for issue of information were consistently complied with and met and the project was progressed without delays and was completed ahead of program.



Ian Black Consulting Ltd

Contact Ian Black
 Address Wallace Buildings, 23 Market Place, Lisburn
 Northern Ireland
 BT28 1AN Co Antrim, United Kingdom

Phone +44 28 9267 6500
 Email ian.black@ianblackconsulting.co.uk



Ian Black Consulting Ltd
 Consulting Structural & Civil Engineers

Ian Black Consulting Ltd is a well established Structural and Civil Engineering Company based in Northern Ireland, with a vast breadth of experience, providing engineering services to clients in Northern Ireland, Republic of Ireland and the UK mainland inclusive of considerable experience in Design and Build procurement having completed numerous large schemes ranging from £5 million to £25 million. The services of Structural Engineering, Civil Engineering, Site Appraisals and CDM Co-ordinator are offered in an extremely professional yet personable manner while recognising that quality of design and attention to detail are key issues in realising the aspirations of architects and clients alike.

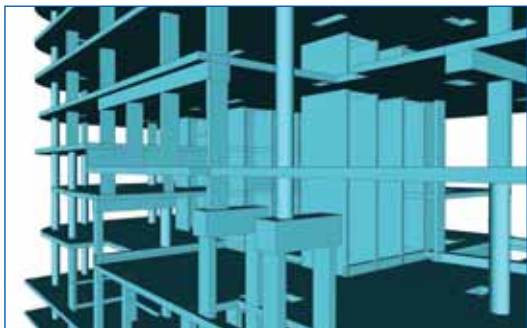
Structural Engineering forms the primary business and is focussed on providing and delivering a quality package to the client of structures that are functional, durable and economically viable. Fields of expertise cover commercial (office/retail structures), educational buildings, structures for the leisure industry and residential accommodation. Civil Engineering commissions are undertaken for infrastructure works associated with new residential

and commercial developments comprising the design and detail of roads/drainage and liaising with statutory authorities to ensure projects are completed with minimum disruption.

The Company is also experienced in commissions relating to the appraisal of development sites in relation to potential foundation issues, infrastructure difficulties etc and the assessment and refurbishment of existing structures.

Ian Black Consulting Ltd utilizes the very latest in Information Technology and computer aided design resources with considerable expertise in advanced analytical techniques such as Scia Engineer that are constantly developing in line with the progression within the industry.

The Company are Construction Line registered and a member of the Association for Consultancy & Engineering (ACE) and in order to ensure an efficient service to clients operates a Quality and Environmental Management system, attaining and maintaining ISO14001 certification and a Quality system compliant with the requirements of ISO 9001.



Swiss Centre, Leicester Square, London

Short Description

The project regards an 11 storey concrete framed building over 2 storeys of integral basement. The Swiss Centre has an impressive glass façade, in which mixed led illumination will be applied; it is situated on the prestigious Leicester Square and comprises a deluxe 5-star hotel accommodation, high quality retail, leisure facilities (a casino in the basement), restaurants and high specification penthouse apartments with spectacular views over central London.

From foundations to the finished product Ian Black Consulting Ltd realised the structural design of the Swiss Centre. With the latest software and modelling techniques they created a new iconic landmark for the London skyline.

Project Information

Owner: Swiss Centre Ltd
Architect: Jestico & Whiles
General Contractor: McAleer & Rushe
Engineering Office: Ian Black Consulting (Lisburn)

Construction Start: 01/09/2008
Construction End: Spring 2010
Location: London, United Kingdom



Overview

The site occupies approximately 1800 square metres in Leicester Square, London with the project comprising a Design and Build procurement to construct a 200+ bedroom 5 star deluxe hotel over 9 floors, 10 high specification duplex apartments above the hotel structure, retail and commercial use at ground floor and a two storey basement for leisure use (Casino) formed inside the original basement structure. The building façade is to comprise a unitised system with a single glazed glass veil suspended from 8th floor but requiring lateral support at each floor.

Substructure

A piled solution was adopted for the foundation design and due to height restrictions below temporary props piling was constructed utilising low headroom piling rigs which limited the piles to a 450 mm diameter bored pile with a SWL of 1200 kN cored through the existing basement raft and terminating in very stiff London Clays at approximately 25 m. The structural piling and substructures also had to be co-ordinated with 100 mm diameter geothermal piles approximately 100 m long that were used to assist with the heating and cooling of the building. Due to the close proximity of London Underground tube lines (Piccadilly line) which runs approximately 9 m from the face of the building at a depth of

approximately 31.5 m to the crown of the tunnel an extensive design process and subsequent negotiations regarding sequence of work etc had to be undertaken to ensure that the new piled foundations when installed in a controlled manner (inclusive of sleeves to the piles) should not have any detrimental effect on the underground tunnels.

Basement

The basement slabs comprise reinforced concrete flat slabs spanning between reinforced concrete columns and walls with the new basement walls comprising a conventional reinforced concrete structure cast against the existing retaining walls that are being retained, the new wall being propped at floor levels. The basement retaining walls and the lower basement slab are constructed using Caltitite water resisting concrete to provide a dry (Grade 3) environment in the basement areas.

Ground Floor

The ground floor generally comprises a 325 mm reinforced concrete flat slab on two distinct levels to create retail and restaurant usage. A loading bay with a 'break out' zone for future plant replacement had to be incorporated into the slab design, the loading bay being designed for an imposed loading of 15kN/sqm. In order to achieve this, the loading area and 'break out' zone is trimmed by reinforced concrete

Used software: Scia Engineer

downstand beams with the breakout zone comprising a semi-precast concrete system. Due to the requirements of the utility providers the slab to the transformer room is placed at a depth of 1.1 m below the main slab requiring reinforced concrete beams to achieve acceptable deflection requirements.

Superstructure

The structural frame comprises an in situ reinforced concrete frame utilising a column grid of 7.6 m x 9.0 m. The structure comprises a 325 mm reinforced concrete flat slab spanning between columns varying in size depending on level and location but are generally 800 x 300 mm in bedroom floors and 600 mm diameter in public areas. Transfer structures are required primarily at first floor level to create an acceptable column layout on the lower floors, the transfer being achieved using in-situ reinforced concrete downstand beams spanning between reinforced concrete columns, all transfer beams being designed to resist blast loadings. The 8th floor above which the apartment structure commences utilises a 450 mm deep flat slab to transfer the loadings from the apartment levels above to the main frame.

The floor slabs are designed to accommodate the following uniform imposed load set out below.

Guestroom floors

- Bedroom live load: 2.0 kN/m²
- Partitions: 1.5 kN/m²
- Corridor and staircase live load: 4.0 kN/m²
- Ceiling and services: 0.5 kN/m²

Public /Business/Administration area

- Live load: 5.0 kN/m²
- Partitions: 1.0 kN/m²
- Ceiling and services: 0.5 kN/m²

Other areas in the building will be designed to accommodate the following live loads

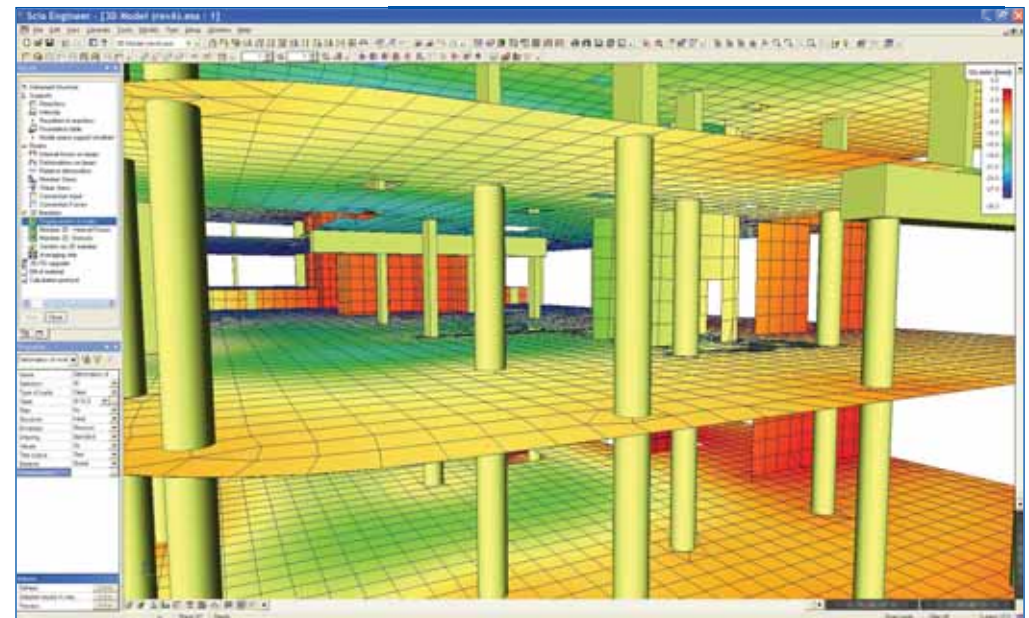
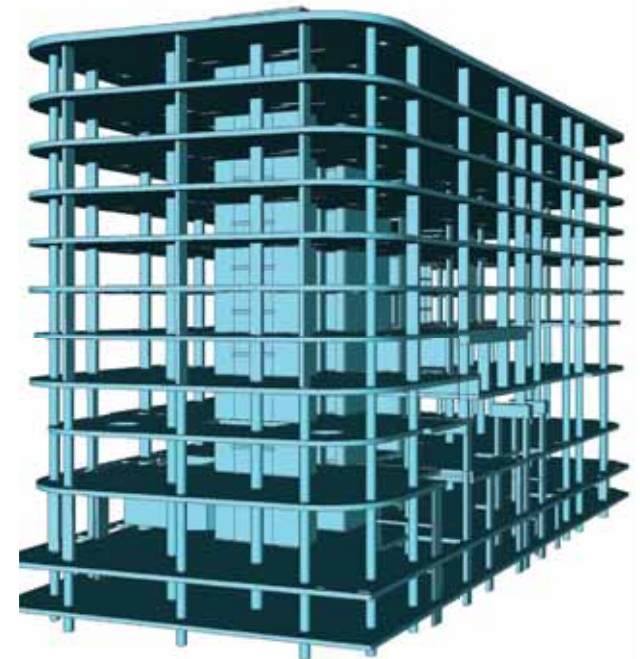
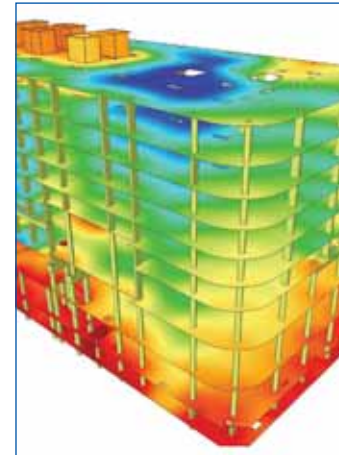
- Public toilets: 2.0 kN/m²
- Kitchen and ancillary areas: 3.0 kN/m²
- Roof (maintenance access only): 1.0 kN/m²
- Plant rooms: 7.5 kN/m²
- Loading bay and car parking areas: 15.0 kN/m²

The building has an entirely glass façade, the façade and unitised system being contractor designed with the structural frame having to be designed for deflection limits of the lesser of L/500 or 20 mm under imposed loads and creep deflections and L/250 under dead and imposed loads, the deflection limitations being of paramount importance on slab edges due to the glazed façade of the building attaining lateral support at each floor.

Resistance to lateral loads is achieved by the diaphragm action of the reinforced concrete floors transferring the lateral loads to a series of concrete shear walls primarily around the lift cores, the shear walls generally 250-300 mm thick reinforced concrete elements constructed using conventional formwork technology.

The structure is also designed for disproportionate collapse with key elements designed as protected members to provide additional robustness and damage resistance.

The building is currently under construction and is due to be completed in Spring 2010.



IGUBA, s.r.o.

Contact Ivan Guba
Address Miletičova 70
Miletičova 70
821 09 Bratislava, Slovakia
Phone +421 2 5341 5370
Email iguba.sro@mail.t-com.sk



The company

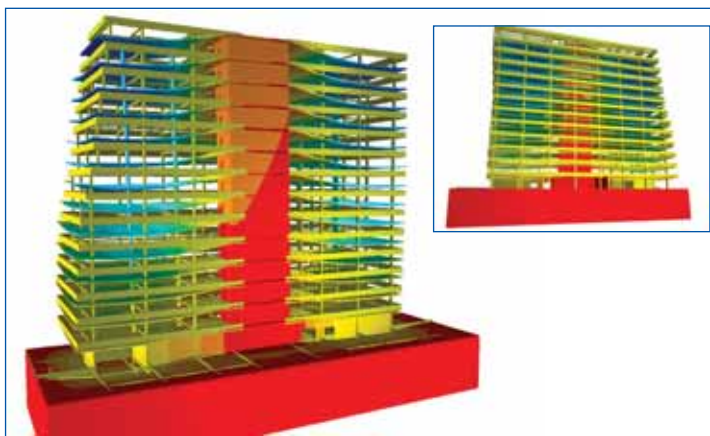
The IGUBA company was established in 1997. The owner, Ivan Guba, is a static engineer who works on his own. The annual turnover of the company amounts from 60.000 to 75.000 Euros.

- Structural engineering
- Civil engineering: all about static and construction
- Design of the static of residences and commercial buildings
- Diagnostics of bearing constructions
- Technical consulting

Projects since 1990

- Lift shaft of 120 m height for a Boiler Steam Structure 2x500 MW in Shen-Tou (China)
- Some platforms for a Boiler Steam Structure 2x360 MW Jorge Lacerda IV (Brasil)
- Reconstruction of the Bank „METROPOL“, Bratislava (Slovakia)

- Steel Structures of many Tank and Oil Stations „AVANTI“ (now SHELL) in the Slovak Republic, Czech Republic, Hungary, Austria, Rumania, etc.
- Commercial building „Swietelsky“ in Bratislava (Slovakia)
- Secondary Combustion Chamber & Steam Boiler and Flue Gas Cleaning in Nyborg (Denmark) – see my project in Scia User Contest Book 2002, p. 80
- Object of Furniture ATRIUM Bratislava (Slovakia) - see my project in Scia User Contest Book 2005
- Technological Centre E.O.S. Žilina (Slovakia) - see my project in Scia User Contest Book 2007
- Hockey Hall Macharova Bratislava (Slovakia) - see my project in Scia User Contest Book 2007
- Shopping-storing project Vajnorska Bratislava - see my project in Scia User Contest Book 2007



Emporia Towers, Bratislava

This project regards the static of the reinforced concrete structure (C30/37) for the Emporia Towers Building in Bratislava–Slovakia, which will be mounted from January 2008 to May 2009. The supporting structure of the object is made of reinforced concrete from spilt concrete consisting of vertical wall and horizontal board elements forming a compact unit with transversal as well longitudinal stiffening in horizontal and vertical planes. The total length of these two towers together is $2 \times 53,1 = 106,2$ m, the width approximately 17,4 m, the surface area 1842 m² and the volume more than 105.000 m³. The total volume of reinforced concrete for the structure amounts up to $2 \times 10,000 = 20,00$ m³ and its weight up to $2 \times 25000 = 50,000$ t. The total building costs come to 100,000.000 Euro.

Short Description

Project Information

Owner: Dipl. Ing. Ivan Guba
Architect: Dipl. Ing. Arch. Matej Siebert, Phd.
General Contractor: Emporia Towers, s.r.o., Bratislava
Engineering Office: Siebert+Talaš, s.r.o., Bratislava

Construction Start: 03/01/2008
Construction End: 30/06/2009
Location: Bratislava, Slovakia



This project regards the static of the reinforced concrete structure (C30/37) for the Emporia Towers Buildings in Bratislava–Slovakia; the buildings will be mounted from January 2008 to May 2009. The total length of these two objects together is $2 \times 53,1 = 106,2$ m, the width approximately 17,4 m, the surface area 1842 m² and last but not least the volume more than 105.000 m³. The total volume of the reinforced concrete for the structure amounted to $2 \times 10,000 = 20,00$ m³ and its weight to $2 \times 25000 = 50,000$ t. The Building costs are 100,000.000 Euro.

Description of the Structure

The reinforced concrete structure of the Emporia Towers has 21 modules 1-21, consisting of a box girder type 13-storeyed tower having a breadth distance of 17,40 m, and between which there is an expansion gap of min. 30 mm, so that the overall length of the towers will be 106,50 m. The supporting structure of the building is made of reinforced concrete from spilt concrete consisting of vertical wall and horizontal board elements forming a compact unit with transversal, as well longitudinal stiffening in horizontal and vertical planes. On the supporting circumferential walls there are, fastened from the outside, warming panels of a planar weight 30kg/m² protecting the hall from meteorological and precipitation influences of weather and of a thermal bridge.

The horizontal structures of the ceilings are formed with monolithic plates of a thickness of 250 mm with a span of max. 7,30 m. The double-armed stairway is monolithic too. The individual towers are stiffened by monolithic circumferential walls and an internal stairway-holding wall. On the front shield wall of the stores we see the main entrance with a dominant oblique monolithic roof.

Description of the Parts of the Concrete Structure

The primary supporting system of the project is combined in the transversal, as well as in the longitudinal direction and it has been calculated for every loading effect. The object of the project in the static calculation is especially the monolithic structure supported by circumferential walls from three sides (on the fourth side – the front one – there is a glass wall) and several supporting columns in axial distances of max. 7,00 m and it is considered as one special unit.

The vertical supporting structures of the building, as well as the horizontal supporting structures of the ceilings consist of monolithic plates of a thickness of 200 mm out of concrete C30/37, which according to the static calculation are mutually stuck.

The vertical communication areas – stairways – are situated in the stairway area limited by the internal supporting monolithic walls (thickness 200 mm),

which are limiting the stairway area (approximately 5,30 x 2,60 m).

All stiffening elements of the building are monolithic structures of the supporting system, i.e. they are designed in longitudinal, as well as in transversal direction; in the ceiling occur plane monolithic wall elements and on the fourth storey we also find supporting columns.

Foundations - Material and Loading Data

The foundation and the bearing structures were designed acc. to ENV 1993-1-1:1992 Eurocode 3. The design of the device consists of the calculation and evaluation of a number of load cases and their complex combination effect. Besides the dead load (own weight) was considered the live load; for ceilings it is the standardized value 2,50kN/m², for the stairway 3,00kN/m², for snow loading (area II.) so = 0,70 kN/m² and for wind loading $w_0 = 0,55 \text{ kN/m}^2$ (during erection and on the final building). After that was considered seismicity 7o MSK-64, category "A" and temperature loading (the shell structure received higher temperatures than the column support during the operation).

Description of the Static Calculation

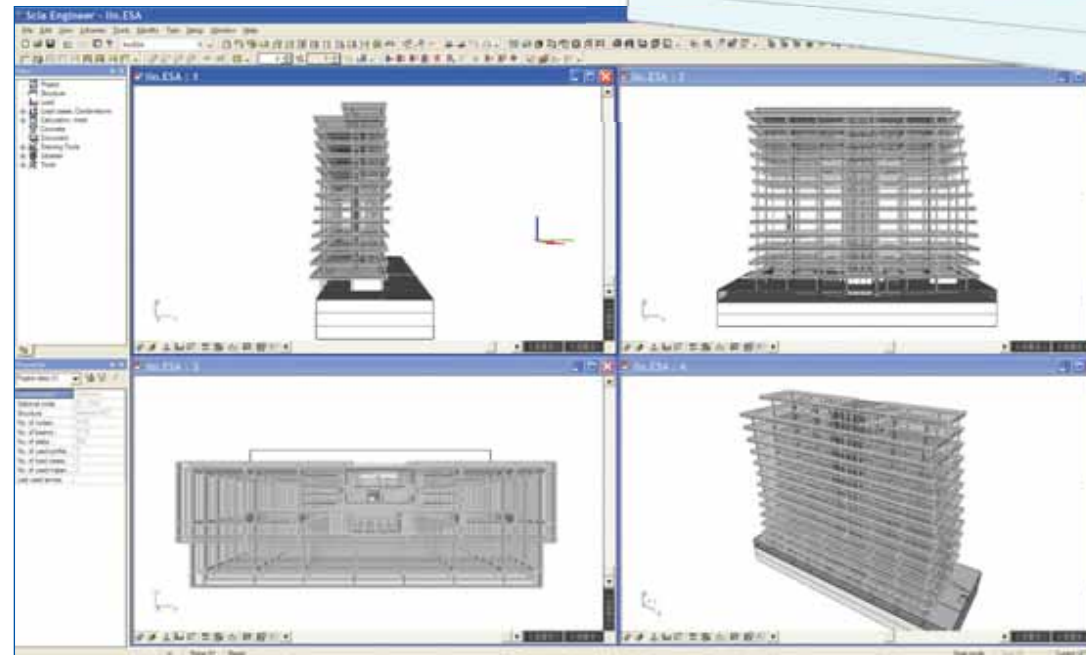
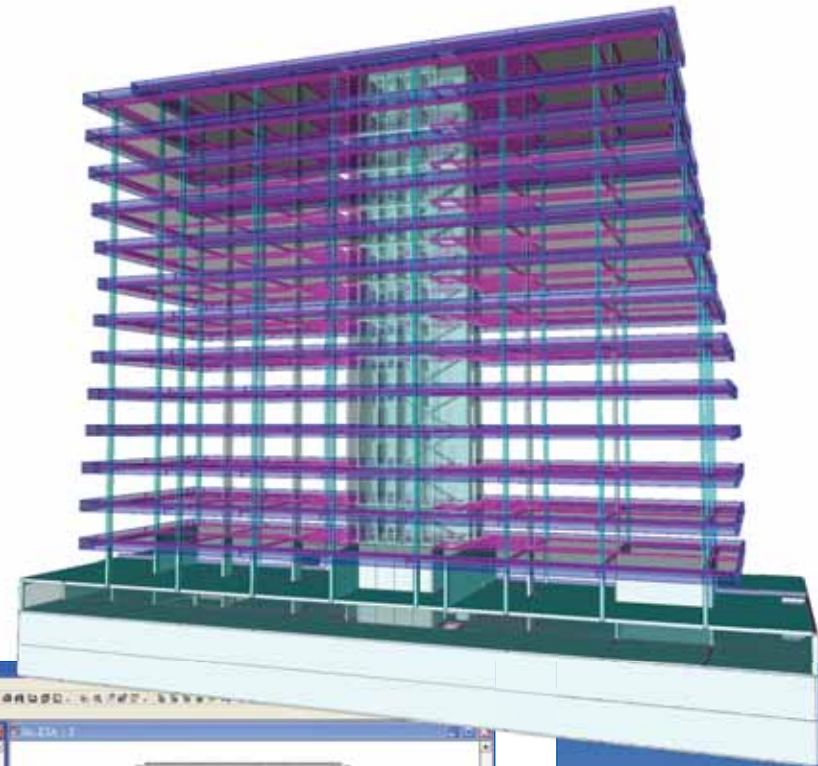
The static calculation is prepared with the software NEXIS rel. 3.100. The 80 most dangerous combinations were calculated acc. to ENV 1993-1-1:1992 Eurocode 3 with coefficient 1,35 in two basic combinations (bearing capacity and deformations).

The model contains 1385 macros in 1D and 2D.

Bearing Capacity, Deformations of the Walls and Ceilings

The text enclosure shows a bearing capacity of the walls and ceilings in relevant load case combinations (the same in the graphic enclosure). The nodes were selected in all four corners on each floor elevation.

The horizontal deformation in x, y direction should not exceed 1/1000 of node elevation above the support (of the structure as whole) acc. to the recommended limit deformations in ENV 1993-1-1:1992 Eurocode 3. The software evaluates extreme deformations in every direction separately (x, y, z) as well as maximum node rotation around the axes x, y, z.



IMd

Contact Mischa Andjelic, Pim Peters
 Address Jan Leentvaarlaan 62
 3065 DC Rotterdam, Netherlands
 Phone +31 10-2012381
 Email imd@imdbv.nl
 Website www.imdbv.nl



Organisation

IMd Raadgevende Ingenieurs is an organisation with a great core of highly qualified employees, who have been applying their experience, know-how and expertise for many years with regard to advising about, designing and working out main structures for buildings. At present the firm consists of 40 highly educated employees. IMd is completely independent and does not have any business links with manufacturers, suppliers, contractors, developers and other interested parties who could influence our impartial and independent consultancy.

IMd is a member of the Dutch association of consulting engineers (ONRI) and possesses the "quality management system" certificate according to NEN-AND-ISO 9001.

It is a firm where the internal communication proceeds smoothly and all employees are kept informed about the most recent developments.

In the almost 50 years that our firm has existed the quality of our service has always been a key issue. The most important characteristics of this service for us are:

- A good product that fits the budget of the client
- A product that fits the concept of the architect
- Creativity and ingenuity
- A flexible and service-oriented attitude

Projects

They vary greatly: from prestigious office complexes to pedestrian bridges, from houses to complex shopping centres, from alterations to new-housing and from simple and small to complex and large. Each project has its own charm and is a

constructive challenge. The projects are carried out at the request of property developers, government organisations, foundations, architects, contractors and private parties. This diversity in clients is made possible because of the independence of the firm of consulting engineers.

View IMd Raadgevende Ingenieurs

The view of IMd is that the success of a project largely depends on the first stage of the design process. The cooperation between architect, client, mechanical engineer and structural engineer is decisive in order to have a fine design in complex projects. In the preliminary design various alternatives are presented for the structure of a building. The advantages and disadvantages of every constructive alternative will then be discussed in the design team. Wishes of the client and architect, requirements in the field of building physics, possibilities regarding the technical installations: they all affect the choice of an optimal structural design.

In addition to the constructive design, IMd regards its role as a coordinating engineer as very important. In its existence IMd has built up a perfect reputation. In addition to the inspection of the basic principles of the drawings and calculations of suppliers of prefabricated concrete and steel constructions, the content of these elements is also assessed with great care. We ask the client to make it possible for us to carry out the consultancy work in a constructive way. In the end this will create the best result for the client.

Aircraft carrier as Pon head office

The office building of this project has the appeal of an aircraft carrier. To give shape to this idea, the building rises steeply from a water element. The 'bridge deck construction', lifted above the ground, consists of two building layers. The prestigious design has two elevations.

The building is supported by cantilevered pylons. In order to prevent deformation, prestressing was implemented in the in situ placed pylons and floors. To approach the occurring deformation in the best manner possible, IMd Raadgevende Ingenieurs have made an extensive analysis with the use of a three-dimensional computational model, processed with Scia Engineer. The constructive design aims at controlling the subsidence during the building phase as much as possible.

Short Description

Project Information

Owner: PON Onroerend goed, Nijkerk
Architect: QUA Architecten, Amsterdam i.s.m. Inbo Adviseurs Bouw Amersfoort, Amersfoort
Engineering Office: IMd Raadgevende Ingenieurs
General Contractor: Heijmerink Bouw, Bunnik

Construction Start: 19/06/08
Construction End: 30/06/09
Location: Almere, Netherlands



Introduction

Designed by architectural firm Qua, the new Almere head office of Pon – automobile- and equipment importer – was to become a building with the appeal of an aircraft carrier. To give shape to this idea, the building rises steeply from a water element. The 'bridge deck construction', lifted above the ground, consists of two building layers. The prestigious design has two elevations. The most remarkable one consists of the cantilevers, placed above the water. The opposite side serves as the building's backbone, and it reminds the viewer – because of its massive and dense appearance – of an aircraft carrier's engine. Through a slope, which gradually transforms into a platform, visitors are directed to the entrance. Apart from the building's allure, the client was also concerned with the aspect of durability, and the construction was designed accordingly.

Design

The main supporting structure was designed by IMd Raadgevende Ingenieurs. The in situ 'bridge deck' is supported by cantilevered pylons. Right on top of the floor, a whole different type of construction is created: a light steel construction with hollow core slabs and prefabricated concrete shaft walls. By using a crafty construction, including prestressing in the pylons located at the side ends, two-directional cantilevers of approximately nine metres have been created. The prestressing reduces possible deformations, in order to ensure the façade's impermeability. The pylons and the bridge deck's lower side have been constructed using aesthetical concrete. Partly because of the slender floor design, and the subsequent limited space for prestressing cables, it was decided that prestressing was only applied partially. This means that during everyday use, crack formation may



Used software: Scia Engineer

occur. Apart from prestressing, reinforced steel was implemented as well.

The design was composed and calculated three-dimensionally, using Scia Engineer. The 3D-computational model was principally used to analyse occurring deformations during the construction and post-construction phase. By including different levels of concrete rigidity, as well as different load sequences, the possible deformations were determined. The different levels of rigidity were determined with Scia Engineer-concrete section, using M-N-Kappa diagrams that included the variable degrees of creep deformation. Because of the eccentricity of the resulting load on the foundation, the building is likely to 'tilt'. This eccentric load is intercepted by the foundation. The foundation poles are implemented with a specific spring rigidity, in order to cope with the cantilever's deformation. Because of the large cantilevers, the calculated deformations are relatively large. That is why the building is 'curved' upward, using an arch, which ensures the subsidence to reach standard level after the construction phase.

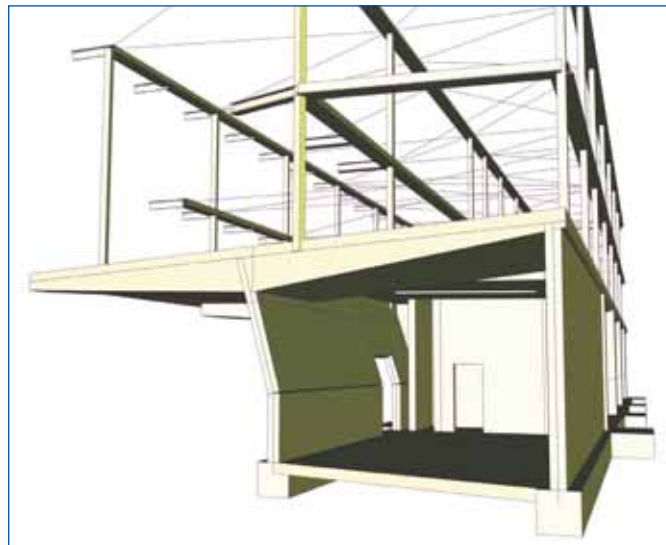
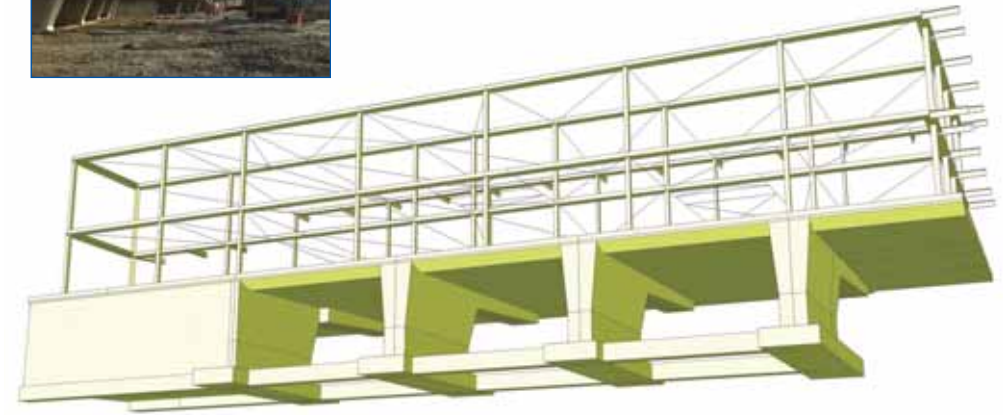
The prestressing was executed as a load case, and the position as straight eccentric cable offset.

Execution

During the execution, it is of great importance to control the subsidence. The form work construction, which has to be assessed higher because of the subsidence, has been determined by using a special arch plan. The temporary creep support will only remain on the cantilevered heads. They are regularly loosened, to jolt the building, and are twisted shut after that. That way, the building can experience controlled subsidence. To see whether the subsidence levels reach prior calculations, they are to be monitored in pre-determined building phases. The largest subsidence is to be expected during the construction phase. The steel framework of the superstructure is linked, during the concluding phase, to the hollow core slabs, which are constructed in the form of a disc. The superstructure deformations, due to the cantilever subsidence, are to be kept at a minimum during the execution. Bolt

connections are therefore left loose wherever possible, and the hollow core slab joints and -clefts are filled at the latest possible moment, to increase rotation capacity. The columns, too, are initially placed with a slight deviation, to make sure they end up standing straight.

During the eccentric prestressing, there is a considerable risk of unwanted crack formation in the visible part of the profiled concrete. To prevent this, stainless steel slabs are placed, serving as crack initiators. The massive pylons have a large concrete volume; crack-restraining reinforcement is to prevent the formation of too large shrinkage cracks.



IMd

Contact Remko Wiltjer, Michiel Niens, Albert Repko, Norman Breuer
Address Jan Leentvaarlaan 62
 3065 DC Rotterdam, Netherlands
Phone +31 10-2012381
Email imd@imdbv.nl
Website www.imdbv.nl



Organisation

IMd Raadgevende Ingenieurs is an organisation with a great core of highly qualified employees, who have been applying their experience, know-how and expertise for many years with regard to advising about, designing and working out main structures for buildings. At present the firm consists of 40 highly educated employees. IMd is completely independent and does not have any business links with manufacturers, suppliers, contractors, developers and other interested parties who could influence our impartial and independent consultancy.

IMd is a member of the Dutch association of consulting engineers (ONRI) and possesses the "quality management system" certificate according to NEN-AND-ISO 9001.

It is a firm where the internal communication proceeds smoothly and all employees are kept informed about the most recent developments.

In the almost 50 years that our firm has existed the quality of our service has always been a key issue. The most important characteristics of this service for us are:

- A good product that fits the budget of the client
- A product that fits the concept of the architect
- Creativity and ingenuity
- A flexible and service-oriented attitude

Projects

They vary greatly: from prestigious office complexes to pedestrian bridges, from houses to complex shopping centres, from alterations to new-housing and from simple and small to complex and large. Each project has its own charm and is a

constructive challenge. The projects are carried out at the request of property developers, government organisations, foundations, architects, contractors and private parties. This diversity in clients is made possible because of the independence of the firm of consulting engineers.

View IMd Raadgevende Ingenieurs

The view of IMd is that the success of a project largely depends on the first stage of the design process. The cooperation between architect, client, mechanical engineer and structural engineer is decisive in order to have a fine design in complex projects. In the preliminary design various alternatives are presented for the structure of a building. The advantages and disadvantages of every constructive alternative will then be discussed in the design team. Wishes of the client and architect, requirements in the field of building physics, possibilities regarding the technical installations: they all affect the choice of an optimal structural design.

In addition to the constructive design, IMd regards its role as a coordinating engineer as very important. In its existence IMd has built up a perfect reputation. In addition to the inspection of the basic principles of the drawings and calculations of suppliers of prefabricated concrete and steel constructions, the content of these elements is also assessed with great care. We ask the client to make it possible for us to carry out the consultancy work in a constructive way. In the end this will create the best result for the client.

Building complex 'De Kop van Boulevard Zuid'

Short Description

The project regards a complex and daring construction including a commercial area and two apartment buildings on top of it in the Feijenoord area of Rotterdam. The striking feature of the building complex is the 15 meter-measuring cantilevered façade, which reaches a height of approximately 50 meters. The complex' computational analysis of the façade, which has been outfitted with a large number of window openings, was carried out using 3D ESA-Prima Win. During the design process, extensive analyses were performed, in order to form a realistic estimate of the building's horizontal deformation. Aspects such as the subsidence of the Kedichem clay layer in the subsoil were also included.

Project Information

Owner: Celastian International, De Bilt
Architect: De Zwarte Hond, Rotterdam
General Contractor: Sprangers Bouwbedrijf, Breda
Engineering Office: IMd Raadgevende Ingenieurs B.V.

Construction Start: 01/01/2008
Construction End: 30/09/2009
Location: Rotterdam, Netherlands



Introduction

The Rotterdam Feijenoord area is the scene of action of the 'Kop van Boulevard Zuid' project. This project consists of a Media Markt store, with two apartment buildings - consisting of 6 and 13 storeys respectively - on top of it. The highest tower reaches approximately 50 meters, and is therefore, in terms of design, the most interesting. The 15 meter-measuring cantilever design is nothing short of spectacular. The position of the large number of window openings proved to be a complicating factor in the design of the cantilevered façade's supporting structure. In order to gain insight into the construction's adhesion, both a 2D- and 3D model were used for the entire tower, using ESA-Prima Win computational software.

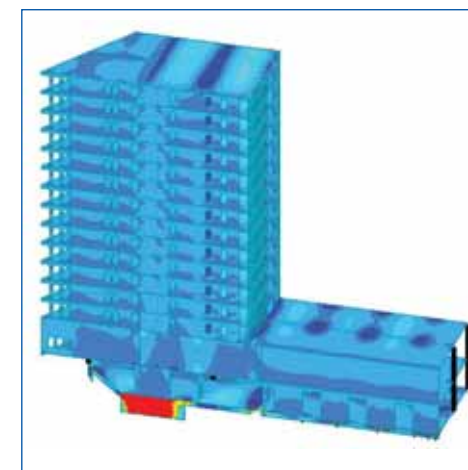
The project was designed by the architectural firm 'De Zwarte Hond', and is executed by the Sprangers building company. The complex consists of 61 apartments, 15 town houses, and a Media Markt store of 5.000 m².

Design

During the design process, the architect decided - after consulting IMd - to alter the initially rather common building construction, creating a complex and daring construction instead. At the store entrance, the corner column was removed, which gave a more open feel to the place. Aesthetically, the building improved spectacularly, by the creation of a

15-metre cantilever above the entrance. Furthermore, the number of wall slabs and columns was kept to a minimum in the store areas, which lead to a significant increase of space. The roof and the store's walls are used to ensure the stability of the two towers.

As is customary, the cantilever façade design was first processed at large, before turning into detail. Initially, simple manual calculations were carried out to determine the rough measures. Then, 2D computational models of the supporting walls were created, which were subsequently merged in a 3D model of the entire construction. The 3D computational model processed the one-way



Used software: ESA-Prima Win

stretching broad floor slabs as orthotropical slabs, in order to create the most realistic presentation of adhesion. At the cantilevered wall, the adjacent floors function as horizontal draw benches, and are reinforced accordingly.

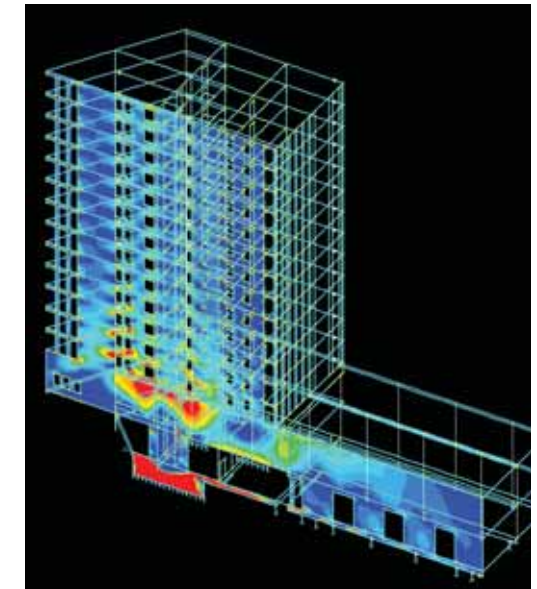
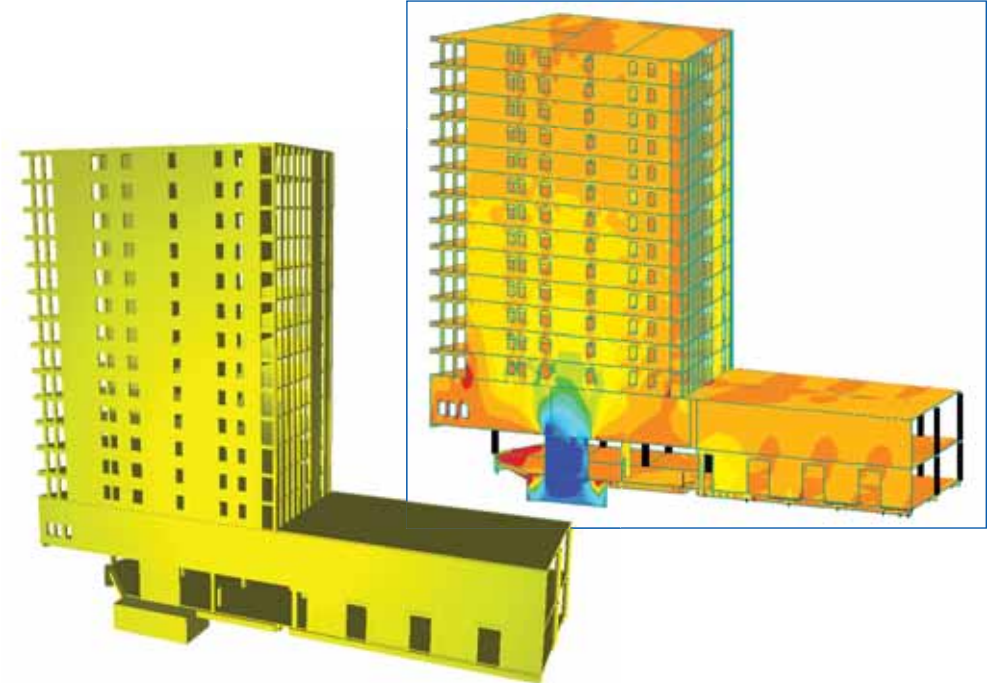
Development and execution

One of the more complex aspects of the design is the horizontal deformation of the building. As a result of the cantilever, the vertical load presses eccentrically in comparison with the foundation's mass centre, which may cause the building to tilt. This effect is strengthened by the presence of the so-called Kedichem clay layer below the foundation pole-bearing sand package. This layer consists of relatively weak clay, which is prone to deform when experiencing high pressure.

In order to reduce the building's total rotation, the façade corbel is cantilevered on both sides during the preliminary construction phase, and vertically kept apart from the adjacent low-rise buildings. This way, the horizontal displacement is reduced tremendously, and during the preliminary construction phase, the wall will shift downwards in an almost straight line. Results that were measured during the construction showed that this approach indeed has the desired effect.



Building complex 'De Kop van Boulevard Zuid'



IMd

Contact Remko Wiltjer, Rob Treels, Matthij Moons,
Arnout van IJsseldijk
Address Jan Leentvaarlaan 62
3065 DC Rotterdam, Netherlands

Phone +31 10-2012381
Email imd@imdbv.nl
Website www.imdbv.nl



Organisation

IMd Raadgevende Ingenieurs is an organisation with a great core of highly qualified employees, who have been applying their experience, know-how and expertise for many years with regard to advising about, designing and working out main structures for buildings. At present the firm consists of 40 highly educated employees. IMd is completely independent and does not have any business links with manufacturers, suppliers, contractors, developers and other interested parties who could influence our impartial and independent consultancy.

IMd is a member of the Dutch association of consulting engineers (ONRI) and possesses the "quality management system" certificate according to NEN-AND-ISO 9001.

It is a firm where the internal communication proceeds smoothly and all employees are kept informed about the most recent developments.

In the almost 50 years that our firm has existed the quality of our service has always been a key issue. The most important characteristics of this service for us are:

- A good product that fits the budget of the client
- A product that fits the concept of the architect
- Creativity and ingenuity
- A flexible and service-oriented attitude

Projects

They vary greatly: from prestigious office complexes to pedestrian bridges, from houses to complex shopping centres, from alterations to new-housing and from simple and small to complex and large. Each project has its own charm and is a

constructive challenge. The projects are carried out at the request of property developers, government organisations, foundations, architects, contractors and private parties. This diversity in clients is made possible because of the independence of the firm of consulting engineers.

View IMd Raadgevende Ingenieurs

The view of IMd is that the success of a project largely depends on the first stage of the design process. The cooperation between architect, client, mechanical engineer and structural engineer is decisive in order to have a fine design in complex projects. In the preliminary design various alternatives are presented for the structure of a building. The advantages and disadvantages of every constructive alternative will then be discussed in the design team. Wishes of the client and architect, requirements in the field of building physics, possibilities regarding the technical installations: they all affect the choice of an optimal structural design.

In addition to the constructive design, IMd regards its role as a coordinating engineer as very important. In its existence IMd has built up a perfect reputation. In addition to the inspection of the basic principles of the drawings and calculations of suppliers of prefabricated concrete and steel constructions, the content of these elements is also assessed with great care. We ask the client to make it possible for us to carry out the consultancy work in a constructive way. In the end this will create the best result for the client.

Entrance building "De Admirant" Eindhoven

Short Description

The grand finale of the vast inner city renewal project by 'Rond de Admirant CV' (Heijmans Real Estate) consists in the construction of a striking and futuristic building. The works started in October 2008 and the architectural name used for this construction is known as BLOB (BiLinear OBject).

Both the non-bearing (glass) façade construction and the concrete framework were designed and dimensioned by 'IMd Raadgevende Ingenieurs', using the 3-Dimensional computational software package Scia Engineer.

By using this computational software, the required material quantity was minimised, while the construction process was optimised.

Project Information

Owner: CV Rond de Admirant (Heijmans Vastgoed)
Architect: Massimiliano Fuksas Architetto
General Contractor: Heijmans Bouw Best B.V
Engineering Office: IMd Raadgevende Ingenieurs

Construction Start: 01/10/2008
Construction End: 01/03/2010
Location: City Center Eindhoven, Netherlands



Introduction

The ambitious inner city renewal project "Rond de Admirant" is located on the Emmasingel, near two monumental buildings: the former Philips head office "De Bruine Heer" ("The Brown Gentleman"), and the former factory site "De Witte Dame" ("The White Lady").

The Italian architectural firm Massimiliano Fuksas Architetto was asked by the developer to design the "De Witte Dame" plan.

The building's shape resembles a (half-) droplet, or egg; the largely transparent glass façade shows the occasional indentation. This modern architectural design - known as BLOB (BiLinear OBject) - has caused quite a stir in Eindhoven.

Because of the building's shape, the floor space decreases with each storey (measuring 1000 m² on the ground floor, and only 200 m² on the 4th floor); also, the 2nd, 3rd and 4th floors have large voids, stretching out to the façade.

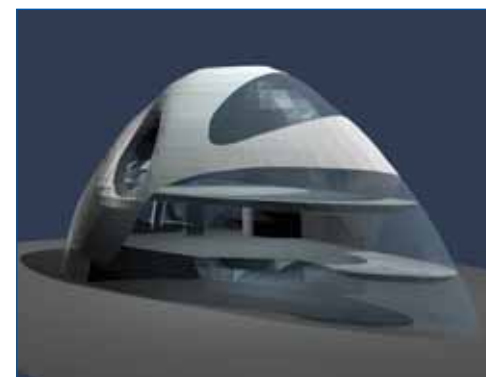
The steel construction is non-bearing, because of the glass façade; the concrete framework (floors, walls and columns) are therefore self-supporting. The framework also provides for stability, whereas the glass façade is only supported horizontally on storey-level.

Design

The concrete skeleton was designed as a 3-D model with the use of Scia Engineer.

The ground- and 1st floor are to be used as store locations, therefore, the principal insisted on relatively large spaces between the columns (maximum of approximately 9 metres). At the same time, the architect demanded similar edge distances on each floor, compared to the superjacent (curved) floor framing.

Because of these demands, hardly any column is placed directly above another, and every floor level (concrete floor, d = 400) is constructed as a transition slab (with high concentrations of punching stress and shear forces here and there, as well as flexural moments).



Used software: Scia Engineer, ESA-Prima Win

Entrance building “De Admirant” Eindhoven

A flat, in situ-placed slab floor was used, without column slabs and beams.

The 3-Dimensional computational model for the entire concrete framework has an important benefit: the adhesion factor can easily be determined, which means that the column positions are relatively easily optimised, in agreement with the architecture.

The same model was used to calculate the weight- and stability figures, as well as the required amount of reinforcement in the storey floors.

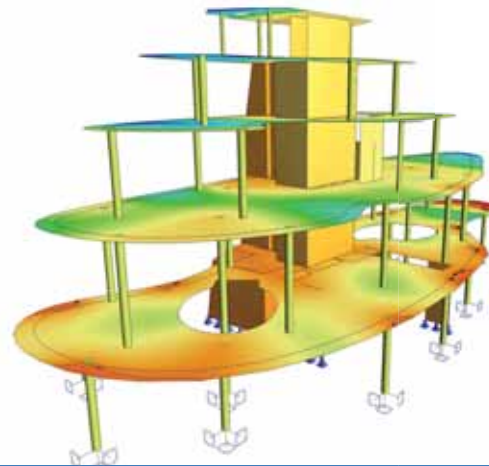
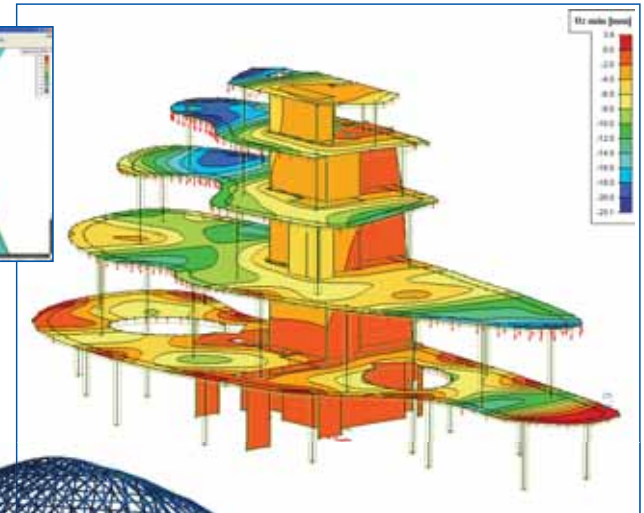
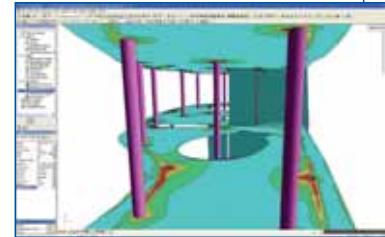
As part of the concept design, IMd has calculated the preliminary figures for the glass façade steel construction. This, too, was carried out using a 3-D computational model, which was transported from the architect's 3-D drawing compilation to Scia Engineer. Vertically, the façade construction only transfers its own weight and possible snow accumulation to the building's foundation; horizontally, it transfers the wind pressure to the storey floors of the concrete framework.

A large part of the façade lacks horizontal support, since the building's ridge - from the 2nd floor upwards - includes large voids. Thanks to the 3-Dimensional computational model, the required amount of steel necessary for the façade construction could be kept to a minimum: the building's shape itself was applied to achieve optimum result, implementing disc- and scale effect, as well as flexural force.

Taking into account the large size of the unsupported façade surface, the applied steel frames (pipes 90 x 90) can be considered exceptionally thin. The subsequent phase of the design process included the German consulting engineers Knippers Helbig, who - together with Fuksas - further developed the façade construction, using their 3-Dimensional software package. Their results, incidentally, did not differ from earlier calculations.

Development and execution

Construction works were started in October 2008, with the piling of FUNDEX poles. Prior to that, IMd presented the complete design- and reinforcement drawings for the concrete framework. Again, the 3-D model of the design phase was used to determine the amount of reinforcement in the walls and floors. Façade supplier Waagner-Biro, also a Scia software user, is to further develop the façade steel construction.



IMd

Contact Albert Repko, Pim Peters
 Address Jan Leentvaarlaan 62
 3065 DC Rotterdam, Netherlands

Phone +31 10-2012381
 Email imd@imdbv.nl
 Website www.imdbv.nl



Organisation

IMd Raadgevende Ingenieurs is an organisation with a great core of highly qualified employees, who have been applying their experience, know-how and expertise for many years with regard to advising about, designing and working out main structures for buildings. At present the firm consists of 40 highly educated employees. IMd is completely independent and does not have any business links with manufacturers, suppliers, contractors, developers and other interested parties who could influence our impartial and independent consultancy.

IMd is a member of the Dutch association of consulting engineers (ONRI) and possesses the "quality management system" certificate according to NEN-AND-ISO 9001.

It is a firm where the internal communication proceeds smoothly and all employees are kept informed about the most recent developments.

In the almost 50 years that our firm has existed the quality of our service has always been a key issue. The most important characteristics of this service for us are:

- A good product that fits the budget of the client
- A product that fits the concept of the architect
- Creativity and ingenuity
- A flexible and service-oriented attitude

Projects

They vary greatly: from prestigious office complexes to pedestrian bridges, from houses to complex shopping centres, from alterations to new-housing and from simple and small to complex and large. Each project has its own charm and is a

constructive challenge. The projects are carried out at the request of property developers, government organisations, foundations, architects, contractors and private parties. This diversity in clients is made possible because of the independence of the firm of consulting engineers.

View IMd Raadgevende Ingenieurs

The view of IMd is that the success of a project largely depends on the first stage of the design process. The cooperation between architect, client, mechanical engineer and structural engineer is decisive in order to have a fine design in complex projects. In the preliminary design various alternatives are presented for the structure of a building. The advantages and disadvantages of every constructive alternative will then be discussed in the design team. Wishes of the client and architect, requirements in the field of building physics, possibilities regarding the technical installations: they all affect the choice of an optimal structural design.

In addition to the constructive design, IMd regards its role as a coordinating engineer as very important. In its existence IMd has built up a perfect reputation. In addition to the inspection of the basic principles of the drawings and calculations of suppliers of prefabricated concrete and steel constructions, the content of these elements is also assessed with great care. We ask the client to make it possible for us to carry out the consultancy work in a constructive way. In the end this will create the best result for the client.

Short Description

Office tower 'Blaaktoren', Rotterdam

This project regards a 20-storeyed office tower, including a split-level 8-storeyed car park in Rotterdam. The most eye-catching feature of the design of the 'Rotterdam Blaaktoren' is the cantilevered façade that protrudes from the 6th floor upwards. The façade's tree structure is also a remarkable element. The building's main supporting structure is partly executed as diagonals and columns, which are placed in the façade and give the building the impression of being 'supported' by trees. The prefab front construction is connected to 5 steel girders, located astern, which stretch over three storeys. This spectacular construction was designed with the use of 2D and 3D ESA-Prima Win computational models.

Project Information

Owner: Blauwhoed Vastgoed, Rotterdam

Architect: DREISSEN architectuur, Rotterdam & GROUPA, Rotterdam

General Contractor: Dura Vermeer, Rotterdam

Engineering Office: IMd Raadgevende Ingenieurs

Construction Start: 01/02/2009

Construction End: 01/01/2011

Location: Blaak, Rotterdam, Netherlands



Introduction

Architectural firms Dreissen and Group A have created the design for a 20-storeyed office tower, including a split-level 8-storeyed car park in Rotterdam. A striking feature of the building is the cantilever, which protrudes from the building at 21 metres above street level, i.e. the Verlengde Willemsbrug. The façade's tree structure, too, is a remarkable element. The building's main supporting structure is partly executed as diagonals and columns, which are placed in the façade and give the

building the impression of being 'supported' by trees. 2D- and 3D-ESA-Prima Win computational models were used for the design of the prefab façades. A distinctive element is the modelling of the cantilevered prefab façade, with the steel lattice framework located behind the front, which transfers the horizontal and vertical pressure load to the rear floors.

Design

Remarkable are the interlocking prefab façade elements. These, together with the draw benches – located in the floors behind the façade – form the supporting wall girders. The prefab fronts are also partly responsible for the building's stability: together, the outward façades form a solid, tube-shaped construction, which processes the largest part of the horizontal load, consisting of wind pressure and the cantilever force.

In order to determine a precise estimate of the local internal pressure existent in the prefab façades, 2D and 3D computational models of the walls were created. The 5 steel lattice framework girders behind the protruding front were also included in the computational models. The horizontal draw benches in the floors were implemented through numeric bars, which exclusively model the horizontal rigidity of the floors. The bars were outfitted with an extremely low flexural rigidity, in order to prevent them from processing a bending force. All prefab façade



Used software: ESA-Prima Win

elements, including the vertical joints between them, were processed through the computational model. The interlocking façades, too, were included in the model. The different prefab façades interlock at the cantilever. First, this effect was determined through vertical springs, with the use of 2D computational models. The relative rigidity of the springs was determined by unit loads. After that, a complete 3D model was made, and closer attention was paid to the exact force-displacement between the walls. Possible flange movement in the stabilising prefab walls was taken into account during the calculations.

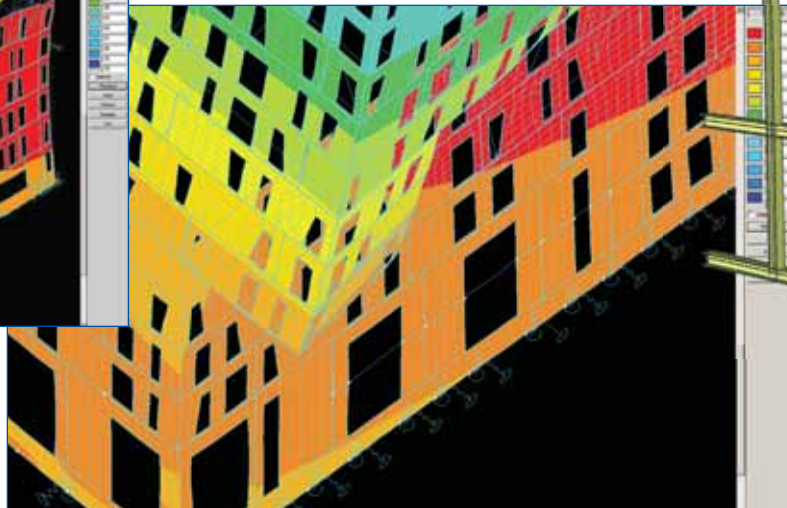
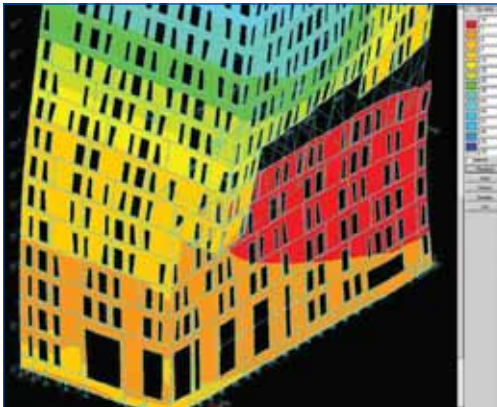
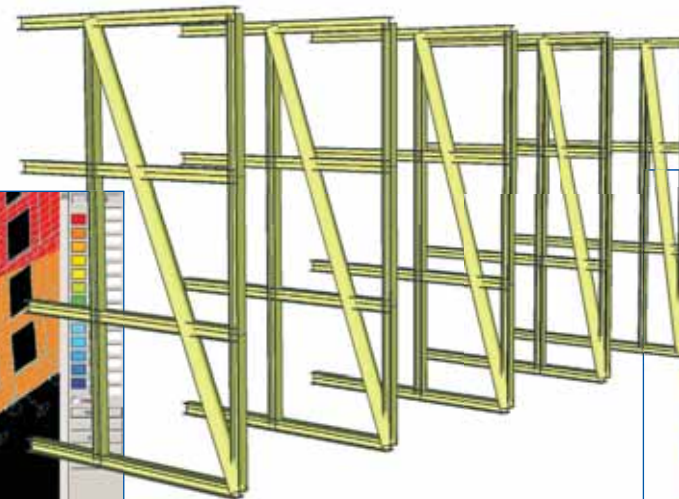
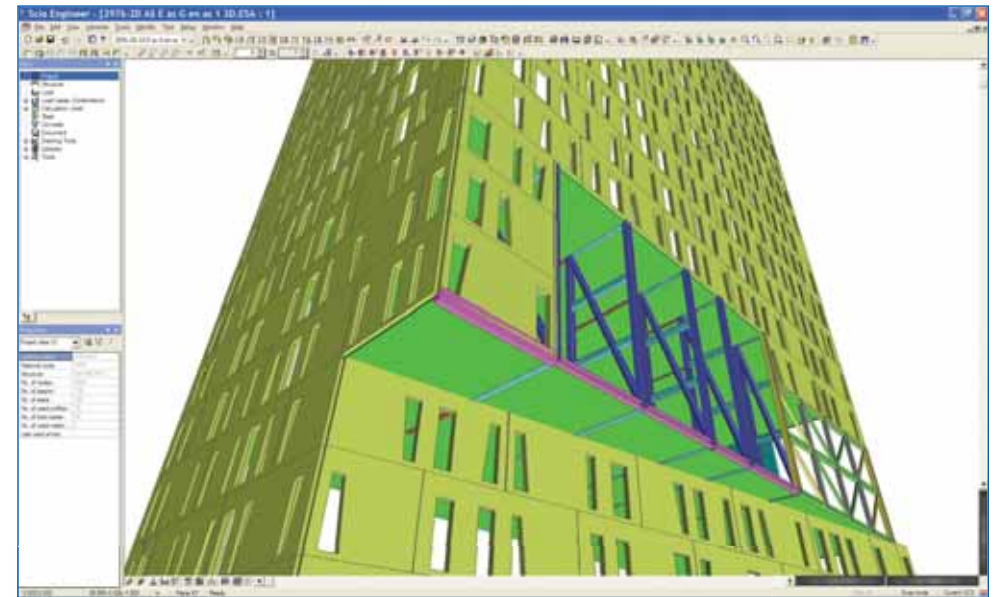
Development and execution

While determining the concept of the building's main supporting structure, close attention was paid to the optimum engineering feasibility of the project as a whole. The concept was designed in such a way, that no temporary supporting systems are necessary during the construction works below the 21 metre-measuring cantilever.

By opting for a prefab façade design, the tower construction can take place at a high pace. In situ constructed façade elements would take up much more time, partly because of the different shapes and positions of the window openings at each floor.



Office tower 'Blaaktoren', Rotterdam



IMd

Contact Michiel Niens, Pim Peters
Address Jan Leentvaarlaan 62
3065 DC Rotterdam, Netherlands

Phone +31 10-2012381
Email imd@imdbv.nl
Website www.imdbv.nl



Organisation

IMd Raadgevende Ingenieurs is an organisation with a great core of highly qualified employees, who have been applying their experience, know-how and expertise for many years with regard to advising about, designing and working out main structures for buildings. At present the firm consists of 40 highly educated employees. IMd is completely independent and does not have any business links with manufacturers, suppliers, contractors, developers and other interested parties who could influence our impartial and independent consultancy.

IMd is a member of the Dutch association of consulting engineers (ONRI) and possesses the "quality management system" certificate according to NEN-AND-ISO 9001.

It is a firm where the internal communication proceeds smoothly and all employees are kept informed about the most recent developments.

In the almost 50 years that our firm has existed the quality of our service has always been a key issue. The most important characteristics of this service for us are:

- A good product that fits the budget of the client
- A product that fits the concept of the architect
- Creativity and ingenuity
- A flexible and service-oriented attitude

Projects

They vary greatly: from prestigious office complexes to pedestrian bridges, from houses to complex shopping centres, from alterations to new-housing and from simple and small to complex and large. Each project has its own charm and is a

constructive challenge. The projects are carried out at the request of property developers, government organisations, foundations, architects, contractors and private parties. This diversity in clients is made possible because of the independence of the firm of consulting engineers.

View IMd Raadgevende Ingenieurs

The view of IMd is that the success of a project largely depends on the first stage of the design process. The cooperation between architect, client, mechanical engineer and structural engineer is decisive in order to have a fine design in complex projects. In the preliminary design various alternatives are presented for the structure of a building. The advantages and disadvantages of every constructive alternative will then be discussed in the design team. Wishes of the client and architect, requirements in the field of building physics, possibilities regarding the technical installations: they all affect the choice of an optimal structural design.

In addition to the constructive design, IMd regards its role as a coordinating engineer as very important. In its existence IMd has built up a perfect reputation. In addition to the inspection of the basic principles of the drawings and calculations of suppliers of prefabricated concrete and steel constructions, the content of these elements is also assessed with great care. We ask the client to make it possible for us to carry out the consultancy work in a constructive way. In the end this will create the best result for the client.

Sculpturally shaped lecture hall

Short Description

The new construction measures close to 10.000 m² of educational capacity and includes also 110 parking places. Rietveld Architects LLP, stationed in New York, has designed a building which consists of three construction parts, each of a different height, that are contracted through angular distortion. Without a doubt, the most striking feature of Hogeschool INHolland Delft's new lecture hall is its steel construction. The lecture hall's sculpturally shaped steel construction has been designed, drawn, and exchanged by all parties involved through fully three-dimensional models. Scia's ESA-Prima Win software was used to achieve all this. During the execution, it was decided to affix an experimental façade, with a high additional tensile load, to the complex-shaped steel construction.

Project Information

Owner: Hogeschool INHolland, Haarlem
Architect: Rietveld architects LPP, New York
General Contractor: Sprangers bouwbedrijf, Breda
Engineering Office: IMd Raadgevende Ingenieurs

Construction Start: 01/10/2008
Construction End: 31/07/2009
Location: Delft, Netherlands



Introduction

At a former University site, located on the Rotterdamseweg, the new construction works of INHolland Delft are concluded. Eye-catching feature of the new building, which is largely made of concrete, is the steel construction of the lecture hall. This sculpturally shaped construction feature was designed, drawn, and shared by all parties involved with the use of fully three-dimensional models, created with ESA-Prima Win computational software. The new construction measures close to 10.000 m² of educational capacity, as well as 110 parking places. Rietveld Architects LLP, stationed in New York, have designed a building which consists of three construction parts, each of a different height, that are contracted through angular distortion. Also, the

building contains a number of floating plateaus, as well as sloping columns, measuring over 17 meters. The large atrium, at the north-side of the building, boasts the presence of the lecture hall, which holds 174 chairs.

Design

The initial architectural drawings, within the boundaries of which IMd was to design its construction, consisted of a 3D model of the inner- and outer shell, with a total thickness of 500 mm. After subtracting 2x100 mm, accounting for the slabs and the required tolerance, 300 mm was left for the construction. Bearing in mind both the complex shape as well as the large span, a steel construction proved to be the most economical option. The floor



Used software: ESA-Prima Win

is constructed by using hollow core slabs with an in situ layer, while metal decking is used in the roof floor. Both floors serve as a panel, which is crucial to the construction's stability.

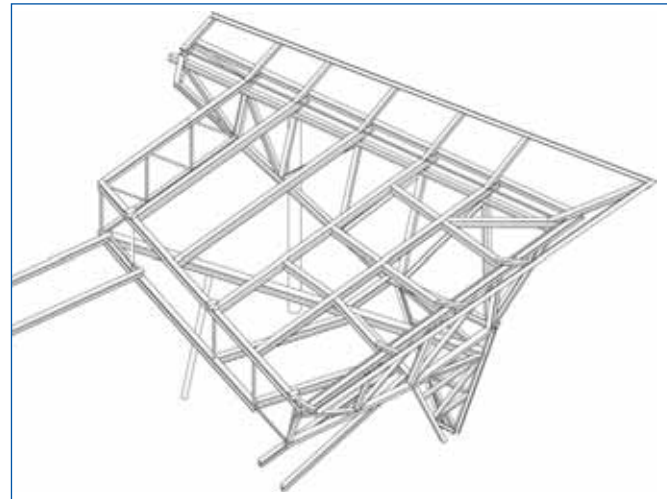
First, a three-dimensional wire-frame model was drawn, within the architectural boundary conditions, according to our well-developed engineering instinct. Then, this model was transferred to the 3D computational model of ESA-Prima Win, after which the various steel sections were determined. This was all done within the architect's set conditions; because of the cohesion of the different slopes, this was an imperative requirement. Wherever possible, trusses were implemented in order to reduce the weight. However, this could not be achieved in all places, which required the appliance of heavy steel sections; for instance, an HD-section was used for the diagonal floor beams. After adjusting the 3D-drawings to the final ESA-Prima Win profile measures, the architect implemented these to her drawings, and adjusted them wherever necessary.

Development and execution

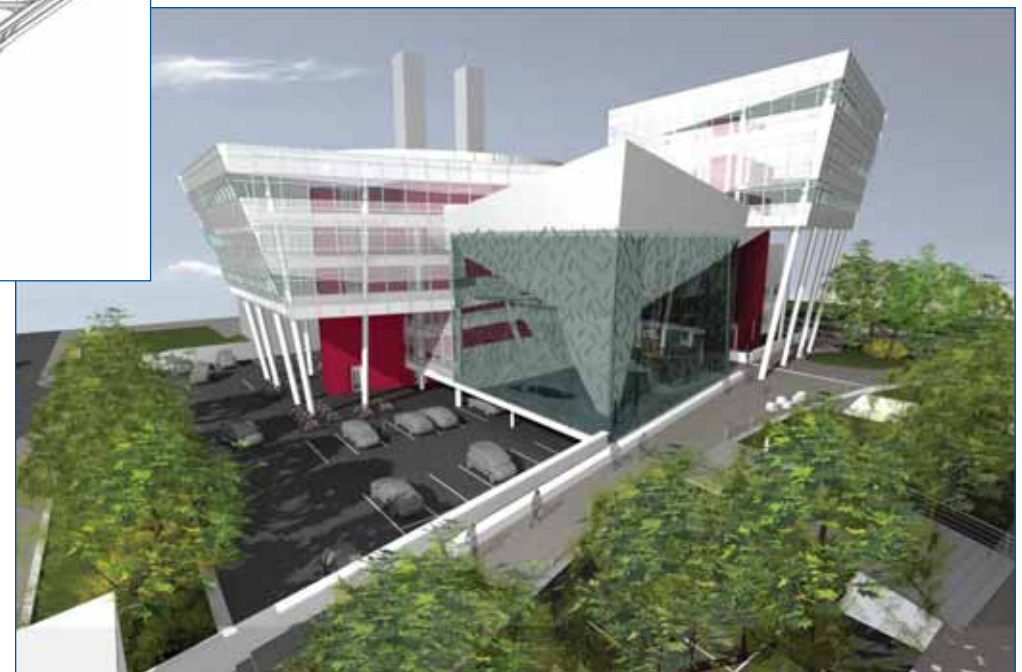
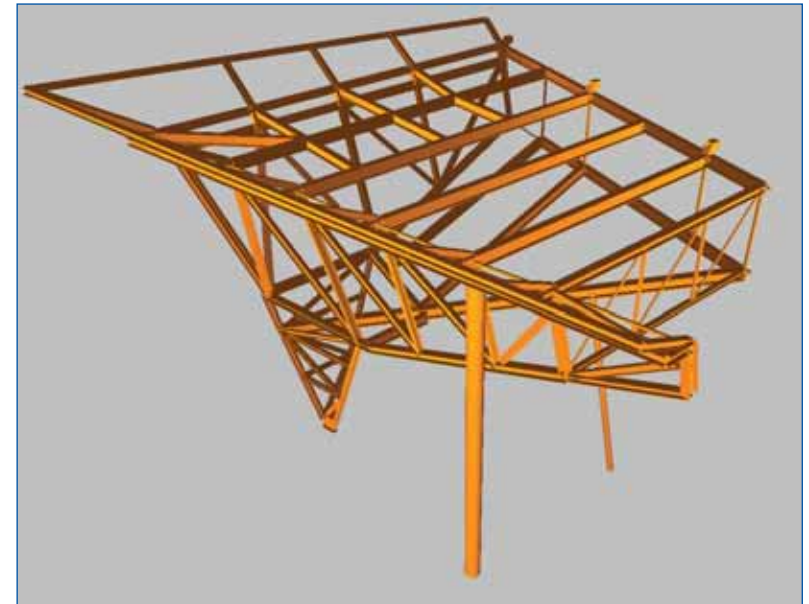
During the execution phase, steel sub-contractor Moeskops used IMd's 3D-drawing model to design the details. After thorough consultation, IMd adjusted a few elements, with regard to the production- and assembling time. Transport by water enabled the steel construction to be divided into large units. We were therefore able to get the largest truss, measuring 22 meters in length and 7 meters in height, to be delivered as a prefab unit. In only one week's time, the complex-shaped steel construction could be assembled.

Prestressed façade

While execution on site took an advance with placing the foundation piles, it was decided to enclose the atrium surrounding the lecture hall with an experimental façade. The design goal of this 12-metre high cladding is to administer it without visible reinforcements, and create a super-slender appearance. The lecture hall design was again analysed with the use of Scia's ESA-Prima Win, allowing for the substantial vertical tensile force which is supported by the upper edge of the lecture hall's two large trusses. This resulted, among other things, in applying heavier steel sections, and a single extra column. Despite the inconvenient time of the adjustment, it was nonetheless executed properly by all parties in design and execution. Therefore, the planned delivery date of July 2009 is still within reach.



Sculpturally shaped lecture hall



Ingenieurbüro Ohr

Contact Markus Tautorat
Address Faber-Castell-Str. 14
90522 Oberasbach, Germany
Phone +49 911 969 770
Email m.tautorat@ib-ohr.de
Website www.ib-ohr.de



Das Ingenieurbüro Ohr wurde im Januar 1998 von dem Geschäftsführer Peter Ohr gegründet und besteht aus einem jungen Team von Ingenieuren und Konstrukteuren das von den langjährigen Senioir - Ingenieuren Herrn Ernst Ohr und 2 freiberuflichen Mitarbeitern tatkräftig unterstützt wird.

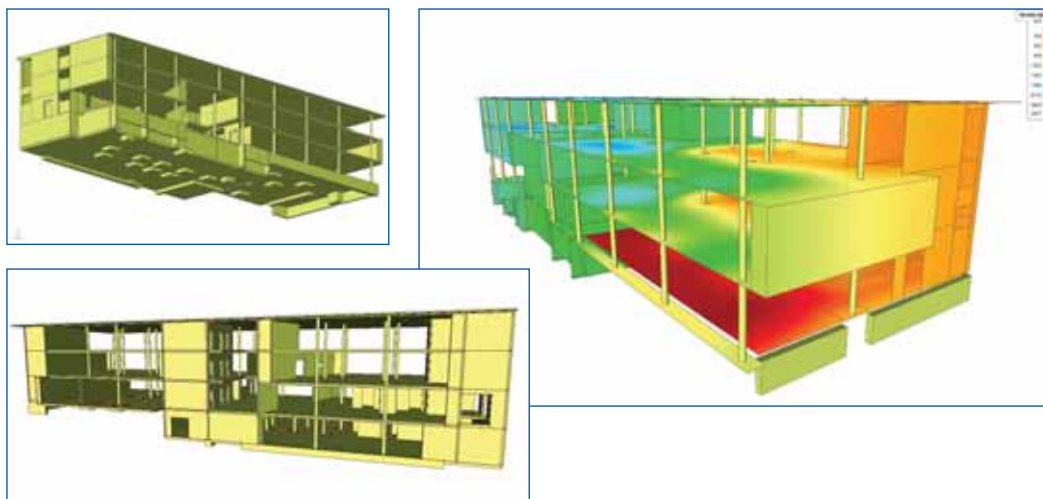
Unser Ziel ist es, immer am Puls der Zeit zu sein, die Neuerungen der Technik und den technologischen Fortschritt zu nutzen um für unsere Kunden Bauwerke mit technischer Präzision in Hinblick auf sinnvolle Konstruktionen unter wirtschaftlichen Gesichtspunkten zu planen.

Wir verstehen uns als Team, das gemeinsam die gestellten Aufgaben bearbeitet, damit alle relevanten Aspekte in den Entwurf des Gesamtkonzeptes mit einfließen. Um das zu ermöglichen, haben wir uns auf die Aufgabengebiete Stahlbetonbau,

Stahlbau, Mauerwerksbau, Fertigteilbau und Holzbau spezialisiert. Die Bereiche, die von gängiger Software nicht abgedeckt werden, programmieren wir im Haus selbst, um alle auftretenden Probleme schnell und sicher lösen zu können. Dabei geht es uns nicht allein um eine statische Bearbeitung der Gebäudestruktur, sondern um ein stimmiges Konzept, in dem Konstruktions- und Montageablauf, die Nutzung und spätere Änderungsmöglichkeiten für den Bauherrn bereits mit berücksichtigt werden.

Alle Projekte werden durchgehend digital mit CAD in 2D und 3D bearbeitet. Wir verwenden dafür Allplan 2008 der Firma Nemetschek.

Die statische Bearbeitung erfolgt mit den Programmen Scia Engineer, PCAE, Friedrich & Lochner, Frauendorfer, DEHA, HILTI, Fischer, WEKA und eigenen Excel- und Bautextprogrammen.



New School Otto-Seeling-Promenade in Fürth

Short Description

The project regards a new school building with the following sizes: 60,0 m in length, 18,5 m in width and 15,3 m in height. All the floor slabs are carried by columns of reinforced concrete. The bracing of the construction is given through the staircases on both ends of the structure.

A special challenge was the construction in the middle of the building where two columns in the first and second floor must be carried by the floors because in the ground floor could not be a column. Only by considering the effect of all floors together, the columns could be carried by the floor without a below positioned beam.

Project Information

Owner: Stadt Fürth
Architect: Gebäuwirtschaft der Stadt Fürth
General Contractor: IHB Schleusingen
Engineering Office: Ingenieurbüro OHR Büro für Hochbau GmbH

Construction Start: 15/07/2008
Construction End: 31/10/2009
Location: Fürth, Germany



Projektbeschreibung

Die Stadt Fürth baut eine neue 3-geschossige Hauptschule mit Teilunterkellerung.

Das Bauwerk umfasst sämtliche Klassenräume, diverse Räume für Musik-, Hauswirtschafts- und Werkunterricht sowie einen Küchenbereich mit Speisesaal.

Die Besonderheit ist, dass zum ersten Mal ein städtisches Gebäude komplett über regenerative Energie versorgt wird. Die Heizungsanlage wird durch ein ausgeklügeltes System, das die Erdwärme nutzt gespeist. Dafür werden, rund 30 Löcher 83 Meter tief in den Boden gegraben, um so warmes Grundwasser zu einem Wärmetauscher zu transportieren.

Den Strom liefert eine Solaranlage auf dem Dach. Auf diese Weise kann die neue Schule ihren Energiebedarf ohne CO₂-Ausstoß und unabhängig von fossilen Brennstoffen wie Öl oder Gas decken. Desweiteren wird die gesamte Einrichtung behindertengerecht ausgestattet.

Tragwerk

Das Tragwerk der Schule wird aus punktgestützten Flachdecken und einer umlaufenden Glasfassade definiert. Die Aussteifung wird durch die beiden Treppenhauskerne an den Enden der Schule und dem WC-Trakt in der Mitte hergestellt. Die Flurwände werden aus 2 Meter hoch betonierten Wänden und durchlaufenden Fensterbändern gebildet. Im Eingangsbereich in der Mitte der Schule wird

durch einen 2-geschossigen Luftraum und die filigrane Stahlterasse, die direkt gegenüber liegt, eine großzügige Atmosphäre erzeugt.

Besonderheiten

Um eine große Aula zu erhalten wird die tragende Hauptwand in der Mitte des Schulgebäudes im EG auf zwei kurze Wandscheiben an den Außenwänden reduziert und eine Stütze aus den beiden oberen Geschossen in der Decke über dem EG abgefangen. Um die Stockwerkshöhe gering halten zu können wurde diese Stütze Unterzuglos mit der 30cm starken Decke abgefangen. Durch die räumliche Berechnung und das Zusammenwirken der 3 Geschossdecken konnte nachgewiesen werden, dass bereits in den oberen Geschossen eine geringere Last auf diese Stütze entfällt, als es bei durchgehender Stützung bis zum Fundament der Fall wäre. Ebenso wurde auch bei einer weiteren Stütze verfahren, die in einem Geschoss um 1 Meter neben der darunter stehenden Stütze angeordnet wurde.

Gründung

Die Gründung der Schule wird durch elastisch gebettete Bodenplatten mit Verstärkungen im Bereich der Stützen gebildet. Um den hohen seitlichen Erddruck auf die Kellerwand des nur zur Hälfte unterkellerten Bauwerkes zu vermeiden, wird eine Stütze durch die Bodenplatte des nicht unterkellerten Bereiches bis zur Gründungsebene

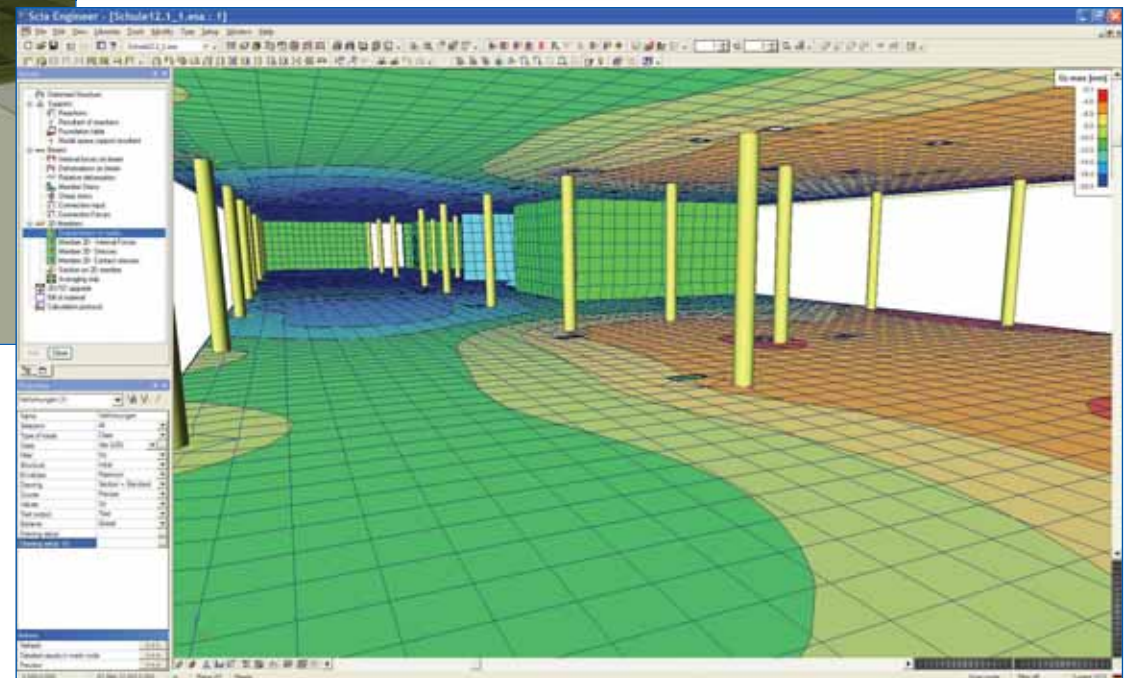
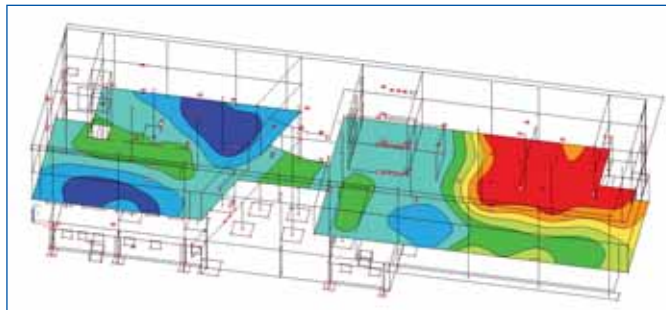
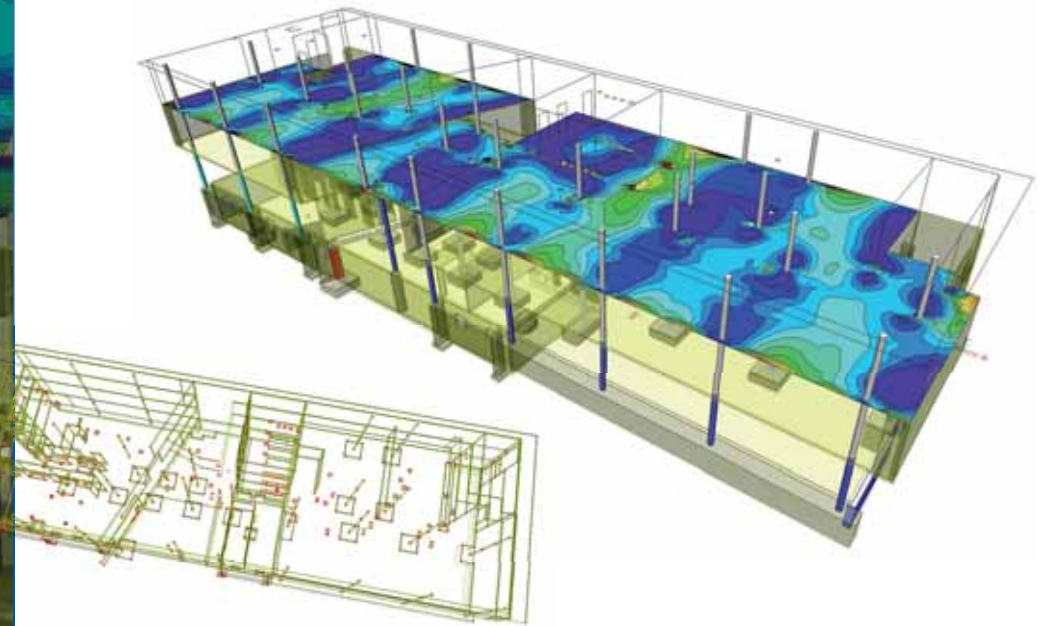
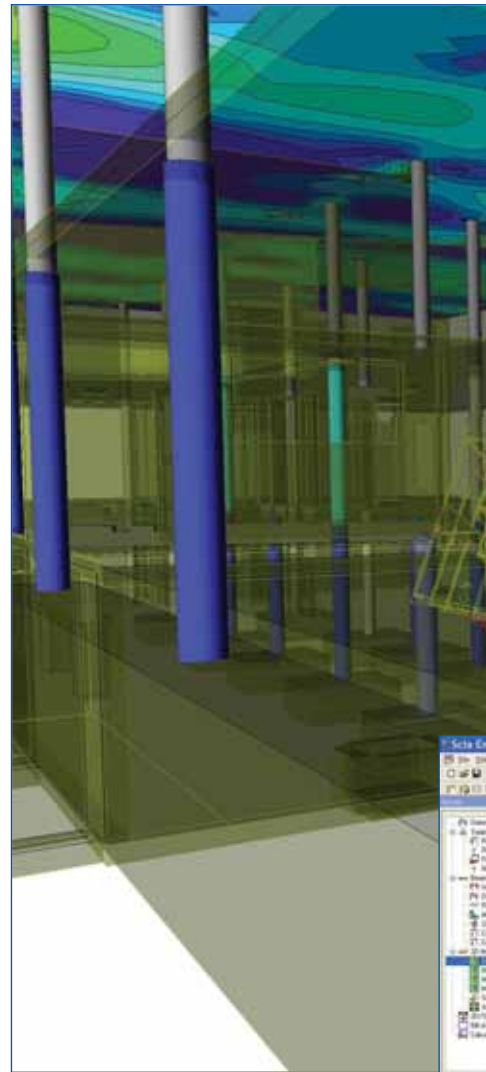
der Kellerbodenplatte geführt, und dort mit einem Einzelfundament abgetragen.
Auf einer Längsseite der Schule ist die Fassade über das gesamte Erdgeschoss hinweg um einen Meter nach innen versetzt. Daher stehen die Stützen hier im Außenbereich. Neben den bauphysikalischen und betontechnologischen Betrachtungen die sich daraus ergaben, mußten die Stützen im nicht unterkellerten Bereich durch einen wärmetechnisch von der Bodenplatte getrennten Fundamentbalken gegründet werden. Im unterkellerten Bereich wurden wärmegeämmte Pfeilervorlagen an Kelleraußenwänden ausgeführt. Auf diesen wurden zum einen die Stützen aus dem EG abgefangen, zum anderen wurden hier die Lichtschachtwände mit einer Spannweite von 6,50 m eingehängt.

Besonderer Nutzen durch Scia Engineer

Der besondere Nutzen der durch den Einsatz von Scia Engineer in diesem Projekt erzielt wurde lag vor allem in der räumlichen Betrachtung der Tragstruktur. Die Abfangung der Stütze wäre durch „herkömmliche“ Berechnungsweisen nicht unterzugslos möglich gewesen. Außerdem konnte das Tragwerk immer wieder schnell an die sich ändernde Planung angepasst und neu bemessen werden. Vor allem, als die Achse der Mittelwand verschoben und das Stützenraster komplett geändert wurde, war der Einsatz von Scia Engineer nicht wegzudenken.
Die Planung der Solarmodule auf der gesamten Dachfläche, sowie die außergewöhnlichen Fundament- und Bodenplattendurchbrüche für die Erdwärmanlage erforderten zusätzlich jederzeit schnelles Modifizieren, Ändern und Anpassen der Struktur an die neuen Gegebenheiten, um schnelle Aussagen über die Durchführbarkeit von einzelnen Trassen geben zu können.

Abmessungen

- Länge: 60,0 m
- Breite: 18,5 m
- Höhe: 15,3 m



Ingenieursburo IOB

Contact Edwin van Strien
 Address Struytse hoek 1
 3224 HA Hellevoetsluis, Netherlands
 Phone +31 181 - 318 122
 Email e.vanstrien@iob.nl
 Website www.iob.nl



iob
 INGENIEURSBURO

Ingenieursburo IOB met vestigingen in Hellevoetsluis en Dordrecht, heeft als visie 'Engineering op hoog niveau'. Met haar 160 medewerkers is IOB hét Ingenieursbureau voor bouwkunde en civiele techniek.

Voor bouwkosten- en installatieadvies heeft Ingenieursburo IOB zelfstandige en onafhankelijke adviesbureaus. De bouwkundige specialisaties van Ingenieursburo IOB richten zich op detaillering, plantoetsing, wet- en regelgeving, beheer en onderhoud, terwijl de constructieve specialisaties zich richten op onder andere hoogbouw en parkeer garages. Het bureau is opgericht op 1 juli 1979 en is gestart vanuit haar vestiging in Hellevoetsluis.

Ingenieursburo IOB onderscheidt zich van de traditionele bouwteams, omdat het alle disciplines onder één dak heeft. De bouwkundigen en constructeurs worden ondersteund door de bestekschrijvers en adviseurs op het gebied van bouwrecht, wet- en regelgeving en brandpreventie en het installatie- en bouwkostenadviesbureau van IOB. De medewerkers worden regelmatig voorzien van terugkoppeling uit de praktijk door eigen opzichters en bouwbegeleiders. De technische uitwerking heeft zowel betrekking op complete nieuwbouw, als op de renovatie of herontwikkeling van bestaande gebouwen. Ingenieursburo IOB vervaardigt sinds jaren voor vastgoedbeheerders, gemeenten, woningbouwverenigingen en multinationals meerjaren onderhoudsplannen. Hieraan voorafgaand verricht Ingenieursburo IOB inspecties die kunnen variëren van quickscans tot inspecties op basis van de Rijksgebouwendienst conditiemeting.

Bouwkostenadvies IOB bv budgetteert, begroot, bewaakt en optimaliseert bouwkosten en kwaliteit zowel proces- als fasegericht. Door het gecombineerd kunnen aanbieden van bouwkostenadviezen in de vorm van haalbaarheidsstudies, VO/DO elementenramingen, aannemersbegrotingen en bestekken zijn kosten en kwaliteit in één hand gewaarborgd.

Installatieadvies IOB bv verzorgt innovatieve, economische en pragmatische ontwerpen voor alle gebouwgebonden installaties. Naast ontwerpen behoren bestekken, begrotingen, opnames en beoordeling van panden op het gebied van gebouwgebonden installaties tot de te leveren diensten.

Ingenieursburo IOB is een organisatie met directe, korte lijnen. Elk nieuw project krijgt een projectmanager toegewezen die de volledige verantwoordelijkheid draagt en het contact met de opdrachtgever onderhoudt.



Health park 'Overkamppark'

Short Description

This project called "Overkamppark" is part of the major plan "Health park" at Dordrecht (The Netherlands). It consists of 3 towers with a total amount of 165 apartments incl. parking facilities, commercial spaces and health services nearby. The main structure is made of concrete (cast in place).

The soil profile at the site has a large fluctuation (over 30% within 10 metres). On the other hand the floors with integrated balcony require attention. Efficient integration of the balcony in the execution, the structural safety and physical details are important.

The structure is executed as a 3D model in Scia Engineer. Due to this model and use of concrete it was possible to design a flexible and easy to build structure with capability to redistribute forces during the execution.

Project Information

Owner: AM Rotterdam
Architect: Klunder architects Rotterdam
General Contractor: Bam Woningbouw Breda
Engineering Office: Ingenieursburo IOB
 Hellevoetsluis

Construction Start: 01/02/2009
Construction End: 01/06/2010
Location: Dordrecht, Netherlands



Algemene projectbeschrijving

In 2004 zijn de Gemeente Dordrecht, het Albert Schweitzer Ziekenhuis en AM Rotterdam een samenwerking aangegaan om de locatie rondom het Albert Schweitzer Ziekenhuis te herstructureren tot een modern en aantrekkelijk gezondheidspark. Dit bestaat uit een combinatie van wonen, sporten, winkelen en werken met in de directe nabijheid medische ondersteuning. Het project maakt onderdeel uit van dit Gezondheidspark. Aan de rand zijn drie woontorens met in totaal 165 luxe appartementen gelegen. Met vier appartementen op één woonlaag zijn de appartementen meerzijdig georiënteerd. Ieder appartement heeft dan ook minimaal 2 gevels. Het parkeren gebeurt op de onderste twee lagen van en tussen de torens. Ingenieursburo IOB (IOB.nl) is vanaf februari 2007 nauw betrokken bij de ontwikkeling vanuit het schetsontwerp. Dankzij geavanceerde rekenmethodieken staan de drie woontorens met bijbehorende stallinggarage en commerciële ruimten klaar voor realisatie. IOB is als hoofdconstructeur verantwoordelijk voor de constructieve vormgeving.

Technische projectbeschrijving

Het totale bebouwde terrein omhelst een oppervlakte van 147,00 x 32,00 m². Iedere woontoren beslaat een

grondvlak van ca. 550 m² en is ca. 50 m hoog. De 2-laagse bovengrondse stallinggarage dient tevens als afbakening van het gezondheidspark.

Flexibiliteit en duurzaamheid van beton zijn belangrijke eigenschappen. Door deze aspecten in combinatie met de hoge mate van geluidwerendheid van het materiaal genoot een dragende betonconstructie de voorkeur. Tot en met de 1^o verdiepingvloer zal traditioneel gewerkt worden met gebruik van bekistingplaatvloeren. Vanaf de 1^o verdiepingvloer wordt er een tunnelbekisting ingezet.

De grondslag is sterk wisselend en geeft zeer variabele paal draagvermogens. Tussen 2 sonderingen over een afstand van 10 m kunnen verschillen optreden tot 30% (865kN t.o.v. 1360kN). De fundatie dient derhalve uitermate kritisch beschouwd te worden. Herverdelingscapaciteit via de constructie is daarin essentieel. Het ontwerp en de benadering is mede bepalend voor de risicobeheersing in het uitvoeringstraject. Door de flexibiliteit en herverdelingscapaciteit van de constructie in combinatie met de gekozen 3D Eindige Elementen Methode (EEM) kan tijdens de uitvoering adequaat geanticipeerd worden op bijv. lage kalenderingen (beperkt draagvermogen). Tijdvertraging en aanpassing van de constructie in de uitvoeringsfase wordt hiermee tot een minimum beperkt.

Ruime balkons met oriëntatie over meerdere windrichtingen verhogen het woongenot voor de eindgebruiker. Bijgevolg is dit als randvoorwaarde in het project opgenomen. Alle appartementen worden voorzien van een eigen buitenruimte binnen de gevellijn. De oriëntatie van de appartementen onderling en de 'inpanidige' balkons brengen uitdagingen met zich mee. Immers, het efficiënt integreren van de balkons in de bouwcyclus, de constructieve veiligheid en bouwfysische detaillering zijn daarbij complexe aandachtspunten. Er is gekozen voor prefab balkons omdat, omwille van de bouwfysische onderbreking, het verjongen van insituvloeren tot onwenselijke dikten (lees gewicht) zou leiden. Om de uitvoeringscyclus niet te verstoren worden de prefab balkons tijdens de ruwbouw opgenomen en geplaatst op de tunnelkist. Door de meerzijdige krachtsafdracht van de vloeren, met daarin geïntegreerd de prefab balkonplaten, kan dit met een plaatprogramma efficiënt ontworpen worden.

De aanwezige betonwanden verzorgen de stabiliteit van het gebouw. Door toepassen van 3D EEM wordt de constructie voor de afdracht van de windbelasting in het model efficiënt gemobiliseerd. Hierdoor is een aanzienlijke hoeveelheid palen bespaard.

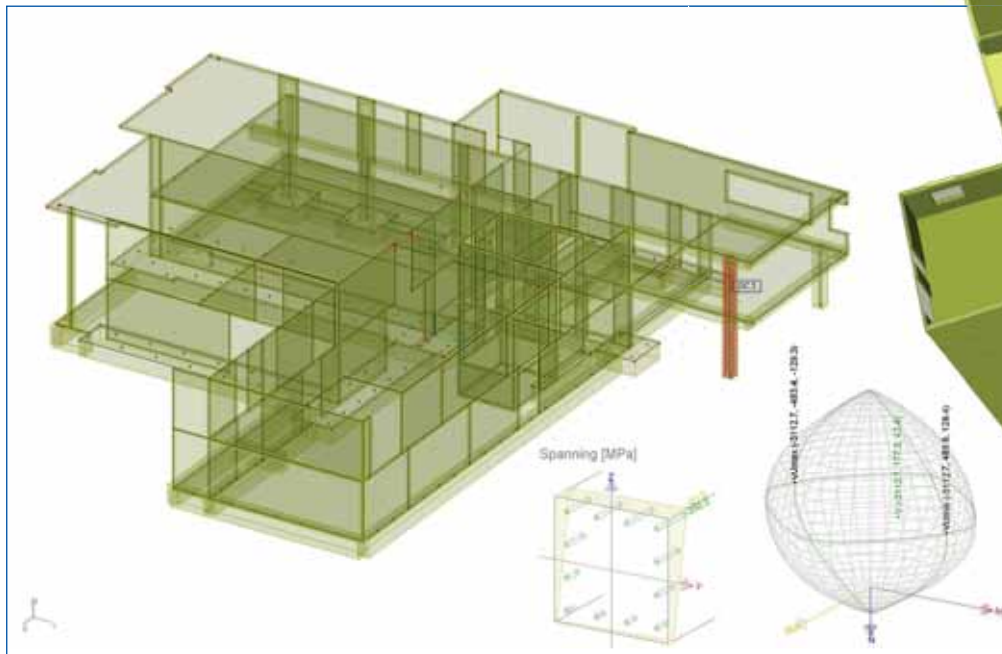
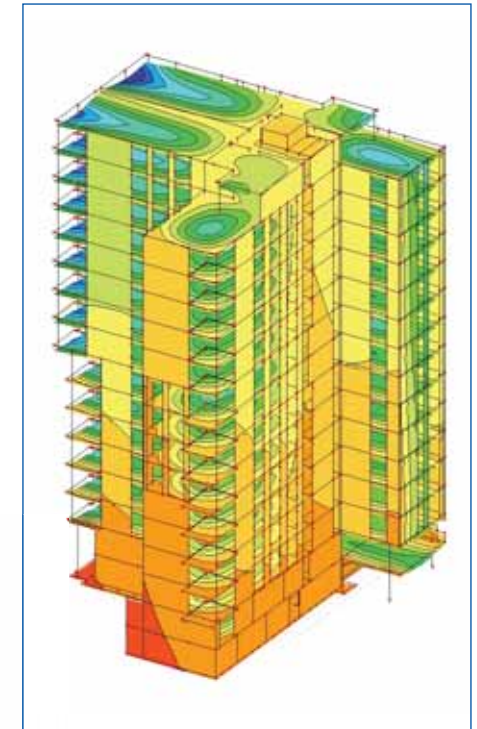
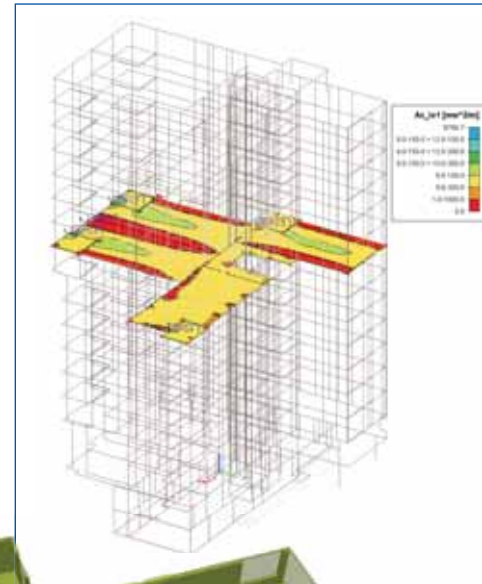
Technische gegevens Scia Engineer

- Versie: 8.1.50
- Aantal knopen: 3428
- Aantal staven: 1151
- Aantal platen: 717
- Aantal belastinggevallen: 8(12)
- Materialen: 16
- Functionaliteit: (Niet) lineair, Fysisch niet lineair voor gewapend beton, Staal.

Vanaf een schetsontwerp wordt een project steeds gedetailleerder. Met deze faseverdeling wordt ook Scia Engineer toegepast. In eerste instantie is een hoofdberekening voor de bepaling van de krachtsafdracht opgezet. In de latere fasen worden onderdelen, zoals vloeren, balken en kolommen, nader gedetailleerd.

Naast het feit dat het project in een 3D FEM programma (Scia Engineer) is uitgewerkt is het tevens als geheel in 3D uitgetekend. We zijn als IOB trots dat we door "Engineering op hoog niveau" aan dit "Wonen op hoog niveau" hebben kunnen bijdragen.

Overkamp park Dordrecht



Ing. Milan BOBAČIĆ - INKOS

Contact Csaba Mészáros
Address Dubová 4
81104 Bratislava, Slovakia
Phone +421 263536364
Email postav.meszaros@gmail.com



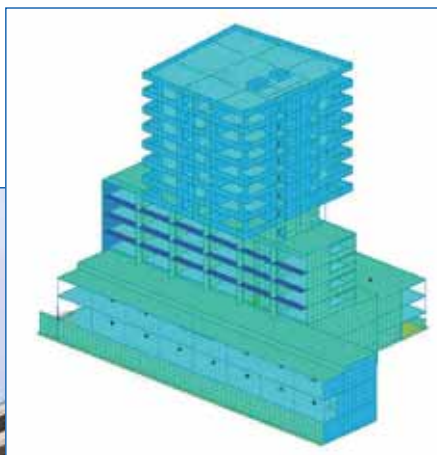
Our small company has been founded in 1992 and is dealing with the design and solution of static problems of bearing constructions of buildings, technological buildings and also transportation buildings.

During the existence of our company we have participated in the design of bearing constructions in the field of industrial buildings - productive and technological halls - and constructions,

technological buildings with regard to productive technological equipment in the agricultural area and also residential constructions of multifunctional and apartment buildings (concrete skeletons of the bearing constructions).

We are a member of the Slovak Chamber of Civil Engineers.

Our small office employs 3-4 engineers.



Short Description

Tatra City Multifunctional Complex

The Tatra City complex located in the capital city of Slovakia, Bratislava, contains on the one hand an administrative part and on the other hand a residential part.

It is composed of 15 above-ground floors and one basement floor and has a height of 46 m.

The bearing system of the building is created from a concrete monolithic combined plank and wall system. The basic bearing system of the tower blocks consists of concrete cores with the parameters 7.6 x 9.9 m a vertical communication core.

Project Information

Owner: Tatra Residence

Architect: Ing.Arch. L. Závodný

General Contractor: ZIPP Bratislava

Engineering Office: Ing.Arch. Lubomír Závodný Aa

Construction Start: 01/04/2007

Construction End: 01/05/2009

Location: Bratislava, Slovakia



In general

The Tatra City complex is a multifunctional building with one administrative part and a residential part. In particular we are going to deal with the residential one because it was the main purpose of our work.

The authors of the architectural design are Ing.arch. L. Závodný, Ing.arch. D. Michalák, Ing.arch. m. Lang, mgr.arch. O. Pleidel. The chief designer of the project is Ing. Lubomír Žemla. The building has 2 dilatation units and each of them has 15 above-ground floors and one basement floor. The maximum height of the object is 46 m above the terrain.

Geological conditions

It is located on the right bank of the river Danube. From the geological point of view massive gravel-sand layers with the river sedimentation of the river Danube are participated in the location of interest. This layer reaches to 10-15 m and the ground is made up from neogenic sediments in sand-clay and clay evolution. The level of the underground water can be found 4.0 – 4.2 m under the surface.

Foundation

Following preliminary research of the area it was clear that the building had to be founded on the gravel layer. Based on this presumption the foundation of the object was designed on the plank. The calculation showed sufficient suitable ground. The supplier of

the construction decided to change the system of the foundation from planar to piles. The piles were designed by a company which realised both the distribution and the carrying power of the piles; it was solved with their length. Following the presentation of their design the calculation of the whole object was requested. In the final phase we arrived at 820 mm thick piles with 10 – 14 m length. The basement parts of the object were solved as waterproof construction because of wobbling level of the underground water.

Bearing system

The bearing system of the object is created from the concrete monolithic combined plank and wall systems and the skeleton construction based on the foundation plank with piles together with the point-supported ceiling planks. In particular in the tower blocks, the basic bearing system consists of concrete cores with the parameters 7.6 x 9.9 m. The thickness of the walls is narrowed from the foundation to the last floor (400-200 mm). Bearing columns, size 600/300 mm, represent the next part of the system in the open spaces and in the basement because of the parking area.

The object has 2 large above-ground floors – the multifunctional part. It is a linear residential building with a width of 13.25 m, up to the 8th above-ground floor. The technological floor is located on the 9th floor. On this floor the angle bracket construction of the remaining floors partially begins. This is the most

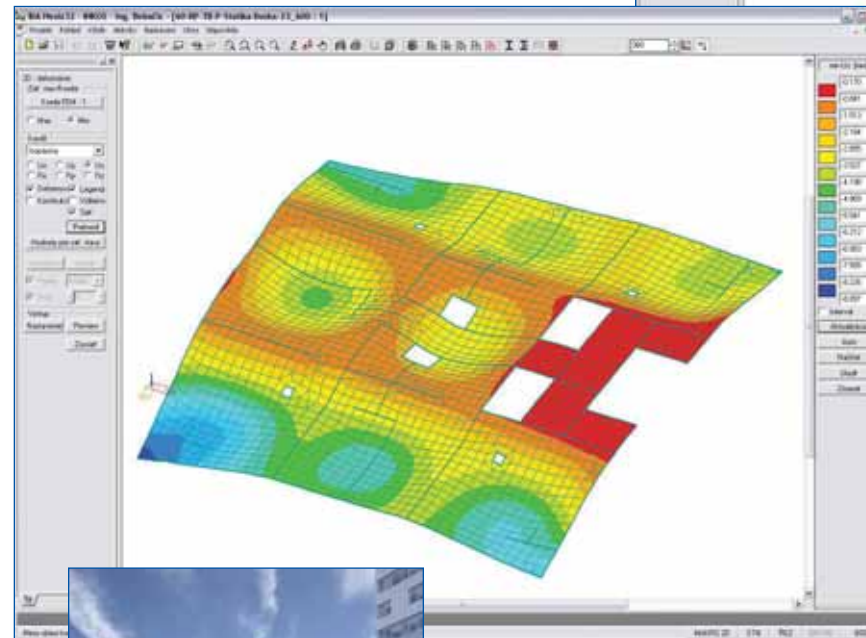
critical point not only from the calculation point of view but also from the realisation of the construction itself. It was checked in detail by the supplier and the planner. The remaining floors are characterised as a wall system of 200 mm thickness and a plank system of 250 mm thickness. The full solidity of the planks is secured by a circuit firm attic gable.

The construction of the elevator wells was designed as a separately standing object, horizontally secured in the particular levels of the planks.

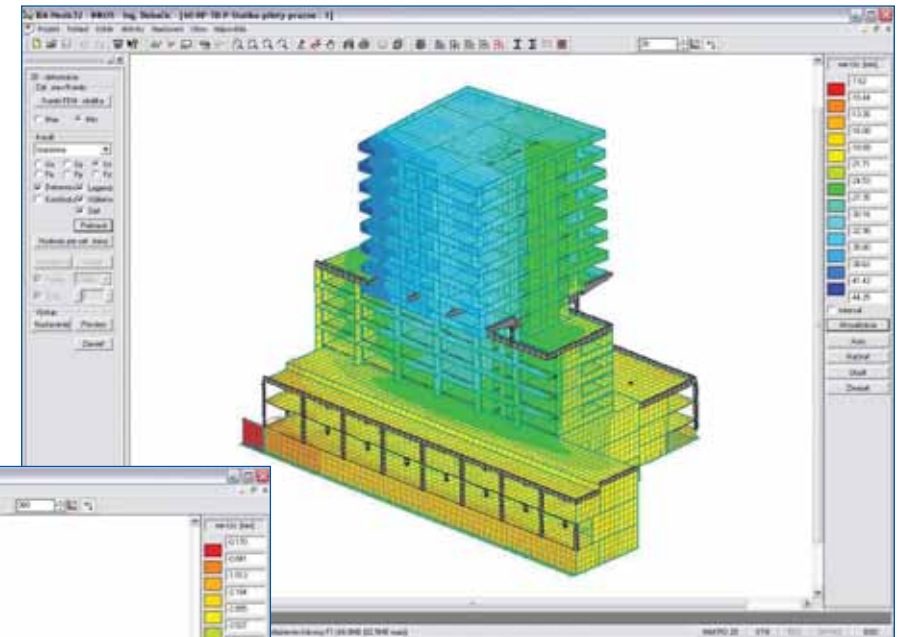
The material used in the wall and plank construction was concrete C25/30. The columns were designed from concrete C30/37.

Calculation

The construction was modelled with the ESA-Prima Win Nexis 60 programme. The whole bearing construction of the object was simulated with the 3D model; this was necessary for the analysis of the construction according to the interesting shape. The basement was solved with the soilin module following the Winkler combination together with the elastic support in the place of the future piles. The sufficient horizontal stiffness was showed so the modelling of the partial ceiling planks could follow. Each ceiling plank got its partial 3D model of its own floor. The most critical ceiling plank construction was the one on the level of the angle bracket above the 9th floor. Here we had to solve some models together with the particular phases of the realisation of the object. The results were the required dimension stiffening drawings directly from the program.



Tatra City Multifunctional Complex



Meylan Ingénieurs SA

Contact Eric Molleyres
 Address Rue de genève 82
 1004 Lausanne, Switzerland
 Phone +41 216200090
 Email info@meylaningenieurs.ch
 Website www.meylaningenieurs.ch



Présentation bureau

La société établie à Lausanne, fondée en 1979 en nom Frank Meylan, s'est transformée en une société anonyme FM Frank Meylan SA en 1986. MM. Molleyres & Gregorin se sont associés, puis ils ont pris la direction de la société le 1 janvier 2009.

Domaine d'activité

Notre structure efficace nous permet d'aborder tout projet de construction.

Nous bénéficions d'une grande expérience dans de vastes domaines de la construction, de la rénovation et de la transformation d'ouvrages, tels que bâtiments d'habitation, bâtiments publics et commerciaux, habitat, sports et loisirs.

Nous sommes également actifs dans des domaines plus spécifiques, tels que : travaux spéciaux (fondations profondes, reprises en sous-œuvre, soutènements), analyse et conception parasismique, expertises et études financières.

Nous sommes entourés de 2 à 8 dessinateurs spécialisés. Chaque collaborateur est impliqué

dans les décisions du bureau et a la possibilité de guider son parcours en fonction de ses affinités et préférences professionnelles.

Nous offrons une liberté d'action stimulante, la possibilité de se former en permanence et des échanges riches et créatifs.

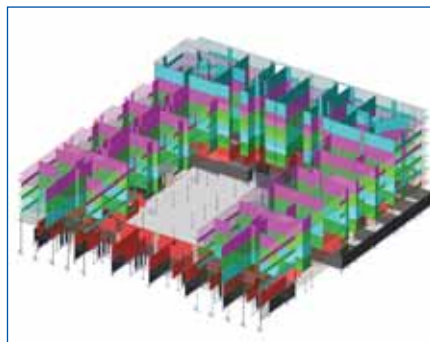
Les principaux critères de sélection de nos collaborateurs sont l'état d'esprit, le dynamisme, l'indépendance et un grand sens des responsabilités.

Clients

Nos clients sont des investisseurs privés, des institutions publiques et privées, des sociétés industrielles.

Références récentes :

- Résidence Léman House à Montreux (15'000 m³)
- Complexe d'immeuble Central Parc à Rolle (35'000 m³)
- Surélévation Hôtel Novotel à Bussigny, Groupe Accord
- Immeuble administratif Gétaz Romang à St-Légier Rolle (8'400 m³)



Building blocks 'Les Moulins de la Veveyse'

This project comprises four blocks of buildings, all standing on a common large basement car park. The total volume for block A is 64.500 m³. Next to this block, an industrial hall inscribed as a historical building will become a multipurpose space. In the middle, a pavilion will host a nursery.

Each block is separated by a vertical spacing required to avoid seismic pounding. All buildings have their own independent structure. The rectangular five-storey concrete buildings are supported by walls and columns. As the ground level is dedicated for commercial purposes, there are only placed a few seismic walls. Ductile wall systems were designed by using and comparing the replacement force approach and the spectral response acceleration approach.

Short Description

Project Information

Owner: Groupe Delarive SA

Architect: Pezzoli & Architectes Associés SA

General Contractor: FIDIAS SA

Engineering Office: Consortium Meylan Ingénieurs SA et Willi SA

Construction Start: 2008

Construction End: 2010-2012

Location: Vevey, Switzerland



Depuis 2007, le site des anciens Ateliers de Construction Mécanique de Vevey (ACMV) se transforme en quartier écologique entièrement labellisé Minergie Plus. Sur une parcelle de 86.765 m², située au bord de la Veveyse, près de 400 nouveaux logements pourront accueillir 1000 habitants d'ici à 2010. Actuellement le plus important chantier de Suisse à pollution zéro, en termes de chauffage et de production d'eau chaude.

Fondés en 1842 par Benjamin Roy, les ACMV réparent des machines agricoles et fabriquent des roues de moulins. Ils se forment rapidement une réputation internationale en livrant des machines destinées à percer le tunnel du Gothard, des turbines hydro-électriques, des ponts polaires pour les centrales nucléaires françaises, des réservoirs de méthaniers aux Etats-Unis, des trolleybus et des charpentes métalliques. Aux modernisations et agrandissements des années soixante, suit le déclin progressif des années quatre-vingt qui conduit à la fermeture des ACMV en 1992.

Comme c'est le cas pour de nombreuses friches industrielles en milieu urbain, le quartier est actuellement au centre d'un nouvel intérêt. Redonner vie à une portion de ville aussi chargée en histoire est un projet passionnant pour tous les concepteurs.

La 1ère étape du projet (ilot A) consiste en la construction d'un vaste parking enterré, de quatre nouveaux bâtiments de logements et commerces

(volumes 64.500 m³) ainsi que d'un pavillon destiné à accueillir un jardin d'enfants. S'y ajoute une halle industrielle voisine, la halle inox, inscrite à l'inventaire des bâtiments historiques, dont la transformation servira d'espace polyvalent. Cette 1ère étape est en cours de réalisation et se terminera en 2010.

Les étapes suivantes, soit les ilots B & C (volumes 114.000 m³), sont en cours d'étude et de conception pour un début des travaux de gros-œuvre dès juin 2009. Le quartier sera complet avec au Nord l'ilot D et la transformation de l'immeuble existant sur l'entrée Nord de la parcelle.

Concept structurel

Chaque ilot est composé de bâtiments distants séparés verticalement par des joints parasismiques/dilatations, avec comme base commune le niveau du sous-sol attribué au parking et techniques. Chaque bâtiment comporte des structures porteuses propres à sa partie d'ouvrage. La structure porteuse est constituée de dalles en béton armé de 25 cm pour les étages et de murs, piliers en béton. Le concept Minergie P, implique un réseau de ventilation double-flux dans les dalles, ainsi que des techniques et sanitaires denses dans celles-ci.

Les ouvrages, de forme rectangulaire, se composent de 5 niveaux sur rez-de-chaussée. Comme les niveaux du rez sont attribués aux

commerces et bureaux, les murs, notamment les refends parasismiques, sont peu nombreux. Une étude particulièrement poussée a été réalisée sur le dimensionnement parasismique de chaque ouvrage. En effet, nous avons réalisé des dimensionnements suivant le concept dit 'ductile' et 'non ductile', et ceci avec la méthode des forces de remplacement MFR avec des recoupements avec le spectre de réponse MSR. Grâce à une collaboration particulièrement efficace avec le bureau d'architecte, nous sommes parvenus à fixer un concept pour chaque bâtiment en fonction des refends parasismiques disponibles.

Utilisation de Scia Engineer

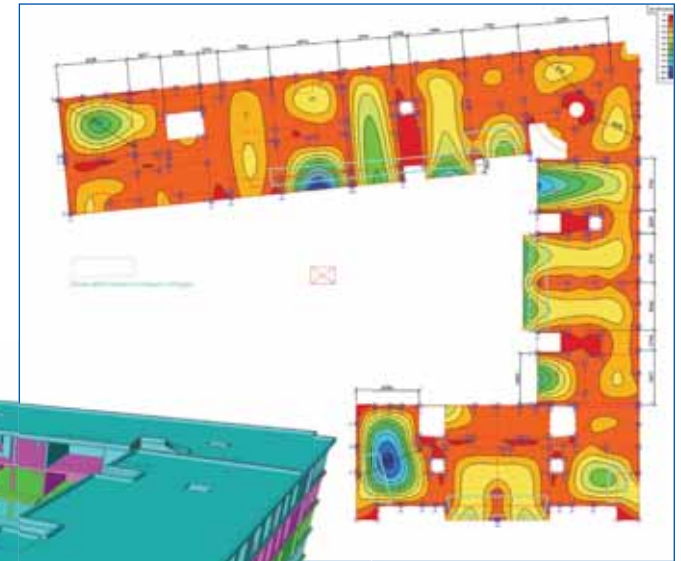
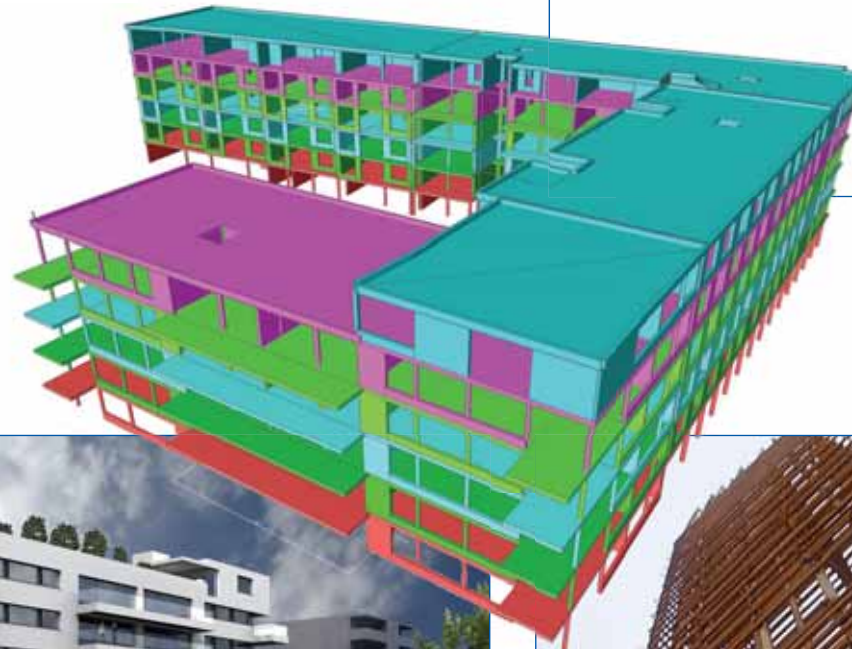
Nous utilisons ce programme depuis 1998, et avons suivi avec intérêt tous les développements de ses fonctions déjà performantes à la base. Nous ne possédons pas toutes les fonctionnalités disponibles, mais nous exploitons avec efficacité celles à notre disposition. En résumé, nous possédons calculs statique linéaire 3D, contrôle acier, dalles et voiles b.a., outils de productivité, calculs dynamiques.

Le challenge, pour ce type de projet, est d'économiser, d'optimiser le temps à disposition. Eviter toutes les répétitions superflues des actions sur la structure et les calculs, les simplifier, définir rapidement une descente de charges, mise à jour des corrections et édition de notes de calculs réalisées sur mesure.

Cela n'a pas été sans peine, mais au final, la synthèse des acquis par rapport au programme est la suivante :

- Nous avons élaboré pour la conception du projet, mais également afin d'optimiser la saisie de la structure 3D des ouvrages, des plans de structure de synthèse. Ces derniers ont été très appréciés lors de cette phase de l'étude.
- Nous avons modélisé les ilots entier, les éléments structurels (appuis, rotules, caractéristiques des matériaux), les charges, combinaisons, les résultats principaux, déformations et armatures, mais également une note de calcul complète. Puis, nous avons sauvegardé le tout, et scindé par bâtiment. De ce fait nous travaillons avec des fichiers normaux, avec un nombre d'élément à calculer pas trop important.
- Nous avons fait en sorte que les parties d'ouvrage figurent, par zoom centré, sur la partie de l'image nous intéressant

- Nous avons exploité le module Espace papier pour sortir des documents de présentation
- La méthode de calcul parasismique basée sur la méthode des forces de remplacement MFR a été préférée à celle du Spectre de réponse du modèle Scia Engineer pour des raisons de rapidité, de lisibilité et de lecture des résultats.
- Nous avons mis le doigt sur plusieurs problèmes propres au programme. Ces derniers ont été localisés et maîtrisés. Nous sommes adeptes des contrôles manuels en parallèle des résultats informatiques.
- Comme nous sommes en cours d'étude pour les ilots suivants, nous recherchons sans cesse de nouvelles connaissances et procédures informatiques pour exploiter au mieux toutes les fonctionnalités du programme Scia Engineer.



Movares

Contact Ybele Jelsma
 Address Postbus 2855
 3500GW Utrecht, Netherlands
 Phone +31 302655555
 Email ybele.jelsma@movares.nl
 Website www.movares.nl



Movares

From concept to completion

Movares is an engineering consultancy company, analyzing issues and providing solutions in the fields of planning, mobility, infrastructure and transportation. Usability, future value and sustainability play a major role in the designs we produce and the advice we give. Increasingly, we are turning our attention to related markets, such as water and energy. We contribute to accessibility through our unique combination of expertise. Movares operates throughout Europe and has offices in the Netherlands, Germany and Poland.

An engineering consultancy based on engineers

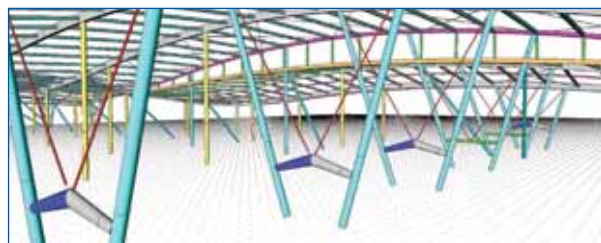
Movares has some 1400 professional staff. In all they do, they are 'professional, enterprising and human' – reflecting our three core values. Our engineering consultancy is engineer-based. That means we focus on developing our people. The result: ideas and solutions that contribute to sustainable development. Development maintaining a healthy balance between social relevance, quality of life, sustainability and economic growth. To us, socially responsible business is not just something you do. It's what you are. And our customers notice the difference.

Giving shape to mobility

Infrastructure is the backbone of development, both for society and for the economy: from initial studies and the earliest planning phases, to the design and execution of projects and further on to management and maintenance. 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'.

Projects

Movares is involved in a wide range of projects. Those of which we are mostly proud include the dedicated freight line from the Netherlands into Germany (the Betuweroute), the high-speed line into Belgium (known as the HSL-Zuid), doubling the number of tracks between Amsterdam and Utrecht (the busiest line in the Netherlands), several projects in the port of Rotterdam, a high-voltage switching station and a new public transport terminal in Utrecht.



Public Transport Terminal, Central Station, Utrecht

Short Description

The project regards a state of the art building to integrate all public transport facilities and shops within one location. The works will be carried out in phases, as the station needs to remain fully operational during construction. The integral station building will be able to handle up to 100 million travellers per year. The implementation will take place from 2010 till 2015.

Scia Engineer has been used to get the steel structure determined.

The main construction of the roof is made out of steel and consists of seven lines of curved beams supported by columns. Across these beams are mounted girders, which are curved in one direction. The roof plating is mounted on the girders. The pedestrian and shopping areas are made out of concrete floor.

Project Information

Owner: ProRail
Architect: Benthem Crouwel Architects
General Contractor: n/a
Engineering Office: Movares Nederland B.V.

Construction Start: 2010
Construction End: 2015
Location: Utrecht, Netherlands



Introduction

The present buildings for the Utrecht Central Station have a capacity of 35 million passengers per year. Nowadays the station is already used by 55 million travellers annually. In the next twenty years the number of travellers will raise to about 100 million. The existing building cannot accommodate these numbers of passengers. The plans provide in a state of the art building to integrate all public transport facilities and shops within one location.

The new public transport terminal (called OV-Terminal) will be the largest station in the Netherlands in size as well as in transit values. The realization of the OV-Terminal is planned in the period 2010-2015. As the station needs to remain fully operational during construction, works will be executed in phases.

Design OV-Terminal

The OV-Terminal will consist of a concrete floor structure and a steel roof structure. The concrete traverse is a structure of repeated concrete columns supporting tie beams and PI-beams which connect the tie beams such that they act as portal structures. Spanning the tracks is realised by the use of TT-girders.

The main dimensions of the roof structure are approximately: length 250m, width 90m and maximum height 17m.

Traverse Roof structure

The roof structure of the traverse consists of a main structure with seven rows of steel main girders, supported by steel columns at the existing patterns. In order to reduce the deadweight of the structures and the possibility to utilize large spans, steel as main material was chosen instead of concrete.

For the benefit of the double sided curved roof surface, the main girders are singularly bent. On top of these girders the curved purlins are mounted. During assembly the purlins need to be slightly twisted. In fact all purlins are shaped differently.

On top of the purlins steel roof plating in trapezium shapes, as in the present situation, will be attached. Due to the enormous dimensions of the roof and the temperature changes, the roof has two expansion joints in the longitudinal direction dividing the structure in three parts. The stability in transverse direction is realized by the application of steel tension-compression shores. In longitudinal direction per pattern and per separated part, a steel stabilizing element is applied. The elements consist of two columns connected by buckled elliptically shaped and tapered beams and at the top the columns are connected by wires as wind framing. Near the roof cut, also called "the eye", for architectural reasons it is decided to apply "Vierendeelliggers" between the higher and lower roof

structure. At this point the main roof girder is split into two separate tubes serving as upper and lower edge of the "Vierendeelliggers".

The fire resistance of the main steel superstructure itself is established at 30 minutes. The application of Sprinkler systems prolongs the fire resistance by 30 minutes and due to a low fire load another 30 minutes can be added, totaling to a fire resisting period of 90 minutes.

Because of the fact that the traverse is surrounded by high-rise buildings wind tunnel tests were carried out. Results from the tests are integrated in the design parameters and measures as local increase in wind loading are applied into the design. In relation to wind loadings an analysis of the frequencies of the total roof superstructures was executed.

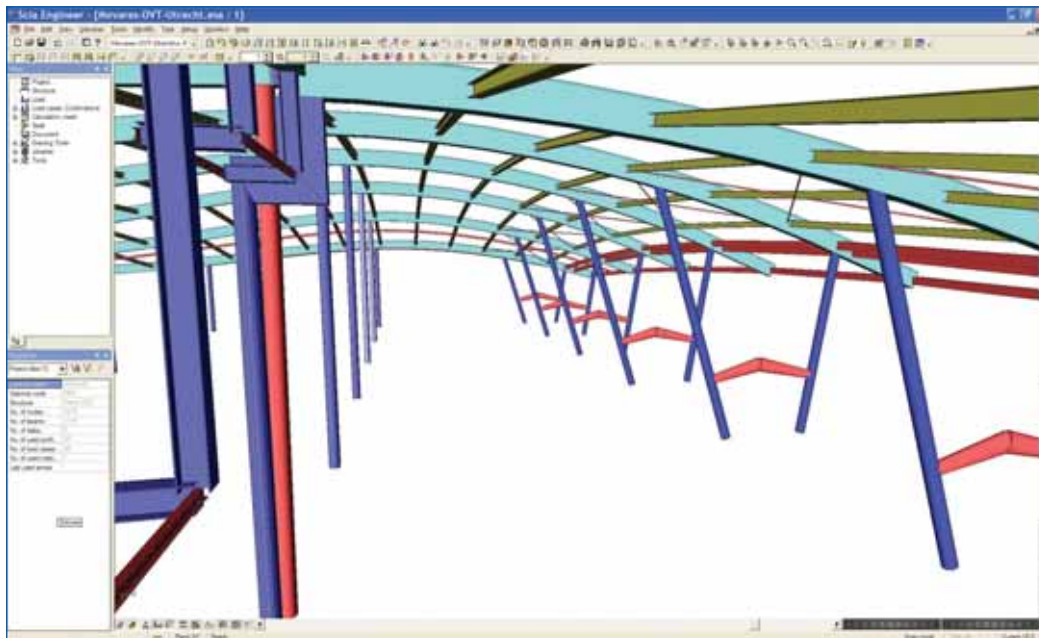
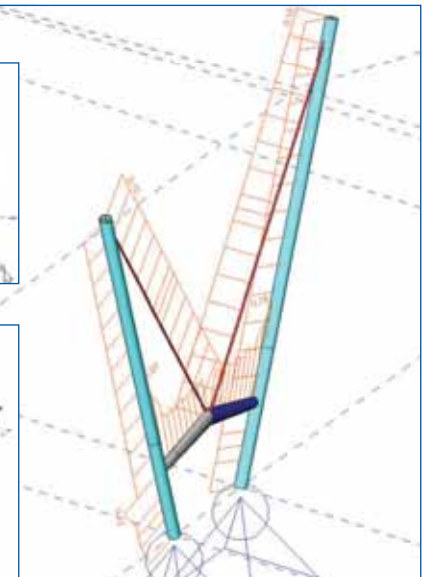
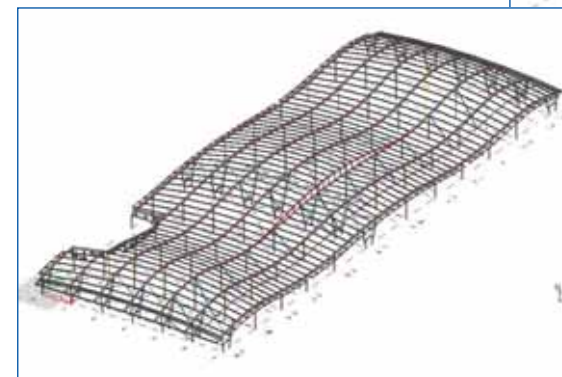
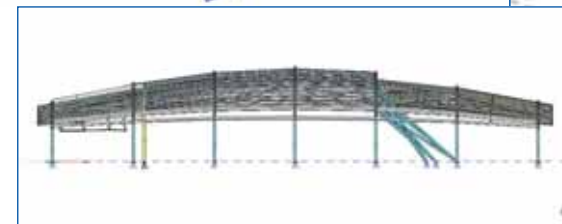
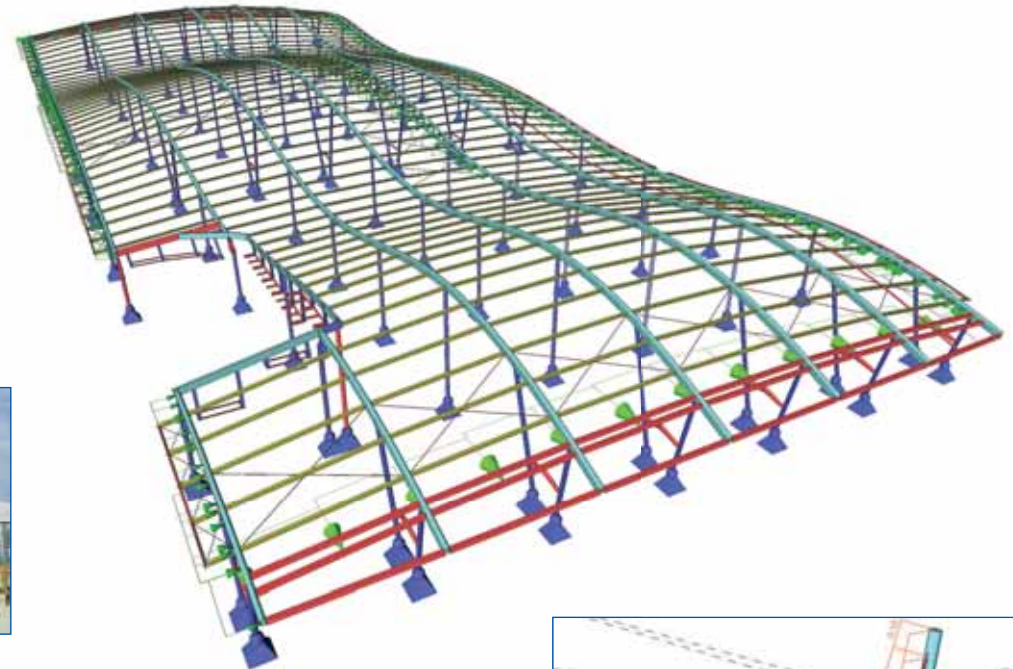
As the wind- and stabilizing elements can only transfer tensile forces, these elements are introduced as non-linear members. Consequently all structural members are tested on results from non-linear analyses. Buckling lengths and the verification of the Codes, as well as the analyses of deformations are done by using Scia Engineer.

In relation with the wind tunnel tests determination of the natural frequencies, the dynamic properties, is established in order to compare the test results with the basic assumptions as mentioned in the Codes.

Link: <http://www.movares.nl/Projecten/Stations/OV+Terminal+Utrecht+Centraal.htm>

The use of Scia Engineer software

For the analyses of the steel structures the Scia Engineer software is used because the double bent roof definitely needs 3-dimensional analyses. Originally the main model was shaped with the 3D AutoCAD package and the result is read into Scia Engineer. To the basic model all other structural elements and conditions are added.



Petignat & Cordoba Ingenieurs Conseils SA

Contact Manuel Cordoba
 Address 11, rue de la Paix
 1820 Montreux, Switzerland
 Phone +41 21 963 05 63
 Email m.cordoba@petignat-cordoba.ch
 Website www.petignat-cordoba.ch



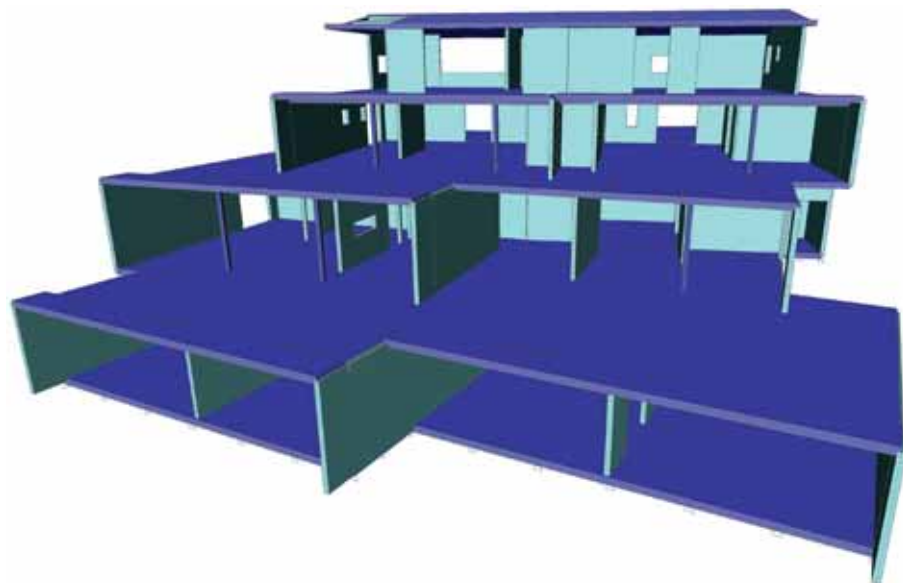
Le bureau Petignat & Cordoba Ingénieurs Conseils SA, dont le siège est à Montreux, avec une succursale à Aigle et à Châtel-St-Denis, exerce depuis plus de trente-cinq ans ses activités.

Notre rayon d'action est la Riviera Vaudoise, le Chablais Vaudois et la région de la Veveyse.

Nos collaborateurs, ingénieurs polytechniciens, ingénieurs techniciens, dessinateurs, disposent de moyens informatiques puissants, utilisés tant pour les calculs d'ingénieurs que pour l'élaboration des plans. Grâce à leurs compétences, nous pouvons assurer à notre clientèle un travail effectué dans les règles de l'art.

Nos domaines d'activité sont les suivants :

- Toutes études d'ouvrages du génie civil, de bâtiments, de traitements des eaux, d'ouvrages hydrauliques, de travaux spéciaux, de parkings publics, etc.
- Planification et direction des travaux
- Gestion de chantier et coordination
- Rénovation bateaux historiques
- Calcul en fibres de carbone
- Panneaux sandwichs
- Remontées mécaniques pour le ski
- Etudes d'ensoleillement et optimisation des panneaux solaires en énergie renouvelable



Terrace building 'Terrasses Blanches'

Terrasses Blanches is a terrace building that follows the shape of the slope where it is located. Each floor is slightly rotated compared to the next one, which implies that absolutely no element of a storey is aligned with its neighbours. Only through a 3D modelisation could the various issues be solved, including the design of walls and the check of deflections.

Short Description

Project Information

Owner: JF Development SA - Montreux

Architect: Archi-DT SA - Montreux

General Contractor: Dentan Frères

Engineering Office: Petignat & Cordoba Ingénieurs Conseils SA

Construction Start: 03/2008

Construction End: 12/2008

Location: Lutry, Switzerland



Descriptif de l'objet

Terrasses Blanches est un bâtiment situé en terrasses afin d'épouser la topographie du terrain, ainsi que de s'intégrer à l'urbanisme du village de Lutry d'une façon homogène et complète. L'architecte a été amené à faire un système de terrasses sous forme de cubes ou « boxes » qui subissent une légère rotation à chaque étage, conservant le type d'architecture évoqué ci-dessus. De ce fait, la descente de charge de cet ouvrage s'en trouve complètement décalée, obligeant l'ingénieur à faire appel à un calcul en trois dimensions pour répartir, non seulement la charge, mais les déformations qui sont indirectement dues à ce décalage. L'ouvrage est constitué en béton armé avec plusieurs modules d'élasticité.

Une part importante de la structure est en béton apparent. 1'000 m³ de béton ont été utilisés pour faire ce bâtiment, avec 100 tonnes d'acier. Les portées varient entre 6 et 8 mètres avec des épaisseurs de dalles variant entre 24 et 30 cm. La fondation du bâtiment est faite sur un radier élargi en béton armé qui fait appel à des armatures de poinçonnement et des encastresments aux murs.

Descriptif du modèle de calcul

Le model de calcul utilisé est composé de coques en trois dimensions : des dalles en plaques, des murs en voile et la toiture modélisée en éléments coques faisant appel à des efforts non seulement flexionnels mais aussi membranaires. Comme mentionné ci-dessus, une des difficultés réside dans le décalage



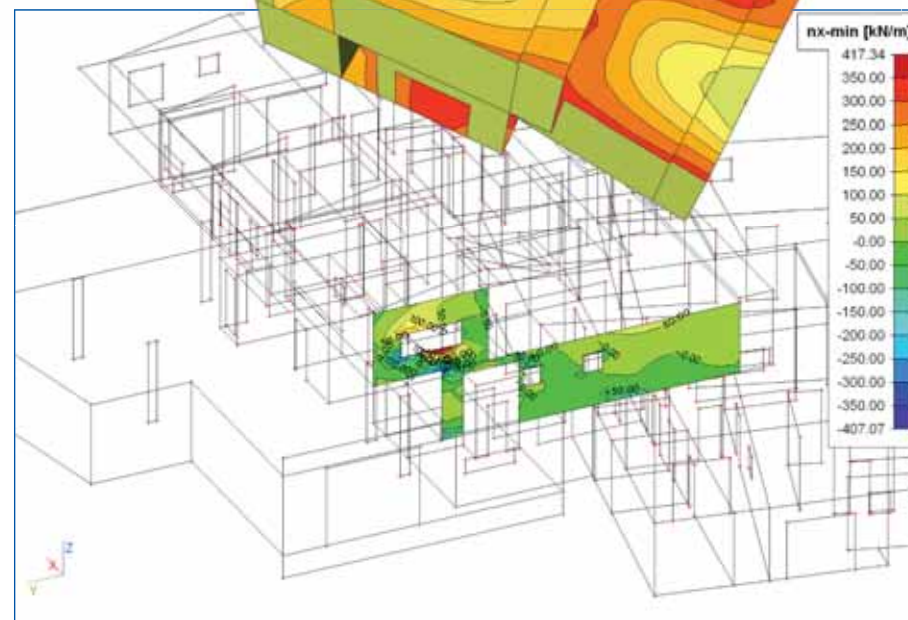
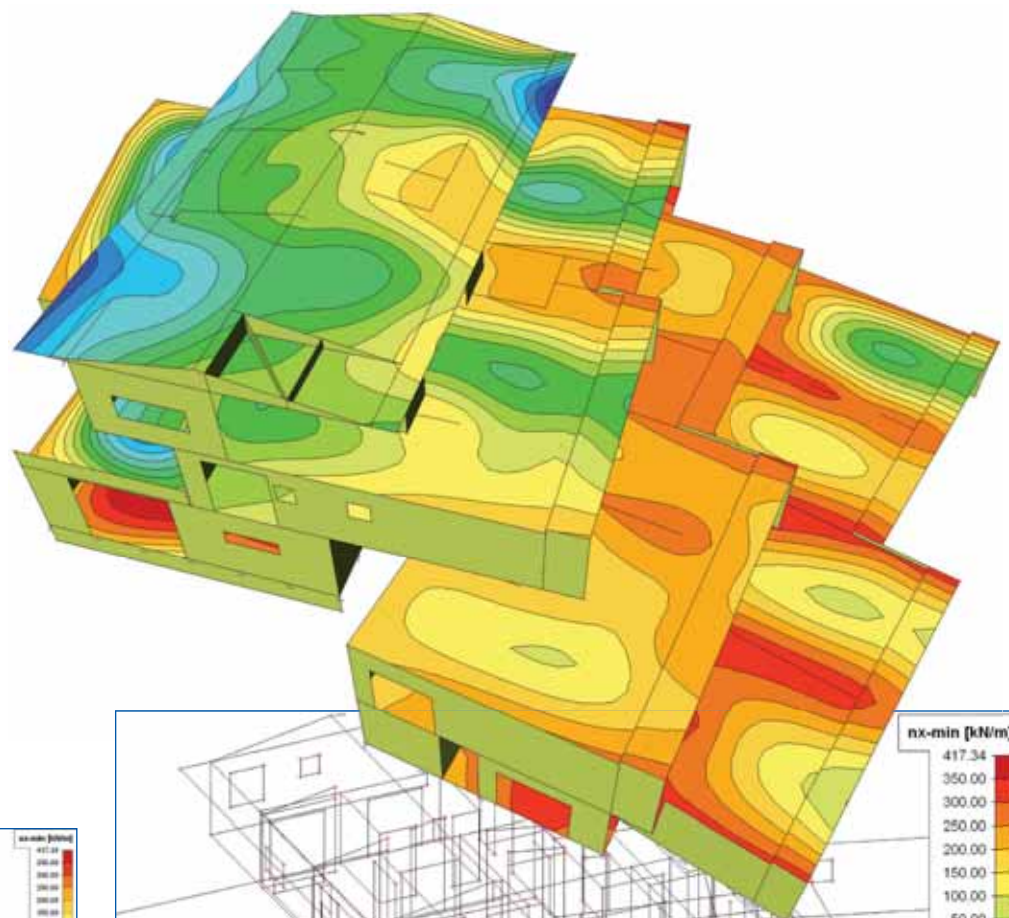
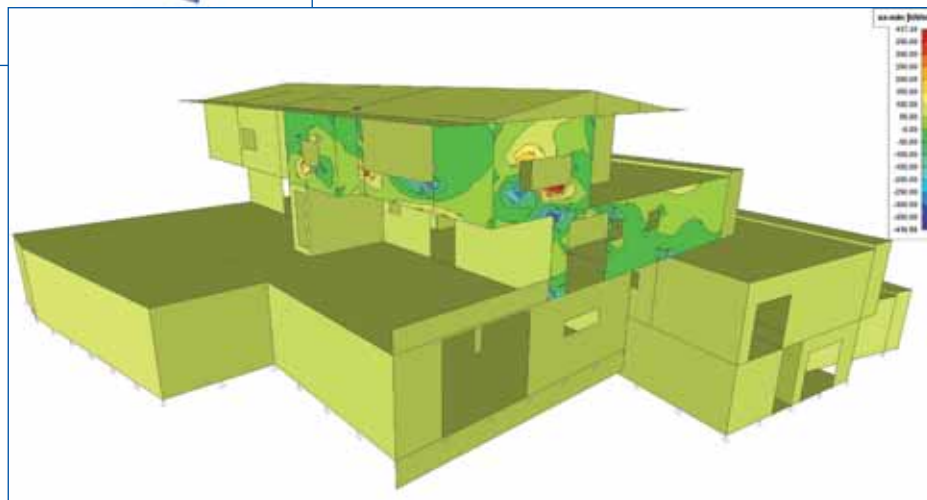
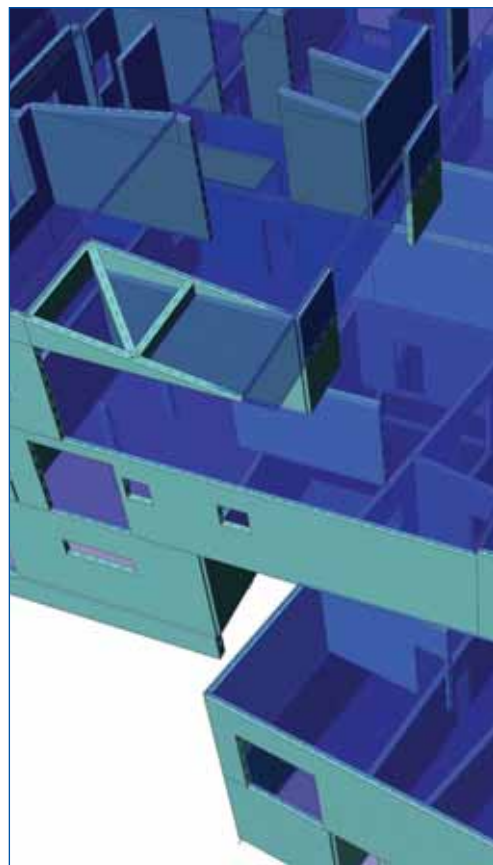
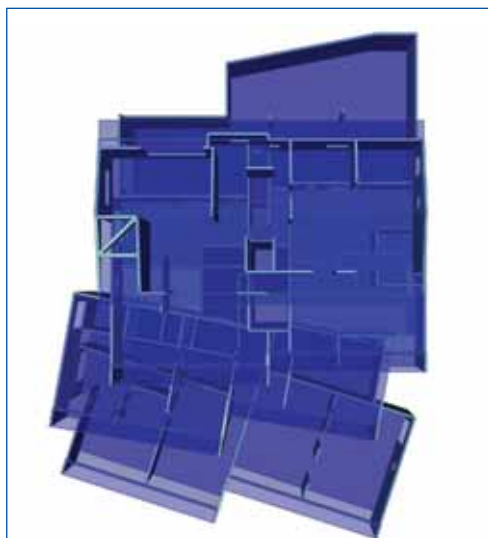
Used software: Scia Engineer

de chaque étage par rapport à ses voisins, engendrant bon nombre de conflits géométriques au niveau des dalles.

Outre le dimensionnement classique des dalles, le modèle en 3D a permis de résoudre certains aspects particuliers qu'un calcul traditionnel en 2D avec descente de charges n'aurait pas pu appréhender correctement. Cela inclut notamment le dimensionnement de certains murs-voiles, les sollicitations au niveau de la toiture, ainsi que la vérification des déformations pour l'ensemble de la structure.

Bâtiment "Terrasses blanches"

2



S.C. ROM CARO SERVICE S.R.L.

Contact Corneliu Leonard Dinca
 Address Sos. Colentina nr. 53, Bl. 59, Sc. C, Et. 10, Ap. 113, Sector 2
 026113 Bucuresti, Romania
 Phone +40 723318082
 Email romcaroservice@gmail.com
 Website www.proiectare-structuri.ro



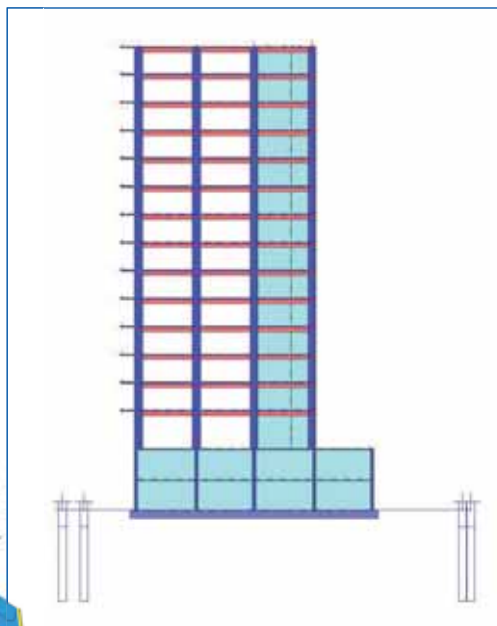
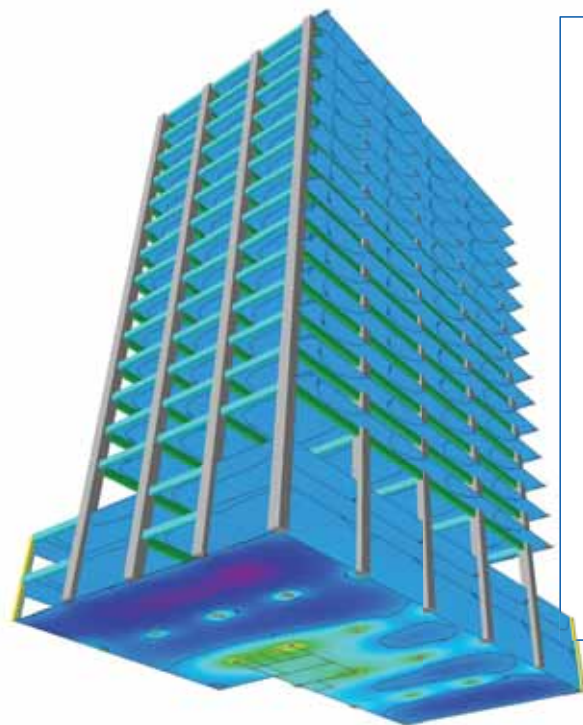
**S.C. ROM CARO
SERVICE S.R.L.**

The company was established in 1992 by engineer Corneliu Mihail Dinca (who unfortunately died before his time) in order to develop civil works.

It is a small company; presently we are working with only 2 own employees but we also collaborate with some other companies. Our company mostly develops small residential houses for one or two families.

Many projects have been developed by our company, but for sure, the largest one has begun in

2007 for a large company in Bucharest. The main goal for this project is to develop in Bucharest a 5 star hotel with all dependencies and with office buildings. In order to realize a project with the best design, not only economically, but also with regard to effectiveness and time-saving solutions for the execution, we analyzed various types of solutions. One of the best examples is the project we present with a solution for the fourteen-storeyed building for offices with 2 basements.



Office building, Bucharest

Short Description

The project is part of a greater complex which includes a luxury hotel and office buildings in the centre of Bucharest. Below the office building have to be created parking spaces for the offices above, that is why the building has 2 levels of basement. The rest of the building is designed for offices as there is an enormous need for buildings of this type in the surroundings. The main designing problem for this building was to create a structure to resist the seismic activity.

Project Information

Owner: n/a
Architect: LUCARNA
General Contractor: n/a
Engineering Office: ROM CARO SERVICE S.R.L.

Construction Start: 2008
Construction End: 2011
Location: Bucharest, Romania



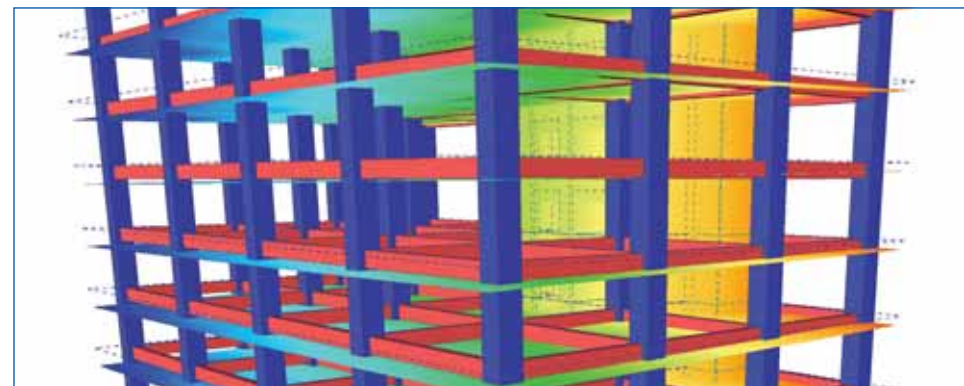
The project is part of a large complex including a luxury hotel and office buildings in the centre of Bucharest. The complex will be executed in 4 years. The project has been authorized in the middle of the year 2008.

The main goal for designing this office building is to create as much as necessary parking spaces for the offices above. That is why the building has 2 levels of basement, which is a part of a large basement for the whole constructed area. The rest of the building is designed for offices and spaces which are mandatory for this part of the town. The client requested as much as possible space for his future buildings, because there is a lack of this type of buildings in the surroundings.

The main designing problem for this building was to create a correct structure to resist the seismic design in our country. We must specify that our country has a large depth seismic activity, and the designing

problems in this type of activity is to create a building which will endure a seismic wave and will not put in danger the life of people who work in it. For tall buildings, with a structure on reinforced concrete frames or steel frames, the response spectrum and the characteristic period are near the main period of that type of buildings (the designed period for Bucharest is $T_c=1.6$).

To create that type of building we needed to create many types of structures to satisfy the client's necessities. One of the problems was that the client wanted a curtain wall on all facades, but we were not allowed to put any braces, which is almost imperative for tall buildings. That is why the client rejected a cheaper structure, which was based on a steel structure with bracings and a lot quicker to execute. Therefore the structure for this building will be only from concrete elements: columns, beams and shells on all storeys.



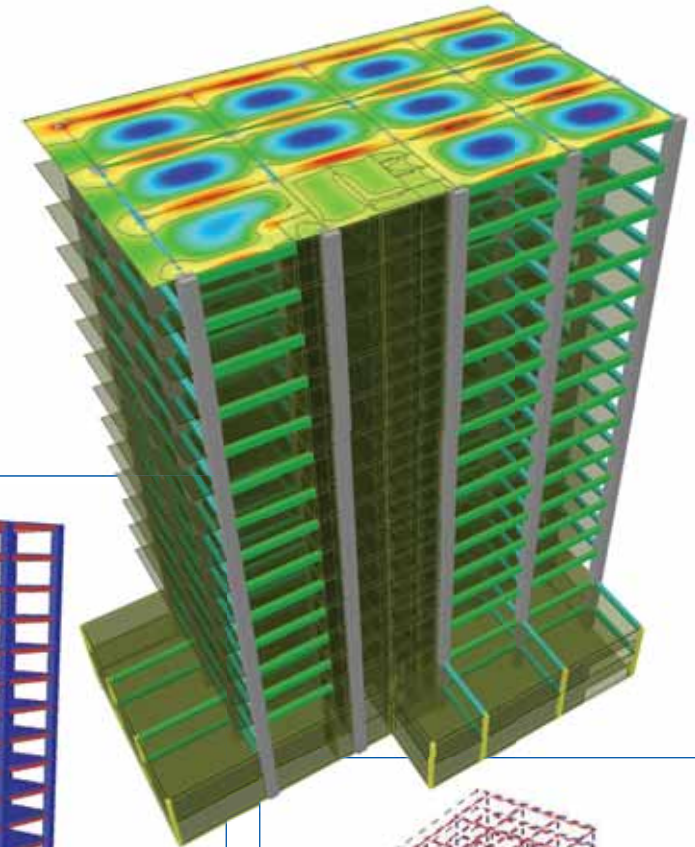
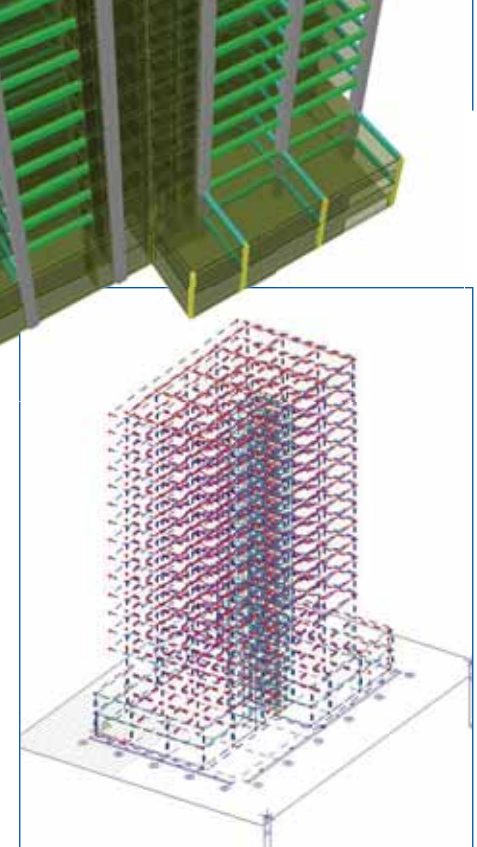
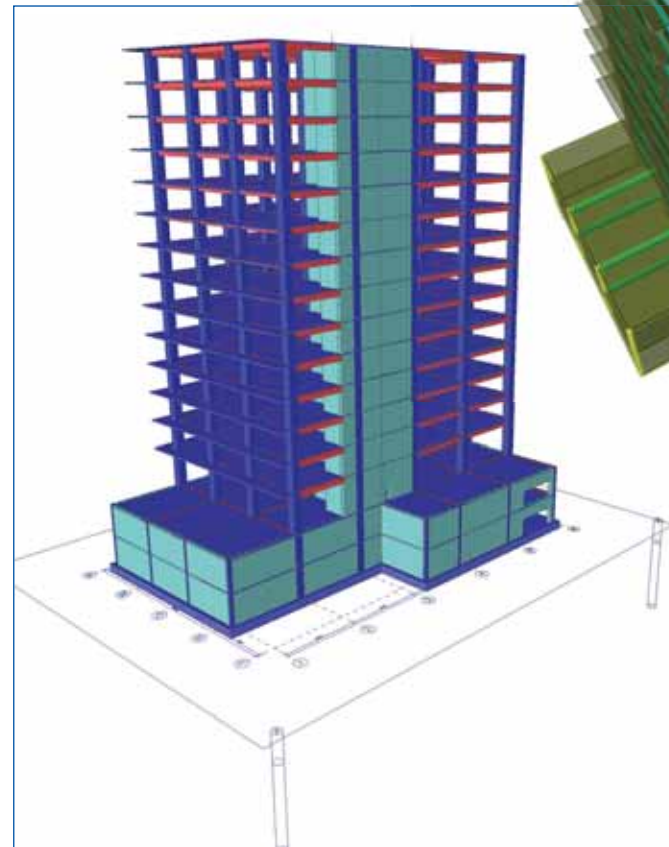
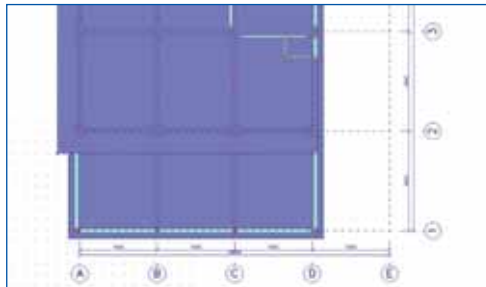
Used software: Scia Engineer, Allplan Engineering

Our designing team did a remarkably work in a very short time only because of the program's reliability and accuracy. That is why we purchased the SCIA program in the first place. The program computed dynamic and seismic analysis in a very short period of time, in comparison with others design and analysis program (e.g. ETABS). Because our operating system was Windows Vista x64 we encountered some difficulties in running Scia for that type of O.S., but due to fast response from the Nemetschek Group of Romania we quickly resolved that problem.

Another problem was the height of the reinforced concrete frame beams, which, because of the big distance between the columns, was too big. The solution for this problem was to increase the storey height, but for that, we needed to reduce the number of storeys. Then another problem appeared: the reinforced concrete columns were not able to resist the

new enlarged beam forces. Therefore we increased the dimensions of the columns up to 1.00 by 1.00 m. Also, for the columns to be able to take the shear forces transmitted by beams, we placed a composed HEB steel profile inside the columns. That type of composite section reduced a lot the displacements and, in addition, increased the stiffness of the structure. In order to keep the reinforced concrete slab with a small depth, capable to take the designed pressure, and in addition to be able to transmit horizontal forces to columns, we created a deck, which is supported by steel beams network. Those steel beams will be supported by the reinforced concrete beams of the frames.

The rest of the project, with the solution for the type of structure accepted, will be detailed for execution. We are confident that the detailing process will also be dealt with in a satisfactory way with Allplan.



Taylor & Boyd

Contact Steven Sloan
 Address 107 Malone Avenue, Belfast
 BT9 6EQ Northern Ireland, United Kingdom
 Phone +44 28 9066 7951
 Email norman.cromie@taylor-boyd.co.uk
 Website www.taylor-boyd.co.uk



TAYLOR+BOYD
 Consulting Structural and Civil Engineers
 www.taylor-boyd.co.uk

Over the 45 years of its existence, Taylor & Boyd have been involved in more than 14000 projects throughout Northern Ireland and abroad. With a total staff of 36, it is one of the largest structural engineering consultants in Northern Ireland. The practice strives to provide a quality service meeting client's requirements, as closely as possible and in order to maintain this level of service the practice became quality assured to BS EN ISO 9001 in December 1993.

Projects have ranged from small private schemes to large commercial sector developments. Some recent projects have been individually valued in excess of thirty million pounds. Projects include schools, hospitals, hotels and leisure, supermarkets, large commercial and industrial complexes, offices and residential accommodation.

Schemes have encompassed structural steelwork, reinforced concrete, masonry, timber and aluminium ranging from the simple to the highly sophisticated and innovative. Taylor & Boyd have also designed numerous civil engineering works, primarily in site development, roads, main drainage and sports fields and topographical surveys.

A wide variety of investigative work and reporting has also been undertaken, including damage claims,

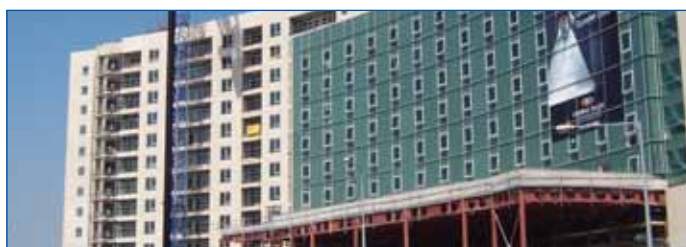
conditions of structures and providing advice for the refurbishment of old buildings.

Taylor & Boyd have consistently been involved with many large private sector developments, some of which have been on a design and build basis. The economical designs and efficient work methods of the practice were paramount in securing these projects against stiff competition from other Consultants.

The practice provides a full consultancy service in structural and civil engineering. It is custom of the practice to liaise with the client and architect from the earliest stage of scheme development, refining its engineering input to meet precisely with the constraints of the project concerned.

This close liaison with other members of the design team enables Taylor & Boyd to produce economical, practical and, when called for, innovative designs, constantly aligning resources to meet current project requirements.

The practice has several advanced computer systems, each backed by the latest engineering design software. The computer aided draughting facility links up with the design modules to form a full computer aided design and detailing system.



Short Description

Crowne Plaza Hotel and Apartment complex

This project comprises two adjoining buildings including a 10-storeyed Crowne Plaza Hotel and 13-storeyed Apartment Development. The hotel, situated beside the Blanchardstown shopping centre includes 188 bedrooms, as well as 12 meeting rooms, the largest having a room capacity of 450. The adjacent apartment building includes 96 apartments over 13 floors, with a double storey basement car park (295 spaces) serving both the hotel and apartments. This project is a Design & Build contract with McAleer & Rushe being the main contractor and Consarc Design, the architect. The client for the apartments is Green Property and Crowne Plaza is the client for the hotel development.

Project Information

Owner: Crowne Plaza & Green Property
Architect: Consarc Design Group
General Contractor: McAleer & Rushe Ltd
Engineering Office: Taylor & Boyd LLP

Construction Start: 11/2006
Construction End: 10/2008
Location: Blanchardstown, Dublin, Ireland



This project comprises two adjoining buildings including a 10 storey Crowne Plaza Hotel and 13 storey Apartment Development. The hotel, situated beside the Blanchardstown shopping centre includes 188 bedrooms, as well as 12 meeting rooms, the largest having a room capacity of 450. The adjacent apartment building includes 96 apartments over 13 floors, with a double storey basement car park (295 spaces) serving both the hotel and apartments. This project is a Design & Build contract with McAleer & Rushe being the main contractor and Consarc Design the architect. The client for the apartments is Green Property and Crowne Plaza is the client for the hotel development.

Both the hotel and apartments include a two storey basement with a total of 295 parking spaces. The basement car parking extends beyond the footprint of main buildings. The foundations comprise of a 1500 mm deep raft slab supporting the basement and main building, and a 750 mm deep raft slab supporting the areas of two storey basement only. The use of ESA-Prima Win was instrumental in determining the optimum slab depths, as well as modelling bearing pressures and deflections.

Reinforced concrete retaining walls enclose the basement. These walls are 250 mm thick and are typically 6 metres high, propped at mid-height by a floor slab. The Basement -1 slab is a 275 mm thick flat slab supported on RC columns and walls. The

ground floor slab is divided into two areas. The area of slab outside of the main footprint of the buildings had to be designed for construction traffic so it was therefore necessary to thicken the slab here. A steel frame is also supported on this 450 mm deep slab, so accurate analysis was required to model the transfer of loads into the car park columns below.

The apartment building is 13 storeys high and is of reinforced concrete flat slab construction. Floor slabs are typically 275 mm thick supported on RC columns and walls. The construction height between the first and second floor is 5.5 metres with all other floor to floor heights above being 3.0 metres. The higher space between ground and first floors was left to allow for a possible mezzanine floor. It was decided later in the contract to add the mezzanine floor over part of the building. As the main concrete frame had already been erected, the mezzanine floor was constructed using steel slimflor beams and a concrete T-beam and block floor system.

The columns supporting slabs were positioned within walls in the apartments above ground, and between car parking spaces in the basement. In order to achieve an efficient structure it was preferable to keep the column positions fixed throughout the entire height of the building. This was not possible in a few cases and RC transfer beams were required to transfer these column loads. These downstand beams are of maximum 1500 mm deep. The concrete

Used software: ESA-Prima Win

grade in the columns is C40/50 from foundation to second floor and then reduced to C28/35 from second floor to roof. Stability is achieved using RC shear walls with thicknesses of 400 mm and 250 mm, some of which are reduced in width further up the building.

The Crowne Plaza Hotel building is 10 storeys high and is constructed in both reinforced concrete and steelwork. The construction heights differ from the apartments due to the different requirements for occupancy. The construction height between ground and third floors are 4.6 m, 3.5 m and 3.5 m respectively. Floor to floor heights are then 3 metres from third floor to roof.

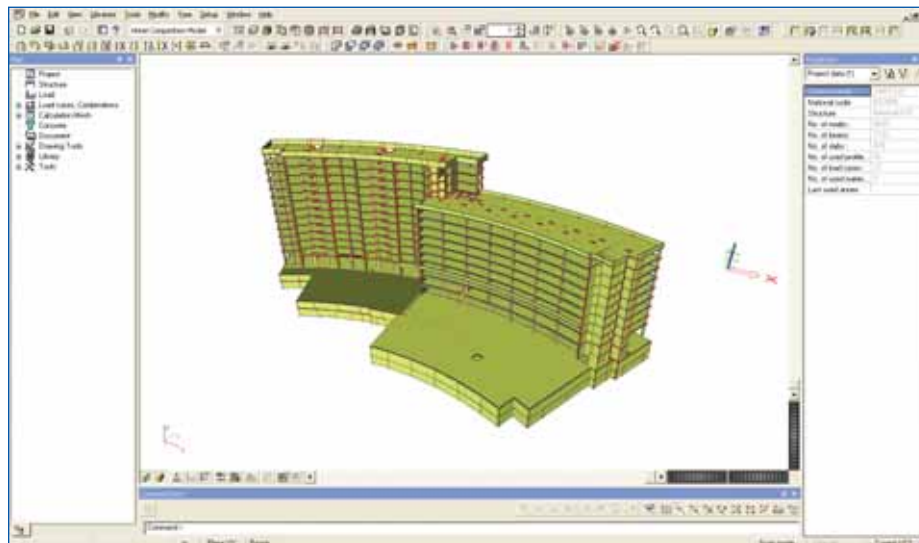
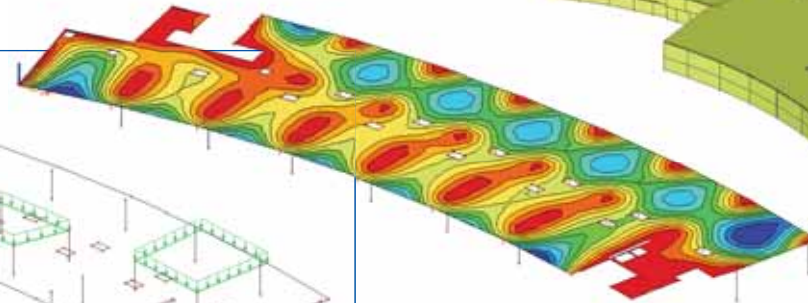
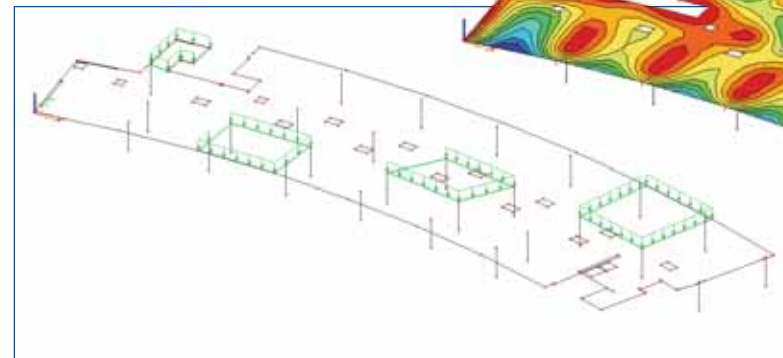
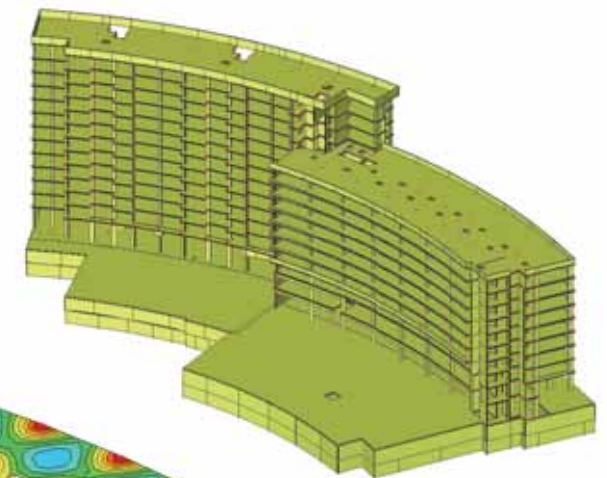
Slabs are again typically 275 mm thick, supported on RC columns and walls. Stability is achieved using RC shear walls of 400 mm and 250 mm in thickness, again some of which are reduced further up the height of the building. The concrete grade in the columns is C40/50 from foundation to first floor, which is then reduced to C28/35 above first floor.

There are RC downstand beams required in the slabs from first to third floor at the interface between the concrete and steel frames. A steel frame was required for three stories at the front of the building to form the entrance foyer and function rooms. The long clear spans required led to the use of cellular steel beams. The steel frame is supported on the RC podium slab at ground floor.

Slabs for both the apartment and hotel buildings were modelled using ESA-Prima Win. Loadings for each slab were selected from British Standard BS 6399, and all concrete elements have been designed to BS 8110. This software was useful at evaluating the ultimate and serviceability state design requirements as well as producing the reinforcement requirements. Due to the nature of this design and build contract, the design was continually developing during construction so the software was very easy to amend models with regards to, for example, additional slab openings or loadings.

Punching shear and moment transfer checks were carried out on all slabs by extracting the column loads and moments from the model and using both spreadsheets and hand calculations.

Crowne Plaza Hotel and Apartment complex



Thomasons LLP

Contact Antony Antorkas
 Address 528 High Road
 Leytonstone
 E11 3EE London, United Kingdom
 Phone +44 208 988 5820
 Email aantorkas@thomasons.co.uk
 Website www.thomasons.co.uk



Thomasons

Thomasons was founded in 1947 and is now one of the most established independently owned consulting engineering firms in the UK. The firm has established a deserved reputation for engineering excellence, innovation and a high quality of customer service, a process that is measured year by year in our customer surveys. Thomasons prides itself on its success rate for building long term relationships with its customers, some of whom we have worked with since we were founded.

The firm and its associated companies currently operate from five regional offices in Guildford, London, Leeds, Manchester and Southend-on-Sea with approximately 135 staff. We work throughout the UK and have also undertaken projects internationally in areas including Ireland, France and the Channel Islands.

Thomasons undertakes commissions in all areas of civil and structural engineering including major healthcare, education, residential, retail and mixed

use town centre redevelopments. The firm has a reputation for solving unusual and complex technical problems and extensive experience in the design of infrastructure and civil works, particularly for larger developments. The design of roads and drainage to adoptable standards is a normal part of our activities. The open structure of the firm allows us to tackle projects ranging from minor works to those costing many millions of pounds, in a cost and technically efficient manner.

Thomasons is committed to modern design and management techniques and is at the forefront in the application of information technology. Each of our offices has modern computer and communication networks and full Autocad and 3 dimensional drawing capabilities. The firm keeps abreast of emerging environmental issues.

An ISO9001 Quality Management System is operated in all offices and externally audited by a UKAS accredited assessment body.

Woodgrange Road

The project is situated on the corner of Woodgrange Road and Station Approach in Forest Gate area of London E7. It is a mixed commercial and residential development comprising six blocks. The site is rectangular in shape with the blocks arranged around the perimeter leaving a courtyard in the middle largely comprising ground floor car parking. The blocks comprise a refurbished public house, two new-build masonry blocks and three concrete framed blocks up to 7 storeys in height. ESA-Prima Win was used to model the concrete framed blocks comprising of flat slab construction supported on piled foundations. These concrete framed blocks comprise commercial areas and car parking at ground floor and a communal landscaped garden area at roof level.

Short Description

Project Information

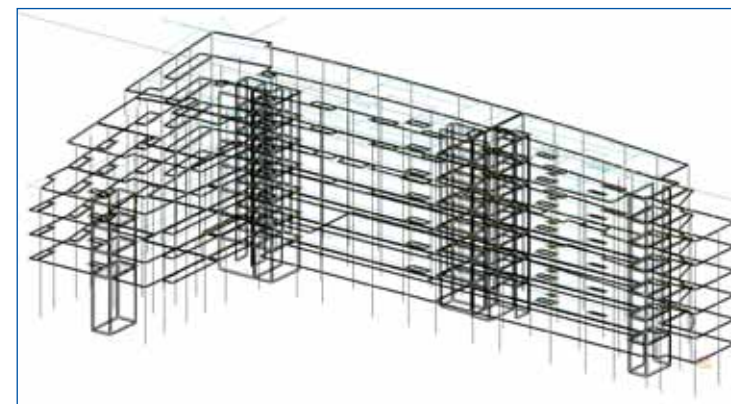
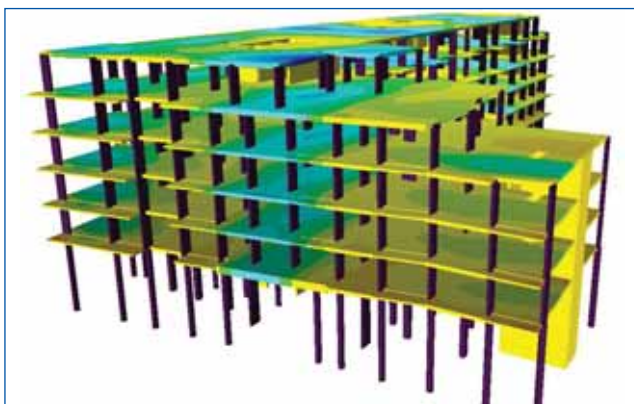
Owner: One Housing Group
Architect: Stock Woolstencroft
General Contractor: Galliford Try Partnerships
Engineering Office: Thomasons LLP

Construction Start: 08/2006
Construction End: 09/2008
Location: London, United Kingdom



The development is situated on the corner of Woodgrange Road and Station Approach in Forest Gate area of London E7. It is a mixed commercial and residential development comprising six blocks. The site is rectangular in shape with the blocks arranged around the perimeter leaving a courtyard in the middle largely comprising ground floor car parking. The blocks comprise a refurbished public house, two new-build masonry blocks and three concrete framed blocks up to 7 storeys in height. ESA-Prima Win was used to model the three concrete framed blocks. The three concrete framed blocks range in height from 4 to 7 storeys. These three blocks appear as a single L-shaped block however a vertical movement joint separates one of the blocks from the other two.

The buildings on each side of the movement joint are treated as independent structures. The blocks comprise of flat slab construction supported on concrete columns and ultimately on piled foundations. Reinforced concrete walls within the lift cores and staircase cores provide the lateral stability for the blocks. Precast concrete slabs are present at ground floor, supported on ground beams and pile caps. At ground level, these concrete framed blocks comprise part commercial areas and part car parking. A mezzanine level is present in two of the blocks typically above the car parking areas hence creating seven storeys. At roof top levels, private gardens and a communal landscaped garden area are present, comprising of paved, turf and planter areas.



Used software: ESA-Prima Win

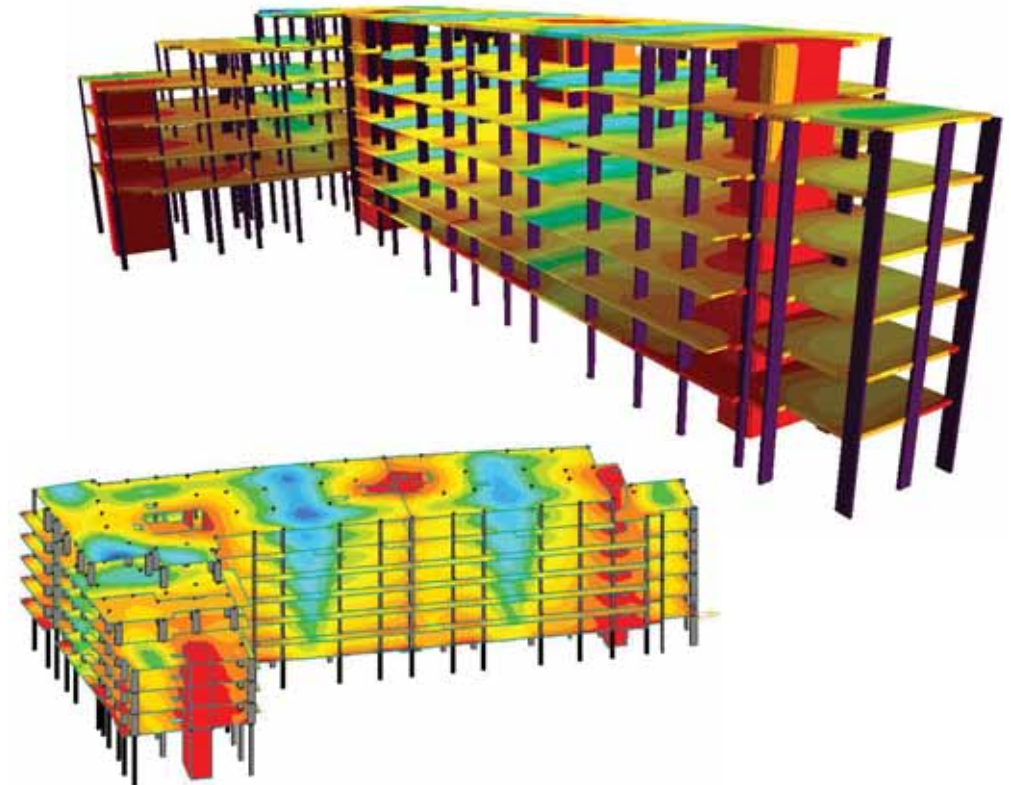
An opening through one of these concrete framed blocks provides a vehicle access route into the courtyard area and car parking areas. As a consequence, a transfer slab is present locally at first floor level to bridge over this vehicle access route in order to support the 5 storeys above it. Another transfer slab is present for the top storey, again locally above the vehicle access area only because the column positions for the top storey are different to those below. There were many challenges when undertaking the design of the three concrete framed blocks and these included the following:

- The three concrete framed blocks were created in a single ESA-Prima Win file; this ESA-Prima Win file comprised of two independent structural models due to presence of vertical movement joint separating one of the blocks from the other two blocks.
- The general plan outline of the three concrete framed blocks is L-shaped however not many floor edges are straight due to the presence of faceted slab edges, the presence of inset balconies and also cantilever balconies. In addition, each floor plan area is different due to each storey height being stepped.
- The blocks comprise of many column types ranging from circular, rectangular and square. In addition, the shape and/or size of many of these columns is not consistent all the way up the building. This was dictated by both architectural and cost constraints.
- The commercial areas are effectively 2-storeys in height as the mezzanine floor is not present in

these areas. As a consequence, these columns are typically larger at ground floor level to cater for the increased column height however were reduced in size the higher up the building in order to reduce construction costs.

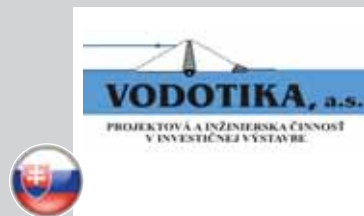
- An ESA-Prima Win creep analysis was undertaken to determine the additional reinforcement required to control deflection to acceptable magnitudes. This was particularly important for these blocks as the maximum span between columns was over 7 metres over the car parking areas. In addition, the creep analysis was particularly important for the transfer slabs and also the roof top slabs supporting the garden areas where loading was higher than typical roof loading conditions.
- Reinforced concrete shear walls forming the lift and stair cores provided the lateral stability for the blocks. The large pile caps supporting these cores were analysed using a separate ESA-Prima Win FE model.

The ESA-Prima Win software allowed us to analyse and design the building structure to a degree of economy that would not have been possible using more conventional software packages or hand calculations. The nature of the software also helped us to assess the effects of design development decisions quickly and efficiently. This allowed us to have a key role in the value engineering of the building.



VODOTIKA a.s.

Contact Miroslav Malast, Ján Cigánek
 Address Černyševského 26
 85101 Bratislava, Slovakia
 Phone +421 2 624 10 376
 Email vodotika@vodotika.sk
 Website www.vodotika.sk, www.vodotika-mg.sk



The company Vodotika was established in May 1990 starting out from one of the largest Slovak engineering companies. At the present time we employ 20 people with various specializations such as architects, civil and structural designers, M-E engineers, hydro-mechanics and hydro-energetic engineers.

The main activities are divided into two parts covering all design stages:

- Water and environmental structures (hydropower stations, dams, powerhouses)
- Buildings (apartment blocks, multifunctional buildings, domestic dwelling)

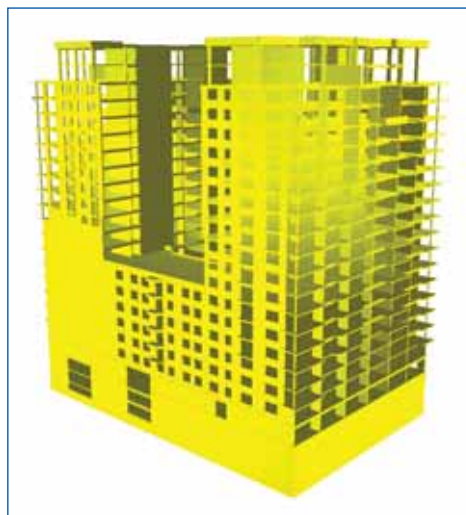
From 2002 on, our company is the chief designer of polyfunctional buildings in Bratislava-Petržalka (Sustekova-Bosakova streets). Development

plan is in 6 phases divided. "High rise buildings – VODOTIKA" is the 3rd phase of home building.

Vodotika obtained its EN ISO 9001:2000 certificate in 2003 and a lot of essential water-management structures have been designed and built in its 18 years of existence.

Most important references:

- Apartment Blocks and Multifunctional buildings: Sustekova-Bosakova streets, Bratislava-Petržalka
- Small hydro-electric powerstations: SHS Velke Blahovo, Ziar nad Hronom, Vozokany, Kralovany, Strecno
- Dams: Oreské, Slatinka
- Flood protection dam: Sturovo - Waterproofing for River Danube



Short Description

High rise building - Vodotika

The project regards a multifunctional high-rise building situated in Bratislava-Petržalka and contains flats, offices and retail units. It has two 20-storey towers, which are connected up to the 7th floor and it includes 3 sublevels. The floor dimensions are 60 m by 40 m and the maximal height of the building is 63,5 m. The main bearing system is a combination of reinforced concrete walls, columns, communication cores and floor slabs. For the static and dynamic (seismic) design of the structure a 3D model was created for this project with the help of Scia software, using finite element methods.

Project Information

Owner: Vodotika - MG, spol. s.r.o.
Architect: Vodotika a.s.
General Contractor: Vodotika - MG, spol. s.r.o.
Engineering Office: Vodotika a.s.

Construction Start: 01/11/2007
Construction End: 01/11/2010
Location: Bratislava, Slovakia



In general

The project "High rise building – VODOTIKA" is being built at this moment in Bratislava-Petržalka. It is multifunctional building, where you can find flats, offices and retail units. It includes two 20-storeys towers connected until the 7th floor.

There are 3 underground floors. Because of the underground water the building is designed as a dilatation unit. The floor plan dimensions of whole object are 60 m x 40 m. The maximal height of the building is 63,5 m.

Geological conditions

According to the results, a geological examination of the foundation's soil was determined: the surface layer is created by dirt-sand with clay addition, then there is a layer of gravel and at 13 m under the surface the layer of neogen clay was found. Underground water was found in 2,5-3,0 m depth during geological examinations. It is in direct relation with the Danube River.

Load bearing system

The main bearing system is a combination of reinforced concrete walls, columns, communication cores and floor slabs. In each tower there are 2 communication cores.

The building has 3 underground storeys which is created by a reinforced concrete box with a

foundation raft. The walls are from 200 mm – to 400 mm thickness. There are various types of dimensions of columns. The floor slabs are 200 mm thick. There are two types of concrete used - C30/37 (walls and columns at first and second storey) and C25/30 (the rest of the structure).

Structural design

The calculation consists of a static analysis from the vertical load, wind load and from a dynamic analysis from a combination of vertical and seismic loads. For the static and dynamic (seismic) design of the structure a 3D model was created for the whole object in the Nexis 32 3.60.17 software package using the finite element methods.

The loads were calculated according to the Slovak standards. Because of the reinforced concrete fixed retaining walls, the footwall was simulated in two concepts of the soil interaction and the foundation raft.

At first the footwall was calculated like the "elastic" with relevant values "cz" of a spring and compared with the results from Scia's Soilin module with real properties of the foundation's soil.

The seismic load is considered as a standard designed spectrum of the seismic response according to Slovak standards. The seismic response of the structure was calculated using a modal analysis, which consists of an eigen vectors solution, followed

by an internal forces solution for each load case. All floor slabs were calculated separately too. For each slab a proper model was created and the internal forces and deflections including creep were calculated.

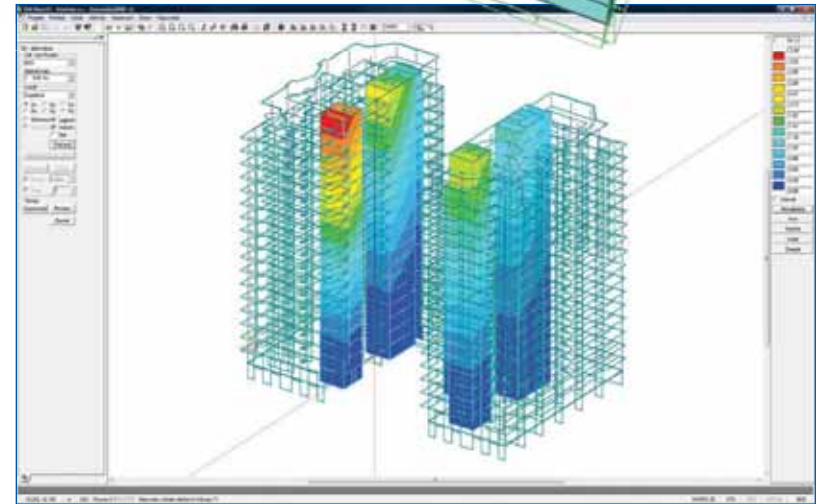
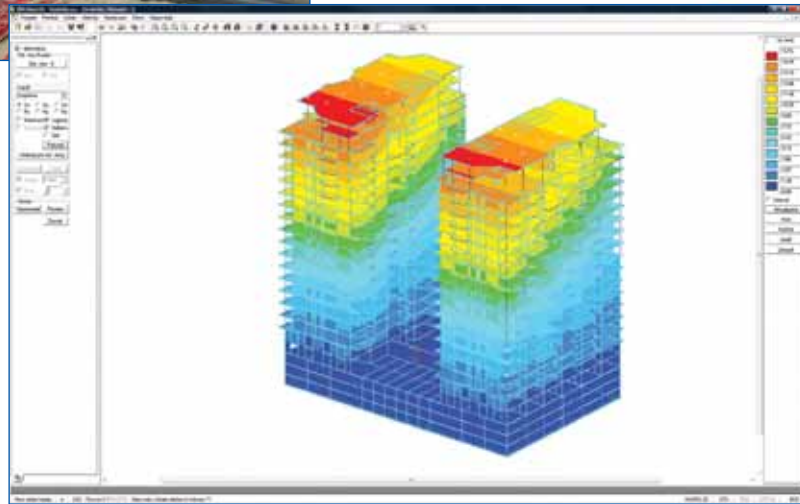
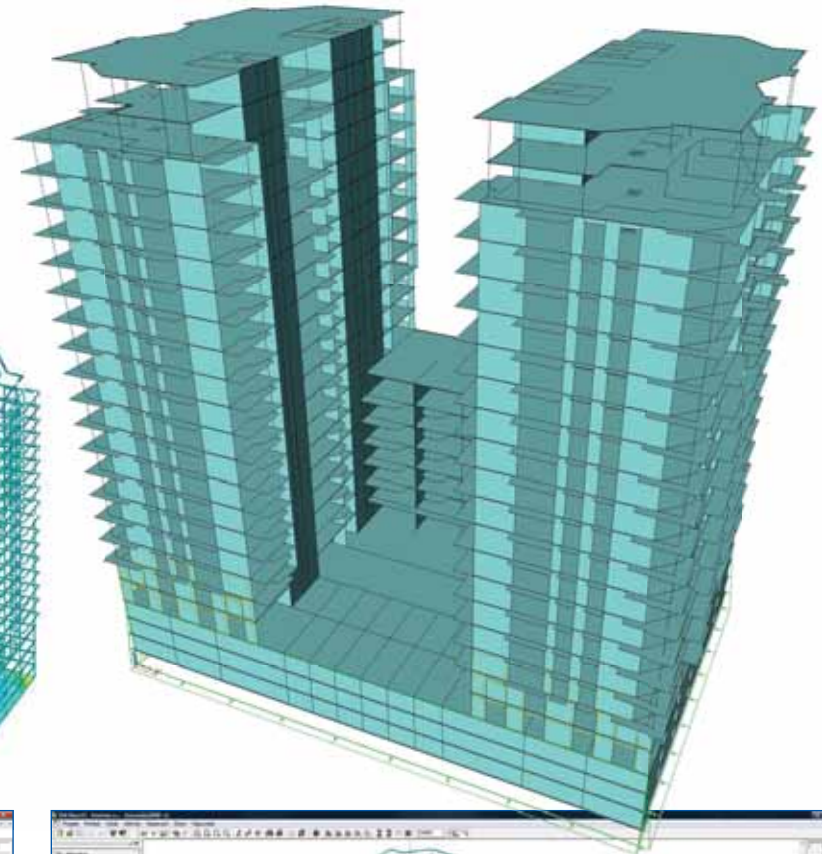
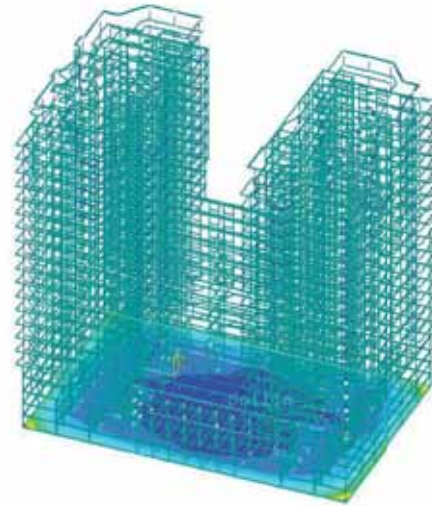
Conclusion

To find an adequate solution of the internal forces and deflections on such a demanding structure, it is important to define the interaction of the footwall and foundation structures and the stiffness of the whole structure. Scia's software fulfils these requirements.



High rise building - Vodotika

2



Design Software for Foundation Engineering



**Delft
GeoSystems**

Delft GeoSystems

Rotterdamseweg 185, 2629 HD, Delft, The Netherlands

Tel: +31 (0)88 335 7909, Fax: +31 (0) 88 335 8111

www.delftgeosystems.com, info@delftgeosystems.com



Deltares

Any type of structure that fits within civil engineering, at which Frilo or Scia Engineer calculation software has been used. It regards structures including each type of bridge (steel, concrete, suspended bridge...), tunnels, bulkheads, locks, barrages, in short general infrastructure...
The level of application of engineering science is decisive.



Mott MacDonald s.r.o.

Contact Lukáš Vráblík
Address Národní 15
110 00 Praha 1, Czech Republic
Phone +420 221 412 876
Email lukas.vrablik@mottmac.com
Website www.mottmac.cz

WINNER



Mott MacDonald Praha s.r.o., česká pobočka mezinárodní multi-disciplinární společnosti Mott MacDonald Ltd, je jednou z předních inženýrských společností na českém trhu již od roku 1993.

Naše společnost poskytuje poradenství zákazníkům z veřejného i soukromého sektoru zejména v oblasti dopravy, energetiky, fondů EU, mostů, PPP projektů, special services, tunelů a geotechniky, vodního hospodářství a životního prostředí.

Nabízíme komplexní služby od naplánování projektu až po jeho realizaci. Máme dlouholeté zkušenosti s managementem projektů různého rozsahu, přípravou odborných posudků projektové dokumentace, včetně posouzení jejich hospodárnosti a vybraného technického řešení. Pro klienty zajišťujeme také supervizi dopravních, vodohospodářských a inženýrských staveb, vypracovávání projektové a zadávací dokumentace, nebo finanční management,

především projektů spolufinancovaných prostřednictvím půjček EIB a z fondů EU.

Spolupracuje s mnoha domácími organizacemi, kterým mimo jiné dáváme možnost práce a spoluúčasti na místních i mezinárodních projektech. Snažíme se porozumět místnímu prostředí a respektovat znalosti, zkušenosti a potřeby našich partnerů. Naším cílem je přinést našemu klientovi co možná nejvyšší přidanou hodnotu našich služeb.



Bridge over Vltava river in Prague-Troja

The project regards a new bridge across the river Vltava in the Troja district; it is a part of the new City Ring Road in Prague. The presented structural design is based on the winning architectural and constructional competition design worked out by Mott MacDonald in the Czech Republic and the architect's office Roman Koucky. Because of the innovative structure, the low arch rise, the structural slenderness and the geometrical non-linearity of the hangers it was necessary to make a detailed static and dynamic analysis, taking into account the difficult 3D behaviour. The structure was analyzed by complicated slab-deck element models but also by simplified mathematical models based on analytical solutions. The bridge was also tested for flutter stability, buffeting, galloping and vortex shedding.

Short Description

Project Information

Owner: Prague city
Architect: Doc. Ing. arch. Roman Koucký, Ing. arch. Libor Kábrt
Engineering Office: Mott MacDonald Ltd. Prague - Ing. Ladislav Šašek, CSc., Ing. Lukáš Vráblík, Ph.D.

General Contractor: Metrostav a.s.
Construction Start: 01/06/2009
Construction End: 01/10/2011
Location: Prague, Czech Republic



Quote of the Jury

"An unusual and imaginative concept for integrating road and rail traffic on a single bridge. The resulting structure posed significant analysis problems requiring extensive use of a range of Scia products. The result is an extremely attractive yet functional structure with an individual appearance."

Popis Mostu, Konstrukční Řešení

Nový most přes Vltavu v Praze Troji je součástí stavby 0079 Městského okruhu v úseku Špejchar-Pelc-Tyrolka. Převádí automobilovou dopravu směrem ke křižovatce s městským okruhem na trojském břehu a dále k současné ulici Povltavské. Společně se čtyřproudou vozovkou je po mostě na samostatném tělese vedena tramvajová trať a po obou stranách ještě komunikace pro pěší a cyklisty. Přemostění je tvořeno dvojicí samostatných konstrukcí oddělených dilatací nad pilířem umístěným na trojském břehu v těsné blízkosti řeky. Hlavní pole je navrženo jako prostě podepřená ocelová oblouková konstrukce (rozpětí 200,4 m vzepětí oblouku 20,0 m) s táhlem a předpjatou betonovou mostovkou doplněnou systémem síťově uspořádaných lanových závěsů. Navazující pole na trojské straně je projektováno jako prostě podepřená dvourámová konstrukce (rozpětí 40,4 m) s prefabrikovanými příčnicí a monolitickou deskou. Most celkové šířky 35,25 m je rozdělen konstrukčním uspořádáním na jednotlivé jízdní pásy pro různé druhy dopravy. Uprostřed je na samostatném tělese vedena dvoukolejná tramvajová trať, po stranách

mostu je symetricky vždy dvouproudá vozovka a komunikace pro pěší a cyklisty. Konstrukční systém tvoří ocelový oblouk (S460 NL) s táhlem tvořeným podélným ocelovým nosníkem a předpjatou betonovou deskou (C50/60-XF2) podporovanou prefabrikovanými příčnicí (C60/75-XF2). Mostovka je zavěšena na oblouku pomocí síťovitě uspořádaných závěsů z uzavřených ocelových lan. Závěsy jsou uzavřené lana kruhového průřezu $\varnothing 70$ mm v osových vzdálenostech cca 1,4 m. Ploché svařovaný ocelový oblouk maximálního vzepětí 20 m (1/10 rozpětí hlavního pole) má neprůlezný komorový příčný průřez proměnné výšky od 800 mm do 4500 mm a šířky od 1100 mm do 6200 mm ve vrcholu.

Spojité síťové uspořádání závěsů (pavučinová síť) obloukového mostu umožňuje rovnoměrnější roznesení zatížení, a tedy i snížení lokálních namáhání oblouku i desky mostovky. To umožnilo navrhnout velmi subtilní konstrukci s nízkou konstrukční výškou nižší než 1/10 rozpětí. Závěsy působí jako tenká, ale tuhá stěna působící v tahu. Konstrukce mostu tedy působí současně jako oblouk s táhlem a plnostěnný nosník. Ocelový

oblouk tvoří jeho horní přírubu a betonová předpjatá mostovka přírubu dolní. Způsob uspořádání a tvarování mostu, při rozpětí 200,4 m, vytváří světově unikátní konstrukci. Monolitická deska mostovky tloušťky 250 mm je předepnuta v příčném i podélném směru. V příčném směru je deska vyztužena prefabrikovanými předpjatými příčnými žebry v osové vzdálenosti 4 m. Prefabrikované předpjaté příčníky mají konstantní tloušťku 400 mm a proměnnou výšku maximálně 1500 mm.

Popis Statické A Dynamické Analýzy Mostu

Pro globální analýzu konstrukce byly vytvořeny tři základní prostorové modely v programech Scia Engineer, NEXIS a je-den rovinný model v programu NEXIS s využitím modulu TDA pro analýzu postupu výstavby s uvážením vlivu dotvarování smršťování betonu. Deskostěnové modely byly použity pro globální statickou a dynamickou analýzu, model sloužil i jako podklad pro detailní řešení aerodynamické stability konstrukce. Ve výpočtech byla uvážena geometrická nelinearita – řešení podle teorie 2.řádu a nelineární řešení závěsných prvků jako lan s průvěsem s osovou tahovou silou respektující tzv. tahové zpevnění – „tension stiffening“. Veškeré výsledky byly porovnávány se zjednodušenými výpočty na modelech, u kterých je známé přesné analytické řešení.

Závěsy mostu byly modelovány jako nelineární prvky – lana s průvěsem schopné přenášet pouze tahové namáhání. Pro jednotlivá lana byly spočteny jejich příčinkové plochy pro stanovení účinků pohyblivého zatížení a určena tzv. matice účinku předpětí popisující vzájemnou interakci závěsných lan (účinek předpětí jednoho lana na zbytek systému).

Nedílnou součástí výpočetní analýzy jsou i montážní stavy – návrh a posouzení montážního ztužení, výsuv konstrukce, připojování prefabrikovaných příčníků atd. Výpočet deformací byl proveden na prostorových modelech – geometrická (teorie II. řádu) i fyzikální (závěsy zadány jako lanové prvky s průvěsem, přenášejí pouze tahové namáhání) nelinearita je ve výpočtu zohledněna.

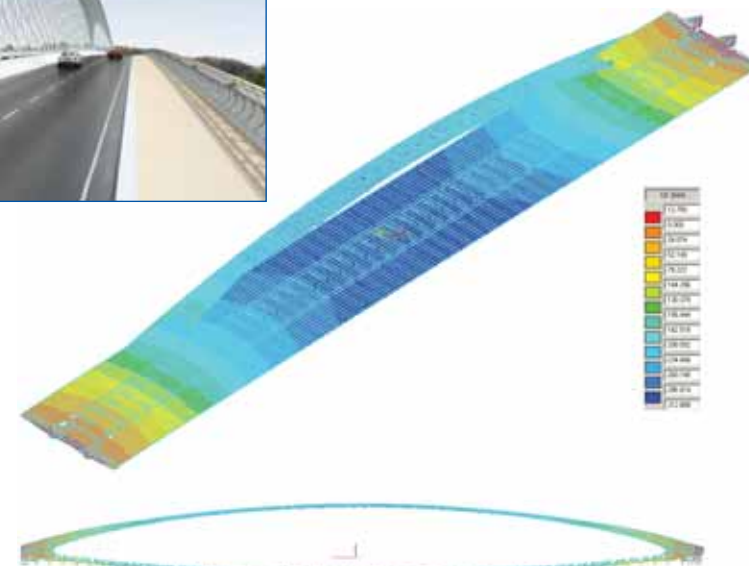
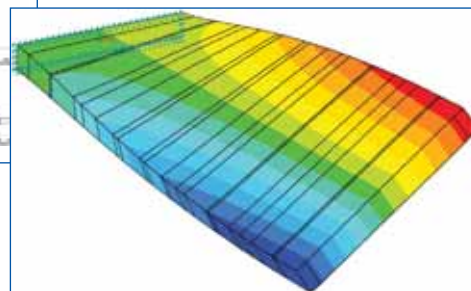
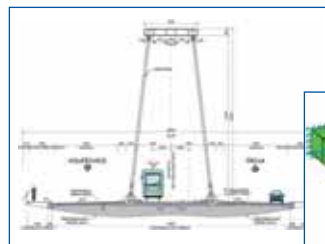
Pro analýzu dynamických účinků pohyblivého zatížení - byl použit prostorový matematický model systému mostní konstrukce × pohybující se vozidlo včetně vystižení nerovností vozovky. Při řešení dynamického

chování systému se pozornost soustředila především na dynamickou odezvu mostní konstrukce. Pohyblivé zatížení mostu bylo při dynamickém výpočtu modelováno pomocí čtyř různě uspořádaných sestav prostorových modelů základních vozidel Tatra T815 o celkové hmotnosti 26 t.

Zvýšená pozornost byla vzhledem k charakteru konstrukce věnována možné ztrátě aerodynamické stability. Byly provedeny zjednodušené výpočty založené na empirických vztazích a odhadech derivací součinitele vztaku; zároveň však proběhla detailní analýza-měření charakteristik na sekčním modelu a následné numerické výpočty, které potvrzují, že ke ztrátě aerodynamické stability dochází při rychlosti mnohonásobně vyšší než je referenční rychlost udávaná normou pro danou oblast.

Výpočet stability konstrukce probíhal ve dvou krocích. Výpočet klasickým způsobem dle Eulerovského pojetí stability způsobené bifurkací rovnováhy – hledal se násobitel daného zatížení, při kterém dojde ke ztrátě stability.

Druhý výpočetní postup vycházel z řešení konstrukce podle teorie II. řádu a určení rezervy v napětí pro dané zatížení k dosažení meze kluzu použité oceli v rozhodujících částech mostu. Pro výpočet byly uváženy možné výrobní nepřesnosti. Jejich zadání bylo vždy vztaženo k příslušnému vlastnímu tvaru (normování vlastních tvarů dle maximálních hodnot imperfekci). Samotný výpočet pak probíhá jako iterační proces, kdy je nezbytné stále kontrolovat a porovnávat výsledky dle teorie II.řádu s výsledky přibližné metody. Vzhledem k malému vzepětí se konstrukce řešila jako plochý oblouk s uvážením stlačení střednice.



Nový most přes vltavu v Praze Troji



Ney & Partners

Contact Matthieu Mallié
 Address Chaussée de La Hulpe 181
 1170 Bruxelles, Belgium
 Phone +32 2 643 21 84
 Email mm@ney.be
 Website www.ney.be

NOMINATION



Ney and Partners is a structural engineering consultancy, established in Brussels. Since its foundation in 1997, the office has worked with an active view on the art of engineering through the integration of the different civil works disciplines. This integration and optimisation of structural elements aims to overcome the classic hierarchic assembly of constructive solutions. Innovative passerelles, bridges, roof structures and works of art developed by our office, express most clearly this vision.

In our collaborations with architects, engineers or artists we aim at a full integration of architecture, structure and context.

The construction project quality lies in the synthesis of specific design constraints. The structural

aspect is of primary importance to this synthesis. From the very beginning of the design process, Ney & Partners conducts a constant research for advanced engineering integration. In doing so, our position as Engineering Consultancy overcomes the standardized dimensioning of predefined technical solutions.

An intense collaboration with the design team from an early stage on allows the development of innovative solutions, adapted to the context of the project.

Ney and Partners currently employs more than 40 civil engineers, architects, draughtsman, etc..



Second bridge over the river Scheldt

Monumental, massive and industrial: these words apply to the first bridge connecting Temse and Bornem (Belgium). It is a heavy steel grey structure originally designed by Eiffel and later reconstruct in the year 1950 after having been subject to heavy damage during World War II.

Right next to this old one, a second bridge will be built.

The pile foundations of the new bridge will be next to the existing foundations. The new bridge has a length of 374 m and consists of seven fixed stayed spans varying from 18 m to 74 m and two 28 m long mobile spans. Because of the elegantly detailed finish, the atypical moulds for the abutments and the subtle lighting scheme, the bridge will blend into its environment and contrast beautifully with its neighbour.

Short Description

Project Information

Owner: Waterwegen en Zeekanaal - Afdeling Zeeschelde
Architect: Ney and Partners
General Contractor: THV Tweede Scheldebrug
Engineering Office: Ney and Partners

Construction Start: 01/01/2007
Construction End: 30/05/2009
Location: Temse, Belgium



The "Tweede Scheldebrug" (Second bridge over the river Scheldt) is located in Temse, to the south of Antwerp. This bridge is the result of a Design and Build procedure that Ney and Partners have won in 2006 for the THV Tweede Scheldebrug, a joint venture of Cordeel (concrete works), Hye (foundations), Aelterman (steel) and Fabricom-GTI (electro-mechanics).

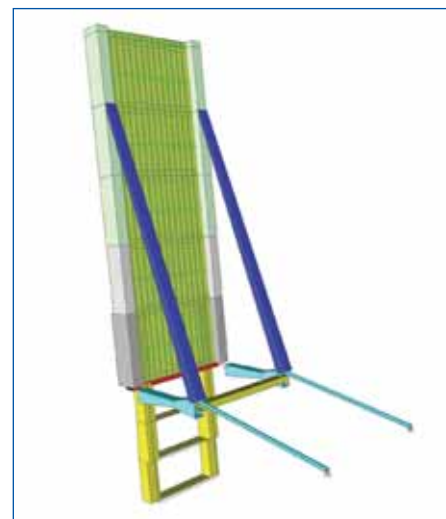
Monumental, massive and industrial: these words apply to the first bridge connecting Temse and Bornem. It is a heavy steel grey structure originally

designed by Eiffel and later reconstructed in the year 1950 after having been subject to heavy damage during World War II.

The pile foundations of the new bridge will be next to the existing foundations. The new bridge is 374 m long and consists of seven fixed stayed spans varying from 18 m to 74 m and two 28 m long mobile spans.

The 8.4 m wide vehicular concrete deck consists of a 30 to 40 cm light weight semi precast concrete slab that comprises polystyrene void formers within its depth. This slab spans between two steel girders whose upper flange doubles up as a stay that is attached to 6,7 m tall masts for the fixed spans. In the 28 m span mobile part, a light steel orthotropic steel deck spans between a series of secondary beams onto the two main girders. The suspension cables unload the box girders, and allow for an extremely open structure.

On the upstream side of the cross-section next to the vehicular deck is situated a 1 m wide maintenance path; on the downstream side a timber clad deck for the pedestrians and cyclists that has a varying width of 4,5 m to 6 m, bordered by a light stainless steel railing. Both maintenance and pedestrian and cyclist paths are carried by fins cantilevering from the longitudinal steel box girders. These girders form a physical barrier between vehicular and soft traffic.



Used software: Scia Engineer

The mobile bridge has one span of 56 m consisting of 2 opening parts of 28 m allowing for the passage of large ships. When closed the hydraulic jack functions as a suspension cable. A pair of masts is situated at the hinging point of the mobile section. Each of these masts is connected to the mobile section through a fixed-length stay and to the fixed bridge section by a variable length 0.56 m diameter piston stay. The fixed-length stay forms a non deformable triangle with the mast and the mobile section. The mast is used as a lever to tilt the bridge open or closed. The piston stay powers the opening and closing mechanism and forms a deformable triangle with the mast and the static section. In order to keep the piston force as small as possible (for operating and maintenance costs), a first large top counter weight is placed running between the mobile mast heads and a second smaller bottom counterweight under the bridge deck.

Temse bridge will be opened to the public in 2009. This piston stayed bascule bridge with its slender elements does not dominate but complements the existing monumental 1950's truss girder bridge. The engineering ingenuity of the design lies in total integration of the kinematics into its structure.

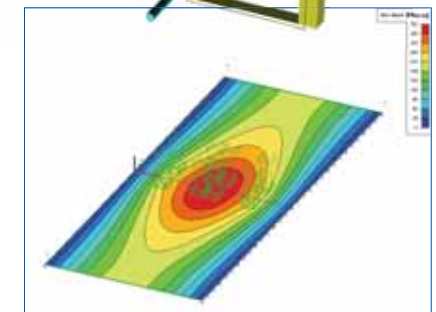
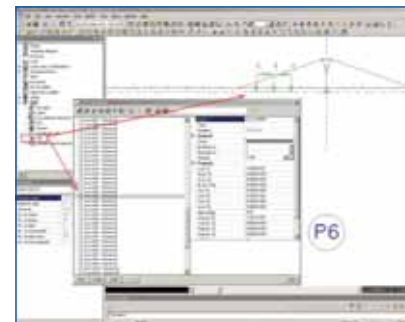
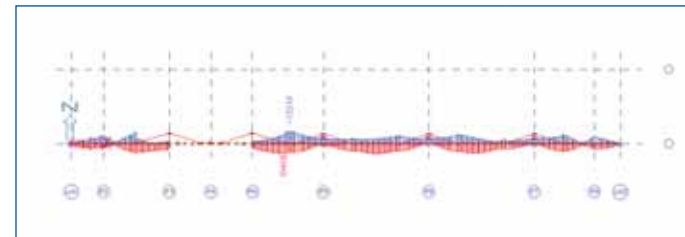
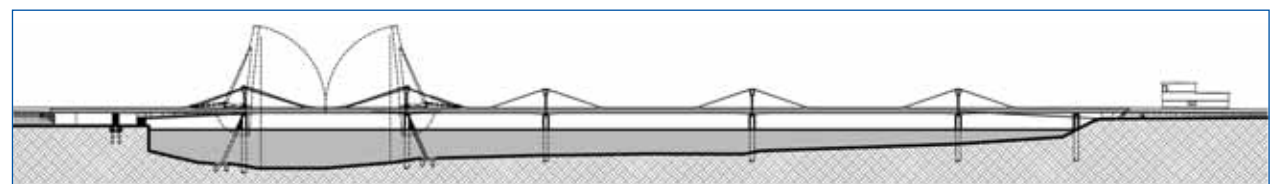
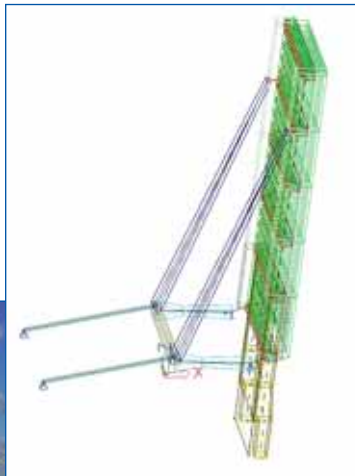
Because of the elegantly detailed finishes, the atypical moulds for the abutments and the subtle lighting scheme, the bridge will blend into its environment and contrast with its neighbour.

At Ney and Partners', we have been using Scia Engineer for global as well as local models.

The steel box girders were designed according to the Eurocode 3 for steel structure on basis of the internal

forces computed in the Scia Engineer model. The model consists of linear 2D beam elements. We have used numerical elements with a connecting node each 4 meters approximately. As the geometrical characteristics vary with the thickness of the plate, we would have to define manually more than 100 elements and their cross-section. Therefore we used the XML functionality to automatically create the cross-section, the nodes and the 2D elements in Scia Engineer. The traffic loads, of which the position moves along the bridge, were also created using the XML functionality. It allowed a quick link between a list in MS Excel and Scia Engineer. The internal forces (Nsd, Vsd, Msd) as well as the deflection were computed with Scia Engineer and used for the final design calculations. As the bridge is not symmetrically by nature, two models were needed; this could have been time-consuming without the automatic creation via XML.

Other models were used for other necessary calculations such as: assessment of the 3D behaviour of the mobile bridge, assessment of the 3D behaviour of the static span, design of the concrete slab, and other detailed calculations of specific parts of the structure.



“Tweede Scheldebrug” - Second bridge over the river Scheldt

SBE

Contact Guy Van Nuffel
 Address Slachthuisstraat 71
 9100 Sint-Niklaas, Belgium
 Phone +32 37779519
 Email guy.vannuffel@sbe.be
 Website www.sbe.be

NOMINATION



SBE

Middelen

SBE werkt met een 35-tal medewerkers voornamelijk projectingenieurs, studie-ingenieurs en tekenaars.

Historiek

Reeds een 15-tal jaren profileert SBE zich als bouwkundig ontwerper met, afgezien de klassieke stabiliteitsopdrachten, een specifiek accent op water- en havenbouw, geotechnische problemen, staalstructuren en funderingstechnieken.

Vakgebieden en specialisaties

Havenbouw: kaaimuren - sluizen; aanlegsteigers; dijken en oeverbescherming; renovatie.

Burgerlijke bouwkunde en gebouwen: algemene stabiliteitsstudies; speciale funderingen en geotechniek; bruggen in staal, gewapend beton en voorgespannen beton; tunnels, riolering- en wegenwerken; eco-engineering.

Staalconstructies: ontwerp - berekeningen - overzichtstekeningen; werkhuistekeningen CAD - 3D.

Geotechnische en hydraulische modellering: 2D en 3D geotechnische modellen; 2D en 3D grondwaterstromingsmodellen; 1D, 2D en 3D rivier-, kust- en sedimentsimulaties.

Referenties

Havenbouw: Albertkanaal: diverse kaaimuren; containergetijdok "Waaslandhaven"; verbetering waterkering Afdamde Maas; Containerkade Noord Antwerpen; aanlegsteigers voor scheepvaart Linker Oevergebied Antwerpen en op de Schelde; Leie Doortocht Kortrijk; nieuw sluisencomplex Panamakanaal; nieuwe sluis Haven van Sevilla;

restauratie en herstellingswerken van kaaimuren, sluizen en droogdokken (Zennegatsluis, D'Herbouvillekaai, droogdok Cadiz).

Burgerlijke bouwkunde en gebouwen: Petroleumbrug Antwerpen; Muidebrug Gent; tunnel onder startbaan Zaventem; Tunnels HSL: Centraal Station Antwerpen en Berchem: ondertunneling bestaande sporen; Bureelgebouw en parking Lieven Bauwens Gent; voorgespannen brug over de Leie te Wielsbeke; Appartementengebouw Parklane II Gent; Parking Astridplein Antwerpen; Mercedes garage Sint-Niklaas; Brug te Halle; Waasland Shopping Center; Commercieel gebouw Wilma; HST-lijn Brussel-Amsterdam - diverse vakken; nieuwe Boulevardbrug Willebroek; Brug westelijke tangent Sint-Niklaas.

Staalconstructies: Verzinkingslijn met koeltoren Sidmar; Kontingietierij 2; HQ2 Canary Warf; Efteling Kaatsheuvel Nederland; industriële gebouwen Baudour Frankrijk; diverse installaties op Petrochemische bedrijven zoals BASF, 3 m, Solvay; Vliegtuigloods München; Denox-installaties Harelbeke, Houthalen, Brugge, Brussel; LNG-plant Hammerfest.

Geotechnische en hydraulische modellering: Leveren en iken van numerieke modellen Scheldebekken Antwerpen; Grondwaterstromingsmodel en zettingsberekeningen Antwerpen Containerdok-West; Stabiliteitsberekening caissons Containerkaai Zuid Antwerpen met 3D model; Uitvoeringsstudie Deurganckdok; Stabiliteitsnazicht kaaimuur Verrebroekdok Antwerpen; optimaliseren wachtbekken Webbekom; ontwerp leefbaarheidsbuffer Doel.

Launching of a bridge in Trinidad

Short Description

This project regards the study of the launch of a bridge in Trinidad.

Two situations can be considered:

- Construction phases: parts of the bridge are connected to each other
- Launching phases: the bridge is pushed forward over a certain length

For each position, the displacements to place the bridge on the temporary supports are calculated. Reactions, section forces, deformations and profile checks are made for each position. All this displacements are determined with ESA-Prima Win.

Project Information

Owner: Republic of Trinidad and Tobago

Architect: n/a

General Contractor: Vinci

Engineering Office: Vinci

Construction Start: 01/2008

Construction End: 09/2008

Location: Port of Spain, Trinidad Tobago



The W-S Ramp Bridge is launched and has supports on the launching way (sliding shoes) and on the piers (temporary supports during the erection). Between two launching phases, parts of the bridge are connected to the end of the part of the bridge that has supports at A0 at that moment (= construction phases).

Two situations can be considered:

- Construction phases (#11): parts of the bridge are connected to each other
- Launching phases (#10): the bridge is pushed forward over a certain length

First, a main model is being build up. This model is used as a starting point to create the calculation models for the different positions of the bridge during the erection phases.

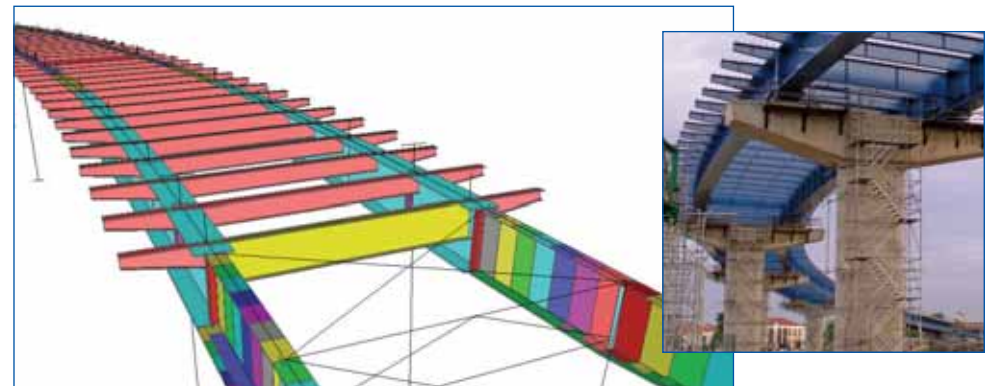
This model contains

Geometry

- The geometry of the total bridge (all parts) in its final position
- The geometry of launching nose, connected to the part T1 in its final position
- The position of the temporary supports (for all phases the same)
- The launching way

Loads

- Load case 1: self weight of the structure
- Load case 2: wind - direction 1 - launching
- Load case 3: wind - direction 2 - launching
- Load case 4: wind - direction 1 - between launching



Used software: ESA-Prima Win

- Load case 5: wind - direction 2 - between launching
- Load case 6: displacements = bridge "fitting": depends on the position of the bridge and for each calculation model this will be different)

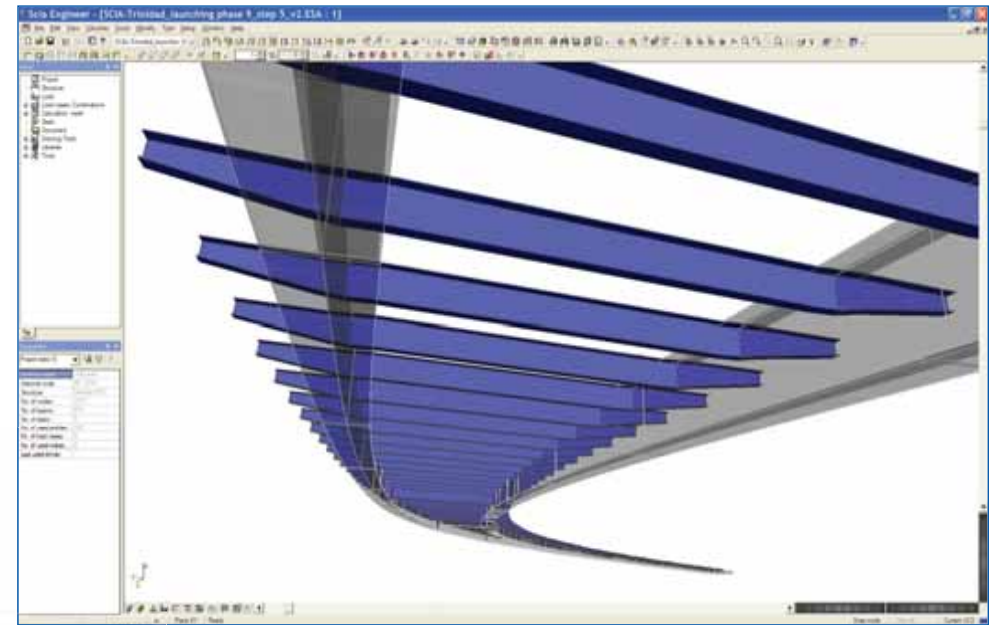
The position of the bridge during the erection is given by a relative parameter α_{rel} .

Following steps are taken to model a certain position of the bridge:

- Calculation of α_{rel} that corresponds with a certain position of the bridge.
- Delete parts of the bridge that are not yet connected in that stage of launching or construction.
- Rotation of the nodes of the bridge (+launching nose). At this point, the form of the bridge is still the same as in the final position. The nodes of the launching way and the temporary supports are not rotated.

- Determination of the intersection points of the south and north girders with the vertical plane of the temporary supports and the launching way.
- Determination of the displacements, so that the part of the bridge is placed on the temporary supports (** = creating load case 6 (= "bridge fitting" = displacements): the displacements of block 3 (see step 4) are given to the part of the bridge that is being considered. This load case is added to the combinations.
- The model is ready to be calculated.

For each position, the displacements to place the bridge on the temporary supports are calculated (see load case "bridge fitting"). Reactions, section forces, deformations and profile checks are made for each position. All this displacements are determined with ESA-Prima Win with secondary drawing beams.



Petignat & Cordoba Ingenieurs Conseils SA

Contact Manuel Cordoba
Address 11, rue de la Paix
1820 Montreux, Switzerland

Phone +41 21 963 05 63
Email m.cordoba@petignat-cordoba.ch
Website www.petignat-cordoba.ch

NOMINATION



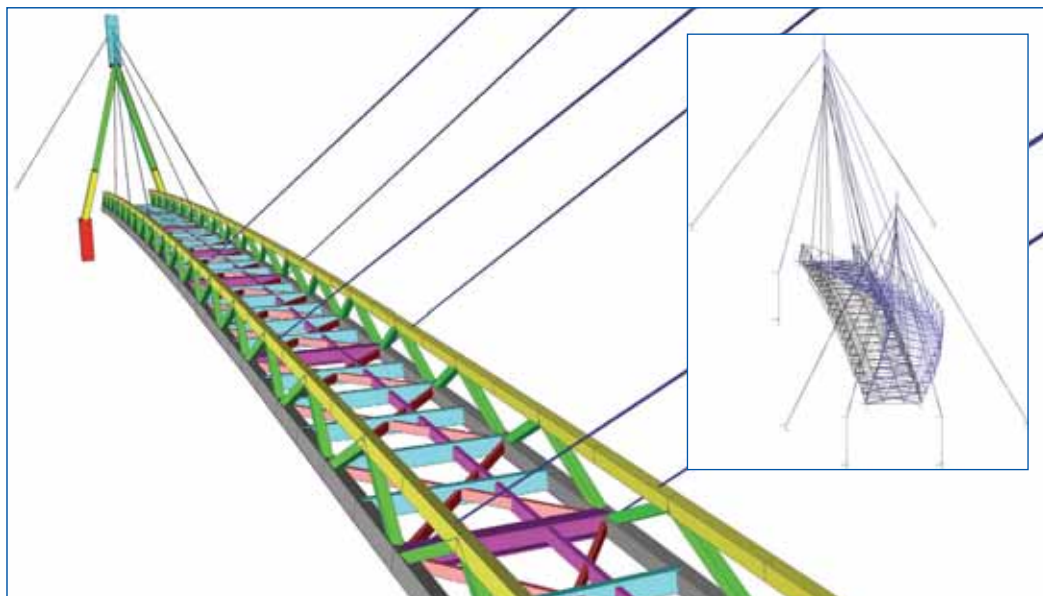
Le bureau Petignat & Cordoba Ingénieurs Conseils SA, dont le siège est à Montreux, avec une succursale à Aigle et à Châtel-St-Denis, exerce depuis plus de trente-cinq ans ses activités.

Notre rayon d'action est la Riviera Vaudoise, le Chablais Vaudois et la région de la Veveyse.

Nos collaborateurs, ingénieurs polytechniciens, ingénieurs techniciens, dessinateurs, disposent de moyens informatiques puissants, utilisés tant pour les calculs d'ingénieurs que pour l'élaboration des plans. Grâce à leurs compétences, nous pouvons assurer à notre clientèle un travail effectué dans les règles de l'art.

Nos domaines d'activité sont les suivants :

- Toutes études d'ouvrages du génie civil, de bâtiments, de traitements des eaux, d'ouvrages hydrauliques, de travaux spéciaux, de parkings publics, etc.
- Planification et direction des travaux
- Gestion de chantier et coordination
- Rénovation bateaux historiques
- Calcul en fibres de carbone
- Panneaux sandwichs
- Remontées mécaniques pour le ski
- Etudes d'ensoleillement et optimisation des panneaux solaires en énergie renouvelable



Reconstruction of the Illarsaz bridge

The pedestrian bridge of Illarsaz was destroyed by the flood of the river Rhône in autumn 2000. A cable-stayed bridge was built in replacement, made of concrete piles, steel cables and a light weight timber deck. The bridge has one single span of 82 m, the largest in Switzerland. A 3D model was used for all checks, including especially the serviceability and dynamic behaviour under pedestrian traffic and wind actions.

Short Description

Project Information

Owner: Canton de Vaud et Canton du Valais

General Contractor: Timber: Berrut-Ducret ;
Concrete: Carraux-Moret ; Cables: Freyssinet

Engineering Office: Petignat & Cordoba Ingénieurs
Conseils SA

Architect: Petignat & Cordoba Ingénieurs Conseils SA
Construction Start: 2003

Construction End: 2004

Location: Aigle-Illarsaz, Switzerland



Introduction

La passerelle d'Illarsaz, construite en 1894, reliait les communes d'Aigle et d'Illarsaz par l'ancienne route RC 721. Elle était située à proximité du village d'Illarsaz et de la zone industrielle d'Aigle.

Lors des fortes précipitations et inondations survenues en automne 2000, la passerelle d'Illarsaz a été emportée par le Rhône le 14 octobre 2000.

Le projet

Le projet de reconstruction a été mis au concours sur invitation de 6 bureaux d'ingénieurs. Notre bureau a proposé la solution d'une passerelle haubannée en bois, d'une seule portée de 82 m, qui en fait la plus grande en Suisse. Notre solution a été qualifiée pour l'exécution du projet.

Les matériaux utilisés ont été choisis pour profiter au maximum de leurs avantages respectifs : mâts en compression en béton, haubans en traction en acier et tablier en bois pour la légèreté du poids propre. Pour le bois, le choix s'est porté sur le mélèze, dont les caractéristiques mécaniques sont supérieures à celles du sapin et de l'épicéa. En outre, l'excellente résistance du duramen aux attaques d'insectes et champignons lui confère une bonne durabilité naturelle. De plus, les matériaux choisis entraînent un impact aussi faible que possible sur l'environnement, tant au niveau de l'énergie consommée pour la production des matériaux et la construction de la passerelle que des nuisances engendrées, ce qui en fait aussi un choix écologique.

Les fondations des mâts et des culées sont intégrées dans le même ouvrage, reprises par des micropieux.



Used software: Scia Engineer

Les mâts sont construits en 3 parties à l'aide de coffrages grimpants stabilisés par un échafaudage, en béton 45 / 35 GDS donnant une compacité élevée et une bonne résistance aux agressions ambiantes et d'entretien.

Pour les haubans à torons, les ancrages fixes se trouvent en tête de mât, la tension se faisant au niveau de la membrure inférieure du tablier à l'aide d'un vérin monotoron Freyssinet.

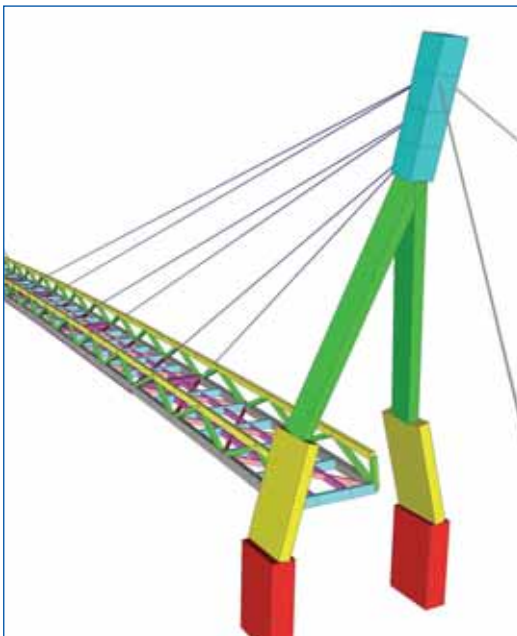
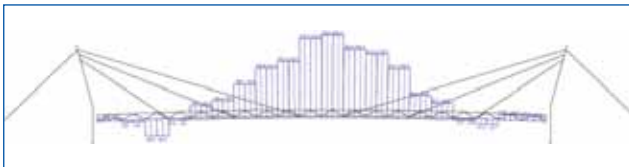
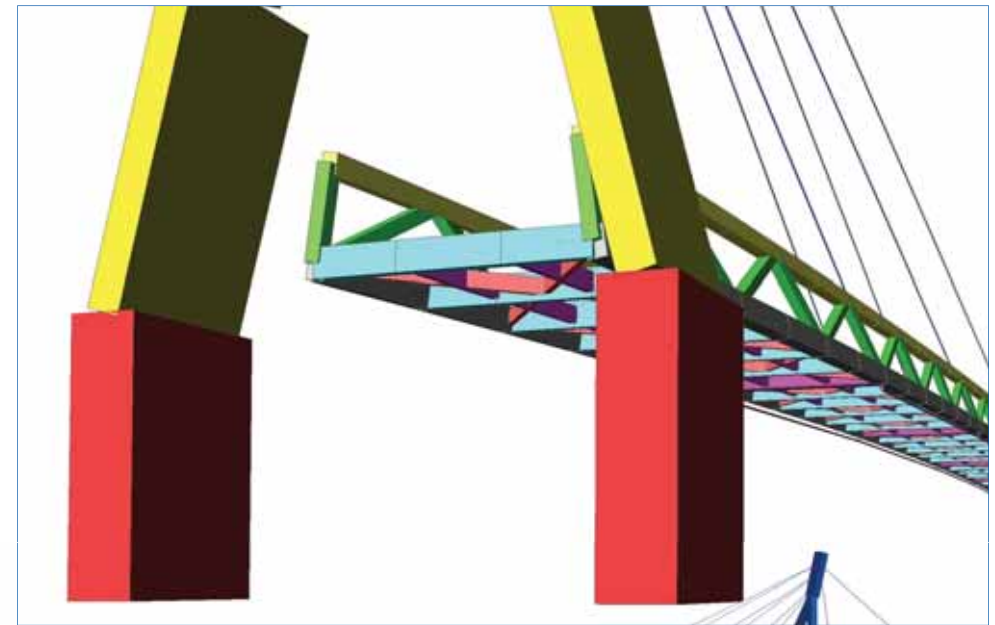
Les éléments du tablier en bois lamellé-collé de mélèze ont été entièrement réalisés en atelier, par tronçons de différentes longueurs (2x 27m, 2x 12m et 1x 4m). Ces éléments ont ensuite été transportés sur le chantier et mis en place à l'aide d'un camion-grue. Chaque élément a été directement haubané lors de sa mise en place. Les poutres maîtresses sont inclinées dans le même plan que les haubans pour rapprocher la suspension des haubans au tablier.

Modélisation

La modélisation 3D de la passerelle, entièrement en éléments barres et poutres, a servi avant tout à vérifier le comportement d'ensemble de l'ouvrage. Etant donné le nombre limité d'étapes de montage du tablier, le réglage du tablier ne posait pas de problème majeur au niveau du calcul.

Le modèle a permis une vérification aisée de la sécurité structurale. Néanmoins, l'aspect déterminant pour ce type d'ouvrage particulièrement léger est le comportement en service. Les déformations de la structure ont pu être vérifiées. Une approche simplifiée, basée sur des résultats de calcul statique, a également permis de s'assurer du bon comportement dynamique, tant sous l'effet du trafic piéton que des sollicitations dues au vent.

Réconstruction de la passerelle d'Illarsaz



Breijn

Contact ir. Bas van den Berk
 Address Graafsebaan 67
 5248 JT Rosmalen, Netherlands
 Phone +31 73-5436546
 Email bberk@breijn.nl
 Website www.breijn.nl



breijn

Over Breijn

De wereld verandert. Trends, politieke opvattingen, inzichten in milieu en leefomgeving, nieuwe technieken volgen elkaar in een razend tempo op. Opdrachtgevers vragen steeds meer om een totaaloplossing die rekening houdt met al deze, vaak complexe, factoren. Dit is het werkterrein van Breijn! Een ingenieursbureau waar snelheid, vooruitdenken en flexibiliteit centraal staat. Wij voegen hier graag aan toe: met behoud van perfectie en betrouwbaarheid.

Breijn is de combinatie van alle hoogwaardige en gerenommeerde Heijmans advies- en ingenieursdiensten. Met ruim 300 professionals, 8 vestigingen en 5 bedrijfsonderdelen spelen we in op de toenemende vraag naar totaaloplossingen voor complexe en omvangrijke projecten. Breijn helpt u uw projecten te realiseren met een optimaal rendement door slimme oplossingen die ook praktisch uitvoerbaar zijn. Kortom, verrassend in oplossing maar altijd met beide benen op de grond.

Eerst denken, dan doen. Dat is Breijn. Hierdoor leveren we altijd optimale oplossingen in ontwerp en uitvoering. Door de bundeling van onze kennis en expertise bieden we voortaan een integrale aanpak voor alle ingenieursdiensten in de breedste zin van het woord.

Onze missie

Breijn is het meest succesvolle ingenieursbureau van Nederland waar met passie en plezier, samen met klanten, mooie en bijzondere projecten worden voorbereid, uitgevoerd en beheerd.

Breijn Bedrijfsonderdelen

Breijn is sterk in ruimtelijke en mobiliteitsvraagstukken en in grootschalige en stedelijke Infra- en bouwprojecten. Om onze kennis en expertise voor u optimaal in te zetten, hebben we onze werkzaamheden ondergebracht in een vijftal bedrijfsonderdelen.

Grootschalige Infra

- Stedelijke Infra
- Infraontwikkeling
- Wegbouwkunde
- Geodesie

Referenties

- A2 Eindhoven
- A2 Deil-Culemborg
- N201 Aalsmeer-Uithoorn
- A4 Halsteren
- RWZI Harnaschpolder

www.breijn.nl



Short Description

Carcass of railway platform

In Breda (The Netherlands) a new terminal for public transportation is realised. The carcass of this tunnel is now under construction by Heijmans (www.heijmans.nl) and the design was made by Breijn (www.breijn.nl). Scia Engineer was used for the design of both the sub- and superstructure (train decks). Because the new tunnel is situated beneath a railway, the structure had to be designed by the design-codes from Prorail (Dutch railway manager). In this code it is demanded that a calculation is made to show how the forces in longitudinal direction affect the stress and deformation in the railway track itself. This calculation was also made by Breijn with Scia Engineer. In this model non-linear connections are used between the superstructure and the railway track. By using this advanced modelling it was proven that the stresses and deformations in the railway track comply with the requirements.

Project Information

Owner: Prorail
Architect: n/a
General Contractor: Heijmans Beton en Waterbouw

Engineering Office: Breijn
Construction Start: 01/01/2008
Construction End: 01/07/2010
Location: Breda, Netherlands



Het project betreft het ontwerp van de ruwbouw van de perrontunnel in het kader van de nieuw te ontwikkelen Openbaar Vervoer Terminal Breda.

Zoals in de vraagspecificatie van de opdrachtgever wordt omschreven, dient de tunnel:

- Het railverkeer op de sporen 2 t/m 8 en de reizigersstromen tussen de perrons en OV-terminal Breda te faciliteren
- Ruimte te bieden voor de afbouw van de perrontunnel en geschikt te zijn voor de realisatie van overige delen van OVT Breda CS
- Te beschikken over de daarbij behorende perrons, inclusief alle voorzieningen

Het huidige station Breda bestaat uit 3 eiland perrons, namelijk naast de sporen 3 en 4, 5 en 6 en 7 en 8. Naast spoor 2 ligt een randperron. Dit zijn zgn. zandperrons. In deze perrons zijn de voorzieningen aanwezig voor kabels en leidingen. Binnen de systeemgrenzen bestaat het station Breda uit 7 sporen (2 t/m 8). De sporen zijn uitgevoerd in ballast.

De Perrontunnel wordt gerealiseerd ten westen van de bestaande perrontunnel, in de situatie van een bestaand station dat blijft functioneren.

Aan de zuidzijde van de Perrontunnel bevindt zich het bestaande station Breda CS met de commercie en kaartverkoop.

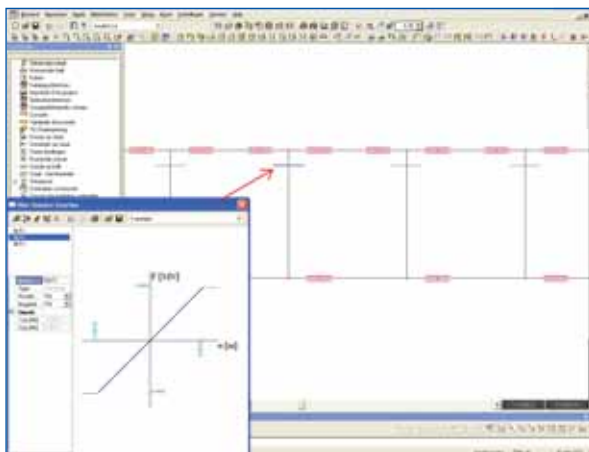
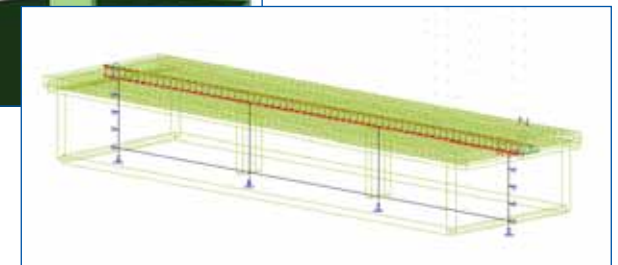
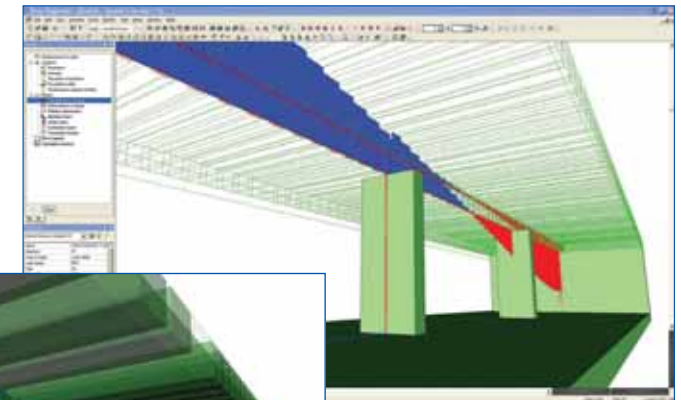
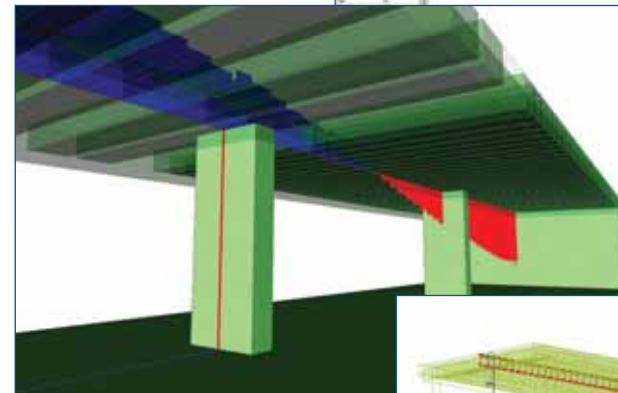
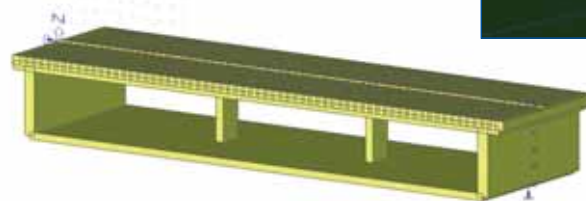
De bestaande (ruimtevakwerk) overkapping van het CS heeft naast de beschermende werking tegen weersinvloeden ook een functie voor de exploitatie (reizigersinformatie, verlichting, bovenleiding en omroepinstallatie zijn hieraan bevestigd). Aan de noordzijde van de Perrontunnel lag een goederen emplacement. Dit ligt buiten de systeemgrenzen. Aan deze noordzijde vinden de bouwactiviteiten voor de nieuwe OV-terminal plaats. De bouwactiviteiten t.b.v. de nieuwe OV-terminal aan de zuidzijde zullen plaatsvinden na realisatie van de Perrontunnel.

De Perrontunnel wordt in ruwbouw situatie opgeleverd waarbij, in samenhang met de nog aanwezige onderdelen van het bestaande station, de volledige stationsfunctie op het niveau van het huidige station Breda CS gehandhaafd is. Boven de sporen en de perrons zal in de toekomst een parkeerdek worden gemaakt. De belasting van dit parkeerdek wordt voor een deel door de Perrontunnel gedragen. Verder dient, uit overweging van bouwfasering voor de overige delen van de OVT Breda CS een gedeelte van de funderingsconstructies gerealiseerd te worden.

Voor het ontwerp betekent dit dat de volgende zaken binnen het bereik van het uit te voeren definitief ontwerp vallen:

- Ontwerp ruwbouw perrontunnel
- Ontwerp spoordekken
- Ontwerp ruwbouw stijgpunten
- Ontwerp perrons binnen systeemgrenzen
- Ontwerp bouwkuip
- Ontwerp baanconstructies t.p.v. de perrontunnel
- Ontwerp spoorwerk t.p.v. de perrontunnel
- Ontwerp kabels en leidingen Prorail en derden

Voor het ontwerp van de perrontunnel is gebruik gemaakt van het softwarepakket Scia Engineer. Voor zowel onder- als bovenbouw is de constructie in dit softwarepakket gemodelleerd en aan de hand van de verkregen krachtsverdeling gedimensioneerd. Omdat het een spoorwerk betreft en daarom aan de Prorail-voorschriften (OVS) moet voldoen, is het ook noodzakelijk een zogenaamde langskrachtenberekening uit te voeren. Deze berekening is van belang om de maximaal optredende staalspanning in de spoorstaven evenals de (verschil) verplaatsingen van de spoorstaven te kunnen bepalen en toetsen, hetgeen uiteraard van groot belang is voor het spoor. Ook voor deze langskrachtenberekening is gebruik gemaakt van het pakket Scia Engineer, waarbij gebruik gemaakt is van niet-lineaire verbindingen tussen het spoordek en de spoorstaven om de eigenschappen van de spoorstaafverbindingen conform de OVS te modelleren. Door het gebruik van dit geavanceerde model is aangetoond kunnen worden dat de optredende spanningen en vervormingen aan de OVS voldoen.



ESM Ingénieurs Associés SA

Contact Pierre Laurencet
 Address 14, rue du Coppet
 1870 Monthey, Switzerland
 Phone +41 24 475 70 10
 Email plaurencet@esm-group.ch
 Website www.esm-group.ch



études
structures
matériaux
esm-group
 Ingénieurs civils
 www.esm-group.ch

Le groupe ESM est constitué de 4 bureaux d'ingénieurs civils. Les associés sur les cantons de Vaud et Valais sont Dr P. Laurencet, Dr P. Mivelaz, ainsi que Dr H. Charif. Sur le canton de Genève, le bureau est dirigé par M. J. Ponti. Les bureaux du groupe ESM assurent la continuité des bureaux Alexandre Sarasin, fondés en 1921, et du bureau Hagin, à la Tour-de-Peilz.

De par la formation et les expériences diverses acquises par chacun de ses collaborateurs, les bureaux ESM sont à même d'offrir des services de qualité tout en privilégiant des relations personnalisées et de proximité. La taille des bureaux, soit une quarantaine de collaborateurs en tout, permet la réalisation de projets de grande envergure, dans tous les domaines du génie civil, soit les structures, la conservation des structures, les ouvrages enterrés, l'hydraulique, les travaux publics et travaux industriels

esm-group www.esm-group.ch	Genève esm-ingénierie sa	Lausanne esm-sarasin ingénieurs sa	La Tour-de-Peilz esm-hagin ingénieurs sa	Monthey esm-ingénieurs associés sa
--------------------------------------	-----------------------------	---------------------------------------	---	---------------------------------------



Bridge of Laty

The project regards a 70 m long prestressed concrete bridge, built in 3 casting stages. It has 3 spans of 21, 28 and 21 m.

Although the two main beams are straight, the cantilevers of the deck are uneven, due to the slightly curved trajectory of the street leading to the Large Saint Bernard. The 3D model includes the construction stages as well as the 6 post-tensioned cables. Additionally to the standard ULS and SLS checks, a seismic analysis of the structure was performed.

Short Description

Project Information

Owner: Etat du Valais, SRCE-DTEE,
 Section Bas-Valais
Architect: n/a
General Contractor: Züblin Murer SA
Engineering Office: ESM Group

Construction Start: 03/2007
Construction End: 04/2008
Location: Orsières-Liddes, Switzerland

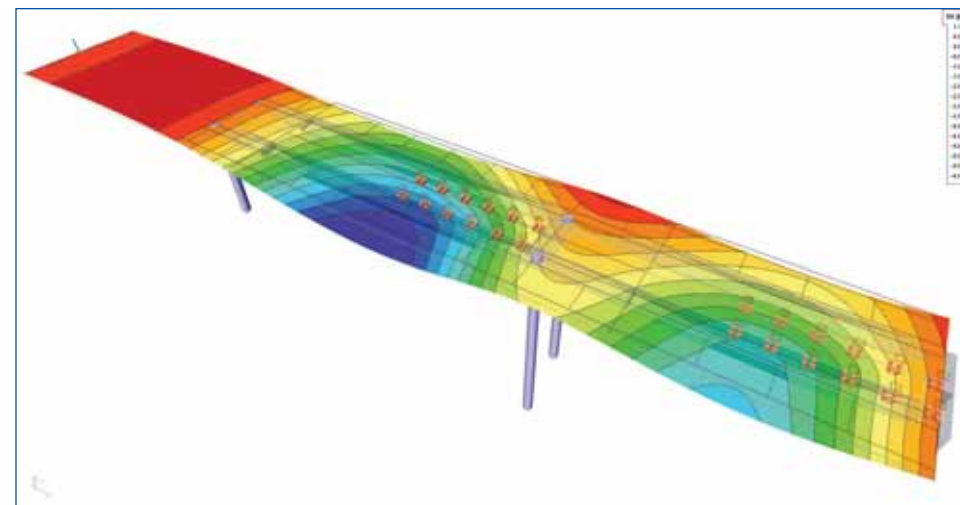


Le pont de Laty se situe entre Orsières et Liddes sur la route du Grand Saint-Bernard. Cet ouvrage de 70 m en béton précontraint permet le franchissement d'un versant, alors que l'ancienne route faisait un lacet pour le contourner. Ce mandat a été obtenu dans le cadre d'un concours.

D'une longueur totale de 70 m, comportant 3 travées de 21, 28 et 21 m, la structure est portée par deux poutres rectilignes précontraintes par 6 câbles de 350 to. Le tablier a une largeur hors tout de 10.50 et les porte-à-faux sont de longueur variable (de 2,25 m à 2,75 m) car le tracé de la route n'est pas parallèle à l'axe des poutres.

Afin de minimiser l'impact sur l'environnement et le trafic routier, la méthode d'exécution prévoyait, d'une part, la préfabrication des piles et leur mise en place à la grue et, d'autre part, la construction du tablier en 3 étapes à l'avancement, de l'aval vers l'amont, sur un cintre auto-porteur reposant sur les fondations.

Dans un souci de faciliter l'entretien, les équipements sont limités au strict minimum nécessaire, soit un seul joint de dilatation sur la culée amont, 4 appareils d'appuis sur les culées, 2 sur les piles les moins hautes, les plus hautes demeurant encastrées dans le tablier.



Used software: Scia Engineer

Modélisation et calcul

Le pont a été modélisé en 3D. Le tablier est modélisé par des éléments plaque d'épaisseur variable selon la largeur. La largeur des porte-à-faux étant variable, ils ont été découpés en tronçons d'environ 3.50 m de long pour approcher au mieux les variations d'épaisseur. Le tracé de la route à cet endroit est en fait une courbe en S à la jonction entre deux arcs de clothoïde. Etant donnée la très faible courbure, les bords du tablier ont été admis rectilignes, tout en respectant néanmoins la largeur des portes-à-faux aux extrémités du pont. L'écart par rapport au tracé réel reste inférieur à 10 cm sur toute la longueur du tablier.

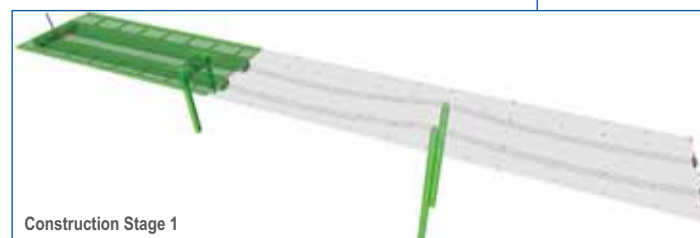
Les poutres maîtresses sont modélisées par des nervures excentrées, ainsi que les entretoises. Les piles sont des éléments de poutre, encastrées à leur base.

Les phases de construction ont été prises en compte dans le modèle. A chacune des 3 phases de bétonnage, 2 câbles sont mis en tension dans chaque poutre. Une 4e phase introduit un câble de continuité dans chaque poutre sur toute la longueur du pont.

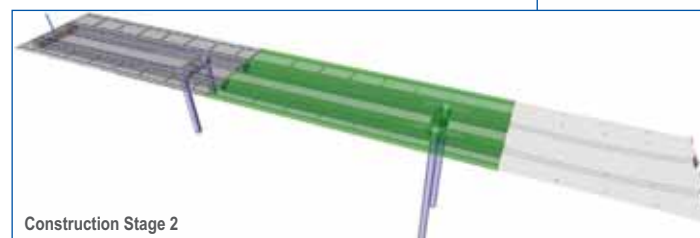
Pour chaque phase de construction, des charges de chantier ont été prise en compte. Les charges de trafic, selon la norme SIA 261, ont également été appliquées (trafic conventionnel et convoi exceptionnel).

En complément, l'ouvrage se trouvant en zone sismique 3b, une analyse dynamique par la méthode du spectre de réponse a été effectuée pour s'assurer de la sécurité vis-à-vis du séisme.

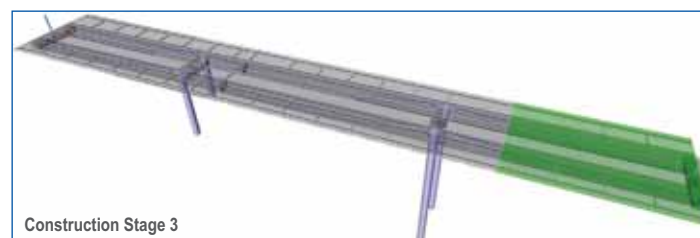
L'utilisation de nervures pour la modélisation des poutres maîtresses permet des sorties de résultats aisées pour le comportement longitudinal, tout en conservant une analyse fine pour le comportement transversal – ce qui serait impossible dans une approche purement en poutre – ce qui fait de Scia Engineer un outil idéal pour ce type de calcul.



Construction Stage 1



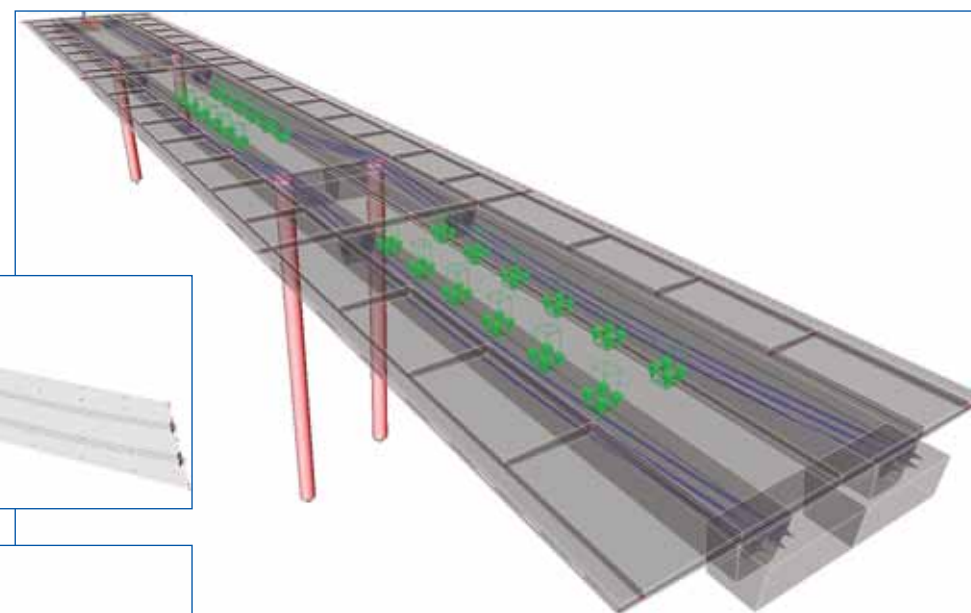
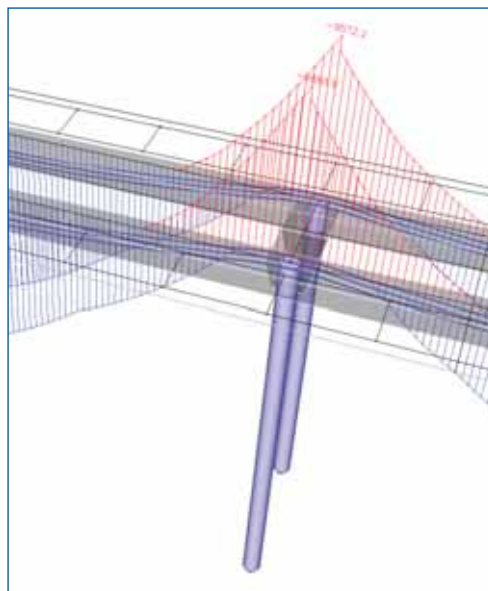
Construction Stage 2



Construction Stage 3



Construction Stage 4



ESM Sarrasin Ingénieurs SA

Contact Hazem Charif, Pierre Mivelaz
 Address 40, rue des Jordils, 1025 St-Sulpice
 Switzerland
 Phone +41 21 697 23 15, +41 24 475 70 10
 Email hcharif@esm-group.ch, pmivelaz@esm-group.ch
 Website www.esm-group.ch

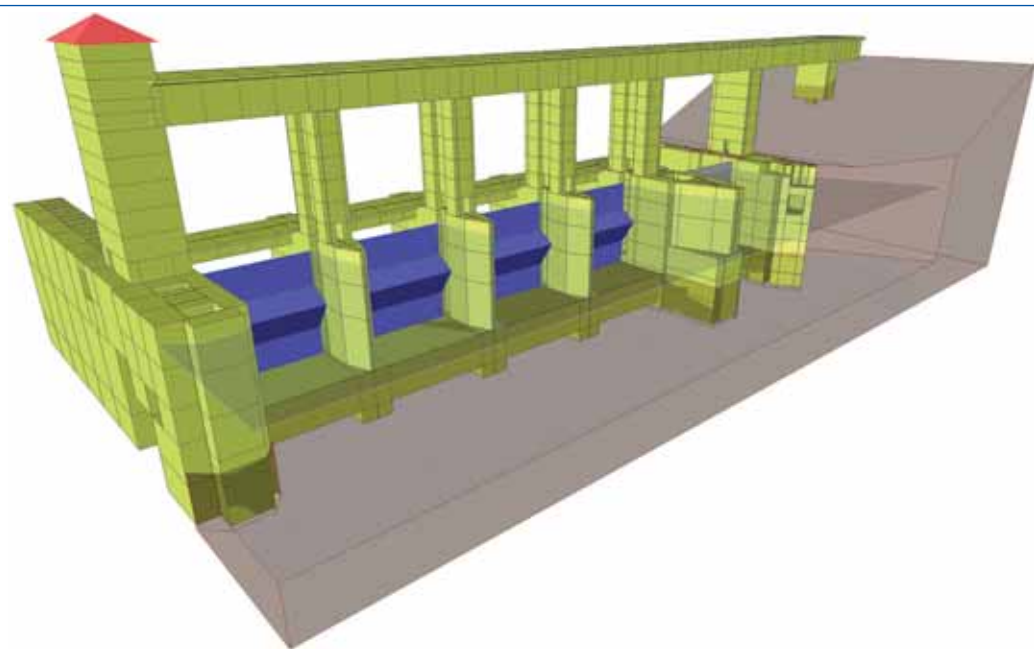


études
structures
matériaux
esm-group
 Ingénieurs civils
 www.esm-group.ch

Le groupe ESM est constitué de 4 bureaux d'ingénieurs civils. Les associés sur les cantons de Vaud et Valais sont Dr P. Laurencet, Dr P. Mivelaz, ainsi que Dr H. Charif. Sur le canton de Genève, le bureau est dirigé par M. J. Ponti. Les bureaux vaudois et valaisans assurent la continuité des bureaux Sarrasin, fondés en 1921 par Alexandre Sarrasin.

De par la formation et les expériences diverses acquises par chacun de ses collaborateurs, les bureaux ESM sont à même d'offrir des services de qualité tout en privilégiant des relations personnalisées et de proximité. La taille des bureaux valaisans et vaudois, une vingtaine de collaborateurs, leur permet de traiter des projets de grande envergure, dans tous les domaines du génie civil.

esm-group www.esm-group.ch	Genève esm-ingénierie sa	Lausanne esm-sarrasin ingénieurs sa	La Tour-de-Peilz esm-hagin ingénieurs sa	Monthey esm-ingénieurs associés sa
--------------------------------------	-----------------------------	--	---	---------------------------------------



Paraseismic reinforcement of Chancy-Pougny dam

Short Description

The Chancy-Pougny dam is located on the river Rhône near Geneva, on the Swiss-French border. Paraseismic reinforcement works had to be undertaken, because of the evolution of the code requirements regarding this topic. The preliminary draft of the project is now about to be finalized. In that phase, the whole structure was modelised for seismic analysis, using an updated Response Spectrum Method. Three possible reinforcement alternatives could be defined from that study and the model will be used for further calculations during the final phase of the project.

Project Information

Owner: n/a
Project Coordination: Compagnie Nationale du Rhône
General Contractor: n/a
Engineering Office: ESM Sarrasin Ingénieurs SA

Construction Start: n/a
Construction End: n/a
Location: Chancy (Switzerland), Pougny (France)

Le barrage de Chancy-Pougny est situé sur le Rhône dans la région de Genève, à cheval sur la frontière franco-suisse. Dans le cadre de sa rénovation et suite à l'évolution des normes en matière de comportement sismique depuis sa construction, l'ouvrage en question doit être mis en conformité avec les normes actuellement en vigueur. La phase d'avant-projet de cette étude est en cours de finalisation et, dans ce contexte, l'ouvrage a été modélisé dans son ensemble afin d'obtenir les résultats nécessaires pour la phase de projet définitif.

Démarche générale

La modélisation en question porte sur la zone de l'ouvrage comportant les vannes, ainsi que le pont supérieur qui l'enjambe, supportant les équipements de manœuvre des vannes et les câbles électriques reliant les alternateurs aux transformateurs.



Le calcul dynamique et sismique de la structure est effectué par la méthode du spectre de réponse. Pour faciliter le post-traitement et contourner les problèmes de signature et de concomitance des résultats, les accélérations obtenues par la méthode du spectre de réponse sont exportées et récupérées dans Excel, multipliées par la masse en chaque point de la structure et les charges statiques équivalentes ainsi obtenues sont réintroduites dans le modèle via l'interface XML de Scia Engineer. Les traitements nécessaires dans Excel sont assurés par des macros VBA.

Quelques aspects particuliers de la modélisation

Le modèle 3D est composé d'éléments finis de coque, d'épaisseur pouvant être variable, et d'éléments poutres. Ce type de modélisation a l'avantage de permettre de modifier aisément le modèle pour les études de variantes (conditions de liaisons...) contrairement à un modèle 3D en éléments volumiques.

La partie inférieure de l'ouvrage, essentiellement située en-dessous du plan d'eau, est composée d'éléments en béton plus ou moins massifs. Elle a été modélisée par un ensemble de plaques entrecroisées. Les buts de cette partie de la modélisation sont, d'une part, de vérifier les contraintes dans ces parties basses et, d'autre part, d'assurer des conditions de bord réalistes à la partie supérieure de la structure.

Used software: Scia Engineer

La partie supérieure s'apparente à un pont et a été modélisée comme telle, à l'aide d'éléments filaires.

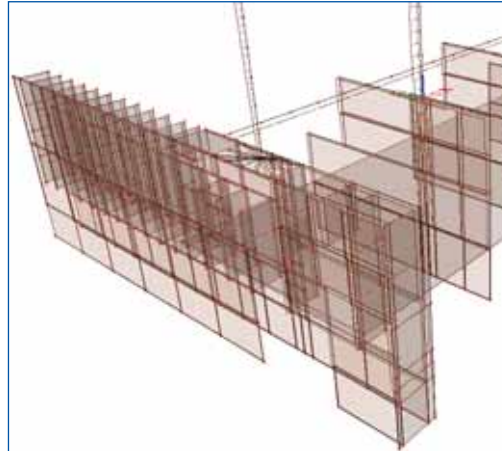
La culée en rive droite pose un problème particulier : elle est fondée sur un talus relativement souple par rapport au fond rocheux supportant tout le reste de l'ouvrage. Le comportement dynamique propre de ce talus a donc dû être introduit dans la modélisation. Sur la base d'une étude géotechnique détaillée du versant, son comportement dynamique a pu être reproduit à l'aide d'une combinaison de masses et de ressorts. Ce modèle simplifié du talus a été calibré pour chaque direction et introduit dans le modèle global. Outre le comportement du talus lui-même, l'interface entre le talus et la culée a fait l'objet d'une étude particulière dont les résultats ont également été pris en compte dans le modèle de talus.

L'eau de la retenue a été introduite selon le modèle de Westergaard, sous la forme de masses d'eau entraînées.

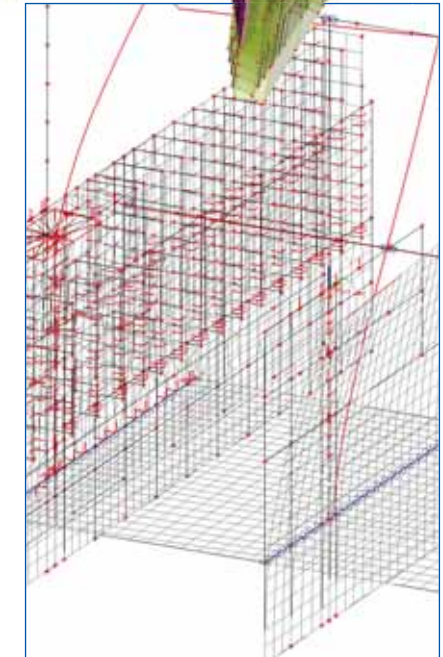
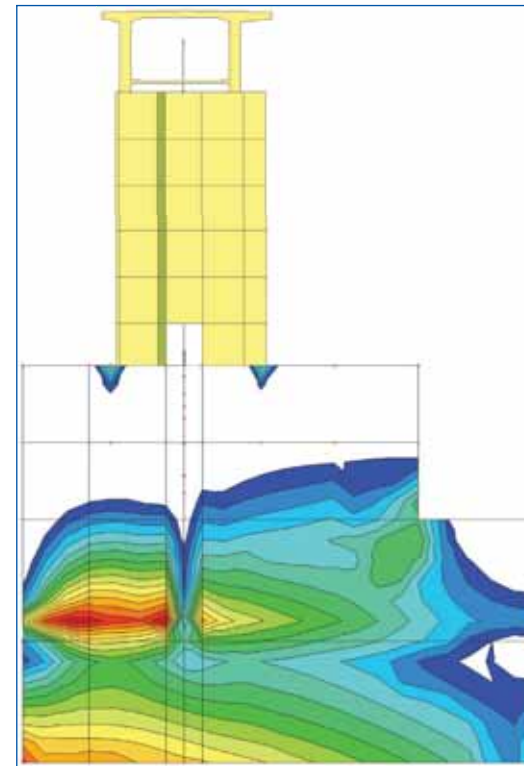
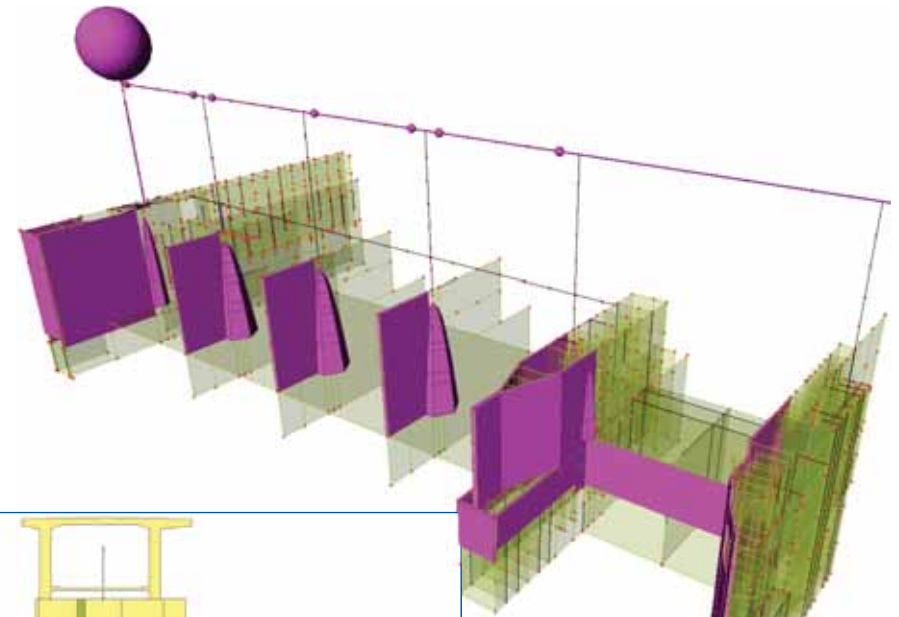
De nombreuses variantes ont d'ores et déjà été calculées, notamment en modifiant les conditions de liaison des éléments du pont supérieur, dans le but d'étudier la faisabilité et l'opportunité de certaines possibilités de confortement et de choisir la ou

les variantes qui devront être étudiées de façon approfondies lors du projet définitif. Des études de sensibilité ont également été menées sur l'influence de différents paramètres (amortissement, caractéristiques des matériaux...).

A ce stade de l'étude, le modèle de calcul a été validé et trois variantes de confortement répondant aux critères du maître de l'ouvrage ont pu être retenues pour la suite de l'étude.



Confortement parasismique du barrage de Chancy-Pougny



ESM Sarrasin Ingénieurs SA / ESM Ingénieurs Associés SA

Contact Hazem Charif Pierre Laurencet
 Address 40, rue des Jordils 14, rue du Coppet
 CH-1025 St-Sulpice CH-1870 Monthey
 Phone +41 21 697 23 15 +41 24 475 70 10
 Email hcharif@esm-group.ch plaurencet@esm-group.ch
 Website www.esm-group.ch



études
structures
matériaux

esm-group
Ingénieurs civils
www.esm-group.ch

Le groupe ESM est constitué de 4 bureaux d'ingénieurs civils. Les associés sur les cantons de Vaud et Valais sont Dr P. Laurencet, Dr P. Mivelaz, ainsi que Dr H. Charif. Sur le canton de Genève, le bureau est dirigé par M. J. Ponti. Les bureaux vaudois et valaisans assurent la continuité des bureaux Sarrasin, fondés en 1921 par Alexandre Sarrasin.

De par la formation et les expériences diverses acquises par chacun de ses collaborateurs, les bureaux ESM sont à même d'offrir des services de qualité tout en privilégiant des relations personnalisées et de proximité. La taille des bureaux valaisans et vaudois, une vingtaine de collaborateurs, leur permet de traiter des projets de grande envergure, dans tous les domaines du génie civil.

esm-group www.esm-group.ch	Genève esm-ingénierie sa	Lausanne esm-sarrasin ingénieurs sa	La Tour-de-Peilz esm-hagin ingénieurs sa	Monthey esm-ingénieurs associés sa
-------------------------------	-----------------------------	--	---	---------------------------------------



Pont sur la Veveyse de Fégire



© IS-BETON 2009

Verification of Swiss bridges for 40 tons traffic

As a consequence of opening the Swiss border to European truck traffic, the truck weight limit was raised from 28 to 40 tons. Therefore, most of the Swiss bridges would have to be checked against those new requirements.

As a part of that project, a set of 26 bridges of various types, located as well on motorways as on canton streets, were modelled using ESA-Prima Win or Scia Engineer. Two examples are described in this project.

Short Description

Project Information

Owner: Etat de Vaud, Etat du Valais

Architect: n/a

General Contractor: various

Engineering Office: ESM Sarrasin Ingénieurs SA,
ESM Ingénieurs Associés SA

Construction Start: n/a

Construction End: n/a

Location: Cantons de Vaud et du Valais,
Switzerland



Vérification de ponts existants pour le trafic 40 tonnes Suite à l'ouverture de la Suisse au trafic poids lourds européen, la limite de poids est passée de 28 à 40 tonnes. De ce fait, la capacité portante de l'ensemble des ouvrages d'art du réseau Suisse devait être vérifiée pour ces nouvelles exigences. Dans ce cadre, les 26 ponts listés ci-après ont été modélisés. Ces ponts sont situés aussi bien sur le réseau des routes cantonales (RC) que nationales (RN – autoroutes), répartis sur les territoires des cantons de Vaud (VD) et du Valais (VS).

Les vérifications effectuées portent sur la capacité portante des ouvrages, donc uniquement à l'ELU. Dans cette optique, la précontrainte a été prise en compte du côté de la résistance et n'apparaît donc pas en tant que telle dans les modèles. Enfin, lorsque cela était nécessaire, certaines redistributions plastiques des efforts ont été admises, tant longitudinales que transversales.

Ces études ont été réalisées sur la base des plans d'exécution des ouvrages étudiés. Si les données concernant les ouvrages autoroutiers étaient généralement très complètes, il n'en allait pas toujours de même pour ceux des routes cantonales, en particulier en ce qui concerne le ferrailage. Certaines hypothèses ont donc dû être faites dans ce domaine. Les ouvrages ont été modélisés en 3D, généralement en combinant des éléments finis de coque et des éléments poutres. L'analyse était élastique linéaire, avec prise en compte de phases de construction dans certains cas particuliers.

Les charges de trafic considérées suivent le modèle

40to développé par l'ICOM (Institut de Construction Métallique - Ecole Polytechnique Fédérale de Lausanne) basé sur la norme SIA 160. Ces charges actualisées permettent de tenir compte de charges correspondant aux conditions d'exploitation réelles des ouvrages, au lieu de l'approche sécuritaire des normes. Des cas de trafic à l'axe et au bord du tablier ont été systématiquement étudiés.

L'utilisation d'ESA-Prima Win et Scia Engineer a permis de modéliser ces différents ouvrages de manière efficace et de résoudre les difficultés particulières de chaque cas. L'étude a permis de montrer que la capacité portante de la plupart des ouvrages étudiés est suffisante.

- Estacade 3 Place Cobal (RC VD) : Estacade en béton armé
- Pont de la Baye de Clarens (RC VD) : Ancien pont en maçonnerie élargi par une structure en béton précontraint
- PS (passage supérieur) de Clochatte (RC VD) : Pont à béquilles en béton précontraint
- Pont sur la Veveyse de Fégire (RN VD) : Pont précontraint en encorbellement
- Pont de Massa (RC VS) : Pont arc en béton armé
- Pont des Raffineries (RN VD) : Pont à poutres multiples préfabriquées en béton précontraint
- Pont d'Illas (RC VS) : Pont arc en béton armé
- Pont de Chenaux (RN VD) : Pont à poutres maîtresses en béton précontraint
- Pont du Fayot (RC VS) : Pont arc en béton armé
- Pont sur la Chandelard (RN VD) : Pont mixte acier-béton à deux poutres maîtresses

Used software: Scia Engineer, ESA-Prima Win

- Pont sur la Gryonne (RC VD) : Pont-dalle biais en béton armé
- Pont sur la Salenche (RC VD) : Ancien voûtage en maçonnerie élargi par une structure en béton armé
- Pont sur la Tinière (RC VD) : Pont cadre en béton armé
- Pont sur le Flon à la Chocolatière (RN VD) : Pont arc en béton armé
- Pont sur la Grande Eau (RN VD) : 2 ponts-dalle biais mixte acier-béton
- PS de la Veyre (RN VD) : Pont dalle biais en béton précontraint
- PS Le Mont-Pavement (RC VD) : Pont cadre biais et courbe en béton précontraint
- PS Etoy-Buchillon (RC VD) : Pont dalle-poutre en béton précontraint
- PS sur le Grand Canal (RC VD) : Pont dalle en béton précontraint
- PS RC 178 (RC VD) : Pont dalle et poutres biais à section variable en béton précontraint
- PS RC 401 (RC VD) : Pont dalle biais en béton précontraint
- PS RC 47 (RC VD) : Pont dalle et poutres biais en béton précontraint
- PS RC 79-80 (RC VD) : Pont à poutres maîtresses en béton armé
- Viaduc de la Plaine du Rhône (RN VD) : Pont à poutres maîtresses en béton précontraint
- Viaduc d'Epandes (RN VD) : Viaduc d'autoroute en béton précontraint
- Viaduc du Chêne (RN VD) : Double viaduc mixte acier-béton

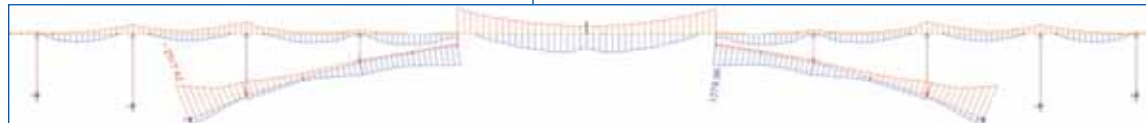
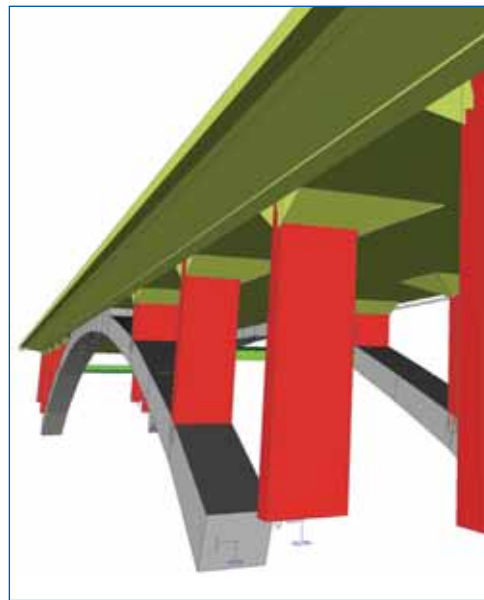
À titre d'exemples

Pont sur la Veveyse de Fégire

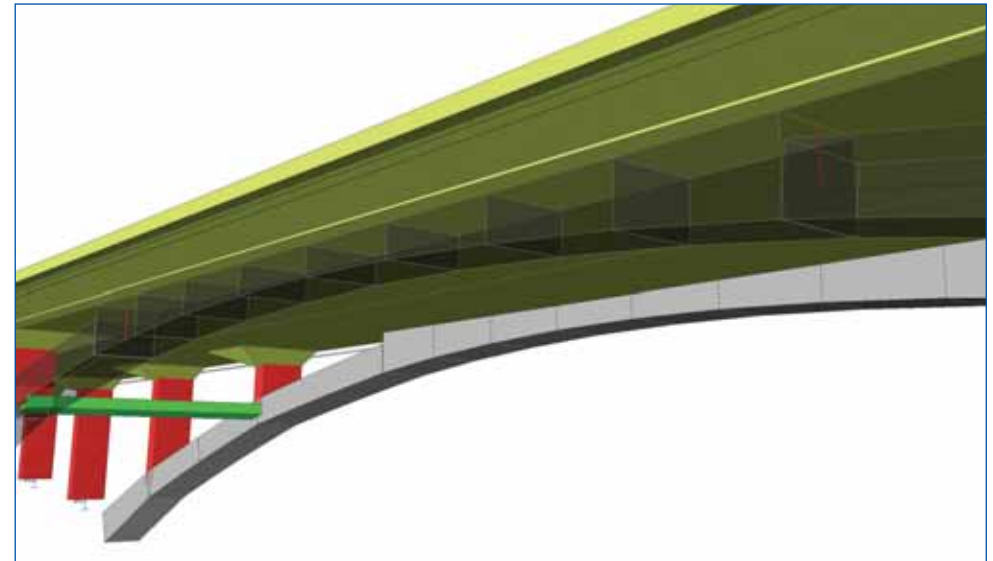
- Type : Pont post-contraint en encorbellement
- Emplacement : autoroute A12, Châtel-St-Denis
- Maître d'ouvrage : Etat de Vaud, Service des Routes Nationales
- Portée type : 90m
- Longueur totale : 600 m (6 travées)
- Logiciel utilisé : ESA-Prima Win
- Particularités de modélisation : essentiel de la modélisation en éléments coque ; raidisseurs transversaux des porte-à-faux du tablier modélisés comme nervures

Pont de Massa

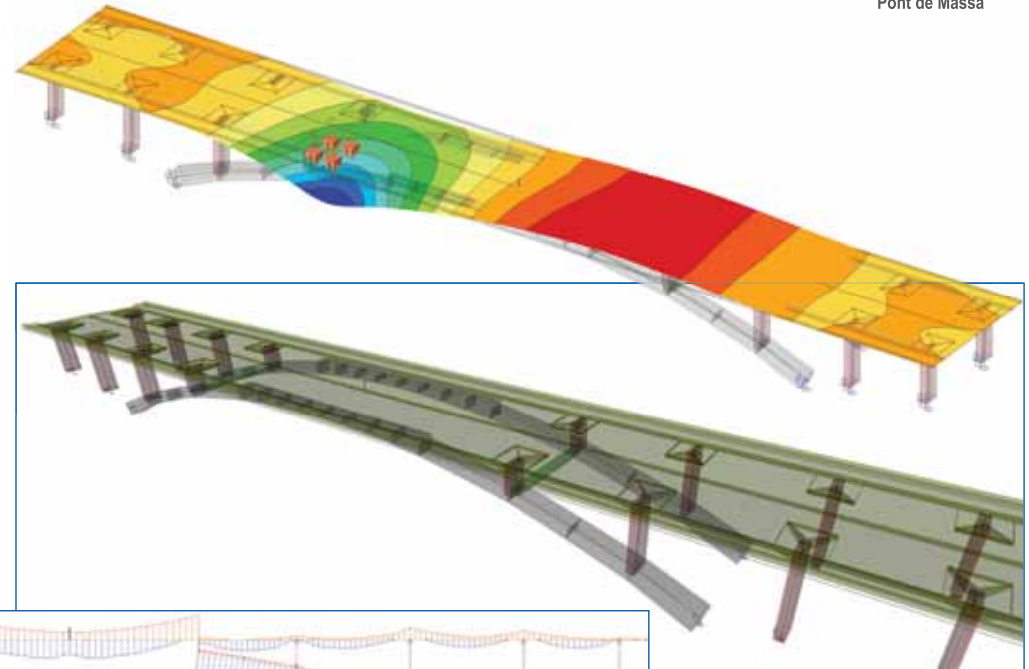
- Type : Pont arc en béton armé
- Emplacement : route Viège-Zermatt
- Maître d'ouvrage : Etat du Valais, Routes Cantonales
- Portée centrale : 43m
- Longueur totale : 62.5m
- Logiciel utilisé : Scia Engineer
- Particularités de modélisation : tablier modélisé en coque dans un seul plan avec excentricités et épaisseurs variables pour les dévers, trottoirs et bordures ; sous-régions pour les champignons de liaison avec les piles. Piles et arcs modélisés par des éléments poutre (courbes pour les arcs). La zone de clef des arcs, où ceux-ci touchent le tablier, est modélisée par des nervures excentrées à section variable ; la liaison des arcs aux extrémités de ces zones est assurée par des bras rigides. Des nervures fictives (de section négligeable, mais avec une largeur collaborante couvrant le tablier) ont été ajoutées dans le tablier dans l'axe des arcs pour permettre des sorties de résultats aisées des efforts longitudinaux dans le tablier.



Vérification d'ouvrages pour le trafic 40 tonnes



Pont de Massa



GVH St-Blaise SA

Contact Pierre Gorgé
Address Moulins 16
2072 St-Blaise, Switzerland

Phone +41 327569760
Email p.gorge@gvh.ch
Website www.gvh.ch



gvh
ingénieurs civils EPF-SIA

La société GHHV, ingénieurs civils SIA, société en nom collectif, a été créée en 1982 par Messieurs Pierre Gorgé, André Vaucher et Bernard Houriet avec l'ouverture de bureaux à Tramelan puis à St-Blaise. A cette époque, notre effectif était de 8 personnes dont 4 ingénieurs dipl. EPF. Nos premiers mandats à Tramelan, La Patinoire et le CIP, ainsi qu'à St-Blaise, les Portails et Centrales du Tunnel Est de Neuchâtel et la nouvelle usine de Métaux Précieux SA à Marin, nous ont encouragés à poursuivre le développement de nos bureaux dans l'arc jurassien.

En 1987, nous avons étendu notre potentiel en ouvrant des bureaux à La Chaux-de-Fonds, comme succursale du bureau de St-Blaise et à Delémont avec un nouvel associé sous la raison sociale : Gnaegi, Houriet & Associés.

Dès 1988 de nouveaux mandats importants tels que les viaducs du Loewenberg, le tunnel du Mont Terri, les tranchées couvertes de Malvilliers et Boudevilliers et l'Office fédéral de la statistique à Neuchâtel nous ont poussés à revoir, dès le 1er janvier 1990, la forme juridique de nos sociétés, qui sont devenues indépendantes sous forme de société anonyme.

A cette période, le groupe GVH a participé avec succès à de nombreux concours de ponts dont les viaducs du Loewenberg (1er rang et réalisation), les ponts sur la Mentue (1er rang et réalisation), le pont de la Poya (1er rang, réalisation en 2008...), le pont sur la Rade de Genève (1er rang, non exécuté...) et, en collaboration avec l'architecte Mario Botta, le pont haubané de Regensburg sur le Danube en Allemagne (3ème rang).

Le groupe est aujourd'hui constitué des 4 sociétés principales indépendantes suivantes :

- GVH St-Blaise SA
- GVH Tramelan SA
- GVH La Chaux-de-Fonds SA
- GVH Delémont SA

GVH St-Imier SA (ouverture le 1er janvier 1993) et GVH Fribourg SA (ouverture le 1er janvier 1998) sont venus compléter le groupe GVH.

Les bureaux GVH sont spécialisés dans la conception et l'exécution de tous les types d'ouvrages de génie civil, de constructions industrielles et de bâtiments. Ils offrent également des prestations de conseils et d'expertises aux différents Maîtres d'ouvrage publics ou privés. Le groupe dispose de spécialistes dans tous les domaines de la construction :

- Ouvrages d'art : ponts et viaducs, tranchées couvertes, passages inférieurs
- Bâtiment : structures porteuses, fouilles et fondations spéciales
- Travaux souterrains : tunnels, centrales, cavernes et puits de ventilation
- Travaux spéciaux : structures haubanées, réservoirs, châteaux d'eau
- Assainissement : ponts et viaducs, tranchées couvertes et tunnels
- Génie civil : routes, canalisations, adductions d'eau, gazoducs, viabilités
- Expertises : ponts et viaducs, tranchées couvertes et tunnels, bâtiments

L'effectif actuel du groupe GVH est de 45 collaborateurs.

Short Description

The Poya Bridge

The 853 m long structure includes 3 bridges. The central part is a cable-stayed bridge, with a main span of 196 m and 2 side spans of 86 m. The deck lies up to 70 m above the river Sarine. On each side, 2 curved bridges of 253 and 231 m connect the structure to the abutments.

The mixed deck of the access bridges is made of a 28 cm thick concrete slab and 2.2 m high steel beams, with transverse beams every 6 m. The deck is 19.25 wide (varying up to 23.25 m at the approach of the south end) with 5.825 m cantilevers. In the cable-stayed section, the main beams are reduced to only 1 m high. The cables are laid out in 2 lateral layers and are anchored in the vertical part of the masts. The fixed anchorages at deck level are located above it and are made of a steel sub-system that simplifies the mounting and maintenance of the cables.

Project Information

Owner: Etat de Fribourg
Architect: n/a
General Contractor: n/a
Engineering Office: GVH Tramelan SA et GVH St-Blaise SA

Construction Start: 30/08/2009
Construction End: 30/10/2011
Location: Fribourg, Switzerland



Concept de la structure

Conception générale

D'une longueur totale de 851.6 m, l'ouvrage avec tablier en structure mixte comprend les éléments suivants:

- Le viaduc central haubané, constitué de deux mâts avec suspension latérale du tablier, réalisé en encorbellement haubané avec une travée centrale de 196 m et deux travées latérales de 86 m.
- Le viaduc d'accès Palatinat de 252.6 m de longueur, réalisé par lancement préalable de l'ossature métallique, avec des portées de 39.6, 51 et 3 x 54 m.
- Le viaduc d'accès Schönberg de 231 m de longueur, réalisé par pose préalable de l'ossature métallique, avec des portées de 54, 50, 47, 45 et 35 m.



Système statique

Le système statique est flottant sur 851.6 m en phase d'exploitation. Les culées sont provisoirement bloquées dans le sens longitudinal en phase de montage. Les mâts sont liés monolithiquement au tablier et assurent la stabilité longitudinale de l'ouvrage. Les piles N°3, 4, 5 et 8 sont liées longitudinalement au tablier. Toutes les piles sont connectées transversalement au tablier par l'un des deux appuis. Deux appuis pots mobiles en tous sens et un appui de guidage longitudinal sont prévus aux deux culées. Le pont fût modélisé avec Scia Engineer.

Tablier des viaducs d'accès

Le tablier en bi-poutres mixte acier-béton comprend les éléments suivants:

- Dalle de roulement en béton armé de 28 cm d'épaisseur, renforcée à 52 cm et munie de raidisseurs de 110 cm de hauteur dans les zones de bord.
- Poutres maîtresses métalliques dont la hauteur est maintenue constante (2.05 m) pour des raisons d'esthétique et de rationalisation du montage, malgré la largeur et la pente transversale variables du tablier.
- Entretoises métalliques de forme trapézoïdale espacées de 6 m dont les porte-à-faux sont maintenus constants (5.6 m), l'élargissement

du tablier côté Schönberg étant réalisé en variant l'écartement des poutres maîtresses.

Tablier de la zone haubanée

Le tablier mixte acier-béton, dont le comportement structural s'apparente à celui d'un tablier mince, se distingue du tablier des viaducs d'accès par les éléments suivants:

- La hauteur des poutres maîtresses est réduite de 2.05 à 1.05 m (réduction linéaire au droit des piles N°5 et 8).
- La largeur des raidisseurs latéraux est portée de 55 à 115 cm (la largeur totale du tablier (19.25 m) et la hauteur des raidisseurs de bord (1.1 m) sont maintenus constants).
- Un sommier métallique de bord, ultérieurement noyé dans le béton du raidisseur latéral, est adopté pour rationaliser le montage des haubans et plus particulièrement la mise en place des ancrages fixes prévus au niveau du tablier.

Mâts

Le fût inférieur vertical des mâts est constitué d'une section hexagonale creuse dont les dimensions extérieures sont fixées à 9.8 m x 4 m. Le concept, essentiellement dicté par des considérations architecturales, permet une transition élégante avec la partie supérieure des mâts dissociée en deux branches de section rectangulaire creuse pour permettre le franchissement du tablier. Une entretoise précontrainte de section rectangulaire pleine reprend la traction transversale engendrée par la dissociation susmentionnée. La tête des mâts est constituée d'une structure mixte acier-béton creuse dans laquelle sont disposés les ancrages mobiles des haubans.

Haubannage

Le haubannage est constitué de deux nappes latérales en semi-harpes ancrées verticalement dans le mât (haubannage en parapluie).

Les haubans sont constitués de torons de 150 mm² de section nominale, protégés individuellement contre la corrosion et mis en place individuellement.

Les ancrages fixes au niveau du tablier sont réalisés au-dessus de ce dernier au moyen d'une structure métallique visible et aisément accessible, ce qui simplifie le montage et l'entretien des haubans.

La place intérieure disponible en tête des mâts permet la mise en tension individuelle des torons au droit des ancrages mobiles. Un dispositif d'accès à la tête des mâts, prévu dans les branches supérieures permet la surveillance et, le cas échéant, l'échange de tous les haubans, toron par toron.

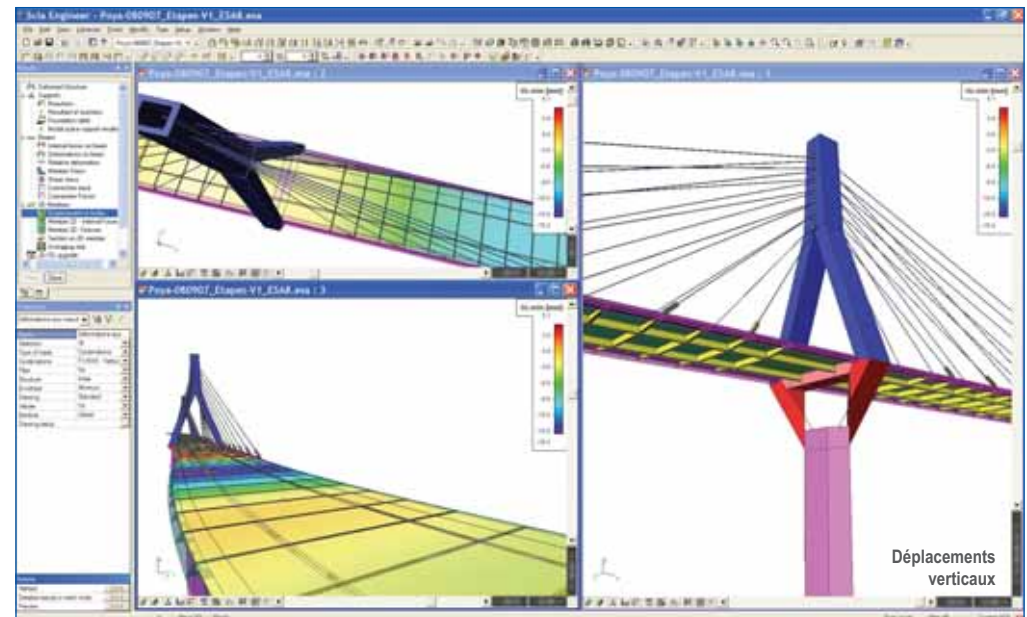
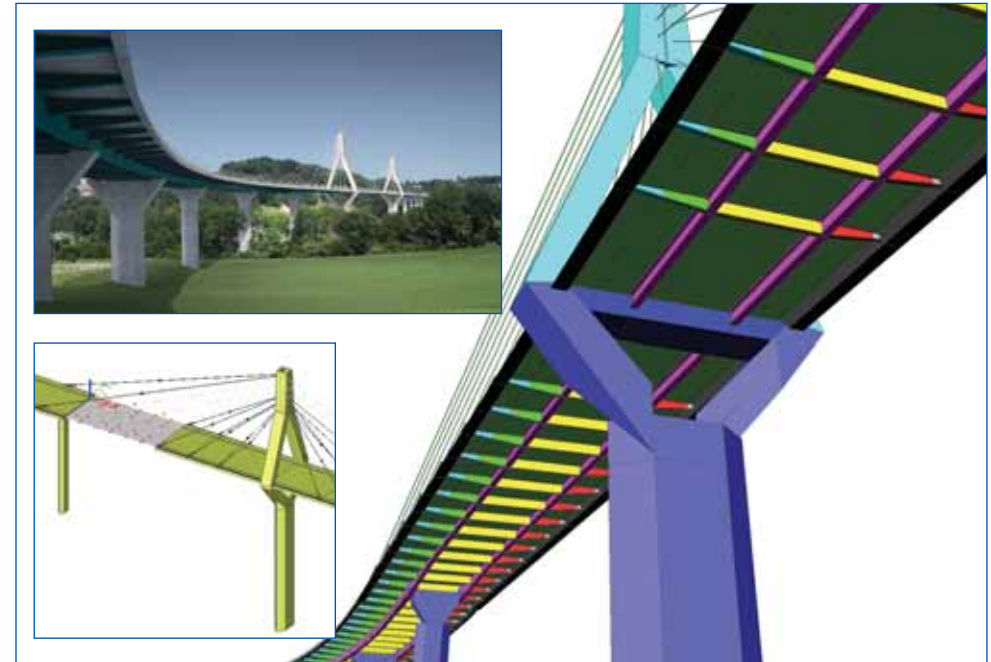
Piles

La conception structurale et architecturale des piles répond à celle des mâts.

Fondations

Les piles N°2 à 5 et 8 sont fondées sur 2 puits de section pleine réalisés jusque dans la molasse gréseuse saine. Les piles N°9 à 11 sont fondées dans les alluvions fluviatiles interglaciaires au moyen de semelles superficielles. Les piles N°1 et 12 ainsi que la culée N°13 sont fondées dans la moraine également à l'aide de semelles superficielles. La culée N°0 est fondée dans les couches de remblai.

Les deux mâts sont fondés dans la molasse gréseuse saine au moyen de 12 pieux forés tubés DN 150 cm.



Hollandia b.v.

Contact Jan Kodde
Address Schaarlijk 23
2921 LG Krimpen aan den IJssel, Netherlands

Phone +31 180 540540
Email j.kodde@hollandia.biz
Website www.hollandia.biz



HOLLANDIA

Geschiedenis van Hollandia

Hollandia is in 1928 ontstaan, aanvankelijk als dochter van de Amsterdamse Ballast Maatschappij en is actief in vele marktgebieden in de staalbranche. Na de overname van Bailey in 2001 is Hollandia een fusie aangegaan met de in 1948 opgerichte Zuid-Nederlandse Staalbouw (ZNS), actief in de industriebouw, hoogbouw en petrochemie.

Vervolgens zijn Grimbergen en het productiepersoneel van Kalmar toegetreden tot het ontstane conglomeraat van zelfstandig werkende bedrijven. In 2005 zijn de aan Hollandia gelieerde bedrijven als één onderneming gehuisvest op het voormalige Van der Giesen – De Noord terrein in Krimpen aan den IJssel. In 2008 zijn Hollandia en ZNS volledig geïntegreerd en opereert het bedrijf onder de naam Hollandia met als hoofdvestiging Krimpen aan den IJssel en als nevenlocatie Heiningen. Hollandia zal als een robuust en toonaangevend bedrijf de staaluitdagingen van de 21ste eeuw aangaan. Bij Hollandia werken ongeveer 700 medewerkers.

Werkwijze: alles in één hand

Opdrachtgevers kunnen bij Hollandia terecht voor design, engineering, productie, fabricage, transport en montage van staalconstructies.

Voor de verzorging van ontwerpstudies heeft Hollandia een eigen engineeringafdeling. Daar worden niet alleen de constructief beste oplossingen bedacht, maar wordt ook de prijs daarvan scherp in de gaten gehouden. Hollandia beschikt over een modern machinepark en ruime, goed toegeruste productiehallen. Het productiepersoneel is vakbekwaam en de lassers zijn gecertificeerd volgens de laatste normen.

Producten die Hollandia maakt

- Bruggen (vast en beweegbaar)
- Hijskranen
- Offshore platforms en hefmechanismen daarvoor
- Staalconstructies voor gebouwen
- Stadionsdaken (vast en beweegbaar)

Referentieprojecten

Het Wembley stadion, het reuzenrad London Eye, het augurk-vormige gebouw van het Swiss Reinsurance gebouw in Londen, de Willemsbrug in Rotterdam, de Eilandbrug in Kampen, de basculebruggen over de sluis bij Terneuzen, de Maaslandkering in de Waterweg bij de Hoek van Holland, etc.



Movable bascule bridge over lock

The movable bridges over the lock chamber of Terneuzen were repeatedly damaged by passing sea-going vessels, due to the shape of the vessels and to strong side-wind during the sailing into the lock. To avoid this damage in the future, Hollandia has designed a new type of movable bascule bridge with its pivoting point at a greater distance from the lock wall. The bridge has a span of 46,9 meter and is providing a crossing for 2 lanes of road traffic, 2 lanes for cyclists and 2 lanes for pedestrians. The Warren trusses are made of steel tubes. The bridge deck is an orthotropic steel deck with longitudinal trapezoidal stiffeners. The moved pivoting points rest on 4 new designed beams. These beams have a curved shape to make space for the counterweight and are designed to limit the effects of the moving of the main pivoting points on the concrete substructure.

Short Description

Project Information

Owner: Rijkswaterstaat
Architect: n/a
General Contractor: Hollandia b.v
Engineering Office: Hollandia b.v

Construction Start: 01/07/2006
Construction End: 14/11/2008
Location: Terneuzen, Netherlands



Inleiding

De vorige bruggen (bouwjaar 1965) over de zeesluis bij Terneuzen zijn diverse malen aangevaren. Dat kwam, doordat sommige zeeschepen een vormgeving hebben, die veel zijdelings uitsteekt. Na de laatste aanvaring van februari 2006 kwam de wens naar boven om nieuwe bascule bruggen te maken met ca 4 meter meer doorvaartbreedte op een niveau van + 20.00 meter.

Om dit mogelijk te maken moest het draaipunt van de brug 1.95 meter naar achteren verplaatst worden. Gevolg was, dat het bewegingswerk van de vorige bruggen met tandbaan niet meer te gebruiken was. Uit economische overwegingen is voor het nieuwe bewegingswerk gekozen voor een aandrijving met hydraulische cilinders.

Door de verschuiving van het draaipunt naar achteren, nam het buigend moment op de betonnen draagconsolens aanmerkelijk toe. Om deze te kunnen handhaven zijn er gebogen onderslagbalken toegepast. Deze onderslagbalken rusten aan de voorzijde op dezelfde locatie op de betonnen consoles als waar eerst het draaipunt van de brug was. Aan de achterzijde rusten de onderslagbalken op de achterzijde van de kelderwand. Het bevestigingspunt van de hydraulische cilinder is ook aan de onderslagbalken gemaakt, zodat de aandrijfkraften niet door de betonconstructie geleid hoeven te worden.

Het contra gewicht van de bestaande brug wordt hergebruikt, omdat deze niet in zijn geheel uit de kelder weg te nemen is. De brug is als volgt geconstrueerd: Het dek is gemaakt van orthotrope plaat met trogprofielen als verstijving er onder. Plaatdikte bij voet / fietspad is 10 mm en bij overig verkeer 16 mm. De troggen zijn gelast tussen de dwarsdragers die 2.93 m uit elkaar liggen. De dwarsdragers rusten op de hoofdspanten die 9.65 m uit elkaar liggen. Het verkeer rijdt in 2 stroken tussen de hoofdspanten. De voet / fietspaden zijn uitkragend aan beide zijden buiten de hoofdspanten gemaakt.

De hoofdspanten zijn gemaakt van ronde buisprofielen (bovenrand en diagonalen) en een uit platen opgebouwde onderrand. Schemahoogte



Used software: ESA-Prima Win

hoofdspant is 6.6 meter en knoofafstand is 5.86 meter. Deze knoofafstand komt dus overeen met de lengte van twee velden ($2 \times 2.93 = 5.86$). De onderrand is t.p.v. het val 0.8 m hoog en gaat naar achteren bij de staart over in een hoogte van ca. 3 meter. In dit deel is het draaipunt gemaakt. Aan het einde van de staart is het contragewicht bevestigd.

Hoofdkenmerken

- Doorvaartbreedte: 40.0 meter
- Totale lengte inclusief staart: 62.1 meter
- Totale breedte: 17.8 meter
- Gewicht basculebrug + CW: 900 ton
- Gewicht onderslagbalken: 106 ton totaal

Gebruik van ESA-Prima Win

De brug is gecontroleerd op sterkte, stijfheid, stabiliteit en vermoeiing. Deze berekeningen zijn voor dwarsdragers en troggen met de hand uitgevoerd. Voor controle van de hoofdspanen is dat met behulp van ESA-Prima Win gedaan.

Daartoe zijn 6 rekenmodellen gemaakt:

- A Bruggesloten, belast met verkeer
- B1 Brug bewegend, openingshoek 0° , 1 cilinder actief
- B2 Brug bewegend, openingshoek 0° , 2 cilinders actief
- C1 Brug bewegend, openingshoek 88° , 1 cilinder actief
- C2 Brug bewegend, openingshoek 88° , 2 cilinders actief
- D Brug geopend, openingshoek 88° , vastgezet op stormpenen.

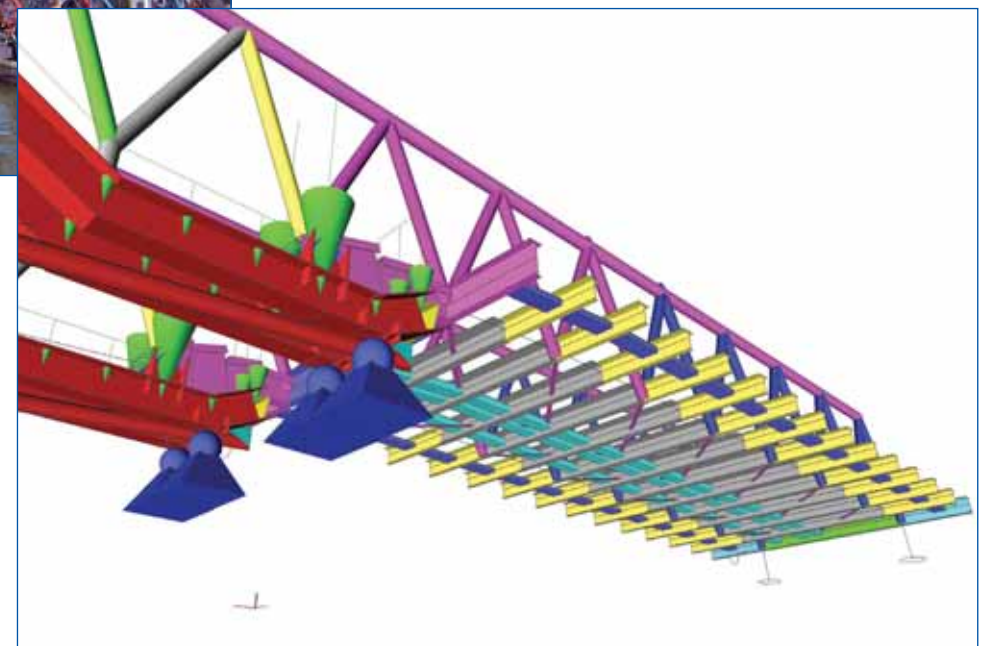
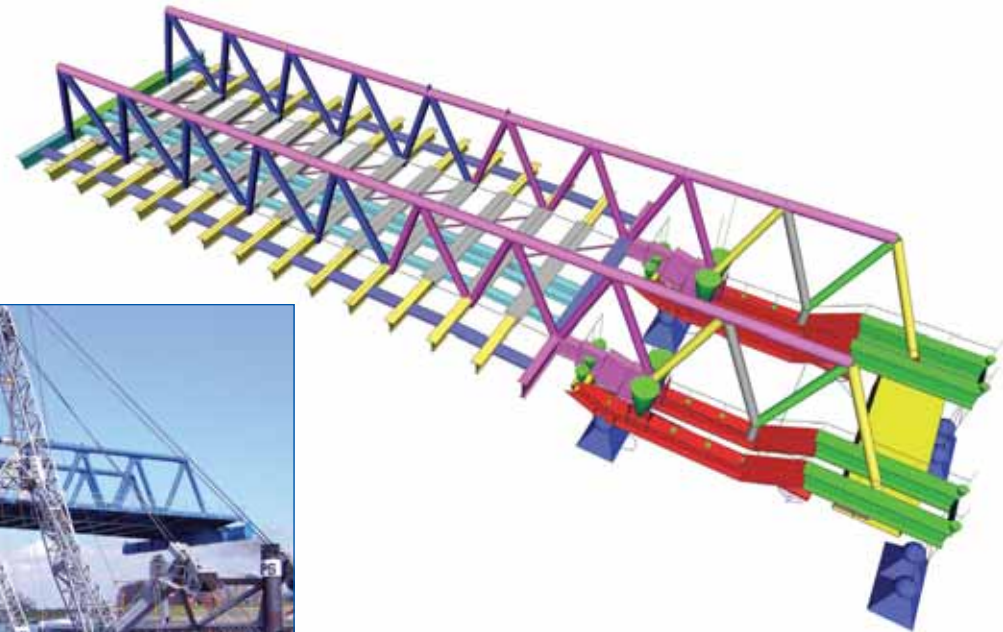
Van elk van deze modellen zijn de randvoorwaarden (steunpunten) of de positie van brug t.o.v. onderslagbalken verschillend. Telkens zijn de onderslagbalken mee gemodelleerd om een juist beeld van temperatuurspanningen en verplaatsingen te krijgen.

Resultaten

- Toetsing op sterkte was eenvoudig uitvoerbaar omdat de spanningen per model direct gepresenteerd worden bij de resultaten.
- Toetsing op stijfheid is gedaan door op enkele kritische punten de vervormings-resultaten te controleren.
- Toetsing op stabiliteit is gedaan door de in de resultaten gevonden snede-krachten en snede-

momenten van de op druk belaste staven te toetsen volgens H 12.3-1 van NEN 6770.

- De overall stabiliteit van de vrije bovenrand van het spant is met de hand gecontroleerd volgens NEN 6771 H.12.1.4.2b.
- Toetsing op vermoeiing is gedaan door een vermoeiingsbelasting uit verkeer op model A te zetten. Tevens zijn de resultaten van spanningen door eigen gewicht voor modellen B2 en C2 van elkaar afgetrokken. De totale vermoeiingsschade tengevolge van verkeer en openen/sluiten is volgens de beschadigingsregel van Palmgren-Miner met Excel berekend.



Ingenieursbureau Stendess N.V.

Contact Jurn De Vleeschauwer, Wim Dewilde
 Address Grote Baan 18
 9920 Lovendegem, Belgium

 Phone +32 9 370 71 25
 Email mail@stendess.com
 Website www.stendess.com



Ingenieursbureau Stendess N.V., a steel and concrete engineering company

The engineering firm Stendess was founded by an experienced team specialising in the study and design of steel constructions. From its establishment Stendess has made high quality and full service provision its top priority. Thanks to this 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.

Stendess can follow up on cross-border projects in accordance with most standards and codes: Eurocode, NBN, NEN, DIN, NF, AISC, British Standards and specific national codes.

Key activities

- Industrial buildings: steel factories, power plants, depots, etc,
- Other buildings: service buildings, concert halls, sport facilities, swimming pools, apartment buildings,
- Bridge constructions: arch bridges, cable –stayed bridges, suspension bridges, bascule bridges, swing bridges, orthotropic bridges, mixed steel-concrete bridges...
- Off-shore projects: lock gates, Roro, oil rigs...
- Industrial equipment: silos, cranes, crane ways, storage tanks...
- Erection engineering: longitudinal and transverse repositioning, skidding, lifting, bridge launching...

Locations of the constructions: Belgium, the Netherlands, France, Germany, United Kingdom, Spain, Sweden, Saudi Arabia, Greece, Singapore, Chile, Brazil, Cameroun, Russia, Thailand...

Short Description

Bicyclist and pedestrian bridge, Beernem

The bridge of this project is build to cross the canal Ghent-Ostend in an easy and safe way. It connects the station district of Beernem with the centre of the village.

This bridge is also a real surplus value, a touristic trump for the yacht-basin of the town.

The bridge is a cable stayed bridge with a mixed concrete-steel deck. The deck consists of a concrete slab which is supported by 4 longitudinal beams. These longitudinal beams have a common lower flange which is curved. The pylon is an A-shaped pylon. The legs of the pylon have an elliptical cross section of which the dimensions are variable along the height of the pylon.

Project Information

Owner: Beernem
Architect: AMS
General Contractor: Van Britsom & Verheye
Engineering Office: Ingenieursbureau Stendess N.V.

Construction Start: 2008
Construction End: 2008
Location: Beernem, Belgium



- Type: cable stayed concrete-steel bridge
- Location: Beernem, Belgium
- Total Steel weight: +/- 215 tons
- Total length: 98 m width: 4,5 m

The bicyclist and pedestrian bridge of Beernem is build to cross the canal Ghent-Ostend between Vaart-North and the Stationsstreet in an easy and safe way. It connects the station district with the centre of the village. The bridge is also a surplus value for the yacht-basin of Beernem. This connection is a touristic trump to expand the yacht.

The bridge can be described as a cable stayed bridge with a mixed concrete-steel deck. The deck consists of a concrete slab which is supported by 4 longitudinal beams. These longitudinal beams have a common lower flange which is curved. The pylon

is an A-shaped pylon. The legs of the pylon have an elliptical cross section of which the dimensions are variable along the height of the pylon.

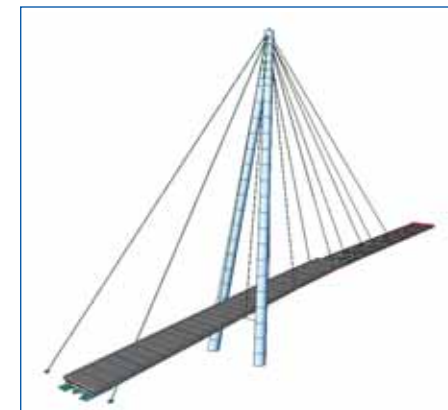
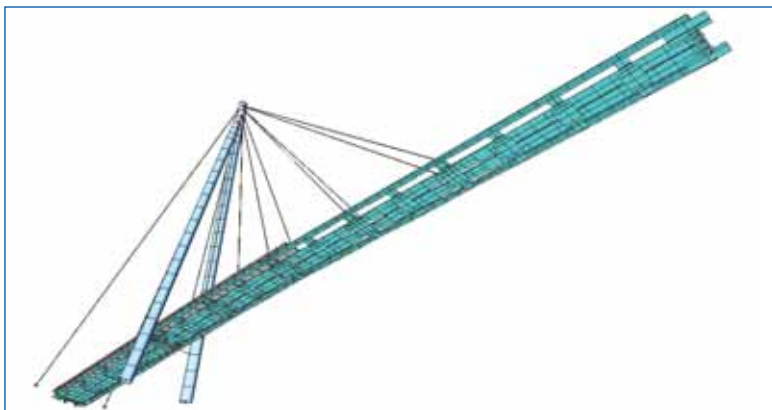
Use of ESA-Prima Win

Description of technical questions to be solved with ESA-Prima Win

Both, for the dimensioning of the bridge in the traffic situation and the erection engineering of the bridge, ESA-Prima Win was used.

From point of view engineering this project has several challenges.

First, there was the fact that the bridge deck was mixed concrete-steel. This implied a deck calculation in several stages with different stiffness factors and



the calculation of cracked-uncracked concrete.

The possibility of calculating mixed section and of the use of graphical section by ESA-Prima Win was a big advantage.

Second, there was the limitation of the reactions on the bridge end supports. Also here ESA-Prima Win proved its possibilities.

Third, there was the simulation of the realistic behaviour of the cables. The cables were simulated as classic bars, but with the E-modules of the tension bar material in relation to the inclination of the tension bars (this means they were considered as cables with a fictive E-modulus). Because the linear calculations resulted in compression in the tension bars a non linear calculation was needed.

Fourth, there was a second order calculation needed for the check of asymmetrical pylon based on a stability calculation.

Fifth, for the erection engineering the different construction stages had to be examined and a severe erection and pretensioning manual for the mounting of the cables was needed. This to achieve the theoretical form of the bridge deck.

Sixth, the dynamic behaviour of the bridge was to be checked.

Description of how our experience with ESA-Prima Win proved its completeness

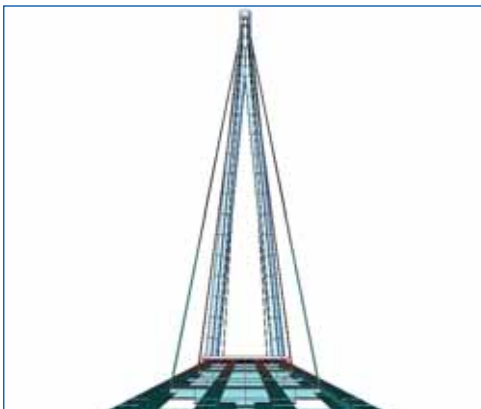
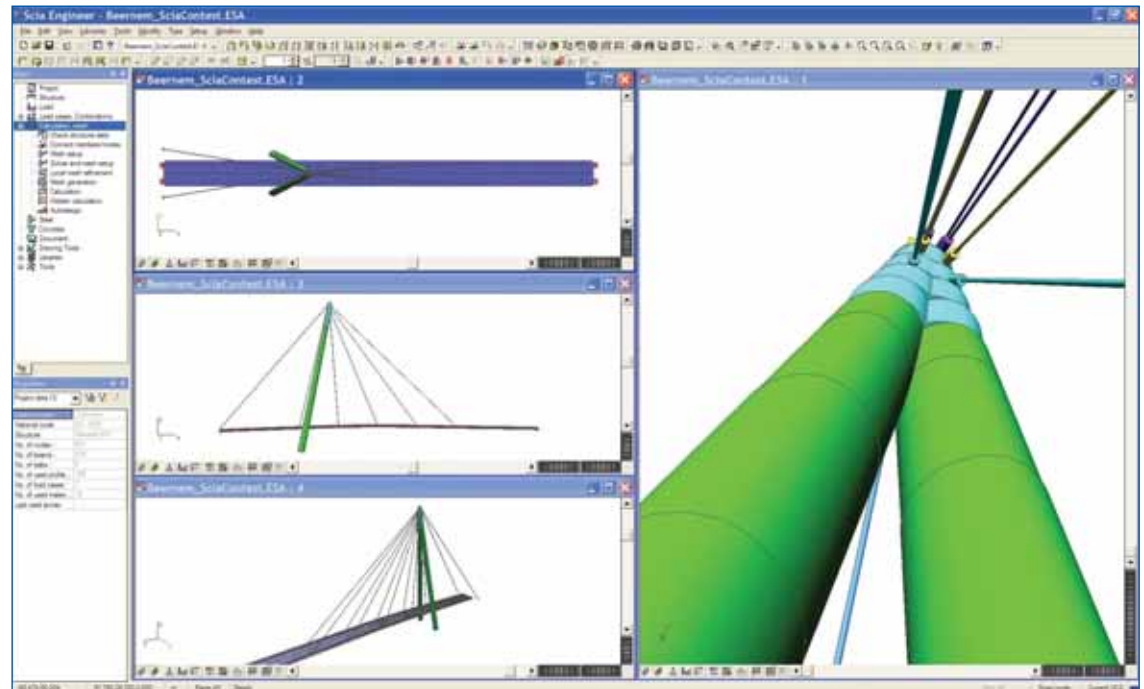
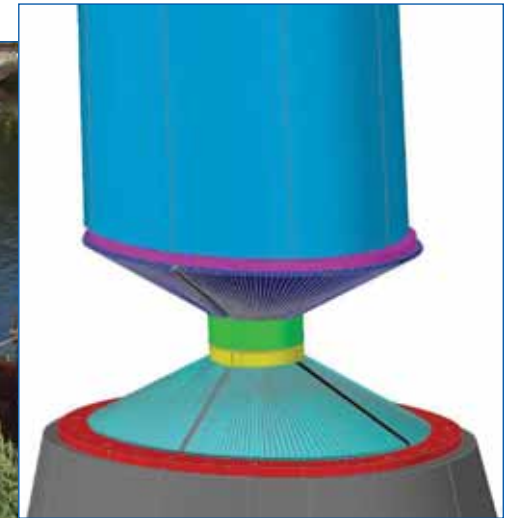
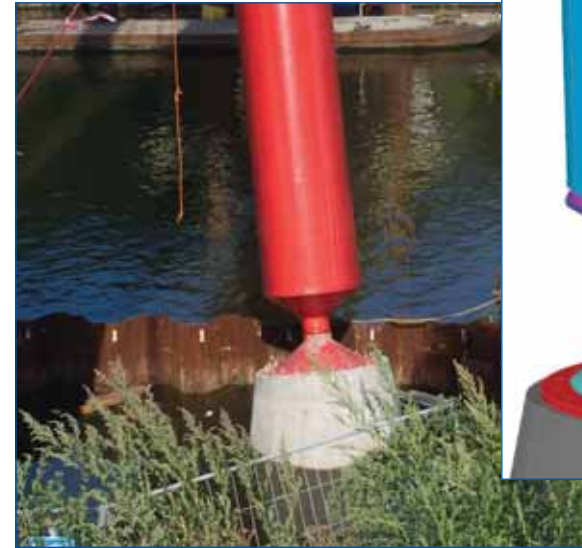
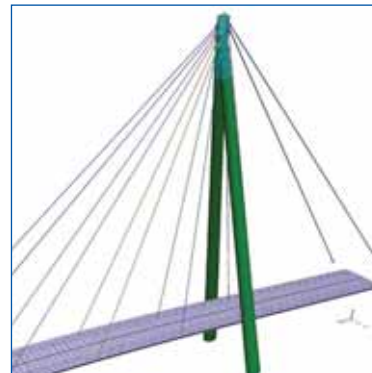
- Dimensioning a 3D structure consisting of different materials (steel, concrete).
- The possibility of using and combining the results of ESA-Prima Win in a flexible way.

- The possibility of calculating mixed concrete-steel sections.
- The possibility of calculating graphical sections.
- The possibility of using tension only elements for the modelling of the cables.
- Stability calculation and second order calculations.
- Checking the dynamic behaviour of the structure by calculating the eigenvalues of the structure.

This project proves the great diversity of ESA-Prima Win in checking the structure and the use of materials.

Used modules

- Base
- 3D frame
- Dynamics
- Steel code check (NEN)
- Stability
- Physical non linear conditions



Ingenieursbureau Stendess N.V.

Contact Jurn De Vleeschauwer
Address Grote Baan 18
 9920 Lovendegem, Belgium

Phone +32 9 370 71 25
Email mail@stendess.com
Website www.stendess.com



Ingenieursbureau Stendess N.V., a steel and concrete engineering company

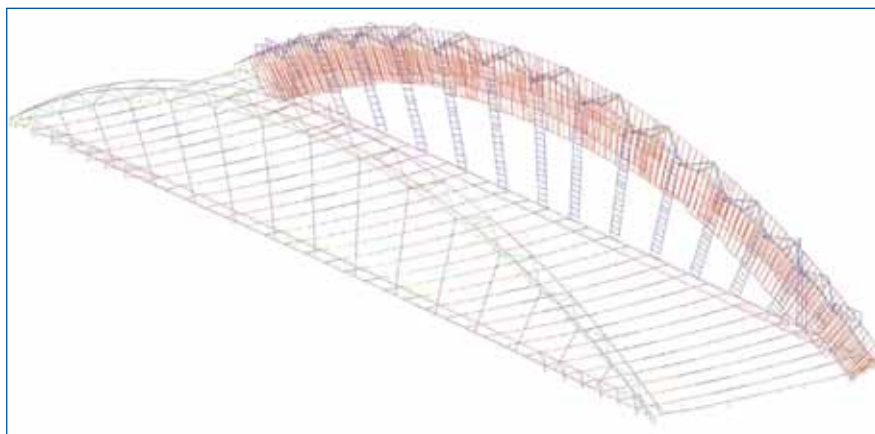
The engineering firm Stendess was founded by an experienced team specialising in the study and design of steel constructions. From its establishment Stendess has made high quality and full service provision its top priority. Thanks to this integral service, where the design of the metal superstructure 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.

Stendess can follow up on cross-border projects in accordance with most standards and codes: Eurocode, NBN, NEN, DIN, NF, AISC, British Standards and specific national codes.

Key activities

- Industrial buildings: steel factories, power plants, depots, etc,
- Other buildings: service buildings, concert halls, sport facilities, swimming pools, apartment buildings,
- Bridge constructions: arch bridges, cable –stayed bridges, suspension bridges, bascule bridges, swing bridges, orthotropic bridges, mixed steel-concrete bridges...
- Off-shore projects: lock gates, Roro, oil rigs...
- Industrial equipment: silos, cranes, crane ways, storage tanks...
- Erection engineering: longitudinal and transverse repositioning, skidding, lifting, bridge launching...

Locations of the constructions: Belgium, the Netherlands, France, Germany, United Kingdom, Spain, Sweden, Saudi Arabia, Greece, Singapore, Chile, Brazil, Cameroun, Russia, Thailand...



Bowstring Bridge of Bamberg, Germany

The city of Bamberg in Germany wanted to replace the old "Luitpoldbrücke" across the Main-Danube-Canal. This bridge is an important access to city centre. The old bridge has been removed and replaced by a "3-feld bridge" existing of 2 concrete approach spans (± 10.5 m) and a steel midspan of 80 m. The arches are build up with 3D-braced arches composed of arched tubes ($\varnothing 406, 4$). The bridge deck is hung up at the arches by a radially placed hanger ($\varnothing 100$). The construction consists of two main beams connected by I-shaped, in height changing, cross members. The mean beams consist of two above each other placed tubes ($\varnothing 406, 4$) connected with a central vertical plate. The node that connects the arches with the last cross member and the main beams is realized with cast steel in the form of a snail's shell.

Short Description

Project Information

Owner: City of Bamberg, Germany

Architect: Rieger + Brandt Planungsgesellschaft im Bauwesen

General Contractor: Max Bögl Stahl-und Anlagenbau & Co KG

Engineering Office: Ingenieursbureau Stendess N.V.

Construction Start: 2006

Construction End: 2006

Location: Bamberg, Germany



- Total steel weight: ± 735 tons
- Total length: 10.5 m – 80 m – 10.64 m Width: 19 m

About the project

The city of Bamberg in Germany wanted to rebuild the "Luitpoldbrücke" over the Main-Danube-Canal. This bridge is the access to city centre. The old bridge is removed and replaced by a "3-feld bridge" existing of 2 concrete approach spans (± 10.5 m) and a midspan of steel 80 m. The arches are build up with 3D-braced arches composed of arched tubes ($\varnothing 406, 4$). The bridge deck is hung up at the arches by a radially placed hanger ($\varnothing 100$).

The construction consists of two main beams connected by I-shaped, in height changing, cross members. The mean beams consist of two above each other placed tubes ($\varnothing 406, 4$) connected with a central vertical plate.

The node that connects the arches with the last cross member and the main beams is realized with cast steel in the form of a snail's shell.

For the erection by launching the piles of the old bridge are used and demolished afterwards.

Use of ESA-Prima Win

Description of technical questions to be solved with ESA-Prima Win

Both, for the camber and deformation calculation and the erection engineering of the bridge, ESA-Prima Win was used.

The complete 3D-model was put with bars and different building stages were set.

For the calculation in erection situation each bridge member was given a buckling factor based on the rules of EC3. The beam check was then made by EC3 Steel Check of ESA-Prima Win.

The buckling control of the arches was done in three ways. The first method was done with EC3-Steel Check of ESA-Prima Win. The second method was based on the calculation of the axial critical buckling force, which was compared by ESA-Prima Win with

Used software: ESA-Prima Win

the max. calculated axial force. The third method was done by using the stability check of ESA-Prima Win in which a sinusoidal pre-deformation was given for the arches.

Because the linear calculation resulted in compression in the tension bars between arch and deck, a non-linear calculation was needed.

In the calculation of this project the use of ESA-Prima Win was very intense and diverse:

- Non-linear calculation
- Stability control
- Building stages

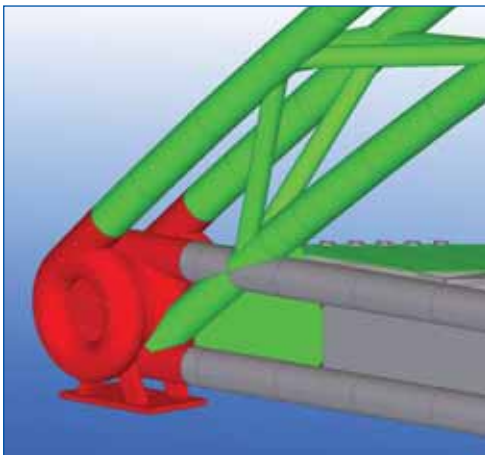
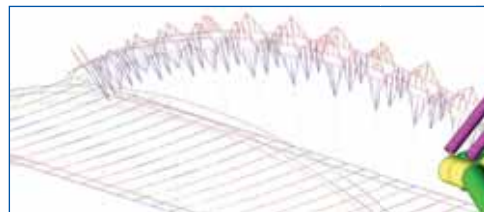
Description of how our experience with ESA-Prima Win proved its completeness

- Dimensioning a 3D structure.
- The possibility of using and combining the results of ESA-Prima Win in a flexible way.
- The possibility of calculating graphical sections.
- The possibility of using tension only elements for the modelling of the cables.

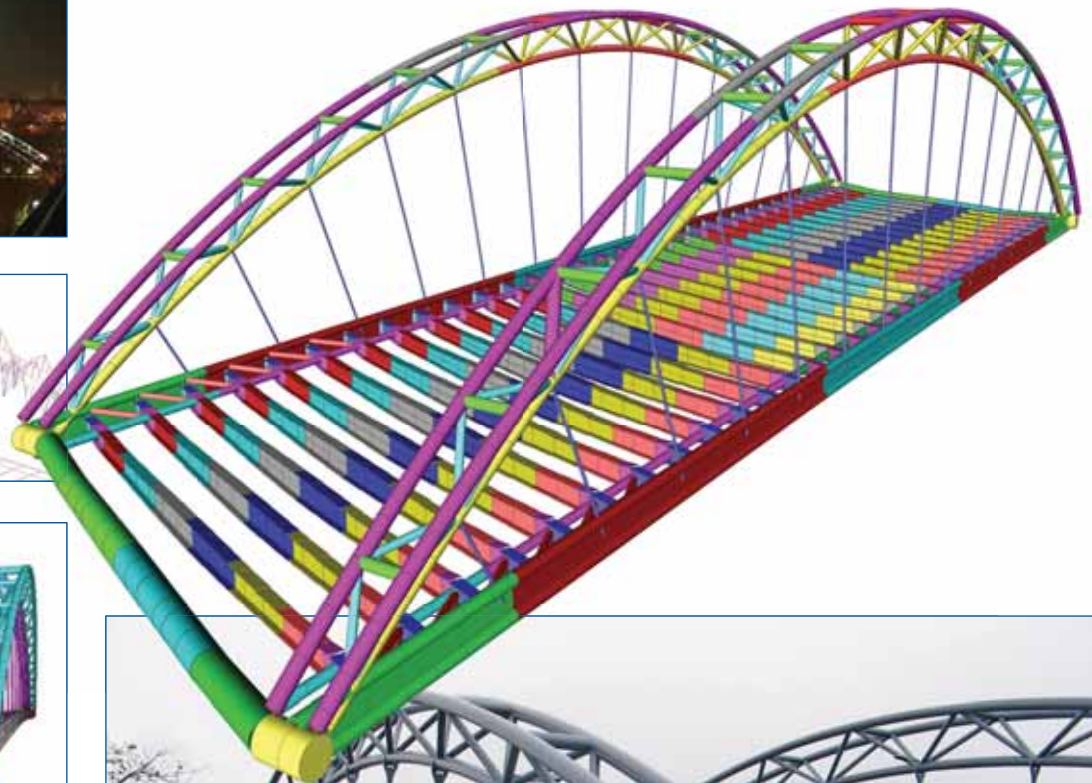
• Stability calculation and second order calculations.
This project proves the great diversity of ESA-Prima Win in checking the structure and the use of materials.

Used modules

- Base
- 3D frame
- Dynamics
- Steel code check (DIN)
- Stability
- Physical non linear conditions



Bowstring Bridge of Bamberg, Germany



Ingenieursbureau Stendess N.V.

Contact Jurn De Vleeschauwer, Pascal Vandewalle
 Address Grote Baan 18
 9920 Lovendegem, Belgium
 Phone +32 9 370 71 25
 Email mail@stendess.com
 Website www.stendess.com



Ingenieursbureau Stendess N.V., a steel and concrete engineering company

The engineering firm Stendess was founded by an experienced team specialising in the study and design of steel constructions. From its establishment Stendess has made high quality and full service provision its top priority. Thanks to this 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.

Stendess can follow up on cross-border projects in accordance with most standards and codes: Eurocode, NBN, NEN, DIN, NF, AISC, British Standards and specific national codes.

Key activities

- Industrial buildings: steel factories, power plants, depots, etc,
- Other buildings: service buildings, concert halls, sport facilities, swimming pools, apartment buildings,
- Bridge constructions: arch bridges, cable –stayed bridges, suspension bridges, bascule bridges, swing bridges, orthotropic bridges, mixed steel-concrete bridges...
- Off-shore projects: lock gates, Roro, oil rigs...
- Industrial equipment: silos, cranes, crane ways, storage tanks...
- Erection engineering: longitudinal and transverse repositioning, skidding, lifting, bridge launching...

Locations of the constructions: Belgium, the Netherlands, France, Germany, United Kingdom, Spain, Sweden, Saudi Arabia, Greece, Singapore, Chile, Brazil, Cameroun, Russia, Thailand...



Bowstring bridge with deck for cars and pedestrians

Short Description

The specified bridge crosses a fluvial stopping place of boats situated at Béthune. It is a prolongation of a pedestrian path to a dead arm of the canal Aire which serves as a docking station for boats and it leads to a regional road.

The construction consists of two main beams (box beams) which have spans of 23.04 m, 92 m and again 23.04 m. Between these two beams transverse elements are placed. Most of the weight of the bridge is held up by the suspension cables. On top of the main structural steel construction, premade concrete slabs are positioned to form the actual driving lanes. The calculations included the control of the bridge under service conditions as well as a calculated proposal of the different construction phases. Calculations were made according to EC 3 with special requirements in compliance with the French codes.

Project Information

Owner: Département du Pas de Calais, Direction des infrastructures et des transports
Architect: Direction des Infrastructures et des Transport, Service des ouvrages d'art
General Contractor: Aelterman Bvba and DG Construction

Engineering Office: Ingenieursbureau Stendess N.V.
Construction Start: 2007
Construction End: 2008
Location: Béthune, France



- Type: Bowstring bridge with concrete deck for cars and cyclist/pedestrian traffic
- Location: Béthune (Northern France)
- Total steel weight: +/-950 tons
- Total length: 23.04 m – 92 m – 23.04 m
- Width of concrete slab: 11.5 m
- Exploitation: 2 rows + multifunctional area's

the main longitudinal beams and the arches. These arches guarantee the stability of the bridge solicited by permanent as well as traffic loads.

On top of the main structural steel construction, premade concrete slabs are connected onto the transverse beams to form the actual driving lanes. The calculations included the control of the bridge under service conditions as well as a calculated proposal of the different construction phases. Calculations were made according to EC 3 with special requirements in compliance with the French codes.

About the project

The specified bridge has as goal to crossover a fluvial stopping place of boats situated at Béthune. (following the deviation RD 937)
 The bridge overtakes a pedestrian path (situated in the park of Loisne), a dead arm of the canal Aire which serves as a docking station for boats and a regional road.

The construction consists of two main beams (box beams) which have spans of 23.04 m (Land head-pylon), 92m (pylon-pylon) and again 23.04 m (pylon-land head).

Between these two beams transverse elements are placed, which are standard I-rolled sections, except for the box beams at the pylon support. Most of the weight of the bridge is held up by the suspension cables (made of Z-strings) which connect

Use of ESA-Prima Win

Description of the technical questions to be solved with ESA-Prima Win

Both, for the dimensioning of the bridge under traffic situation as well as the erection engineering of the bridge, ESA-Prima Win was used.

From a technical point of view the engineering part of this project had several challenges

First of all the implementation of the different solicitation models was done according to the French code in an efficient and modular way.

Used software: ESA-Prima Win

Bowstring bridge with deck for cars and pedestrians

Secondly, thanks to the module absences, the different collision scenarios could be checked whereby each time one suspension cable was taken out of consideration.

Even by the very start of the project the graphical sections module proved to be very useful for dimensioning the box beams of the arches and the main beams.

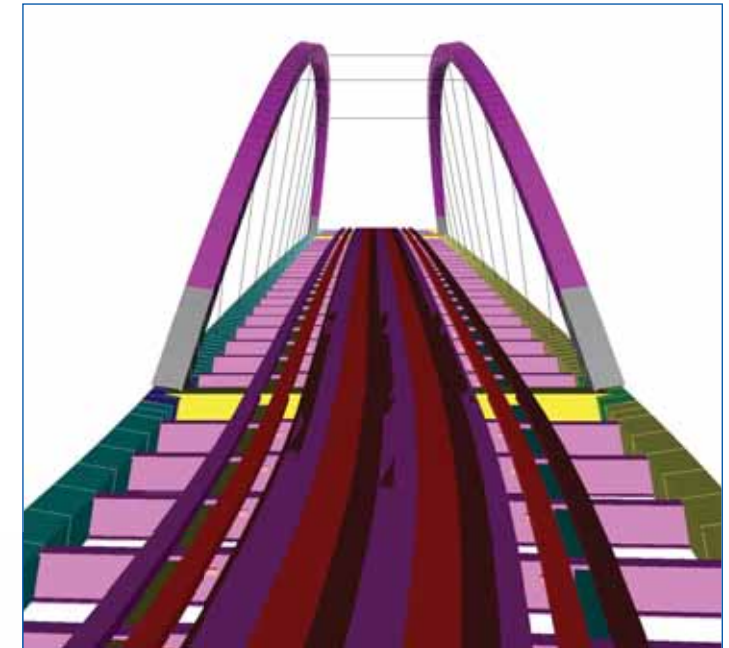
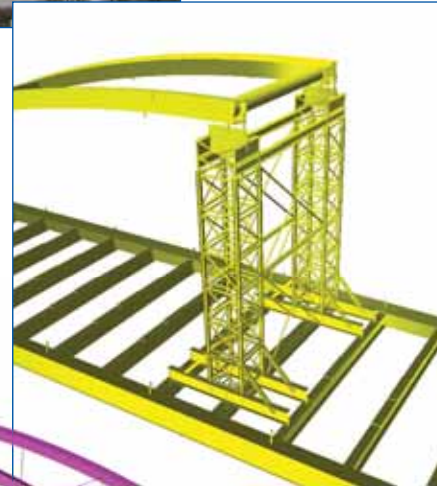
During the process of the construction engineering it was possible to model temporary structures and loading conditions. For example the hydraulic uplifting of the main beams was calibrated to be able to close the assembly-joints.

Further on due to the importance of the arch in the total bridge design a second order check of this element was performed with the non-linear second order settings.

Off course we must not forget once the different combinations were put in, a steel code check of the profiles could easily be made!

Used modules

- Norm control CM66
- Linear static 3D
- Tension members
- Only pressure support point
- Non linear test
- 2nd order calculation (arch)
- Graphical section
- Language: French



Ingenieursbureau Stendess N.V.

Contact: Jurn De Vleeschauwer
 Address: Grote Baan 18
 9920 Lovendegem, Belgium
 Phone: +32 9 370 71 25
 Email: mail@stendess.com
 Website: www.stendess.com



Ingenieursbureau Stendess N.V., a steel and concrete engineering company

The engineering firm Stendess was founded by an experienced team specialising in the study and design of steel constructions. From its establishment Stendess has made high quality and full service provision its top priority. Thanks to this 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.

Stendess can follow up on cross-border projects in accordance with most standards and codes: Eurocode, NBN, NEN, DIN, NF, AISC, British Standards and specific national codes.

Key activities

- Industrial buildings: steel factories, power plants, depots, etc,
- Other buildings: service buildings, concert halls, sport facilities, swimming pools, apartment buildings,
- Bridge constructions: arch bridges, cable –stayed bridges, suspension bridges, bascule bridges, swing bridges, orthotropic bridges, mixed steel-concrete bridges...
- Off-shore projects: lock gates, Roro, oil rigs...
- Industrial equipment: silos, cranes, crane ways, storage tanks...
- Erection engineering: longitudinal and transverse repositioning, skidding, lifting, bridge launching...

Locations of the constructions: Belgium, the Netherlands, France, Germany, United Kingdom, Spain, Sweden, Saudi Arabia, Greece, Singapore, Chile, Brazil, Cameroun, Russia, Thailand...

Short Description

Cable stayed bridge, Dilsen-Stokkem

The bridge of this project is built to cross over the Zuid-Willemsvaart between Dilsen and the new industrial zone of Lanklaar, the IQ-park. It can also be considered as the "missing link" in the renowned and busy bicycle route network of Limburg.

The 88 meter long bridge deck is supported by 2 x 8 cables which are connected to the top of an A-framed curved pylon. The curved pylon is 43 m high and has a width of 11,50 m at the base.

The stability of the pylon is guaranteed by 2 x 3 cables which are going backwards to a big concrete foundation.

The pylon and bridge were completely assembled in the workshop. Two pontoons have transported the two pieces to the site and were used for the erection. After the assembly of the pylon, bridge deck and cables, the concrete slab on the deck was finished.

Project Information

Owner: Dilsen-Stokkem

Architect: Arcadis Belgium

General Contractor: TV Superbeton
 Laeremans N.V. and Lemants N.V.

Engineering Office: Ingenieursbureau Stendess N.V.

Construction Start: 2007

Construction End: 2008

Location: Dilsen-Stokkem, Belgium



- Type: Cable stayed mixed concrete-steel bridge
- Location: Dilsen-Stokkem, Belgium
- Total steel weight: ± 340 tons
- Total length: 123,50 m span: 88 m Width: 5 m
 Height Pylon: 42,5 m

From an engineering point of view this project has several challenges.

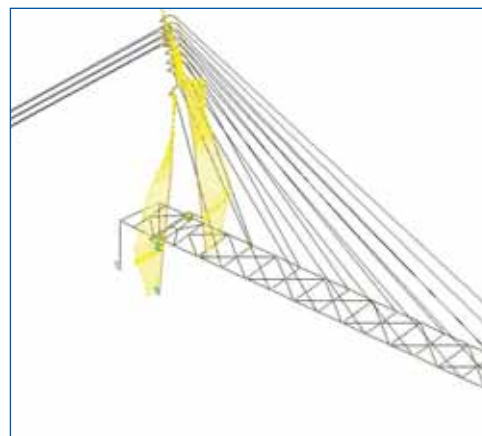
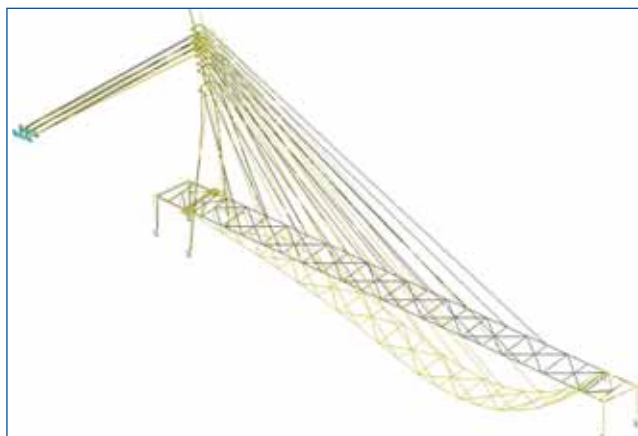
Firstly, there were the curved cross-sections of the main beams. The possibility of input and the use of the graphical section by ESA-Prima Win was a big advantage.

Secondly, there was the limitation of the reactions on the bridge end supports. Also here ESA-Prima Win proved its possibilities.

Thirdly, there was the simulation of the realistic behaviour of the cables. The cables were simulated

Description of technical questions to be solved with ESA-Prima Win

Both, for the dimensioning of the bridge in the traffic situation and the erection engineering of the bridge, ESA-Prima Win was used.



as classic bars, but with the E-modules of the tension bar material in relation to the inclination of the tension bars (this means they were considered as cables with a fictive E-modulus). Because the linear calculations resulted in compression in the tension bars a non linear calculation was needed.

Fourthly, there was a second order calculation needed for the check of the curved pylon based on a stability calculation.

Fifthly, engineering the different construction stages had to be examined for the erection and a severe erection manual for the mounting and the pretension of the cables was needed; this to achieve the theoretical form of the bridge deck.

And finally, the dynamic behaviour of the bridge had to be checked.

Description of how our experience with ESA-Prima Win proved its completeness

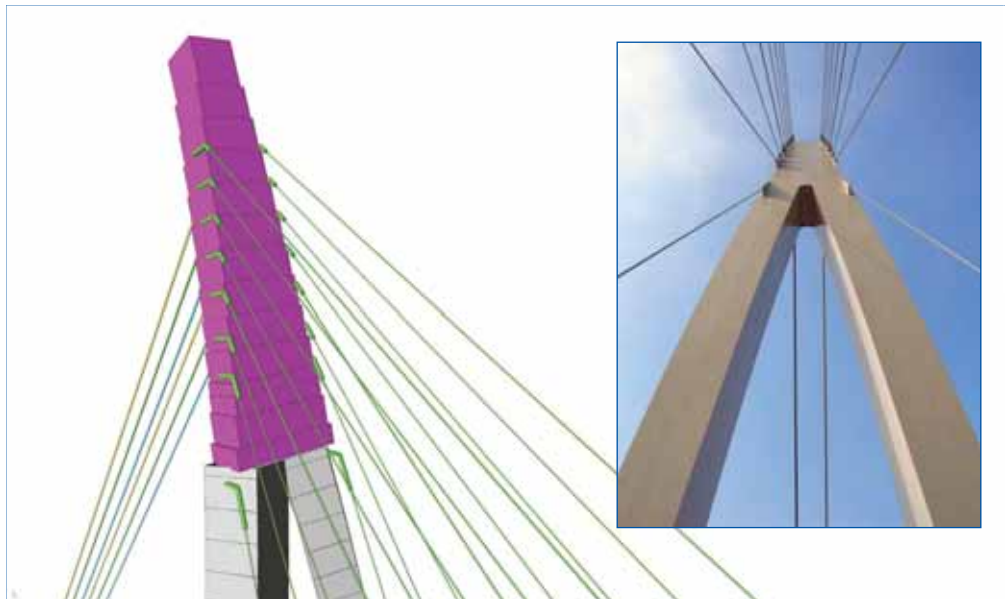
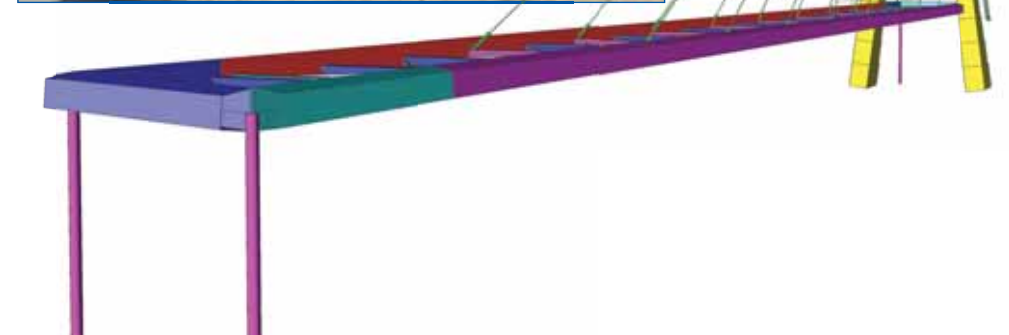
- Dimensioning a 3D structure consisting of different materials (steel, concrete).
- The possibility of using and combining the results of ESA-Prima Win in a flexible way.
- The possibility of calculating graphical sections.
- The possibility of using tension only elements for the modelling of the cables.

- Stability calculation and second order calculations.
- Checking the dynamic behaviour of the structure by calculating the Eigen values of the structure.

This project proves the great diversity of ESA-Prima Win in checking the structure and the use of materials.

Used modules

- Base
- 3D frame
- Dynamics
- Steel code check (EC)
- Stability
- Physical non linear conditions



Cable stayed bridge, Dilsen-Stokkem

Ingenieursbureau Stendess N.V.

Contact Jurn De Vleeschauwer, Wim Dewilde
Address Grote Baan 18
9920 Lovendegem, Belgium

Phone +32 9 370 71 25
Email mail@stendess.com
Website www.stendess.com



Ingenieursbureau Stendess N.V., a steel and concrete engineering company

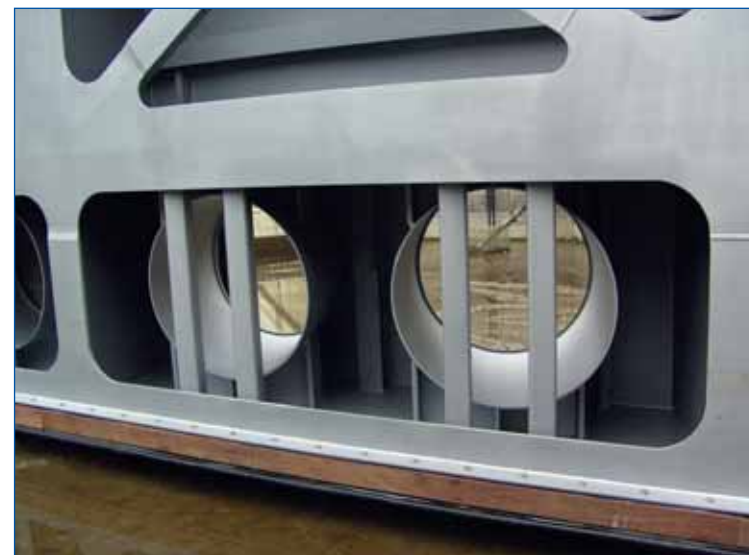
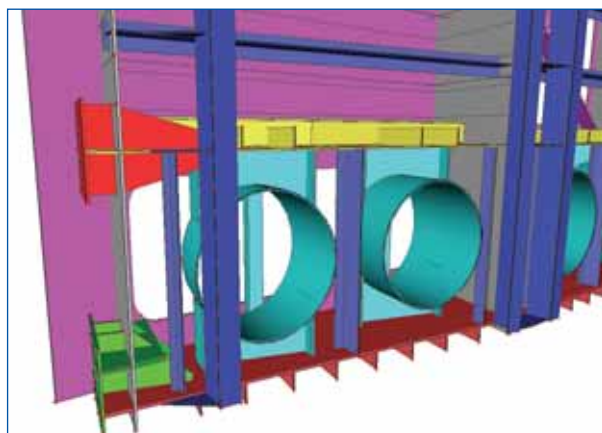
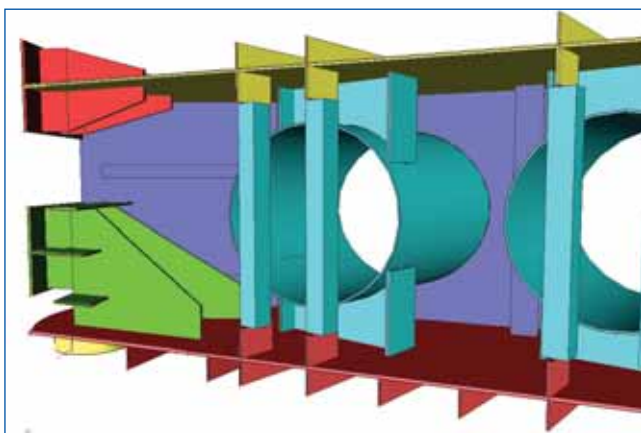
The engineering firm Stendess was founded by an experienced team specialising in the study and design of steel constructions. From its establishment Stendess has made high quality and full service provision its top priority. Thanks to this integral service, where the design of the metal superstructure 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.

Stendess can follow up on cross-border projects in accordance with most standards and codes: Eurocode, NBN, NEN, DIN, NF, AISC, British Standards and specific national codes.

Key activities

- Industrial buildings: steel factories, power plants, depots, etc,
- Other buildings: service buildings, concert halls, sport facilities, swimming pools, apartment buildings,
- Bridge constructions: arch bridges, cable –stayed bridges, suspension bridges, bascule bridges, swing bridges, orthotropic bridges, mixed steel-concrete bridges...
- Off-shore projects: lock gates, Roro, oil rigs...
- Industrial equipment: silos, cranes, crane ways, storage tanks...
- Erection engineering: longitudinal and transverse repositioning, skidding, lifting, bridge launching...

Locations of the constructions: Belgium, the Netherlands, France, Germany, United Kingdom, Spain, Sweden, Saudi Arabia, Greece, Singapore, Chile, Brazil, Cameroun, Russia, Thailand...



Short Description

Lock complex, Evergem

The lock complex of Evergem (situated near Ghent) lies on one of the busiest water routes in Belgium. To maintain a safe and reliable passage of cargo- and leisure-ships on this important junction, the government decided to update the complex. As a part of this update, 12 lock gates had to be replaced.

Project Information

Owner: Waterwegen en Zeekanaal N.V.
Architect: AMS
General Contractor: Aelterman, Belgium
Engineering Office: Ingenieursbureau Stendess N.V.

Construction Start: 2007
Construction End: 2008
Location: Evergem (Ghent), Belgium



- Total steel weight: 12 lock gates weighing $\pm$ 62 tons, amounting to 744 tons in total
- Dimensions: Height: $\pm$ 8, 40 m
- Overall length: $\pm$ 14, 10 m (total width when closed $\pm$ 25 m)
- Thickness: $\pm$ 1, 50 m

Description of the project

The lock complex of Evergem (situated near Ghent) lies on one of the most heavily trafficked routes in Belgium. To maintain a safe and reliable passage of cargo- and leisure-ships on this important junction, the government decided to update the complex. As a part of this update, 12 lock gates had to be replaced.

Use of Scia Engineer

Description of technical questions to be solved with Scia Engineer

The lock gate has a quite complex geometry: the presence of tubes cutting through an inclined plate, the global section is slanted instead of a rectangular box; the presence of an airbox... This complexity necessitated the use of a detailed FEM-model to simulate the real behaviour with all its intricacies. An independent, simplified beam-model was used to double-check the veracity of both models.

The low ratio between height, width and rise disrupted the normal working, in a three-hinged arch. Due to tension occurring on the concrete abutments,

a non-linear calculation was performed to simulate the real behaviour of the gate.

Description of our experience with Scia Engineer with the realisation of this project

The ease of use of Scia Engineer.

Scia Engineer proved its worth when creating a FEM-model of significant complexity. Due to the instinctive and extensive possibilities when creating, manipulating and altering such a model, Scia Engineer really made a difference.

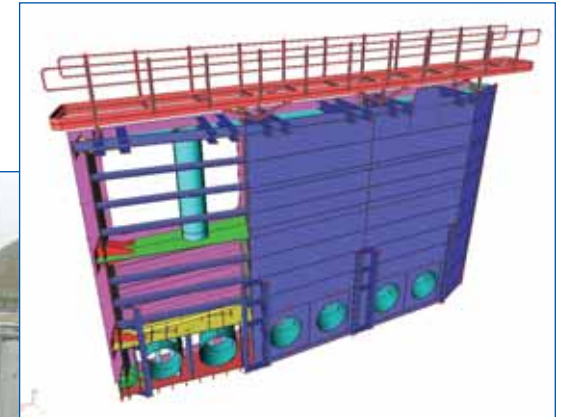
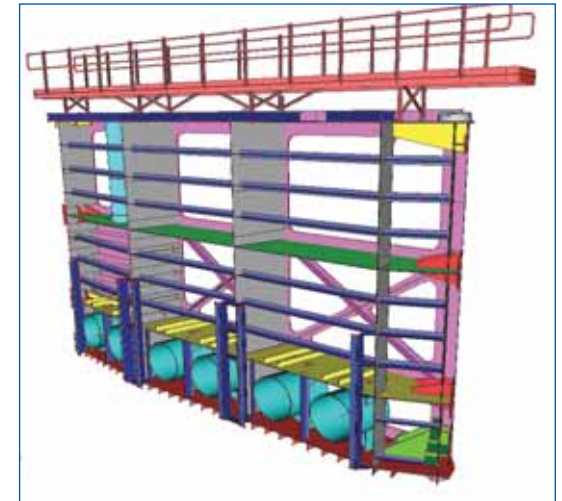
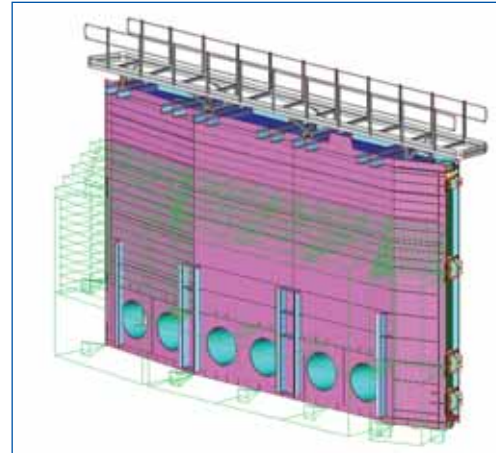
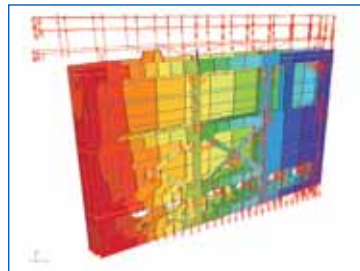
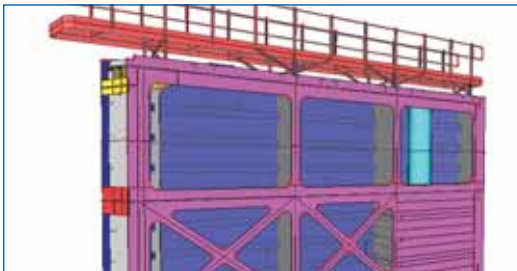
The different modes of visualisation (layers, saved selections containing shells and bars, cutting box...) really made it possible to keep an oversight and select the most appropriate visualisation in function of what the engineer wanted.

The new document-functionalities (in comparison with prior software) also made the compilation of the results significantly easier. The possibility of copying and altering a given resulttable was used to great effect, just as the possibility to generate data in function of a collection instead of manually creating the data for every element within the collection.

These advantages greatly outweighed the somewhat more cumbersome resultquerying (time needed to visualise results).

Used modules

- Base
- Shells
- Non linear calculations



Ingenieursburo IOB

Contact Andre Lankhof
Address Struytse hoeck 1
3224 HA Hellevoetsluis, Netherlands

Phone +31 181318122
Email a.lankhof@iob.nl
Website www.iob.nl



Ingenieursburo IOB met vestigingen in Hellevoetsluis en Dordrecht, heeft als visie 'Engineering op hoog niveau'. Met haar 160 medewerkers is IOB hét Ingenieursbureau voor bouwkunde en civiele techniek.

Voor bouwkosten- en installatieadvies heeft Ingenieursburo IOB zelfstandige en onafhankelijke adviesbureaus. De bouwkundige specialisaties van Ingenieursburo IOB richten zich op detaillering, plantoetsing, wet- en regelgeving, beheer en onderhoud, terwijl de constructieve specialisaties zich richten op onder andere hoogbouw en parkeer garages. Het bureau is opgericht op 1 juli 1979 en is gestart vanuit haar vestiging in Hellevoetsluis.

Ingenieursburo IOB onderscheidt zich van de traditionele bouwteams, omdat het alle disciplines onder één dak heeft. De bouwkundigen en constructeurs worden ondersteund door de bestekschrijvers en adviseurs op het gebied van bouwrecht, wet- en regelgeving en brandpreventie en het installatie- en bouwkostenadviesbureau van IOB. De medewerkers worden regelmatig voorzien van terugkoppeling uit de praktijk door eigen opzichters en bouwbegeleiders. De technische uitwerking heeft zowel betrekking op complete nieuwbouw, als op de renovatie of herontwikkeling van bestaande gebouwen. Ingenieursburo IOB vervaardigt sinds jaren voor vastgoedbeheerders, gemeenten, woningbouwverenigingen en multinationals meerjaren onderhoudsplannen. Hieraan voorafgaand verricht Ingenieursburo IOB inspecties die kunnen variëren van quickscans tot inspecties op basis van de Rijksgebouwendienst conditiemeting.

Bouwkostenadvies IOB bv budgetteert, begroot, bewaakt en optimaliseert bouwkosten en kwaliteit zowel proces- als fasegericht. Door het gecombineerd kunnen aanbieden van bouwkostenadviezen in de vorm van haalbaarheidsstudies, VO/DO elementenramingen, aannemersbegrotingen en bestekken zijn kosten en kwaliteit in één hand gewaarborgd.

Installatieadvies IOB bv verzorgt innovatieve, economische en pragmatische ontwerpen voor alle gebouwgebonden installaties. Naast ontwerpen behoren bestekken, begrotingen, opnames en beoordeling van panden op het gebied van gebouwgebonden installaties tot de te leveren diensten.

Ingenieursburo IOB is een organisatie met directe, korte lijnen. Elk nieuw project krijgt een projectmanager toegewezen die de volledige verantwoordelijkheid draagt en het contact met de opdrachtgever onderhoudt.



Geothermic power station, Den Haag

Short Description

This project is the first geothermic project of this size in the Netherlands. Heat from the inside of the earth (ca. 2km) is pumped up and distributed to several districts and companies.

The main structure of the geothermic power station is a steel structure with a concrete floor, a foundation and a basement. The station is constructed on concrete piles.

The structure is executed as a 3D model in Scia Engineer. The steel-structure and the concrete foundation with basement are placed into one model. Adjusting the model during the design stage and possible changes during construction have been and will be easy to make. The results and conclusions of several changes where checked and gave the opportunity to optimize the construction.

Project Information

Owner: Aardwarmte Den Haag vof
Architect: Splinter Architecten BV
General Contractor: n/a
Engineering Office: Ingenieursburo IOB

Construction Start: 01/06/2008
Construction End: 31/08/2010
Location: Den Haag, Netherlands



Algemene projectbeschrijving

Het project 'Aardwarmte Den Haag Zuidwest' omvat de aanleg van een geothermiesysteem waarmee aardwarmte van ca. 70°C uit de diepe ondergrond (ca. 2 km) opgepompt wordt. Een warmtedistributiesysteem, vergelijkbaar met het huidige Nederlands stadsverwarmingssysteem, transporteert die warmte naar verschillende wijken in Den Haag Zuidwest. De warmtelevering van het systeem bedraagt in totaal ca. 4.000 woning equivalenten. Het project is het eerste geothermieproject van deze aard en omvang in Nederland en draagt sterk bij tot de reductie van de CO2-emissie.

Voor een financieel optimaal resultaat en voor een maximaal 'leereffect' hebben alle partijen in

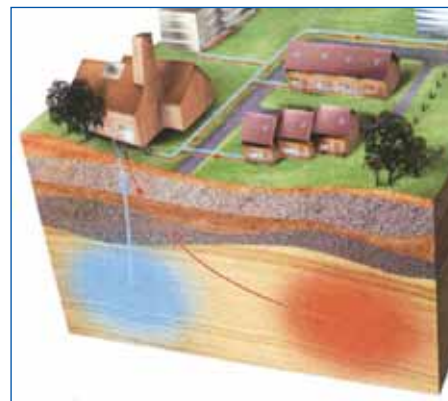
de keten 'van bron naar klant', te weten de Gemeente Den Haag, E.ON, Eneco en de drie woningcorporaties HaagWonen, Staedion en Vestia, zich voor gelijkaardige deelname in het op te richten warmteleveringsbedrijf verenigd. Dit samenwerkingsverband kreeg als officiële naam 'Aardwarmte Den Haag vof'. Het architectonisch ontwerp van de geothermiecentrale (aardwarmtecentrale) is gemaakt door Splinter architecten BV uit Den Haag. In de centrale wordt de geothermische warmte uitgewisseld met het warmtedistributienet en verder verdeeld naar de woningen. Ingenieursburo IOB (iob.nl) uit Hellevoetsluis is als hoofdconstructeur verantwoordelijk voor de constructieve vormgeving van deze geothermiecentrale.

Technische projectbeschrijving

Het bebouwde terrein van de aardwarmte centrale behelst een oppervlakte van ca. 800 m². Naast een transformatorput van 1.4 m diep en een oppervlak van ca 50 m² komt er een entresolvloer met een oppervlak van 60 m². Deze entresol komt op kalkzandsteen te liggen.

Het constructief ontwerp is in overleg met de opdrachtgever en de architect bepaald. Belangrijke zaken die in grote mate het constructieve ontwerp hebben bepaald zijn:

- De architectonische vorm van het gebouw



Used software: Scia Engineer

- De functionele (flexibele) indeling van het gebouw
- Een ontwerp passend bij de milieu-aspecten van het project.

Een belangrijk uitgangspunt in het (constructieve) ontwerp is de flexibiliteit van de ketel- en pompruimte. De flexibiliteit schuilt in de grote open ruimte, zowel in horizontale als in verticale zin. Daarnaast wordt de vloer zodanig ontworpen dat deze vrijwel equipment-onafhankelijk is.

Hoofdropzet constructie

De hoofd draagconstructie bestaat uit een stalen frame. Deze staalconstructie staat op een betonvloer met randbalken. De betonvloer is gefundeerd op palen. Omwille van een bestaande kelder die deels onder het gebouw ligt, zal een aantal palen door de oude constructie heen worden geboord.

Stabiliteit

De stabiliteit wordt ontleend aan stabiliteitsverbanden in de gevels. Daar waar gevels demontabel moeten zijn ten behoeve van vernieuwing van apparatuur, zal daar in de stabiliteitsberekening rekening mee gehouden worden. Met de toepassing van een eindige elementen methode in 3D kan de constructie geheel in lijn met de filosofie van het project efficiënt gedimensioneerd worden. Overdimensionering van de constructie opdat tijdens de werkzaamheden één gevelvlak tegelijkertijd geopend kan worden, is hiermee tot een minimum beperkt.

Technische gegevens Scia Engineer

- Versie: 8.1.50
- Aantal knopen: 200
- Aantal staven: 232
- Aantal platen: 8
- Aantal belastinggevallen: 11
- Materialen: 2
- Functionaliteit: (Niet) lineair, Fysisch niet lineair voor gewapend beton, staal

Toepassing Scia Engineer

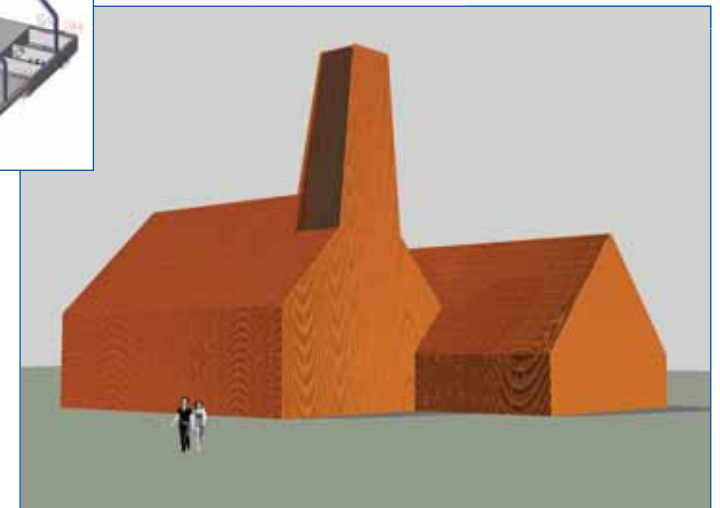
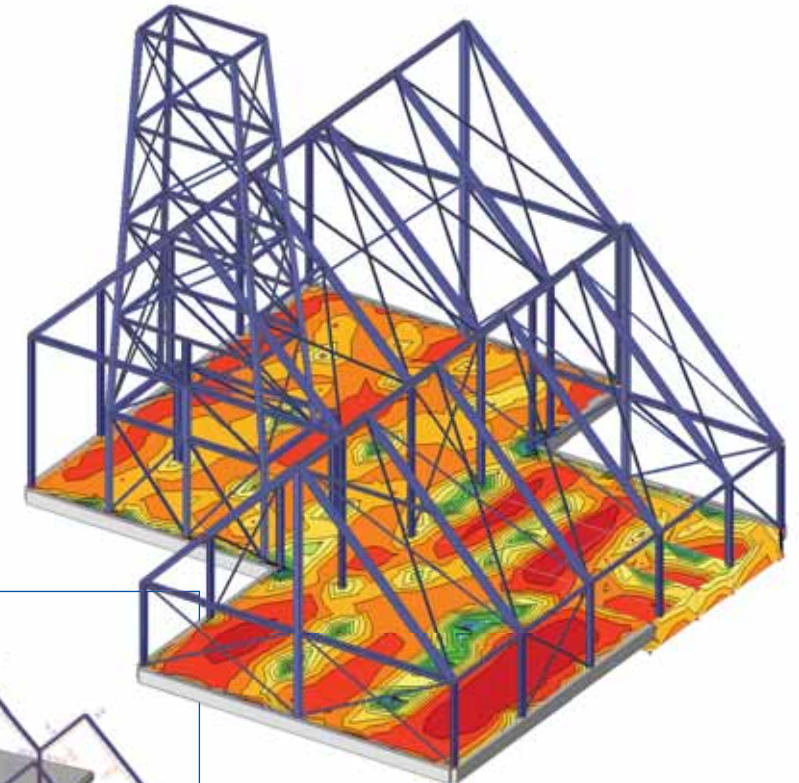
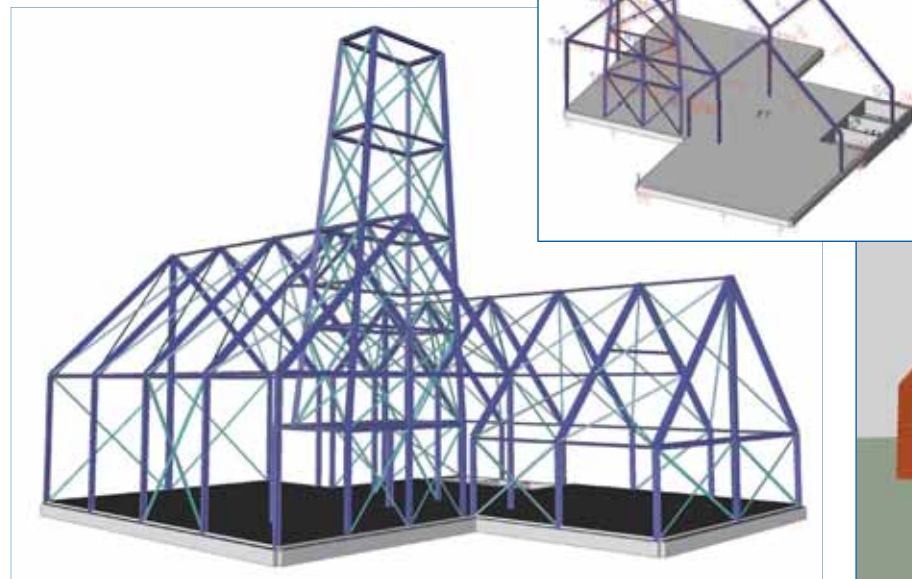
Vanaf het VO is het gebouw volledig 3D ingevoerd in Scia Engineer hetgeen als grote voordeel had dat alle aanpassingen en wijzigingen snel konden worden verwerkt. Mogelijke aanpassingen welke in de

uitvoeringsfase naar voren komen, bijvoorbeeld t.g.v. van de bestaande kelderconstructie, kunnen ook dan snel en adequaat verwerkt worden. Gevolgen voor de palen, fundering en/of de staalconstructie worden dan goed zichtbaar. Tijdvertraging in de uitvoeringsfase kan hierdoor tot een minimum beperkt worden.

Bij dit soort innovatieve projecten zijn wijzigingen in het ontwikkelingstraject eerder regel dan uitzondering. Dit stelt niet alleen hoge eisen aan de leden van het ontwikkelingsteam maar ook aan het constructieve ontwerp en de wijze waarop dit ontwerp uitgewerkt wordt. Na het definitieve ontwerp zal het project steeds gedetailleerder worden uitgewerkt. Voor deze faseverdeling wordt ook de Scia Engineer technologie toegepast. In eerste instantie is een hoofdberekening voor de bepaling van de krachtsafdracht en de dimensionering van de staalprofielen opgezet. In de latere fasen worden onderdelen, zoals vloeren, balken en kolommen, nader gedetailleerd.

Daarnaast gaf het drie dimensionaal model duidelijkheid naar de opdrachtgever en de architect over hoe de constructie er uit zal komen te zien.

We zijn als IOB trots om aan een dergelijke vooruitstrevend project te kunnen deelnemen waarbij het milieu in belangrijke mate wordt ontzien. "Engineering op hoog en groen niveau".



IOA

Contact Philippe Le Bouquin
 Address Les Pléiades - Park Nord
 74370 Metz Tassy, France
 Phone +33 450 27 10 85
 Email siegesocial@ioa.fr
 Website www.ioa.fr



IOA qui fête cette année ses 20 ans est une PME reconnue, forte de ses trois agences en métropole et ses filiales à l'outre-mer.

Son activité initiale de bureau d'études ouvrage d'art, très orientée en structure métallique, s'est élargie aux études génie civil qui atteignent une place importante de l'ordre de 50% de l'activité. Aujourd'hui, l'équipe IOA est pluridisciplinaire. Elle regroupe plus de 35 personnes aux diverses compétences, lui permettant de s'impliquer dans de nombreux domaines.

Les compétences sont les suivantes

- Ingénieurs, Calculateurs, Projeteurs, Dessinateurs
- Ingénieurs soudeurs, Techniciens COFREND II
- Inspecteurs ACQPA/FROSIO, Inspecteurs ACFM
- Techniciens métrologie, Techniciens topographes
- Techniciens de chantier

Elles se regroupent selon quatre métiers

- Maîtrise d'œuvre complète ou assistance technique au Maître d'œuvre
- Assistance Maîtrise d'Ouvrage (assistance technique en phase de conception et de réalisation)

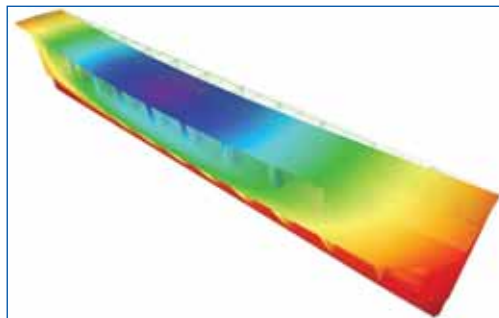
- Laboratoire/Expertise
- Bureau d'Etudes

Domaines d'activité

- Ouvrages d'art (ponts routes et rails, passerelles, ponts mobiles, ouvrages maritimes ou fluviaux, soutènements, tunnels, pare-avalanches et ouvrages de protection...)
- Ouvrages hydrauliques (Stations d'épuration, Stations de pompage, Réservoirs...)
- Bâtiments industriels
- Edifices publics (gare, spectacle, sport, piscine...)
- Infrastructures et outillages portuaires.
- Equipements de montagne
- Structures métalliques (éléments de signalisation, pylônes...)

Moyens

- Bureaux d'études de structures spéciales
- Laboratoire avec personnels certifiés IWT COFREND II et ACQPA/FROSIO
- Coordonnateur sécurité et protection de la santé niveau 1
- Personnels habilités aux travaux en hauteur



Short Description

Ship's door on shipyard of Ciotat

This project regards the study of the impact of corrosion on a ship's door, a steel St52 structure, at the shipbuilding wharf of Ciotat (built in 1968). IOA realized the entire modelling in shells and beams by means of Scia Engineer all with the purpose to evaluate the corrosion incidence on the functioning of the structure. The applied loads are the own weight and the hydrostatic pression. The support lines take account of the stiffness of the concrete and wood. The calculated deformations with the nominal thicknesses correspond with the obtained measures. The calculated average nominal constraint in the principal sections is 100MPa. The study shows that the disorders due to the corrosion do not yet have an incidence on the structure and as a consequence the door can still be repaired.

Project Information

Owner: SEMIDEP (ex Chantiels navals de la Ciotat)
Architect: n/a
General Contractor: Provence Industrie
Engineering Office: MAN

Construction Start: 1967
Construction End: 1968
Location: La Ciotat, France



Le bateau-porte des chantiers navals de La Ciotat permet la mise à sec de la forme de radoub afin d'effectuer des opérations de maintenance et réparation de navires de taille moyenne.

Ce bateau-porte à ossature métallique qui mesure 62m de long pour une hauteur de 12m et une largeur de 7m pèse 456 tonnes a été construit en 1968. Il est composé horizontalement d'un platelage circulaire en partie supérieure, d'une poutre caisson principale située à mi-hauteur faisant office de ballasts d'immersion et complétée aux extrémités en partie supérieure par des cellules d'équilibrage et d'une poutre de seuil en partie basse. Verticalement une paroi étanche longitudinale sépare les deux cotés, et 9 couples transversaux raidissent l'ensemble. La structure métallique s'appuie sur le génie civil constitué d'un seuil en partie basse et des murs latéraux. La flottaison du bateau-porte s'effectue par injection d'air comprimé dans les ballasts, celui-ci chassant l'eau initialement contenue par des orifices aménagés dans le bas des caissons. Lors de la mise à sec de la forme, l'eau contenue dans les caissons s'écoule par gravité. La stabilité est complétée par 60 tonnes de lest disposées sur la poutre de seuil.

Aujourd'hui, le bateau porte présente des nombreuses zones de corrosion et son état nécessite une réhabilitation pour assurer la pérennité de sa structure et sa manœuvrabilité. Par ailleurs, le dossier

d'archive ne comprend pas de notes de calculs mais uniquement les plans d'exécution (établis en 1967 par la société MAN). De ce fait les contraintes et déformations de la structure dans son état initial ne sont pas connues.

Afin d'assister le maître d'ouvrage dans le choix des travaux à entreprendre, IOA, dans le cadre d'une mission d'expertise de l'installation, a proposé une modélisation du bateau porte soumis à la poussée hydrostatique avec 3 objectifs :

1. Calculer les déformations théoriques et les comparer avec un relevé géométrique,
2. Evaluer le taux de contrainte initial et l'incidence des dégradations dues à la corrosion,
3. Définir les zones à réparer et la méthode.

Le bateau-porte a donc été modélisé en position de « porte fermée » à l'aide du logiciel Scia Engineer, avec modèle 3D coques et barres. La principale difficulté de la modélisation résidait dans le grand nombre d'éléments du modèle pour rester fidèle à la réalité : près de 2200 plaques et 900 barres. Sa réalisation a été grandement facilitée par l'importation de blocs réalisés séparément. Le fait de pouvoir travailler par calques a également permis d'isoler plus facilement les éléments pour l'application des charges et l'édition des résultats.

Les appuis ont été modélisés par des appuis linéiques élastiques après calcul des raideurs des

Used software: Scia Engineer

parois de la cale sèche et des appuis en bois du bateau-porte. Une deuxième difficulté est apparue car il a fallu faire des calculs itératifs pour désactiver certains appuis en fonction du rapport des réactions dans les différentes directions et du coefficient de frottement du bois sur le béton.

On a appliqué au modèle une combinaison unique de deux cas de charges : le poids et la poussée de l'eau sur le bateau-porte. Pour ce dernier, il a d'abord fallu définir les différences de pression entre les zones et modifier la masse volumique des éléments immergés.

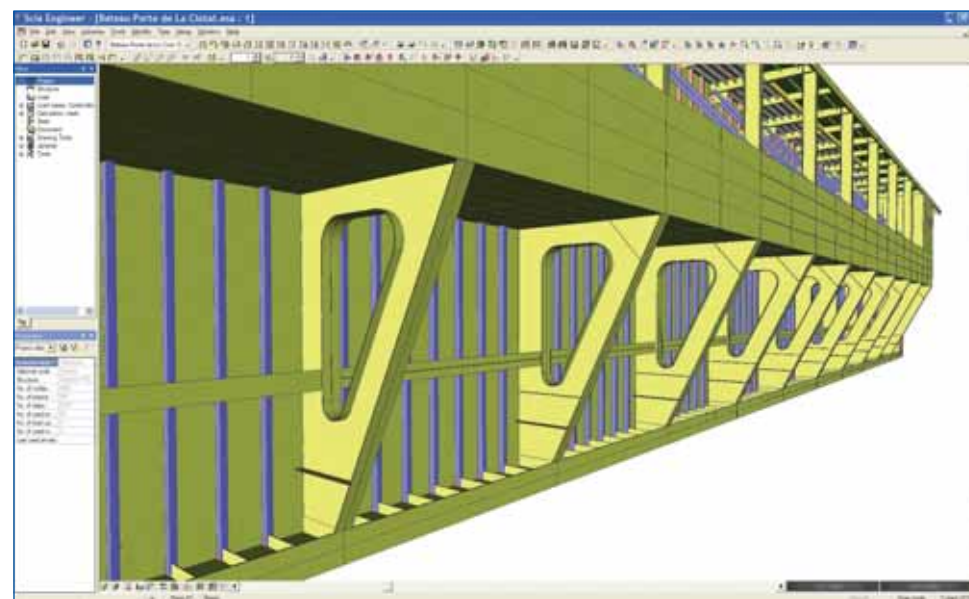
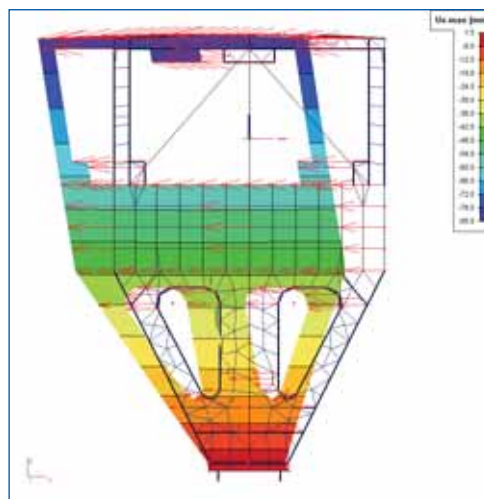
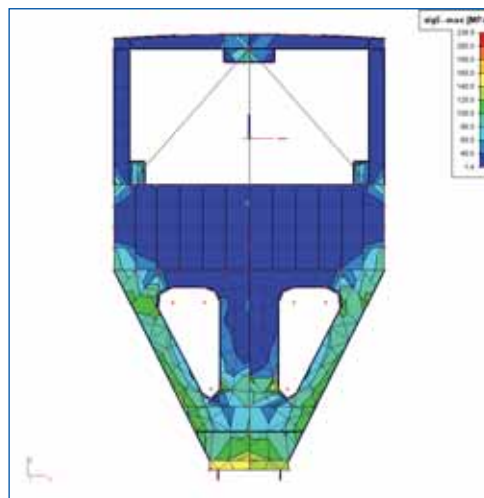
Après ces différents réglages du modèle, nous avons pu calculer les déformations, efforts et contraintes dans la structure considérée neuve.

Les déformations horizontales mesurées sur site par rapport à l'axe longitudinal correspondent assez bien aux valeurs calculées tout en restant inférieures en moyenne. Les dégradations dues à la corrosion n'affectent pas le comportement de l'ouvrage de manière significative.

Les contraintes nominales calculées dans les sections principales sont relativement faibles : de l'ordre de 100 MPa pour un acier de nuance St52, équivalent au S355 actuel. Or la poutre formée par les caissons présente peu de perte d'épaisseur au niveau de ses semelles, et la section des tôles situées dans un plan perpendiculaire qui reprend l'effort tranchant est très importante même si elle est très corrodée localement (quelques perforations en face supérieure des caissons). Cela explique pourquoi certains désordres, qui paraissent impressionnants (perforation des l'âme des montants par exemple), n'ont pas encore de

conséquences. L'étude a permis de confirmer que la structure était réparable moyennant le changement des éléments les plus corrodés.

Il avait été envisagé d'effectuer les réparations en laissant le bateau-porte en position pour limiter la durée d'immobilisation de la forme. Aussi, nous avons étudié ces cas en supprimant successivement un montant et la tôle supérieure des caissons. Bien que les déformations cumulées obtenues soient inférieures à 30mm, cette éventualité ne sera pas retenue pour privilégier la qualité des travaux.



Mott MacDonald s.r.o.

Contact Marek Foglar, Eva Karasová
Address Národní 15
110 00 Praha 1, Czech Republic

Phone +420 221 412 800
Email marek.foglar@fsv.cvut.cz, eva.karasova@fsv.cvut.cz
Website www.mottmac.cz



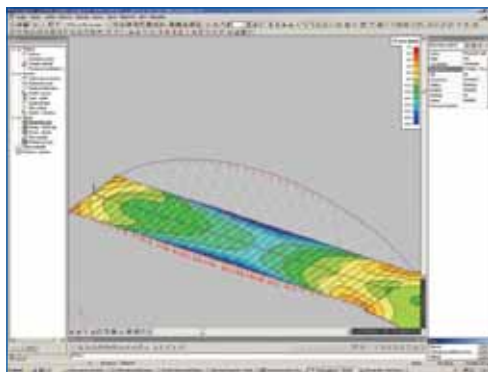
m Mott
MacDonald

Mott MacDonald Praha, Czech branch of the international multi-disciplinary company Mott MacDonald Ltd, is one of the leading engineering companies on the Czech market since 1993.

Our company provides consulting services to public as well as private sector customers, particularly in the field of transport, power, EU funds, bridges, PPP projects, special services, tunnels and geotechnics, water and environment.

We offer complex services from the project design to its implementation. We have confirmed experience with management of projects of various sizes, preparation of expert opinions concerning project documentation, including cost-benefit analysis and evaluation of proposed technical solutions. We provide clients with services related to the supervision of transport, water management and engineering constructions, preparation of project and tender documentation, or financial management, mainly for projects co-financed by the EIB or from the EU funds.

We cooperate with many local organizations and give them the opportunity to work and participate on local and international projects. We have in-depth knowledge and understanding of local conditions and practices; we respect the knowledge, experience and needs of our partners. Our target is to provide the highest possible added value of our services to our clients.



Short Description

Bridges on the grade-separated connection of the road II/468 and the industry area in Třinec-Baliny (CZ)

The text introduces bridges on the grade separated connection of the road II/468 and the industry area in Třinec-Baliny (CZ).

The terrain configuration and the arrangement of the surroundings result in massive reduction of construction height. Two 73.5 m long and 12.25 m high network arches, the intersection part and adjacent ramps work as one structure from the point of structural and dilatation behaviour.

Many modules of IDA Nexis and Scia Engineer had to be used to perform a complex static and dynamic analysis of the structure including all the building phases.

Project Information

Owner: Správa silnic Moravskoslezského kraje, p. o.
Architect: n/a
General Contractor: ODS - Dopravní stavby
Ostrava, a. s.

Engineering Office: Mott MacDonald Praha, s. r. o.
Construction Start: 30/10/2007
Construction End: 30/04/2009
Location: Třinec, Czech Republic



Introduction

The construction site is located in Třinec (CZ) at the end of the industry area Baliny.

The industry area is connected to the capacity road II/468 by a level crossing of major railway line Cadca (SK) – Bohumin and three tap lines owned by Třinecké železárny, one of the major iron works in the Czech Republic. While the crossing-gates are closed, the trucks exiting the industry area are blocking the tap lines. The goal of the project is to replace the level crossing by a capacity grade-separated crossing which will not influence the operation of all the railway lines.

The terrain configuration and the arrangement of the adjacent industry area results in massive reduction of construction height at the crossing of the first tap line. Two network arches with span of 73,5 m are designed together with bridges on the connecting ramps. The four bridges work as one structure from the point of structural and dilatation behaviour.

General description of the project

The grade-separated connection of the road II/468 and the industry area in Třinec-Baliny composes of four bridges and three retaining walls. The bridges will be described shortly:

SO 201 – Bridge over the railway line carries four traffic lanes and is designed as a network arch, span

73.5 m, height of the arch 12.25 m, bridge deck height variable 0.55-0.75 m, bridge width 22.8 m. The deck made of concrete C35/45-XF2 is longitudinally prestressed by 9 27-strand prestressing cables, transversely prestressed in each rib of the deck by 2 13-strand prestressing cables, 76 in total. The connection of the arch and the deck is provided by 36 hangers Ø 60 mm, steel S460N. No bracing between the arches is provided, thus the dimensions of the arch-box are 1150x650 mm; the arches are made of steel S355NL.

SO 202 – Bridge over the road II/468 composes of a network arch carrying two traffic lanes (span and height similar to SO 201), bridge deck height variable 0.65-0.75 m, bridge width 13.0 m and a 18.5 m long interchange part, where the two side traffic lanes of the SO 201 turn right (left) to the adjacent bridges SO 203, SO 204 respectively.

The network arch is longitudinally prestressed by 6 27-strand prestressing cables, transversely prestressed in each rib by 1 13-strand prestressing cable, 38 in total. The connection of the arch and the deck is provided by 36 hangers Ø 52 mm, steel S460N. No bracing between the arches is provided, thus the dimensions of the arch-box are 950x650 mm; the arches are made of steel S355NL.

The interchange part is the most complicated part of the bridge. Half of the longitudinal prestressing of the network arches is anchored in the end cross-beam

of the other network arch. The longitudinal prestressing of the ramps is anchored in the end cross-beam of SO 201. The third layer of the prestressing is the transverse prestressing of the interchange part, which is necessary to mitigate the radial forces from the longitudinal prestressing of the ramps.

The deck of the interchange part is 0,75 m thick in minimum.

SO 203 – Bridge on the ramp No. 3 and SO 204

Bridges on the ramps No.3 (No.4) carry one traffic lane from (to) the interchange part.. The bridge decks of concrete C35/45-XF2 are 0.75 m high and are prestressed by 7 19-strand prestressing cables. The span lengths vary, from 12 to 16,5 m.

Specifics of the construction method

The network arches are built as simple beams. They are prestressed by one half of the prestressing cables anchored in the steel end cross-beam and are free to dismantle the scaffolding. Then, the interchange part together with the ramps is cast. The rest of the longitudinal prestressing cables of the network arches, the transverse prestressing of the interchange part and the longitudinal prestressing of the ramps follows.

Due to the division of the grade-separated connection into four bridges, four sets of breaking and acceleration forces have to be considered in the design. It is not possible to assign such horizontal forces to one fixed bearing, so a unique configuration of bearings with no fixed bearing had to be developed. Bearings with lateral fixation are placed on all four ends of the bridge system – the system works as if it would have a fixed bearing in the intersection point of the laterally fixed bearings connection lines.

Software and modules used in this project

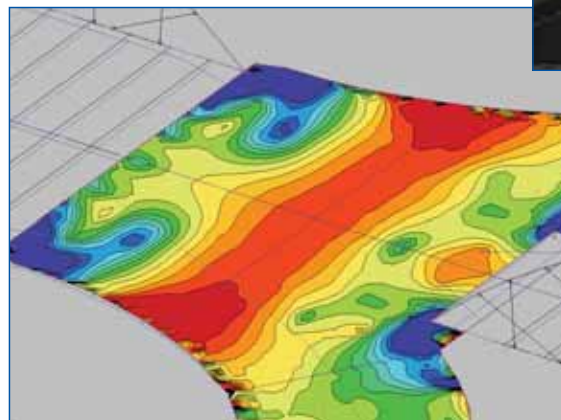
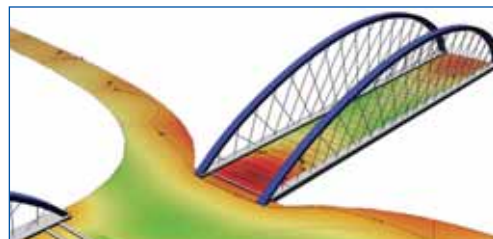
Such a complex task required development of a set of sophisticated 3D-models. The models were developed in IDA Nexus 32 3.90 then later exported and further developed in Scia Engineer and its predecessors. Many modules were used, among them:

- Building phases, both 2D and 3D
- Time dependent analysis
- Stability frame – estimation of the critical buckling factor

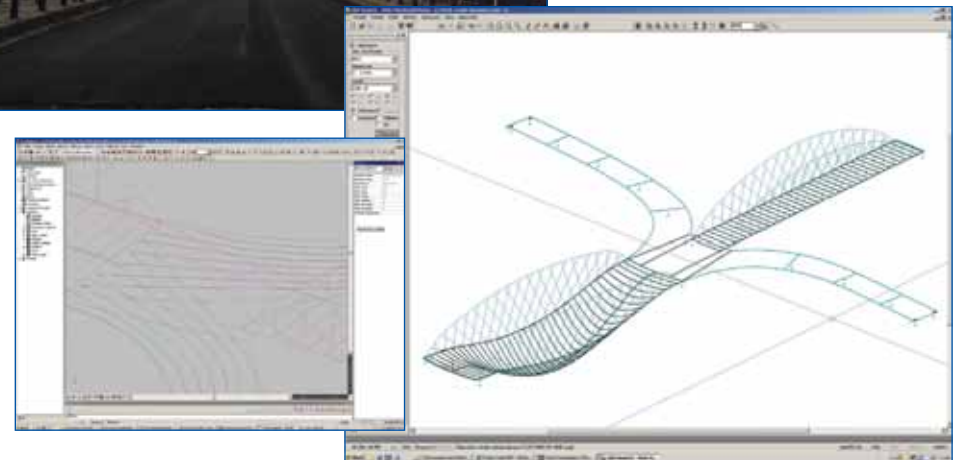
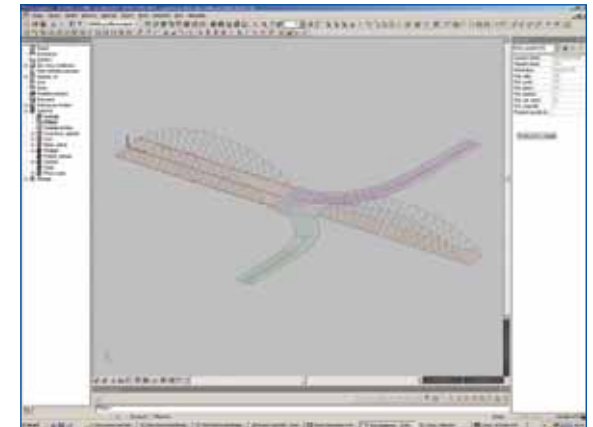
- Second order calculations
- Non-linear elements
- Dynamics – calculation of the Eigen frequencies
- Graphical sections
- Base
- 3D Frame, 3D shell, 2D frame
- Rib calculations
- Free loads on 2D-model
- Free input of cables on 2D objects
- Check of prestressed concrete according to CSN 73 6207

Experience with the Nemetschek Engineering Group software

Many functions of the used software were appreciated, among them the building phases which were necessary for the analysis of the construction sequence, the TDA which helped to quantify the losses in the prestressing cables due to creep and shrinkage and the construction sequence. The crucial function appeared to be the newly developed free input of cables on 2D objects, which enabled detailed check of the prestressing of the interchange part.



Bridges on the grade-separated connection of the road II/468 and the industry area in Třinec-Baliny (CZ)



SBE

Contact Guy Van Nuffel
Address Slachthuisstraat 71
9100 Sint-Niklaas, Belgium

Phone +32 37779519
Email guy.vannuffel@sbe.be
Website www.sbe.be



SBE

Middelen

SBE werkt met een 35-tal medewerkers voornamelijk projectingenieurs, studie-ingenieurs en tekenaars.

Historiek

Reeds een 15-tal jaren profileert SBE zich als bouwkundig ontwerper met, afgezien de klassieke stabiliteitsopdrachten, een specifiek accent op water- en havenbouw, geotechnische problemen, staalstructuren en funderingstechnieken.

Vakgebieden en specialisaties

Havenbouw: kaaimuren - sluizen; aanlegsteigers; dijken en oeverbescherming; renovatie.

Burgerlijke bouwkunde en gebouwen: algemene stabiliteitsstudies; speciale funderingen en geotechniek; bruggen in staal, gewapend beton en voorgespannen beton; tunnels, riolering- en wegenwerken; eco-engineering.

Staalconstructies: ontwerp - berekeningen - overzichtstekeningen; werkhuistekeningen CAD - 3D.

Geotechnische en hydraulische modellering: 2D en 3D geotechnische modellen; 2D en 3D grondwaterstromingsmodellen; 1D, 2D en 3D rivier-, kust- en sedimentsimulaties.

Referenties

Havenbouw: Albertkanaal: diverse kaaimuren; containergetijdok "Waaslandhaven"; verbetering waterkering Afdamde Maas; Containerkade Noord Antwerpen; aanlegsteigers voor scheepvaart Linker Oevergebied Antwerpen en op de Schelde; Leie Doortocht Kortrijk; nieuw sluisencomplex Panamakanaal; nieuwe sluis Haven van Sevilla;

restauratie en herstellingswerken van kaaimuren, sluizen en droogdokken (Zennegatsluis, D'Herbouvillekaai, droogdok Cadiz).

Burgerlijke bouwkunde en gebouwen: Petroleumbrug Antwerpen; Muidebrug Gent; tunnel onder startbaan Zaventem; Tunnels HSL: Centraal Station Antwerpen en Berchem: ondertunneling bestaande sporen; Bureelgebouw en parking Lieven Bauwens Gent; voorgespannen brug over de Leie te Wielsbeke; Appartementengebouw Parklane II Gent; Parking Astridplein Antwerpen; Mercedes garage Sint-Niklaas; Brug te Halle; Waasland Shopping Center; Commercieel gebouw Wilma; HST-lijn Brussel-Amsterdam - diverse vakken; nieuwe Boulevardbrug Willebroek; Brug westelijke tangent Sint-Niklaas.

Staalconstructies: Verzinkingslijn met koeltoren Sidmar; Kontinugietierij 2; HQ2 Canary Warf; Efteling Kaatsheuvel Nederland; industriële gebouwen Baudour Frankrijk; diverse installaties op Petrochemische bedrijven zoals BASF, 3 m, Solvay; Vliegtuigloods München; Denox-installaties Harelbeke, Houthalen, Brugge, Brussel; LNG-plant Hammerfest.

Geotechnische en hydraulische modellering: Leveren en iken van numerieke modellen Scheldebekken Antwerpen; Grondwaterstromingsmodel en zettingsberekeningen Antwerpen Containerdok-West; Stabiliteitsberekening caissons Containerkaai Zuid Antwerpen met 3D model; Uitvoeringsstudie Deurganckdok; Stabiliteitsnabicht kaaimuur Verrebroekdok Antwerpen; optimaliseren wachtbekken Webbekom; ontwerp leefbaarheidsbuffer Doel.

Bow-string bridge of Beek

Short Description

The project regards a bow-string bridge in Beek, near Bree (Belgium); the overall length of the structure is 84 m. The upper structure is studied in an overall model. In these models we used the following different options of ESA-Prima Win:

- Profile check and optimisation according to EC3
- Non-linear calculation of the structure
- Second order calculation
- Stability-check

The nodes in the steel structure - with profiles in different directions - are studied in a detailed 3D plate model. This gives an extra view and better insight of the forces in the different parts.

The foundation as well as the bridge deck is also studied in detailed models in ESA-Prima Win.

Project Information

Owner: nv De Scheepvaart
Architect: nv De Scheepvaart
General Contractor: SBE nv
Engineering Office: SBE nv

Construction Start: 2008
Construction End: 10/2010
Location: Bree, Belgium



Voor de studie van de brug van Beek te Bree is uitvoerig gebruik gemaakt van ESA-Prima Win.

De brug is een boogbrug met een totale overspanning van 84 m. Voor de studie van de bovenbouw en onderbouw zijn verschillende modellen gebouwd in ESA-Prima Win.

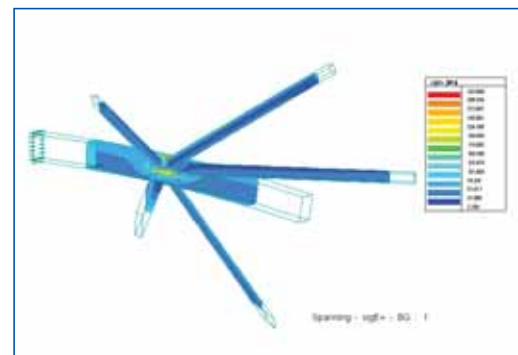
Voor de bovenbouw is een globaal model gebouwd waarin gebruik is gemaakt van volgende onderdelen van ESA-Prima Win, naast de standaardgegevens als snedekrachten, reacties, vervormingen, ... :

- Profielcontrole en optimalisatie volgens EC3
- Niet-lineaire berekening van de brugstructuur
- Tweede orde berekening van de brugstructuur
- Stabiliteitscontrole van de brugstructuur

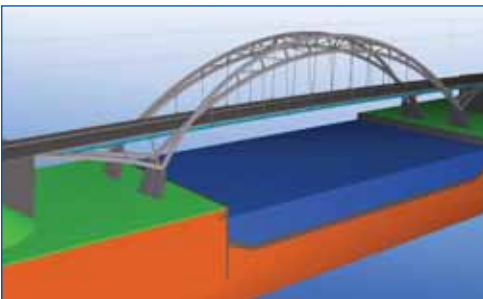
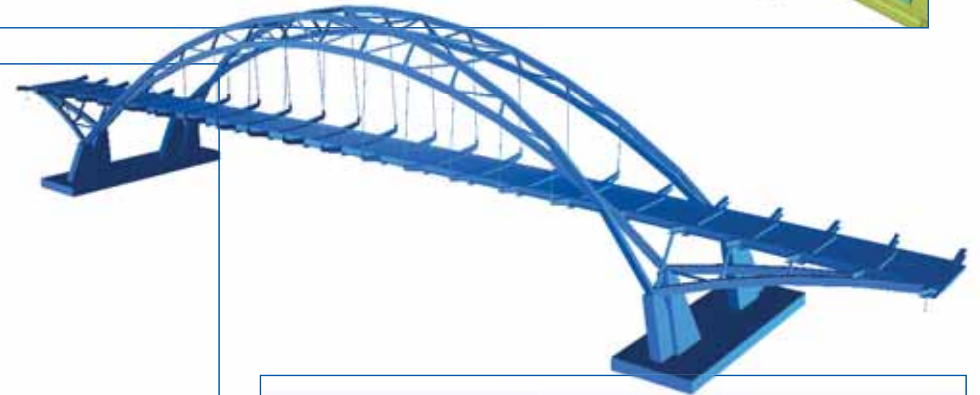
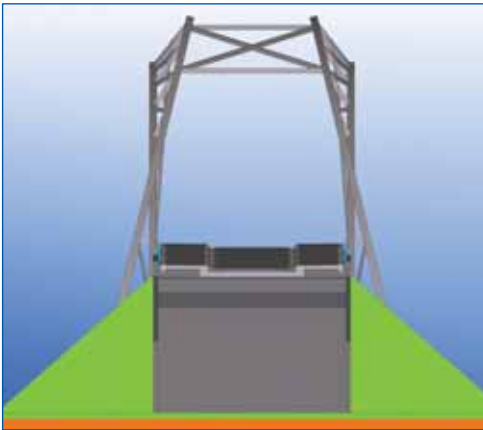
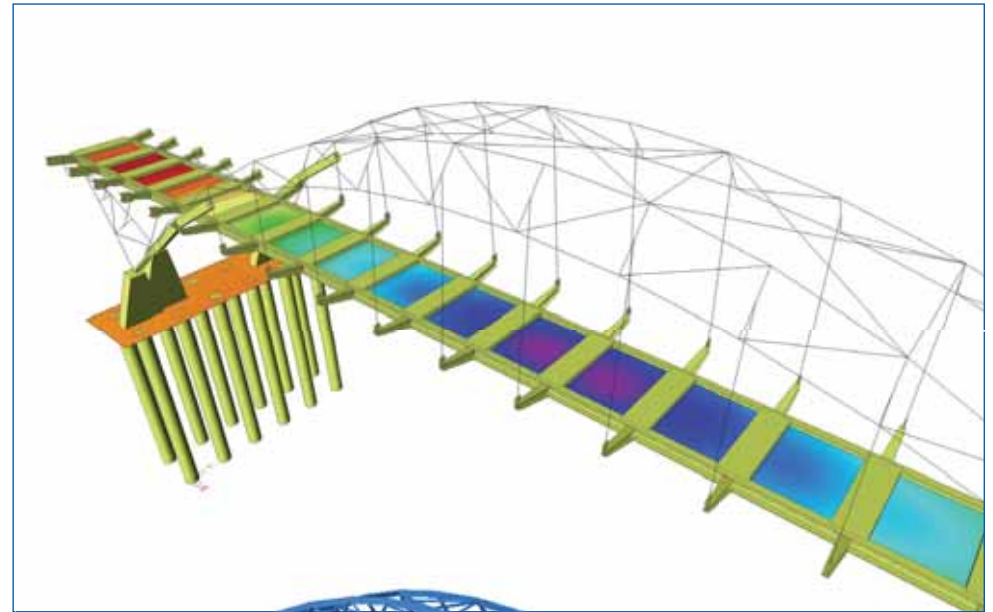
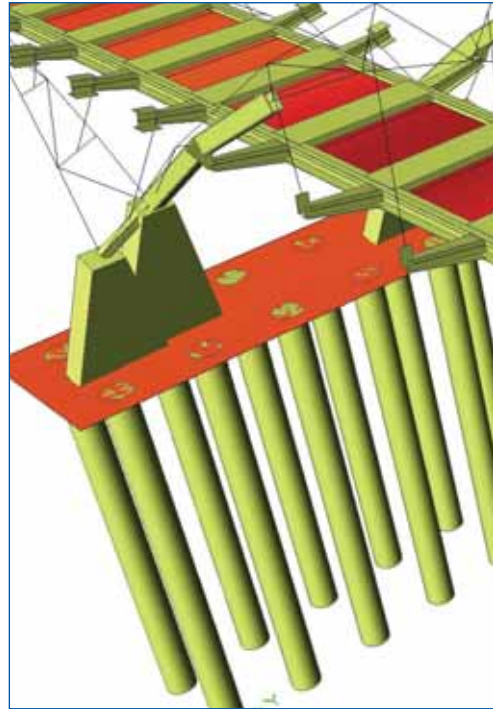
Van de complexe knopen in de staalstructuur van de bovenbouw zijn volledige plaatmodellen gebouwd. Hierin kon een duidelijk beeld van het krachtenverloop en het spanningsgedrag in de verschillende schuin toekomende profielen van een knoop bestudeerd worden.

Van het wegdek is eveneens een afzonderlijk detailmodel gebouwd voor een extra controle en inzicht in het krachtenverloop.

Het landhoofd met zijn paalfundering is in een afzonderlijk 3D platen en stavenmodel opgebouwd. De pijlers met hun paalfundering zijn in het globale model opgenomen.



Used software: ESA-Prima Win



SD Ingénierie Genève SA

Contact Jacques Candolfi
 Address Rue de Lyon 75
 Case postale 550
 1211 Genève 13, Switzerland
 Phone +41 22 338 60 60
 Email j.candolfi@sdingenierie.com
 Website www.sdingenierie.com



sd ingénierie

Le groupe SD Ingénierie est une société multicantonale de Suisse Romande articulée autour d'une holding et de sociétés filles cantonales. La société fut fondée en 1955 avec un établissement rapide dans les 6 cantons de Suisse Romande.

Son effectif est de 140 collaborateurs avec chiffre d'affaires annuel de 20 millions. Le capital-action est 100% en mains des collaborateurs actifs.

La structure du groupe SD Ingénierie permet la promotion des échanges de savoir-faire entre les collaborateurs des diverses sociétés pour les opérations importantes.

Elle étend ses activités et son expérience dans les domaines suivants :

Travaux public:

- Aménagements routiers, ferroviaires et aéroportuaires
- Génie civil général
- Canalisations eaux pluviales, usées, mixtes

Structures

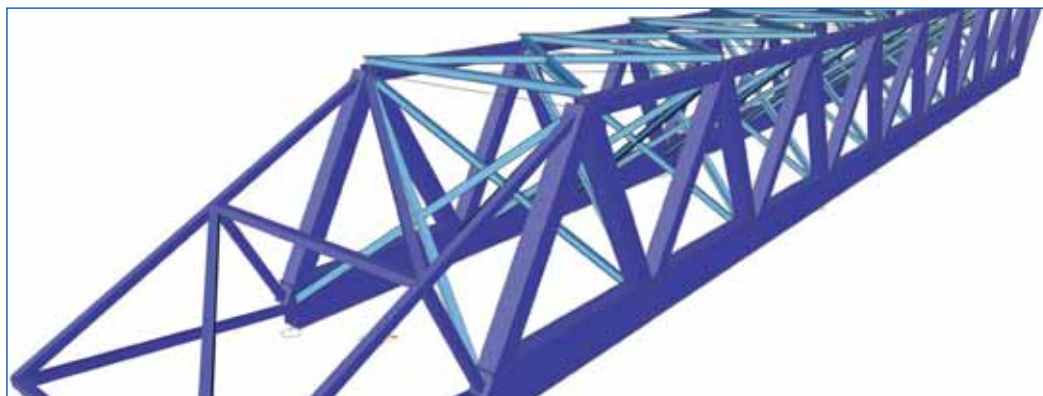
- Bâtiments
- Ouvrages d'art: ponts, murs de soutènement, tranchées couvertes, tunnels, pousse-tubes
- Maintenance, inspection, réfection
- Sismique

Environnement

- Eau potable, eaux usées, traitement des eaux
- Hydrologie, hydraulique, PGEE, PREE
- Déchets, sols contaminés
- EIE et leurs études sectorielles
- Développement durable

Planification

- Pilotage d'opérations, coordination
- Direction de travaux
- Aménagement du territoire
- Planification et management de la qualité
- SIT / SIG



Railway bridge over the river Arve

The bridge on the river Arve is part of the CEVA rail connection. It is an 84 m long, single-span, mixed steel-concrete structure. 3 models have been used for this project: one for the launching of the prefabricated steel structure, one for the in-place casting of the concrete elements and serviceability calculation, and one for the analysis of a particular problem of lifting of the rails at the ends of the bridge.

Short Description

Project Information

Owner: Canton de Genève et Chemins de Fer Fédéraux
Architect: BMS Atelier d'Architecture
General Contractor: assignment under contract
Engineering Office: SD Ingénierie Genève SA

Construction Start: 2009
Construction End: 2010
Location: Genève, Switzerland



Introduction

C'est en juillet 2004 que la co-maîtrise d'ouvrage (Canton de Genève et CFF) a lancé un concours de projet portant sur le pont traversant l'Arve pour la liaison ferroviaire Cornavin - Eaux-Vives - Annemasse. Le groupement Vd'A a été désigné lauréat de ce concours fin novembre 2004 par la Maîtrise d'ouvrage. Le groupement est composé du bureau d'ingénierie SD Ingénierie Genève SA et de BMS Atelier d'Architecture.

Description de la structure

Il s'agit d'un pont situé au plus près du niveau d'eau de l'Arve, sans appui dans la rivière. Longitudinalement, le système statique est une poutre à treillis isostatique, d'une portée de 84m. Le principe de structure porteuse est de relier deux poutres à treillis par une auge et une dalle supérieure. Les poutres à treillis sont composées de membrures

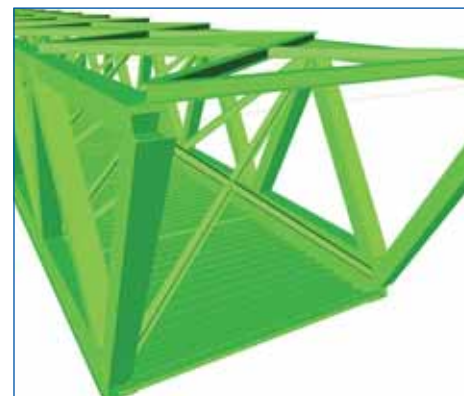
en béton et de diagonales en acier. Les dimensions des sections sont imposantes, par exemple en travée la membrure inférieure est un caisson de 1800 mm x 950 mm avec une épaisseur de tôle de 80 mm pour la semelle. Le bétonnage des sommiers latéraux supérieurs est exécuté ultérieurement, après poussage de la structure métallique. L'auge est constituée d'une section mixte acier béton. Le platelage inférieur en acier a une épaisseur de 10 mm et un raidissage avec des 1/2 profilés (HEBT 700 et HEAT 340). L'ouvrage comporte deux culées visitables, permettant de contrôler les appuis ou de les remplacer. Les deux façades sont entièrement vitrées, composées d'éléments triangulaires.

La structure métallique est entièrement assemblée sur les berges. Elle est ensuite poussée, munie d'un avant-bec pour diminuer la portée, sur les culées et la pile provisoire. Les différentes parties sont ensuite bétonnées : les membrures supérieures, puis l'auge et les sommiers inférieurs, et enfin la dalle supérieure. Les façades vitrées sont ensuite préfabriquées depuis la dalle supérieure et installées.

Modélisation n°1 : poussage de la structure métallique

Pour le calcul du poussage, la structure métallique a été modélisée seule. L'essentiel du modèle est composé d'éléments filaires (membrures et diagonales des deux poutres triangulées, contreventement provisoire et avant-bec). La tôle inférieure de l'auge est modélisée par une coque excentrée nervurée.

Les étapes de poussage ont été introduites à l'aide



Used software: Scia Engineer

d'absences, plutôt que de phases de construction. D'une part, la structure étant entièrement assemblée avant d'être poussée, chaque étape de poussage peut être calculée indépendamment des autres, sans prise en compte de l'historique, et d'autre part, l'utilisation des absences permet d'activer et désactiver un même appui plusieurs fois, ce qui simplifie la création du modèle, par rapport aux phases de constructions. Ce modèle a été essentiellement utilisé pour la vérification de la sécurité structurale et le dimensionnement de la structure métallique.

Modélisation n°2 : bétonnage et exploitation

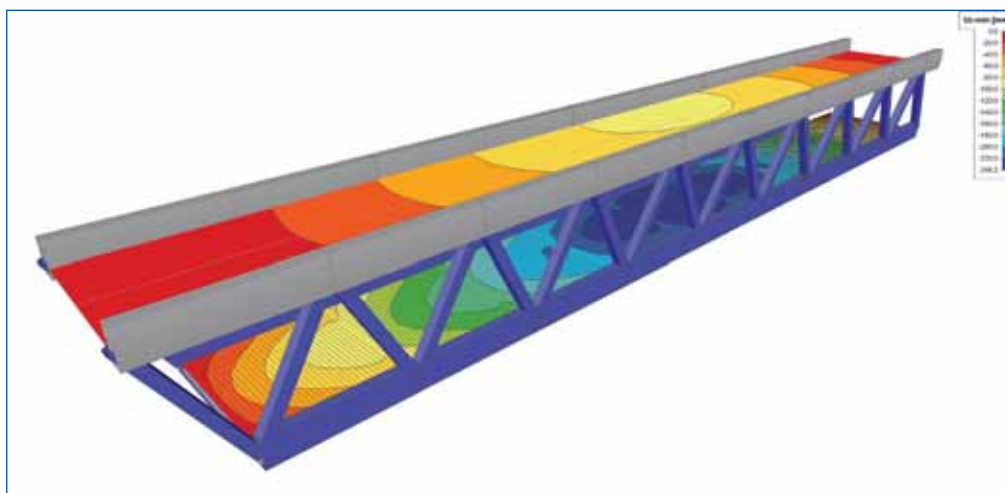
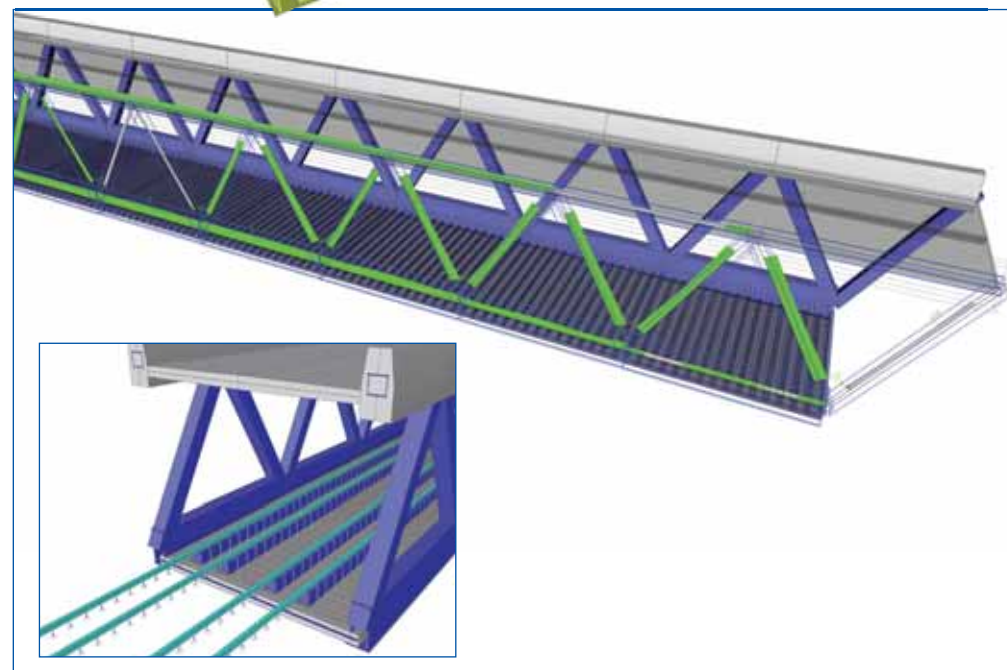
La structure métallique du modèle précédent a été reprise et complétée par les éléments en béton. Les phases de bétonnage ont été prises en compte. La section des membrures supérieures est mixte et phasée. La dalle inférieure de l'auge est composée d'une coque excentrée, représentant la tôle du fond, et de deux séries alternées de nervures excentrées. La première série représente les profilés qui raidissent la tôle. La deuxième série représente le béton de la dalle qui est coulée par la suite (la dalle mixte ne porte que dans la direction transversale). A ce stade de la construction, la structure est essentiellement une poutre simplement appuyée.

Ce modèle a servi à la vérification de la sécurité structurale en stade de construction et en exploitation, aux vérifications de déformations en service, ainsi qu'à la détermination des contreflèches.

Modélisation n°3 : interaction avec la voie

La voie est posée sur le pont, ainsi que dans les tranchées couvertes de part et d'autre, à l'aide d'un système de blochets amortisseurs synthétiques, sans traverses ni ballast. Si ce système a l'avantage de ne nécessiter pratiquement aucun entretien, l'effet tampon du ballast en est absent et les tolérances de déformation de l'ouvrage sont fortement réduites. Un problème typique dans ce cas de figure est l'éventuel soulèvement de la voie à la sortie du pont lors du passage d'un train sur l'ouvrage.

Le modèle n°2 a été repris, au stade final, sans les phases de construction, et les rails ont été ajoutés au modèle ainsi que les blochets de support. Aux extrémités du pont, les rails continuent, appuyés sur des appuis élastiques en compression seule. Le but est d'évaluer le soulèvement des rails dans ces zones lorsqu'un train se trouve sur le pont.



University of Žilina, Faculty of Civil Engineering

Contact prof. Ing. Josef Vičan, PhD., Ing. Jaroslav Odrobiňák, PhD.
 Address Department of Structures and Bridges
 Univerzitná 8215/1
 01026 Žilina, Slovakia
 Phone +421 41 513 5650, +421 41 513 5664
 Email vican@fstav.uniza.sk, odrobinak@fstav.uniza.sk
 Website svf.uniza.sk/kskm



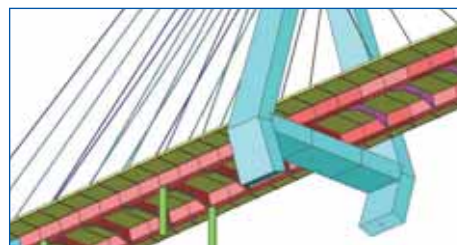
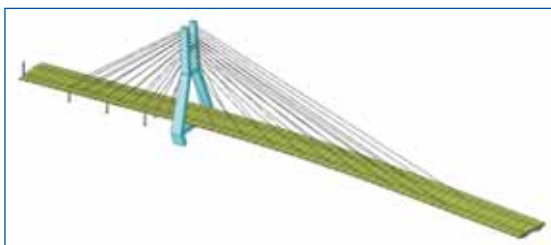
The Department of Structures and Bridges is one of the basic parts of the Faculty of Civil Engineering at the University of Žilina. The department insures training in subjects of the theory of building structures, such as steel, concrete, timber and masonry structures, and the subject of building materials as well. As a profile department of the educational program Civil Engineering Structures, the department also insures training in subjects of bridge building, i.e. steel, concrete and timber bridges and subjects focussed on FEM modelling and analysis of structures with specialization on bridges.

The research activities of the department are oriented to investigation of actual behaviour of steel and concrete structures and bridges, as well as to problems connected with evaluation of existing building structures and bridges. There is analysed the influence of essential failures of bridge structures on their global behaviour and reliability of the whole system in order to define residual lifetime and to determine optimal inspection intervals, as well as to determine the optimal time for rehabilitation and reconstruction of bridges in service. The obtained knowledge of analysis of actual behaviour of building structures and bridges are taken in consideration

at design of new structures with emphasis to very effective prestressed and steel and concrete composite bridge systems.

In the ambit of cooperation with practice, the department performs technical, judgement and advisory activity in following regions:

- Diagnostics of building structures and bridges,
- Evaluation of technical state of existing building structures and bridges,
- Static calculations, verification of reliability and determination of load carrying capacity of existing bridges,
- Verification of behaviour of new bridges as well as existing bridges by means of proof load testing,
- Expertises of projects of building structures and bridges as well as projects of reconstructions with regard to new scientific-technical knowledge and development trends in bridge engineering,
- Development of conceptions and methodologies, especially in the regions of bridge management, evaluation of existing bridges and determination of their load carrying capacity,
- Organisation of educational courses and seminars specialised in bridge management and harmonisation of the Slovak technical standards with European standards.



Asymmetrical cable-stayed bridge

This project regards a new road bridge over the Váh River in Trenčín (SK); an asymmetrical cable-stayed bridge with two planes of inclined cables onto a pylon combined with a continuous composite steel and concrete deck. A six-span continuous deck, that overpasses spans of a length of 21+18+18+20+140+21 m, is composed of two trapezoid-shaped steel box girders and a reinforced concrete slab. The 49 m high pylon with latticed double cranked pylon legs plays a dominant aesthetic role. Firstly, several plane member models were analysed for the preliminary design. Optimised data, like geometry, stiffness redistribution, cable prestressing, etc., were implemented into a three dimensional model using a combination of plane and member finite elements. Initial prestressing, nonlinear behaviour of cables and second order effects were taken into account during the nonlinear analyses.

Short Description

Project Information

Owner: Trenčín city
Architect: n/a
General Contractor: n/a
Engineering Office: Reming Consult, a.s.

Construction Start: 2010
Construction End: 2011
Location: Trenčín, Slovakia



The static analysis was carried out by the Department of Structures and Bridges within the scope of the preparation of the documentation for a building approval ordered by the engineering and consulting company Reming Consult, a.s. The aim of the project of a new bridge in Trenčín was to design a connection between the city borough Orechové and an island located between the natural course of the Váh River and the Biskupice artificial river-canal. Because of the length of the bridge and the request for an architecturally dominant structure, a cable-stayed bridge was suggested. An asymmetrical cable-stayed bridge with inclined cables on a pylon combined with a continuous composite steel and concrete deck was chosen. The cross-section of the deck consists of two trapezoid-shaped steel box girders and a reinforced concrete slab. A six-span continuous deck overpasses the spans; the lengths are 21+18+18+20+140+21 m. The longest span bridges the natural course of river, while the others overpass the inundation area.

The bridge deck must bear an 8.0 m wide road and 2.0 m wide sidewalk on both sides. The main trapezoidal steel box girders are of a constant height of 1.4 m and the axial distance of the girders is 7.6 m. The cross beams are of a variable height and have circular bottom haunches. The reinforced concrete slab is 15.5 m wide with varying thicknesses from

200 mm at the end of the overhang up to 375 mm above the main girders. The 49.0 m high pylon plays the dominant aesthetic role. It consists of two double cranked legs with a width of 1.6 m at the top and 2.0 m at the bottom. In the longitudinal direction the width of the pylon conically increases from 2.5 m at the top to 5.0 m at the foundation plate. Both abutments and pier P5, placed on the island's side, are made of reinforced concrete. On the other hand, three remaining supports P1, P2 and P3 are designed as hinged piers made of a pair of steel tubes filled with concrete, because they have to carry tensile reactions resulting from the response of an asymmetrically hung deck. The foundation of all supports is designed as a base plate resting on reinforced concrete piles with a diameter of 970 mm.

The analysis and design were done with respect to the proposed method of the bridge's erection. The system of temporary supports during concrete casting and consequent cable activation were the main aspects to be taken into account. It means:

- The erection of the steel structure was a combination of an in-situ assembly and longitudinal sliding on permanent and intermediate temporary supports;
- Then, the steel structure is acting as an eleven-span continuous structure during the casting of the concrete;

Used software: Scia Engineer, Nexis

- The temporary supports will be removed after the hardening and activation of the concrete and the subsequent construction works will be executed on the cable stayed structure of the final static scheme.

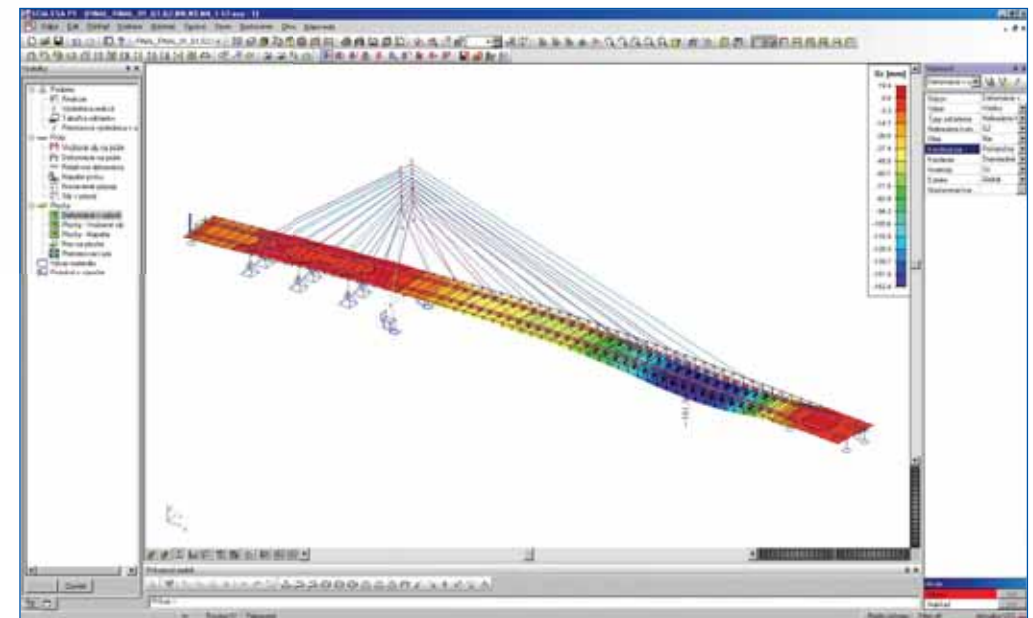
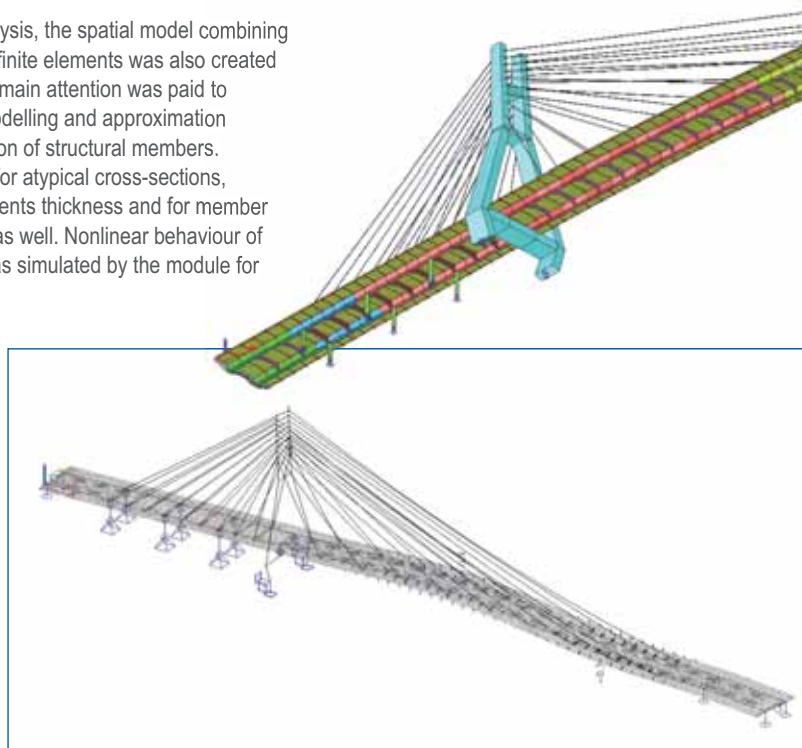
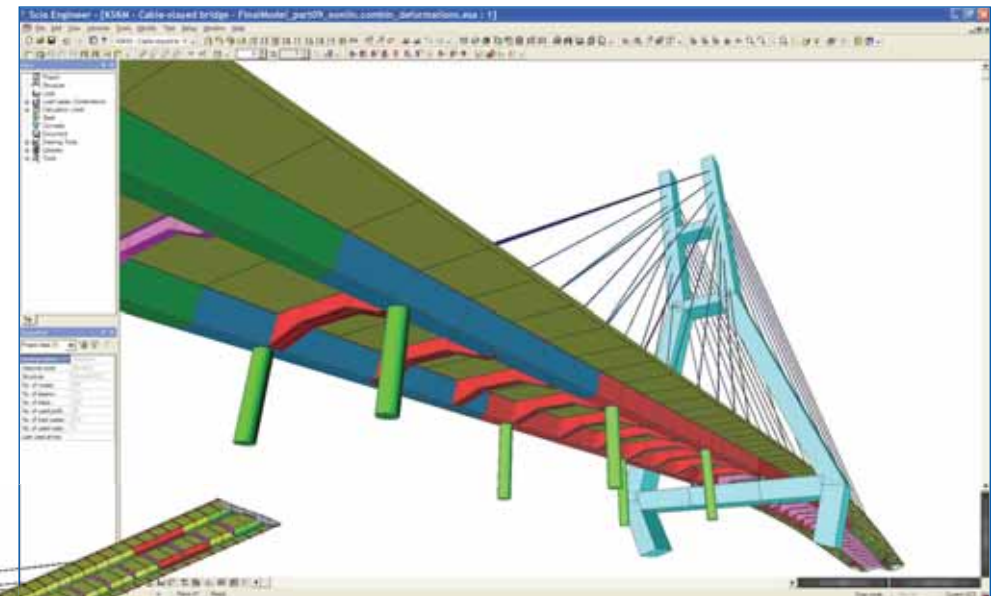
Firstly, several plane member models in Scia Engineer were analysed for the preliminary design. For instance, the following models were created: a model of the steel structure during the casting and hardening of the concrete, a model of the final cable-stayed structural system, a model where cables were substituted by dummy supports... During the analyses of those plane models, data were designed and optimised using Scia Engineer modules and custom-made programmes: e.g. the depth of the deck, the thickness of the steel plates for steel cross sections, parameters of the reinforced concrete slab, height, shape and inclination of the pylon, cross sections of the pylon, cable-type and number of strands in cables, initial prestressing, etc. Optimised geometry, stiffness redistribution, cable prestressing, load cases and critical cross-sections were implemented into the three dimensional model and checked.

For the final FEM analysis, the spatial model combining both plane and beam finite elements was also created in Scia Engineer. The main attention was paid to accurate geometry modelling and approximation of stiffness redistribution of structural members. Programme modules for atypical cross-sections, variance of plate elements thickness and for member haunches were used as well. Nonlinear behaviour of prestressed cables was simulated by the module for

rope members including the influence of self weight on the strain in the rope. Interaction of bridge supports with the ground was finally not implemented into the model, because the described nonlinear analysis including this effect was time consuming.

However, quasi-constrained behaviour of the pylon was verified using the Soilin module in software NEXIS 3.60.17. Consequently, values of settlement were considered in relevant combinations of load cases in a 3D model. More than a thousand linear combinations of load cases and almost two hundred nonlinear ones had to be considered. Initial prestressing, nonlinear behaviour of cables and second order effects were taken into account during the nonlinear analyses. Because of the block slab casting, the rheology effects of concrete could be solved using a simplified methodology in which the distributed relative deformations are approximated by the imposed loads in two time phases during the lifetime of the bridge. Finally, the dynamic calculation was done. Only natural frequencies and modes of vibration were determined at this stage of the project.

Road bridge over the Váh river, Trenčín (SK)





Kennis over staal

Infosteel, actief in België en Luxemburg, wijdt zich aan de promotie van het goed gebruik van staal in de bouw. Het wordt ondersteund door een 600-tal leden komende uit de sidérurgie, staalbouwbedrijven, studie bureau's en architectenbureau's. Infosteel groepeert tevens de belangrijkste onderwijsinstellingen in architectuur en ingenieurswetenschappen alsook hun vele studenten.

Infosteel doet aan promotie door onder andere het organiseren van evenementen zoals de Staalbouwwedstrijd voor zowel professionals als studenten en projectbezoeken. Het tijdschrift 'info_steel' en de website www.infosteel.be verzekeren een up-to-date verspreiding van informatie.

De **cursussen, opleidingen, technische publicaties** en **bibliotheek** ondersteunen de kennisoverdracht naar geïnteresseerden. De **helpdesk** behandelt elk jaar ongeveer 800 overwegend technische vragen, over **brandveiligheid, karakteristieken van specifieke producten, stabiliteitsberekeningen, oppervlaktebehandelingen ...**

Connaissance de l'acier

Actif en Belgique et au Grand-Duché de Luxembourg, Infosteel s'attache à promouvoir l'usage qualitatif de l'acier dans la construction. Organisé en ASBL, il est soutenu par plus de 600 membres issus principalement de l'industrie sidérurgique, des entreprises de construction, des bureaux d'études et d'architecture. Il regroupe aussi les principales institutions d'enseignement de l'architecture et de l'ingénierie ainsi que de nombreux étudiants.

L'action de promotion d'Infosteel s'appuie sur l'organisation d'événements tels que la Journée Construction Acier, les concours nationaux pour professionnels et étudiants ainsi que les visites de projets. Le magazine 'info_steel' et le site web www.infosteel.be assurent la communication médiatique actualisée.

Les **cours, les formations, les éditions techniques** et la **bibliothèque** assurent le transfert de connaissances aux groupes intéressés. Chaque année, le **helpdesk** traite environ 800 questions, principalement techniques, relatives à **la sécurité incendie, aux caractéristiques de produits spécifiques, aux calculs de stabilité, aux traitements de surface...**



infosteel

Zelliksesteenweg 12
12 Chaussée de Zellik
B-1082 Brussel - Bruxelles
t +32-2-509 15 01
f +32-2-511 12 81
e info@infosteel.be
w www.infosteel.be

www.infosteel.be

Category 4: CAE Industrial Buildings & Plants

Design of general steel structures, power plants, frame structures, large span halls and hangars, pre-engineered buildings, metal or aluminum structures... for which Frilo or Scia Engineer design software has been used. The focus is on the size of the structure, and the level of detailing for the steel or aluminum members & connections.

4



Iv-Consult

Contact ir. W.M. Visser
Address Vestiging Papendrecht
Postbus 1155
3350CD Papendrecht, Netherlands
Phone +31 786448555
Email w.m.visser@iv-bouw-industrie.nl
Website www.iv-groep.nl

WINNER



Iv-Bouw & Industrie is renamed into Iv-Consult per the 30th of March 2009 and is a division of Iv-Groep, a group of professional engineering companies with approximately 700 employees. Iv-Groep was founded in 1949 as a design and drawing office for steel structures. Through the years the company has developed itself into a sparring partner for clients that need independent advice or a constructive solution.

Iv-Consult has engineers for design and Engineering of Concrete and Mechanical Structures. Iv-Consult employs about 120 persons. The company is specialised in providing an independent advice for large heavy, complex and moving structures in different markets. A brief description of the Iv-Consult main markets are;

- Transport, storage and transfer systems and equipment;
- Heavy and special steel and mechanical structures;
- Special constructions such as attractions for amusement parks;
- Design of harbour and airport terminals, including logistic advice;
- All the offices, silos and store sheds etc. included in the projects.

The available manpower in the other divisions of Iv-Groep enables Iv-Consult to deploy extra capacity and, if required, other disciplines such as systems engineering, maintenance concepts and 3D measurement and 3D laser scanning.

The disciplines within Iv-Consult consist of steel engineering, mechanical engineering, civil engineering, logistic engineering, connection design and management/staff services.

Iv-Consult offers its services all over the world. Besides the home market in the Netherlands and Belgium, Iv-Consult serves clients in China, Malaysia, Middle East, Pakistan, Australia and India. For these international services Iv-Consult also runs a fully equipped office in Kuala Lumpur, Malaysia.

Iv-Consult's main objectives are:

- To be a reliable partner for its clients
- To be the innovating and creative consulting engineer for special and large steel, mechanical and concrete structures from feasibility studies up to preparation of shop drawings
- To be the logistic advisor for: Storage and Transfer, Internal logistics, People Logistics, Construction Logistics

Iv-Consult strives to be the constructive partner.

Iv-Consult wants to be the best in steel concrete and mechanical projects, from first draft up to realization.

Clients

- Iv-Consult has a wide variety of clients:
- Contractors (national and international);
 - Operators of terminals and factories;
 - Suppliers of installations and equipment;
 - Project developers;
 - Port authorities;
 - Government.

Hard-coal power station, Karlsruhe Rheinhafen

Short Description

Iv-Consult is the engineering company for the structure of the boiler house of the Rheinhafen Dampfkraftwerke Unit 8 (RDK8) for Alstom Power Systems in Stuttgart - Germany. The RDK8 power plant will have a capacity of approx. 900 MW and will be constructed during 2008 up to 2011. The base of the RDK8 will be 68 by 68 meters and has a height of 120 meters. In total the structure will have more than fifty thousand calculated steel elements. Iv-Consult used Scia Engineer as the engineering program for both static and dynamic calculations and it proved to be a very useful tool for this large project.

Project Information

Owner: EnBW
Architect: EnBW and fcg-architekten
Contractor: Alstom
Engineering Office: Alstom Stuttgart

Construction Start: 2008
Construction End: 2011
Location: Karlsruhe, Germany



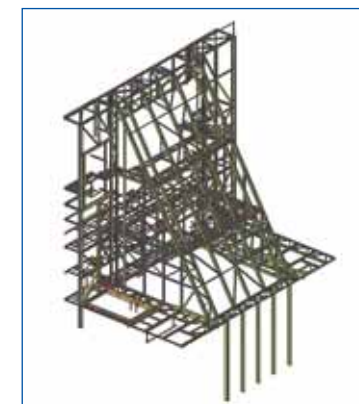
Quote of the Jury

"The high technical level of the structure, the updating of the 3D model including the pipelines and equipment make the project quite complex. The whole structure consists of in total 50.000 elements, 5000 loads, 70 combinations which have been calculated with different models. Also the utilization of Scia Engineer is quite impressive, especially the creative use of the output files obtain the appropriate data."

This new generation of high-tech coal-fired power stations with a gross output of approx. 900 MW will be constructed from 2008 to 2011. Iv's Client "Alstom Power Systems GmbH" is the designer, who will have the construction executed for the German power supplier EnBW Energie Baden-Württemberg AG. The dimensions of the boiler house are relatively large, with a length x breadth x height of about 68x68x120 metres. The various installations, turbine

and generator housing, chimney and cooling tower will also be constructed by other suppliers.

The core of the power station consists in general of a square boiler suspended in a very heavy and rigid boiler stand. A boiler house is constructed with a partial suspension from this stand, which will support the flue gas duct, all the equipment, pipelines, landings, staircases, etc.



Used software: Scia Engineer

Iv-Consult will design and carry out the calculations for the RDK 8 boiler house, wherein details of the main steel, secondary steel, and the most important connection details will be worked out. The profile database used consists of around 250 Korean and assembled cross-sections. The RDK 8 boiler house comprises a total of 6 walls, 35 floors, 6 staircases and various special suspension and support structures. The boiler house consists of around 50,000 elements. Each floor is again split-up into 8 sections and a variable number of assembly partitions. In total, there are more than 5,000 different loads acting in the x, y and z directions and occurring in around 70 different combinations and 40 load instances.

At night, the 3D Design model is automatically updated and exchanged with the client's reference models of the pipelines and other equipment. The task is to match all the components to each other. In view of the large amount of information, many processes have been partially automated.

All the information that is received and administrated is put into separate Scia Engineer models. Due to the vast amount of members, the total size, the project approach and the schedule it is not possible to integrate all information into one model. For this purpose over 200 models have been built. The geometry from the 3D design model is used to make the models.

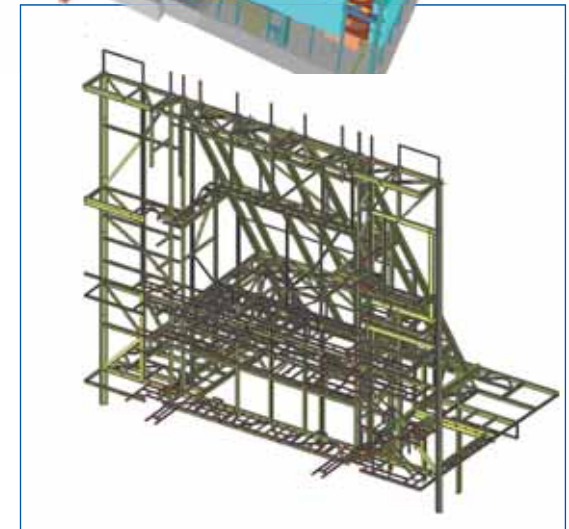
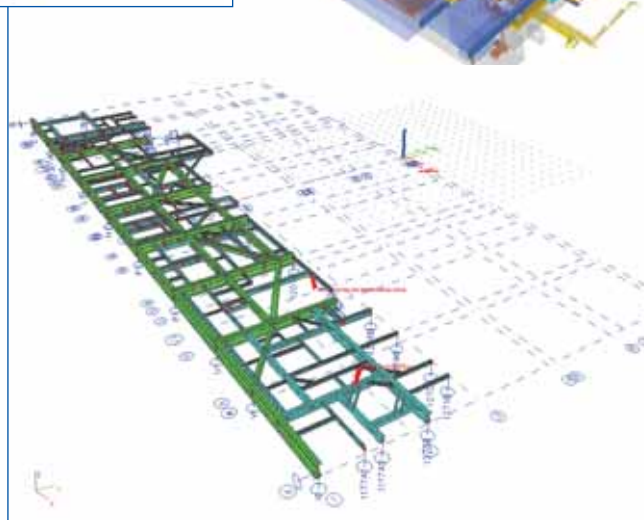
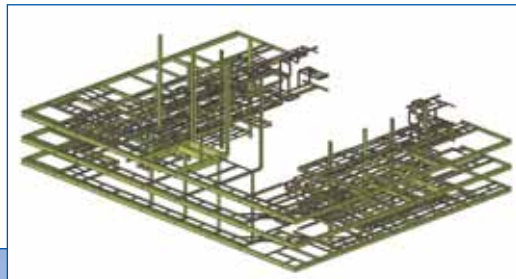
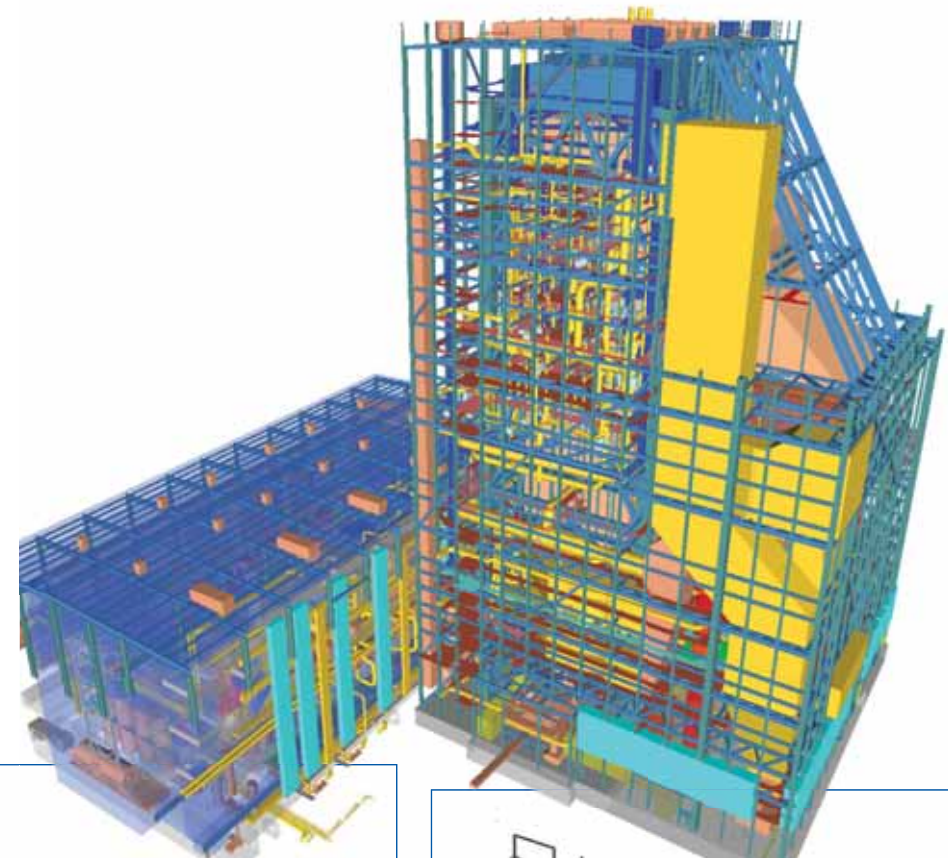
The Scia Engineer output data is filtered with the use of some programming in Visual Basic and transferred into the required output format and in various tables used for the connection design. Scia Engineer was also used to perform various earthquake analysis and Eigen frequency checks of structural parts and proved to be a useful tool.

Due to the vast amount of information within this project and a pre-described way of numbering the elements, combinations and load cases, the administrative flexibility within Scia Engineer was highly appreciated.

In general Scia Engineer proved to be a useful tool for designing power plant structures in a systematic way.

The work was commenced in July 2007 and taking into account all the additional improving revisions, it is expected to continue to around June 2009.

(Photo's © fcg-architekten and EnBw)



Baudin Châteauneuf

Contact Eric Lesueur
Address Rue de la Brosse
BP 30019
45110 Châteauneuf sur Loire, France
Phone +33 2 38 46 38 46
Email eric.lesueur@baudinchateauneuf.com
Website www.baudinchateauneuf.com

NOMINATION



En 1919, la SNC Baudin et compagnie est créée par deux hommes : Basile Baudin, entrepreneur, et Georges Imbault, ingénieur spécialiste des ponts. Fondée à Châteauneuf sur Loire, la société est baptisée Baudin Châteauneuf en 1952. Née de la production de pylônes électriques et de hangars agricoles, l'entreprise s'oriente vers la construction de ponts métalliques. Après la deuxième Guerre Mondiale, Baudin Châteauneuf participera activement à la reconstruction des ponts en France. Ces nombreux chantiers valoriseront son expérience et enrichiront sa connaissance des ponts suspendus.

La diversification

Dès 1954, Baudin Châteauneuf cherche à diversifier ses activités. Sa parfaite maîtrise du métal l'entraîne logiquement vers les charpentes de bâtiments. La véritable expansion de la société s'est produite vers les années soixante-dix, affirmant l'ambition de Baudin Châteauneuf d'incarner un acteur important de l'aménagement de notre pays.

Construire pour la vie

Baudin Châteauneuf s'est développée grâce à la maîtrise de la réalisation des ponts suspendus et a étendu son savoir-faire dans les domaines variés de la construction. Nous développons ainsi notre activité autour de trois axes majeurs :

- Bâtir notre environnement en concevant et réalisant des ouvrages pour le compte des entrepreneurs et des collectivités
- Franchir nos espaces, terrestres et fluviaux
- Rénover notre passé, en réhabilitant tout ouvrage d'art ou équipement industriel.

Aujourd'hui, Baudin Châteauneuf propose une gamme complète de prestations, au plus haut niveau

technologique, aussi bien en construction et rénovation d'ouvrages d'art, en charpentes métalliques, en génie mécanique, en génie civil, en entreprise générale ou en transport exceptionnel. Elle a récemment étendu ses activités à la couverture et au bardage, au traitement de l'eau et de l'air, aux câbles offshore ou encore à l'éolien. Baudin Châteauneuf s'est également dotée d'un Département Immobilier lui permettant de s'engager auprès des Personnes Publiques dans les partenariats publics-privés. Sa tradition de modernité toujours respectée, Baudin Châteauneuf est plus que jamais à l'écoute de son temps.

Baudin Châteauneuf en quelques chiffres

De nombreux secteurs d'activités :

- Ponts Métalliques
- Charpentes Métalliques
- Entreprise Générale
- Piscines et Centres aquatiques
- Rénovation d'Ouvrages d'Art
- Rénovation de Bâtiments
- Equipements Portuaires et Fluviaux
- Génie Mécanique
- Montages Neufs
- Génie Civil
- Câbles
- Export
- Eoliennes
- Immobilier

En 2007 :

- Effectif Baudin Châteauneuf : 620
- Effectif du groupe BC : 1250
- Chiffre d'affaires de Baudin Châteauneuf : 136 000 000 €
- Chiffre d'affaires du Groupe : 230 000 000 €

Engine room of the EPR of Flamanville

Short Description

This project regards the realization of an engine room for a new generation nuclear reactor, the EPR (European Pressurized water Reactor). It is 120 m long, 60 m wide and high and it includes over 7000 tons of steel. The lower part of the engine room includes many technical floors, whereas the upper part, with the top of the turbine generator set, forms an immense nave with an overhead travelling crane of 51 meters range and 300 tons lifting capacity.

This project represents a double challenge, both by its technically exceptional dimensions and the fact that it is the first project, for our company, to be calculated in Eurocodes.

The principle of overall stabilization of the structure by the floors required the use of a full 3D model of the structure. The analysis of the results of the linear and seismic analyses mobilized all energy of the Steel Frames Department in order to allow the beginning of the assembly of the framework in June 2008.

Project Information

Owner: Electricité de France
Architect: Bridot Willerval
General Contractor: EDF
Engineering Office: EDF - CNEPE

Construction Start: 01/06/2008
Construction End: 01/12/2009
Location: Flamanville, France



En 2004, afin de préparer le remplacement des centrales nucléaires aujourd'hui en service, Electricité de France engage le processus de construction de la tête de série en France d'une nouvelle génération de réacteurs nucléaires, l'EPR (réacteur à eau pressurisée européen). D'une puissance de 1650 mégawatts, ce nouveau réacteur sera implanté sur le site de Flamanville, dans la Manche, aux cotés des deux unités de 1300

MW en service depuis une vingtaine d'années.

Au milieu de l'année 2006, les travaux préparatoires de Flamanville 3 commencent, avec comme objectif une mise en service programmée pour 2012.

Au sein du groupement d'entreprises Quille / Bouygues TP / Baudin Châteauneuf, titulaire du lot « Génie Civil Principal », notre entreprise a en charge la réalisation de la Salle des Machines.

L'ouvrage

120 mètres de long, 60 mètres de large, 60 mètres de haut et plus de 7000 tonnes d'acier, telles sont les mensurations de ce bâtiment hors normes. Il doit abriter le groupe turbo-alternateur qui récupère la vapeur produite par le réacteur nucléaire pour la transformer en électricité.

Jugée plus adaptable et plus flexible en vue du démantèlement, c'est une structure entièrement métallique qui a été préférée à une ossature en béton surmontée d'un hall en acier. La partie inférieure de la Salle des Machines comprend de nombreux planchers techniques, dalles en béton sur bacs collaborants et poutres aciers mixtes, alors que la partie supérieure, au-dessus du groupe turbo-alternateur, forme une immense nef dans laquelle circule un pont roulant de 51 mètres de portée et de 300 tonnes de capacité de levage.



Used software: Scia Engineer

La stabilité d'ensemble de l'ossature est assurée par une série de portiques transversaux, inégalement espacés, une palée de stabilité verticale, du niveau des fondations jusqu'à la toiture, sur chacune des quatre faces de l'ouvrage, deux diaphragmes horizontaux formés par les planchers des niveaux 0 et +16.60 m (niveau de la table du groupe turbo-alternateur) et un contreventement général de toiture.

Ce projet représente un double défi pour Baudin-Châteauneuf : ses dimensions en font un ouvrage techniquement exceptionnel et il s'agit du premier projet, pour notre société, calculé aux Eurocodes.

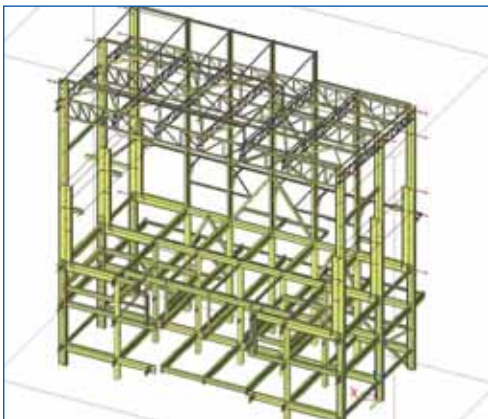
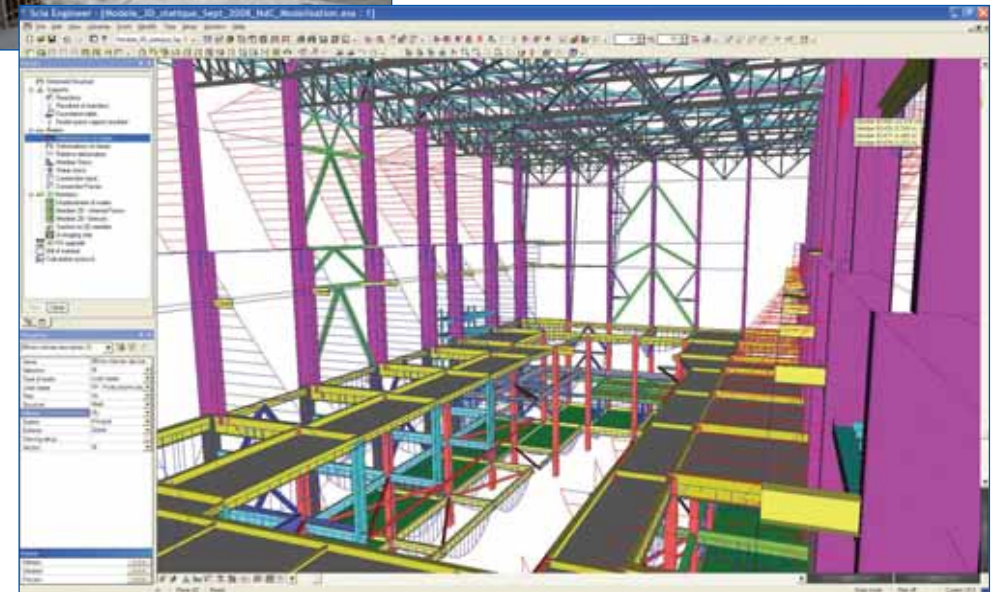
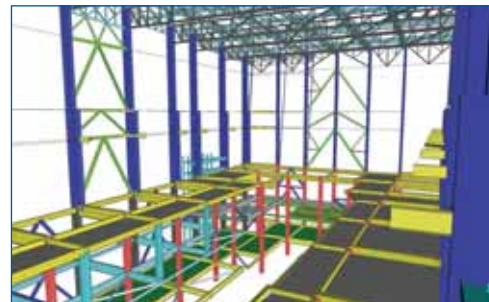
Le modèle de calcul

3121 nœuds, 13955 éléments 1D, 7774 éléments 2D, 179 cas de charges statiques et 1 spectre de séisme, telles sont les données, elles aussi hors normes, de la structure modélisée avec Scia Engineer. Le principe de stabilisation d'ensemble de la structure par les planchers a nécessité le recours à un modèle global 3D de l'ossature. Seuls les éléments principaux sont modélisés : poteaux, poutres de portiques, fermes treillis de toiture notamment. Les planchers des 2 diaphragmes horizontaux sont introduits sous forme d'éléments 2D de type « Plaque ». La modélisation a débuté en novembre 2006, dix mois ont été nécessaires pour la réalisation et la mise au point du modèle et des procédures de calculs. Les résultats de l'analyse modale ont été particulièrement étudiés afin d'appréhender au mieux le fonctionnement d'un tel modèle. L'usage du module de calculs de stabilité de Scia Engineer a été rendu nécessaire afin d'analyser le

plus finement possible les paramètres de flambement de chaque poteau au sein de cette structure multi-contreventée. L'exploitation des résultats des analyses linéaires et sismiques a mobilisé toutes les énergies du bureau d'études du Département Charpentes Métalliques de Baudin Châteauneuf afin de permettre le début du montage de l'ossature en juin 2008, qui se poursuivra jusqu'en décembre 2009.

Une expérience exceptionnelle

Plus de 7000 tonnes d'acier seront nécessaires pour édifier cette structure qui, à l'image du modèle de calculs, relève de l'exceptionnel. Baudin Châteauneuf, constructeur des 2/3 des salles des machines du parc français, a su mettre en œuvre toute son expertise dans le domaine du nucléaire pour la réalisation de cette charpente complexe.



Ateim

Contact Olivier Denis
Address Route express
59430 Fort Mardyck, France
Phone +33 3 28 24 34 00
Email olivier.denis@ateim.fr
Website www.ateim.fr

NOMINATION



Historique

Depuis sa création en 1969 à Dunkerque, Ateim Technologie s'est développé régulièrement pour devenir leader de son activité au Nord de la France.

Le groupe ATEIM, fort de son indépendance avec ses filiales DI Ingénierie à Valenciennes, Enitec au Havre, Maning à Lille et CF Ingénierie à Paris et fort de ses 500 collaborateurs, intervient aujourd'hui tant au niveau national qu'international.

Domaines d'activité

D'une vocation d'origine sidérurgique et pétrolière, le groupe a pour ambition de se diversifier au travers d'industries aussi variées que la métallurgie, la chimie, la pétrochimie, le verre, la construction automobile, ferroviaire et aéronautique, l'agroalimentaire, la pharmacie, l'énergie, l'industrie papetière, les cimenteries, la valorisation des déchets, le tertiaire, les installations générales.

L'expérience acquise, le savoir faire, les moyens du groupe permettent de proposer une large palette de services dans les domaines tous corps d'état de l'ingénierie, des études techniques et des études de produits.

En structures, les ingénieurs d'Ateim, du moins pour les plus anciens utilisent depuis près de 30 ans les logiciels de calculs développés par Nemetschek Scia.

Corps de métier

- Structures métalliques
- Génie civil
- Mécanique
- Manutention continue
- Bâtiment
- Fluides et appareils sous pression ou non
- Electricité
- Produits



Extension of ArcelorMittal steel plant, Dunkerque

The project regards the design and dimensioning of an extension of the ArcelorMittal steel plant on the site of Dunkerque. It concerns the alteration of 3 adjoining halls:

1. The extension of the casting hall where 2 crane runways of 400 tons are running on crane girders at a height of 5 m and with a span of 22 m.
2. The second hall in which circulates a crane runway of 160 tons at 37 m above ground level.
3. The hall of the supplies.

To leave the halls completely cleared during the process, the stability of the building in the transverse direction was provided by a frame structure. These frame structures undergo very significant forces from the three cranes and have a ridge height of over 50 m. The calculations have led us to use PRS columns with a web height of 4.5 m, a flange width of 1.6 m and a weight ranging from 150 tons up to 250 tons for the highest ones.

Short Description

Project Information

Owner: n/a
Architect: n/a
General Contractor: ArcelorMittal
Engineering Office: ATEIM

Construction Start: 20/03/2008
Construction End: n/a
Location: ArcelorMittal Usine,
Dunkerque, France



Le projet consistait à concevoir et dimensionner l'extension de l'aciérie du groupe ArcelorMittal sur le site de Dunkerque.

On distingue 3 halles accolées:

1. Le prolongement de la halle de coulée où circulent 2 ponts roulants de 400 T sur des poutres de roulement d'une hauteur de 5 m et d'une portée de 22 m.
2. La halle RH2 où circule un pont roulant de 160T à 37 m du sol.
3. La halle des additions.

Spécificité de la charpente

Afin de laisser les halles totalement dégagées pour le process, la stabilité du bâtiment dans le sens transversal a été réalisée par une structure en portique. Ces portiques subissant des efforts très importants des trois ponts roulants (2 de 400T et un de 160T) avec une hauteur au faîtage des portiques de plus de 50 m, les calculs nous ont amené à utiliser des poteaux en PRS d'une hauteur d'âme de 4.5 m et d'une largeur d'aile de 1.6 m et d'un poids allant de 150T à 250T pour les plus hauts.

Toute la conception du bâtiment a été tributaire des ossatures des structures process présentes à l'intérieur des halles, rendant parfois très compliquée

la conception d'ensemble à la base très simple. (Exemple: poteaux de la structure process traversant une poutre de freinage du chemin de roulement de 400 T).

L'ossature de la toiture se décompose en trois « couches », les pannes treillis fixées entre les arbalétriers reçoivent les empannons qui à leur tour supportent les pannelettes. Toutes l'ossature de bardage à partir de 10 m du sol jusqu'à 50 m et entièrement suspendue aux sablières ou aux fermes treillis en pignon.

Une poutre caisson en porte à faux de 3 m sur les poteaux et d'une portée de 30 m reprend en pignon les charges verticales d'exploitation d'une passerelle visiteur ainsi que d'une tour d'escalier d'accès au pont de près de 30 m de haut.

Modélisation

Le caractère spécifique de la structure a nécessité une modélisation complète et précise, allant de l'ossature principale (Portiques, stabilités, sablières, chemin de roulement) à l'ossature secondaire (poutres au vent, poteau de bardage, passerelles et escaliers).

Cela d'autant plus que le modèle Scia Engineer a été utilisé pour la création de la maquette 3D sur notre

logiciel de dessin Prosteel pour la sortie des plans d'avant projet détaillé.

L'application des charges de vent a été réalisée via le générateur de charges surfaciques directement sur les poteaux de bardage du bâtiment.

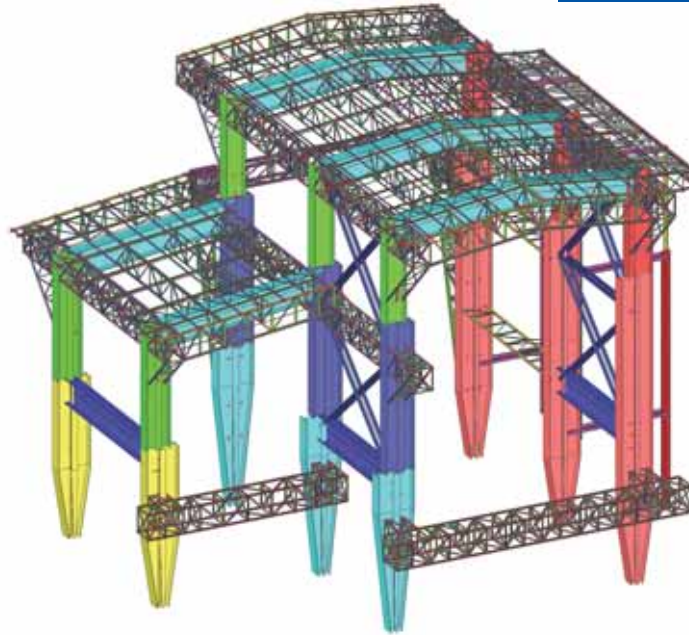
Le module d'ouverture dans les barres nous a permis de modéliser les trous d'hommes prévus dans les poteaux de portiques.

Conclusion

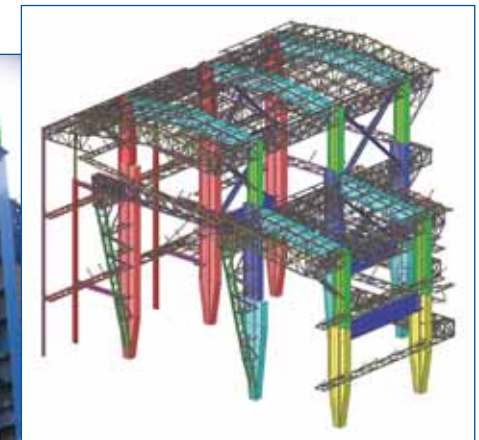
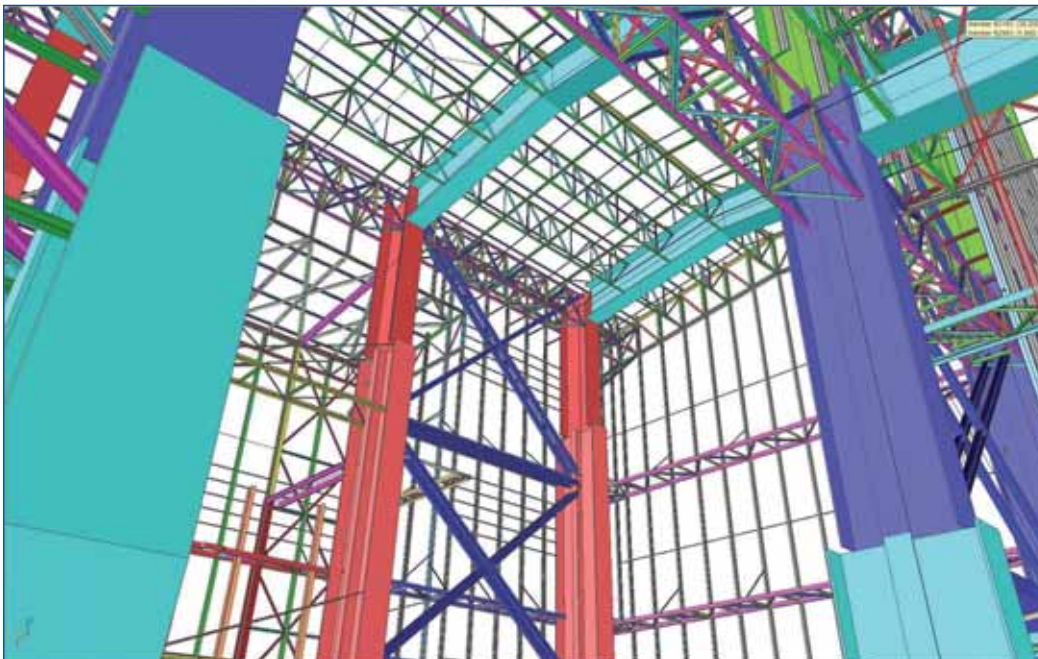
Les divers modules d'optimisation ou de générateur de charges surfaciques nous ont permis de d'appliquer les charges sur la structure pour l'un et de dimensionner la structure pour l'autre avec une facilité et une rapidité non négligeable.

Grâce au module de transfert des modèles Scia Engineer vers le logiciel Prosteel, la phase APD du projet a pu être réalisée avec une optimisation certaine du planning.

Cette optimisation est donc maintenant généralisée à l'ensemble des projets entre la phase calculs et la phase dessin.



Extension de l'aciérie ArcelorMittal - Projet Rhob 2



Heindl & Partner ZT GmbH

Contact Karlhans Heindl
Address Gusentalstrasse 10
4222 St. Georgen a. d. Gusen, Austria
Phone +43 72372821
Email zt.heindl@heindl.at
Website www.heindl.at

NOMINATION



Die Heindl & Partner ZT GmbH ist eine Gesellschaft mit beschränkter Haftung mit dem Tätigkeitsfeld Zivilingenieur für Bauwesen.

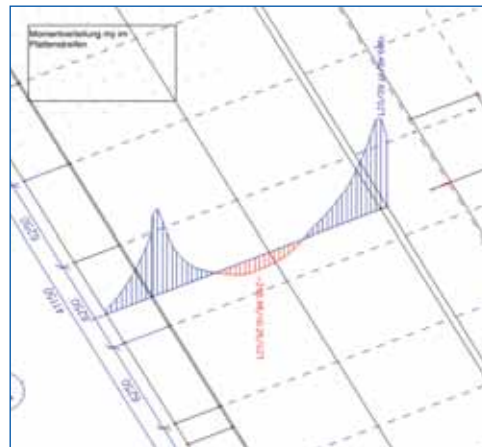
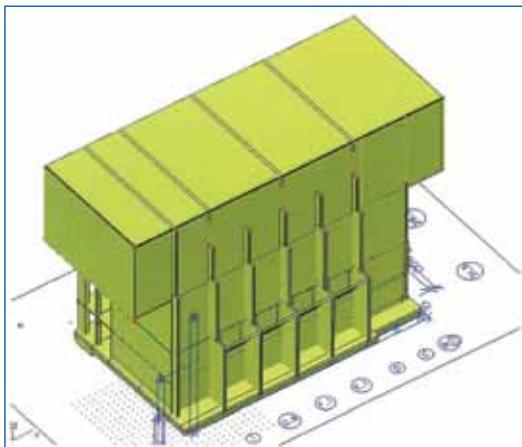
Die 1987 als Einzelunternehmen gegründete Firma wird seit 2000 als GmbH geführt. Die Heindl & Partner ZT GmbH hat die Schwerpunkte Ihrer Tätigkeit im Massiv- und Stahlbau in den Bereichen:

- Wärmekraftwerksbau (Müllverbrennungsanlagen, Kombikraftwerke, Biomassekraftwerke, Fernwärme-Heizkraftwerke)
- Wasserkraftwerke
- Industriebau (Stahlwerke, Kaltwalzwerke, Stranggussanlagen, Sägewerke, Biodieselanlagen, Betriebe der Lebensmittelerzeugung, Druckereimaschinen, usw.)
- Umwelttechnik (Kläranlagen, Deponiebau, Aufbereitungsanlagen für Biomasse)
- Büro- und Betriebsgebäude

Der Grundsatz der Fa. Heindl & Partner liegt in der flexiblen, technisch und wirtschaftlich optimierten, der jeweiligen Kundenwünsche angepassten Bearbeitung von Projekten.

Die Heindl & Partner ZT GmbH versteht sich als Partner des Bauherrn und unterstützt diesen bei der Bearbeitung aller Phasen eines Projektes von der Bedarfserhebung, der Grobkostenschätzung über die Genehmigungsplanung, den Konstruktionsentwurf, der Ausschreibung, der Tragwerksplanung bis zur Projektleitung, sowie der technischen und kaufmännischen Bauleitung.

Durch die gewonnene langjährige Erfahrung bei der Planung und Abwicklung von Großprojekten festigte sich das Motto des Ingenieurbüro Heindl & Partner "Planen mit Kompetenz".



Waste power plant, Zistersdorf

Short Description

ASA established a new waste power plant for the disposal of 120.000 tons of waste per year. The project we present is only one of the buildings, the waste storage bunker.

For the temporary storage of delivered waste before thermal combustion, there is a storage bunker situated at the north of the boiler house.

The storage bunker consists of the following main components:

- Waste storage l/b/h=39,4/13,1/21,2
- Input of waste and its deposit to the boiler. At each end of the waste storage building is a cantilever part to remove the waste in case of a breakdown of the plant
- A crane runway for the waste crane at level 28,80
- The hall roof - consists of hollow floor boards stored with a constructional top concrete layer on steel-concrete beams

Project Information

Owner: ASA
Architect: Von Roll Umwelttechnik AG
General Contractor: Von Roll Umwelttechnik AG
Engineering Office: Heindl & Partner ZT GmbH

Construction Start: 2007
Construction End: 2009
Location: Zistersdorf, Austria



Allgemeines

Die ASA errichtet seit dem Jahr 2007 in Zistersdorf in Niederösterreich eine Müllverbrennungsanlage für die Entsorgung von 120.000 to/a mit einer Brennstoffwärmeleistung von 22,65 MW.

Die Anlage besteht im Wesentlichen aus folgenden Bauteilen:

- Verwaltungsgebäude in Massivbauweise
- Anlieferhalle in Stahlbauweise mit Fundamente im Massivbauweise
- Abfallbunker in Massivbauweise
- Maschinenhalle in Stahlbetonfertigteiltbauweise mit einem Treppenturm in Massivbauweise fundiert auf einer Fundamentplatte in Massivbauweise
- Kesselhaus in Stahlbauweise mit einem Fluchttreppenturm und einer Fundamentplatte in Massivbauweise
- Rauchgasreinigungsanlage in Stahlbauweise fundiert in Massivbauweise
- Schlackehalle in Stahlbauweise fundiert in Massivbauweise
- Außenanlagen mit Stützbauwerken zur Geländeanpassung

Projektbeteiligte

Bauherr: ASA Abfall Service Zistersdorf
Hans-Hruschka-Gasse 9
A-2325 Himberg

Generalunternehmer: Von Roll Umwelttechnik AG
Hardturmstraße 127
CH-8037 Zürich

Baufirma: ARGE Alpine-Porr
Am Ziegelwerk 4
A-2225 Zistersdorf

Tragwerksplanung: Heindl&Partner ZT GmbH
Gusentalstraße 12
4222 St. Georgen/Gusen

Abfallbunker

Zur Zwischenlagerung der angelieferten Abfälle vor der thermischen Verwertung ist nördlich des Kesselhauses ein Abfallbunker mit den Abmessungen l/b/h = 40,25/22,10/37,20 angeordnet.

Der Abfallbunker besteht aus folgenden Hauptbauteilen:

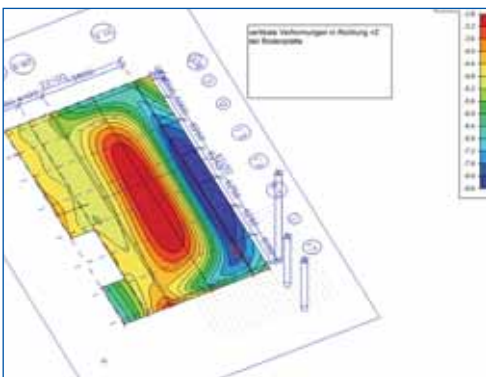
- Abfallspeicher l/b/h=39,35/13,10/21,20 Oberkante Bodenplatte 0,00 mit den Abfalleinwurföffnungen in

- der Nordwand auf Kote 12,20
- Schurrenebene auf Kote 21,00 mit der Einwurföffnung in den Verbrennungskessel und den seitlich auskragenden Bunkerteilen zur Kranrevision und Ausbringung von Müll im Störfall.
- Kranbahn für den Müllkran auf Kote 28,80 als Stahlträgerkonstruktion aufgelagert auf Stützenlisenen und Konsolen
- Hallendach bestehend aus Hohlblechen mit konstruktivem Aufbeton gelagert auf Stahlbetonbindern mit einer Spannweite von 21,40 m

Die Konstruktion des Abfallbunkers wurde unter Kote 21,00 als dichte Wanne in Ortbetonbauweise konzipiert.

Aus Gründen der Schalung und Rüstung wurden die Bauteile der Kote 21,00 als selbsttragende Fertigteilkonstruktion mit Ortbetonerfüllung oberhalb Kote 24,50 errichtet.

Sämtliche Bauteile der Dachscheibe wurden unterstellungsfrei errichtet.



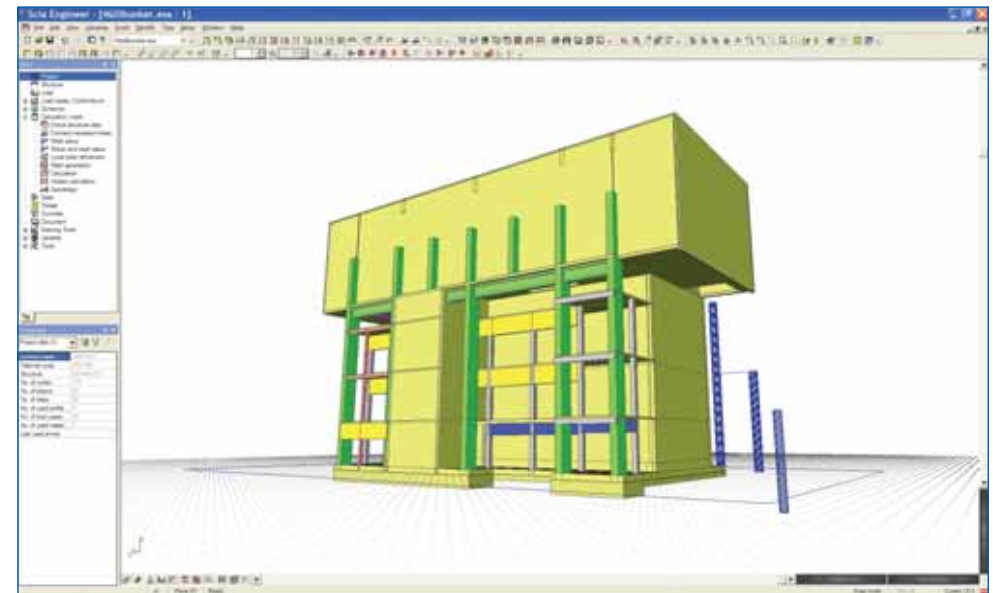
Statisches System

Das Statische System des Abfallbunkers besteht aus folgenden Elementen:

- elastisch gebettete Bodenplatte
- in der Bodenplatte eingespannte Bunkerwände und Lysenen
- Zwischendecke im Bereich der E-Räume kesselhausseitig, der Schurrenebene und der seitlich auskragenden Bunkerteile
- Dachscheibe

Der Bemessung wurden folgende Lastfälle zu Grunde gelegt

- Eigengewicht der Stahlbetonkonstruktion
- Erddruck mit Auflast aus Verkehr
- Horizontaler Mülldruck und Gewicht des gelagerten Mülls
- Wind in x und y Richtung auf die Bunkerkonstruktion
- Schneelast am Dach
- Radlasten aus 2 Müllkränen in allen möglichen Stellungen
- Nutzlast aus den Nebenräume und den Bunkerzwischendecken
- Last aus der Schurrenkonstruktion



Agro- en Industriebouw Philip Vandaele

Contact Benny Buyse
 Address Stadensteenweg 44
 8920 Poelkapelle, Belgium
 Phone +32 57 48 50 82
 Email info@philipvandaele.be
 Website www.philipvandaele.be



Historie

Philip Vandaele startte 15 jaar geleden, in 1994, zijn eenmanszaak als bouwpromotor en richtte zich hoofdzakelijk tot de agrarische sector. De zaak breidde zich verder uit tot KMO-bedrijven en al snel werd ook de industriële sector bewerkt. Later, in 2001, werd het montagebedrijf Phimonta opgericht. Vandaag zijn we al uitgegroeid tot een zaak met faam in de westhoek en kuststreek van België.

Visie en bedrijfsfilosofie

Landbouwers worden managers en dit sluit perfect aan met onze strategie. Door in te spelen op de steeds grotere concepten, d.m.v. economisch zeer scherpe prijzen en een ijzersterke structuurberekening, staan we in de streek aan de top op het vlak van het ontwerpen en het bouwen van varkensstallen.

De strategische keuze van dhr. Philip Vandaele en mevr. Magda Vynckier, om kwaliteit hoog in

het vaandel te dragen, was een schot in de roos. Hierdoor ervaren we een zeer sterke groei binnen de agrarisch-industriële projecten.

Dankzij ons doorzettingsvermogen en onze perfecte afwerking worden we steeds meer een kind aan huis bij de bouwheer, zowel voor, tijdens als na het realiseren van hun project.



Short Description

Piggery, Heuvelland

Scaling-up is also in agriculture, and especially in the pig sector, a familiar phenomenon; consequently buildings become bigger and bigger. In former days, a span up to a maximum of 20 m was standard; nowadays spans of over 35 m are occurring more and more. Traditional frame constructions are no longer possible.

The piggery of this project needed a span of 37 m; Eng. Benny Buyse of Philip Vandaele developed a totally new concept using Scia Engineer. He completely shrugged off the traditional frame construction and developed a mushroom structure. It was placed centrally in the building and on both sides of the structure were placed descending connections to the outer walls of the pig house.

Project Information

Owner: Taillieu Guy
Architect: Bert Luc
General Contractor: Agro- en Industriebouw Philip Vandaele

Engineering Office: Studiebureau Philip Vandaele
Construction start: 01/2008
Construction end: 05/2008
Location: Heuvelland, Belgium



Inleiding

De kuststreek van België (West-Vlaanderen) is binnen Europa een bekend gebied op het vlak van veeteelt en meer bepaald varkensteelt. Als pionier in ontwikkeling, ontwerp en de bouw van de bijhorende gebouwen, is onze firma een sterke pion voor de landbouwer en zijn bedrijf.

Zo ook bij het bedrijf van dhr. en mevr. Guy Taillieu. Het ontwerp en de bouw van de mestopslag, de ventilatie en alle wettelijke reglementeringen die er van toepassing zijn werd onze verantwoordelijkheid. Om binnen de bouwgrenzen te blijven was een overspanning van 37 meter een noodzaak. Daar de vereisten op vlak van afwerking zeer hoog liggen bij de West-Vlaamse varkensboeren zijn niet alle profielen bruikbaar. Dankzij Scia Engineer kwamen we tot een zeer economisch en esthetisch waardevol gebouw.

Ontwerp

Om te voorkomen dat varkensmest de staalstructuur aantast, dient men ervoor te zorgen dat de profielen niet buiten de prefabmuren komen aan de zijde waar de varkens zijn gehuisvest. Zo kan een profiel worden gebruikt als pijler, van maximaal 220 mm breed. In de centrale gang is dit slechts 160 mm. Combinaties van de profielen, die voldoen aan de vermelde vereisten, dienen een afstand van 37 meter te overbruggen. Eveneens mogen de dakliggers niet hoger zijn dan

de gordingen om de montage van isolatie mogelijk te maken.

Binnenin de stal is een centraal kanaal gemonteerd om een gedwongen ventilatie mogelijk te maken. Hierin moet een luchtverplaatsing van 122.500 m³ lucht per uur (= 34 m³/sec) mogelijk zijn. Deze zuigkracht dient tijdens de calculatie in rekening worden gebracht samen met alle stalbenodigdheden die aan de structuren worden bevestigd zoals voederleidingen, isolatie, OSB-platen, elektriciteit, ventilatoren enz.

Strategie staalstructuur en sterkteberekening

Om een stabiele structuur te bekomen wordt er afgestapt van de klassieke portieken. Deze brengen telkens overgedimensioneerde pijlers met zich mee. Geïnspireerd door de natuur, meer bepaald door de paddenstoel, wordt een eindontwerp bekomen. De centrale structuur, 2 steunende pijlers (de voet van de paddenstoel), wordt vergezeld van een luifel aan beide zijden (de hoed van de paddenstoel). Binnenin de hoed is nog een extra profiel geplaatst om de krachten ten gevolge van de daklasten sneller af te leiden naar de voet.

Om het geheel te vervolledigen verlengen we de luifels om zo de 37 meter te overbruggen. Op die manier is een profiel van 200 mm voldoende en voldoet deze aan de vereisten.

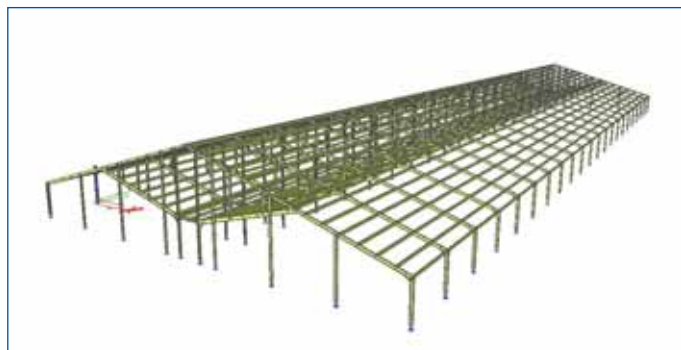
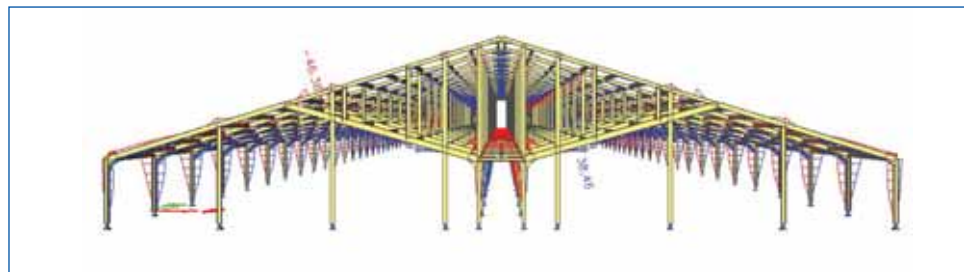
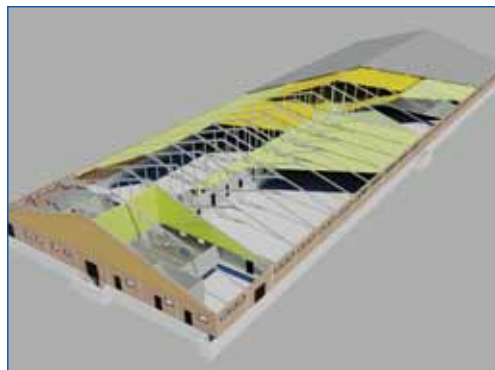
Het volledige gebouw is onderkelderd. Binnenin de kelder is het een kluwen van gangen voor mest, verse lucht voor de dieren en wateropslag.

Om arbeid te reduceren bestaat de volledige vloer uit prefabelementen voorzien van mestgleuven. Ook deze elementen worden geplaatst op de mestkelder. Daarom dient de 1500 m³ beton in de kelder perfect te worden gegoten zodat alle onderdelen kunnen rusten op de keldermuren.

Om te garanderen dat de kelder het gehele gebouw, en in het bijzonder de paddenstoel, kan dragen, wordt de bewapening tot in het kleinste detail op sterkte berekend.

Technische gegevens van het project

- Opdrachtgever:
Taillieu Guy
Rijselstraat 82
8953 Heuvelland
- Constructeur: Agro- en industriebouw Philip Vandaele
- Uitvoering: 01/2008 tot 05/2008
- B: 37 meter
- L: 108 meter
- H: 3 meter
- Dakhelling: 17 graden
- Opp: 3996 m²
- Staalstructuur: 84.423 kg
- Houten gordingen: 8.713 meter
- Prefabmuren: 2.083 m²
- Verankeringen op kelder: 124 stuks
- Isolatie: 6.116 m²



BGC nv / Establis

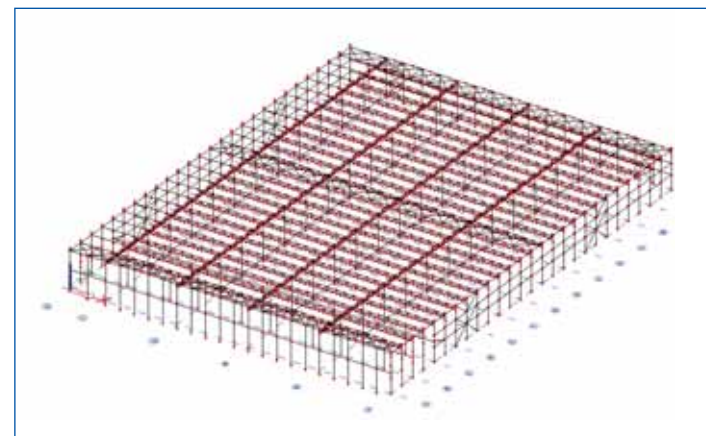
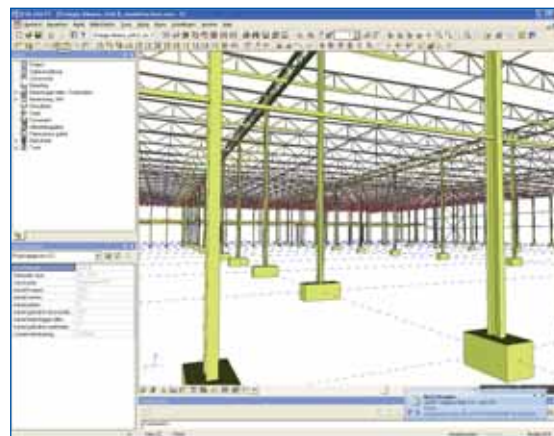
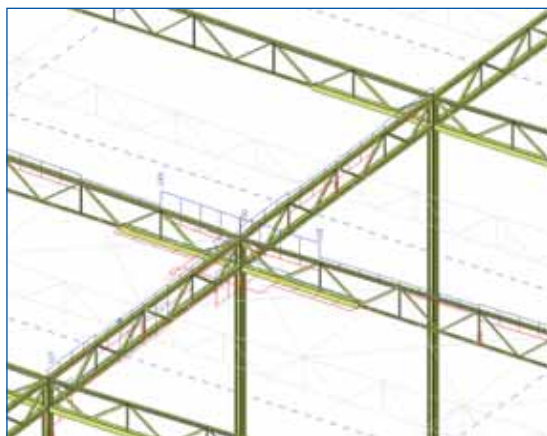
Contact Vanessa Van Croonenborch
Address Industrieweg 4
2320 Hoogstraten, Belgium
Phone +32 3 420 03 80
Email vvc@bgcgroup.eu
Website www.bgcgroup.eu



Warehouse projects are under squeeze from all sides: construction costs, financial resources, available personnel, ROI. Not to mention time and space constraints. That's where BGC can help. As a general contractor, BGC carries out logistical real estate projects in Europe. Our mission is to create space for the real estate developer to add value.

Our fields of expertise are design, construction engineering, project planning, subcontracting and project management. Our clients are logistics players and investors, including distribution managers, project developers, brokers and landowners. BGC is committed to high quality of building standards, accurate timing and strict budget planning for real estate developers and investors of larger warehouse projects in Europe.

We have the know-how you need in engineering, project management, logistics processes and land availability. Moreover we have an extensive network of construction and engineering companies all over Europe. BGC's speed, efficiency and knowledge of logistical processes ensure higher satisfaction of your customers, increase your return on investment and boost your company's image. BGC enhances the flexibility and effectiveness of a real estate developer and investor in the logistic industry.



Short Description

ProLogis: Warehouse and offices in Almere

The project consists of a 27.000 square metres warehouse with a 3.500 square metres office space on the mezzanine above the loading docks. The steel construction consists of two identical units separated by a fire wall. The columns are positioned based on the racking. The general stability of the structure is insured by rigid connections of columns and beams, and this in both directions. The complete structure was developed as a 3D-model with Scia Engineer, exactly because of that bi-directional stability and to be able to exactly define the distortion and underlying forces in the connections. Because of the complexity of the project the different components were modelled as separate files. Much attention was paid to the nomenclature in order to prevent the identical definition of steel members while all similar load configurations received the same name. Eventually all components were combined in one file.

Project Information

Owner: ProLogis Realty IX B.V.
Architect: Johan de Vries Architect BV
General Contractor: BGC NV
Engineering Office: Establis NV

Construction Start: 24/11/2008
Construction End: 09/2009
Location: Almere, Netherlands



Preliminary construction works have started at the Stichtsekan in Almere for the Prologis' tenant Antalis. Considering the very restricted budgets and ambitious time frame, our customer, Prologis, based on the successful cooperation in Etten-Leur for Hollister, decided to team up again with BGC. The project consists of a 27.000 sqm warehouse with a 3.500 sqm office space on a mezzanine above the loading docks.

The steel construction consists of two identical units separated by a fire wall. The columns are positioned based on the racking. The front part of the warehouse

holds a mezzanine with pre-stressed hollow concrete floor elements on a structural steel frame.

The general stability of the structure is insured by rigid connections of columns and beams, and this in both directions. In spite of the restricted construction height (1.25 m in the middle of span) and a limited span of 22.5 m, nevertheless was opted for a roof structure with trusses in 2 directions. This simplifies the realization of the rigid nodes between the structural elements. The complete structure was developed as a 3D-model with Scia Engineer, exactly because of that bi-directional stability and to be able to

Used software: Scia Engineer

exactly define the distortion and underlying forces in the connections. Because of the complexity of the project the following work procedure was laid out: the different components (front elevation and mezzanine, rear elevation, primary and secondary porches) were modelled as separate files. Much attention was paid to the nomenclature to prevent identical definition of steel members while all similar load configurations received the same name. Then each component was optimized. Eventually all components were combined in one file. All steel members were checked again and adjusted where necessary. During 'navigation' through the model and for the output much functionality were used: grid, layers, activities (through layer, through reference plane...), shifting of reference coordinates. For the further technical elaboration of the project several documents were created: result reports, stress diagrams, foundation loads.

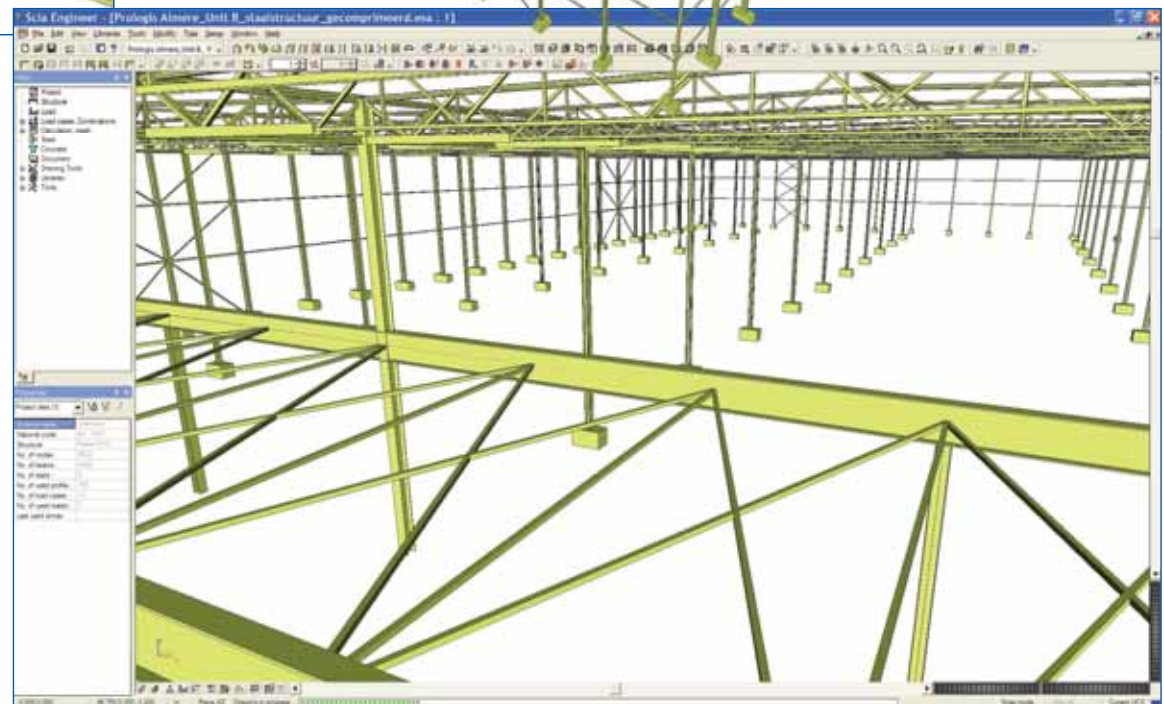
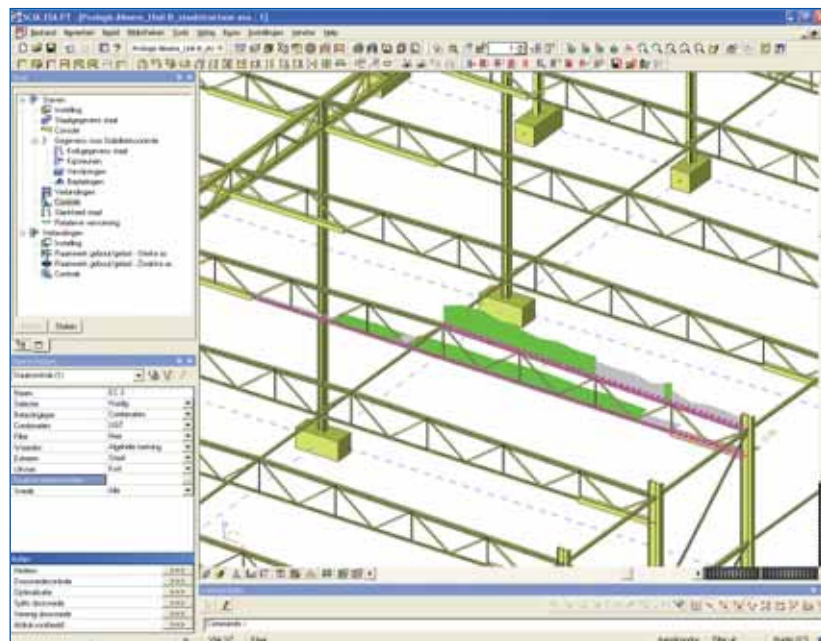
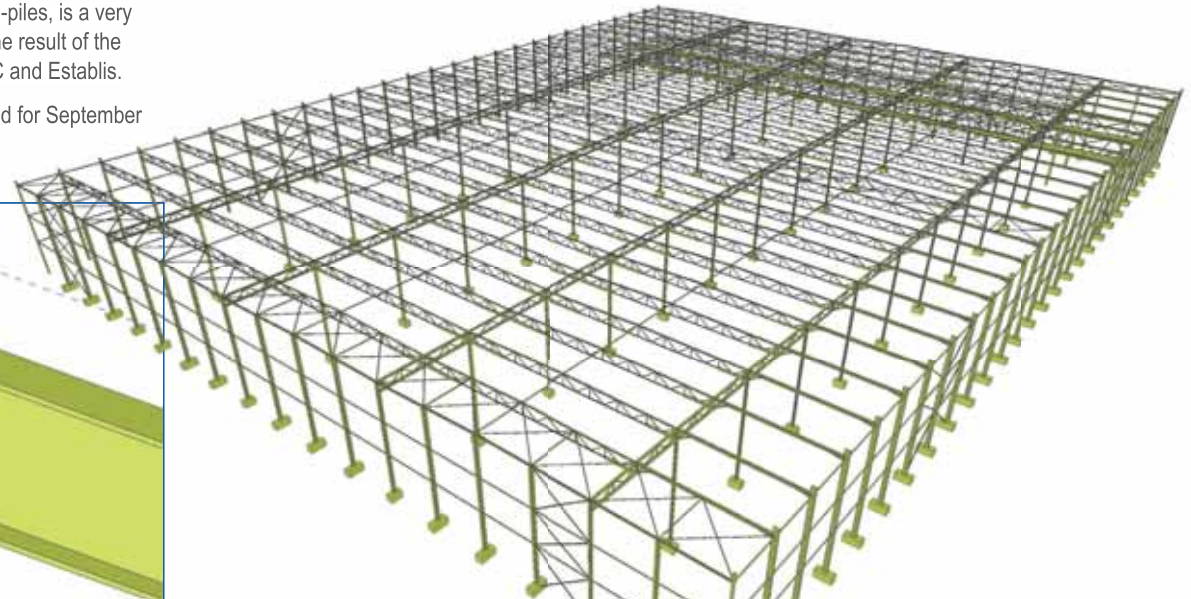
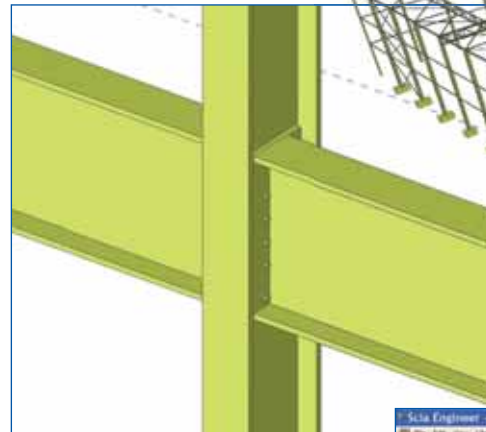
Our task is to realize a turnkey project in cooperation with all of the stakeholders: Prologis, Antalis, Dekker Packaging and Modo van Gelder.

Since its cooperation with Establis proved to be valuable on several recent occasions, especially for international projects, BGC again chose to team up with

Establis for the structural engineering of the project in Almere.

The municipality of Almere for the first time allowing the foundation of the floor plate with HSP-piles, is a very remarkable accomplishment and is the result of the successful cooperation between BGC and Establis.

The handover of the project is planned for September 2009.



ProLogis: Warehouse and offices in Almere

Bureau d'Etudes Lemaire

Contact Cédric Decrolière
Address Route du Condroz, 404
4031 ANGLEUR, Belgium
Phone +32 4 366.60.40
Email c.decroliere@belemaire.be
Website www.belemaire.be



Créée en 2000 sous l'impulsion d'un jeune ingénieur, le Bureau d'études Lemaire sprl réalise des études techniques dans les domaines de l'industrie, du génie civil, du bâtiment et des infrastructures. Il se distingue par son dynamisme, son savoir-faire et ses compétences.

Le Bureau d'études Lemaire sprl est composé d'une équipe solide, comprenant de jeunes ingénieurs et dessinateurs DAO hautement qualifiés, vouant une passion pour la construction et participant activement à la conception, au développement et à la réalisation des projets.

Le Bureau d'études Lemaire sprl assure la pluridisciplinarité des études. Le staff comprend 25 personnes : ingénieurs structure, électromécaniciens, hydrauliciens et dessinateurs

expérimentés. La faculté de prendre en charge la totalité des études techniques d'un projet constitue un des atouts de la société.

Dès la naissance d'un projet, le Bureau d'Etudes Lemaire sprl s'efforce de dégager des solutions techniques créatives et originales respectant la dimension architecturale souhaitée par son concepteur. Avec des outils informatiques performants et à la pointe de la technologie, le Bureau d'études Lemaire sprl offre à sa clientèle un service moderne, innovant et d'excellente qualité.

En assurant leur confiance au Bureau d'études Lemaire sprl, les clients s'associent à un partenaire fiable et soucieux de défendre leurs intérêts et objectifs.



North Freight Area - Liège Airport

In order to expand its activities, Liège Airport has decided to develop its 'North Freight Area' by building a new hall. This building has a total space of 12.500 m² and it also includes offices. The area is divided in two parts which are completely similar, in this way two different companies can work independently from each other.

The steel structure contains beams with a length of 25 and 28 meters. There are only four columns inside both areas. This makes the operational work of handling goods very easy.

The structure has been optimized by Scia Engineer software.

Short Description

Project Information

Owner: Liège Airport s.a.
Architect: BAG - Acte 1
General Contractor: Ets Jean WUST s.a.
Engineering Office: Bureau d'Etudes Lemaire

Construction Start: 30/07/2007
Construction End: 18/03/2008
Location: Bierset, Liège, Belgium



- Client : Liège Airport s.a.
- Architectes : Acte 1 Altiplan & Bureau d'Architecture Greisch
- Bureau de contrôle : SECO
- Entrepreneur : WUST s.a.
- Surfaces : hall 12.500 m² bureaux 1.285 m² (en 2 phases)
- Hauteur : 14 m

la construction d'un nouveau hall et d'un bâtiment administratif. Une société est également créée dans le but de réaliser les opérations de handling. Le bâtiment est réalisé en deux phases symétriques. Un mur en béton est placé entre les deux halls afin d'assurer la protection au feu.

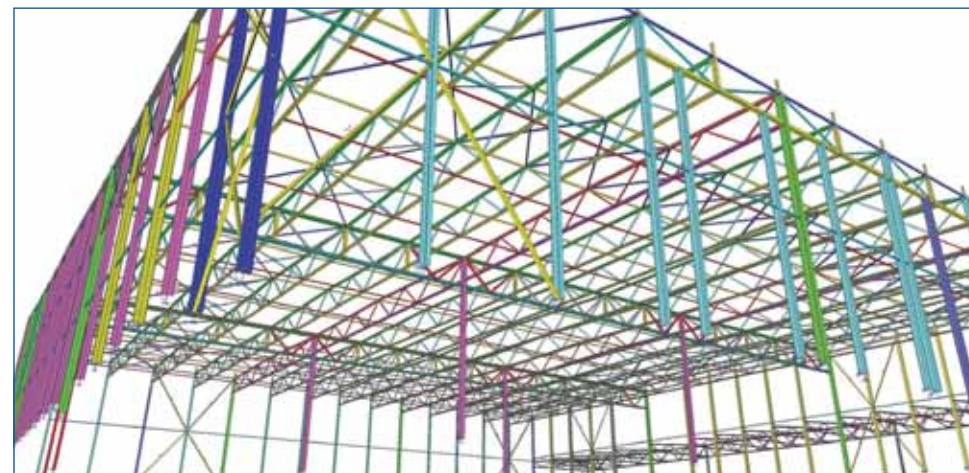
Design of the Structure

La charpente des halls est une ossature métallique. Les bardages (caissons – isolant – tôle de finition) ainsi que la toiture (tôles trapézoïdales – isolation – étanchéité) sont réalisés également à partir d'éléments métalliques.

La structure est composée de deux portiques

Description

Liège Airport s.a. poursuit son développement en créant une nouvelle zone, Cargo City Nord, destinée au traitement de fret aérien. Afin d'attirer de nouvelles compagnies aériennes, l'aéroport a lancé



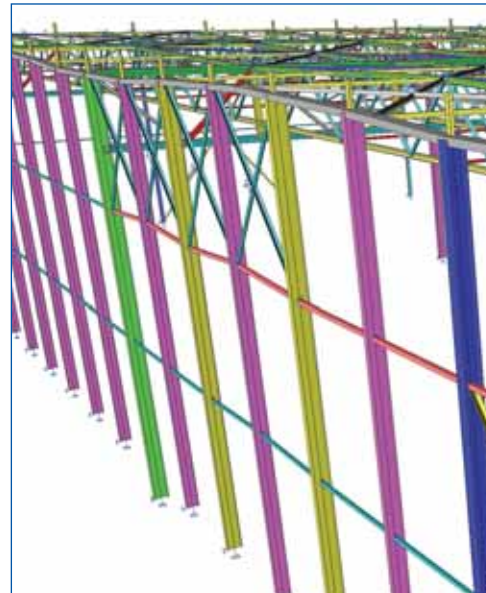
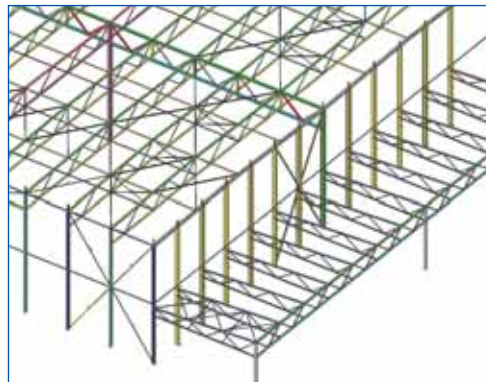
Used software: Scia Engineer

principaux et de deux façades contreventées selon les deux directions du bâtiment. Les poutres en treillis franchissent des portées libres de 25 et 28 mètres. Le maillage de la structure est de 25 mètres par 28 mètres. Chacun des halls comporte seulement 4 colonnes centrales pour une surface totale de 6.250 m². Les colonnes centrales sont encastrées dans la fondation suivant les deux directions du bâtiment. Elles sont composées d'un profil IPE450 et de deux demi-HEA360 qui lui sont soudées perpendiculairement. Un auvent côté Airside est réalisé également à l'aide de poutres treillis et l'assemblage a été conçu de façon à ne pas introduire de moments complémentaires dans la colonne de façade.

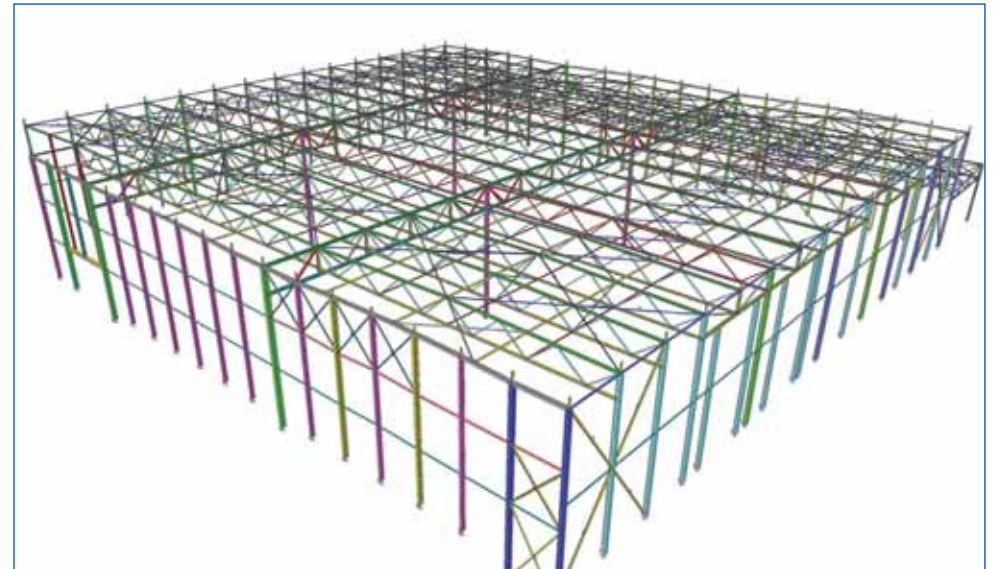
Dans une première étape, la charpente a été calculée à l'aide de modèles 2D. Les résultats obtenus ont été optimisés lors de la réalisation du modèle 3D. Cette dernière intègre la raideur des contreventements et donc l'influence sur la répartition des efforts. Les calculs sont réalisés sur la base de l'Eurocode 3 et utilisent le module élément non linéaire pour définir les contreventements en traction seule.

Design Challenge

Le logiciel Scia Engineer permet à l'aide de son module 3D d'optimiser le calcul des structures. L'ingéniosité des ingénieurs, des architectes et de l'entrepreneur, couplée à l'efficacité du logiciel de calcul, a permis au Bouwteam de remporter le marché de la construction du hall de fret.

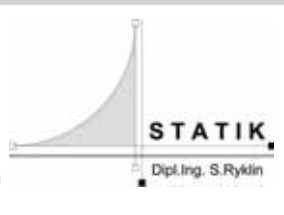


Construction d'un entrepôt de traitement de fret aérien



Dipl.-Ing. S.Ryklin STATIK

Contact Sergej Ryklin
Address Liselottestrasse 17
69123 Heidelberg, Germany
Phone +49 6221830673
Email statik@ryklin.de



Personal Information

Sergej Ryklin
Born in 1963 Moscow

1981-1985: Diploma Study of Civil Engineering at the Automobile and –Road Institute, Moscow; speciality “Bridges & Tunnels”.

1985-1991: Repair and maintenance of automobile bridges in Moscow.

Since 1993: Structural designer and verifier by “Römhild & Hecker” Consulting Engineers in Landau, Germany.

Since 1997: Currently self-employed Structural designer.

Specialization

- Planning and optimisation of Steel-, Aluminium-, Solid-, Timber- and Membrane Structures;

- Project consultancy;
- Building physics calculations;
- Dynamics calculations.

Philosophy

Flexibility in planning due to an integrated 3D-Design and the ability to find feasible and low-cost solutions already in the draft stage.

Experience

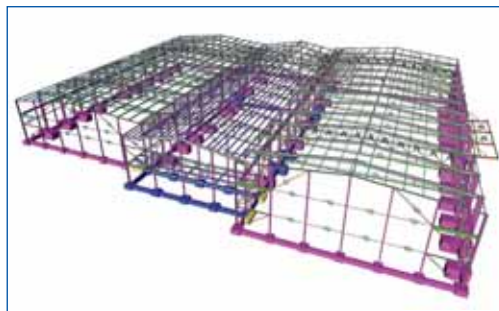
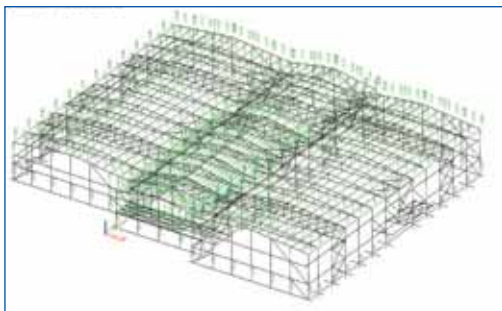
About 800 different projects processed - a.o. residential- and industrial buildings, park decks, pedestrian bridges, swimming pools, silos, membranes...

References

Daimler AG, John Deere AG, SAP AG, DB AG, Siemens AG, Henkel AG, Formel 1...

Equipment

2 Workstations, 2 Notebooks with following software: Scia Engineer, Nemetschek, Autocad, Dcad, Prosteel 3D, Kretz, LSS, Pcae, ForTen, Adobe.



Short Description

Extension of storage area for the Steel Trade Company Sachs&Weber

In order to extend the production and storage capacity of the SW-Steel Trade in Edenkoben (Germany), the existing steel hall had to be enlarged and two new side steel halls had to be erected. It was to be kept in consideration that the production activity had to carry on during the structural alterations, that there were six independently working crane systems operating and that the old block foundation had to be re-used for the extension. The new dimensions were to be 61.5x67.2 m. The height of the extended and left side part is 11.0 m. The height of the right side part is 15.0 m.

For the calculation the programme 3D-Model of Scia Engineer was chosen. About 40 drawings with views, elevations and details were derived from the 3D-Model for the further production steps.

Project Information

Owner: Sach&Weber Edenkoben Germany
Architect: Dipl.-Eng. Volker Lamotte, Landau, Germany
General Contractor: Dipl.-Eng. Michael Riedel, Landau/ESBEE Steel & Industrie GmbH

Engineering Office: Dipl.-Ing. Sergej Ryklin STATIK
Construction Start: 01/09/2008
Construction End: n/a
Location: Edenkoben, Germany



Client

Since its foundation in 1985, the company SW- Steel Trade stands for a modern and reliable service of steel products in full assortment. They have a wide range of clients from the industry, processed steel crafts, mechanical engineering and constructional trade.

The supply program includes steel beams and bars, tubes, plates, high-grade steel, reinforcement- steel and meshes and others.

Order

In order to extend the production and storage capacity of the SW-Steel Trade in Edenkoben Germany, an extension of the existing steel hall and two new side steel halls had to be erected in 2008. The production activity had to be maintained during the building time. To lower the investment costs and to gain more storage space the existing structure and its foundation had to be used also for bearing the new parts.

Due to the many planned passage ways across the halls, many bearing points were dropped and the structure required needle shoring at those points. Six independently working crane systems had to be taken in account.

Technical data

The existing building consists of steel frame-work beams and full restrained columns with horizontal and vertical bracing. Its former dimensions were 21.50x40.2x11.0 m.

The new main structure was chosen as a trussed beam with fixed supports. The additional roof- and side bracing provides the whole structure with stability in space. The new dimensions will be 61.5x67.2 m. The height of the extended and left side parts is 11.0 m. The height of the right side part is 15.0 m. The block foundation was used for the old as well as for the new parts.

Software and model

In order to minimize the horizontal deflection of the six parallel working cranes, to have the opportunity of variable optimisation, for overviews, for plan views with foundation, elevations of each axis, for constructions details, for cost estimation: for all these reasons 3D-model calculation with Scia Engineer was chosen.

Because a lot of structural elements with different parameters such as location in the hall, parts, types of material and types of usage... had to be modelled, it was important to create previously a

certain assignment to the layers; this helps to choose or combine the elements according to their properties or user needs.

For the elevations of the building, an exact grid mesh according to the architectural drawings had to be created too.

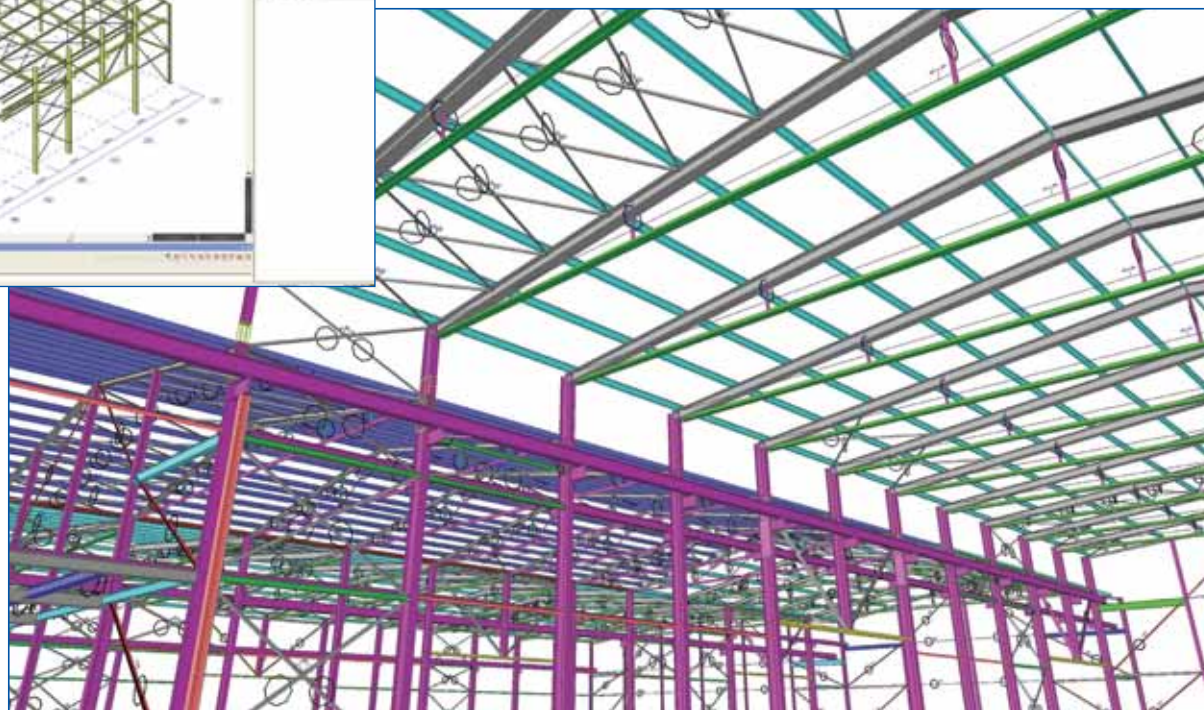
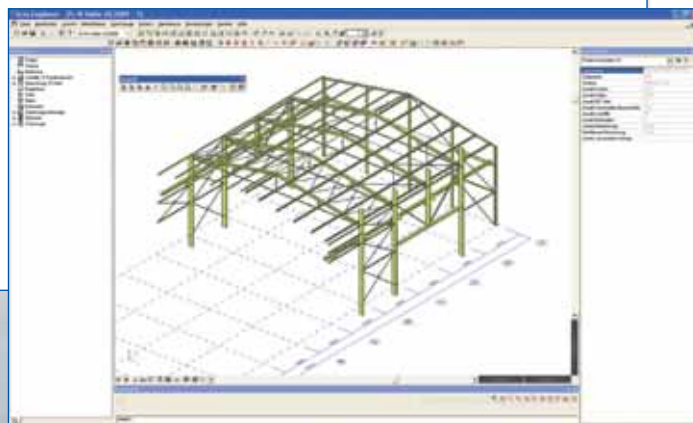
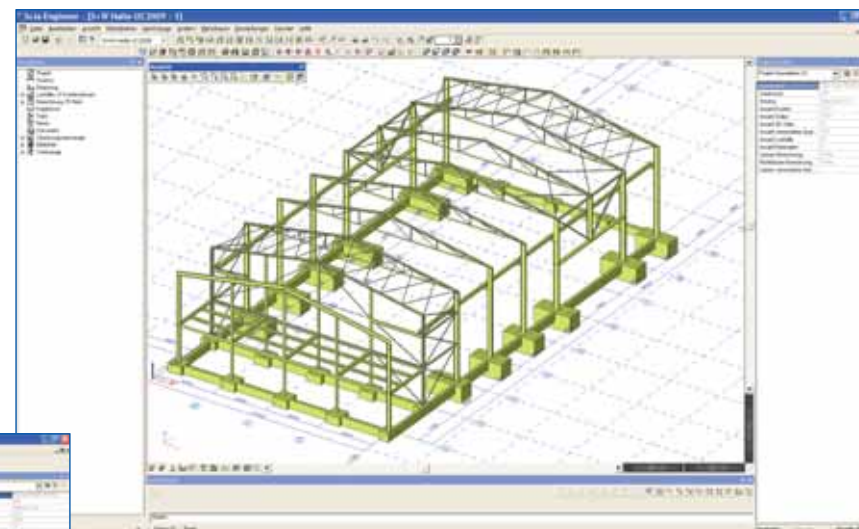
Calculation steps

- Design and optimisation of steel structure with verification according to the IInd order theory.
- Design of the new foundation and verification of the existing foundation.
- Design of the connection points between old and new column parts.
- For the third calculation further detail modelling with plates was needed.

Presentation

Four document parts (Scia files) had to be defined for the output to surpass the Scia Engineer document capacity.

About 40 drawings with views, elevations and details were derived from the 3D-Model.



Extension of storage area for the Steel Trade Company Sachs&Weber

Establis

Contact Bart Maerten
Address Beversesteenweg 612
8800 Roeselare, Belgium
Phone +32 51 43 12 00
Email bmaerten@establis.eu
Website www.establis.eu



establis
STABLE & CREATIVE SOLUTIONS

Establis (voormalig TAB) werd opgericht als éénmanszaak in 1982 door Roger Moortgat, als adviesbureau voor aannemers en constructeurs. Sindsdien is het bedrijf uitgegroeid tot een bedrijf met een 13-tal medewerkers.

Establis is sinds 1995 ISO 9001 gecertificeerd en is lid van ORI, de Orde van Raadgevende Ingenieurs van België.

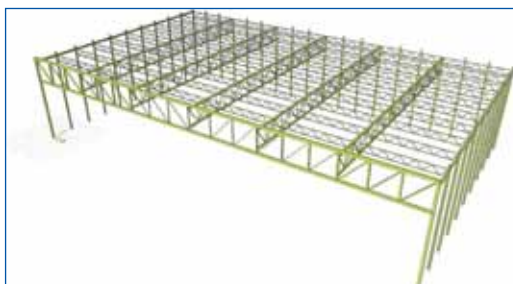
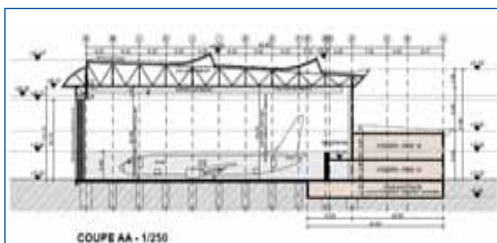
Establis is gespecialiseerd in, en heeft grote ervaring in, het ontwerpen van allerhande bouwkundige constructies. Wij kunnen een brede waaier van oplossingen aanbieden wat garant staat voor een optimale oplossing aangepast aan de specifieke eisen en omstandigheden. Nieuwe ontwikkelingen worden op de voet gevolgd door het bijhouden van gespecialiseerde vakliteratuur en het bijwonen van studiedagen en congressen in binnen- en buitenland.

- Optimalisatie
- Berekeningen gebruik makend van de laatste stand der techniek wat betreft software en rekenmethodes
- Bepalen van de meest geschikte materialen (beton, staal, hout, ...) in functie van budget en uitvoeringstermijn (ook in het buitenland)

- Coördinatie van het ontwerp en de studies
- Aanbestedingsdossier ruwbouw
- Prijsaanvraag en vergelijking
- Werfopvolging
- Berekeningen volgens buitenlandse normen
- De verbindingen van staalconstructies worden door ons ontworpen wat noodzakelijk is voor een optimaal ontwerp
- Ontwerp van houtconstructies
- Funderingen
- Ontwerpen van constructies in aardbevingsgebied
- Eindig elementen berekeningen

Onze referenties zijn zeer breed en gaan van industriebouw over kantoorbouw, naar chemische productie-eenheden, veilingen, diepvriezers en frigo's, appartementsgebouwen, skipistes, parkeergebouwen en bioscoopcomplexen.

Bovendien stelt geen enkel materiaal een probleem voor ons, zoals studie van paalfunderingen, putten, keerwanden, damwanden, staalconstructies, betonconstructies, houtconstructies, metselwerk, ...



Airplane Maintenance Hangar Brussels Airport

Short Description

A few years ago, Hangar 40 at Brussels Airport was destroyed by a fire. The current owner, Sabena Technics, wants to rebuild a new hangar on the same site.

After the fire, the total steel structure was destroyed, but the underground basement and the other foundations were almost undamaged.

The new design has to make sure that the new actions on the basement and the foundations are not bigger than the actions from the former building. By studying old plans and pictures, the structural behaviour of the former hangar could be analysed.

This, together with some new conditions, was the basis of the new structural design.

Project Information

Owner: Sabena Technics
Architect: m & Jm Jaspers - J Eyers & Partners
General Contractor: n/a
Engineering Office: Establis

Construction Start: 2009
Construction End: n/a
Location: Brussels, Belgium



Enkele jaren geleden werd Hangar 40 op Brussels Airport vernield door een brand. De huidige eigenaar, Sabena Technics, wil op dezelfde plaats in 2 fasen een nieuwe hangar bouwen. De nieuwe hangar moet dienen voor onderhoud van vliegtuigen van alle types (Boeing, Airbus, militaire toestellen, ...). Naast een grote hangar moet het nieuwe gebouw ook voorzien zijn van ateliers, magazijnruimtes en kantoorruimtes.

De vernielde hangar bestond uit een kolomvrije ruimte van ongeveer 60 x 150 m. Aan de achterkant lagen ateliers en kantoren (4 bouwlagen) over de volledige lengte: 20 x 150 m. Het geheel was onderkelderd over 30 x 150 m: de kantoorzone is volledig onderkelderd + 10 m van de loods. De kelder was via een hellend vlak aan de buitenkant bereikbaar, waardoor die perfect bruikbaar was als opslagruimte en voor het onderbrengen van de technische installaties.

Na de brand werd de bovenbouw volledig afgebroken, maar alle ondergrondse delen (kelder en andere funderingen) bleven goed intact. De bouwheer wenst deze dan ook te recupereren in het nieuwe ontwerp.

Het is dus zaak om er voor te zorgen dat de nieuwe bovenbouw niet meer belasting overbrengt naar de funderingen dan de vroegere structuur. Via oude foto's en plannen kon de draagstructuur van de vroegere structuur worden ontleed.

Specifiek aan een loods voor vliegtuigonderhoud is dat de voorgevel met de grote poorten volledig moet kunnen geopend worden en in dit geval kolomvrij moet zijn. Bij de vroegere structuur was dit dus over 150 m. Het spreekt voor zich dat dit een enorme impact heeft op de structuur.

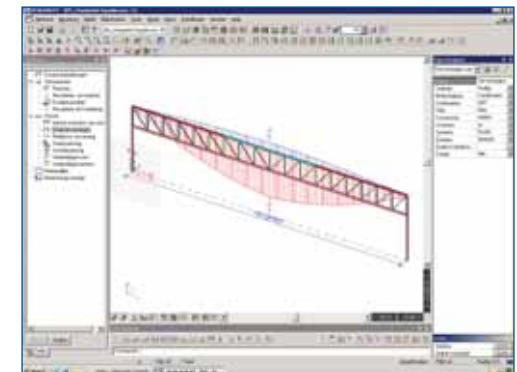
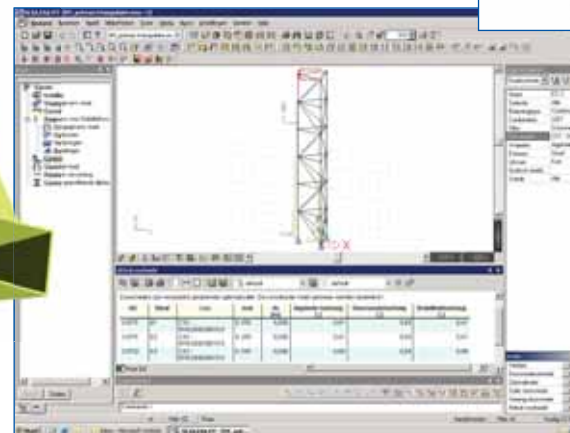
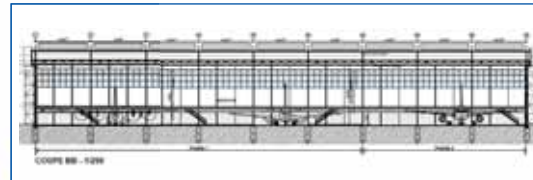
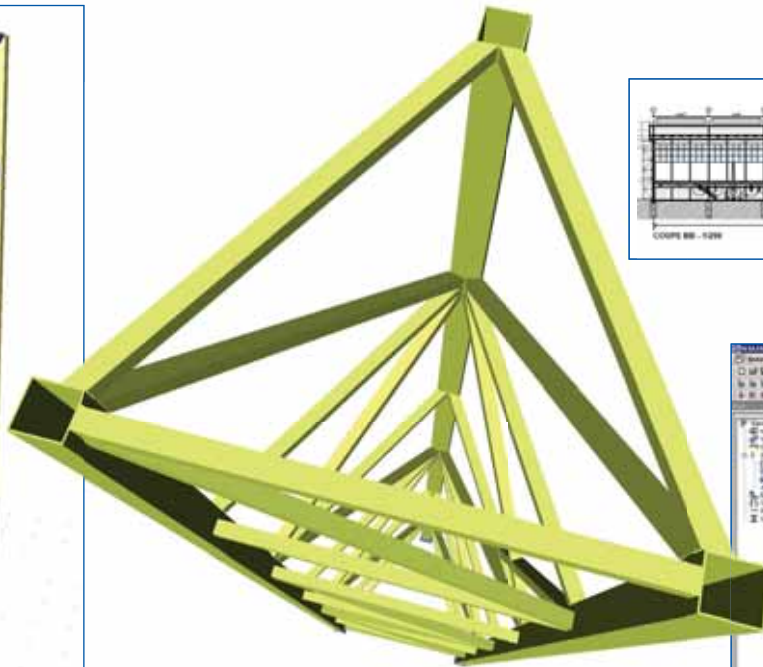
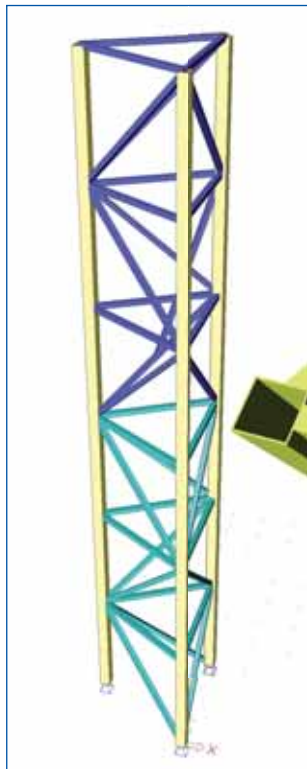
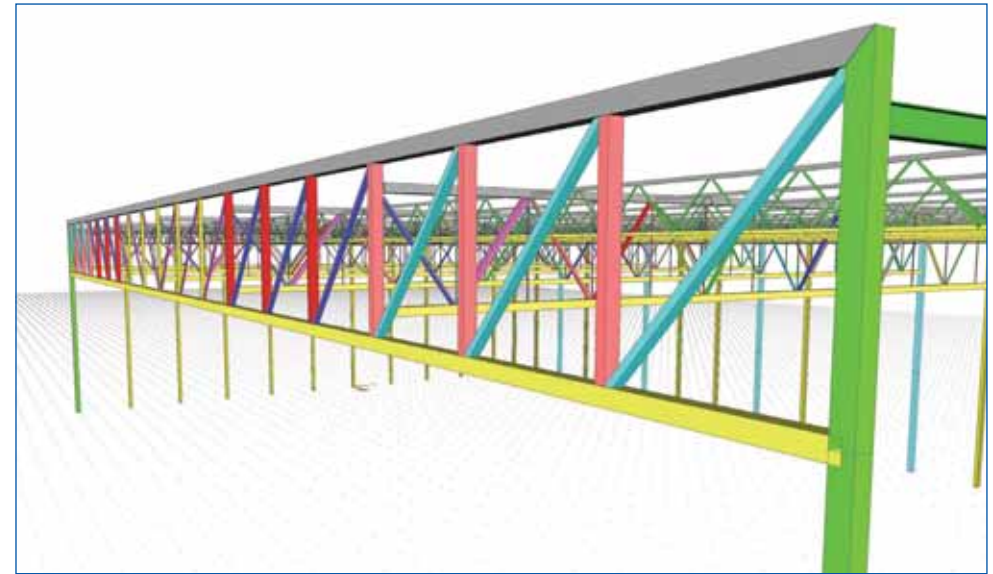
De primaire dakstructuur bestond uit vakwerkliggers, ongeveer alle 16.5 m. Deze vakwerkliggers steunen op een zware kolom die staat op de overgang tussen hangar en kantoor. Aan de kant van de hangar zit de vakwerkligger in uitkraging tot aan de voorgevel (60 m). Aan de kant van de kantoren doet die dienst als dak van het kantoor en wordt op de achtergevel via trekkabels naar beneden getrokken en verankerd in de enorm dikke achterwand van de kelder. Het gewicht van de 4 bouwlagen kantoren dient als tegengewicht. Tussen deze primaire structuren zitten secundaire structuren. De zijgevels zijn slechts kopgevels die weinig dak dragen. Het nieuwe ontwerp moest dus rekening houden met zware funderingen op de overgang tussen kantoor en loods, alle 16,5 m, en lichte funderingen in de zijgevels. Even werd gedacht aan het imiteren van de vroegere structuur. Dit was niet haalbaar omdat de nieuwe kantoren slechts 1 bouwlaag beslaan, eventueel in de toekomst 2. De vakwerkligger kon niet als dak van de kantoren worden doorgetrokken en bovendien is het tegengewicht van de 4 bouwlagen niet meer aanwezig.

De primaire vakwerkstructuur alle 16 m wordt wel behouden, maar niet doorgetrokken boven de kantoren. De zware funderingen tussen loods en kantoren worden herbruikt. Aan de voorgevel is echter een tweede steunpunt nodig voor de primaire vakwerken. De voorgevel moet kolomvrij blijven, maar in het nieuwe ontwerp moet dit slechts over 100 m en niet over 150 m. Men wil in eerste fase een hangar bouwen van 60 x 100 m. Bij het bouwen van de uitbreiding van nog eens 50 m mag de hoekkolom blijven staan. Daardoor is het net haalbaar om boven de poorten een opvangvakwerk voor de primaire structuur te plaatsen van 100 m overspanning. Het vakwerk heeft een maximale hoogte, ongeveer 7 m. De zijgevelkolommen komen op precies dezelfde plaats als de bestaande kolommen en zijn ook slechts kopgevelkolommen.

Ook de algemene stabiliteit moest herbekeken worden. De vroegere loods steunde af tegen het kantoorgedeelte, wat voorzien was van stabiliteitswanden en vaste kernen.

Door het wegvallen van het kantoorblok moet de nieuwe hangar op zichzelf recht blijven. Hij werd ontworpen als een volledig geschoorde structuur: volledig windverband in dak, windverbanden in de 3 gesloten gevels en 2 driehoekige vakwerkkolommen in de hoeken van de voorgevel. De windverbanden in de zijgevels zijn schuin, waardoor die kunnen afsteunen op nieuwe funderingen die tussen de bestaande funderingen vallen. De kolommen in de hoeken van de voorgevel zijn ingeklemd op nieuwe funderingen. Ze ondersteunen enerzijds het zware voorgevelspant en geven anderzijds horizontale stabiliteit evenwijdig met de voorgevel door hun inklemming.

Het project zit momenteel in aanbestedingsfase. Daarom en door het feit dat alles geschoord is, werd de structuur nog niet als 3D-model uitgerekend. Elk onderdeel werd apart gedimensioneerd: secundaire spanten, primaire spanten, windverbanden, voorgevelspant, driehoekige kolommen, ...



Pieters Bouwtechniek Zwolle

Contact J.H. Brinkhuis
Address Grote Voort 5
8041 AM Zwolle, Netherlands

Phone +31 38 421 0820
Email jbrinkhuis@pieters.net
Website www.pietersbouwtechniek.nl



PIETERS BOUWTECHNIEK

Inleiding

Pieters Bouwtechniek is een ingenieursbureau voor bouwconstructies, met goed bereikbare vestigingen in Almere, Amsterdam, Delft, Eindhoven, Haarlem, Utrecht en Zwolle. Het bureau - opgericht in 1974 - telt in totaal 120 hoog opgeleide en ervaren medewerkers, onder wie constructeurs, projectleiders en ontwerpers. Pieters Bouwtechniek onderscheidt zich door een klantgerichte aanpak en een grote mate van betrokkenheid. De platte organisatiestructuur zorgt bovendien voor optimale flexibiliteit en efficiency.

Bureauvisie

Pieters Bouwtechniek onderscheidt zich van andere ondernemingen op het vakgebied door een eigentijdse en creatieve benadering van het vak. Onze werkwijze en benadering wordt, geleid op de gestage groei van onze onderneming en het type opdrachten, door opdrachtgevers en architecten bijzonder gewaardeerd.

Meedenken

Naast de algemene taken van de hoofdconstructeur zoals het ontwerpen, berekenen en tekenen van constructies beschouwen wij vooral het "meedenken" met de opdrachtgever en de overige bouwteam-partners tot één van de belangrijkste taken van een creatief adviseur. Adviseren in bouwconstructies is voor ons meer dan het oplossen van rekensommen. De nadruk ligt op het zoeken naar alternatieven in bouwsystemen en technieken. Naar onze mening is de constructie van een gebouw onlosmakelijk verbonden met de architectuur. Zonder op de stoel van de architect te willen gaan zitten, willen wij juist daarom de dialoog aangaan met onze bouwpartners.

Integraal ontwerpteam

Projecten dienen bij voorkeur door een integraal team te worden ontworpen. Optimale oplossingen op deelgebieden kunnen en mogen niet los gezien worden van het grote geheel. Een integraal ontwerpteam kan naar ons idee optimaal functioneren:

Indien de leden van het ontwerpteam in openheid en gelijkwaardigheid, over de grenzen van hun vakgebied heen kunnen en durven spreken. Indien de leden van het ontwerpteam in staat en voldoende ongeremd zijn om te kunnen "brainstormen". Hierbij moet in aanvang niet direct gedacht worden in oplossingen (antwoorden die men al kent), maar in "ideaal modellen". Onder invoering van de beperkingen (regelgeving, budget, maakbaarheid enz.) zal zich daarna het ontwerpresultaat vormen; en niet anders om!

Geén Mission Impossible

Elke discipline kan en moet aan het bovengenoemde proces een bijdrage leveren. In een vroegtijdig stadium moeten ambitieniveau en budget getoetst worden. De opdrachtgever zal ter inleiding zijn wensen en eisen met betrekking tot het programma, het ambitieniveau, de kwaliteit, het budget en het tijdsplan moeten kunnen motiveren. De architect zal op basis van het voornoemde, aan de hand van schetsen en modellen zijn visie toelichten. De overige adviseurs (constructies, installaties, bouwfysica, bouwkosten) zullen op hun beurt, in de breedste zin van het woord, hun visie geven op datgene wat door opdrachtgever en architect als uitgangspunten en ambitie is gesteld.

Concrete structure of waste bunker REC, Harlingen, Netherlands

The structural design of the concrete and steel structures of the waste incineration plant of Harlingen (the Netherlands) has been made by Pieters Bouwtechniek Zwolle. The concrete structure of the waste bunker has been dimensioned and calculated using a 3-D model in Scia Engineer 2008. The calculation includes the pile forces, internal forces and the horizontal and vertical displacements of the concrete structure. Especially the horizontal displacements of the bunker walls at the level of the crane beams had to be restricted in order to guarantee a safe operation of the waste cranes.

Short Description

Project Information

Owner: OMRIN
Architect: Auke J. de Vries Architecten
General Contractor: Jorritsma Bouw
Engineering Office: Pieters Bouwtechniek Zwolle

Construction Start: 15/01/2009
Construction End: 01/06/2010
Location: Harlingen, Netherlands



Inleiding

De komende jaren blijft een tekort aan verbrandingscapaciteit in Nederland bestaan. Dit heeft tot gevolg dat de tarieven voor verbranding hoog zullen blijven. Vanwege het gebrek aan verwerkingscapaciteit wordt nu veel brandbaar afval gestort, ook Fries afval. OMRIN wil echter zoveel mogelijk afval hergebruiken en vindt storten daarom niet de beste optie. Een onderzoek heeft uitgewezen dat het exploiteren van een Reststoffen Energie Centrale (REC) in Friesland goedkoper is dan het elders laten verbranden van het Friese huisvuil.

Daarom wil OMRIN het brandbaar afval dat vrijkomt uit haar scheidings- en bewerkingsinstallatie (SBI) zelf verbranden. In deze SBI wordt huishoudelijk afval gescheiden in herbruikbare deelstromen, waaronder brandbaar afval dat kan worden omgezet in energie.

Globale projectbeschrijving

Sinds medio 2006 wordt gewerkt aan het ontwerp voor de Reststoffen Energie Centrale (REC) te Harlingen. Het ontwerp bestaat in procesvolgorde uit: Portiersloge met Weegbruggen, Oprit, Ontvangsthal met Werkplaatsen en Magazijnen, Afvalbunker, Ketelhuis, Rookgasreiniging, Slakkenopslag en Schoorsteen. Verder zijn aanwezig in het complex: Bluswatervijvers met een Bluspompgebouw, een Leidingbrug met een lengte van 800 m en een Condensorgebouw.

De installatie bestaat uit één verbrandingslijn met een capaciteit van 230.000 ton afval per jaar. Dit afval wordt per as aangevoerd en gestort in de bunker, een betonconstructie met afmetingen lxbxh 50x33x41 m, met een netto inhoud van 26.500 m³ huishoudelijk afval.

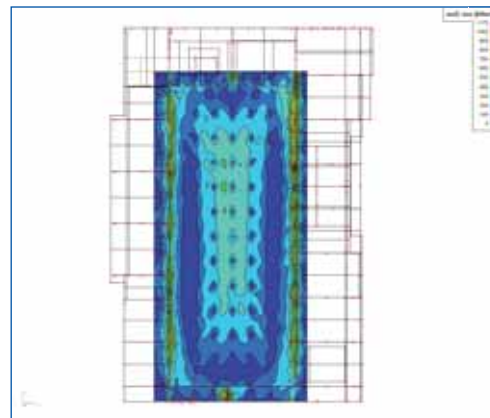
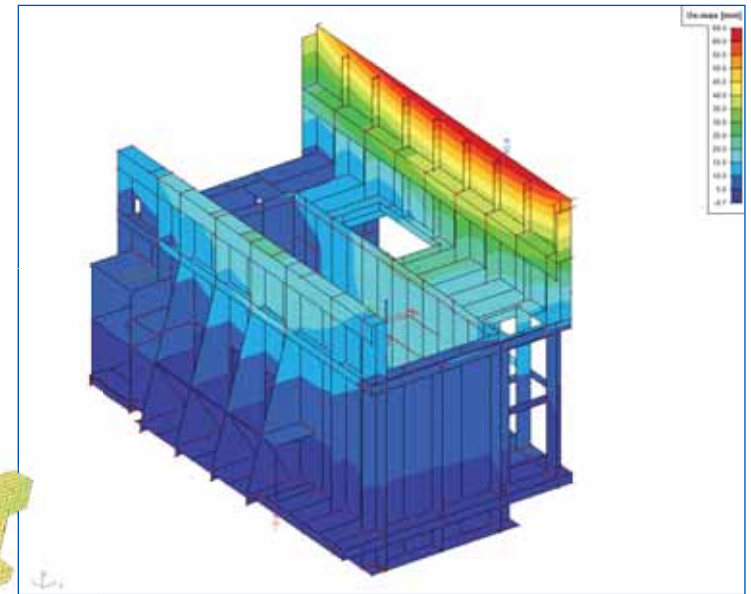
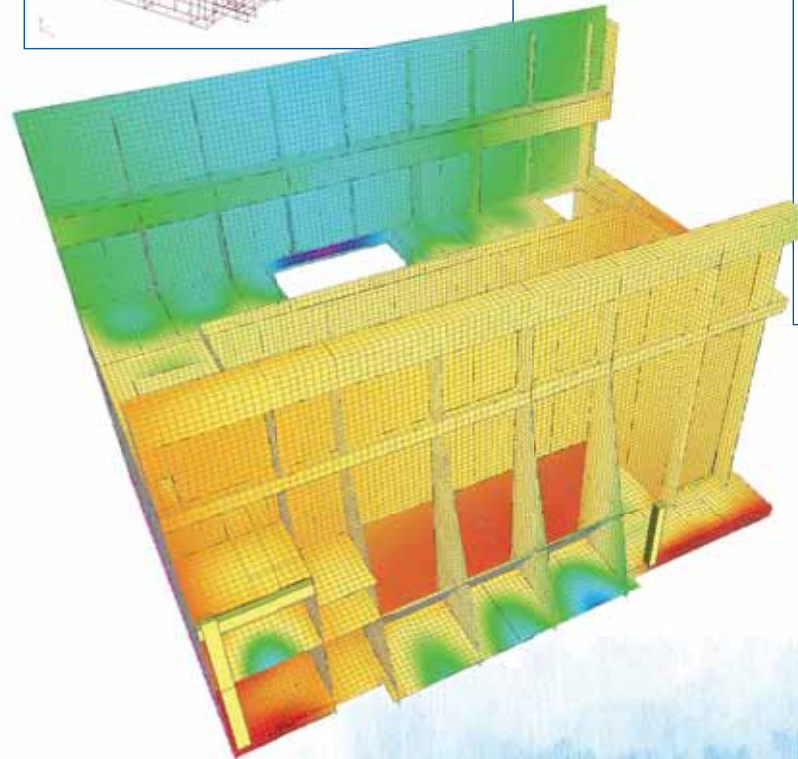
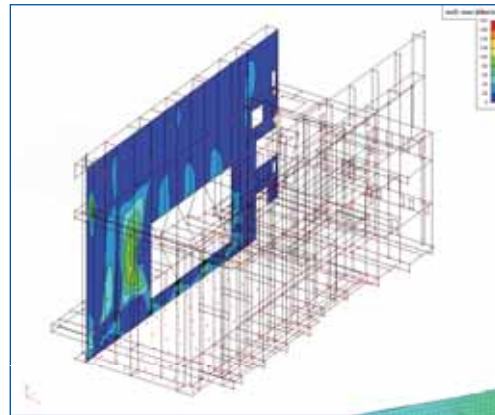
Afvalbunker

In de bunker zijn twee bovenloopkranen aanwezig die het afval sorteren, stapelen en naar de invoertrechter van het verbrandingsrooster en de ketel transporteren. Deze kranen opereren 24 uur per dag, en kunnen zowel manueel bediend worden als volledig automatisch functioneren. De kraanbaanliggers zijn opgelegd op de bunkerwanden. Deze wanden zijn verstijfd met penanten die uitkragen vanuit de fundatieplaat en gesteund zijn door de beganegrondvloer. De betonconstructie van de wanden met penanten en de kolommen wordt uitgevoerd met een glijbekisting, de vloeren worden hoofdzakelijk gerealiseerd met prefab breedplaten die in het werk worden afgestort en de balken worden in het werk gestort met een traditionele bekisting. Op de wanden van de bunker wordt een staalconstructie met vakwerkspanten voor het dak gemonteerd. De dakconstructie is scharnierend bevestigd aan de wanden van de bunker en dient niet als horizontale koppeling voor de bunkerwanden. Een belangrijk ontwerpaspect bij de dimensionering en berekening van de betonconstructie van de

bunker wordt gevormd door het toelaatbare horizontale verplaatsingsverschil van de beide kraanbaanliggers op 33,7 m boven het funderingsniveau t.g.v. de horizontale belasting van het afval op de bunkerwanden, de horizontale kraanbelastingen en de windbelasting. Om vastlopen c.q. ontsporen van de kranen te voorkomen diende dit verplaatsingsverschil beperkt te worden tot maximaal 30 mm.

Gebruik van Scia Engineer

Voor de berekening van de betonconstructie van de afvalbunkers is gebruikgemaakt van het softwareprogramma Scia Engineer 2008. Met een 3D model zijn de paalbelastingen, de interne krachten en de vervormingen berekend.



Afvalbunker Reststoffen Energie Centrale Harlingen

Wendt SIT GmbH & Co. KG

Contact Udo Leist
Address Beindersheimer Strasse 79
67227 Frankenthal, Germany
Phone +49 6233/7704-0
Email uleist@wendt-sit.de
Website www.wendt-sit.de



WENDT



WENDT SIT - Experts for Sound Proofing and Insulation

Starting with rubber products in 1874 WENDT has developed to one of the leading suppliers of noise hoods, sound and thermal insulation and high temperature insulation products. WENDT delivers its noise protection hoods to a lot of branches. First of all is the energy sector with power plants and oil and gas. But also in mining and the chemical industries WENDT is a great supplier of noise protection equipment. We have a lot of pleased customers such as ALSTOM, SIEMENS, BASF, Vattenfall, KBA, Bertsch Boilers, Wingas, Linde, MAN, RWE, Kawasaki, MTU, Daimler and many others.

Up to now WENDT has installed successfully more than 500 noise enclosures. We are the leading supplier of noise enclosures for gas and steam turbines for such companies as ALSTOM, SIEMENS and Kawasaki. Chemical companies like BASF we supply with thermal insulation and sound protection for compressors or other processes. To mining industries WENDT delivers noise protection systems for huge excavators and conveyors for such customers like Vattenfall and RWE.

Noise Protection and Ventilation for Turbines

WENDT belongs to the leading manufacturers of sound enclosures for turbines all over the world. This is an effect of our high standard of quality and our very close co-operation with our customers. Consultation with and feedback of our customers are very important to meet the ideas and needs to the full satisfaction of our customers. These are the main advantages of our noise hoods:

- Patented modular design of panels and

accessories for quick assembly and disassembly without use of bolts

- A quick maintenance disassembly also of single elements is possible
- Sound enclosures are provided in any required dimension, suitable for in- and outdoor location
- Surface of the panels is galvanized, Aluzink® or coated
- Our gas tight sound enclosures are suitable for the installation of fire fighting equipment.
- Delivery of our products in time and safe to every place in the world
- The assembly of the sound enclosures are easily done because of our detailed erection manual
- If requested we execute the professional assembly of the sound enclosures

Engineering

WENDT offers a lot of Engineering Services such as:

- Acoustic design
- Static and seismic calculations
- Design of ventilation systems
- CAD 3D and PDMS
- Circuit diagrams
- PLC programming
- Technical documentation

Components of Noise Hoods

Additional to our main products we deliver many accessories like:

- Structural Steelwork, Platforms, Ladders and Stairs
- Ventilation Systems, Flaps and Fans
- Silencers
- Electrical installation, Cabinets, PLC's and Instrumentation
- Static Filter Systems for Combustion Air

Noise Enclosure Project - Sengkang Power Plant

Short Description

The outdoor noise enclosure is part of a power station located in Southern Sulawesi, Indonesia. Wendt SIT GmbH & Co. KG delivered two noise enclosures with a completely new design, which is expected to become the execution standard for future projects.

The enclosure is designed for an outdoor arrangement with the purpose to replace the turbine building of the power plant. This way of working leads to an enormous cost reduction and was one of the important arguments for the positive decision of the customer for this kind of execution.

The static system of the enclosure in transverse direction consists of frameworks. In longitudinal direction it is stabilized by bracings. The static analysis is calculated using a 3D model to optimize the weight of the structural steel.

Project Information

Owner: PT Energi Sengkang
Architect: Siemens AG Power Generation
General Contractor: Siemens AG Power Generation
Engineering Office: Wendt SIT GmbH & Co. KG

Construction Start: 01/08/2007
Construction End: middle of 2008
Location: Sengkang, Indonesia



The outdoor noise enclosure is a part of the power plant PT Energi Sengkang power plant located in Southern Sulawesi, Indonesia. The owner is Energy World Corp. Ltd.

Wendt SIT GmbH & Co KG delivered two noise enclosures to cover Siemens gas turbines. The two units are designed equal. WENDT was ordered to deliver these noise enclosures with a completely new design which is expected to become an execution standard for future projects.

The noise enclosures are designed for an outdoor arrangement with the purpose to replace the turbine building of the power plant. This manner leads to an enormous cost reduction and was one of the important arguments for the positive decision of the customer to this kind of execution.

The shown noise enclosure has the function to reduce noise emissions caused by a gas turbine and its connected generator. The enclosure is divided into 4 different compartments, one for the gas turbine, one for the auxiliary, one for the Lube oil and one for the generator. Special operation conditions have to be considered during design period to meet the technical requirements of the project.

The enclosed machinery has a big heat loss, so the noise enclosure has to be equipped with a ventilation system to fulfil maximum interior temperatures

lower than 60°C. Higher temperature inside would be harmful for the electrical equipment and would also not allow access of maintenance personnel during operation. Special attention was paid to the hazardous area inside the gas turbine compartment which is possible to occur by a leakage in the turbo machinery system.

The noise panels of the enclosure have the advantage to be removable without losing any connection elements. The wall and roof elements are executed weather- and gas tight as well.

Above of the generator building is a filter house. The loads resulting from this filter house are derived by its own steel structure.

During the design period a lot of interfaces of components had to be considered. Several penetrations caused by the generator bus duct, turbine diffuser, ventilation ductwork and piping had to be integrated into the design of the noise enclosure. Static System:

The static system of the noise enclosure in the transverse direction consists of frameworks. In longitudinal direction the building is stabilized by roof and vertical bracings.

The static analysis according EC3 is calculated using a 3D-model to optimize the weight of the structural steel.

Used software: ESA-Prima Win

The columns of the steel structure are aligned in a way that the front flanges of the column sections have the same outline dimensions to allow easy assembly of the sound damping panels. Therefore additional eccentricities had to be considered. The steel structure is designed for an easy disassembly to allow fast access to the machinery for maintenance and repair purposes.

The following components are a part of the delivery of Wendt SIT GmbH & Co. KG:

Engineering

- Acoustic design of the enclosure elements including splitter silencers of the ventilation system.
- Complete design, layout -, outline-, detail- and erection drawings.
- Static analysis of the steel structure and structural parts of the enclosure including the consideration of seismic and wind loads.
- Design of the ventilation system, fans and filters.
- Design of the electrical equipment and lighting.

Hardware

- Structural steel structure
- Platforms, stairs and ladders
- Wall and roof panels
- Ventilation systems and filters
- Fans
- Lighting
- Seaworthy Packing

Technical Data of the enclosure

- GT-Compartment
Length 10,6 m
Width 8,4 m
Height 6,7 m
- GENO-Compartment
Length 12,2 m
Width 8,4 m
Height 6,7 m
- AUX-Compartment
Length 10,8 m
Width 5,0 m
Height 3,05 m

- Lube-Oil-Compartment
Length 9,15 m
Width 4,3 m
Height 4,8 m

Weight of the steel structure: ~ 27 tons per unit
Area of wall and roof elements: 1700 m²

Program description

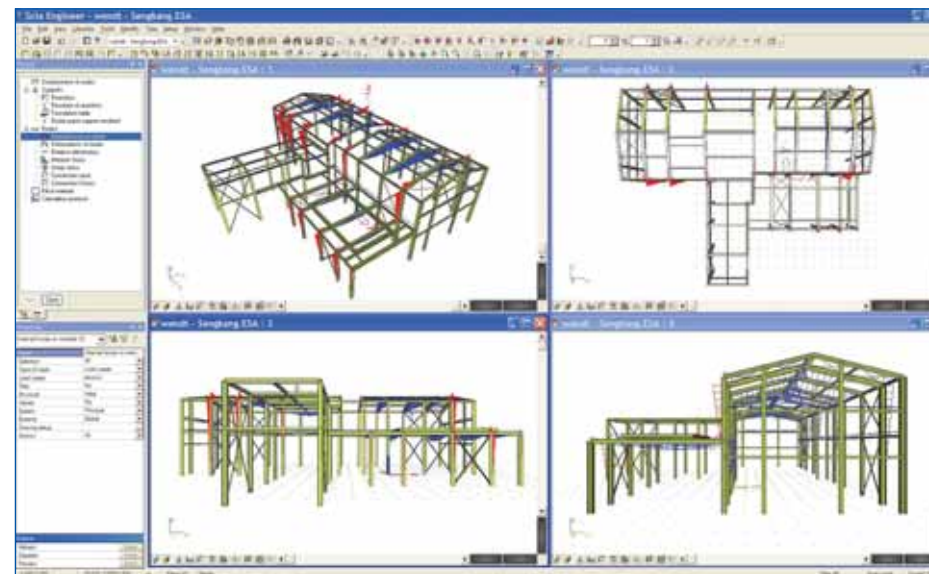
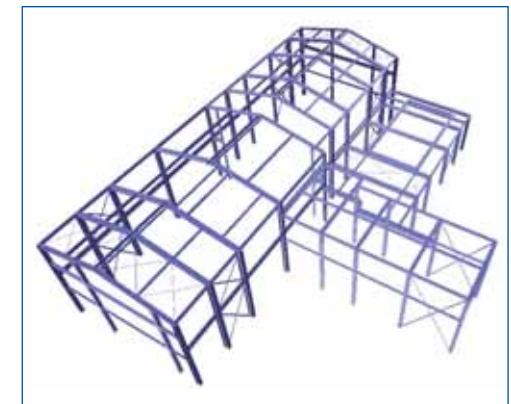
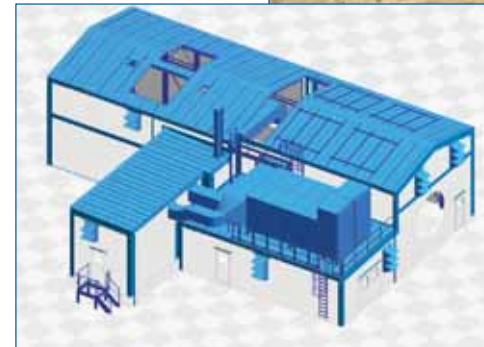
The following software was used for the calculation: ESA-Prima Win 3.100 (now named Scia Engineer).

Advantages of the software

During the design phase it was necessary to check a lot of different versions to find an optimized solution. Thanks to ESA-Prima Win these different checks could be realised very easily. The load cases were easily generated with the graphic load generator. The stress calculations and design of frame corners were executed with ESA-Prima Win as well.

Special requirements

The calculation considered the local seismic and wind loads.





Clever. Allplan.

"Allplan is thoroughly intelligent Software. It helps me keep track of things when designing reinforcements for complex structures. And it lets me know when something is wrong. I think that is really clever."

www.allplan.com

Hardy Loosli, Bern/Schweiz/land



How far dare you go?

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

Apollo Bridge: Architect: Ing. Miroslav Matuščík - Alfa 04 a.s., Bratislava;
Design: DOPRAVOPROJEKT a.s., Bratislava

Category 5: CAE Special Projects

Design of structures with a particular character. In this category we expect e.g. mechanical projects which often form a part of a larger project (storage tanks, conveyer belts, cold store installations, supporting structures), playground equipment, scaffolds, works of art, cranes, tubular connections... at which the analysis/design software has been used. To this category also belong stadiums and spectacular roofs. Winning criteria are originality and complexity.

5



BG Ingénieurs Conseils

Contact Michel Capron
 Address Avenue de Cour, 61
 1007 Lausanne, Switzerland
 Phone +41 21 618 14 62
 Email michel.capron@bg-21.com
 Website www.bg-21.com

WINNER



Le groupe BG...

... est une société d'ingénieurs-conseils active sur le plan international dont l'ambition est d'aider ses clients à bâtir un cadre de vie durable. Ses collaboratrices et collaborateurs constituent une remarquable intelligence collective, capable d'apporter des réponses simples à des problèmes complexes face aux défis du développement de notre planète.

Un succès de plus de 50 ans

L'histoire du groupe BG commence en 1954, lors de la création de la société d'ingénieurs par Daniel Bonnard et André Gardel, tous deux professeurs à l'Ecole polytechnique fédérale de Lausanne. Aujourd'hui, BG est propriété de ses collaborateurs et ainsi complètement indépendant. Depuis plus de 50 ans, nos clients des secteurs publics et privés témoignent leur confiance dans la grande qualité de nos prestations et la compétence de notre personnel.

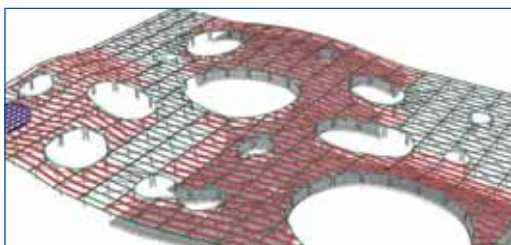
Des prestations étendues

Le groupe BG est actif dans toute la Suisse ainsi qu'au plan international, principalement en France. Ses 300 collaboratrices et collaborateurs offrent

des prestations très larges dans les domaines des infrastructures et du transport, de l'eau et de l'environnement, ainsi que des bâtiments complexes et de l'énergie. Nous excellons dans l'élaboration de projets complexes, exigeants et multidisciplinaires, dans lesquels nos compétences en gestion de projet, analyse de risque et utilisation optimale des ressources sont déterminantes. En tant que planificateur général, nous assumons la responsabilité de l'ensemble des prestations d'ingénierie, allant de la formulation des besoins à la mise en service en passant par le projet et la réalisation.

Trois Domaines

Les infrastructures et transports, l'eau et l'environnement et les bâtiments complexes constituent les principaux domaines de compétences de BG. Des domaines qui ont façonné la réputation de BG depuis ses débuts. En complément, BG intègre pour ses clients des compétences spécifiques appliquées à la gestion des risques, l'expertise et l'énergie, mettant en œuvre des moyens physiques et organisationnels de premier ordre.



Shells of the Rolex Learning Centre

Short Description

This project regards the new prestigious building of the Swiss Federal Institute of Technology in Lausanne (EPFL), designed by the Japanese architect office SANAA.

The main characteristic of this structure of 160m x 120m is that the floor of the buildings follows the convex shape of the two shells of the project. It is aesthetically really breathtaking.

The main challenge of the project was the dimensioning of the extremely slender reinforced concrete shells. Their shape is very irregular, including many patios of large size. Many complex non-linear calculations were carried out with Scia Engineer using a full 3D model: large displacements and 2nd order effects, critical instability modes, construction stages, prestressing and time effects, dynamics and seismic analysis, and, last but not least, stripping by jacks.

Project Information

Owner: EPFL
Architect: Sanaa Ltd, Japan
General Contractor: Losinger Construction SA
Engineering Office: BG Ingénieurs Conseils

Construction Start: 30/09/2007
Construction End: 30/06/2009
Location: Lausanne, Switzerland



Quote of the Jury

"An assembly of complex thin concrete shells providing a visually impressive functional arrangement requiring careful analysis at all stages during the construction. Scia Engineer was used for non-linear and dynamic analysis as well as to simulate the removal of formwork stuts. The result is a facility that blends into the landscape."

Le Rolex Learning Center est le nouvel édifice de prestige à l'entrée de l'Ecole Polytechnique Fédérale de Lausanne (EPFL) conçu par le bureau d'architecture japonais SANAA. La particularité principale de ce complexe de 160m x 120m est que le plancher des locaux suit la forme bombée des deux coques du projet.

En tant qu'expert du projet, la mission de BG a consisté à contrôler et valider les solutions techniques de cet ouvrage exceptionnel.

d'arcs inscrits entre ces patios et sous-tendus par une précontrainte importante disposée dans la dalle sur sous-sol.

La fin du chantier est prévue pour l'été 2009 mais les coques en béton sont déjà décintrées et offrent une vision esthétique exceptionnelle. Les mesures statiques et dynamiques effectuées sur l'ouvrage ont confirmé les résultats des calculs effectués.

Modèle 3D complet

Ces coques ont nécessité de nombreux calculs non-linéaires complexes effectués sur un modèle 3D complet avec :

- Coques modélisées en éléments finis d'épaisseurs variables (40 à 80cm).
- Pieds de coques modélisés par des raidisseurs permettant de déterminer les efforts dans les murs, piliers et pieux du sous-sol en fonction des rigidités relatives de tous ces éléments.
- Précontrainte des sous-tirants dans la dalle (câbles type 31T15s).

Défis statiques et calculs complexes

Le défi principal du projet a été le dimensionnement de ces coques en béton armé présentant des élancements très importants et une forme très irrégulière. Dès l'annonce du choix du projet, de nombreux ingénieurs ont immédiatement manifesté leur scepticisme quant à la faisabilité du projet. De plus, ces coques sont percées de nombreux patios de dimensions importantes. Le système statique de ces coques fonctionne comme une série

Used software: Scia Engineer

Calculs spéciaux effectués avec Scia Engineer

Le logiciel Scia Engineer a été utilisé intensivement dans ce projet hors du commun.

Stabilité globale des coques : Modes critiques d'instabilité calculés avec non-linéarités géométriques et en tenant compte d'une réduction de la rigidité dans les zones fissurées.

Armature importante : Dimensionnement aux ELU et ELS (limitation des contraintes, de la fissuration et des effets différés). Taux d'armatures très importants allant jusqu'à 470 kg/m³ avec l'utilisation de barres de diamètre 50mm manchonnées par soudures.

Influence des étapes de construction : Comportement réel obtenu par superposition de modèles 3D successifs correspondant aux étapes de construction, incluant les étapes de bétonnage, de mise en précontrainte, de décintrage, jusqu'au comportement à long terme.

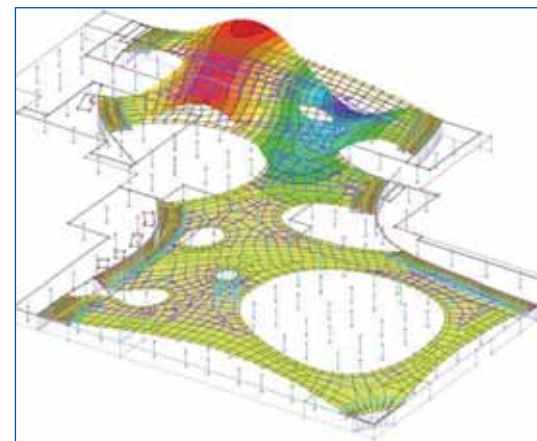
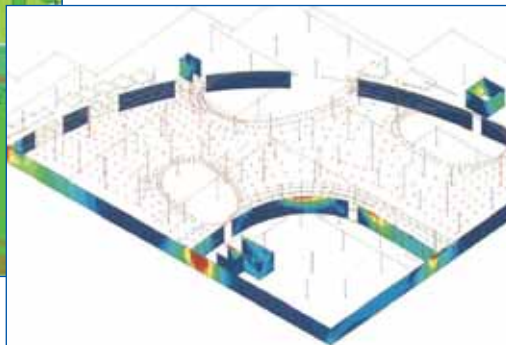
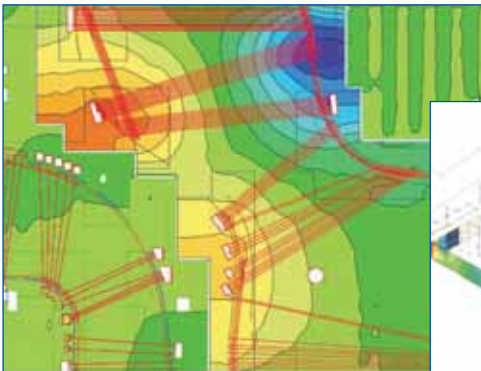
Charpente métallique : La toiture en charpente métallique a été intégrée dans le modèle 3D de manière à lui imposer automatiquement les déformations différées de la coque en béton sur laquelle elle est posée.

D'apparence simple, cette charpente se comporte en réalité comme une éponge souple difficile à raidir et à contreventer par rapport à la déformation de la coque, aux variations de température et aux pressions de vent complexes causées par les ondulations et les patios intérieurs.

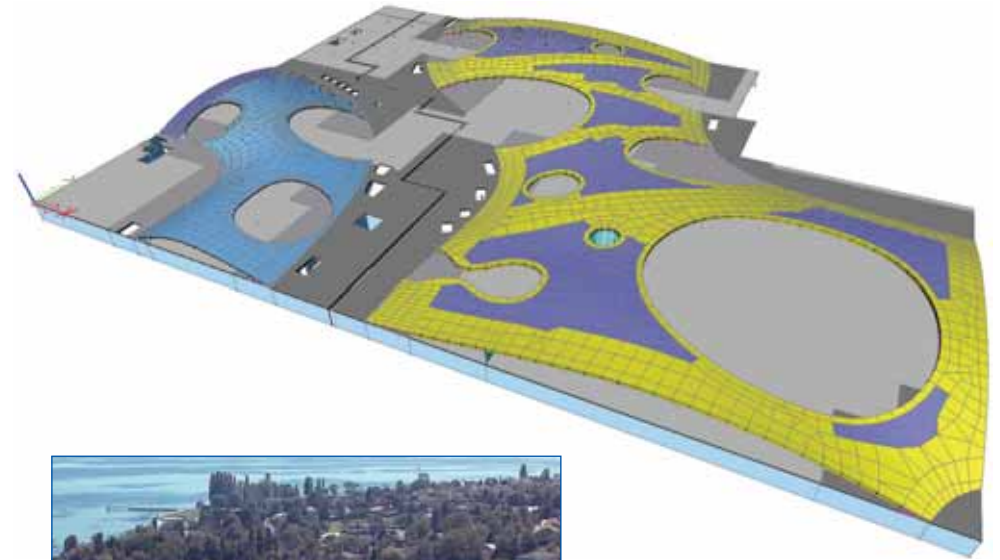
Dynamique-sismique : Le comportement dynamique des coques a été contrôlé par des mesures de vibrations effectuées sur place. La mesure des fréquences propres a permis de confirmer les valeurs calculées et de déterminer la rigidité équivalente de ce béton fortement armé.

Le modèle 3D complet a également permis de procéder à une analyse sismique spectrale complète de l'ouvrage.

Décintrage : Le décintrage des coques constituait une des opérations les plus délicates du chantier. L'opération a consisté à remplacer les 4400 pieds des tourelles de coffrage par une cinquantaine de vérins plats disposés au pied de colonnes métalliques provisoires et à décintrer la coque en pilotant la descente simultanée de ces 50 vérins. Le modèle de calcul 3D a permis d'optimiser le nombre et la position de ces vérins. Grâce à cette procédure, le décintrage s'est effectué en douceur dans un temps record. Les déformations mesurées durant les différentes phases de l'opération ont été conformes aux calculs.



Coques du Rolex Learning Center à l'EPFL



Inženirski biro dr.Saje d.o.o.

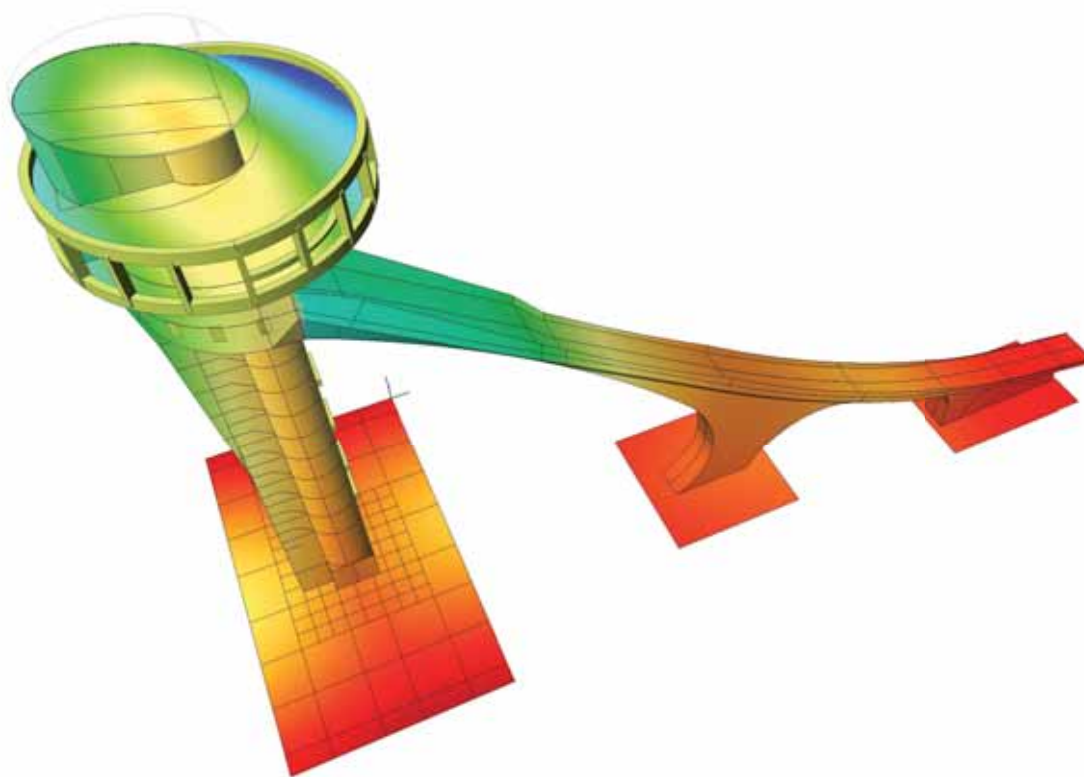
Contact Marko Saje
 Address Kocjanova 12
 1000 Ljubljana, Slovenia
 Phone +386 15120015, +386 41390351
 Email marko_saje@yahoo.com

NOMINATION



The 'Civil Engineering Company dr. Saje LLC' was established in May 2004. Its head and director is Dr.Sc. Franc Saje, Associate Professor at the Faculty of Civil and Geodetic Engineering in Ljubljana, chief director of department of concrete and wooden structures and a member of the European committee for standardization CEN TC250/S2 for concrete constructions. After several years of practical work in Germany, where he participated in important projects

(the summer olympic games buildings - Munich 1972, BMW headquarters,...) and after his later work at the faculty, he wanted to use his expertise in his own company. The company has three employees and several project co-workers. By combining experience, responsible work and zeal, we strive to ensure quality and reliability that clients greatly appreciate.



Erzurum 2011 - Ski jumping center, Turkey

Short Description

The project regards a building including a sports hall and associated premises (bar, services, jacuzzi, dressing rooms; in the basement: a ski service, restrooms, AHU Station, technical room, fitness bar, storage spaces, shop), as well as a Tower with a warm up room, a ski service room on the 12th floor. On the same floor there is a starting place for ski jumpers, at the height of the relative elevation of 40,41 m a.s.l. and the absolute elevation of 2038,79 m a.s.l.

The ski jumps are part of the ski jumping centre that will be hosting the ski jumping competition during the Winter Universiade of 2011.

The static and dynamic calculations for the two ski jumps K125 and K95 were done by our company.

Project Information

Owner: General directorate of youth and sports of Turkey

Architect: Atelje S d.o.o.

General Contractor: n/a

Engineering Office: Inženirski biro dr.Saje d.o.o.

Construction Start: 01/04/2009

Construction End: 2010

Location: Erzurum, Turkey



The investor, General Directorate of Youth and Sports of Turkey, wants to construct, near the new ski jump K95, a building facility with a sports hall and associated premises (bar, services, jacuzzi, dressing rooms and in the basement, a ski service, restrooms, AHU Station, technical room, fitness bar, drink supply storage, restaurant supplies storage, shop with a dressing room), as well as a tower with a warm up room, a ski service room with appertaining restrooms on the 12th floor. On the same floor, there is a starting place for ski jumpers, at the height of the relative elevation of 40,41 m a.s.l., and the absolute elevation of 2038,79 m a.s.l.

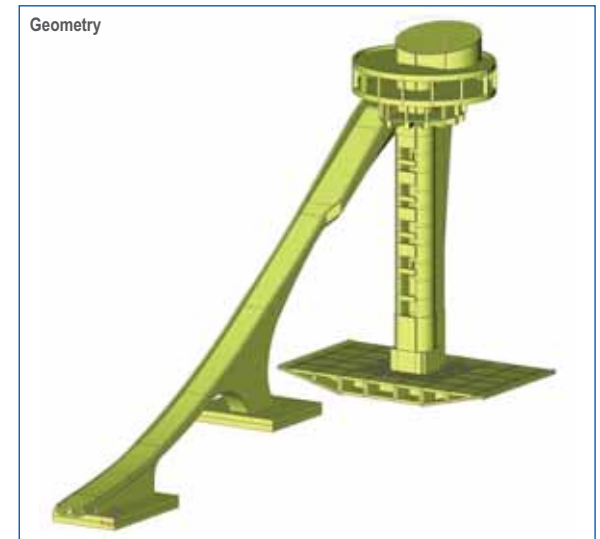
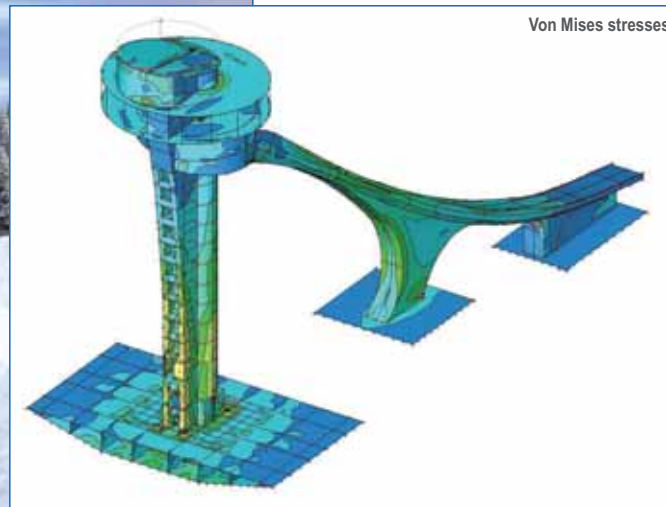
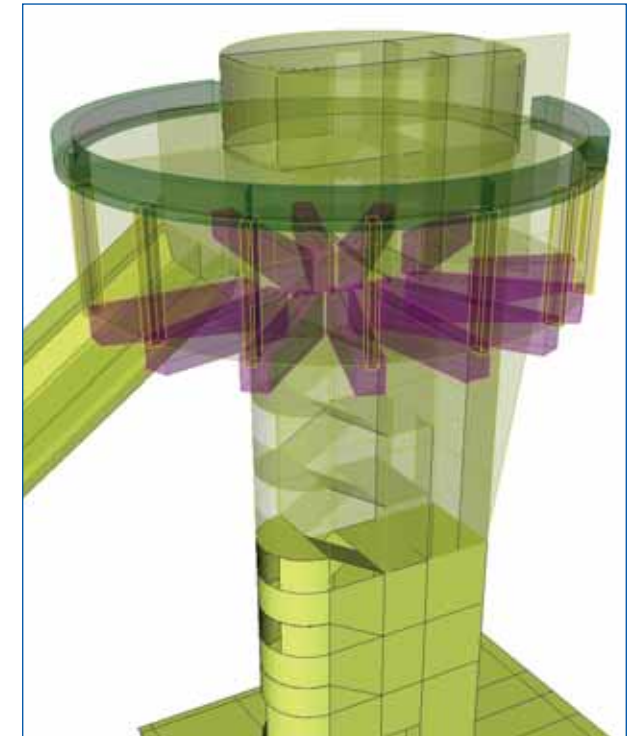
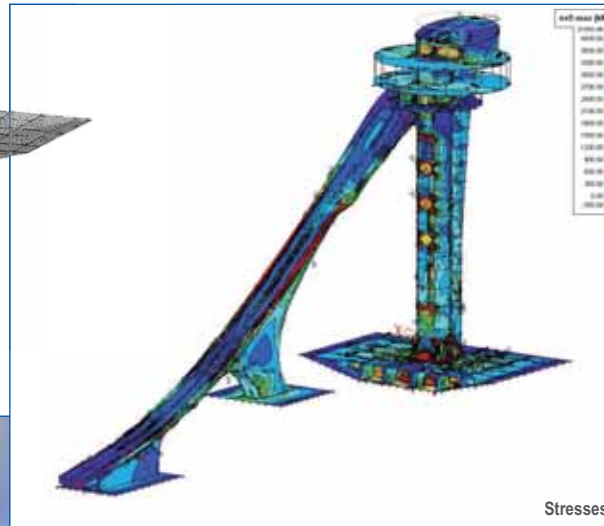
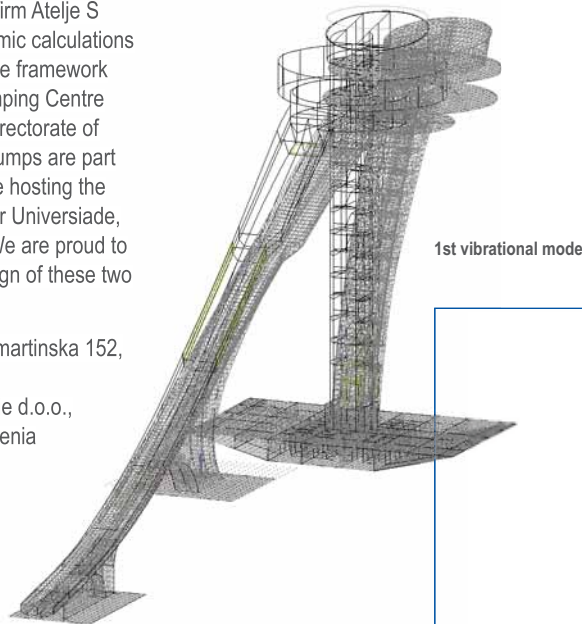
On the 13th floor of the tower, there is a restaurant with a kitchen, and on the next, the 14th floor, at the relative altitude of 48,52 m, respectively, at the absolute altitude elevation of 2046,90 m a.s.l., there is a belvedere terrace with restrooms for visitors and separate dressing rooms for the employees of the restaurant. All the floors of the Tower and Gym are linked by a staircase, from the ground floor terrace and the elevator, from the basement all to the terrace at the top of the tower. The site is located on the edge of the city of Erzurum in Turkey on the site of the new ski jump centre. The Tower and Gym is situated in close vicinity of the new ski jump K95.



Used software: Scia Engineer

Upon invitation of architects from the firm Atelje S d.o.o., we have made static and dynamic calculations for two ski jumps, K125 and K95, in the framework of the project Erzurum 2011 – Ski Jumping Centre – Tower & Gym - for client 'General Directorate of Youth and Sports of Turkey'. The ski jumps are part of the ski jumping centre, which will be hosting the ski jumping competition of 2011 Winter Universiade, but will serve its purpose even later. We are proud to have contributed our share in the design of these two magnificent constructions.

- Project Engineer: Atelje S d.o.o., Šmartinska 152, 1000 Ljubljana, Slovenia
- Civil Engineer: Inženirski biro dr.Saje d.o.o., Kocjanova 12, 1000 Ljubljana, Slovenia
- Structure: Reinforced Concrete



Études et Techniques Internationales

Contact Fabrice Grisot
 Address 9 rue du 19 mars 1962
 BP 285 ZA du rondeau
 38434 Echirolles Cedex, France
 Phone +33 4.76.33.38.21
 Email eti38.dir@wanadoo.fr

NOMINATION



La société ETI, Etudes et Techniques Internationales est un bureau d'études techniques qui a été créé en 1982. Effectif de 11 personnes avec chiffre d'affaires en fort développement. Son siège social est basé à Echirolles dans l'agglomération grenobloise. Elle poursuit son développement dans les régions sud ouest et Grand Est dans les secteurs du bois, des structures métalliques et de la chaudronnerie. Depuis plus de 20 ans son équipe d'ingénieurs et de dessinateurs projeteurs s'adapte aux projets les plus complexes en matière de calculs et de dessins de structure. Ses capacités d'adaptation aux règlements étrangers l'amènent à être présente sur des projets dans le monde entier.

Ses Missions sont les suivantes :

- Études de faisabilité
- Conception et design
- Assistance technique au maître d'ouvrage
- Maîtrise d'œuvre (études de conception, Dossier de Consultation des Entreprises, études techniques et suivi de réalisation)
- Études d'exécution pour bureau d'études générales, d'ingénierie ou société de charpentes métalliques
- Audits techniques et diagnostics

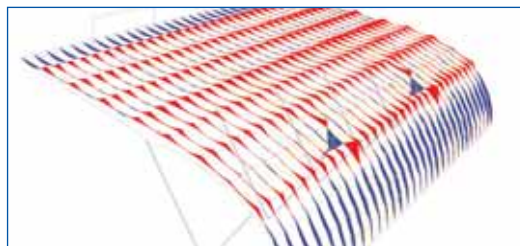
- Conseils et expertises techniques
- Réhabilitation de bâtiments
- Installation générale

Le Type d'étude réalisé s'oriente sur les :

- Structures métalliques, bois, câbles
- Structures mixtes acier-béton
- Ouvrages spéciaux et complexes
- Façades et verrières (acier-verre)
- Couverture bardage
- Calculs en fatigue
- Structures parasismiques
- Renforcement de structures métalliques
- Matériel de manutention, levage
- Chaudronnerie (trémies, silos, gaines)

Ses Domaines d'activités sont les :

- Bâtiments et équipements collectifs : halles d'exposition, centres commerciaux, établissements scolaires, salles de sport ou de loisirs, hôpitaux, murs d'escalade
- Bâtiments professionnels : bureaux, entrepôts, hangars
- Industries : cimenteries, fours à verre, centrales thermiques, usines d'incinération, pétrochimie, trémies, gaines, structures support de process, tour de préchauffage



Stadium of the Alps, Grenoble

Short Description

The Stadium of Grenoble, called now 'Stadium of the Alps' opened its doors in February 2008. The stadium has a capacity of about 20 000 places, extensible to 28 000 ones; it is situated right in the city centre. It seduces by its compact shape, the surface area is 144 x 191 meters. The outstanding technicality makes this stadium one of the more modern of Europe (sixty-seven movie cameras, gigantic screens, interactive systems, 1500 m² of photovoltaic panels in the roof); the alliance between wood, metal and concrete yields a fluid and elegant work of art. This project also confirms that steel remains a material that finds its place in a beautiful architecture all while preserving the ecological aspect at the same time. The company ETI, commissioned by the CABROL company, realized most of the calculations of the principal structure and the glass support.

Project Information

Owner: Communauté d'agglomération La Metro
Mandataire : Territoire 38
General Contractor: Territoire 38 -Grenoble
Engineering Office: INGEROP Rhone Alpes - Meylan 38

Architect: Atelier d'Architecture Chaix et Morel, Paris
Construction Start: 2006
Construction End: 2008
Location: Grenoble 38, France



- Maîtrise d'Ouvrage : Communauté d'agglomération Grenoble Alpes Métropole
- Architectes : Atelier d'architecture Chaix et Morel et Associés
- Maîtrise d'œuvre d'exécution et BET béton : Ingérop
- BET Structures métalliques et façades : AR & C
- BET exécution structure acier : ETI / Gros Œuvre et charpente : Demathieu-Bard
- Verrières, façades et sous traitant charpente : CABROL

Le Stade de Grenoble, rebaptisé Stade des Alpes, a ouvert ses portes le 15 février 2008. C'est un stade qui possède une capacité d'environ 20 000 places extensible à 28 000, construit en plein centre ville, sur la zone de l'ancien Stade Berty et à quelques mètres du tramway, au bord de l'Isère. En pénétrant à Grenoble de la Vallée du Grésivaudan, il semble impossible de passer à côté et, en levant les yeux du Stade par temps clair, la vue sur la chaîne alpine est imprenable.

Ce stade séduit par sa forme précise et compacte, d'une emprise au sol de 144 x 191 mètres, d'une belle technicité qui fait de ce stade un des plus modernes d'Europe (soixante sept caméras, écrans géants, systèmes interactifs, 1500 m² de panneaux photovoltaïques en toiture)

Sa structure, du rez-de-chaussée (locaux annexes et bureaux) jusqu'au deuxième niveau de gradins, est en béton armé et précontraint (poteaux courbes et planchers). Elle est vêtue de parements métalliques, de claustras bois et de panneaux de verre donnant une belle transparence à l'ouvrage. Sur la même trame de 7.95 mètres, une structure métallique galvanisée cintrée définit les rondeurs de l'enveloppe avant d'étirer ses 1'200 tonnes d'acier à 23.50 mètres de hauteur. Une verrière, courbe également, constitue la couverture (18'000 mètres carrés pour cinq mille cent quatre-vingt douze panneaux de verre feuilleté translucide ou strié) qui, par le jeu des pannes acier de sa structure, laisse filtrer toute la lumière de cet endroit. On comprend bien l'engouement des architectes Chaix et Morel pour ce projet.

Sur cet Ouvrage, notre bureau d'études spécialisé dans toutes études de structures métalliques s'est vu confier par la société CABROL une mission d'étude pour effectuer les calculs de la structure et du support verrière, ainsi que les plans d'exécution. Plusieurs notes de calculs :

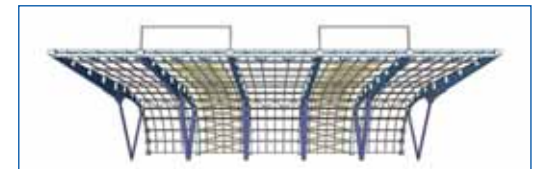
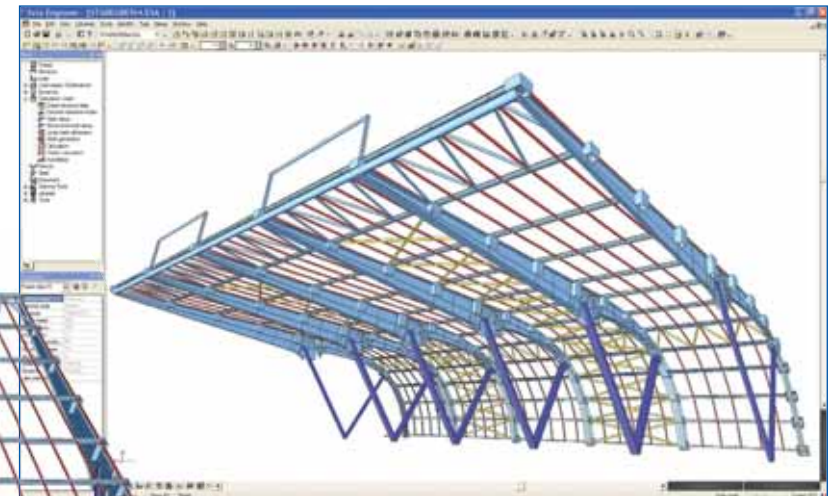
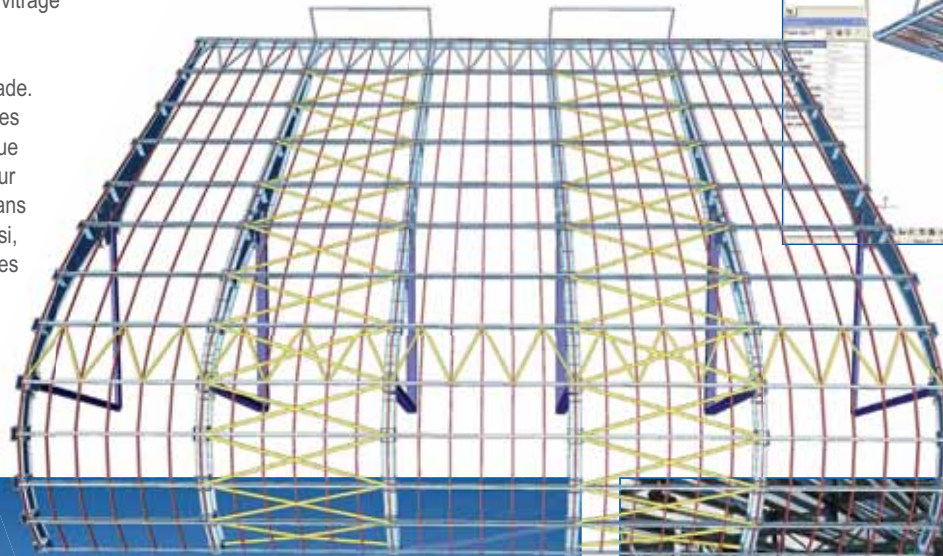
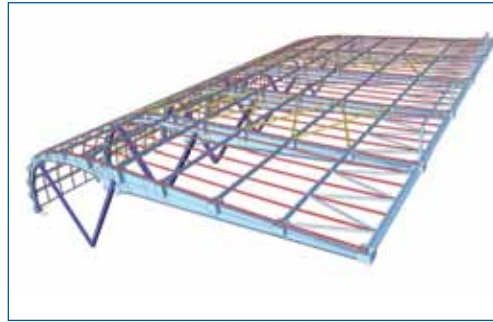
- Note de calcul de la structure métallique – modélisation spatiale des ossatures principale et secondaire
- Note de calcul de la structure support de la verrière y compris claustras latéraux

- Note de calcul de la structure support des claustras y compris pièce moule alu et claustras
- Ainsi que l'ensemble des plans en 3 D des structures calculées.

La structure est composée d'arcs en console de type PRS. Chacun des arcs est ancré au droit des articulations placées au niveau du plancher haut du 1er étage.

Dans la structure, un contreventement dans le plan de la couverture, réalisé en tubes et ronds acier, assure la stabilité longitudinale.

La couverture des gradins est réalisée en simple vitrage feuilleté. L'une des difficultés de ce projet résidait dans la réalisation des assemblages sur les PRS cintrés, et ce particulièrement aux 4 angles du stade. (charpente courbe avec positionnement de plaques de verre planes ; les éléments de stabilité ainsi que les chéneaux qui théoriquement étaient inscrits sur une sphère ont dus être rapportés séparément dans des plans pour une mise en œuvre pratique). Ainsi, chaque trame de 7.95 m est découpée en 6 trames de vitrage. 5'192 panneaux plans sont portés par des menuiseries sur tubes en acier repris sur les pannes.



IMd

Contact Remko Wiltjer, Paul Korthagen
 Address Jan Leentvaarlaan 62
 3065 DC Rotterdam, Netherlands

Phone +31 10-2012381
 Email imd@imdbv.nl
 Website www.imdbv.nl

NOMINATION



Organisation

IMd Raadgevende Ingenieurs is an organisation with a great core of highly qualified employees, who have been applying their experience, know-how and expertise for many years with regard to advising about, designing and working out main structures for buildings. At present the firm consists of 40 highly educated employees. IMd is completely independent and does not have any business links with manufacturers, suppliers, contractors, developers and other interested parties who could influence our impartial and independent consultancy.

IMd is a member of the Dutch association of consulting engineers (ONRI) and possesses the "quality management system" certificate according to NEN-AND-ISO 9001.

It is a firm where the internal communication proceeds smoothly and all employees are kept informed about the most recent developments.

In the almost 50 years that our firm has existed the quality of our service has always been a key issue. The most important characteristics of this service for us are:

- A good product that fits the budget of the client
- A product that fits the concept of the architect
- Creativity and ingenuity
- A flexible and service-oriented attitude

Projects

They vary greatly: from prestigious office complexes to pedestrian bridges, from houses to complex shopping centres, from alterations to new-housing and from simple and small to complex and large. Each project has its own charm and is a

constructive challenge. The projects are carried out at the request of property developers, government organisations, foundations, architects, contractors and private parties. This diversity in clients is made possible because of the independence of the firm of consulting engineers.

View IMd Raadgevende Ingenieurs

The view of IMd is that the success of a project largely depends on the first stage of the design process. The cooperation between architect, client, mechanical engineer and structural engineer is decisive in order to have a fine design in complex projects. In the preliminary design various alternatives are presented for the structure of a building. The advantages and disadvantages of every constructive alternative will then be discussed in the design team. Wishes of the client and architect, requirements in the field of building physics, possibilities regarding the technical installations: they all affect the choice of an optimal structural design.

In addition to the constructive design, IMd regards its role as a coordinating engineer as very important. In its existence IMd has built up a perfect reputation. In addition to the inspection of the basic principles of the drawings and calculations of suppliers of prefabricated concrete and steel constructions, the content of these elements is also assessed with great care. We ask the client to make it possible for us to carry out the consultancy work in a constructive way. In the end this will create the best result for the client.

Health Education Museum CORPUS, Oegstgeest

Short Description

This eye-catching building, located on the A44 motorway and consisting of a sitting human figure, contains not only a museum, but also a congress centre and a car park. In the museum, visitors go on a 'journey through the human body'. Within the museum's set-up, a variety of installations are used, such as lifting platforms and moving walkways. During the construction of the building, various Scia software models were used. The congress and the museum were designed using relatively simple 2D models. The human body was designed using a 3D framework.

Project Information

Owner: Corpus Experience, Wassenaar / Heddes Vastgoed, Hoorn

Architect: PBV Architecten, Wassenaar i.s.m. B3 Bouwadviseurs, Wassenaar

General Contractor: Heddes Bouw, Woerden

Engineering Office: IMd Raadgevende Ingenieurs

Construction Start: 01/06/2006

Construction End: 01/02/2008

Location: Oegstgeest, Netherlands



Introduction

This eye-catching building, located on the A44 motorway and consisting of a sitting human figure, contains not only a museum, but also a congress centre and car park. In the museum, visitors go on a 'journey through the human body'. Within the museum's set-up, a variety of installations are used, such as lifting platforms and moving walkways. During the construction of the building, various Scia

software models were used. The congress and the museum were designed using relatively simple 2D models. The human body was designed using a 3D framework.

Museum

The museum part consists of 8 building layers. A 7,4 m x 6,3 m grid was used, which ensured a limited span of the integrated girders, as well as sufficient flexibility to accommodate the museum's exhibitions. The wind bracing was placed in the building's façades instead of locating them in wind cores, to achieve further flexibility. The many floating plateaus, crevices, elevator- and lifting platform shafts, often uniquely shaped, are fitted within the main framework wherever possible, and are supported by cross-members. This constructive design ensures the possibility of future adjustments, by closing up the crevices or creating additional ones instead.



Used software: ESA-Prima Win

The part of the building where the congress centre is located is cantilevered, protruding over 5 storeys. This can be seen by visitors entering the congress centre directly below this cantilever. All façade planes, including the protruding parts, were designed as 2D models.

Congress centre and car park

Noticeable features of the congress centre are the large column-free spaces and its cantilever, protruding over the split-level car park. These are created by an architectural lattice framework, which also ensures the stability. The façade beams have been outfitted with lattice girders, which in their turn are covered with steel roof slabs. This façade lattice framework enabled the relatively easy construction of the 5-metre cantilever. The lattice framework was calculated with the use of ESA-Prima Win.

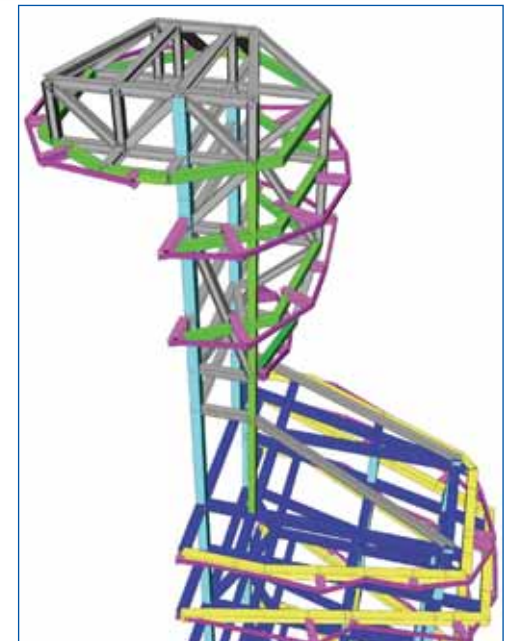
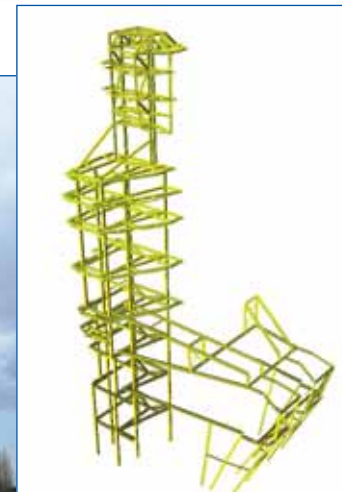
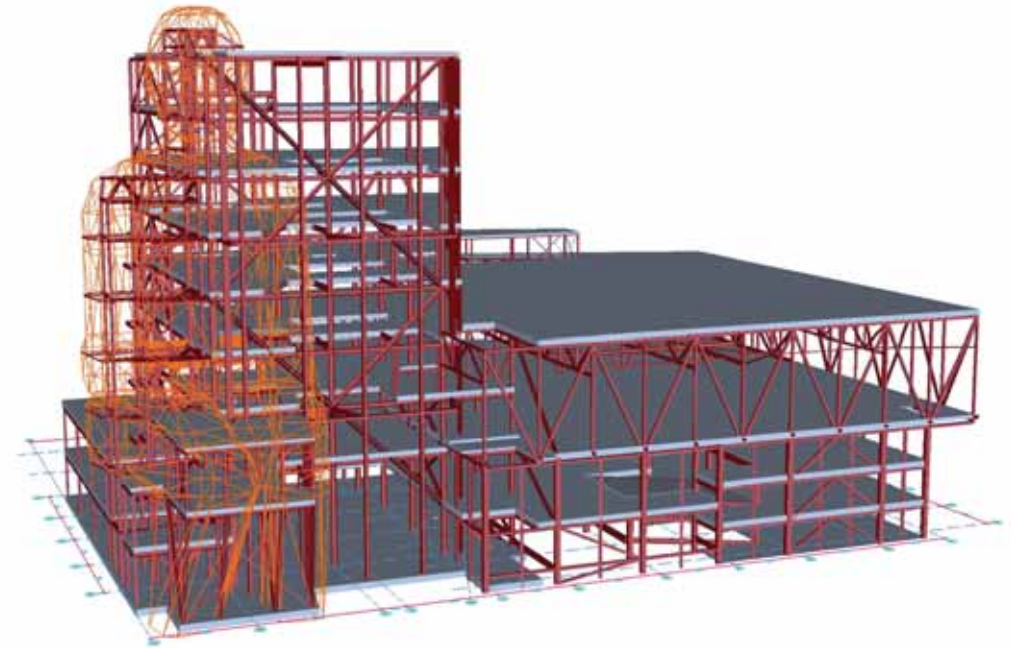
Human body

The museum's façade shows the most remarkable feature of the building: the model of a human body, measuring 35 metres. The steel framework of the figure was custom-designed, surrounding the escape staircase in the body's torso. It was constructed from stabilising rings on storey level. The weight is carried by the body's spine, using 6 columns. Taking into account the uninsulated nature of this construction, the vertical connections with the building have been made flexible, which takes care of possible thermal deformation. For this reason, too, the head above the museum's roof has been made to protrude from the main structure. By prefabricating the body's head right next to building, the costs of an expensive scaffold were saved. The

placing of the head, by a mobile tower crane, saw the spectacular celebration of reaching the building's highest point.

For the construction of this human body, two computational models were used. The first, a 3D framework, showed a schematic presentation of the head and the torso. These transfer their weight vertically. The legs were captured in a second model, which was shifted from the torso. This part rests on a section of the museum's roof. During the construction, the 3d model was also used to determine the weight of parts of the building, as well as for calculating the head's mass centre, including the covering; this consequently determined the suitable hoist points.

The development of a special connection between façade planes (made of Corten steel) and the steel construction enabled the façade to be attached without taking special measurements. This resulted in an extremely short construction period. The connection consists of a bushing, which can be adjusted to three levels of manoeuvring space. The bushing is placed on a wiring end, which in its turn is part of the steel construction. By placing a wooden beam between two adjacent bushings, one of the many indentations is realised in the faceted cover.



Abicon N.V.

Contact Jan De Poortere
 Address Beneluxlaan 4
 8700 Tielt, Belgium
 Phone +32 51 40 23 92
 Email info@abicon.be
 Website www.abicon.be



Abicon N.V. is een onafhankelijk ingenieursbureau dat zich bezig houdt met het berekenen van bouwkundige constructies in staal, beton en hout, in de publieke en de private sector.

Ons kantoor is in belangrijke mate actief in België, al worden de laatste jaren vaker buitenlandse opdrachten uitgevoerd waaronder studies voor projecten in Roemenië, Tsjechië, Slowakije, Frankrijk, Nederland, Turkije, Dubai, USA, ...

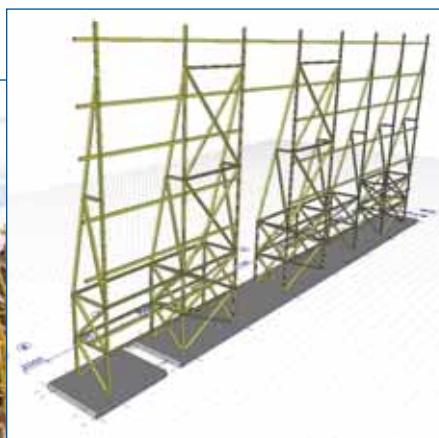
Onze hoofdactiviteit omvat het dimensioneren van:

- Industriegebouwen en stapelplaatsen
- Appartementgebouwen
- Verkavelingen en woningen
- Beschoeiingen

Verder adviseren we in:

- Saneringen
- Gevelrenovaties
- Gerechtelijke expertisen

De grootste troeven van het kantoor zijn de ruime ervaring (25 jaar actief in de sector), de up-to-date kennis en uitgebreide software, de persoonlijke service na aflevering van de studie, het actief nadenken over economisch en praktisch ontwerpen, sterke flexibiliteit, ...



Short Description

New Anspach Center, Brussels

Designed as a modern-day tribute to the prestigious past of the Brussels of the 'Belle Epoque' period, the Anspach is a mixed development project, covering a total surface area of 31.000 m². Its bold architectural design and the quality of its infrastructures cater to the high expectations of a discerning clientele. The project entailed the conservation of a considerable proportion of the facades of the existing buildings to allow them to blend in harmoniously with the urban tissue. The Nemetschek Scia software was used to design the structure which held the remaining facades during construction.

Project Information

Owner: Fortis Real Estate
Architect: Montois Partners Architects
General Contractor: n/a
Engineering Office: Abicon N.V.

Construction Start: 01/01/2007
Construction End: 01/09/2009
Location: Brussels, Belgium



Het Anspach Center heeft een rijke geschiedenis. De bouw, die in verschillende fases verliep, begon al in 1898. Eerst was er 'Le Grand Bazar', ontworpen door Victor Horta in 1903. Daarna werd het heringericht door de bekende Zwitserse art deco architect Michel Polak, in 1927 en 1935, en veranderde de naam in Galeries Anspach. Toen dit warenhuis failliet ging, kocht de stad in 1983 het gebouw op. Zo kon het van de ondergang gered worden. Op dat moment was er geen interesse van particuliere investeerders voor het vrijgekomen pand. Sinds 1994 is de concessie voor de benedenverdieping, de gelijkvloerse en eerste verdieping in handen van Nouvelles Galeries du Boulevard Anspach (NGBA), dat eigendom is van Fortis Real Estate.

Via een publiek-private samenwerking tussen Fortis Real Estate, de stad Brussel en het Brussels Gewest zal het nieuwe Anspach Center plaats bieden aan een casino, een hotel, winkels en woningen. De totale investering wordt geraamd op 40 miljoen euro en zou ongeveer 500 nieuwe banen scheppen.

Algemeen concept: Archi 2000
Concept van de nieuwe gevels en de commerciële ruimte: Atelier du Sart Tilman
Uitvoerend architect: Montois Partners Architects
Projectontwikkelaar: Fortis Real Estate

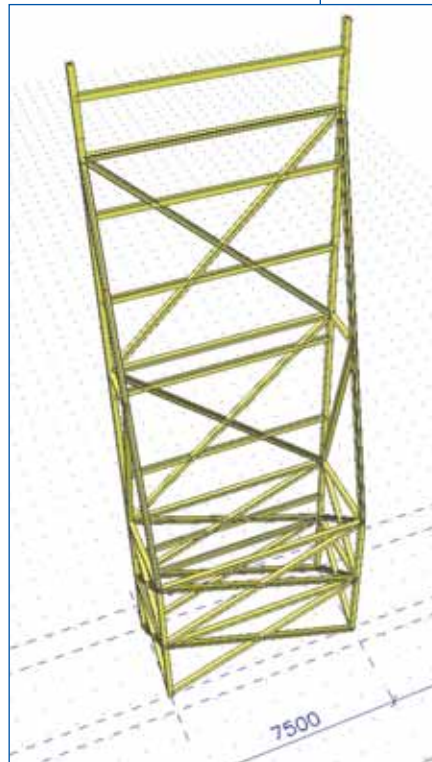
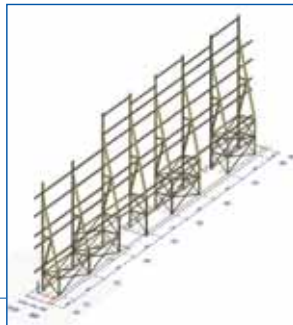
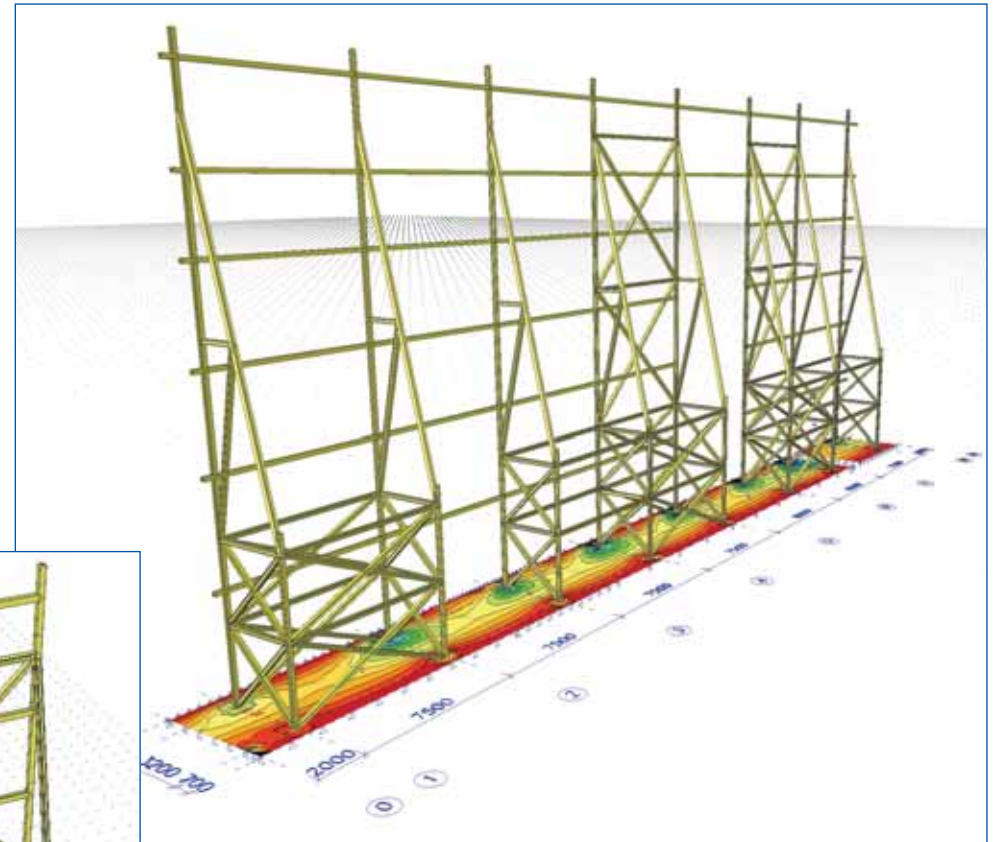
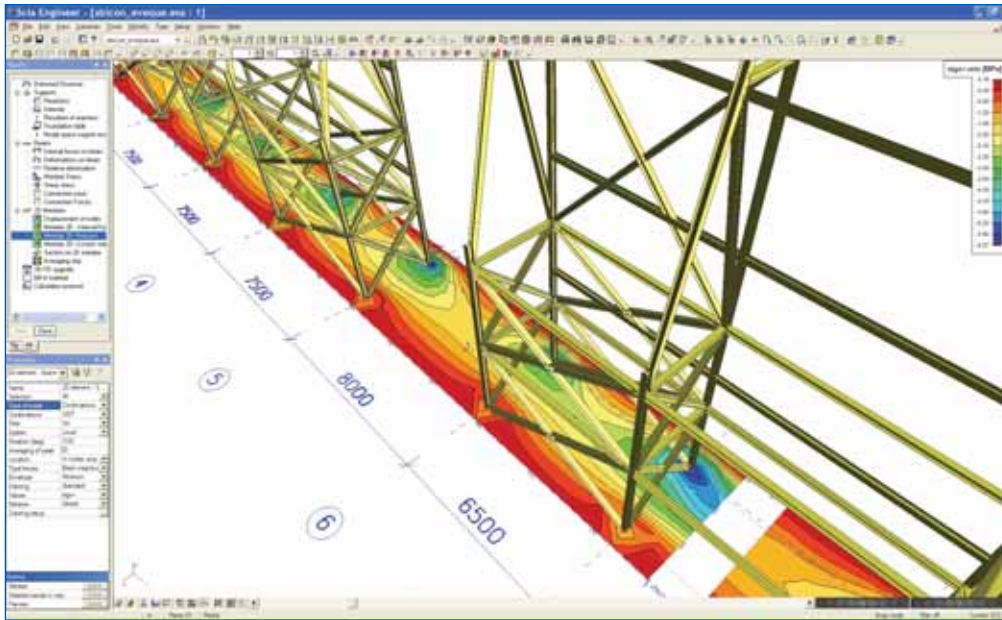
Een grote uitdaging in het project was het behouden van de geklasseerde gevels na afbraak. Hiervoor werd beroep gedaan op de firma

Stabil BVBA uit Meulebeke, die een gevelschoring met ballast voorstelde en heeft uitgevoerd. De stabiliteitsberekeningen werden uitgevoerd door Abicon N.V. uit Tielt.

Naast het inwendig evenwicht van het gevelschoringssysteem, was de kantelveiligheid en het vervormingsgedrag (uitwendig evenwicht) van de totaliteit van groot belang.

Het gebruik van de Nemetschek Scia software liet toe het geheel zeer correct te modelleren. De invloed van onbekende factoren zoals het gedrag van de ondergrond onder de ballastplaat op het geheel van de constructie (bvb. nutsleidingen, metrotunnel, rioleringen, ...) konden met Scia Engineer zeer goed gesimuleerd worden. Lokale heterogeniteiten konden worden gemodelleerd waarbij steeds het totaalbeeld van de stabiliteit, inwendig en uitwendig, kon worden beoordeeld. Via monitoring van de vervormingen tijdens de uitvoering werden de aangenomen parameters beoordeeld.

Used software: Scia Engineer



ACO Industries k.s.

Contact Jiří Loniček
 Address Havlíčkova 260
 582 22 Přebyslav, Czech Republic
 Phone +420 569491232
 Email jlonicek@aco.cz
 Website www.povrchoveupravy.cz



ACO is present with independent companies in over 40 countries on all continents.

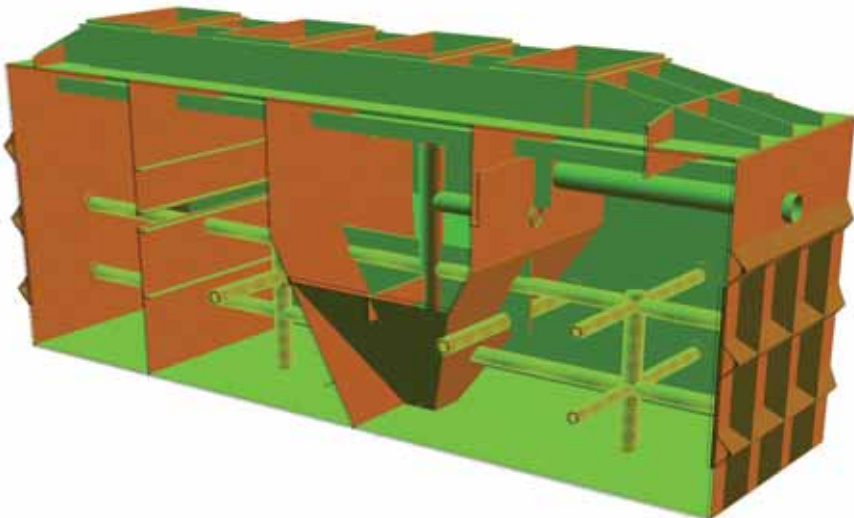
ACO has its own production sites in 12 countries including Australia and the USA.

At the same time as respecting national cultural differences, the focus of our marketing activities is always the ACO brand with its excellent image, high quality standards and unique competence.

ACO Group is the worldwide leader in the manufacture and supply of corrosion-resistant polymer concrete and stainless steel drainage systems for external and internal applications. With more than 40 years of valuable experience in the removal and containment of wastewater, ACO is now

entering the field of wastewater management with systems for the treatment and re-use of grey water.

ACO's modern, state of the art manufacturing plant produces high quality products which are used in projects world-wide.



ACO Clara sewage treatment plant

Short Description

This project regards a treatment plant for sewage; it is designed for the complete biological purification of domestic waste water. The mechanical pre-treatment part is formed of a sedimentation tank with a high buffer area volume. The biological part of the ACO Clara consists of an activation tank and a built-in final sedimentation tank. The activation tank is aerated by micro-bubble aeration.

The analysis part of the project consisted of the stress check and stability analysis of the polypropylene tank of the plant. The complicated geometry of the tank was modelled including all of the technological pipes and inner parts to optimize the polypropylene material consumption. The finite element stability analysis using the iterative solver was used to prove the critical multiplier of the loading greater than 2 ensuring buckling resistance of the tank.

Project Information

Owner: ACO Industries k.s.
Architect: ACO Industries k.s.
General Contractor: n/a
Engineering Office: ACO Industries k.s.

Construction Start: 12/10/2008
Construction End: 20/10/2008
Location: Přebyslav, Czech Republic



Characteristics and application

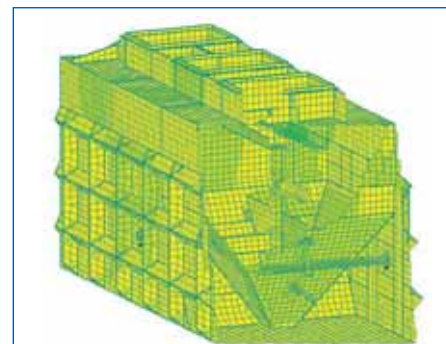
ACO Clara sewage treatment plants are designed for the complete biological purification of domestic waste water:

Treatment process

- Mechanical pre-treatment
- Biological treatment by activated sludge
- Final gravity sedimentation

Technical data

- Diameter D [mm] 2350
- Length L [mm] 2870
- Width W [mm] 2440
- Height H [mm] 2640



Technology description

The ACO Clara sewage treatment plant consists of a mechanical pre-treatment part and a biological compartment.

The mechanical pre-treatment part consists of a sedimentation tank with a high buffer area volume. The sewage water enters the ACO Clara unit via the inlet pipe and flows into the buffer area of the common buffer and storage tank. Settable solids fall to the bottom of the tank and floating matter is caught by a scum board, thus protecting the raw sewage air lift pump against blockage. Hydraulic peaks at the inlet of ACO Clara sewage treatment plants are absorbed in the buffer area. The pre-treated water is then pumped at a uniform flow rate from the buffer area into the biological part of the plant. Hydraulic peak equalising considerably increases the stable purification efficiency.

The biological part of the ACO Clara consists of an activation tank and a built-in final sedimentation tank. The activation tank is aerated by micro-bubble aeration. The water goes from the activation tank into the final sedimentation tank, which enables treated water to be separated gravitationally from activated sludge. The treated water flows out of the sewage treatment plant through the outlet connection. The activated sludge falls to the bottom of the final sedimentation tank, from where it is pumped back

as return sludge and also partly into the storage area as surplus sludge. The final sedimentation tank is optionally equipped with a skimmer for the automatic collection and removal of floating sludge from the water surface. This device reduces maintenance work during the operation.

Used Modules

- Linear static analysis of complicated shells
- Intersections
- Stability of shells
- Geometrical Nonlinearity
- Intelligent document

Analysis description

Plastics structures exhibit a viscoelastic behaviour, dependent on time of load exposition, temperature and stress level reached in the material. The analysis of the thermoplastics starts with the long term strength and creep modulus determination. The number of analysis necessary is then related to these conditions. In case of scrubber 2 crucial states were defined – working state and the short term loads states. Both states have the same geometry and model of the construction but differ in the modulus of elasticity and in the allowable stresses. As a result 2 independent linear analyses and 2 stability analysis were performed. 2 documents are enclosed.

Experience

The design of thermoplastic process equipment, using the appropriate design parameters and material properties can be completed with a combination of hand calculations and computer run Finite Element Analysis (FEA). FEA is necessary to determine peak stresses at discontinuities, corner joints, and to verify strain limits etc. For a complete FEA analysis to be executed for thermoplastic process equipment, a non-linear analysis should be accomplished. However, this is usually impractical due to time, lack of detailed material strength design data, and the relatively low allowable design stresses used. Satisfactory designs have been consistently accomplished by using a linear elastic FEA approach and by using a constant on required years of durability dependent creep modulus value for the design allowable stresses.

Measurements of fabricated thermoplastic structures indicate the linear elastic approach to be a viable and relatively accurate prediction of equipment stresses and deformations.

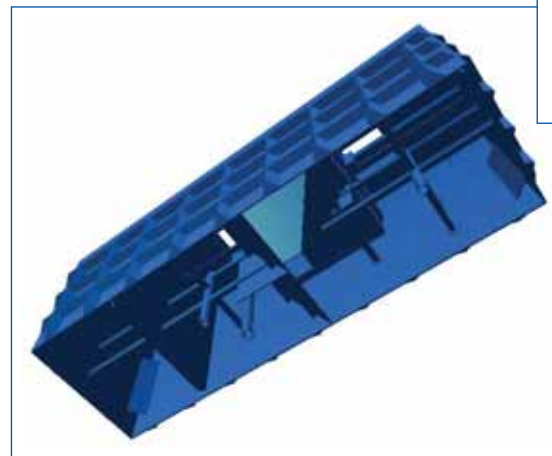
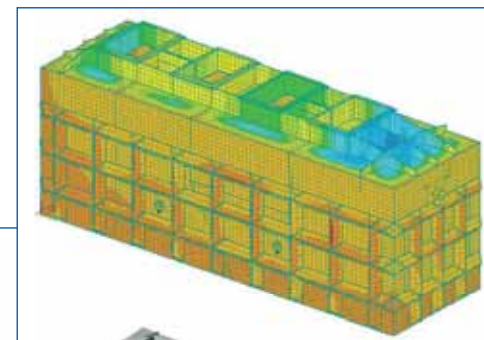
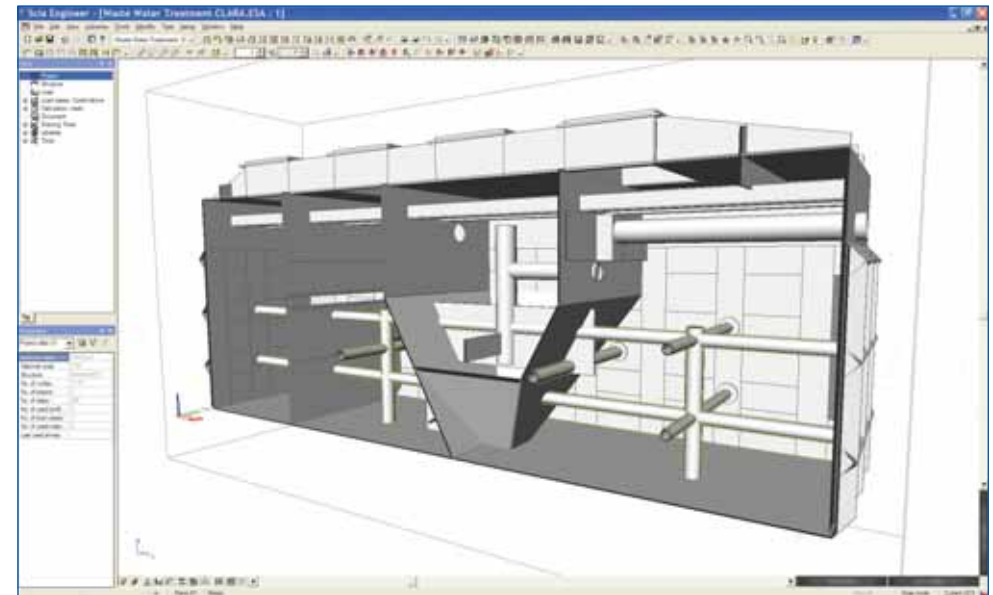
Conclusion

Complicated shapes of thermoplastic vessels require powerful tools for simplifying the geometry creation – intersections are the necessity. Several linear solutions of the structure varying in creep modulus in relationship to the temperature, time of load exposition and the stress level reached must be analysed. Each of the linear analysis must also be complemented by the stability check of the construction for the same creep modulus value.

Sometimes the stability analysis does not give the positive values of the critical factors, depending on the geometry, loads and supports. Then the geometrical nonlinear analysis must be used to find out the remaining load bearing capacity of the structure, several nonlinear analyses with regularly increased loads have to be performed till the collapse of the solver gives the critical load factor value.

The number of equations solved normally varies between 100.000 – 1.000.000. So the requirements for really fast solver are great, mostly the iterative solver takes place.

All above mentioned features are included in ESA-Prima Win software, the best solution for FEA of the thermoplastics vessels I have ever used.



ANTEA

Contact Benjamin Denis
 Address 3 avenue Claude Guillemin
 BP 66119
 45061 Orleans, France
 Phone +33 2 38 64 39 48
 Email b.denis@antea-ingenierie.fr
 Website www.antea-ingenierie.fr



Historique

ANTEA est une société indépendante d'ingénierie et de conseil en environnement. Créée au sein du BRGM (Bureau de Recherches Géologiques et Minières) en 1994, pour reprendre en exclusivité en France et à l'étranger les activités d'ingénierie et de conseil du Groupe, la société ANTEA est devenue totalement indépendante depuis 2003.

Historiquement spécialiste des ressources du sol et de sous-sol, ANTEA a su, au fur et à mesure des années, développer une expertise des sciences de l'environnement. C'est aujourd'hui la capacité à combiner les compétences, dans une vision transversale des problématiques environnementales, qui crée le talent particulier d'ANTEA.

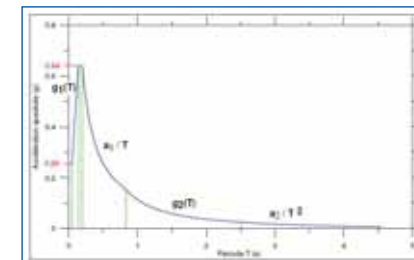
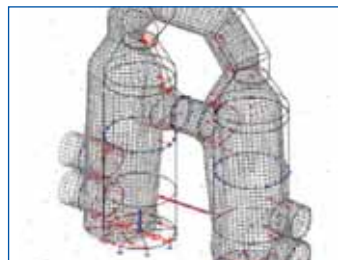
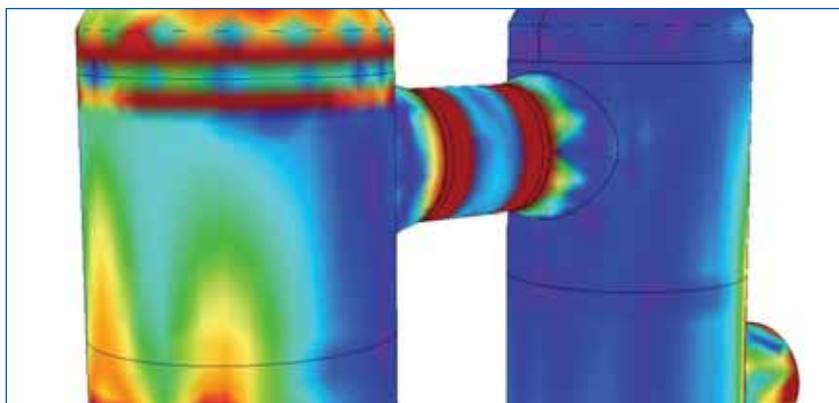
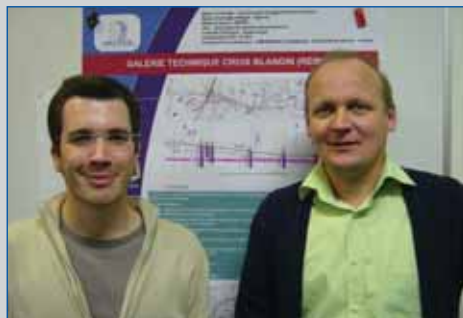
Mission

ANTEA assure des prestations de :

- Conseil
- Etude, pré-étude, audit et diagnostic

- Expertise
- Assistance à Maîtrise d'ouvrage
- Maîtrise d'œuvre de conception et de réalisation
- Gestion de l'image et communication

ANTEA s'engage à vous apporter des solutions globales et innovantes, à vous assister pour répondre à vos besoins de gestion des risques environnementaux dans toute la France et dans les DOM, grâce à son réseau de 20 implantations.



Structural verification of a thermal exchanger under seismic solicitations

Short Description

The project is about the actualization of a risk study with regard to a classified installation. The modifications of the seismic regulation context in France induced operators to justify the resistance under seismic solicitations of their structures which have been classified "dangerous for public". Here are presented the models made with Scia Engineer with regard to the verification of the thermal exchanger of a metallurgic plant under seismic solicitations. The results are very useful when dealing with the envelope or details of the steel structure.

Project Information

Owner: Nyrstar
 Architect: n/a
 General Contractor: n/a
 Engineering Office: ANTEA

Construction Start: 1975
 Construction End: 1975
 Location: Auby, France



Objet du problème

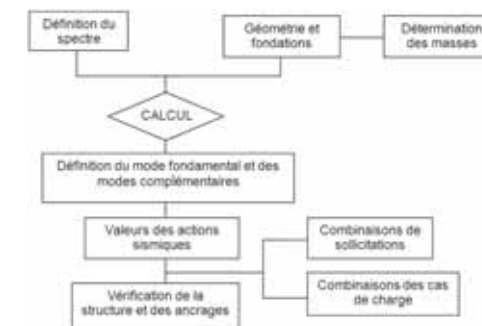
La révision du zonage sismique du territoire français a pour conséquence dans certaines régions le changement des caractéristiques de séisme à prendre en compte, notamment pour le calcul de dimensionnement des infrastructures. Dans le cadre du classement SEVESO du site Nyrstar à Auby (59), l'étude de danger afférente a montré la nécessité de vérifier la résistance sous séisme des échangeurs thermiques d'une unité de traitement des gaz de grillage du minerai de zinc. Ainsi, sur la base de la réglementation existante (règles PS 92, EUROCODES 3 et 8) et à l'aide du logiciel Scia Engineer, nous présentons ci-après un exemple de vérification de structures métalliques d'une usine métallurgique sous ces nouvelles conditions de séisme. L'étude a eu pour but de vérifier la tenue sous séisme des structures actuelles des échangeurs thermiques simple et double (conçus au milieu des années 1970), en tenant compte de

la nouvelle définition du zonage sismique suivant la cartographie éditée en 2005 par le BRGM.

Description des vérifications

Méthodologie de vérification

Le schéma ci-après synthétise la démarche de vérification de la structure sous séisme.



Synoptique de vérification de la structure.

Combinaisons des cas de charges sismiques

La combinaison des réponses modales à une direction sismique prise en compte est celle suivant la méthode SRSS (EUROCODE 8 – article 4.3.3.3.2) :

$$E = \sqrt{\sum_{i=1}^N E_i^2}$$

Les combinaisons des effets des composantes du mouvement sismique sont celles de Newmark selon EUROCODE 8.1 - article 4.3.3.5.2 (soit 24 combinaisons) :

$$CS_X = \pm S_X \pm \lambda S_Y \pm \mu S_Z$$

$$CS_Y = \pm \lambda S_X \pm S_Y \pm \mu S_Z$$

$$CS_Z = \pm \lambda S_X \pm \mu S_Y \pm S_Z$$

Résultats de la modélisation échangeur double

Calcul de la réponse sismique

La méthode de calcul utilisée est celle de la réponse spectrale en base modale. La combinaison des réponses modales est la SRSS (Square Root of the Sum of the Square).

• Déplacements

Les déplacements issus des cas de charge sismique S_x , S_y et S_z restent faibles comparativement aux déplacements dont l'essentiel est induit par la dilatation thermique engendrée par l'application du gradient de température.

• Contraintes

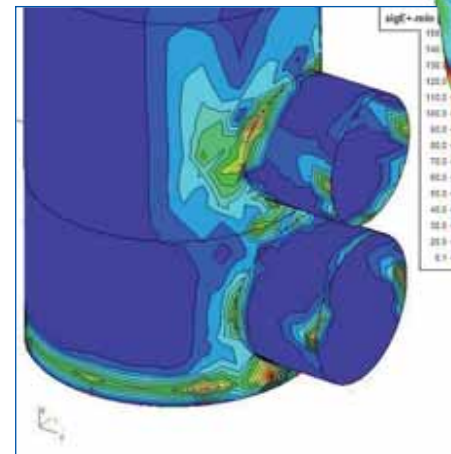
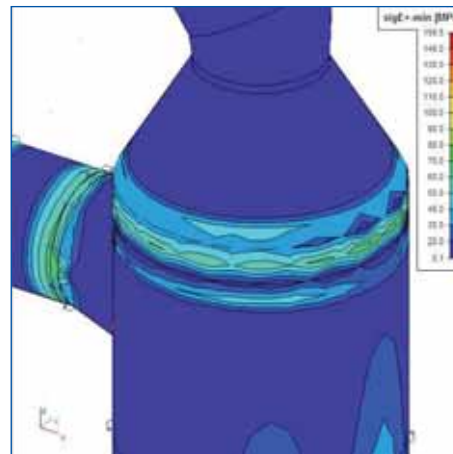
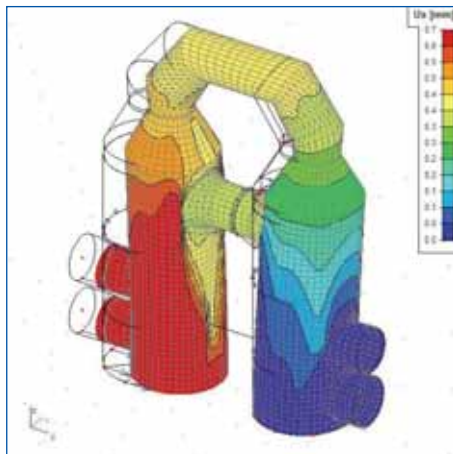
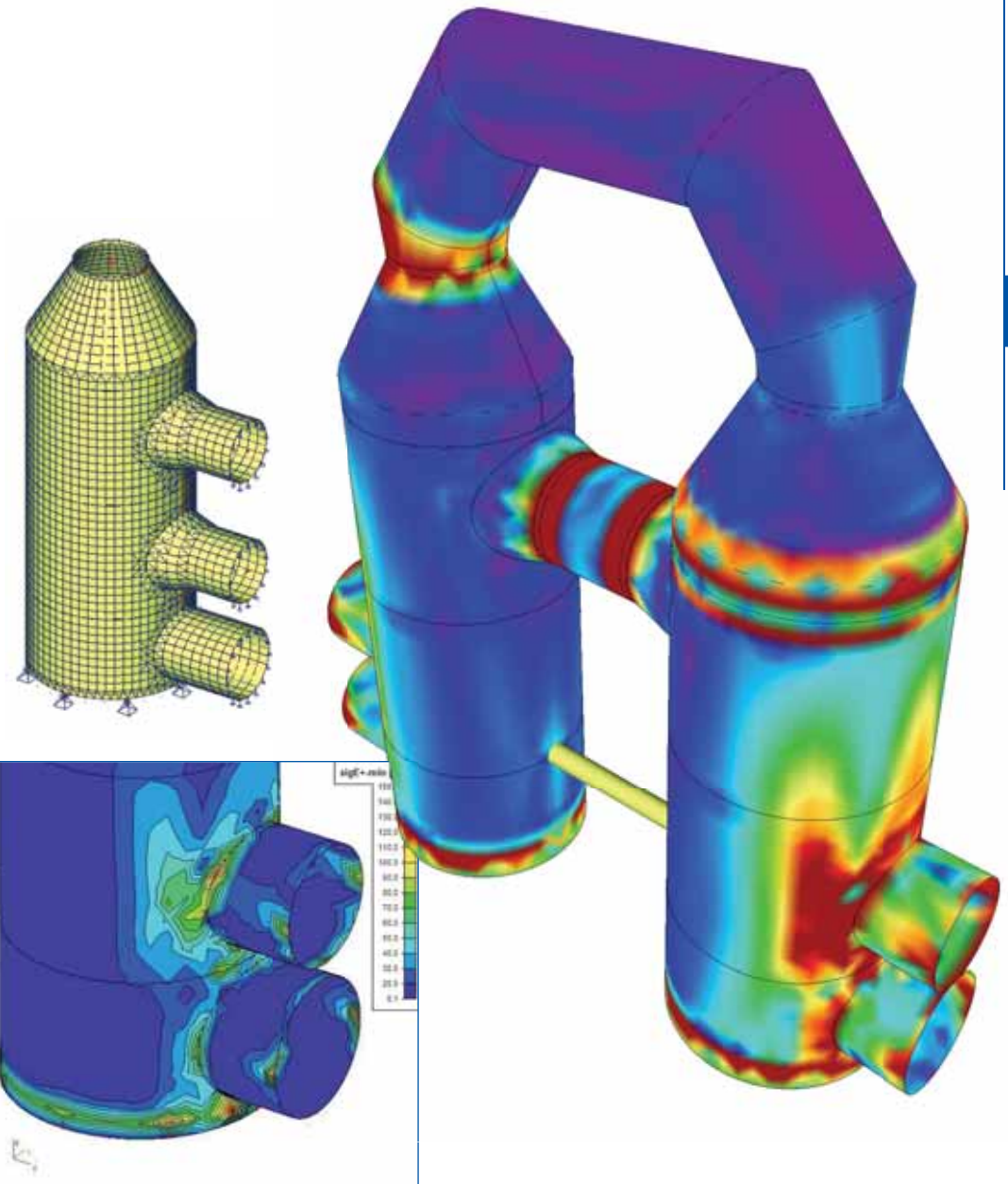
De la même façon que pour les déplacements, les contraintes issues des sollicitations sismiques sont très faibles par rapport aux contraintes issues de l'application du gradient thermique.

Conclusions

Les modélisations réalisées avec Scia Engineer ont permis de démontrer que les sollicitations sismiques ont des incidences relativement faibles sur les structures étudiées en termes de déplacements et de contraintes par rapport à celles issues de l'application du gradient thermique sur l'enveloppe acier de chaque échangeur, y compris au niveau des points singuliers de la structure.

S'agissant de la reprise de l'étude sur des unités anciennes existantes, l'une des principales difficultés rencontrée pour la réalisation des modèles et l'analyse des résultats de calcul est de disposer d'informations fiables sur la géométrie de la structure, la nature des matériaux utilisés (épaisseur, type d'acier...) et sur les masses des équipements. Dans le cas présenté, la nécessité de renouveler les échangeurs environ tous les 10 ans a permis de disposer d'informations d'une grande fiabilité pour la réalisation des modèles.

Vérifications structurales d'échangeurs thermiques sous sollicitations sismiques



B.V. Ingenieursbureau M.U.C.

Contact Daphne de Groote
 Address Bredaseweg43
 4844 CK Terheijden, Netherlands

Phone +31 76-5933450
 Email muc@bv-muc.com
 Website www.bv-muc.com



B.V. Ingenieursbureau M.U.C. (Meeuwsen-Udink-Consult) has been established in 1981 and is a complete independent advisory engineering company active in civil/mechanical engineering, amongst others: soil mechanics, hydraulic engineering and highway construction, the structural sector and on the mechanical engineering and shipbuilding.

The office staff finds her background in the Dutch Civil Engineering and in the Geotechnical as well as environmental consultancy practice.

B.V. Ingenieursbureau M.U.C. works as a design and engineering company for amongst others civil contractors, building contractors, architects, the government, other engineering offices, private companies. The operations are executed for about 500 different clients, companies and institutes at home and abroad.

The current organisation of B.V. Ingenieursbureau M.U.C. comprises 25 employees (a.o. 6 MSc and 6 BSc).

Before 1981 both Mr. Udink and Mr. Meeuwsen worked within the Royal Boskalis Westminster Dredging company of Holland. Boskalis is the world's biggest dredging company.

An important part of the activities of B.V. Ingenieursbureau M.U.C. concerns consultancy, project management engineering and supervision which has to do with amongst others:

- Technique of foundation, including civil technical, mechanical engineering (hydraulic systems, etc.) and shipbuilding aspects (pontons, etc.);

- Soil mechanics and geo hydrology;
- Civil engineering and structural aspects in general;
- Specialist constructions in concrete, steel, wood, stone and aluminium;
- Damage-assessment;
- Special measurements on foundations and measurements in the soil.

As a resume one could say that since 1981, B.V. Ingenieursbureau M.U.C. is involved in design and execution works for all kinds of infrastructural works in The Netherlands and abroad: (Tunnels, ports, high speed and cargo railways, motorways, bridges, flyovers, noise reducing structures, housing, warehouses, high rise buildings, car-parking-sub ground facilities, jetties, quay walls, industrial plants (oil, food, petrochemical), etc., etc.). Specialism for all fields mentioned often is foundation techniques.



Traffic noise reducing barrier, Eindhoven

Short Description

The project regards an acoustic screen, composed of 6.0 m high aluminium tubes, with variable diameters, random assembled in a box construction. This random pattern is accentuated by a variable height of the tubes which all have a different length and color.

The tubes are connected by aluminium strips and perforated over the whole length, inside the tubes is an absorbing filling which is placed for extra noise reducing.

The tubes are hold into an aluminium box construction, the upper plate has cutouts, the tubes are horizontally fixed. At the bottom, bolts take care of the horizontal fixation.

Because of the anodizing process, in the bottom are grooves leaved open, the openings are taken into account in the calculations.

Project Information

Owner: Rijkswaterstaat Noord-Brabant
Architect: VHP Architecten uit Rotterdam
General Contractor: Heijmans Techniek & Mobiliteit
Engineering Office: B.V. Ingenieursbureau M.U.C.

Construction Start: 03/2009
Construction End: 12/2009
Location: Eindhoven, Netherlands



Introduction

B.V. Ingenieursbureau M.U.C. te Terheijden received from subcontractor Van Campen Aluminium B.V. the order to make the calculations of an aluminium acoustic screen for the project: "Geluidbeperkende voorzieningen randweg Eindhoven".

The project concerns a 6.0 and 3.0 m high acoustic screen, composed of aluminium tubes, with diameters of 150 mm and 200 mm; which pattern is random assembled in an aluminium box construction. The box construction is a prefab element with a length of 3.1 m and a width of 1.0 m. The boxes are alternating turned over 180°.

The random pattern is accentuated by a variable height of each individual tube, which besides a different length, also have a different colour.

As the screen has an acoustic function, the tubes are perforated over the whole length; inside the tube, an absorbing filling is placed for extra noise reducing.

The tubes are all connected by aluminium strips of 3.0 mm. The tubes have only a thickness of 3.0 mm, the thickness is restricted to the perforations to be made.

Calculations

The calculations are made for the 6.0 m high acoustic screen.

Overall Description

In figure 01, an isometric view is shown. The random pattern is shown in figure 02.

The thickness of the tubes is 3.0 mm. For the input of the correct characteristics of the tubes in the FEM program, a conversion is made.

The connection of the tubes with the box construction is as followed:

The aluminium box construction has a height of 0.4 m. In the top plate, cut-outs are foreseen, through which the tubes are placed in. The tubes are horizontally fixed facing the top plate. The connection to the under plate will be made by 2 stainless steel bolts for each tube. These bolts will be tightened in the gaps of the connecting strips. The bolts take care of the horizontal fixation facing the under plate.

The aluminium box construction is founded on its 4 corners on piles with pile head, where the anchors are already foreseen.

At the location of the anchors, the under plate is more loaded. Because of this, the under plate will be locally strengthened.

Because of the anodic treatment, in the bottom are water grooves, these openings are taken into account in the calculations.

Characteristics

The perforations in the tubes exist of 5.0 mm holes c.t.c. 12.7 mm (alternated). This means a reduction of the surface of: $100 \times (1 - (\pi/4 \times 5^2)/(12.7^2)) = 12\%$.

This reduction has an immediate relation to the stiffness of the perforated tubes (tSLS: $\text{rep} = 0.88t$). The influence of the perforation to the strength of the tube, is determined in accordance with NEN 6710; art. 11.4:

- $A_1 = 18-5 = 13 \text{ mm}$;
- $A_2 = 2 \times 18 / \sqrt{2} - 2 \times 5 = 15.5 \text{ mm}$;
- $A_{\text{net}}/A = 13/18 = 0.72$.

Above mentioned means a reduction of 28% of the strength ($t_{\text{ULS; fictive}} = 0.72t$).

The thickness of the tubes is 3.0 mm. The thickness which will be imported is such that the FEM program will determine the stresses in a correct way. The preceding gives following input:

- $T_{\text{fictive}} = 0.72 \times 3 = 2.16 \text{ mm}$;
- $E_{\text{fictive}} = 0.88/0.72 \times 70000 = 85556 \text{ N/mm}^2$.

Dimensioning of the Acoustic Screen

The loads acting on the acoustic screen are the dead weight of the tubes, which are generated by the FEM program, and the variable wind load. The wind load is 0.95 kN/m^2 .

The input of this load acts on the projection of the tube. This means that the input will be $0.95/2 \text{ kN/m}^2$. The accuracy will be seen in the results of the calculations.

The load combinations will be generated by the FEM program in accordance to NEN 6702.

For the completeness, the model with the wind load is represented in figure 03.

Dimensioning of the Box Construction

The following thicknesses are taken into account:

- Top plate: 5 mm;
- Side plate: 5 mm;
- Under plate: 5 mm; At the anchors, strengthened with a 25 mm plate (200x200 mm);
- Front and back plate/
- Stiffener plates: 4 mm (2+ 3 pieces)

Note: The stiffener plates are placed that there is never a conflict with the tubes.

The loads exist of the own weight of the box construction, this is generated by the FEM program, the own weight of the tubes and the variable wind load.

The 6.0 m height acoustic screen has a dead weight of 1.34 kN/m . In front and in the back of the screen, are some individual tubes, with a load of:

- $D = 200 \text{ mm}$: $F_{\text{v,rep}} = 0.28 \text{ kN}$;
- $D = 150 \text{ mm}$: $F_{\text{v,rep}} = 0.24 \text{ kN}$.

The wind load is 0.95 kN/m^2 . The horizontal load due to the wind load on the top plate is:

- $q_{\text{rep}} = 0.95 \times 6 \times (6/2 + 0.4)/0.4 = 48.5 \text{ kN/m}$.

The horizontal load due to the wind load on the under plate is:

- $q_{\text{rep}} = 0.95 \times 6 \times (6/2)/0.4 = 42.8 \text{ kN/m}$.

Note: The input of the loads on the top plate is such that the load works on the compressive side of the tube (as in the real situation). As the FEM program cannot make a projection load, the input is adapted so that the result gives the correct load.

The load combinations will be generated by the FEM program in accordance to NEN 6702.

For the completeness, the model with the wind load is represented in figure 04.

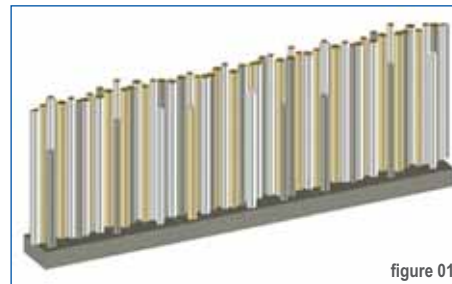


figure 01

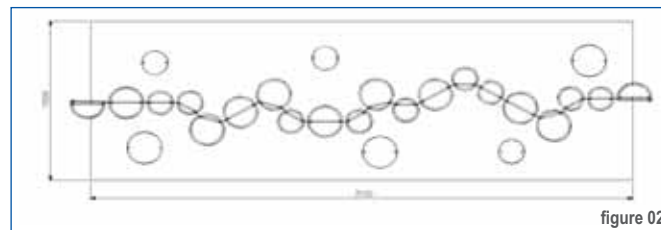


figure 02

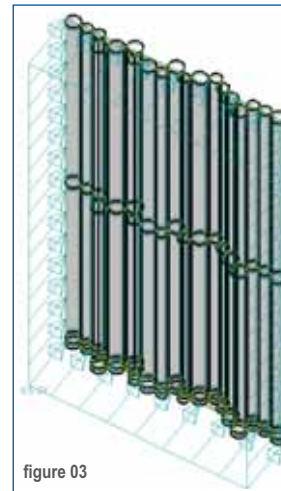


figure 03



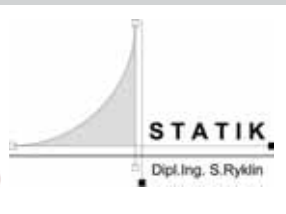
figure 04

Traffic noise reducing barrier, Eindhoven



Dipl.-Ing. S.Ryklin STATIK

Contact Sergej Ryklin
 Address Liselottestrasse 17
 69123 Heidelberg, Germany
 Phone +49 6221830673
 Email statik@ryklin.de



Personal Information

Sergej Ryklin
 Born in 1963 Moscow

1981-1985: Diploma Study of Civil Engineering at the Automobile and –Road Institute, Moscow; speciality “Bridges & Tunnels”.

1985-1991: Repair and maintenance of automobile bridges in Moscow.

Since 1993: Structural designer and verifier by “Römhild & Hecker” Consulting Engineers in Landau, Germany.

Since 1997: Currently self-employed Structural designer.

Specialization

- Planning and optimisation of Steel-, Aluminium-, Solid-, Timber- and Membrane Structures;

- Project consultancy;
- Building physics calculations;
- Dynamics calculations.

Philosophy

Flexibility in planning due to an integrated 3D-Design and the ability to find feasible and low-cost solutions already in the draft stage.

Experience

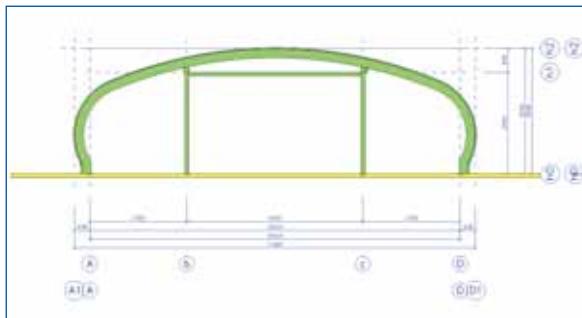
About 800 different projects processed - a.o. residential- and industrial buildings, park decks, pedestrian bridges, swimming pools, silos, membranes...

References

Daimler AG, John Deere AG, SAP AG, DB AG, Siemens AG, Henkel AG, Formel 1...

Equipment

2 Workstations, 2 Notebooks with following software: Scia Engineer, Nemetschek, Autocad, Dcad, Prosteel 3D, Kretz, LSS, Pcae, ForTen, Adobe.



Formula 1 - Bridgestone Flying Stand

This project regards a movable stand in the shape of an ellipse tube to promote the Bridgestone products during the F1 and DTM car races in Europe in 2008.

The support steel structure had to be very light for transportation reasons and it had to be able to be mounted and dismantled quickly. The design of the removable membrane roofing for the ellipse tube form with all the connection details and the optimization of the steel supporting structure was required. The steel supporting structure was created and calculated with the general 3D-Modelling tool of Scia Engineer.

Forten software was used for the estimation of the membrane, cable and connection forces.

For the output, PDF documents in English and German (as Scia Engineer) were created.

Membrane drawings with compensation, detailed production drawings for the connections including 3D-PDF model have been done with the Scia Engineer construction drawing tool.

Short Description

Project Information

Owner: Fa. Objektbau Jung

Architect: Fa. Objektbau Jung

General Contractor: Fa. Objektbau Jung/Fa.

Welcomp AG/Fa. Planex Technik in Textil GmbH

Engineering Office: Dipl.-Ing. Sergej Ryklin STATIK

Construction Start: 26/04/2008

Construction End: 31/10/2011

Location: Flying Stand with Formel1 and GTM Car Races in Europe

Client

Formula1 is one of the most famous car races in the world. Each year these big events are attracting a lot of people. A lot of movable structures from different promoters are presented there. The promotion of the Bridgestone products was organized by the company Objektbau Jung Messe/Shop/Event.

The Order

The company Objektbau Jung has conceived a movable stand in the form of an ellipse tube in order to organize the promotion of Bridgestone products during the F1 and DTM car races in Europe in 2008. The support steel structure needed to be light for transportation and it had to be able to be mounted and dismantled quickly.

The design of removable membrane roofing for the ellipse tube form with connection details and optimization of the steel supporting structure was needed.

Technical data

The support structure consists of six ellipse shaped, steel arches with a distance of 3.50 m which are fixed in two points to the middle frame construction. The trestle stability is achieved through the middle frames

and lengthways roof bracing.

The membrane canvas is stressed over the steel arches and fixed on the trestle by means of the rand cables and edge steel plates with bolts.

Heavy weight movable foundation elements were used for the bearing safety.

The structure has the general dimensions of 12.0 m x 17.5 m x 4.0 m.

The membrane material is Ferrari Type 502.

Software and Model

The steel supporting structure was created with the general 3D-Modelling tool of Scia Engineer.

The Forten software was used for the estimation of the membrane, cable and connection forces.

The foundation consists of proved unified parts and it was not calculated.

The bearing safety was vericated through the comparison of the calculated design and the resisting weight forces.

DIN 4112 Flying Buildings was assumed for wind loads.

In addition to the supporting structure model 1D/2D models of connection parts with cables, plates and bolts were created for the further making of the construction drawing with Scia Engineer drawing tool.

Used software: Scia Engineer

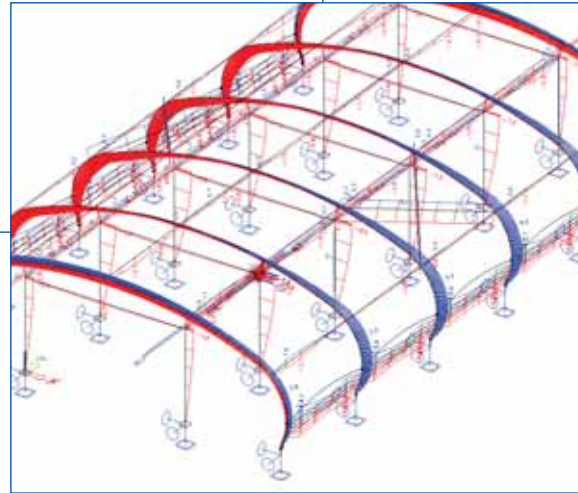
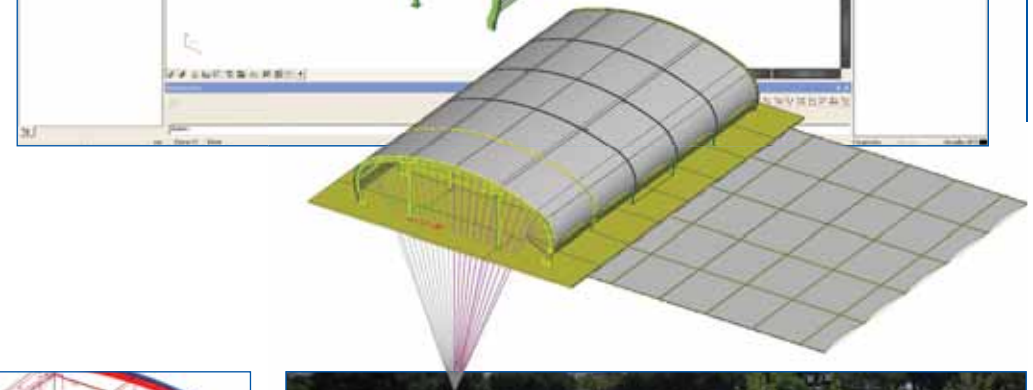
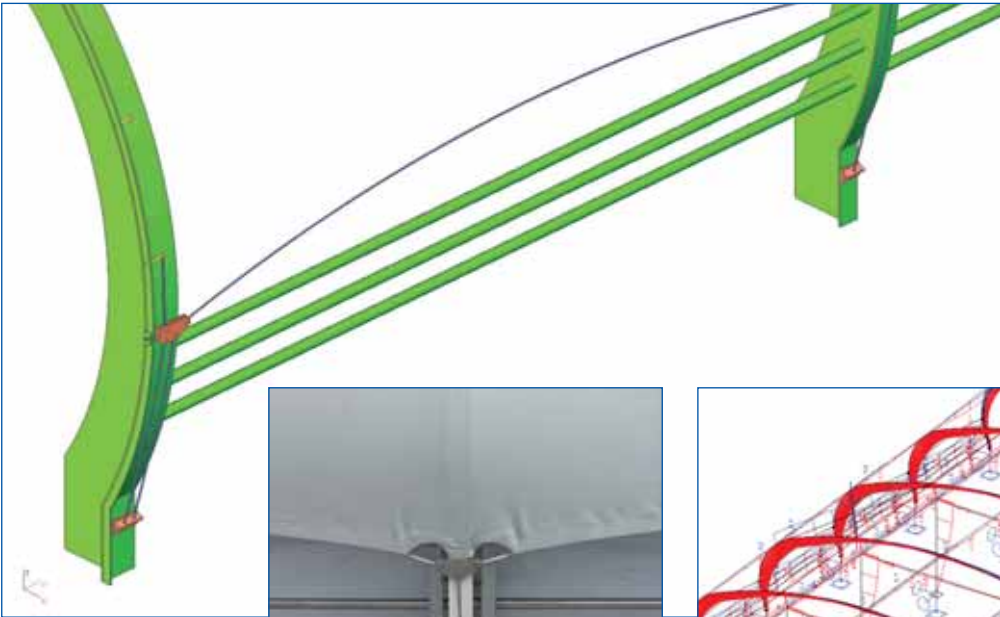
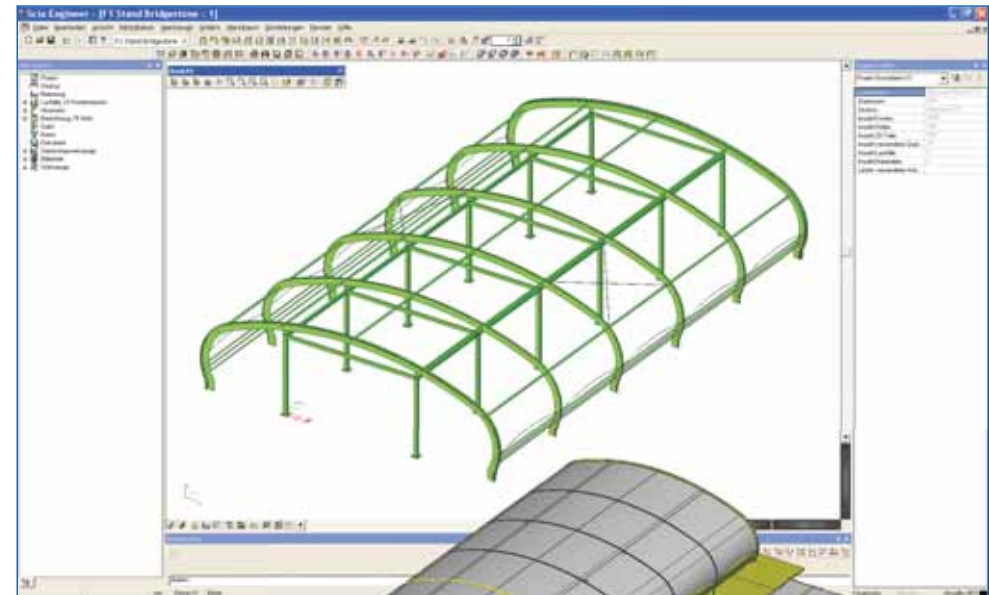
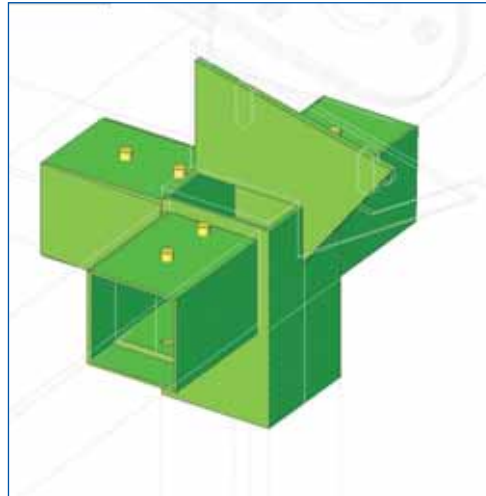
Calculation steps

Calculation of the membrane covering with form finding and estimation of the reaction forces with Forten.
Design and optimisation of steel structure with verification according to the 1st Order Theory with Scia Engineer and verification of the heavy weight foundation elements.

Design of cables and connections.

Presentation

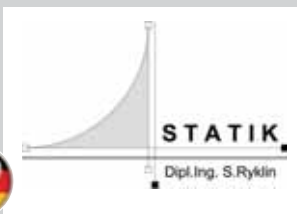
The PDF document in English and German (as Scia Engineer files) has been created for the output.
The membrane drawing with compensation, detailed production drawing for the connections including 3D-PDF model have been done with the Scia Engineer construction drawing tool.



Formula 1 - Bridgestone Flying Stand

Dipl.-Ing. S.Ryklin STATIK

Contact Sergej Ryklin
 Address Liselottestrasse 17
 69123 Heidelberg, Germany
 Phone +49 6221830673
 Email statik@ryklin.de



Personal Information

Sergej Ryklin
 Born in 1963 Moscow

1981-1985: Diploma Study of Civil Engineering at the Automobile and –Road Institute, Moscow; speciality “Bridges & Tunnels”.

1985-1991: Repair and maintenance of automobile bridges in Moscow.

Since 1993: Structural designer and verifier by “Römhild & Hecker” Consulting Engineers in Landau, Germany.

Since 1997: Currently self-employed Structural designer.

Specialization

- Planning and optimisation of Steel-, Aluminium-, Solid-, Timber- and Membrane Structures;
- Project consultancy;
- Building physics calculations;
- Dynamics calculations.

Philosophy

Flexibility in planning due to an integrated 3D-Design and the ability to find feasible and low-cost solutions already in the draft stage.

Experience

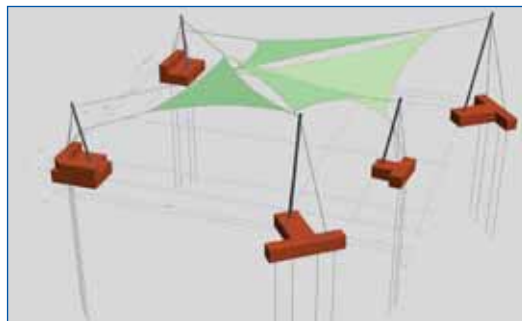
About 800 different projects processed - a.o. residential- and industrial buildings, park decks, pedestrian bridges, swimming pools, silos, membranes...

References

Daimler AG, John Deere AG, SAP AG, DB AG, Siemens AG, Henkel AG, Formel 1...

Equipment

2 Workstations, 2 Notebooks with following software: Scia Engineer, Nemetschek, Autocad, Dcad, Prosteel 3D, Kretz, LSS, Pcae, ForTen, Adobe.



Shadow sail structure covering the square before the railway station Rüsselsheim

Short Description

The Square in front of the Rüsselsheim Train Station was renovated in 2007. In addition to this renovation was conceived a shadow sail construction for the pedestrian area of the square. The sails are going to be used only in the summer to protect the visitors against the sun. The spanning of the square will be done in four parts; each part will be spanned with a three edged sail.

To solve the problem of the limited ground area a foundation with tension piles had to be designed. For the 3D-Modelling with calculations Scia Engineer software was used.

A separate 1D/2D parts model was created to calculate and optimize the connection details between the sails and the masts. The foundation drawing, detailed production drawing for the connections including 3D-PDF model have been done with the Scia Engineer construction drawing tool.

Project Information

Owner: Rüsselsheim City, Germany

Architect: Feierabend Architects

General Contractor: Fa. Planex Technik in Textil GmbH

Engineering Office: Dipl.-Ing. S.Ryklin STATIK

Construction Start: 31/10/2008

Construction End: 2009

Location: Rüsselsheim, Germany



Client

The City Rüsselsheim is best known in connection with the automotive industry. The production of Opel was situated here originally. Now it has about 60.000 residents and many other famous car manufactures such as Hyundai, Kia, Saab and recently Chevrolet are developing their models here.

The Order

In 2007 the Square near the Rüsselsheim Train Station was renovated.

The four parts of the tree edges sails protecting pedestrians from the sun have been planned by the office of Architect O. Feuerabend and will only be used during the summer time.

The problem was to find enough place and the right position for the foundations as the network of pipelines in the underground was very dense. To solve the problem a foundation with tension piles was suggested.

Technical data

The structure consists of four sails with edge lengths between 8.0 m and 15.0 m. The sails are tightened between five guyed steel masts by means of adjustable tension steel bars.

The mast lengths are about 3.5 m, 4.2 m and 6.0 m and the material of the sails is of the Ferrari 502 type. A block foundation with tension piles was used by all bearing points and it follows the ground inclination of the area.

Software and Model

Scia Engineer was chosen to do the general 3D-Modelling. The sails were defined as plates with membrane properties, the edge bars as cables and the tension bars were prestressed, so that the deflection under the dead load and the bars forces in system could be optimized.

The foundation was modelled as 'elastic supported 2D-plates' with tension piles as anchors. For the further elevations of the system, grid meshes according to the joint points were created. DIN 4112 Flying Buildings was used for the wind loads. Separate 1D/2D models were created to calculate and optimize the connection details between the sail and the masts.

Calculation steps

The design and optimisation of the steel and sail structure was verified according to the third order theory. The foundation was designed according to the

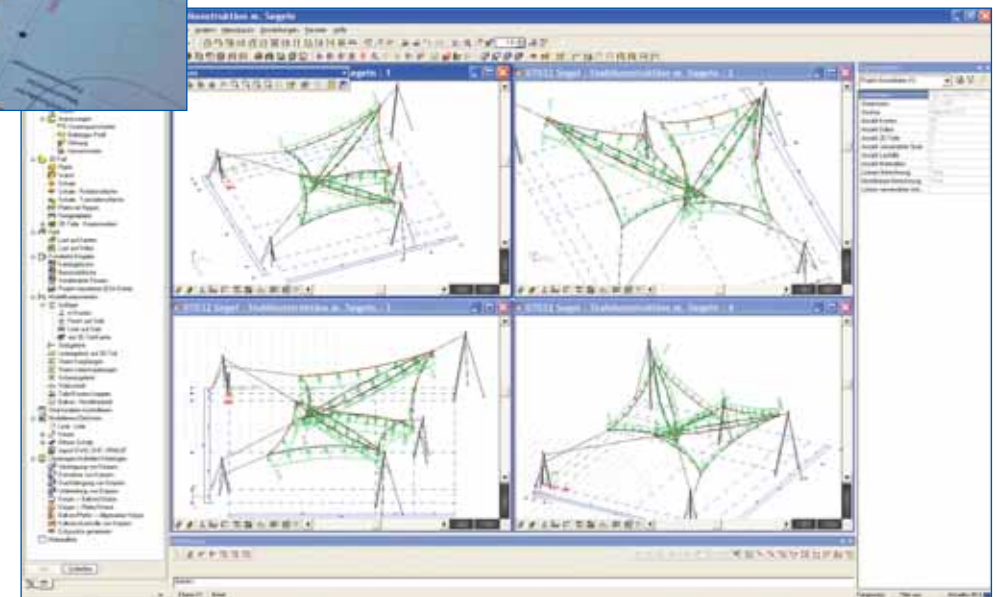
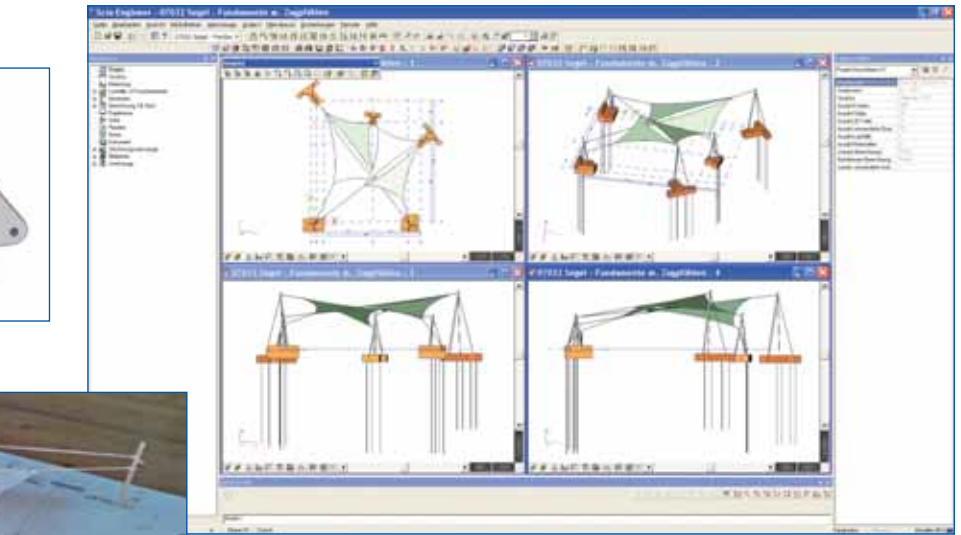
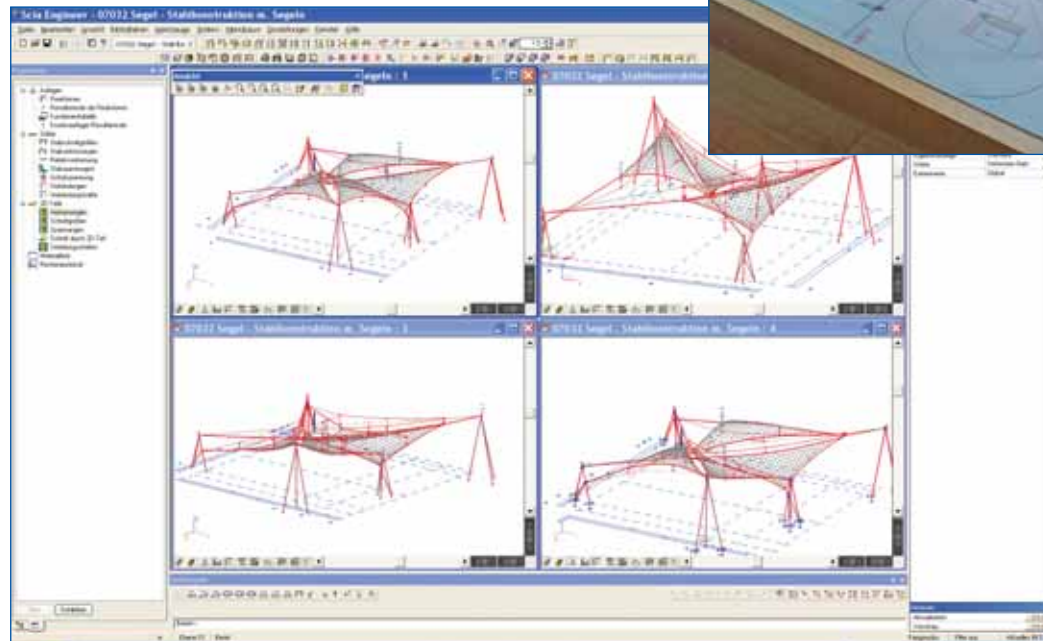
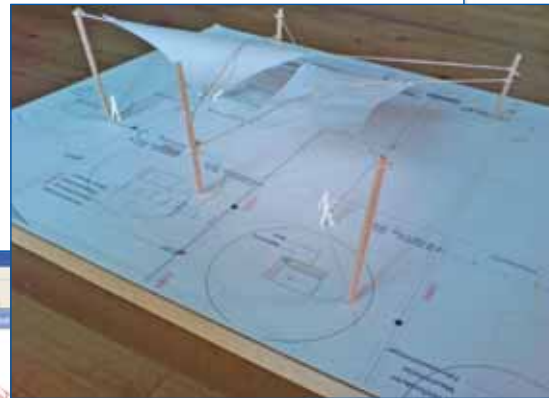
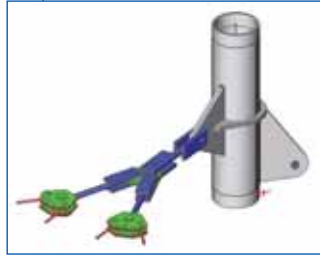
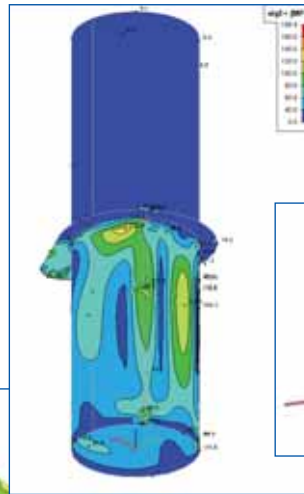
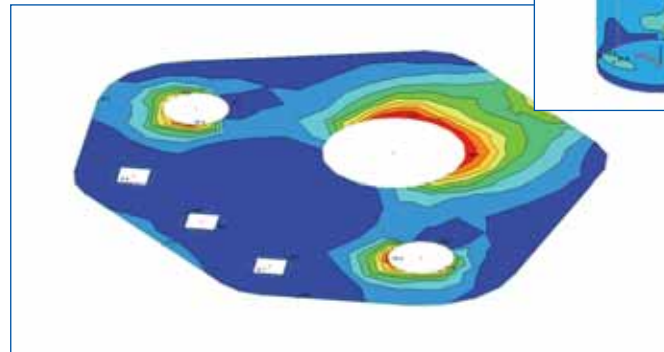
Used software: Scia Engineer

reactions of the steel structure with an estimation of the piles position and an optimization of their forces. The design of the connection points between the sail ends and the masts have also been done.

Presentation

Three PDF documents (Scia files) have been created for the output. Foundation drawings, detailed production drawings for the connections, as well as a 3D-PDF model, have been made with the help of Scia Engineer.

The realisation of the project is planned for 2009.



Shadow sail structure covering the square before the railway station Rüsselsheim

D. MAKOVIČKA

Contact Daniel Makovička
Address K Jasánkám 895/2
155 00 Praha 5, Czech Republic
Phone +421 235510987
Email d.makovicka@volny.cz
Website www.makovicka.cz



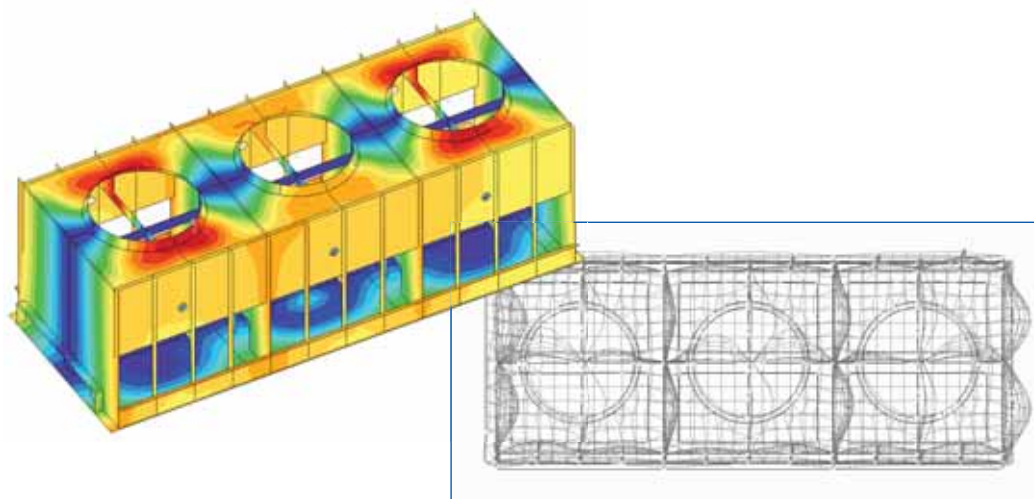
D. MAKOVIČKA
Statika a dynamika konstrukcí

Firma D. MAKOVIČKA byla založena v roce 1990 a je zaměřena zvláště na dynamické a statické výpočty všech druhů konstrukcí, včetně měření vibrací.

V oblasti modelování a výpočtů ocelových, betonových, zděných a dřevěných konstrukcí může firma nabídnout zejména: teoreticko-numerické modelování konstrukcí; stanovení vnitřních sil a průhybů na konstrukci, jejich posuzování a dimenzování na statická a dynamická zatížení; posouzení vývoje charakteristik konstrukce s ohledem na změnu zatížení, stárnutí konstrukce a dotvarování; stanovení mezní únosnosti neporušené konstrukce nebo zbytkové únosnosti konstrukce s trhlinami; prognózu chování stávající konstrukce při nových statických a dynamických zatíženích, při zavádění nové výrobní technologie nebo přestavbě objektu; návrhy vibroizolační ochrany konstrukcí a návrhy odpružení strojů.

V oblasti měření vibrací firma nabízí: měření vibrací v budovách s technologiemi citlivými na účinky vibrací jako je fotolitografická výroba; měření vibrací pro objekty nad metrem nebo v blízkosti komunikací; měření vibrací ve výrobních halách s provozem turbín nebo jiných točivých strojů; měření vibrací způsobených pohybem nebo chováním většího množství osob.

Jedná se o rodinnou firmu, na jejíž činnosti se podílí zejména otec a syn. Zákazníky jsou architektonické, projekční a stavební firmy a také výrobní organizace. V rámci své profese poskytují pracovníci firmy konzultace a mohou spolupracovat jako lektori odborných seminářů. Podrobnější informace naleznete na webových stránkách firmy www.makovicka.cz.



Response analysis of a cooling tower under design and seismic loads

Short Description

This project is a paper dealing with the response of a RC structure of a cooling tower unit under seismic loads and strong wind loads as well as other static and dynamic loads. The calculated values of the envelopes of the displacements and the internal forces due to seismic loading states are compared with the envelopes of the loading states due to the dead, operational and live loads, wind and temperature actions. The seismic effect takes into account the ductility properties of a relatively rigid structure. In this case the actions of wind pressure are higher than the seismicity effect under ductility correction. The other static loads, especially temperature action due to the environment and surface insulation are very important for the design of the structure and for this structure these effects are dominant.

Project Information

Owner: n/a
Architect: n/a
General Contractor: n/a
Engineering Office: Henzl Engineering, s.r.o.,
Prague 8, Czech republic

Construction Start: 04/2008
Construction End: 12/2008
Location: Balloki, Pakistan



Cílem projektu je statický a dynamický výpočet chladicí věže s ventilátory pro tepelnou elektrárnu v Pákistánu. Chladicí věž je součástí stavebního objektu „SO 09 Chladicí věž 7 × 8 m“ pro akci „Balloki 1 × 200 MW CCGP“. Předmětem výpočtu jsou tři ze sedmi buněk (částí) chladicí věže, vybraná trojice buněk tvoří jeden dilatační celek a je založena na společné základové desce.

Každá z buněk chladicí věže má přibližně čtvercový půdorys. Buňka věže je shora ukončena stropní deskou s kruhovým otvorem, nad kterým je umístěn prefabrikovaný difuzor ve tvaru válce. Buňky jsou za sebou umístěny tak, že mají společnou příčnou dělicí stěnu. Podélné obvodové stěny jsou ztuženy svislými žebry. Příčné stěny jsou ztuženy vnitřními výztuhami a rozepřeny střední stěnou v podélném směru v dolní polovině věže. Otvory ve vnitřních stěnách jsou vzájemně propojeny bazény ve všech buňkách věže. Ve středu buněk jsou umístěny sloupky s ventilátory v úrovni stropu. Sloupky jsou rozepřeny ve dvou výškových úrovních do obvodových stěn betonovými průvlaky. Nasávací otvory v podélných obvodových stěnách věže jsou zesíleny svislými žebry a lemuujícími betonovými prvky. Základová deska pod třemi buňkami věže je zesílena podélnými a příčnými základovými pasy. Základová deska se základovým roštem je uložena na štěrkopískovém polštáři.

Pro výpočet a posouzení chladicí věže byl vytvořen prostorový výpočetní model trojice buněk chladicí věže. Sloupky ve středu buněk, lemy nasávacích otvorů v podélných stěnách byly modelovány nosníkovými prvky, všechny ostatní části konstrukce byly modelovány stěnodeskovými prvky.

Základová deska byla podepřena Winkler-Pasternakovým modelem podloží. Parametry podloží jsou doloženy výpočetním programem podle zadané skladby podloží a pro určenou kombinaci zatížení postupnou iterací a zpřesňováním vypočtených hodnot.

Při modelování konstrukce byla použita některá zjednodušení: laminátové difuzory byly zavedeny jen svoji hmotností a klimatická zatížení na difuzory byla přenesena do míst kotvení segmentů difuzoru; u základové desky nebyl zohledněn odpor, který klade základový rošt pod deskou vůči pootáčení věže jako celku okolo svislé osy; nebylo zohledněno zatížení od zábradlí, vnitřních žebříků a kontrolních lávek uvnitř věže.

Model konstrukce byl zatížen statickými a dynamickými zatíženími. Statická zatížení zahrnují vlastní tíhu konstrukce, stálé zatížení od technologie, zemní tlak, užité zatížení, provozní zatížení (hydrostatický tlak vody v bazénu), teplotní vlivy (ochlazení, oteplení, oslunění) a účinky větru.

Dynamická zatížení zahrnují pohyb ventilátorů v buňkách chladicí věže a seismické účinky.

Seismické účinky byly počítány rozkladem seismického zatížení do vlastních tvarů kmitání konstrukce. Bylo stanoveno nejnižších 150 vlastních tvarů pro frekvence, které leží ve frekvenčním pásmu od 3 do 40 Hz.

Základní statický a dynamický výpočet trojice chladicí věží byl proveden podle požadavku investora podle evropských a českých norem pro navrhování, s upřesněním parametrů zatížení a dostupných materiálů podle místních podmínek.

Návrhové veličiny od působení seismického zatížení jsou při zavedení duktility konstrukce nižší než účinky větru. Z tohoto důvodu byl návrh dimenzování konstrukce proveden pro obalovou křivku kombinací zatěžovacích stavů s účinky větru. Při vyztužování konstrukce byly však respektovány zásady pro konstrukce situované v seismických oblastech.

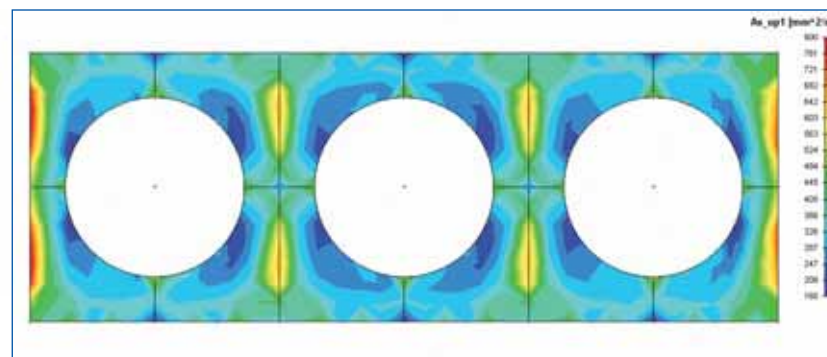
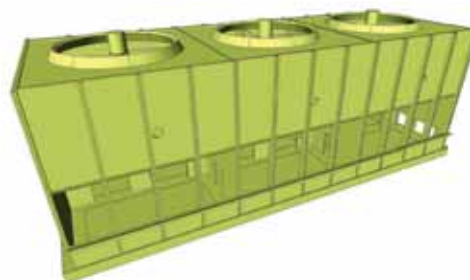
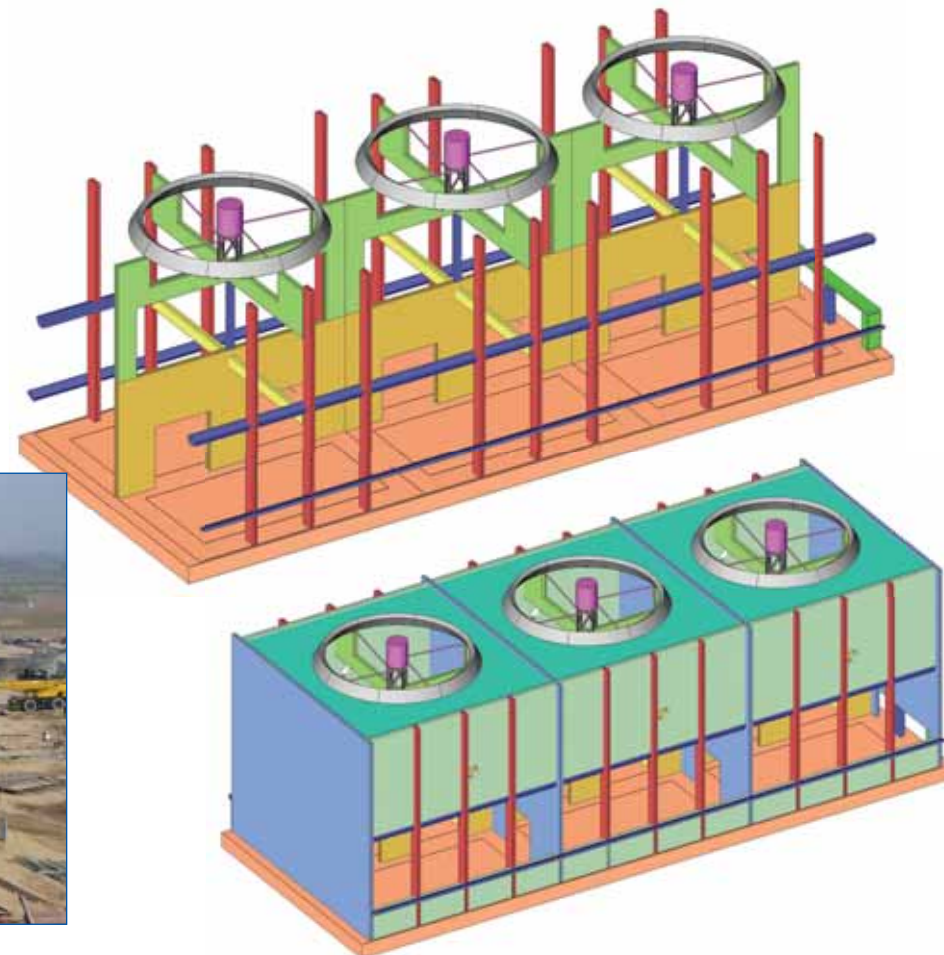
Velikost vnitřních sil od účinků vibračního zatížení od ventilátorů je ve srovnání s vnitřními silami od statických zatížení velmi nízká.

Dominantní účinek na namáhání konstrukce věže mají teplotní vlivy. Podíl těchto teplotních vlivů na celkovém namáhání konstrukce je přibližně 35 až 55%. Z tohoto důvodu bylo mimo jiné doporučeno použít pro náter chladicí věže světlou barvou.

Pro posouzení konstrukce byly vyneseny obálky vnitřních sil a průhybů od mezních kombinací statických i dynamických zatěžovacích stavů. Pro pokrytí odezvy byla vypočtena nutná ohybová a smyková výztuž jednotlivých prvků konstrukce a sestaveno doporučení pro dimenzování.

Při dodržení doporučeného způsobu vyztužení má železobetonová konstrukce věží rezervy i pro duktilní přetvoření při seismickém zatížení. Lze však předpokládat, že po případném přestálém zemetřesení bude nutné konstrukci prohlédnout a opravit trhlami poškozená místa; vnitřní technologické zařízení uvnitř věží bude zřejmě vyžadovat výměnu.

Pro analýzu konstrukce byl využit program Scia Engineer, verze 6.0196 vydaná v roce 2006; výrobce: Scia International nv, Herk de Stat, Belgium, Scia CZ, s.r.o. Czech Republic.



Haverkort Voormolen B.V.

Contact ir. Emile Konter (ontwerpcoordinator)
ing. Sander van het Erve PMSE (constructeur)

Address Landdrostlaan 49
7327 GM Apeldoorn, Netherlands

Phone +31 55 - 538 22 22
Email info@haverkortvoormolen.nl
Website www.haverkortvoormolen.nl



Missie

Haverkort Voormolen is een bouwonderneming die, vanuit een sterke maatschappelijke betrokkenheid, economisch verantwoorde integrale oplossingen aanbiedt voor vraagstukken op het gebied van infrastructuur, water en industrie. Hierbij staat het aangaan van een duurzame en transparante relatie met opdrachtgevers en samenwerkende partijen centraal.

In alle projectfasen van initiatief tot beheer en onderhoud en van kleine tot grote projecten is Haverkort Voormolen een capabele partner.

Algemeen

Haverkort Voormolen is een onderdeel van TBI Infra en als zelfstandige onderneming gespecialiseerd in het aannemen en uitvoeren van projecten in de civiele betonbouw in geheel Nederland. Een bedrijf met een rijke historie, dat midden in de hedendaagse bouwwereld staat.

Haverkort Voormolen is een bruggenbouwer van vraag naar oplossing in letterlijke en figuurlijke zin. Wij hebben de kennis en creativiteit om voor u een passende totaaloplossing te realiseren. Wij staan voor ons werk en dragen daartoe een vergaande verantwoordelijkheid op het eindresultaat en beheersen een breed pallet aan risico's.

Passende bij de wens van de klant en de kenmerken van het project hanteren wij diverse contractvormen van bouwopdracht, naar Design & Construct naar PPS inclusief financiering (DBFM - Design Build Maintain Finance).

Een voortdurende kennisontwikkeling van nieuwe technieken, ontwerp kennis, risicobeheersing,

contractvormen en procesbeheersing is een vereiste om een project, gedurende alle levensfasen van ontwerp naar bouw naar beheer, adequaat en kostenoptimaal te beheersen.

Wij acteren doeltreffend en kostenbeheerst waarbij het projectbelang immer centraal staat in ons werk- en denkproces. Wij beseffen ons dat een project vele belanghebbenden kent zodat een goede communicatie met u, met de omgeving, met de financiers, met onze partners en leveranciers en intern van het allergrootste belang is.

Haverkort Voormolen B.V.
Aantal medewerkers: 235
Omzet ca. 125 miljoen euro



Chimney for coal power plant

E.ON is building a new ultramodern coal power plant next to their existing power plant at the "Maasvlakte" in Rotterdam, it is called 'Maasvlakte Power Plant 3 (MPP3)'. This new plant is build for a capacity of 1.070 MW. This means the plant will generate 7% of the Dutch use of electricity.

By order of E.ON Kraftwerke GmbH, Haverkort Voormolen manufactures a part of this new plant. It concerns the design and construction of a 170 meter high reinforced concrete chimney with an inner tube of synthetic material and the connection to a flue waste heat conduit of synthetic material.

Short Description

Project Information

Owner: E.ON Kraftwerke GmbH
Architect: E.ON Kraftwerke GmbH
General Contractor: Haverkort Voormolen B.V.
Engineering Office: Haverkort Voormolen B.V.

Construction Start: 01/04/2008
Construction End: 01/04/2010
Location: Maasvlakte Rotterdam, Netherlands



Door de E.ON wordt een nieuwe ultramoderne kolencentrale gerealiseerd naast de bestaande kolencentrale op de Maasvlakte. Het betreft de bouw van de zogenaamde Maasvlakte Power Plant 3 (MPP3). Deze nieuwe centrale krijgt een netto capaciteit van 1.070 MW. Dit betekent dat de eenheid zal voorzien in circa 7% van het binnenlandse elektriciteitsverbruik.

In opdracht van E.ON Kraftwerke GmbH realiseert Haverkort Voormolen een deel van de nieuwe centrale. Het betreft het ontwerp en de bouw van een 170 meter hoge gewapend betonnen schoorsteen met een GVK binnenbuis en de aansluiting van een GVK rookgaskanaal.

Werkzaamheden Haverkort Voormolen

Engineering schoorsteen

- Engineering paalfundatie
- Engineering fundatiesloof
- Engineering betonnen schoorsteen

Uitvoering schoorsteen

- Aanbrengen paalfundatie
- Grondwerk t.b.v. fundatie
- Aanbrengen fundatiesloof
- Opbouw glijbekisting, glijwerkzaamheden, afbreken glijbekisting
- Maken vloerplaat schoorsteen
- Maken en op hoogte brengen binnenbordessen
- Wikkelen van de GVK-binnenbuis
- Montage Alminak lift en roldeuren

Korte projectomschrijving

De diameter van de schoorsteen varieert van 23,41 meter aan de voet tot 14,56 meter bovenin, de wanddikte varieert van 60 tot 30 centimeter. Het reusachtige betonnen fundament bevat 2400 m³ beton, ruim de helft die nodig is voor de schoorsteenmantel zelf. De ring werd in een stort van 12 uur gerealiseerd zonder koeling en met mortel afkomstig van drie verschillende centrales. De ring wordt gedragen door twee rijen van in totaal zestig tubexpalen. Hierbij is het van belang dat de optredende paalbelasting en de vereiste paal veerstijfheid overeenkomen met de aanwezige paalcapaciteit.

Er komt een 100 meter lange binnenmantel in de schoorsteen te hangen van gewikkelde vezelversterkte kunststof (GVK). Op 52,5 meter hoogte wordt een aansluiting verzorgd met de rookgasinstallatie door middel van een doorvoer door een opening van 15 meter hoog bij 11 meter breed. Op maaiveldniveau komt een opening van 11 meter hoog bij 15 meter breed ten behoeve van de montage van de wikkelmachine voor de GVK-binnenbuis. Voor het ophangen van de GVK-binnenbuis en de toegankelijkheid worden er betonnen bordessen in de schoorsteen gehangen. De engineering en de bouw van de schoorsteen is als Design & Construct-contract aangenomen. Voor de schoorsteen gelden conform eisen specificatie zowel Nederlandse als Europese normen. De voor de engineering maatgevende norm is daarbij leidend.

Used software: Scia Engineer

Bouw schoorsteen

De nieuwe schoorsteen bestaat uit een betonnen dragende buitenwand monoliet verbonden met het fundament, een vloerplaat met liftkelder, betonnen en stalen bordessen op verschillende niveaus en de GVK-binnenbuis die als rookkanaal dient.

De schoorsteen wordt gestort door middel van een glijdproces met een stalen glijdkist. De onderaannemer Gleitbau uit Oostenrijk is hierin gespecialiseerd. Het glijden van de schoorsteen is een 24-uurs proces, waarbij ca. 4,0 meter hoogte per dag wordt gestort. De schoorsteen moet van binnen uit toegankelijk zijn met een lift. Tevens dienen aan zowel de binnen- als ook de buitenzijde vluchtrampen met valbescherming te worden aangebracht. Op 165 meter hoogte bevindt zich het stalen eindbordes van de lift. Vanaf daar is de schoorsteenmondig met een trap te bereiken.

De betonnen bordessen worden ter plaatse op maaiveldniveau voorgefabriceerd, waarbij ze na het gereedkomen van het glijdproces aan het stalen bordes omhoog worden getild. De bordessen worden op oplegnokken aan de schoorsteenwand opgelegd. De GVK-binnenbuis wordt in de schoorsteen gewikkeld en met behulp van hefliften omhooggetild. De binnenbuis wordt op het betonnen bordes op 70 m hoogte opgelegd.

Schoorsteenmantel

Voor de berekening wordt gebruik gemaakt van het eindige elementenpakket Scia Engineer. De constructie wordt opgedeeld in schaalelementen, die op systematische wijze worden opgebouwd tot wat heet een globaal systeem. Voor het bepalen van de krachtverdeling in de constructie wordt uitgegaan van de lineaire elasticiteitstheorie in het Scia Engineer model. Er dient echter wel rekening gehouden te worden met een reductie van de elasticiteitsmodulus ten gevolge van het eventueel scheuren van de doorsnede voor de correcte bepaling van de horizontale vervorming aan de top van de schoorsteen.

In het model wordt voor het grootste deel van de hoogte de stijfheid gehanteerd behorend bij een ongescheurde doorsnede, omdat onder invloed van het eigen gewicht de constructie in verticale richting voor het grootste deel ongescheurd blijft. Dit voor het grootste

deel ongescheurd blijven is noodzakelijk om aan de vervormingseisen te voldoen. Voor de berekening van de wapening in de schoorsteenmantel is o.a. gebruik gemaakt van de betonmodule. Voor het bepalen van de eigen frequentie en is gebruik gemaakt van de dynamicamodule.

Ringfundament

Het ringfundament wordt op 5,0 meter onder het maaiveld aangelegd en heeft een hoogte verlopend van 3,5 meter naar 2,0 meter. De paalkop wapening wordt in het betonnen fundament opgenomen en verbonden met de wapening van het fundament.

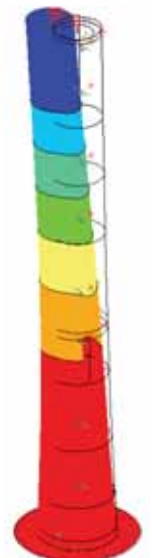
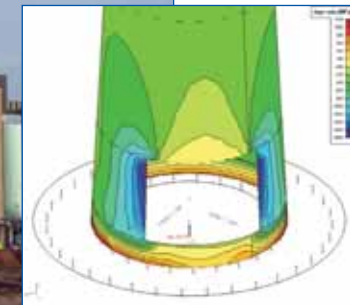
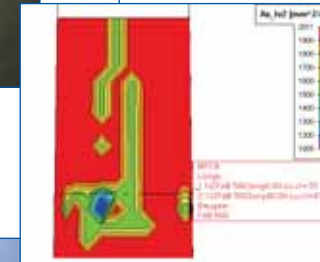
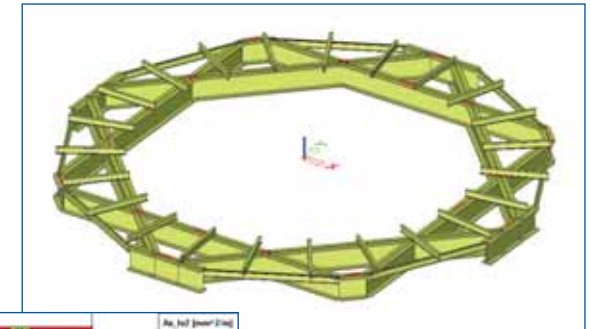
Het resultaat van een iteratief ontwerpproces is een ringfundament met een uitwendige diameter van 37,41 meter en een breedte van 9 meter. Voor de berekening wordt gebruik gemaakt van Scia Engineer. Het fundament is als een plaat element aan de schoorsteenmantel verbonden. Voor het beton wordt uitgegaan van een buigstijfheid behorend bij een ongescheurde doorsnede. De plaat wordt door veerondersteuning ter plaatse van de palen gefixeerd.

Bordessen

Het bordes op +70,0 meter wordt het zwaarst belast door de som van het eigen gewicht en het gewicht van de binnenbuis. Het eigen gewicht van de binnenbuis bedraagt 2500 kN (250 ton).

Ter plaats van de ronde openingen in de bordessen worden staalprofielen HEB700 of IPE600 bevestigd die een positieve invloed hebben op de verdeling van de radiale momenten, vooral bij het gedeelte waar de extra opening van de liftschaft is gepositioneerd. Tevens dienen de profielen als bescherming van het beton. De binnendiameter van de staalprofielen bedraagt 10,2 meter. De bovenstaande bordessen worden via acht oplegnokken aan de schoorsteenwand opgelegd op de schoorsteenwand. Er is geen sprake van een monolieten verbinding met de schoorsteenwand.

Schoorsteen MPP3 Maasvlakte



IMd

Contact Remko Wiltjer, Paul Korthagen
 Address Jan Leentvaarlaan 62
 3065 DC Rotterdam, Netherlands

Phone +31 10-2012381
 Email imd@imdbv.nl
 Website www.imdbv.nl



Organisation

IMd Raadgevende Ingenieurs is an organisation with a great core of highly qualified employees, who have been applying their experience, know-how and expertise for many years with regard to advising about, designing and working out main structures for buildings. At present the firm consists of 40 highly educated employees. IMd is completely independent and does not have any business links with manufacturers, suppliers, contractors, developers and other interested parties who could influence our impartial and independent consultancy.

IMd is a member of the Dutch association of consulting engineers (ONRI) and possesses the "quality management system" certificate according to NEN-AND-ISO 9001.

It is a firm where the internal communication proceeds smoothly and all employees are kept informed about the most recent developments.

In the almost 50 years that our firm has existed the quality of our service has always been a key issue. The most important characteristics of this service for us are:

- A good product that fits the budget of the client
- A product that fits the concept of the architect
- Creativity and ingenuity
- A flexible and service-oriented attitude

Projects

They vary greatly: from prestigious office complexes to pedestrian bridges, from houses to complex shopping centres, from alterations to new-housing and from simple and small to complex and large. Each project has its own charm and is a

constructive challenge. The projects are carried out at the request of property developers, government organisations, foundations, architects, contractors and private parties. This diversity in clients is made possible because of the independence of the firm of consulting engineers.

View IMd Raadgevende Ingenieurs

The view of IMd is that the success of a project largely depends on the first stage of the design process. The cooperation between architect, client, mechanical engineer and structural engineer is decisive in order to have a fine design in complex projects. In the preliminary design various alternatives are presented for the structure of a building. The advantages and disadvantages of every constructive alternative will then be discussed in the design team. Wishes of the client and architect, requirements in the field of building physics, possibilities regarding the technical installations: they all affect the choice of an optimal structural design.

In addition to the constructive design, IMd regards its role as a coordinating engineer as very important. In its existence IMd has built up a perfect reputation. In addition to the inspection of the basic principles of the drawings and calculations of suppliers of prefabricated concrete and steel constructions, the content of these elements is also assessed with great care. We ask the client to make it possible for us to carry out the consultancy work in a constructive way. In the end this will create the best result for the client.

Container Origami, Rotterdam

Short Description

This project regards a work of art for the Rotterdam exposition follyDOCK, a part of 'Rotterdam 2007 - City of Architecture'

Participants were to design a folly, which was to surmount the restrictions of actual practice and which stretches the boundaries between fantasy and reality. 'Container Origami', designed by Wouter Roeterink, Ron Nout, Femke Bijlsma and Allard Roeterink was chosen. Their project: take a steel sea container, cut it open, and 'fold' it like a piece of paper, according to the Japanese technique of origami. After the initial manual calculations, a 3D-drawing was made of the final shape. This was then used to compute a Scia Engineer model of the vast object. The model was first drawn up as a wire-frame model, after which the steel slabs were added as discs. After that, the model was used to optimise the steel edge moulding, which was welded alongside the sea container's slabs.

Ultimately, "Container Origami" was manually constructed, using a carefully cut-open sea container.

Project Information

Owner: follyDOCK, Rotterdam

Architect: Wouter Roeterink, Ron Nout, Femke Bijlsma & Allard Roeterink

General Contractor: Petit 3D Techniek, Rotterdam
Engineering Office: IMd Raadgevende Ingenieurs

Construction Start: 01/05/2007

Construction End: 01/08/2007

Location: Rotterdam, Netherlands



Introduction

On 26 May, the Rotterdam exposition follyDOCK was opened. This international folly competition included artists, designers and architects, who created a wide variety of 'useless' folly constructions. IMd designed two of these constructions, and acted as the project's sponsor as well. FollyDOCK is part of 'Rotterdam 2007 - City of Architecture'.

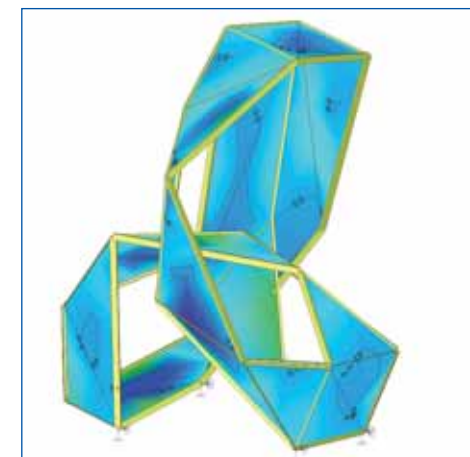
Participants were to design a folly, which was to surmount the restrictions of actual practice, and which stretches the boundaries between fantasy and reality. Of over 45 designs, the organisation picked 21 that were considered suitable for actual construction. One of those was "Container Origami", designed by Wouter Roeterink, Ron Nout, Femke Bijlsma and Allard Roeterink.



Design

IMd Raadgevende Ingenieurs have created a model for "Container Origami". The idea behind the folly is a simple one: take a steel sea container, cut it open, and 'fold' it like a piece of paper, according to the Japanese technique of origami. This leads to a completely different shape of the object.

From the cardboard model, and in a later stage, the steel one, it was concluded that the planned object, measuring eight-and-a-half metres in height, proved

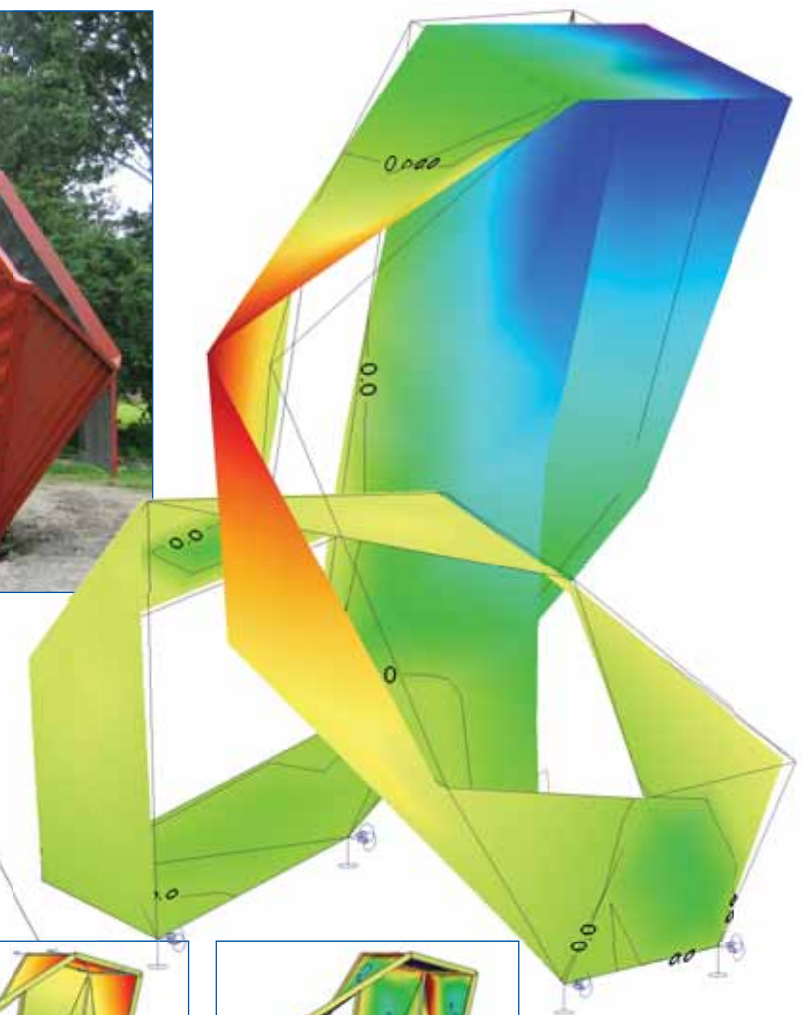
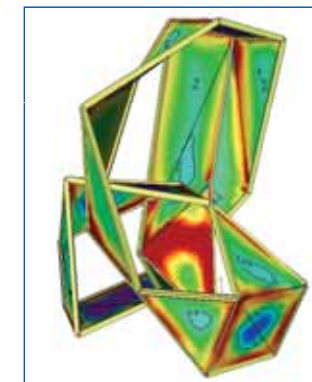
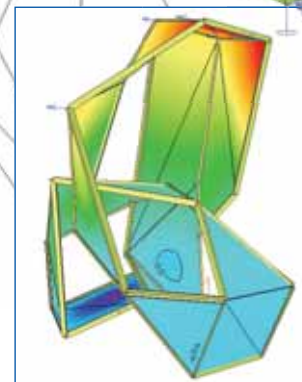
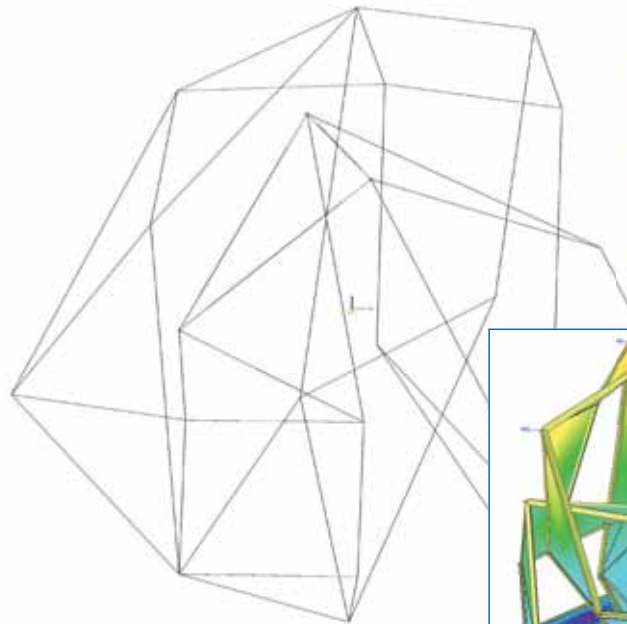


Used software: Scia Engineer

to be rather frail when exposed to (wind) pressure. IMD suggested an extra connection on two places, which led to a much more solid object. This meant that the amount of steel could be reduced.

After the initial manual calculations, a 3D-drawing was made of the final shape. This was then used to compute a Scia Engineer model of the vast object. The model was first drawn up as a wire-frame model, after which the steel slabs were added as discs. After that, the model was used to optimise the steel edge moulding, which was welded alongside the sea container's slabs.

Ultimately, "Container Origami" was manually constructed, using a carefully cut-open sea container. The entire work of art was then moved, by special transport, to its final position. The folly, which initially was to be a temporary construction, was adopted by the city of Rotterdam, and thereby gained its permanent status as a work of art.



IMd

Contact Harold van der Cruisen
 Address Jan Leentvaarlaan 62
 3065 DC Rotterdam, Netherlands

Phone +31 10-2012381
 Email h.vandercruisen@imdbv.nl
 Website www.imdbv.nl



Organisation

IMd Raadgevende Ingenieurs is an organisation with a great core of highly qualified employees, who have been applying their experience, know-how and expertise for many years with regard to advising about, designing and working out main structures for buildings. At present the firm consists of 40 highly educated employees. IMd is completely independent and does not have any business links with manufacturers, suppliers, contractors, developers and other interested parties who could influence our impartial and independent consultancy.

IMd is a member of the Dutch association of consulting engineers (ONRI) and possesses the "quality management system" certificate according to NEN-AND-ISO 9001.

It is a firm where the internal communication proceeds smoothly and all employees are kept informed about the most recent developments.

In the almost 50 years that our firm has existed the quality of our service has always been a key issue. The most important characteristics of this service for us are:

- A good product that fits the budget of the client
- A product that fits the concept of the architect
- Creativity and ingenuity
- A flexible and service-oriented attitude

Projects

They vary greatly: from prestigious office complexes to pedestrian bridges, from houses to complex shopping centres, from alterations to new-housing and from simple and small to complex and large. Each project has its own charm and is a

constructive challenge. The projects are carried out at the request of property developers, government organisations, foundations, architects, contractors and private parties. This diversity in clients is made possible because of the independence of the firm of consulting engineers.

View IMd Raadgevende Ingenieurs

The view of IMd is that the success of a project largely depends on the first stage of the design process. The cooperation between architect, client, mechanical engineer and structural engineer is decisive in order to have a fine design in complex projects. In the preliminary design various alternatives are presented for the structure of a building. The advantages and disadvantages of every constructive alternative will then be discussed in the design team. Wishes of the client and architect, requirements in the field of building physics, possibilities regarding the technical installations: they all affect the choice of an optimal structural design.

In addition to the constructive design, IMd regards its role as a coordinating engineer as very important. In its existence IMd has built up a perfect reputation. In addition to the inspection of the basic principles of the drawings and calculations of suppliers of prefabricated concrete and steel constructions, the content of these elements is also assessed with great care. We ask the client to make it possible for us to carry out the consultancy work in a constructive way. In the end this will create the best result for the client.

Short Description

Theatre with cantilevered steel construction

One of the historic purification industrial halls of the Amsterdam Westergasfabriek is the home of theatre MC. Together with architectural firm MOKO*OMAHA, IMd Raadgevende Ingenieurs have designed the main supporting structure for two large, unique constructions, to be placed in this monumental industrial hall. During the design phase, Scia Engineer was already used to rapidly determine the construction's ideal shape, as well as to gain insight into aesthetically desirable alterations. In this manner, form and function are linked efficiently. During a later phase, the construction was tested, again with the use of Scia Engineer.

Project Information

Owner: Theatergroep MC, Amsterdam
Architect: MOKO*OMAHA Architecten, Amsterdam
General Contractor: Witkamp Bouw, Almere
Engineering Office: IMd Raadgevende Ingenieurs

Construction Start: 15/03/2009
Construction End: 01/09/2009
Location: Amsterdam, Netherlands



Introduction

In 2009, the Amsterdam Westergasfabriek site is where, in one of its monumental halls, a number of exclusive constructions are realised. Constructively speaking, "The Grid" is the most interesting: a steel construction with a 12-metre cantilever protruding from it. This cantilever may be used to present various props and items, such as cars and other heavy stage properties, needed for the groundbreaking theatre productions of the MC theater society. Lamps will be hanging from the construction as well. Therefore, it is of vital importance that the construction shows a high level of rigidity, together with the lowest possible level of deformation. All this must be achieved while retaining a slender appeal, since the architect aims at creating a box, which floats in mid-air.

This construction was analysed using a Scia Engineer 2D- and 3D-model, respectively.

The hall's second large construction is the so-called "Achterhuis" ("Rear House"). This is an entire building within the large hall, including dressing rooms, conference rooms, installation depots and ground-floor storage rooms. Since the storage rooms have to stock large stage items, the front was to be as large as possible, without the construction of columns. This was achieved by placing the staircases on the building's side wings; the columns were situated there as well.

The columns, which under normal circumstances were to be placed below the remaining 12 metres, can be omitted here, because of the large girders that hold the floors in place.

This girder frame forms the Westergasfabriek's roof construction and fits in perfectly with the rest of the building.

During the design phase, Scia Engineer was already used to create a 3D-image of the forms that were to be implemented, as well as the accompanying steel moulding.

What made this project relatively complex was the already existing construction. Not only are the construction works to take place within a building that already exists, this particular building is also branded historically monumental. This means that, basically, no part of the building may be altered. For instance, the new constructions are not to be linked with the already existing ones too much, while such an approach would, constructively, be the best one. These stipulations have led to two fully independent constructions.

Another problem that was encountered was the fact that the Westergasfabriek site used to hold chemical plants, which have polluted the soil. Also, Amsterdam constructions always have to be built using pole-foundations, because of the weak topsoil. The poles that are required for the new construction have to be placed in such a way, that they do not enter the

sphere of influence of the already existing poles. This, too, was included in the design, by using Scia Engineer - set to specific boundary conditions - to determine possible reactions.

Design

During the design process, IMd worked closely together with the architect. First, ideas were pitched and shared using drawing sketches. Soon, however, Scia Engineer was employed to determine a clear 3D-model of the construction.

The constructive challenges (a 12-metre cantilever and a 12-metre column-free protruding span) have led to a project, the form of which directly relates to the construction's dimensions. Construction and design were carefully integrated during the design process, in order to achieve not only aesthetic appeal, but also efficiency; both within the set financial boundaries. Scia Engineer proved to be of great value; any alteration in the construction's shape was rapidly processed, and IMd was able to determine which consequences the alterations would have for the steel moulding.

Scia Engineer was also used for both constructions to determine their ideal constructive shapes, within the boundary conditions of the architect, as well as the

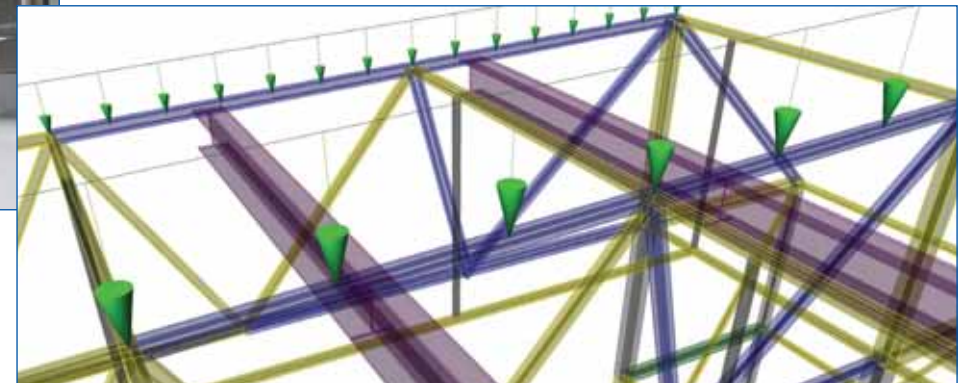
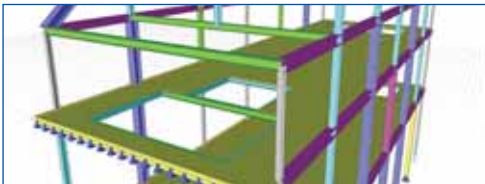
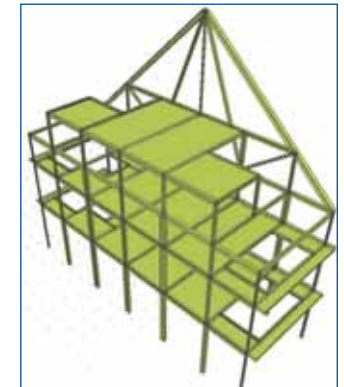
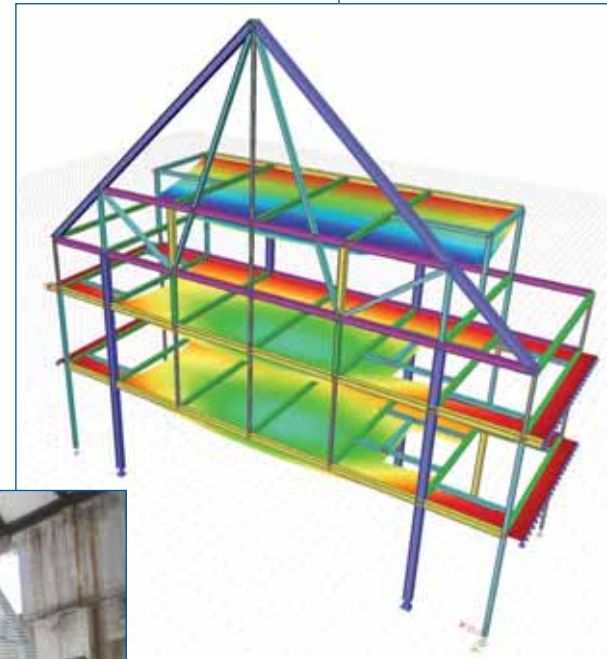
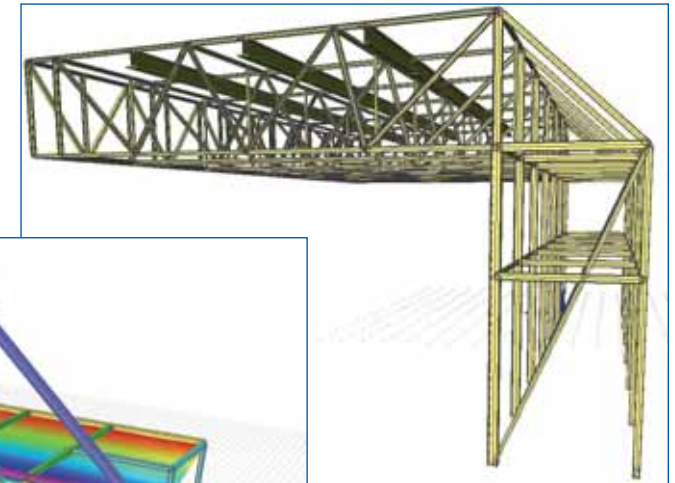
already existing building. Changes in the design could be implemented rapidly, after which the various options could be compared. Communicating through 2D-models about these 3D-shapes has proved to be rather problematic. This 3D-package, which produces clear images, was a very good solution to that problem.

All in all, the well-tuned co-operation between the architect and IMd, with the use of Scia Engineer, has led to a constructive design that fits in nicely with the already existing building. It has met with all the architect's demands and wishes, as well as those of the eventual employer; on top of that, the design proved to be financially feasible.

Development and execution

During the design process, IMd optimised the steel construction as much as possible, which means that during the subsequent phase, this only needs to be completed. The 3D computational model was then used to create the 3D construction drawings. These drawings, together with the completed Scia Engineer computations, were sent to the steel sub-contractor, who will finish the detailed construction. 2009 will see the outset the construction works, which are to be completed before the start of the 2009-2010 theatre season.

Theatre with cantilevered steel construction



IOA

Contact Philippe Le Bouquin
 Address Les Pléiades - Park Nord
 74370 Metz Tassy, France
 Phone +33 450 27 10 85
 Email siegesocial@ioa.fr
 Website ioa.fr



IOA qui fête cette année ses 20 ans est une PME reconnue, forte de ses trois agences en métropole et ses filiales à l'outre-mer.

Son activité initiale de bureau d'études ouvrage d'art, très orientée en structure métallique, s'est élargie aux études génie civil qui atteignent une place importante de l'ordre de 50% de l'activité. Aujourd'hui, l'équipe IOA est pluridisciplinaire. Elle regroupe plus de 35 personnes aux diverses compétences, lui permettant de s'impliquer dans de nombreux domaines.

Les compétences sont les suivantes

- Ingénieurs, Calculateurs, Projeteurs, Dessinateurs
- Ingénieurs soudeurs, Techniciens COFREND II
- Inspecteurs ACQPA/FROSIO, Inspecteurs ACFM
- Techniciens métrologie, Techniciens topographes
- Techniciens de chantier

Elles se regroupent selon quatre métiers

- Maîtrise d'œuvre complète ou assistance technique au Maître d'œuvre
- Assistance Maîtrise d'Ouvrage (assistance technique en phase de conception et de réalisation)

- Laboratoire/Expertise
- Bureau d'Etudes

Domaines d'activité

- Ouvrages d'art (ponts routes et rails, passerelles, ponts mobiles, ouvrages maritimes ou fluviaux, soutènements, tunnels, pare-avalanches et ouvrages de protection...)
- Ouvrages hydrauliques (Stations d'épuration, Stations de pompage, Réservoirs...)
- Bâtiments industriels
- Edifices publics (gare, spectacle, sport, piscine...)
- Infrastructures et outillages portuaires.
- Equipements de montagne
- Structures métalliques (éléments de signalisation, pylônes...)

Moyens

- Bureaux d'études de structures spéciales
- Laboratoire avec personnels certifiés IWT COFREND II et ACQPA/FROSIO
- Coordonnateur sécurité et protection de la santé niveau 1
- Personnels habilités aux travaux en hauteur



Short Description

Crane on floating sea pontoon

The project regards the design of a sheer leg superstructure built up on an existing sea pontoon using the Germanischer Lloyd calculation code.

The sheer leg has two lifting configurations: a safe working load of 200t, ranging up to 10 m to a height of 20 m high and one of 60t, ranging up to 20 m, with a height of 30 m using a jib.

Calculations have been made using static analysis as far as 1st order results were not much different for internal forces and the number of combinations according to the 1st GL regulations was important.

Almost all checks for cross sections and details have been made using manual calculations. The buckling of the mains legs and the jib pipes has been calculated with the stability option and the length of the cables was determined using the second order calculation.

The main members are made with S355 steel pipes with a diameter of 810 mm and 500 mm. The spacing between the legs is 12,50 m on the pontoon and the jib goes up to 37 m above deck level.

The sheer leg built during the summer of 2008 is GL classified.

Project Information

Owner: EJN Negri
Architect: EJN NEGRI / IOA / MAURIC
General Contractor: EJN Negri
Engineering Office: IOA

Construction Start: 01/07/2008
Construction End: 01/09/2008
Location: La Ciotat, France



L'entreprise EJN NEGRI qui réalise des travaux maritimes dans la région de Marseille effectuait ses opérations de levage en mer avec une grue de 130t à chenilles et flèche treillis de 34 m roulant sur un ponton flottant nommé KINARD.

A cause de la capacité de levage limitée de l'ensemble et face aux besoins croissants, EJN NEGRI a alors étudié la faisabilité de transformer le ponton en une bigue à mature fixe. La stabilité du ponton a d'abord été vérifiée par le Bureau MAURIC pour deux configurations :

- Charge utile de 200 tonnes à 10 m avec mât principal seul et hauteur de levage de 20 m,
- Charge utile de 60 tonnes à 20 m avec mât principal relevé et flèche pour une hauteur de levage de 30 m.

Restait ensuite à dimensionner les éléments : mâts en tubes, câbles de retenue, articulations et fixations suivant les règles de calcul du Germanischer Lloyd (GL) afin d'obtenir la classification dont disposait initialement le ponton.

Cette tâche a été confiée à IOA qui a dû rapidement assimiler ce nouveau règlement spécifique aux installations maritimes de levage et concevoir une

structure simple, économique et rapide à fabriquer avec comme choix initiaux définis conjointement des mâts tubulaires en acier et des dispositifs de retenue en câbles. Il faut noter que les règles GL présentent des similitudes avec les règles FEM.

Le principe de la structure, assez simple, a été rapidement défini et une modélisation en éléments barres était suffisante. Les deux configurations de charges nous ont conduit logiquement à réaliser 2 modèles séparés avec ESA-Prima Win. Bien que le nombre de cas de charges statiques de levage était théoriquement limité à 2, il a fallu tenir compte du vent d'exploitation sur la structure et sur la charge (3 directions) puis de l'inclinaison du ponton (roulis et tangage) par mer calme, également du vent hors exploitation et enfin des conditions de mer en fonction de la houle.

Compte tenu de la simplicité de la structure, nous avons d'abord effectué un comparatif des résultats sous charge de service déterminés par un calcul linéaire avec ceux déterminés par un calcul non-linéaire 1^{er} ordre ; nous avons pu constater que si les flèches étaient bien différentes, les efforts sont très proches (pour le calcul linéaire, nous avons modélisé les câbles par des barres en traction seule).

Used software: ESA-Prima Win

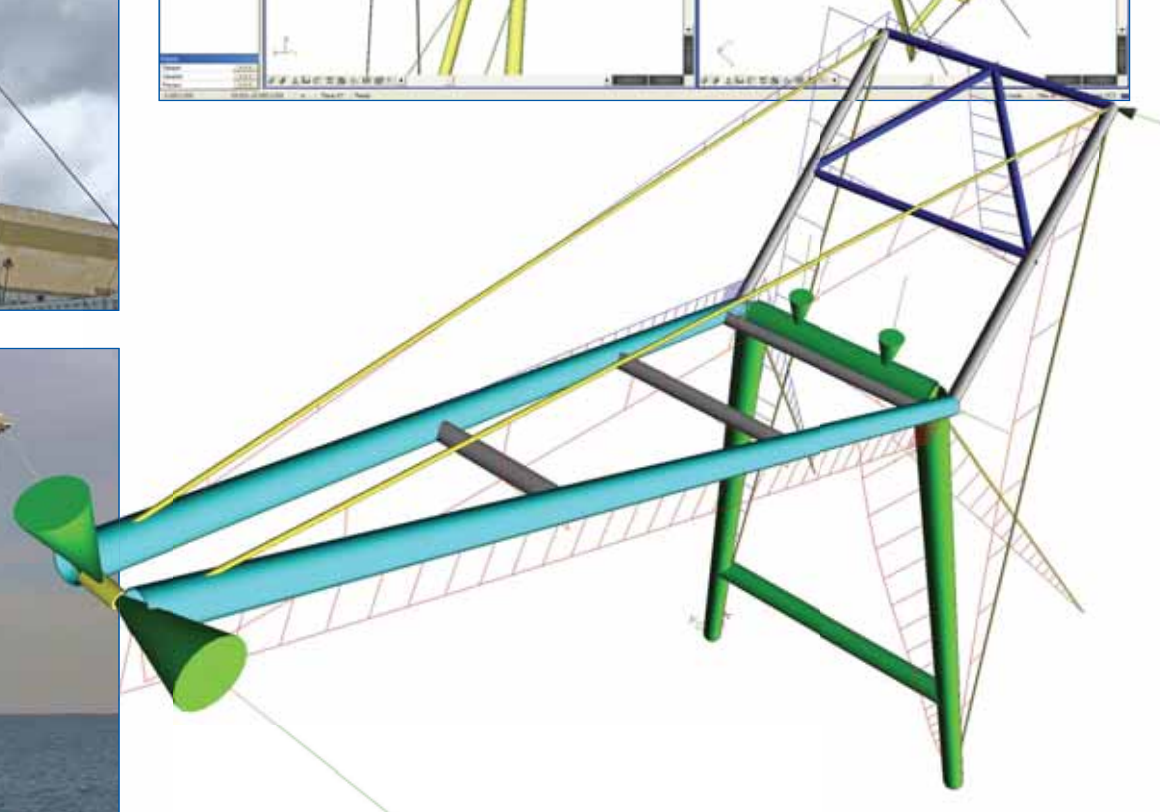
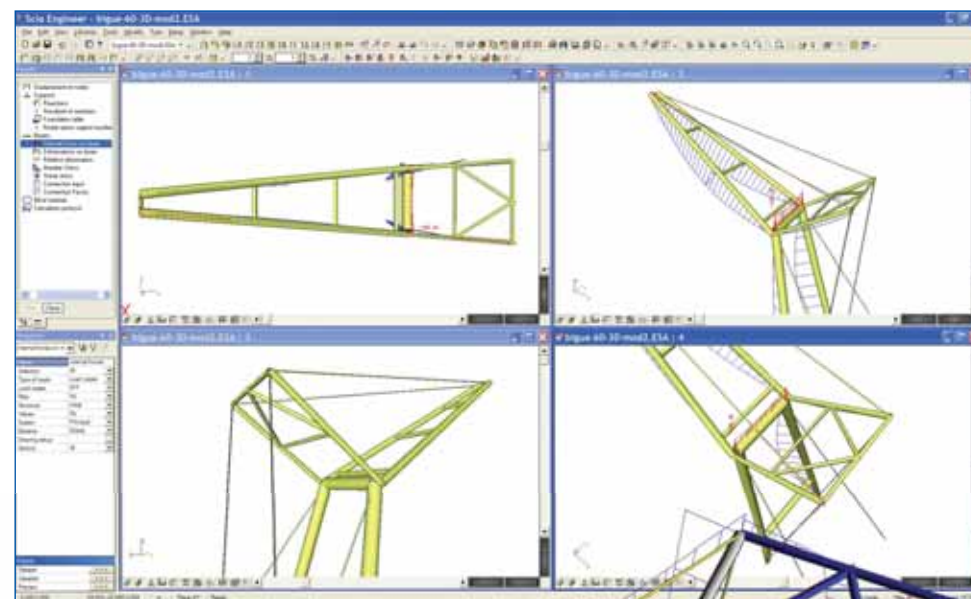
Nous avons donc lancé le calcul des 2 modèles par mer calme avec chacun 8 règles de combinaison statique ELU. Par contre nous avons bien pris soin de nommer les types de combinaisons de charges A, B et C suivant le GL (A=exploitation sans vent, B=exploitation avec vent de travail ou hors exploitation et vent extrême, C=combinaisons spéciales dont perte de la charge ou cas de navigation avec effet dynamique sur la mature, ou encore exploitation en mer avec houle). En effet la difficulté dans l'exploitation des résultats avec ce règlement réside, comme avec la FEM, dans les facteurs de sécurité sur les matériaux qui varient suivant les types de combinaisons de charges, alors que les pondérations des charges varient également dans un même type de combinaison de charges.

Ainsi pour ne pas être trop défavorable, il a ensuite fallu éditer les résultats (solicitations et contraintes) pour chaque élément à vérifier pour les 3 familles de combinaisons, et ceci pour les deux modèles. L'ensemble des vérifications des sections et assemblages a été réalisé par des calculs manuels, à part le flambement où nous avons utilisé le module de calcul de stabilité pour déterminer la charge critique dans les tubes. Ces valeurs ont été contrôlé manuellement car il s'agissait de barre isostatiques.

La longueur des câbles à commander a été définie en calculant leur allongement sous charges permanentes au IIème ordre.

La bigue a été construite à l'été 2008 pour être opérationnelle en septembre 2008. Les tubes principaux sont de diamètre 810 et 500 mm pour un poids de l'ensemble de l'ordre de 55 tonnes. L'entraxe des jambes est de 12,50 m à la base et la flèche monte à 37 m au dessus du pont.

Les notes des calculs ont été rédigées en anglais et soumises à l'approbation du GL et la bigue est classifiée GL.



Iv-Consult

Contact ir. W.M. Visser
 Address Vestiging Papendrecht
 Postbus 1155
 3350CD Papendrecht, Netherlands
 Phone +31 786448555
 Email w.m.visser@iv-bouw-industrie.nl
 Website www.iv-groep.nl



Iv-Bouw & Industrie is renamed into Iv-Consult per the 30th of March 2009 and is a division of Iv-Groep, a group of professional engineering companies with approximately 700 employees. Iv-Groep was founded in 1949 as a design and drawing office for steel structures. Through the years the company has developed itself into a sparring partner for clients that need independent advice or a constructive solution.

Iv-Consult has engineers for design and Engineering of Concrete and Mechanical Structures. Iv-Consult employs about 120 persons. The company is specialised in providing an independent advice for large heavy, complex and moving structures in different markets. A brief description of the Iv-Consult main markets are;

- Transport, storage and transfer systems and equipment;
- Heavy and special steel and mechanical structures;
- Special constructions such as attractions for amusement parks;
- Design of harbour and airport terminals, including logistic advice;
- All the offices, silos and store sheds etc. included in the projects.

The available manpower in the other divisions of Iv-Groep enables Iv-Consult to deploy extra capacity and, if required, other disciplines such as systems engineering, maintenance concepts and 3D measurement and 3D laser scanning.

The disciplines within Iv-Consult consist of steel engineering, mechanical engineering, civil engineering, logistic engineering, connection design and management/staff services.

Iv-Consult offers its services all over the world. Besides the home market in the Netherlands and Belgium, Iv-Consult serves clients in China, Malaysia, Middle East, Pakistan, Australia and India. For these international services Iv-Consult also runs a fully equipped office in Kuala Lumpur, Malaysia.

Iv-Consult's main objectives are:

- To be a reliable partner for its clients
- To be the innovating and creative consulting engineer for special and large steel, mechanical and concrete structures from feasibility studies up to preparation of shop drawings
- To be the logistic advisor for: Storage and Transfer, Internal logistics, People Logistics, Construction Logistics

Iv-Consult strives to be the constructive partner.

Iv-Consult wants to be the best in steel concrete and mechanical projects, from first draft up to realization.

Clients

Iv-Consult has a wide variety of clients:

- Contractors (national and international);
- Operators of terminals and factories;
- Suppliers of installations and equipment;
- Project developers;
- Port authorities;
- Government.

Short Description

Mechanical ships lift dock, Goa

This project regards the design of a mechanical ship lift system located in Goa, India.

Iv-Consult is the engineering company for the main steel and ship supporting structures.

This kind of 'Mechanical Lift Dock' is used in a shipyard as an alternative to dry-docks, floating docks or slipways. Mainly it is a platform suspended by large number of winch systems. The ship is placed on movable trailers and transported over rails to a chosen maintenance area. The Goa lift system has a capacity of 6.000 tons and has a size of 120 by 27 meters, the size of a lock. Iv-Consult used Scia Engineer to design the main structure and the various substructures.

Project Information

Owner: n/a

Client: Bosch Rexroth b.v.

General Contractor: Bosch Rexroth b.v.

Engineering Office: Iv-Consult b.v.

Construction Start: 01/06/2008

Construction End: 01/01/2010

Location: Goa, India



Introduction

Iv-Consult and Bosch Rexroth Systems & Engineering are working together on the design of mechanical lift docks. Iv-Consult is responsible for the engineering of the entire steel and mechanical structures for the Mechanical Lift Dock projects. Bosch Rexroth as main contractor is responsible for the design of the hydraulic and electric installations and the control system.

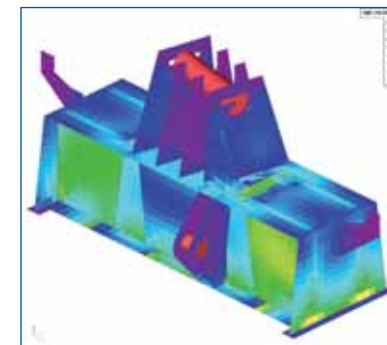
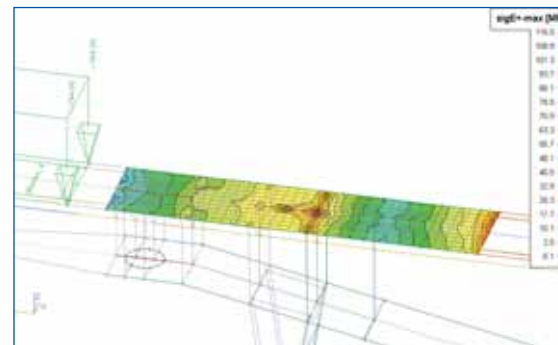
Mechanical Lift Dock versus Ship lift

A Mechanical Lift Dock is often confused with a ship lift. It is therefore necessary to briefly explain the difference between the two systems.

A Mechanical Lift Dock is used in a shipyard as an alternative to dry-docks, floating docks or slipways. A Mechanical Lift Dock consists of a platform

suspended from a number of winch systems. The platform with trestles is lowered under water in the horizontal position, after which a ship takes up position above the platform and the platform is lifted up along with the ship. The ship can then be moved by means of a bogie system and parked on a specific area.

Since ships docked on a Mechanical Lift Dock can be moved by a transport system to other specific locations within the shipyard, a Mechanical Lift Dock can service an large number of parking places. In such cases, the costs per repair location are reduced greatly. In The Netherlands, six Mechanical Lift Docks are in operation, namely in Slidrecht, Alblaserdam, Rotterdam, Den Helder, Amsterdam and Harlingen. A ship lift is a mechanical structure that can move in a water enclosure, approximately the size of a lock chamber. A ship can thereby be raised or lowered



Used software: Scia Engineer

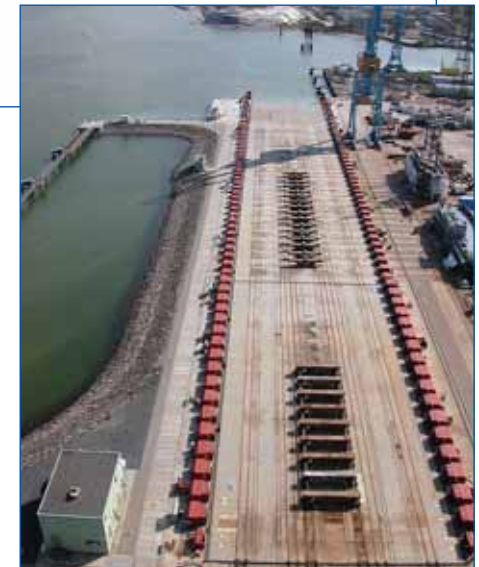
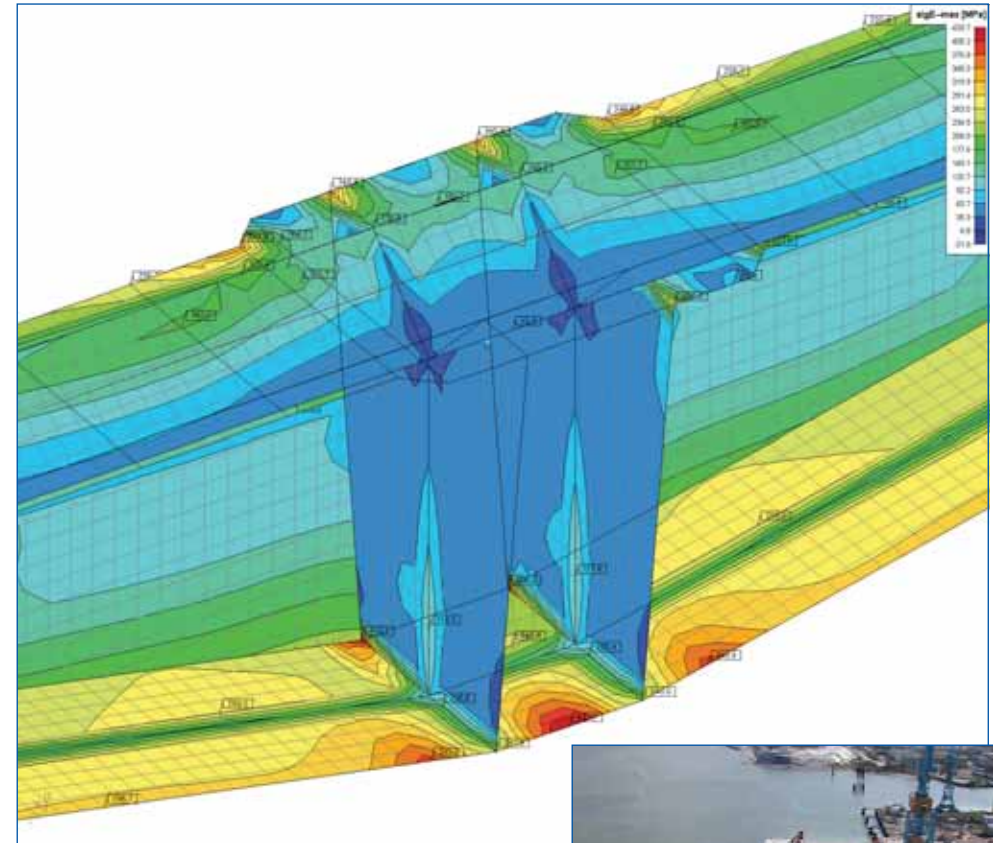
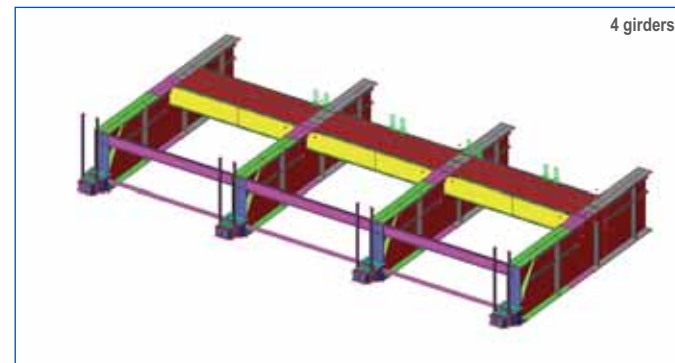
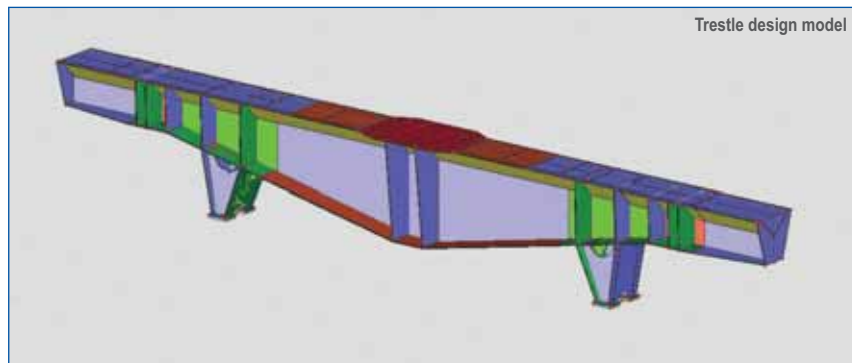
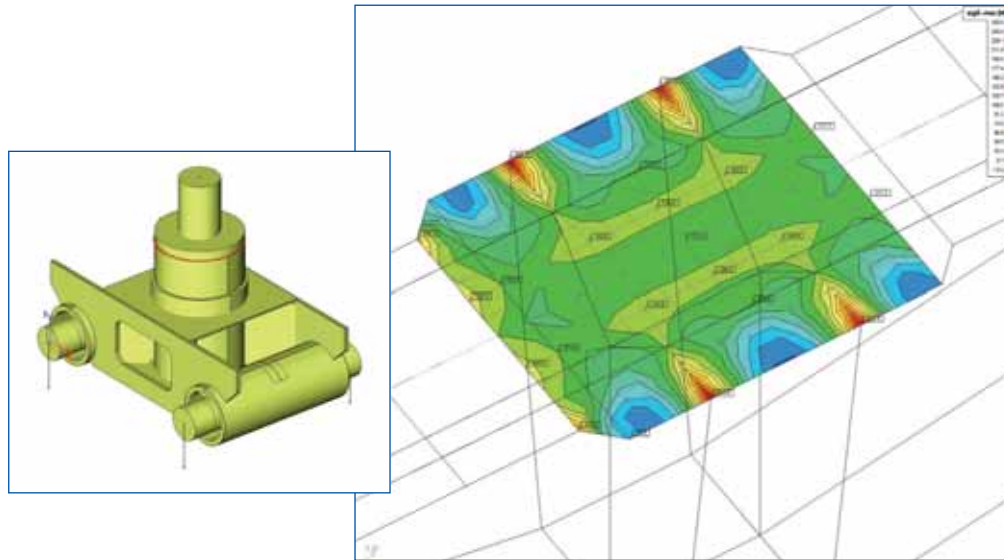
within a channel, over a relatively large distance. This provides an alternative to locks. There are no ship lifts in The Netherlands, although they may be found in Belgium for example, in La Louvière and Strépy-Thieu, and in Germany, such as in Henrichenburg and Niederfinow, among others.

Mechanical Lift Dock projects

Iv-Consult is currently working on the engineering for projects in Dubai, Goa, Sydney and Mega Yacht Lifting System projects. Most Mechanical Lift Dock systems are tailor-made and are capable of handling between 6.000 and 25.000 tons ship weight, with lengths

between 100 and 230 metres. Mega Yacht Lifting Systems – MYLS for short – are an exception to this.

For the GOA lift Dock Iv has used Scia Engineer to design the various parts of the structure, such as the trestles, trailer/boogie frames and the dock platform. The trestles are standard frames to carry the ship and are heavily loaded under various circumstances. The trestles can be lifted with the use of hydraulic trailer/bogie frames which uses a rails that is integrated in the dock platform. The various structures are build out of plates and therefore Iv Consult used the plate module to design the specific parts.



Konstruktieburo Snetselaar BV

Contact Jan Henri Snetselaar
 Address Galileilaan 36
 6716 BP EDE, Netherlands
 Phone +31 318 62 71 62
 Email jhsnetselaar@snetselaar.nl
 Website www.snetselaar.nl



Konstruktieburo Snetselaar BV is een landelijk opererend onafhankelijk en zelfstandig adviesbureau voor bouwconstructies. Onze activiteiten bestaan uit het ontwerpen, berekenen en tekenen van bouwkundige en civiele constructies van gewapend/voorgespannen beton, staal en hout. De bouwsectoren waar wij ons op richten zijn de utiliteits- en woningbouw als ook de industriële bouw en de droge infrastructuur.

Met ons team van ruim 20 adviseurs, constructeurs en tekenaars bieden wij de volgende diensten aan:

- Adviezen en ontwerpen voor bouwconstructies
- Alle werkzaamheden als hoofdconstructeur
- Sterkteberekeningen
- Detailberekeningen
- Ontwerp-, detail- en wapeningstekeningen
- Werkplaatstekeningen staalconstructies voor productie en montage
- Funderingsberekeningen en funderingsadviezen
- Schadeanalyse en schaderapportage
- Vuurbelastingberekeningen
- EPC-berekeningen (woning- en utiliteitsbouw)
- Daglicht- en ventilatieberekeningen
- Verkennend milieukundig bodemonderzoek conform NEN 5740
- Grondmechanisch onderzoek (sonderingen)
- Wapeningsdetectie: niet-destructieve meting van dekking en diameter van ingestorte wapeningsstaven m.b.v. sensor

Voor het verzorgen van deze werkzaamheden maken wij gebruik van moderne reken- en tekensoftware. Bouwconstructies waar wij voornoemde diensten zoal voor leveren zijn:

- Bedrijfshallen en kantoorgebouwen
- Scholen, kerken en zorgcentra

- Woningen en appartementencomplexen
- Fabrieken en winkelcentra
- Parkeerkelders
- Agrarische bouw: stallen, silo's en loodsen
- Bruggen, viaducten, onderdoorgangen en tunnels
- Damwandconstructies en geluidsschermen
- Bijzondere constructies

Onze praktijkgerichte aanpak is gebaseerd op de betrokkenheid van onze medewerkers bij zowel het voortraject als de uitvoering van projecten.

Het meedenken tijdens het bouwen staat voorop. Ons bureau kenmerkt zich door snelle prijsbewuste adviezen met korte lijnen naar de opdrachtgever, waarbij persoonlijke contacten als zeer belangrijk wordt aangemerkt.



Relocation of listed monument 'station of Houten'

Short Description

On 24 August 2007 the station of the city of Houten has been moved over a track of 150 meters. The station was built in 1868 and had to be moved because of the increasing number of railway tracks. On the new location, the building has turned into a multifunctional meeting place, ready for the next century. Konstruktieburo Snetselaar BV was involved in the project as structural engineer. The operation of 'lifting and transporting' the station was executed in seven stages. For the engineering of this project Konstruktieburo Snetselaar BV used Scia Engineer. The main stages in the engineering were the design and calculation of:

1. The reinforced concrete lifting framework
2. The steel lifting piles construction
3. The foundation on the new location

Project Information

Owner: Gemeente Houten (Municipality of Houten)
Architect: n/a
General Contractor: Freyssinet Nederland BV
Engineering Office: Konstruktieburo Snetselaar BV

Construction Start: 01/01/2007
Construction End: 01/12/2007
Location: Houten, Netherlands



Verplaatsing van een uniek monument

Inleiding

Het 'Stationsgebouw Houten' is het enige van de 6 waterstaatstations uit 1868 dat nog bestaat. Om dit unieke monument te bewaren, moest het omwille van spoorverbreding ca. 150 m. verplaatst worden.

Bouwfaserings

Bij opdracht waren de bestaande gegevens bekend en was bekend naar welke locatie het station verplaatst moest worden.

In samenspraak met Freyssinet Nederland BV heeft Konstruktieburo Snetselaar BV toen de faserings-tekening gemaakt, waardoor per fase de cruciale constructie- en belastingssituaties inzichtelijk werd gemaakt.

De fasering was als volgt:

1. Beginsituatie: het verwijderen van de bestaande vloer en het afkoppelen van de nutsleidingen, zodat het mogelijk werd de fundering uit te graven en bloot te leggen.
2. Aan weerszijde van de bestaande fundering werden onderling gekoppelde betonnen steunbalken gestort. De nieuwe fundering werd uitgerust met verticale stalen stangen met schroefdraad die sterk genoeg zijn om het

station te kunnen tillen. Daarna is een hijsframe gerealiseerd. De op het hijsframe geplaatste hydraulische vijzels zijn gekoppeld aan de verticale stangen met schroefdraad.

3. Het opvijzelen is gerealiseerd d.m.v. computer-gestuurde (verplaatsingsgestuurde) vijzels. Het totale gewicht van het gebouw incl. het betonnen vijzelframe bedroeg ruim 800 ton. Uiteindelijk hing het gebouw zo'n drie meter boven de grond.
4. Onder het opgehesen gebouw is een rijbaan met stalen rijplaten aangebracht. De platformwagens zijn aangevoerd en onder het gebouw gepositioneerd. Het station wordt via steunbalken afgevijseld op zes zware transportwagens, de zogenaamde multi-wheel-wagens met in totaal 48 assen en 192 wielen. Er is een constructie bedacht om de stalen vijzeltorens op het betonnen vijzelframe mee te vervoeren, zodat er zo min mogelijk vertraging is voor de gehuurde platformwagens.
5. Het station moest waterpas vervoerd worden. Elk wielstel kon afzonderlijk bediend worden, zowel in horizontale als in verticale richting. De zes wagens, met het station daarbovenop, reden over een speciale zandbaan met stalen rijplaten naar de nieuwe locatie, hetgeen op 24 augustus 2007 onder grote belangstelling van pers en publiek heeft plaatsgevonden.

- Op de nieuwe plaats van bestemming is het gebouw weer een stukje omhoog gehesen, zodat de wagens er onderuit konden.
- Daarna liet men het gebouw heel voorzichtig zakken. Het nieuwe fundament lag klaar voor ontvangst. De stalen vizelframes zijn verwijderd en het gebouw is klaar voor een volgende eeuw.

Engineering

Inleiding

De engineering is gestart met het in kaart brengen van de verschillende fasen van het project. Vervolgens is er een gewichtsberekening van het gebouw gemaakt. De constructieonderdelen die berekend moesten worden zijn:

- Het betonframe waarop het gebouw tijdens liften en verplaatsen staat.
- De stalen vizeltorens waarmee het betonframe opgehesen wordt incl. fundering.
- De fundering op de nieuwe locatie waarop het betonframe afgelaten wordt.

Deze onderdelen zijn met de rekensoftware Scia Engineer berekend. De teken-functionaliteit van dit pakket is ruimschoots gebruikt om 3D inzichtelijk te maken waar de verschillende constructieonderdelen geplaatst konden worden ten opzichte van elkaar.

Berekening betonframe

Het betonframe berekend in de 3 verschillende belastingssituaties:

- Vijzelfase oude en nieuwe locatie
- Rijdfase
- Gebruiksphase nieuwe locatie

De betonbalken worden langs de wanden gepositioneerd en d.m.v. inkassingen in de wanden wordt het gewicht van het gebouw overgenomen in het betonframe. Door de uitvoering in ter plaatse gestort beton, worden er t.p.v. de inkassingen goede oplegvlakken met het metselwerk gecreëerd. De dwarsbalken zijn de hoofd draagbalken van het frame en hebben een afmeting van 500x1200 en eenmaal 600x1200 op as E. De overige balken hebben een afmeting van 300x600 en worden aan weerszijden van een wand toegepast. De inkassingen zijn ca. 500 mm breed ca. 600 mm. hoog en hebben een onderlinge h.o.h.-afstand van ca. 500 mm.

De te rekenen stijfheden van de betonbalken zijn afgeschat m.b.v. M-N-k diagrammen, een functionaliteit die ook in Scia Engineer aanwezig is.

Uit de maximale representatieve momenten volgt de $E_{\text{gescheurd}}$
 Balk 600x1200: $E_{\text{gescheurd}} = 1.3 \cdot 1015 / l = 15500 \text{ N/mm}^2$
 Balk 500x1200: $E_{\text{gescheurd}} = 1.1 \cdot 1015 / l = 15500 \text{ N/mm}^2$

Het maximaal representatief moment in de balken 300x600 bedraagt ca. 65 kNm. Dit is lager dan het scheurmoment, zodat er gerekend wordt met $E = 31000 \text{ N/mm}^2$.

Het verschil tussen de verschillende fasen is de plaats van de steunpunten. In de gebruiksfase is de belasting ook nog eens hoger.

Berekening stalen vizeltorens

De vizeltorens staan op stalen buispalen, waarvan het draagvermogen berekend is met het softwarepakket MFoundation. Verder zijn de staalconstructies van de vizeltorens ook berekend met Nemetschek Scia-software.

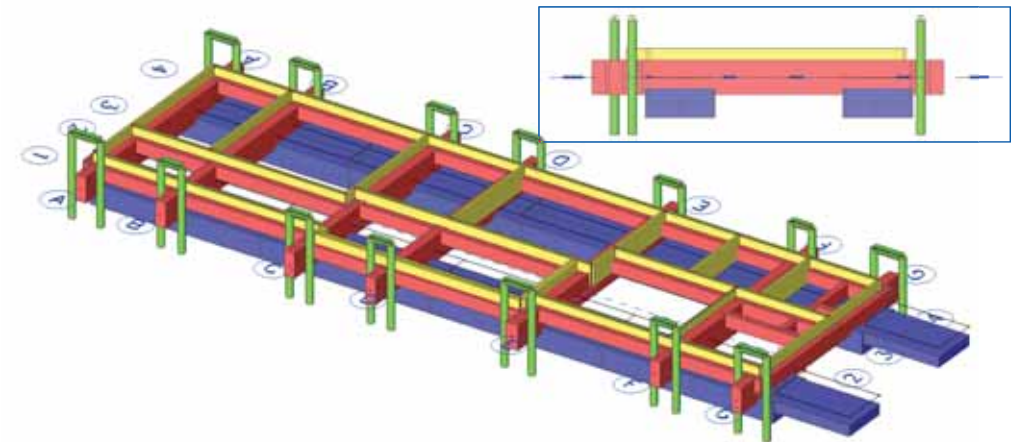
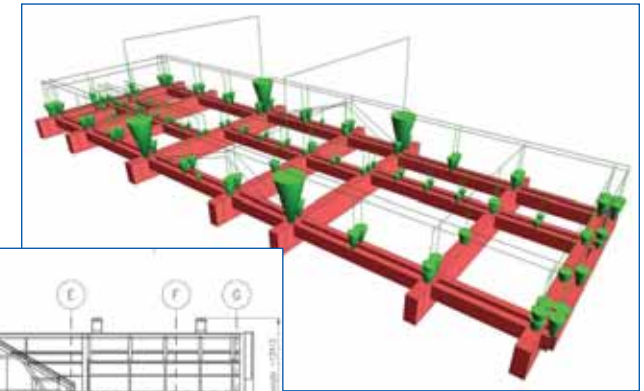
Berekening fundering nieuwe locatie

De prefab betonpalen onder de fundering op de nieuwe locatie zijn ook met MFoundation berekend. De belastingen op de fundering nieuwe locatie komen uit reacties van het betonframe in de fase aflaten en gebruiksfase.

Conclusie

De engineering van dit complexe en bijzondere project is door Konstruktieburo Snetselaar BV m.b.v. Scia Engineer uitgevoerd. De presentatiemogelijkheden van het rekenpakket boden uitstekende mogelijkheden om de technische communicatie met de bouwpartijen vorm te geven.

Verplaatsing van het Stationsgebouw Houten



Ney & Partners

Contact Matthieu Mallié
 Address Chaussée de La Hulpe 181
 1170 Bruxelles, Belgium
 Phone +32 2 643 21 84
 Email mm@ney.be
 Website www.ney.be



NEY
 +PARTNERS/BXL

Ney and Partners is a structural engineering consultancy, established in Brussels. Since its foundation in 1997, the office has worked with an active view on the art of engineering through the integration of the different civil works disciplines. This integration and optimisation of structural elements aims to overcome the classic hierarchic assembly of constructive solutions. Innovative passerelles, bridges, roof structures and works of art developed by our office, express most clearly this vision.

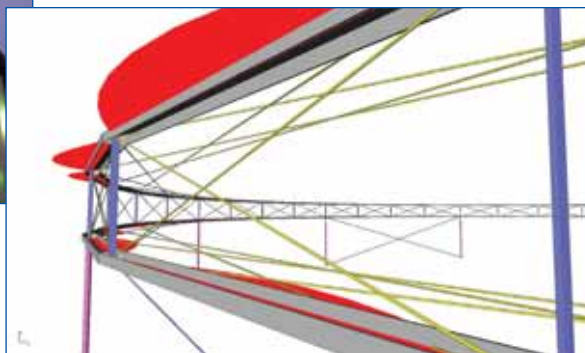
In our collaborations with architects, engineers or artists we aim at a full integration of architecture, structure and context.

The construction project quality lies in the synthesis of specific design constraints. The structural

aspect is of primary importance to this synthesis. From the very beginning of the design process, Ney & Partners conducts a constant research for advanced engineering integration. In doing so, our position as Engineering Consultancy overcomes the standardized dimensioning of predefined technical solutions.

An intense collaboration with the design team from an early stage on allows the development of innovative solutions, adapted to the context of the project.

Ney and Partners currently employs more than 40 civil engineers, architects, draughtsman, etc..



Short Description

Mehr Licht Temporary sculpture in Brussels, Belgium

Mehr Licht is a temporary light art installation designed by the German artists Any and Sibel Oztürk, with the help of the architect Michel Müller. The sculpture was presented on the Schuman roundabout in Brussels (Belgium), for the German Presidency of the EU in the first semester of 2007. The sculpture is a flying light ring interacting with its environment.

Ney and Partners designed the bearing structure on basis of Müller's original idea.

Project Information

Owner: Goethe Institut
Architect: Anny and Sibel Oztürk and Michel Müller
General Contractor: Baeck & Jansen
Engineering Office: Ney and Partners

Construction Start: 01/01/2007
Construction End: 31/06/2007
Location: Brussels, Belgium



"Mehr Licht" is a temporary light art installation designed by the German artists Any and Sibel Oztürk, with the help of the architect Michel Müller. The sculpture was presented on the Schuman roundabout in Brussels (Belgium), for the German Presidency of the EU in the first semester of 2007. The sculpture is a flying light ring interacting with its environment. The circular sculpture has been placed 5 meters above ground level and is made up of vertical metal tubes, the colour of which changes to the rhythm of the traffic and other urban noise. For this reason, microphones have been placed at strategic points around the Schuman Roundabout in order to relay the sound of the city to the sculpture's noise-sensitive metal tubes. According to the artists, this allows for noise from car horns, police sirens, etc., to be transformed into something positive. The sculpture remained in the middle of the roundabout until the end of April 2007.

The object consists in a 43 m diameter ring. The ring is formed by 4 m long on 1 m high steel frames made of pre-bended UPN200 as upper and lower flanges and thin steel plate as diagonals. The structure is stiffened by horizontal tension rods with a diameter of 10 mm linking the different frames. The columns have a diameter of only 80 mm. The result is an elegant and slim, subtle and discrete structure which lets the light express itself.

The structure has been built and put in place by the Flemish company Baeck & Jansens. The ring has

been split in nine 13 m-long frames (arches) welded in the workshop and then bolted on site to make the full circle.

Ney and Partners designed the bearing structure on basis of Müller's original idea.

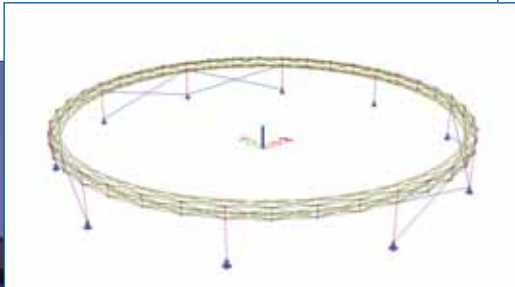
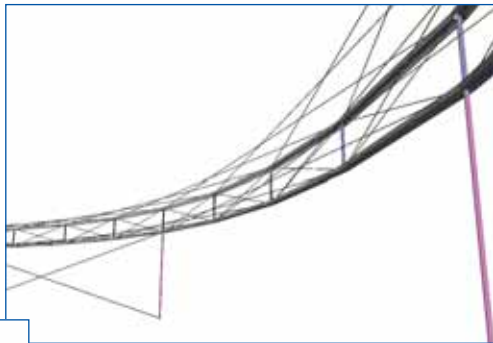
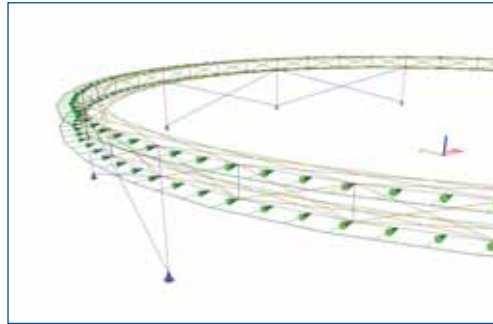
The ring forms a 3D truss beam giving resistance to the vertical weight loading and horizontal wind loading.

The structure acts globally as a rigid frame with pinned supports. This avoids to anchor the structure in the existing slab of the Schuman roundabout, under which the subway passes, as requested by the Administration de l'Équipement et des Déplacements (AED, now known as "Bruxelles Mobilité"), the responsible Brussels' administration. Therefore the foundations consist in precast concrete blocks placed on the existing slab of the Schuman roundabout. The size of each block has been designed to cope with the traction forces on the foundations due to wind loading. The horizontal forces are transmitted to the foundations through friction between the concrete block and the existing slab. The bracing cables (14 mm diameter) are placed in such a way that the paths to the square in the centre of the roundabout are left accessible.

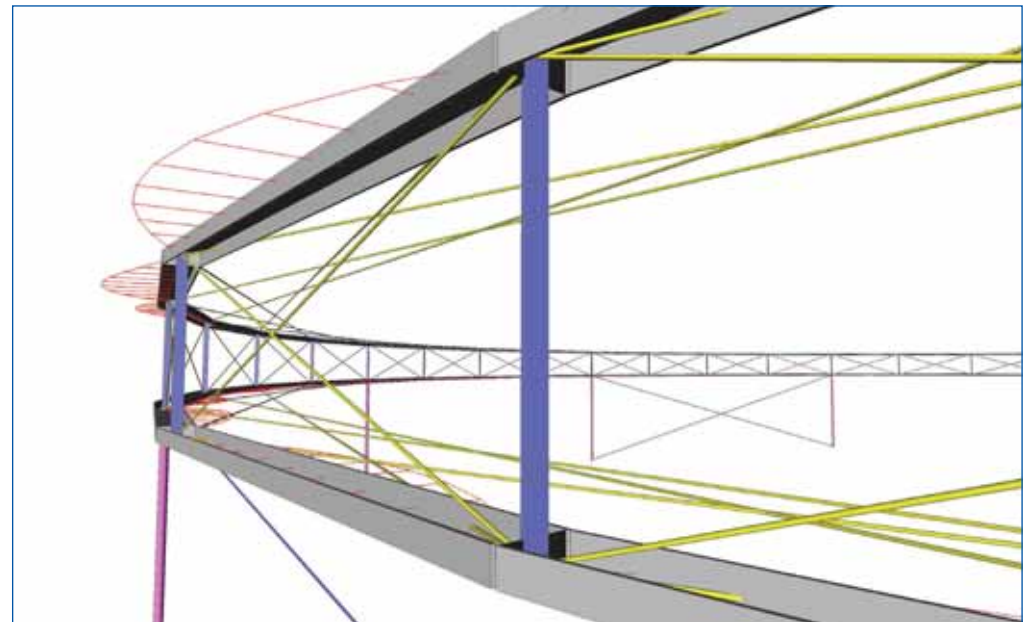
The structure has been completely modelled with Scia Engineer with 3D beam and cable elements. This makes the model non-linear. Moreover the dynamic behaviour and the instability of the structure

have also been accessed. The loads are principally the self-weight of the structure and the light tubes and the horizontal wind loads in both directions. The wind loads were calculated according to the Eurocode ENV 1991-2-4:1995.

As we have tried in first instance to avoid the bracing cables, we have been using Scia Engineer to study various typologies and alternatives. Up to 7 full 3D-models were made in this software. The 3D-rendering capabilities were very useful to communicate easily with the architects and the artists. Automatic screenshots from the model were shown to the partners of the project to convince them of the lightness of the chosen design.



Mehr Licht - Temporary sculpture in Brussels, Belgium



PRECI

Contact Nicolas Meiffre
 Address 28 route de tribies
 30560 Saint Hilaire de Brethmas, France
 Phone +33 466 610 610
 Email meiffre@be-prec.fr
 Website www.be-prec.fr



PRECI
 Préparation Réalisation Etudes Conceptions Industrielles

PRECI est un Bureau d'études, créé en 1999, spécialisé dans la conception et l'étude de structures métalliques et chaudronnées.

Ainsi PRECI peut vous accompagner dans le suivi de vos réalisations depuis le projet jusqu'à l'établissement des plans de fabrication.

PRECI évolue dans le domaine des installations industrielles et plus particulièrement les exploitations de minerais (carrières) mais peut aussi étudier tous types de bâtiments à structure métallique.

Organisation de l'entreprise :

- 3 ingénieurs concepteurs
- 1 ingénieur calculateur
- 9 dessinateurs projeteurs.

Nos domaines de compétences :

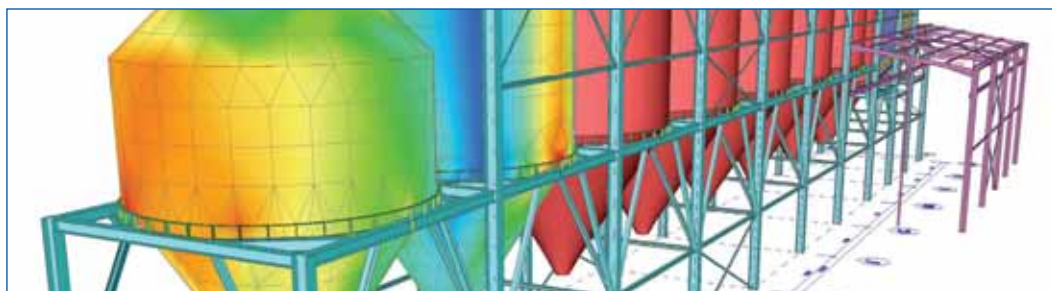
- Avant projet et Projet
- Note de calcul
- Installations de carrières, transporteurs, groupes mobile, etc.
- Installations industrielles
- Charpentes métalliques
- Chaudronnerie
- Déplacement France et étranger

Equipements :

- 1 poste informatique équipé du logiciel de calcul "Scia Engineer".
- 13 postes informatiques équipés de logiciels CAO 2D "Autocad LT"
- 2 postes informatiques équipés de logiciels de dessin 3D et de préparations : "Tekla Structures"
- 2 postes informatiques équipés du logiciel de CAO 3D "SolidWorks"

Nos principales références clients :

- Cemex, Lafarge, Vicat, Sandvik, Krupp Hazemag, Eurovia, Calcia, Colas, Axens, Rhodia, etc.



Short Description

Screening unit for elements in stock

In order to increase the production of aggregates, the company CEMEX in Sorèze, decided to install a screening unit on elements in stock. This metal structure is in fact part of an installation for loading trucks with granulated material. The model included both the steel structure with beam elements and the containers themselves with shell elements including stiffeners, etc. The challenge was to calculate the structure as a whole, integrating the different aspects of dynamic (vibrations) and static (wind) loadings.

Project Information

Owner: Cemex Soreze
Architect: n/a
General Contractor: Sandvik
Engineering Office: BE PRECI

Construction Start: 23/07/2008
Construction End: 01/01/2009
Location: Soreze, France



Dans le but d'augmenter la production de granulat, la société CEMEX à Sorèze, a décidé d'installer une unité de criblage sur éléments de stockage. Ce projet a été commencé en février 2007, pour une fin de réalisation prévue fin d'année 2008 et une mise en production début d'année 2009. Ce projet est un poste de chargement camion de granulat dans une carrière d'exploitation de minerais.

- Nombre de matériaux utilisés : 1
- Nombre de combinaisons : 77

Données techniques

Stockage

- 8 silos : capacité 400 m³ soit 1040 tonnes de granulat
- 1 trémie : capacité 240 m³ soit 624 tonnes de granulat

Dimensions de la structure

- Longueur : 74 m
- Largeur : 15,2 m
- Hauteur : 16 m

Données du projet

- Nombre de nœuds : 1801
- Nombre de barres : 523
- Nombre de plaques : 37
- Nombre de profils utilisés : 24
- Nombre de cas de charge : 9



Used software: Scia Engineer

Poids total de la structure

- 220 tonnes

Code de calcul

Règles CM66 et NV65 (modifiée avril 2000) : Règles régissant les constructions métalliques ainsi que les effets de la neige et du vent.

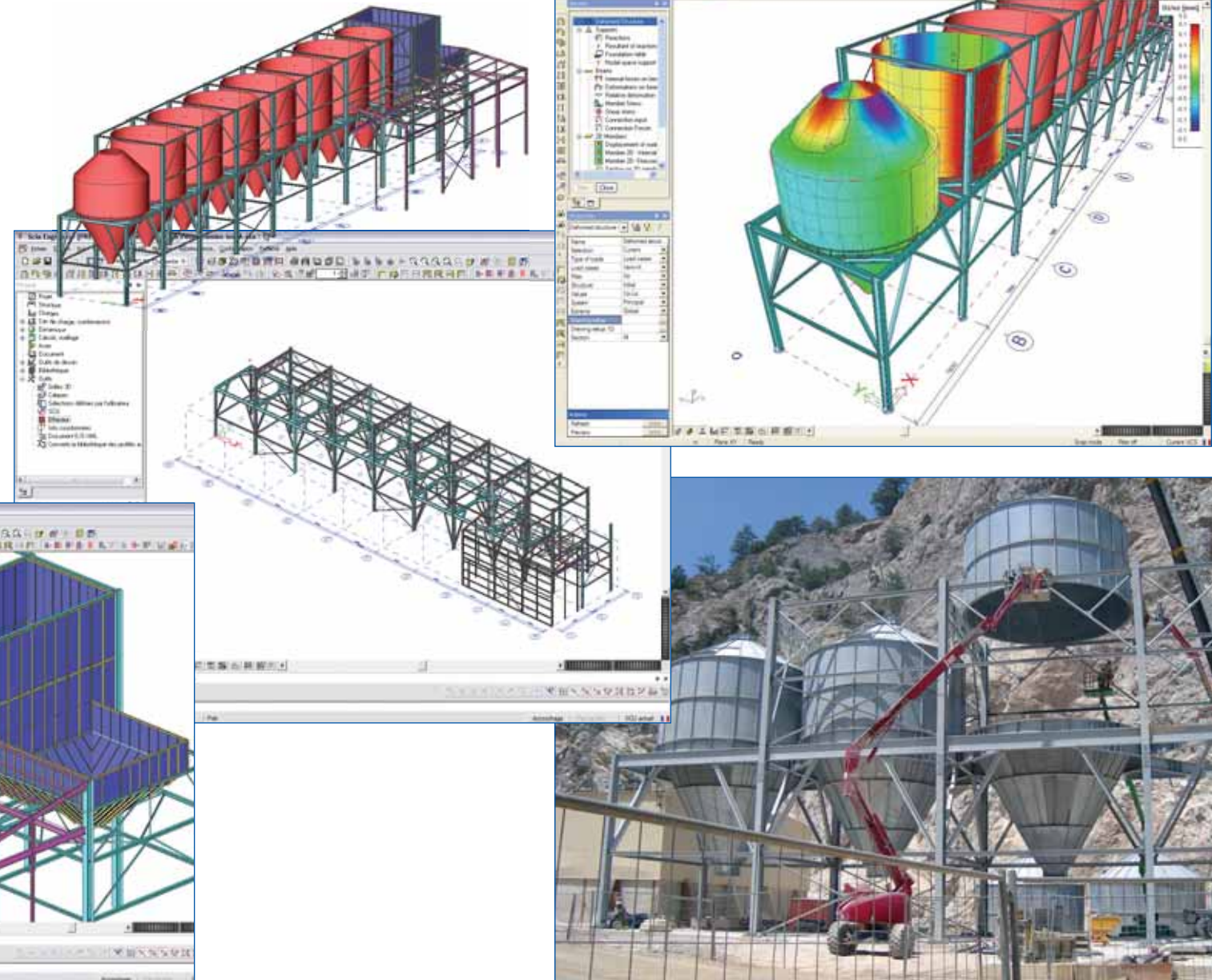
Cahier des charges

La structure doit pouvoir supporter à la fois les éléments de stockage et l'installation de criblage située en dessus des silos et à la fois les efforts due aux charges climatiques d'une région 2 pour les données de vent et une région 2A pour les données de neige suivant la réglementation NV65.

Cette structure métallique à la particularité d'allier le calcul de coques avec celui de barres. Les coques et les plaques des panneaux de trémie sont raidies par des plats, ceci ayant été modélisé par des nervures de plaques.

La difficulté a été de calculer les mode propres de la structure, en intégrant les vibrations des différents cribles de la partie supérieures, et celle due au vent.

Nous avons utilisé dans le module dynamique l'outil de combinaisons de masses pour générer toutes les combinaisons possibles des vibrations afin d'affiner au mieux le calcul des modes propres et des déformées dues à l'action des différentes combinaisons de charges.



SPIE-Controlec Engineering

Contact Hans van der Kloes
 Address de Brauwweg 74-82
 3125 AE Schiedam NL, Netherlands
 Phone +31 10 40 90 400
 Email hans.vanderkloes@spie.Controlec.nl
 Website www.spie-nl.com



SPIE-Controlec Engineering B.V. is a NEN-ISO-9001 certified multi disciplined engineering company specialised in Feasibility studies, Basic & Detailed Engineering, Procurement, Construction & Project Management projects in the process industry for petrochemical, power, pharmaceutical, food nutrition and governmental services.

SPIE-Controlec Engineering is a division of SPIE Nederland B.V.

SPIE Nederland B.V. is part of SPIE SA and worldwide active in more than 28 countries, revenue of € 3.5 billion (2008) and more than 27.000 employees.

SPIE SA has its Head Quarters in Cergy, France.

SPIE Nederland exists of the following divisions

- SPIE-Industrie
- SPIE-Asset Management
- SPIE-Building Systems
- SPIE-Controlec Engineering
- SPIE-Infra

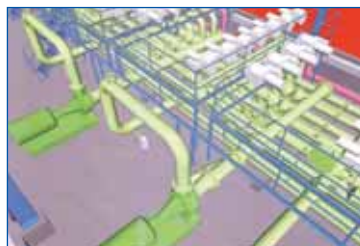
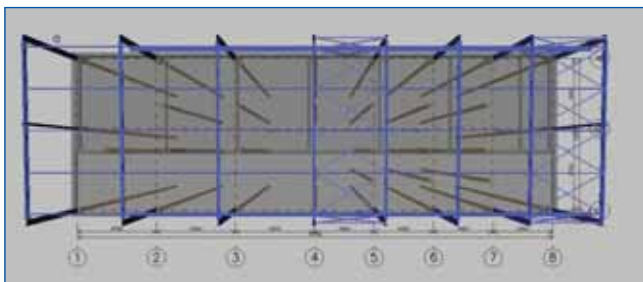
SPIE-Controlec Engineering is based in Schiedam (Rotterdam), Elsloo and Terneuzen, both operating in the local region with a vast variety of clients in the

region i.e. AKZO, AVR, Shell, Esso, Exxon-Mobil, Vopak, Total, Eneco, DSM, Tronox, DOW Chemical, Purac, Kuwait Petroleum etc.

SPIE-Controlec Engineering employs approximately 350 employees.

The engineering disciplines consist of:

- Process
- Electrical
- Instrumentation
- Mechanical
- Piping
- Civil and Structural
- Procurement



Tank pit for Euro Tank Terminal Amsterdam

Short Description

The project concerns a tank pit on the premises of Eurotank Terminal Amsterdam. A number of distribution manifolds are required to load and unload oil from storage tanks to cargo vessels and vice versa. A manifold consists of a number of pumps, valves, piping, measuring devices etc. to distribute the oils as required. The manifold for the Euro Tank Terminal Amsterdam project has been established with the following SPIE-Controlec Engineering and design disciplines:
 Piping – Mechanical – Electrical – Instrumentation – Process - Civil & Structural.
 All disciplines started with their design in the 3D Autoplant Model, then all relevant piping data were imported into the Caesar II application, the output of these calculations were exported to Scia Engineer and afterwards was the entire structural configuration was imported in 3D Autoplant XM.

Project Information

Owner: SPIE-Controlec Engineering
Architect: n/a
General Contractor: n/a
Engineering Office: Schiedam

Construction Start: 01/11/2008
Construction End: 12/08/2009
Location: Amsterdam, Netherlands



Introduction

On the premises of Eurotank Terminal Amsterdam a number of distribution manifolds are required to load and unload oil from storage tanks to cargo vessels and vice versa. A manifold exists of number of pumps, valves, piping, measuring devices etc. to distribute the oils as required.

The manifold for the Euro Tank Terminal Amsterdam project has been established with the following SPIE-Controlec Engineering and design disciplines:

- Piping
- Mechanical
- Electrical
- Instrumentation
- Process
- Civil and Structural

Multi disciplined organisation

Generating documents for the design and engineering is a complex electronic exchange of data where precision (specifically location and orientation of all designed components) plays important role, and therefore all disciplines involved give their input in the 3D Autoplant XM model.

The purpose of multi disciplined and integrated 3D modelling is as follows:

- Avoid clashes during design and engineering and construction.
- Generate 2D documents/drawings out of the 3D Autoplant XM model for all disciplines.
- Excellence of quality through multi disciplined cooperation.

Applications

The following applications are involved:

- 3D Autoplant XM - used for 3D modelling by all departments.
- Scia Engineer - used by Civil and Structural department to perform structural analysis.
- Caesar II by Mechanical department to perform mechanical analysis.

Structure

The structure consists of:

- A piled concrete pit with two slabs on different elevations. Dimensions in lay-out: 13.0 x 40 m².
- A steel structure to support piping, valves, electrical and instrument devices, as well as access platforms.

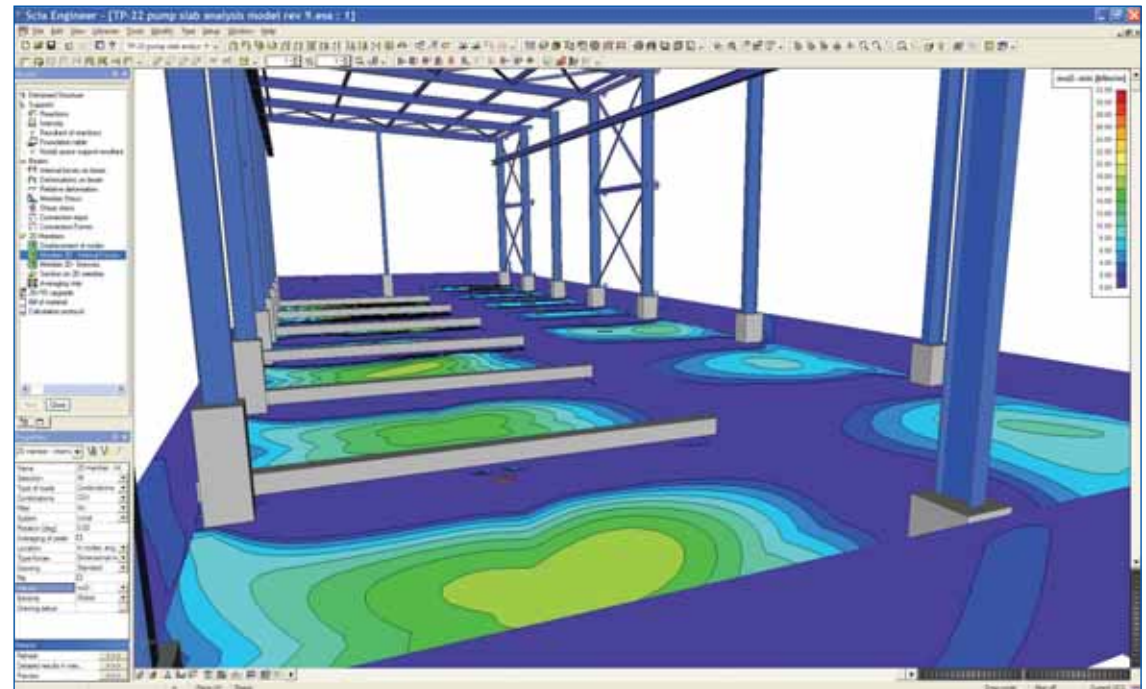
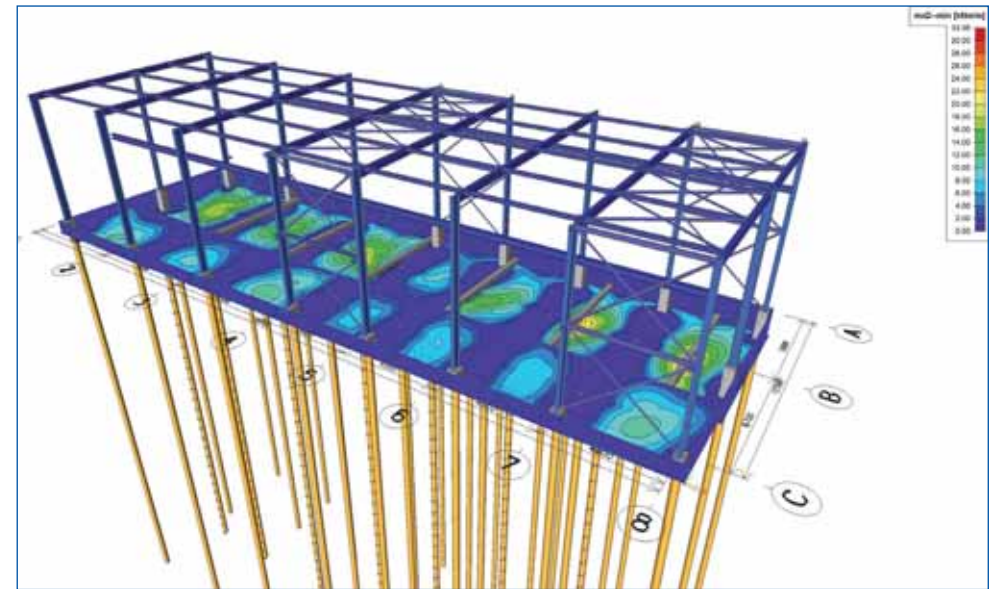
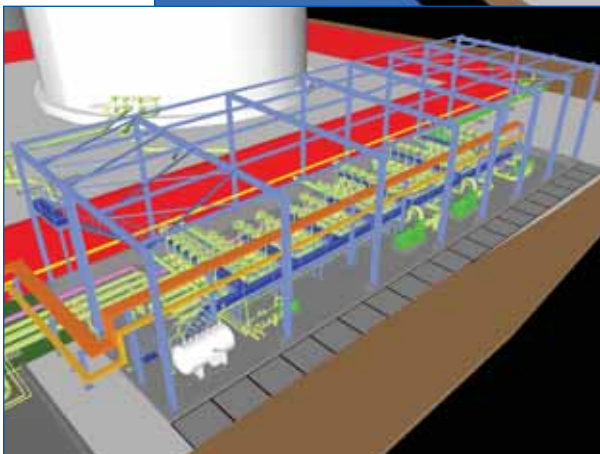
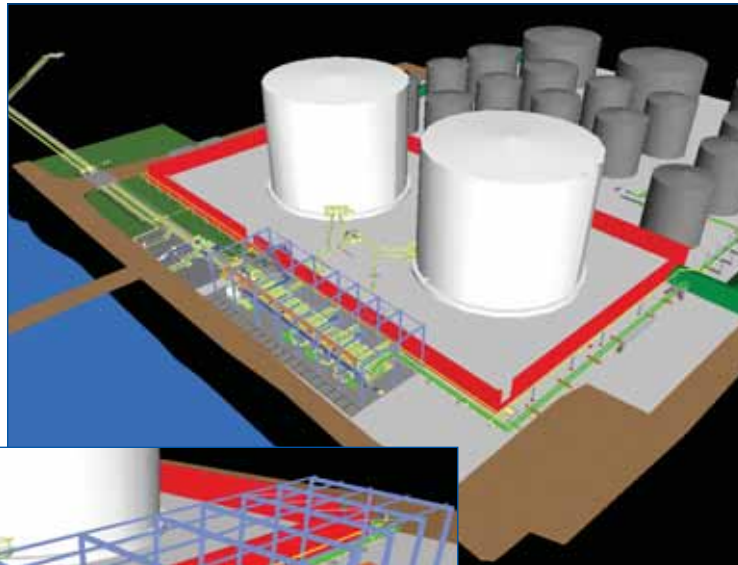
Data exchange

All disciplines start with their design in the 3D Autoplant model. The Mechanical department imports relevant piping data to Caesar II application in order to start preparing piping calculations. The output of Caesar II usually consists of a large number of forces and moments usually grouped in four load cases. Manual definition of all those load values in Scia Engineer is time-consuming and may result in many mistakes due to incompatible coordinate systems (ZScia=YC2, XScia=XC2, YScia= - ZC2). To enhance the efficiency of data exchange between abovementioned applications SPIE-Asset Management has designed two lightweight software applications/interfaces. These two interfaces communicate with Scia Engineer and Caesar II.

The basic principle of both interface applications is converting a file that can be exported from one program to a file format that can be imported in the other one. Extra features are added to filter the data that is transferred, because not all data is relevant in both situations.

This way an xml file is created, which can be easily imported in Scia Engineer with already defined loads and load cases.

Scia Engineer calculates the steel and concrete structure. The structural configuration can then be imported to 3D Autoplant XM and developed into structural model with connection details, hand railings, grating, etc.



Stageco Deutschland GmbH

Contact Thorsten A. Weymar
 Address Rhinstraße 46
 12681 Berlin, Germany
 Phone +49 30 54 98 72 40
 Email thorsten.weymar@stageco.com
 Website www.stageco.com



STAGECO
 DEUTSCHLAND GMBH

History

Stageco wurde vor mehr als 20 Jahren mit der Lieferung der Bühnen für das renommierte Rock Werchter Festival in Belgien geboren.

Seitdem wurde ein umfassendes, international organisiertes Support-Netzwerk entwickelt, welches Stageco zum weltweiten Vorreiter und Trendsetter in der Konstruktion und dem Bau von Konzertbühnen und temporären Bauwerken macht.

Im Januar 1999 wurde die Bühnenservice Augsburg GmbH in Stageco Deutschland GmbH umfirmiert.

In den letzten Jahren wurde Stageco durch die Lieferung der atemberaubenden Bühnen für die internationalen Touren von The Rolling Stones, U2, Bon Jovi und Bruce Springsteen bekannt.

2005 setzte die Stageco Deutschland GmbH bei dem Design und der Umsetzung, der Überdachung des Papstaltars zum Weltjugendtag, ein innovatives

Zeichen. Die Überdachung wurde weltweit als „Papstwolke“ bekannt.

Im Jahr 2006 betreute die Stageco Deutschland GmbH (neben dem Tagesgeschäft wie Festivals oder Konzerten) in Kooperation mit der FIFA, Coca Cola, Mastercard und vielen anderen Sponsoren sämtliche Public Viewings und Fanmeilen zur WM in Deutschland.

Stageco bietet auch eine breite Palette an innovativen Lösungen für temporäre Eventarchitektur sowie für Unternehmens- und Sportveranstaltungen und profitiert hierbei von mehr als zwei Jahrzehnten Erfahrung in der Veranstaltungsbranche. Das Umsetzen ihrer Erfahrung bei der Erstellung leistungsfähiger, erfolgreicher Veranstaltungskonzepte für Corporate Events, wie Produkteinführungen, Präsentationen oder gesponserten Veranstaltungen macht die Marke Stageco zum „Superstar“ dieser Ereignisse!



Stage with reproduction of the Brandenburg Gate

The project concerns the design of a stage with a backdrop to host one of Germany's most popular comedians: Mario Barth. The show took place for 70.000 spectators in the Berlin Olympic Stadium which was a new world record in the category: most spectators in a comedian's live show. Stageco built a scaffolding-construction with the dimensions of 45,69 m x 14,50 m x 16,5 m with a weight of about 80 tons, that is 70% of the size of the real gate. On the backdrop was shown a reproduction of the world-famous Brandenburg Gate. A nice detail: on top of the center part was placed an inflatable Quadriga.

Short Description

Project Information

Owner: Mario Barth
Architect: Stageco Deutschland GmbH
General Contractor: Stageco Deutschland GmbH
Engineering Office: Stageco Deutschland GmbH

Construction Start: 06/07/2008
Construction End: 12/07/2008
Location: Olympic Stadium of Berlin, Germany



Weltrekord mit Mario Barth

„Der Eintrag in das Guinness-Buch der Rekorde ist ihm sicher. Mit 70.000 Zuschauern im Olympiastadion in Berlin übertraf er den bisherigen Rekord eines amerikanischen Comedians um das Vierfache!“ Ein Nachbau des Brandenburger Tors, inklusive Quadriga, bildete den Rahmen zu seiner Abschluss-Show in Berlin. Stageco verbaute 200 Tonnen Material, transportiert auf 13 Trailern.

Beschreibung

Was gemäß Mario Barth mit einer Wette begann, mündete schließlich in einen Weltrekord mit Eintrag in das Guinness-Buch der Rekorde.

Für seinen Auftritt im ausverkauften Berliner Olympiastadion vor 74.000 Zuschauern wünschte sich Mario Barth als Bühnenbild / Kulisse nichts geringeres als das Brandenburger Tor. Dieses sollte sich auch von den Abmessungen möglichst wenig vom Original unterscheiden.

Dies war nun aus geometrischen Gründen im Olympiastadion nicht ganz möglich, aber immerhin gelang eine Nachbildung in ca. 70% der Originalgröße. Im Rahmen der technischen Planung fiel die Entscheidung sehr schnell Richtung Gerüstbau, der durch seine Flexibilität hervorsteht. Aufgrund der Grundrissabmessungen und der Masse der Konstruktion konnte hier trotz der nicht geringen Höhe auf Ballast verzichtet werden.

Sowohl Mittelteil als auch die beiden seitlichen Anbauten wurden anschließend mit Stoffen sowie festen Säulenornamenten verkleidet.

Während die seitlichen Anbauten mit Videowänden bestückt wurden, erhielt der Mittelteil als Krönung eine aufblasbare Quadriga.

Die Konstruktion wurde als Einheit mit dem Stageco-Bühnenboden aus Layher-Allround-Gerüstmaterial errichtet. Ebenso wurde die gesamte Konstruktion nahezu ausschließlich mit dem Modulgerüstsystem Allround aus dem Hause Layher errichtet. Dazu gehörten auch Fußbodenbeläge für die Bühne sowie die „Dächern“ aus dem Hause Stageco.

Die Dächer aller drei Abschnitte waren begehrbar und dienten auch gleichzeitig zur Vorbereitung und Befestigung diverser Pyrotechnik, die sich zum Ende der Show zu einem überaus spektakulären Feuerwerk entzünden sollten.

Der Aufbau erfolgte durch eine erfahrene Stageco-Crew, welche das Brandenburger Tor in einer Zeit von vier Werktagen errichteten. Dies beinhaltete ebenfalls den Aufbau weiterer diverser Nebenbauten für die Show wie Lautsprechertürme, Technikunterstände sowie Unterkonstruktionen für vier weitere Videowände und weiteres mehr. Der Abbau erfolgte direkt im Anschluss an die Show in einem Zeitraum von zwei Tagen.

Technische Daten

- Abmessungen (einschließlich Anbauten): $L \times B \times H = 45,69 \text{ m} \times 14,50 \text{ m} \times 16,5 \text{ m}$
- Abmessungen (nur Mittelteil): $L \times B \times H = 24,97 \text{ m} \times 14,50 \text{ m} \times 16,5 \text{ m}$
- Materialgewicht: ca. 78 to
- Gerüstsystem: Layher Allround (Stahl)
- Aufbauzeit / Show: 5 Tage / 12. Juli 2008
- Aufbauort: Olympiastadion Berlin
- Projektleiter: Thomas Bartz (Stageco)
- Planung / Konstruktion: Sebastian Kraas / Dirk Lauenstein (Stageco)
- Statik: Thorsten A. Weymar (Stageco)

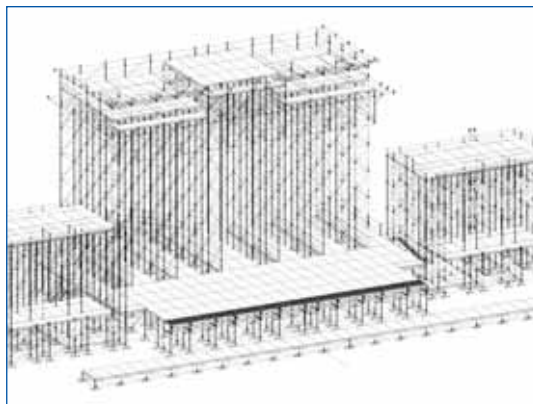
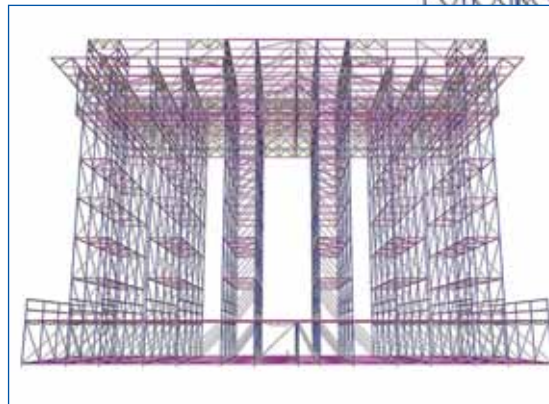
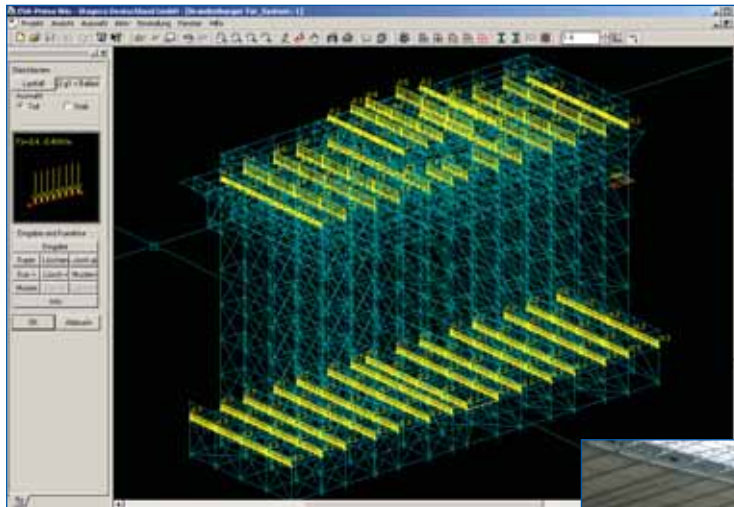
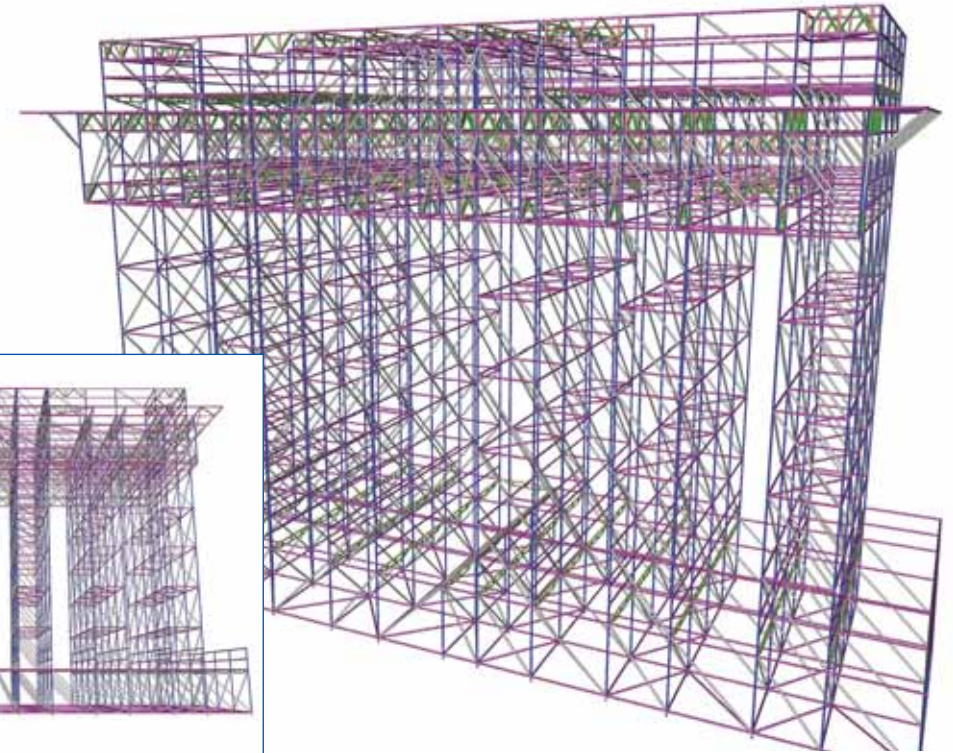
EDV-Berechnung

Die Konstruktion wurde jeweils mittels ESA-Prima-Win 3.90 berechnet und bemessen. Aufgrund der enormen Anzahl an Knoten und Stäben (insgesamt knapp 10.000 Stäbe) musste das Gesamtsystem gesplittet werden, so dass hier der Mittelteil (das eigentliche Tor) sowie die Seitenanbauten separat berechnet wurden.

In diesem Falle wurden als Ergebnis lediglich die maßgebenden Schnittgrößen ausgegeben, welche mit den zulässigen Einwirkungen gemäß Zulassung der Fa. Layher verglichen wurde.

Für die Prüfung durch den TÜV Rheinland erwies sich der Export als dxf-File als sehr hilfreich, um auch den Zeitraum der Prüfung möglichst gering zu halten.

Stage with reproduction of the Brandenburg Gate



VIN Consult s.r.o.

Contact Vladimir Vancik
 Address Jeremenkova 763/88
 CZ-14000 Praha 4, Czech Republic
 Phone +420 244104080
 Email vladimir.vancik@vinconsult.cz
 Website www.vinconsult.cz



VIN Consult Prague was founded in 1993 as a member of Inros Lackner, a German consultancy group. The company is focusing on bridges, structural analysis and traffic engineering.

Key specializations

- Bridges, engineering structures, structural analysis
- Design and renewal of bridges and engineering structures
- Bearing structures of buildings and industrial structures
- Reinforced and prestressed concrete, composite and steel structures, special foundation
- Non-linear analysis, stability problems, dynamics of structures
- Road structures, traffic engineering

History

At the beginning the company started with the design of roads and bridges, partly for German clients. In the second half of the nineties more attention was paid to industrial structures and buildings, with a significant amount of precast concrete structures. At the same time a new construction technology of arch bridges interacting with the soil was developed. In the new millennium VIN Consult is trying to make use of knowledge in different fields of structural analysis and design, focusing on large multifunctional objects and structures both in the

analysis and in the design, combining innovative structural solutions, new materials and clever construction technologies.

References

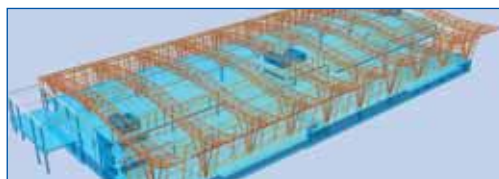
- Shopping Centre Europark Prague, Vankovka Brno, Chodov Prague
- Shopping Centre Arkady Prague, Arkady Liberec, Foundation Pit Liberec
- Bridge over the Kartouzka Street in Prague
- Pedestrian Bridge Ocelarska in Prague

Vision

The company wants to further develop its flexibility and special know-how, combining innovative solutions with high-tech computing and CAD instruments.

Software

VIN Consult uses two fully independent 3D-software packages with prestressing, dynamics and geotechnical model – Trimas from RIB Stuttgart and Scia Engineer. Beside these complex instruments many smaller software tools for local structural problems are used, mainly from RIB, geotechnical programs from FIDES as well as non-linear concrete analysis ATENA from Cervenka Consulting. CAD design is carried out with Allplan.



Short Description

New Airport Terminal in Bratislava

The new airport terminal in Bratislava is designed as a six-storey building (one basement and 5 overground levels) with dimensions of 182x70m in plan and an above-ground height of 22 m. According to high demands on operation, layout and construction technology a rather complicated structure is designed with a corresponding aesthetical level. For the design, a full 3D CAD model of the structure was built in Allplan, which was used for the drawings as well as subsequently for the transfer to a 3D structural model in Scia Engineer. The transfer was successful resulting in a comprehensive structural model that allowed the static structural analysis as well as the dynamic analysis of seismic loading.

Project Information

Owner: Airport M.R.Stefanika, Bratislava
Architect: AGA-Letiste Prague and Casua Prague
General Contractor: Strabag
Engineering Office: VIN Consult Prague

Construction Start: 01/09/2008
Construction End: 31/03/2010
Location: Bratislava, Slovak Republic;



Project history

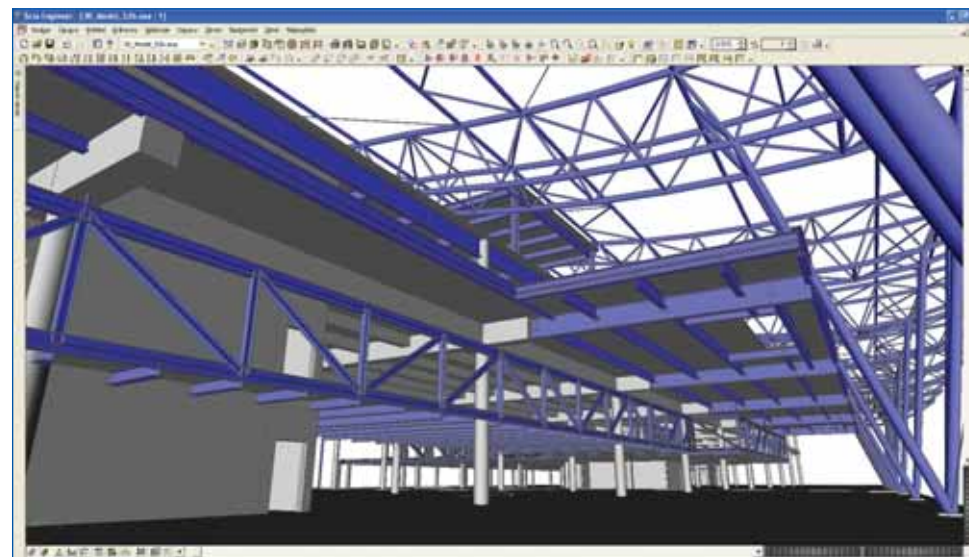
As VIN Consult came to the structural design in early 2008, a routine structure was being planned. During the building permit design the concept solution was totally changed, the aim being to develop a challenging structure, although not purposeless.

The materials and technologies should be used according to layout, operating as well as construction requirements.

Description of the structure

The new airport terminal in Bratislava is designed as a six-storey building (one basement and 5 overground levels) with dimensions of 182x70 m in plan and above-the-ground height of 22 m.

In the basement there are technical rooms and storages, passenger premises are situated on the 1-st and 3-rd floor. On the 2-nd floor there are offices as well as spaces to rent, the 4-th and 5-th level are



Used software: Scia Engineer, Allplan Engineering

only partial decks for technics and machine rooms. The bearing structure is designed as a combined skeleton, with basic modulus span of 18m in the longitudinal direction and irregular spanning of 12+9+18+9 m in the transverse direction.

The foundation slab and underground walls are made of cast-in-place concrete, with cast-in-place flat slab on the ground level. The main overground floor slab on the third level is designed mainly in concrete, with prestressed primary beams and prestressed secondary beams, partly as a composite structure. On the 2-nd level an intermediate deck is designed, which has to be suspended from the main deck according to spatial requirements. The primary beams are thus designed as truss girders spanning 18m, with composite secondary beams. The technological decks on the 4-th and 5-th level are designed as composite structures with primary steel and secondary beams with a concrete slab. The roof structure is designed as a continuous wavy truss girder with a total length of 84,5m, spanning 39+27 m with cantilevers on both ends. Each truss girder is a spatial structure in both longitudinal and transverse direction, supported with three columns, which branch out in four legs to support the truss. Besides the main steel structure of the roof, an auxiliary truss steel structure is designed to support the facade.

CAD design

According to the complicated structural layout (every floor has different dimensions) it was decided to make a complete 3D-model of the structure, while in architecture only 2D-design was carried out. The aim of the 3D-model was to check all of the complicated spatial details of edges and intersections, as well as to generate plan and elevation drawings without mistakes.

The 3D-CAD design was carried out in Allplan, whereas a subsequent transfer to a structural model in Scia Engineer was planned. Furthermore the 3D-model should be later used in as a base for form- and reinforcement drawings.

Structural analysis

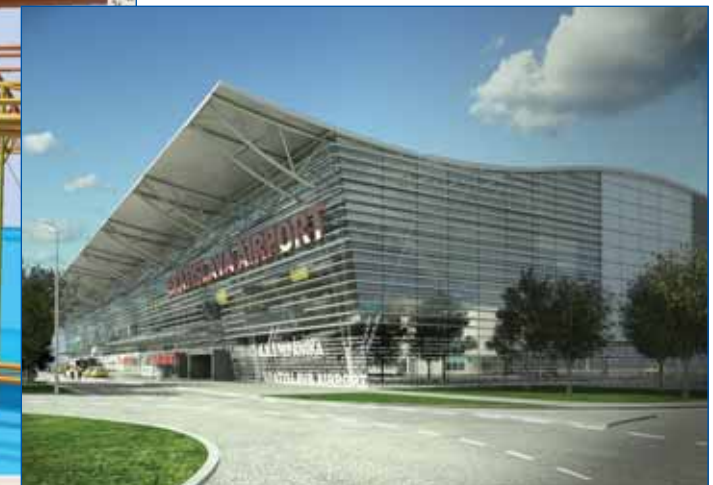
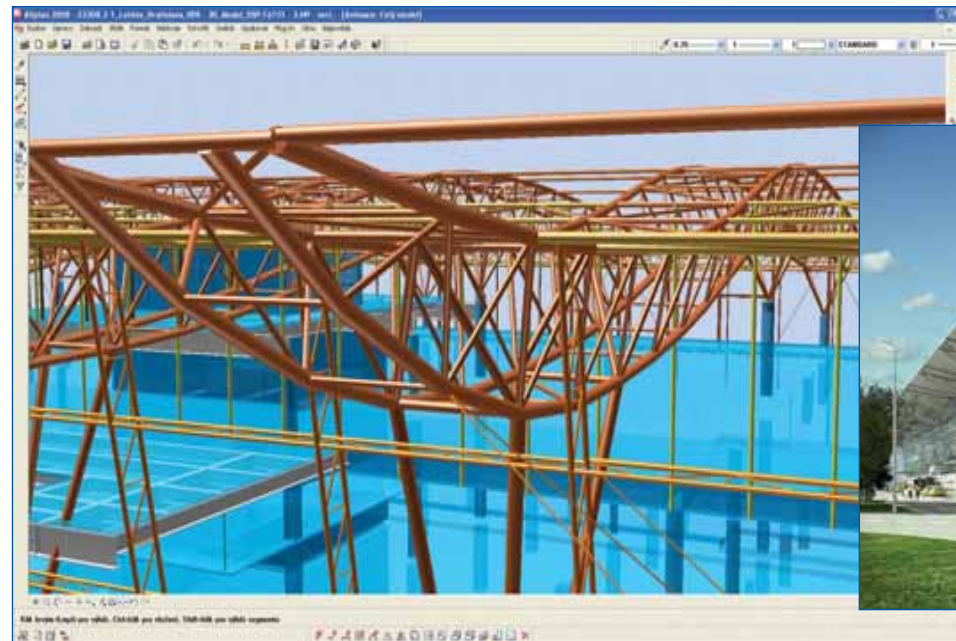
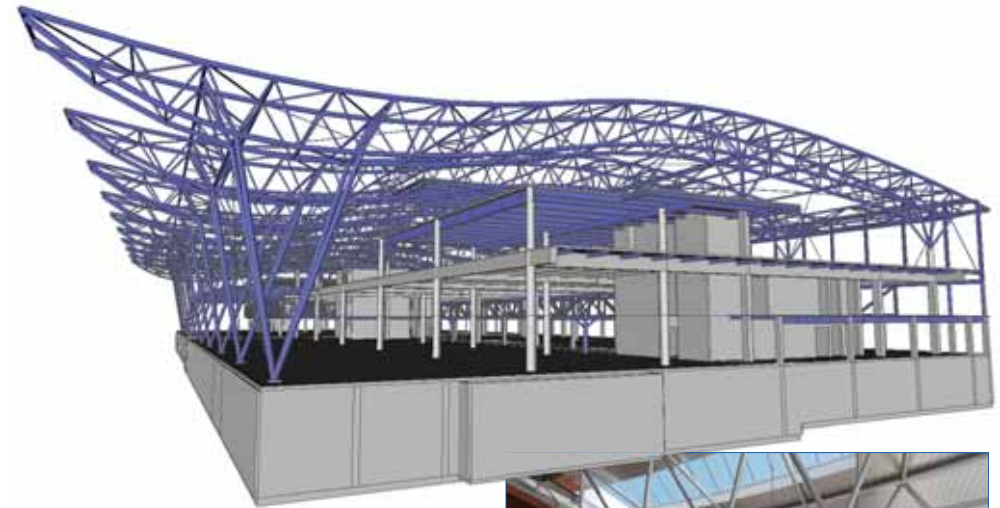
The comprehensive 3D structural model was carried out in Scia Engineer, with partial automatic transfer from Allplan. Although much handwork has to be

added to develop the structural model, the use of the architectural model from Allplan was successful. The structural model was then completed with geotechnical subsoil - thanks to Scia Engineer's Soilin module - and used for the global structural analysis. Besides of static calculations also a dynamic analysis of seismic loading was carried out. In the next step of the design process, it was considered to make the model even more complete with respect to construction phases as well as other detailed solutions.

Project evaluation

The challenging structure of the new airport terminal was successfully designed in the phase of building permit as well as tender documents. The combination of the 3D architectural and structural models of Allplan and Scia Engineer was very useful and saved a great amount of time and routine work.

The next phase of execution detailing started in autumn 2008. The structure is now under construction and the execution detailing is carried out by another consulting company using casual designing techniques.



Zeman & Co GmbH

Contact Jörgen Robra
 Address Schönbrunner Straße 213-215
 1120 Wien, Austria
 Phone +43 1 814 14 - 0
 Email robra@zeco.at
 Website www.zeman-stahl.com



Stahlbau und Hallenbau, Stahlkonstruktionen, Industriehallen, Industriegebäude, Sporthallen sowie Ausstellungs- und Veranstaltungsobjekte: Wir planen und konstruieren, produzieren und montieren sämtliche Elemente der Stahlkonstruktion sowie die Dachausbildung, Wände und Fassaden. Eben die gesamte Gebäudehülle. Durch die präzise Vorbereitung der Organisationsabläufe und die durchdachte Vorfertigung von Leichtbauelementen schaffen wir die Voraussetzungen für eine rasche, ordentliche und termingerechte Montage. Sie wird von einem bestens eingespielten Team von Spezialisten ausgeführt.

Doch auch damit ist es noch nicht genug - wir beschäftigen uns auch mit Maschinenbau. Wie das

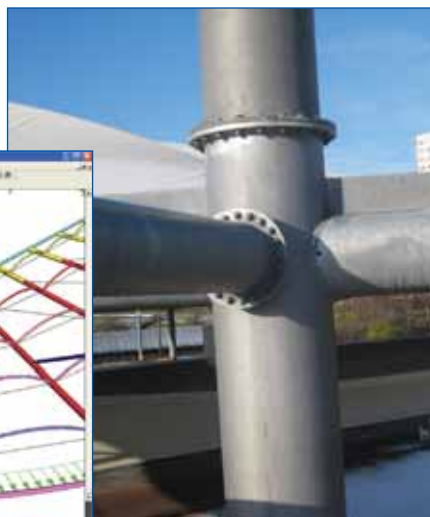
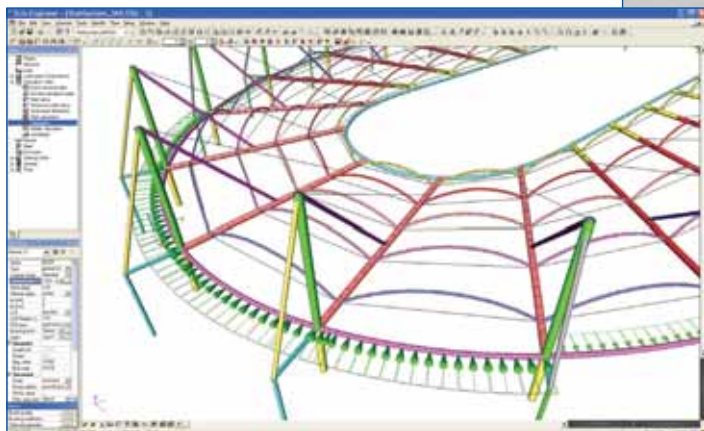
zusammen passt? Mit diesen Maschinen kann man z.B. Leichtbauelemente oder Wellstegträger für den Stahlbau und Hallenbau produzieren.

Hans Zeman gründete seinen Stahlbaubetrieb 1965. Heute besteht der Zeman Konzern europaweit aus 20 Betrieben mit über 450 Mitarbeitern.

Unser Erfolgsrezept: Innovation, Qualität, Tempo und Termintreue. Und das alles zu Preisen, die Sie überzeugen werden.

Nutzen Sie unsere jahrzehntelange Erfahrung. Profitieren Sie von unserem Know How.

Statiksystem Geometrie



Roof of a Cycling Track, Erfurt

Short Description

In Erfurt the old cycling track has been replaced by a new one. The aim of the replacement was not only to match this traditional sport complex to international standards but also to erect a roof over the complex in order to make the workouts and the competitions independent from weather conditions.

For the roofing a membrane structure was chosen. In general the structural calculation of the steel construction for membrane buildings poses a certain challenge because its behaviour is comparatively complicated and the usual calculation method is time-consuming.

By means of the following paper a calculation method is shown that is not only timesaving but also realisable by means of software that is commonly used for structural steelwork.

Project Information

Owner: Erfurter Sportbetrieb
Architect: Bauconcept Planungsgesellschaft mbH
General Contractor: Zeman & Co GmbH /
 CENOTEC GmbH
Engineering Office: Ingenieurbüro Teschner GmbH

Construction Start: 30/03/2006
Construction End: 03/11/2006
Location: Erfurt, Austria



Die Radrennbahn Andreasried in Erfurt kann auf eine lange Geschichte verweisen. Es handelt sich bei der 1885 eingeweihten Bahn um die älteste Radrennbahn der Welt. Rasch entwickelte sich ein Radsportzentrum, dass bis heute in Verwendung steht. In den vergangenen Jahren wurden die Funktionsgebäude saniert und modernisiert. 2005 wurde die 333 m lange bestehende Bahn in eine 250 m lange Bahn umgebaut. Zu diesem Zweck wurde der vorhandene ca. 5m hohe Damm zu 2/3 abgetragen und unter Verwendung des alten Dammes neu errichtet. Gleichzeitig wurde die Errichtung eines Stahldachtragwerkes mit einer transluzenten Membran aus hochfestem PVC-beschichteten Polyestergerewebe als Dachhülle ausgeschrieben. Der Auftrag für das Dachtragwerk konnte durch die Arbeitsgemeinschaft Dach Erfurt bestehend aus den Firmen Zeman & Co GmbH und Ceno Membrane Technology gewonnen werden.

Der Grundriss des Dachtragwerkes mit einer maximalen Länge von ca. 124 m und einer maximalen Breite von ca. 89 m entspricht der ovalen Form der Radrennbahn und überdeckt die Zuschauerplätze und die Bahn vollständig. Der Innenraum ist stützenfrei, so dass das Dachtragwerk nur durch die 20 am äußeren Dachrand auf der Dammkrone befindlichen Pylone getragen wird. Diese sind an den Stützenfüßen eingespannt.

Von den Pylonen kragen die Binder bis zu 31 m in das Gebäudeinnere aus. Im Bereich der beiden Bahnkurven ist die Kraglänge mit 22 m etwas geringer. Die Grundstruktur Pylon / Kragbinder ist durch ein System von Zug- und Druckstäben überspannt, so dass für die relativ große Spannweite ein ausreichend steifes Tragwerk entsteht.

Mithilfe eines äußeren und inneren Ringträgers sind die Binder miteinander verbunden. Der äußere Ringträger verläuft durch die Anschlusspunkte Pylon / Binder und hat im Grundriss die Form einer Ellipse. Der innere Ringträger ist im Bereich der Bahnkurven kreisförmig und verläuft in den Bereichen dazwischen gerade. Durch die Ringträger wird, besonders im Bereich der Bahnkurven, ein räumliches Tragverhalten erzeugt, da deren Bogenwirkung wie ein horizontales Auflager wirkt.

Zwischen den Bindern sind gekrümmte Stahlrohre (Membranbögen) gespannt, welche die Membran in den notwendigen zweiachsig vorgespannten Zustand versetzen.

Zum größten Teil besteht die Konstruktion aus Stahlrundrohren mit Durchmessern bis zu 620 mm. Da das Tragwerk keine Verbände aufweist, wurden, abgesehen von den Bauteilen der Überspannung, alle Anschlüsse biegesteif ausgebildet. Im Verlaufe der Ausführungsplanung durch die Zeman & Co GmbH ergab sich für die

Stahlkonstruktion die Notwendigkeit einer erneuten statischen Berechnung.

Eine Herausforderung stellte dabei die Ermittlung der durch die Membranwirkung erzeugten Lasten dar. Die üblich Vorgangsweise, die Angaben der Belastungsnormen unter Berücksichtigung der Einflussbreiten auf die Stahlkonstruktion zu beziehen, ist bei Membrankonstruktionen nicht ohne weiteres möglich, da neben den Vertikallasten bedingt durch den Membraneffekt hohe Horizontallasten auftreten. Außerdem können, je nach geometrischen Verhältnissen, bei andrückender Gesamtlast örtlich abhebbende Lasten auftreten oder umgekehrt.

Eine mögliche Vorgangsweise zur Berücksichtigung dieser Effekte ist die Berechnung an einem 3D-Gesamtmodell, in dem sowohl die Membran als auch die Stahlkonstruktion modelliert wird.

Um Rechenzeit zu sparen und um einfachere und verständlichere Modelle zu erhalten, wurde bei diesem Projekt von einer Berechnung am Gesamtmodell abgesehen. Statt dessen wurde eine dreistufige Vorgangsweise gewählt, bei der die Membran und die Stahlkonstruktion mit Hilfe von zwei voneinander unabhängigen 3D-Modellen berechnet wurde:

1. Berechnung der Membrane
2. Übertragung der Membranauflagerkräfte in das Modell Stahlkonstruktion
3. Berechnung der Stahlkonstruktion

Diese Vorgangsweise hat den Vorteil, das im Verlaufe der Optimierung des Stahltragwerkes nur der Schritt 3 wiederholt werden muss. Beim diesem Bauwerk ergab sich durch Ausnutzung der Doppelsymmetrie eine

weitere Vereinfachung, da für die Membranberechnung nur ein Viertel des Tragwerkes modelliert werden musste.

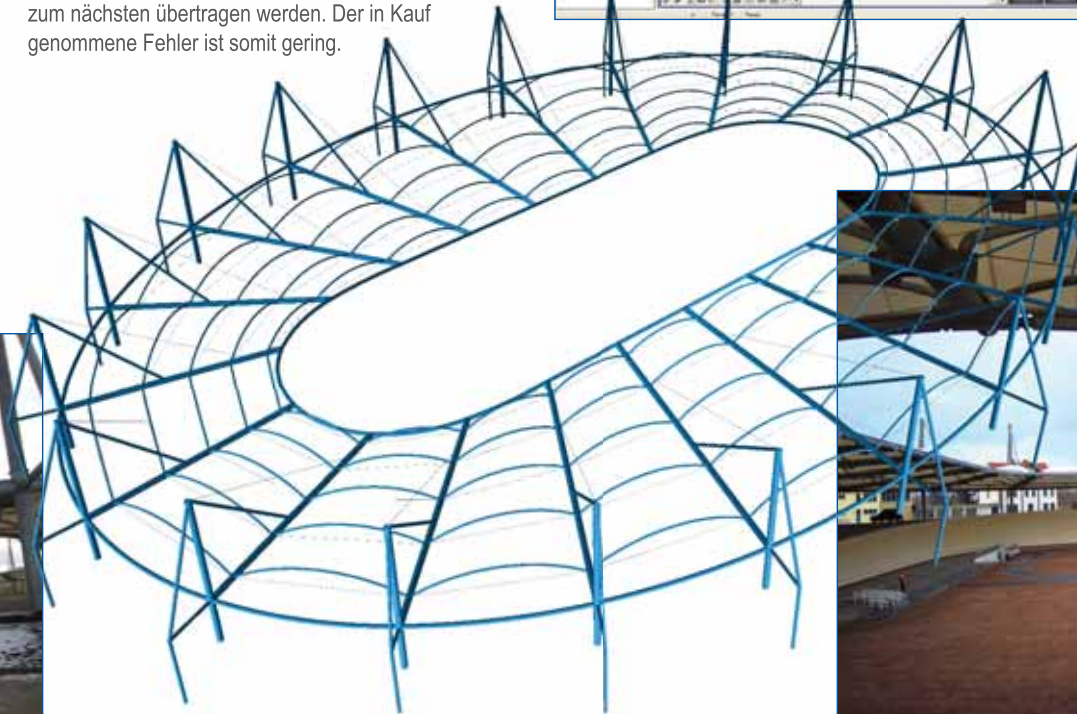
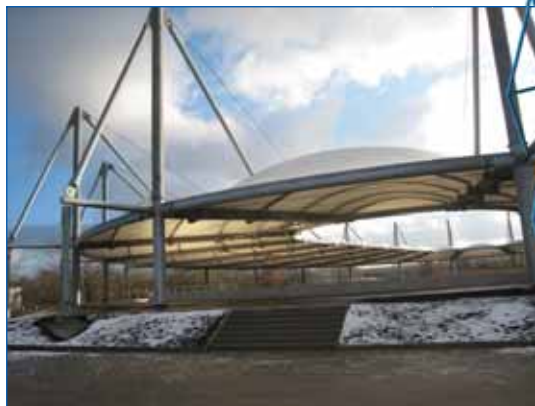
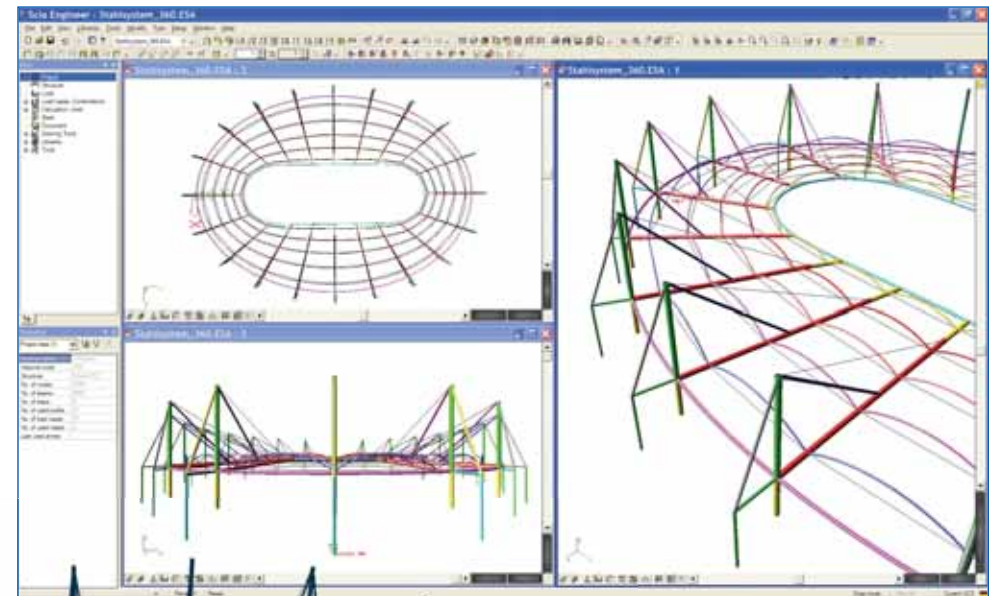
Zur Übertragung der Membranauflagerkräfte als Belastungen in die vier Sektoren der Stahlkonstruktion wurde ein spezielles Computerprogramm erstellt. Um das dreidimensionale Tragverhalten richtig abbilden zu können musste die Stahlkonstruktion als volles System modelliert werden.

Die anschließende Berechnung erfolgte nichtlinear am imperfekten System nach Theorie II.

Ordnung. Die Anfangsimperfektionen wurden in Form von Ersatzlasten berücksichtigt, wobei eine Anfangsschrägstellung der Pylone von H/200 zugrundegelegt wurde.

Die beschriebene Vorgangsweise bietet sich insbesondere an, wenn Membranstatik und Stahlbaustatik nicht in der selben Hand liegen.

Zwar werden, verglichen mit einer Modellierung als Gesamtmodell, Verträglichkeitsbedingungen verletzt, jedoch ist üblicherweise Steifigkeit der Stahlkonstruktion gegenüber der Steifigkeit des Membranfeldes relativ groß, so dass kaum Kräfte vom einem Membranfeld zum nächsten übertragen werden. Der in Kauf genommene Fehler ist somit gering.



PARTNER IN FLOOR SOLUTIONS - FROM DESIGN TO COMPLETION



High-quality, durable floor solutions

Echo is proud to be called **the largest flooring solutions provider** of its kind in Belgium and second in the European market. Over 4,000,000 m² of hollow core slabs leave the Echo Group factories every year. The Group's quality is guaranteed by the **ISO certificate representing**

a continuous product evaluation throughout the year. The **enormous know-how** of the Echo Group shows the opportunity for a **continual development** of new and improved products for the European market, which will form the basis for a future global expansion.

ECHO nv
Donderslagweg 25
BE-3530 Houthalen
Tel. +32 (0)89-84 03 11
Fax +32 (0)89-84 03 35



Category 6: CAD Engineering, Buildings

All types of buildings (residential, office, public and industrial buildings) made of concrete (cast-in-place or precast), steel, compound or mixed materials. Of particular interest are projects that distinguish themselves through an innovative design process (e.g. building information modelling) or an integrated teamwork of architects, structural engineers and MEP engineers. Assessment criteria: innovative design process, level of difficulty, size of project, design originality, fitness for manufacturing and erection.

6

Vahanen Consulting Engineers

Contact Tero Aaltonen
Address Halsuantie 4
00350 Helsinki, Finland
Phone +358 207698698
Email tero.aaltonen@vahanen.com
Website www.vahanen.com

WINNER

VAHANEN

Vahanen Group

Vahanen Group is a Finnish based engineering firm employing some 400 experts in Finland, Estonia, Russia, Romania and Switzerland. The company was founded in 1955 and nowadays it providing services with regard to architectural design, structural design, civil engineering and building services. The company takes an advantage in a multidisciplinary approach combining techniques to processes and systematic engineering to creativity.

The company has a strong position in a Russia. The offices of Moscow and St. Petersburg offer their clients a full service package including concept design, site evaluations, design services, project management, supervision and approval process management.

Vahanen is committed to sustainable development and seeks new approaches in its projects to find enduring, environment safety and energy efficient solutions in cooperation with its customers.

Services and projects

The company has the target to unite an architectural vision into successful business concepts both in greenfield projects and in existing buildings. The company designed already major department stores and shopping malls in Finland and in Russia. One example is the Nevski Centre, a large shopping

centre in the heart of St. Petersburg, where demanding soil conditions and strict historical restrictions had to be taken into account. The company has also designed many commercially successful spas and swimming centres.

The company has been involved in many cultural projects like the National opera of Finland and the refurbishment of The National theatre of Finland. In addition to all these projects, the project portfolio includes The Museum of Modern Art, the Cultural Centre in Hämeenlinna and finally The Helsinki Music Hall.

Vahanen is known for its expertise in building physics. Using high level software, simulation techniques and material technology, the company is designing healthy, comfortable and productive environments for people to work and live. The projects include schools, kindergartens, office premises etc... Laboratory services and field studies provide a sound background for engineering tasks. The emission properties of new and existing materials are being studied thoroughly in order to make the right choices for construction.

There have been many industrial projects in Russia for international companies. Our total service concept has offered our clients a safe and a fast way of putting up production plants, industrial parks and logistic centres.



Helsinki Music Hall

Short Description

The project regards a music hall in the centre of Helsinki. The main concert hall will have seats for 1.700 listeners; there will also be smaller halls for concerts and rehearsals.

The acoustics and vibration isolation were the most important factors affecting the architectural and structural design. As the music hall is located near the Töölö Bay, a part of the Finnish gulf, there is a water pressure of 10 meters loading the underground structures which are made of large bore piles.

The roof structure was also an interesting engineering task as the span is 40 meters and the roof itself is quite heavy for acoustical reasons. Besides that, additional loading to the roof comes from the facade which is made of glass panels which are hanging from the roof.

Project Information

Owner: Senaatti Kiinteistöt
Architect: LPR-arkkitehdit Oy
General Contractor: SRV-viitokset Oy
Engineering Office: Vahanen Group

Construction Start: 01/06/2006
Construction End: 31/12/2010
Location: Helsinki, Finland

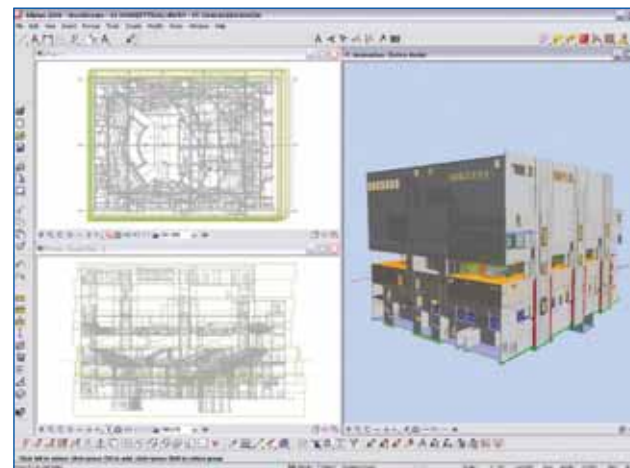


Quote of the Jury

"This project attracts high public interest. It is technically very demanding due to the complex geometry and the acoustic requirements. During the multidisciplinary design process the advantages of BIM have been explored very convincingly, especially for coping with ongoing design changes."

The Helsinki Music Hall is a long awaited building in the centre of Helsinki. It will be located just besides the Houses of Parliament. Excavations started in the summer of 2006. The foundation stone was laid on 22.10.2008 and the first concert is expected to be held in May 2011. The main concert hall will have seats for 1 700 listeners and there are also smaller halls for concerts and rehearsals.

The basic design was done in a period when the construction market was running overheated. The results of the tender competition of the main contract exceeded the budget heavily. Many changes were needed to reduce the cost of the project. In the cost reducing process BIM modelling proved its strength. The changes were relatively easy to design and the costs simple to estimate.



Finally the construction was done using Design and Build Model. The timetable for the erection of the structural frame was very tight. The design was changed one more time into a more production friendly direction. The changes in the structural part were made efficiently using Allplan Engineering. Besides the time based challenges there were also high level technical demands. The acoustics and vibration isolation were the most important factors affecting the architectural and structural design.

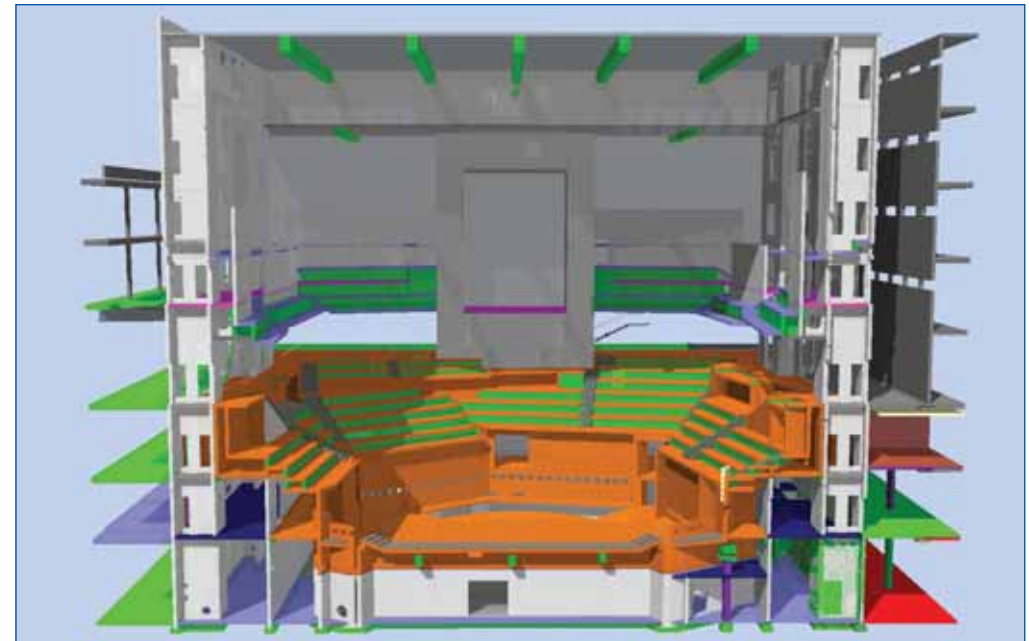
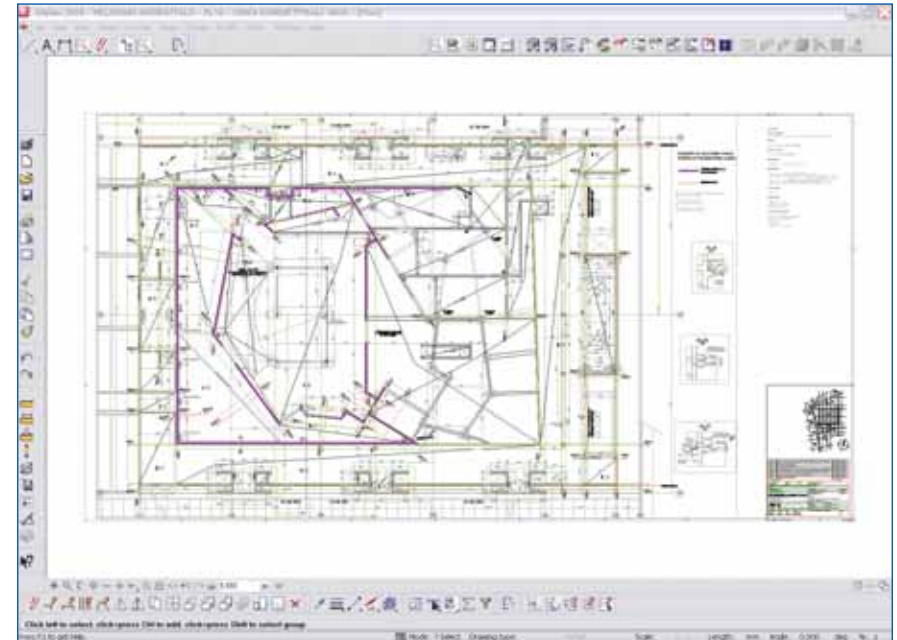
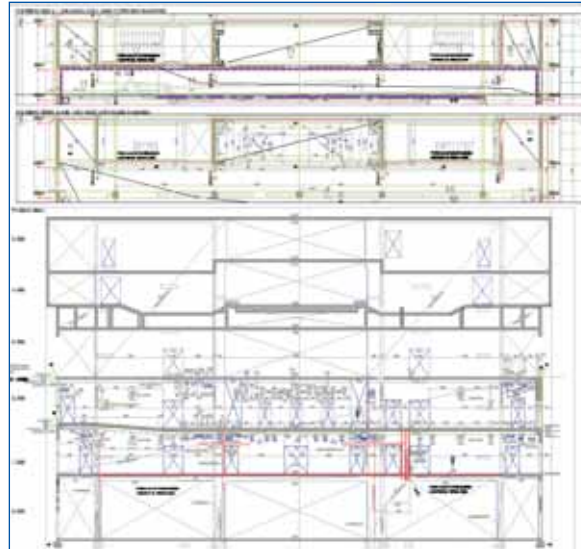
Used software: Allplan Engineering

On the other side of the building is situated the street with the most amount of traffic, including trams and buses, of Helsinki. On the opposite side there is the main railway station. The structural sound isolation was done with the help of structural absorbers, springs and room-in-room techniques.

The shape and form of the main concert hall is quite complex and the acoustic demands are very strict. The concrete structures have been designed with the help of Allplan Engineering. The contractor wanted to have very accurate reinforcement drawings with steel lists of all the reinforcement. The property of Allplan Engineering for reinforcing multiformed structures was used in order to do the work fast, accurately and effectively.

The Music hall is located near the Töölö Bay which is part of the Finnish gulf. As a result there is a water pressure of 10 meters loading the underground structures which are made of large bore piles. The roof structure was an interesting engineering task because the span is 40 meters and the roof itself is quite heavy for acoustical reasons. Additional loading to the roof comes from the facade which is made of glass panels which are hanging from the roof. The roof structure was done using post tensioned concrete beams.

The fitting of the HVAC-techniques to the building proved to be quite a challenging task in this Design and Built project. There were a large amount of openings in the walls and slabs. The fitting and the cross checking was done BIM model based using the IFC standard in the data transfer.



Franz Oberndorfer GmbH & Co KG

Contact Wolfgang Gigelleitner
 Address Lambacher Strasse 14
 4623 Gunskirchen, Austria
 Phone +43 7246 72 72
 Email w.gigelleitner@oberndorfer.at
 Website www.oberndorfer.at

NOMINATION



Die Philosophie hinter der Zukunft des Bauens

Oberndorfer, das sind 90 Jahre Firmengeschichte vom Familienbetrieb zum modernen Industrieunternehmen mit ungebrochener Entwicklungsdynamik. Heute prägt Oberndorfer mit seinen innovativen Produkten und Problemlösungen die Zukunft des Bauens.

Mit nunmehr 8 Standorten haben wir an Kundennähe gewonnen und sind zu einem der führenden Beton-Fertigteilbau Unternehmen Österreichs aufgestiegen.

Wir verfügen über innovatives Know – how und einen der modernsten Maschinenparks Europas, aber unsere Unternehmensphilosophie ist dabei ganz einfach geblieben:

Bestens ausgebildete und kompetente Mitarbeiter verfolgen jeden Tag mit Innovation, Qualitätssicherung und absoluter Termintreue nur ein Ziel: Den Erfolg unserer Partner und die Zufriedenheit ihrer Kunden nachhaltig zu sichern!

Mit unseren 8 Standorten in ganz Österreich sind wir immer in der Nähe unserer Kunden.

Als Komplettanbieter und Systemlieferant im Bereich Betonfertigteile haben wir unsere Produktionsstätten jedoch voll vernetzt. Durch die zentrale Auftragssteuerung und die flexiblen Produktionsanlagen haben wir so auch komplexe Bauvorhaben voll im Griff.

Seit der Gründung im Jahre 1912 sind wir stetig gewachsen, in der Zwischenzeit beschäftigen wir in den 8 bestehenden Standorten an die 900 Mitarbeiter und erwirtschaften einen Umsatz von ca. €145 Mio.

Unsere Produktpalette umfasst:

- Elementdecken
- Vorgespannte Elementdecken
- VSD® Spannbetonhohldielen
- Hohlwandsysteme
- Konstruktive Fertigteile

Die Planung unserer Aufträge erfolgt über die gesamte Produktpalette in der CAD Software der Fa. Nemetschek Allplan Precast 2005.



Salzburg Arena, Austria

Short Description

This impressive concrete and timber structure, one of the largest recently constructed in Austria, was opened in November 2003. An architectural landmark, sited in the Congress Area of Salzburg, on the outskirts of the historic city; the building has an 81 m x 107 m envelope, giving an effective arena area of 2,650 m² and a capacity of 6,700 spectators for sports events, where the city had previously been able to accommodate no more than 2,200 under one roof. In order to meet the quality requirements for the engineering design and the structural analysis, utmost precision and a great deal of experience in precast construction were necessary. It was all the more simple to realise the specified architecture in virtual components and the production and the changes in configuration of reinforcements were also easier to develop using 3D illustrations.

Project Information

Owner: Messezentrum Salzburg Ges.m.b.H.
Architect: KSP Engel & Zimmermann, Braunschweig
General Contractor: Emberger & Heuberger
Engineering Office: Dipl. Ing. Gerhard Heinrich

Construction Start: 01/06/2002
Construction End: 31/10/2003
Location: Salzburg, Austria



Die Planung der multifunktionellen Halle erfolgte durch das Architekturbüro KSP Engel & Zimmermann Braunschweig.

Mit dem Projektmanagement wurde die SAB-Finanz GmbH Salzburg beauftragt. Die Baumeisterarbeiten führt die Firma Emberger & Heuberger GmbH durch, mit der Lieferung der Stahlbetonfertigteile wurde die Fa. Franz Oberndorfer GmbH & Co KG, Gunskirchen beauftragt, die Bauaufsicht hat die Firma Geoconsult ZT GmbH übernommen. Die Dachkonstruktion aus Holz wurde von der Fa. Wiesner - Hager GmbH, Altheim, geliefert. Je nach Bestuhlung können bis zu 6800 Sitzplätze angeboten werden.

In einer Bauzeit von nur 17 Monaten und Gesamtkosten von 32 Mill. € wurde auf dem Areal des Messezentrum Salzburg dieses außergewöhnliche Projekt fertig gestellt.

Der ovale Holzkuppelbau der Salzburgarena vermittelt dem Zuschauer eine außergewöhnliche Stimmung, die auch den Protagonisten der Veranstaltung – nationale und internationale Prominenz - nicht verborgen bleibt. Wie in einem Parabolspiegel konzentrieren sich Aufmerksamkeit und Spannung auf die Bühne oder das Spielfeld. Keine Säule verstellt die Sicht und durch die variable Tribüne gibt es immer engen Kontakt zum Publikum.

Dieses Projekt, das in der Form eines Ovals mit rundum aufsteigenden Auditorium gebaut wird, stellt

die größte Holzbau-Baustelle Österreichs der letzten 30 Jahren dar. Die Dachkonstruktion, welche auf vorgefertigten Betonfertigteilen gelagert ist, wird dabei in der Lage sein, neben den üblichen Dachlasten auch 40 Tonnen Anhängelasten für akustische und lichttechnische Anlagen zu tragen. Die größte Höhe über dem Hallenboden beträgt ca. 26 m, das entspricht beinahe der Höhe eines zehngeschossigen Wohngebäudes. Dieses Bauvorhaben, das zu den größten Europas zählt, leistet einen wesentlichen Beitrag zur Stärkung bzw. zur Anerkennung der Kompetenz in der gesamten Fertigteilbau- und Holzwirtschaft.

Technische Daten

Gesamtlänge Arena: 118,16 m
Gesamtbreite ohne Vorbau: 89,38 m
Gesamtbreite mit Vorbau: 103,34 m



Used software: Allplan Engineering, Allplan Precast

Mehrfunktionsarena in Fertigteilbauweise, Salzburg

Bruttogrundfläche: 21.068,05 m²
Bruttorauminhalt: 179.399,11 m³
Bebaute Fläche: 10.745 m²
Gesamtnutzungsfläche: max. 2.650 m² Aktionsfläche
Sitzplätze je nach Bestuhlung: max. 6.710

Die Salzburgarena ist eine Blackbox (d.h. ohne Tageslicht) und säulenfrei.

Sportnutzung: unterschiedliche Gestaltungsmöglichkeit der Spielfelder lt. internationalen Normen durch mobile Tribünen und Teleskoptribünen.

Kulturnutzung: 280 m² Bühnenelemente, Catering- und Aufenthaltsräume für Künstler, Star- und Sammelgarderoben, Produktionsräume.

Infrastruktur und Ausstattung: 12 VIP-Logen mit eigenen VIP-Lounge, Bistro & Bar Bereich ab 3 Stunden vor Veranstaltungsbeginn geöffnet, Gastro - Kioske im Haupt- und Salzachfoyer, Büros, Lagerräume.

Stahlbetonfertigteile der Fa. Franz Oberndorfer GmbH & CO KG

Fertigteile: über 600 Einzelstücke
Gesamtbewehrung: ca. 350 t

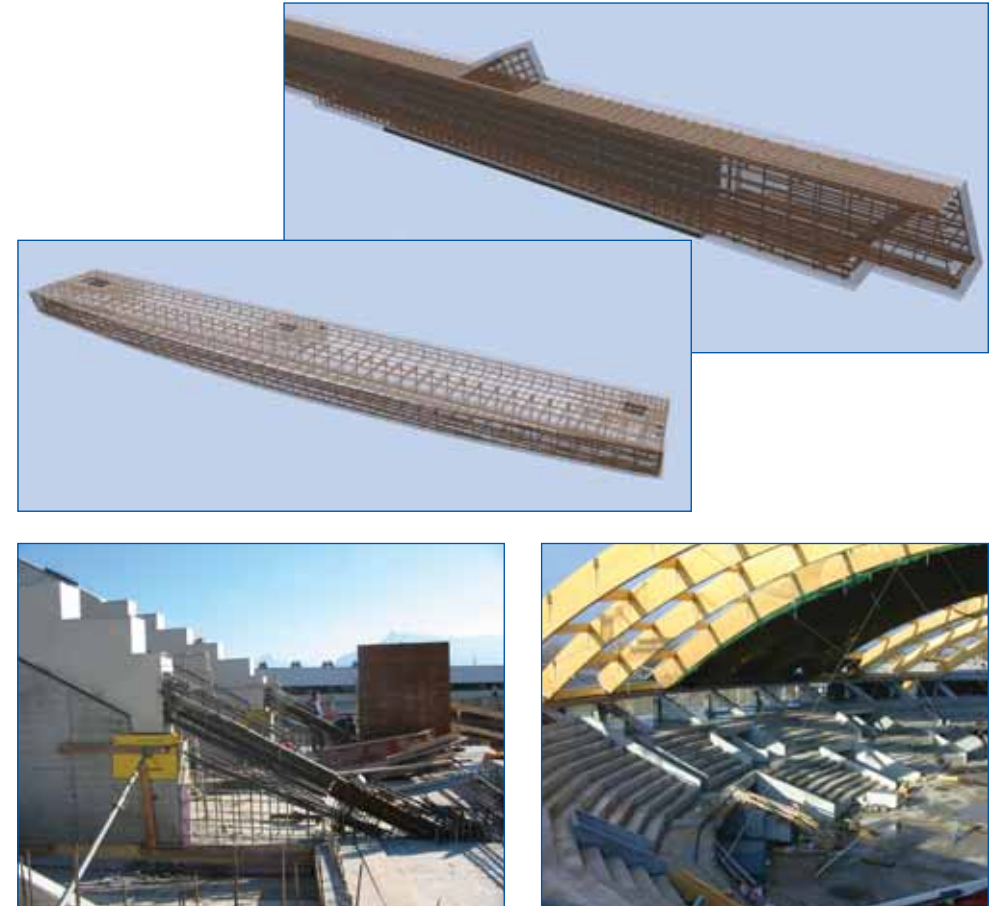
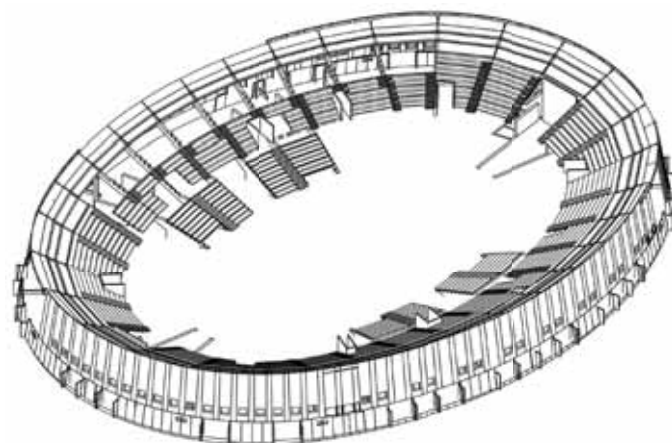
Aufgrund der Komplexität der Fertigteilplanung in Kombination mit der Ortbeton- und Holzleimbinderplanung war uns die große Verantwortung mit der Übernahme dieses Projektes bereits im Vorhinein klar. Die große Herausforderung für Technik, Produktion und Montage waren einerseits die ovale Form des

Veranstaltungsraumes, sowie andererseits die vertikal schräge verlaufende Außenfassade. Ein weiterer technischer Schwierigkeitsfaktor stellte der maßgenaue Einbau der in den Fertigteilträgern integrierten Stahlträger dar.

Für die 32 Rahmenträger der Tribünenkonstruktion mussten ca. 70.000kg Stahlträger in unserer werkseigenen Schlosserei verschweißt und mehr als 3.500 Stück Kopfbolzen auf die Stahlträger aufgeschossen werden. Das Handling der teilweise mehr als 2,5 t schweren Stahlträger im Zuge der Produktion wurde durch unsere erfahrenen Mitarbeiter zur vollsten Zufriedenheit gemeistert. Lage und Maßhaltigkeit der Träger in der Produktion waren ausschlaggebend für den späteren Versetzvorgang auf der Baustelle und den Anschluss an die bauseitigen Stahlträger.

Eine zusätzliche Aufgabenstellung war die Herstellung der abgeschrägten und dem Oval angepassten Fassadenplatten und Deckenplatten.

Hinsichtlich Logistik und möglichst effizientem Einsatz der Stahlschalungen für die abgerundeten Flächenteile waren unsere Mitarbeiter in der Produktionsplanung und Schalungsvorbereitung gefordert. Für beinahe jede Platte musste die Schalungsrundung sowie der Winkel verändert werden. Dies wurde mit einer Sonderanfertigung als verstellbare Rahmenschalung hervorragend bewerkstelligt. Höchste Anforderungen an Fugenbild und Versetzgenauigkeit auf der Baustelle konnten nur so gewährleistet werden.



MUCKINGENIEURE

Contact Walter Muck
Address Maria-Ward-Str. 9
85051 Ingolstadt, Germany
Phone +49 841 / 973 59 59
Email wm@muck-ingenieure.de
Website www.muck-ingenieure.de

NOMINATION



Wir sind ein überregional tätiges, leistungsfähiges Ingenieurbüro für Tragwerksplanung, das ständig nach der Entwicklung und Anwendung neuer innovativer Technologien in der Tragwerksplanung strebt. Dies geschieht mit dem Ziel, in enger Zusammenarbeit mit dem Architekten nach wirtschaftlichen und gestalterisch wertvollen Tragwerkslösungen für den Bauherren zu suchen und diese zu realisieren.

Unsere Lösungsvorschläge:

- Tragwerksanalyse auf neuestem Stand der Technik mit modernsten Berechnungsmethoden-
- Optimierung der Konstruktion durch Vergleichsberechnungen und Suchen von Alternativlösungen- Tragwerkskonstruktion mit modernster CAD-Software und Computertechnik
- Berücksichtigung wärme-, schall- und brandschutztechnischer Belange vom Beginn an
- Anwendung neuer innovativer Technologien in Statik und Konstruktion

- Bauüberwachung und Qualitätskontrolle
- Konstruktionsentwicklung am 3D-Modell
- Farbige Ausführungsunterlagen und präzise Details für einen reibungslosen Bauablauf und Fehlervermeidung

Tragwerksplanung ist:

- Durch frühzeitigen Kontakt mit dem Architekten optimal auf das Projekt abgestimmte Konstruktionen zu ermöglichen
- Kostenbewusstes Denken und Handeln
- Tragwerksanalysen in Hinblick auf Wirtschaftlichkeit, Gestaltung und Ökologie
- Bauphysikalische Überlegungen in das Gesamtkonzept der Konstruktion mit einfließen zu lassen
- Einsatz modernster Computeranlagen und CAD-Software
- Fotorealistische Darstellung der Konstruktion am 3D-Modell

Das Bewehrungssystem BAMTEC® - Kurzinfo

Mit MUCKINGENIEURE, Marktführer in Deutschland in der Anwendung der BAMTEC® -Bewehrungstechnologie, erreichen Sie Betonstahleinsparungen von mehr als 20 % und um bis zu 90 % reduzierte Verlegezeit für Flächenbauteile im Stahlbetonbau.

Organigramm

MUCKINGENIEURE besteht aus dem Inhaber, Herr Dipl.-Ing. (FH) Walter Muck, 5 Ingenieuren, 15 externen Konstrukteuren und 4 internen Konstrukteuren. Im Bereich Verwaltung arbeiten 5 Personen.

E.ON Office building, Zolling

The exceptional nature of the E.ON-Zolling building is not only the extraordinary geometry but also the high expectations with regard to natural light, communication and energy balance. The 26 degree southward inclination of the design allows ideal conditions for exposure to sunlight, whereby the times of artificial light could be reduced to a minimum. This made high demands on the execution plans. At the split-level construction the joists were rounded differently in each level in order to adjust them to the refraction of light (Fresneleffect).

With this unusual design we soon hit the limits of 2D design. The 3D design enabled us to plan many details in order to recognize and solve collisions of structural elements.

Short Description

Project Information

Owner: E.ON Kraftwerke GmbH
Architect: Boesel Benkert Hohberg Architekten
General Contractor: Porr Deutschland GmbH
Engineering Office: MUCKINGENIEURE

Construction Start: 01/11/2006
Construction End: 01/04/2008
Location: Zolling, Germany



Historie des Gebäudes

Für Wohlbefinden am Arbeitsplatz sorgt das neue energieeffiziente Verwaltungsgebäude der E.ON Kraftwerke GmbH im oberbayerischen Zolling. Das Münchener Architekturbüro Boesel Benkert Hohberg wurde beauftragt, für ein verbessertes Arbeitsklima die bisherige Verwaltung vom bestehenden Kraftwerk zu lösen und die CO2 Emissionen zu reduzieren. Rund 45 Mitarbeiter können sich seit September 2008 über ein optimiertes Tageslichtkonzept, fünf im Split-Level angeordnete Büroebenen für die Arbeit im Team sowie eine herausragende Architektur freuen.

Das Besondere am Gebäude ist die um 26 Grad nach Süden geneigte Bauform. Diese nutzt vermehrt blendfreies Tageslicht im Norden und reflektiert durch Nutzung einfacher physikalischer Gesetze die Wärmestrahlung im Süden (Fresnel-Effekt). Kunstlichtzeiten werden so auf ein Minimum reduziert, auf einen kostenintensiven außen liegenden Sonnenschutz konnte verzichtet werden. Das entstandene kompakte Gebäudevolumen mit einem optimierten Verhältnis von Nutzfläche zu Hüllfläche wurde speziell für diesen Standort entwickelt. Gemeinsam mit der aus der Aufgabe entwickelten Fassadengestaltung konnte so ein einzigartiges Verwaltungsgebäude entstehen.

Nachhaltige Gebäudetechnik für ein optimales Raumklima

Die Wärmeversorgung des Gebäudes wird ausschließlich über die kraftwerkseigene Fernwärme aus Kraft-Wärme-Kopplung sichergestellt. Eine Luftaustauschanlage mit Wärmerückgewinnung sorgt für die Reduzierung der Heizlast, wodurch auf weitere Heizquellen wie Heizkörper verzichtet werden konnte. Die Zuluftverteilung erfolgt deckenintegriert über flexible Kunststoffrohre; die Abluft strömt aus den Büroräumen in das Atrium über. Die für die Behaglichkeit erforderliche Kühlung im Sommer stellt eine Kältemaschine mit "Free-Cooling-Register" bereit. Sie erlaubt die Zwischenspeicherung von Nachtkälte in den Geschossdecken (Bauteilkühlung). Hierfür wurden Rohrleitungen oberflächennah



Used software: Allplan Engineering

in die Massivdecken eingesetzt, die auch eine bedarfsorientierte Nutzung der Räumlichkeiten ermöglichen. Eine größere Nutzerakzeptanz und ein geringerer Energieaufwand werden erzielt.

Standortwahl

Die Lage des Neubaus, hervorgegangen aus einer vorgeschalteten Standortanalyse, liegt strategisch günstig an der Ostgrenze des Kraftwerksgeländes und definiert zeichenhaft den neuen Haupteingang zum Kraftwerk. Die genau justierte und aus lichttechnischer Sicht berechnete Lage des Baukörpers zwischen Kraftwerksblock und Kühlturm bietet optimierte Besonnungs- und Verschattungsverhältnisse. Das freigestellte Gebäude vermeidet Schallemissionen und Vibrationen aus dem Kraftwerk. Überblick und Ausblick auf den Betrieb werden gewährt.

Schwierigkeiten im Ingenieurbau

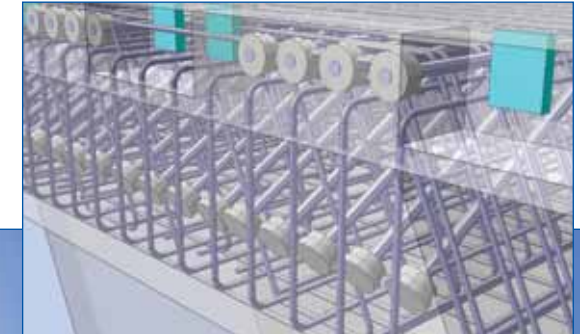
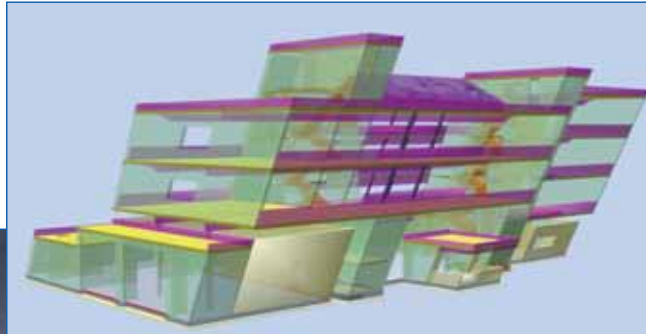
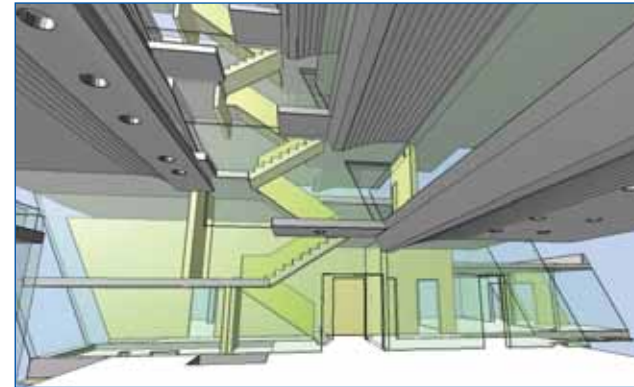
Die Schwierigkeit dieses Projektes war die Neigung der Längswände (26 Grad), weitere Erschwernis war, dass alle Ebenen durch die Architektur in Split-Level-Bauweise erfolgten. Infolge der großen Spannweiten der Decken wurden Unter- und Überzüge angeordnet.

Um bessere Lichtverhältnisse in den Räumen gewährleisten zu können, wurden diese Unterzüge ausgerundet. Durch die Neigung der Längswände und den Vouten an den Unterzügen war es fast unmöglich, das Projekt in einer 2D-Planung zu absolvieren. Hierfür stand das Programm Allplan 2005 bei uns im Büro an vorderster Front. Durch die 3D-Planung und assoziative Schnitte konnte schnell und maßgenau abgeleitet werden. Bei jeder Änderung durch Bauherr / Architekt konnte man Kollisionen der Bauteile sofort erkennen. Für den Prüfer und Baufirma konnte die Bewehrungsführung mit Heizregistern dreidimensional als PDF dargestellt werden, wodurch die Prüfung und die Ausführung erheblich vereinfacht wurden.

Kennzahlen

- BGF 2.513 m² BRI 10.565 m³
- Baukosten 4.5 Mio. €
- Bauzeit 2007 - 2008

Bürogebäude E.ON in Zolling



Con-tura Architekten + Ingenieure GmbH

Contact Jan Grüneveld
Address Klärwerkstraße 1
13597 Berlin, Germany
Phone +49 30 35183344
Email jgroeneveld@con-tura.com
Website www.con-tura.com

NOMINATION



Con-tura: Gespecialiseerd in architectuur, bouwconstructies en bouwfysica

Als vakbekwame partner zien wij ons als uw adviseur en bouwbegeleider. Con-tura kan u ondersteunen in alle bouwfasen van de stedenbouw, stadsplanning, architectuur, bouwmanagement, kostencalculaties gebouwen, bouwconstructies en de bouwfysica. Om uw project precies en binnen uw financiële plaatje passend om te zetten, is een exacte, praktijkgerichte- en realistische planning nodig. Zij is de belangrijkste basis voor een goed verlopend bouwproces.

Con-tura: Uw partner in projectontwikkeling en uitvoering

Uit uw idee moet zich een goed omschreven doel en object vormen, die exact met uw voorstellingen overheer komen.

Daarom staan wij u graag vanaf het begin af aan met onze vakkundige architecten en adviseurs ter zijde.

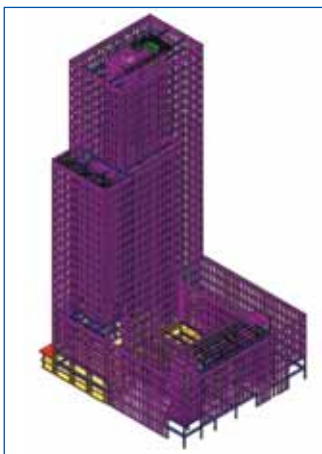
Met onze ervaring, kennis en kunde uit onze vestigingen in Duitsland, Nederland, Slowakije en België bieden wij niet alleen regionale kennis, maar ook internationale know-how als meerwaarde voor onze opdrachtgever.

Vestiging Berlijn-Spandau

Klärwerkstraße 1, 13597 Berlijn
tel: +49 0 30- 35183340, fax: +49 0 30- 35183345
email: berlin@con-tura.com
http: www.con-tura.com

Vestiging NRW-Wuppertal

Deutscher Ring 71, 42327 Wuppertal
tel: +49 0 202-2571391, fax: +49 0 202-2571399
email: wuppertal@con-tura.com



Amsterdam Symphony

Short Description

*This building complex will become one of the most prestigious landmarks in the southern part of the city. It is composed of several units: an underground multi-storey car park; a 29-storeyed block of flats (105 accommodations), a 105 m high office block, a low-rise office building and last but not least a 12-storeyed hotel (217 rooms). Besides the accommodations for living, working and recreational purposes, the ground floor and first floor are provided with public spaces such as shops, bar/restaurants as well as an 'art cluster'. Some figures on the surfaces:
Offices: 35.000 m², Block of flats: 15.000 m², Hotel: 12.500 m², Shops: 2500 m², Commercial space: 3000 m²*

Project Information

Owner: Bouwfonds MAB Ontwikkeling CVG BV en Trimp & van Tartwijk Property Development NV
Architect: de Architecten Cie
General Contractor: Boele & van Eesteren en Dura Vermeer Bouw Haarlemmermeer

Engineering Office: Aveco de Bondt
Construction Start: 01/05/2006
Construction End: 01/03/2009
Location: Amsterdam, Netherlands



Dit prestigieuze project bestaat uit een 2-laagse ondergronds stallinggarage. Boven op de parkeergarage worden diverse gebouwen gerealiseerd; een woontoren van 29 verdiepingen (105 appartementen), een kantoor-toren van 105 m hoog en een kantoorlaagbouw (samen ca. 35.000 m² BVO), evenals een hotel van 12 verdiepingen (217 kamers). Naast het gebruik voor wonen, kantoor en recreatie, worden de begane grond en 1e verdieping van de gebouwen voorzien van openbare ruimten zoals winkels, bar/restaurants en een kunstcluster.

Informatie oppervlakten

Kantoren: 35.000 m²
Woontoren: 15.000 m²
Hotel: 12.500 m²
Winkels: 2500 m²
Woontoren commerciële ruimte: 3000 m²

Bouwmethodiek

Om het geheel binnen de afgesproken bouwtijd te realiseren, is ervoor gekozen om vanaf de 2e verdieping de kantoor- en woontoren compleet in prefab-beton te ontwerpen en uit te werken. Ook de gevel bestaat uit geprefabriceerde betonelementen. Deze zullen als sandwichelement, compleet met metselwerk, aluminium puien en glas aangeleverd en gemonteerd worden vanaf de 6e verdieping, zodat het gebouw vrijwel direct na montage wind- en

waterdicht is. Alleen de voegen tussen de elementen dienen hierna nog afgewerkt te worden. Voor de onderste 6 lagen is voor beide torens voor traditioneel metselwerk gekozen, zodat vanaf straatniveau een authentieke uitstraling is waar te nemen. Het betonwerk onder de 2e verdieping wordt, evenals de stallinggarage, geheel in situ uitgevoerd. De vloeren van de appartementen zijn zgn. kant- en klaarvloeren waarin alle installaties al op de fabriek zijn ingestort.

De constructie van de kantoor-toren omvat prefab betonnen binnenspouwbladen (onder de 6e verdieping) en sandwich gevelelementen (vanaf de 6e verdieping), prefab betonnen binnenkernen en vloeren bestaande uit betonbalken en kanaalplaten. De installatie wordt vooralsnog uitgevoerd als een basisinstallatie. De afbouw concentreert zich in de kernen (complete afbouw) en het aanbrengen van de plafonds in de toekomstige kantoorruimten. De afwerking van de entree ruimten is van hoogwaardige kwaliteit met o.a. glas, RVS en natuursteen.

Het hotel wordt traditioneel gebouwd (gietsbouw) met een metselwerkgevel en binnenspouw uit houtskeletbouw-elementen. De inrichting van de buitenruimte is eveneens onderdeel van de opdracht en omvat tuinmuren en bloembakken welke dezelfde uitstraling als de gevel krijgen. Ook de terrassen worden aangelegd met bijpassende bestrating. Aan de zuidzijde wordt in het terrein een metselwerktrap

aangelegd welke zal aansluiten op de Boelegracht. Met de uitvoering is in mei 2006 gestart en aan het einde van 2006 is men gestart met het betonwerk van de stallinggarage. Rond de bouwvak van 2007 zal met de prefab montage van de torens gestart worden. Begin 2009 zal één van de meest markante bouwwerken van de Zuidas in gebruik worden genomen.

Prefab-engineering kantoren

Con-tura Architecten + Ingenieure GmbH, de Duitse dochter van Aveco de Bondt, heeft de prefab-engineering Amsterdam Symphony kantoortoren en kantoren laagbouw voor haar rekening genomen.

Onze werkwijze prefab-Engineering Amsterdam Symphony kantoortoren is:

1. Tekenen 3D model met Allplan
2. Positieplannen prefab elementen met lijsten prefabelementen
3. Berekeningen elementen met Scia Engineer en Allfem (Frilo)
4. Vormtekeningen elementen uit 3D model, incl. lijst inbouwden
5. Wapeningstekeningen elementen uit 3D model, incl. staaflijst buigvormen,
6. Montageplannen met in te bouwen delen

Overzicht prefab kantoortoren

De prefab kantoortoren bestaat uit: 518 gevelwanden, 456 kernwanden, 53 kolommen, 247 balken, 109

bordessen, 114 trappen en 52 platen. Van deze 1549 prefab elementen zijn 481 vormtekeningen en 324 wapeningstekeningen met Allplan gemaakt. In deze elementen zit in het totaal 5587,8 m³ beton, 1026287 kg wapening, 3595 transportankers, 2054 montage-ankers 14138 gains en 28276 demu-ankers.

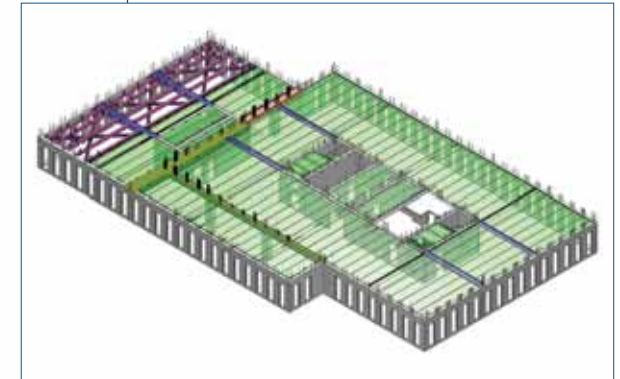
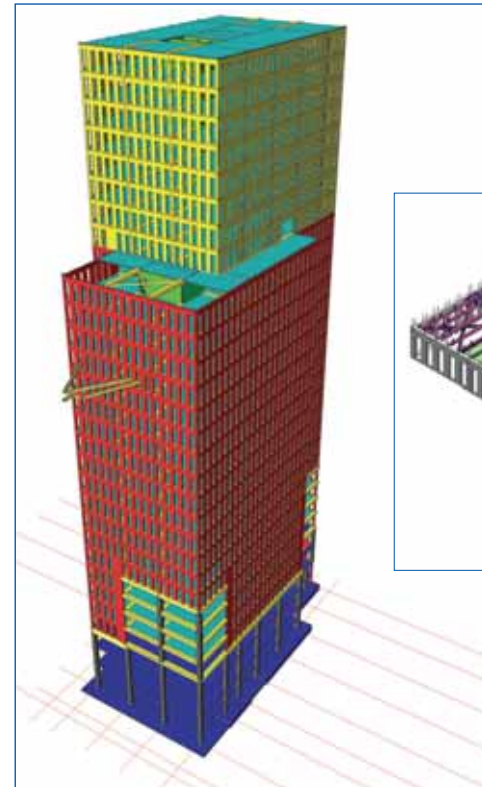
Overzicht prefab kantoren laagbouw

De prefab kantoren laagbouw bestaat uit: 167 gevelwanden, 76 kernwanden, 71 kolommen, 80 balken, 27 bordessen, 27 trappen en 1 plaat. Van deze 459 prefab elementen zijn 311 vormtekeningen en 242 wapeningstekeningen met Allplan gemaakt.

In deze elementen zit in het totaal 1339,5 m³ beton, 184135 kg wapening, 977 transportankers, 628 montage-ankers 8899 gains en 17798 demu-ankers.

Door het 3D-engineering van de prefab met Allplan heb je vooraf een goede controle dat de wapening met de inbouwden van de prefab elementen past, de stekken en de gains tussen de aangrenzende elementen passen en zo ook alle prefab elementen onderling.

Hierdoor is de montage van de prefab op de bouw zeer spoedig verlopen en was het mogelijk om in gemiddeld 5 dagen een bouwlaag te monteren.



Adams Bouwadviesbureau bv

Contact Klaas-Geert Koolhout
 Address Postbus 75
 6650AB, Druten, Netherlands
 Phone +31 487588280
 Email kko@adamsbouwadvies.nl
 Website www.adamsbouwadvies.nl



Adams Bouwadviesbureau BV is een raadgevend ingenieursbureau op het gebied van draagconstructies. Veiligheid, innovatie en kwaliteit staan hoog in het vaandel. Onze uitgebreide ervaring ligt op het terrein van woning- en utiliteitsbouw, uiteenlopend van individuele projecten tot grootschalige stadsvernieuwing.

Sinds de oprichting in 1995 is het bureau gegroeid tot een bedrijf van 27 medewerkers met de flexibiliteit van een klein bedrijf en het kennisniveau van een grote organisatie.

De academische en HBO+ geschoolde projectleiders, constructeurs en tekenaars zijn in staat om van complexe bouwwerken de draagstructuur te ontwerpen, berekenen en detailleren. Onze medewerkers houden hun kennis en werkwijze up-to-date met regelmatige scholing.

Door de jarenlange ervaring kent Adams Bouwadviesbureau bv het wensen- en eisenpakket van zowel opdrachtgever, architect als aannemer. De aanwezige kennis geeft in een vroeg stadium sturing aan het ontwerpproces om binnen de architectonische en kwalitatieve randvoorwaarden te komen tot een optimale constructie. Dit geldt voor de uitvoering, eenvoud, energiezuinigheid en

duurzaamheid. Dit kan in zowel bouwteamverband als traditionele manier van bouwen, waarbij de opdrachtgever met zijn adviseurs het ontwerp definieert.

Zelf ontwikkelde rekenprogramma's en de software van Scia ondersteunen het rekenwerk. Hiermee worden alle twee- en driedimensionale staaf-, plaat- en schijfconstructies berekend.

Alle tekenwerk wordt uitgewerkt met Allplan. Door het 3D-tekenprogramma kunnen wij als adviseur een extra waarde toevoegen aan het gehele bouwproces. De betrokken partijen kunnen vanaf bestekfase als het ware door het gebouw lopen.

Het dienstenpakket van Adams Bouwadviesbureau bv bestaat voornamelijk uit de constructieve advisering in opdracht van opdrachtgevers zoals, woningbouwverenigingen, projectontwikkelaars en architecten en betreft vooral:

- Ontwerpen van constructies in overleg met opdrachtgever en architect
- Berekenen en tekenen van draagconstructies
- Renovatie en herbestemmingen
- Second opinion bij (dreigend) schadegeval
- Constructieve beoordeling van bestaande constructies.



Short Description

Wilhelminahof, Amsterdam

A new housing complex is being built on a former parking zone, at the Koningin Wilhelmina square, near the Rembrandt Park. The total project comprises: 335 flats in 14 building layers, business accommodations on the ground floor and an office block of 15 storeys. The entire complex is built on a two-storey underground parking garage of 170 m by 65 m. The total plan is executed in three phases. The 1st phase has already been achieved in 2007. The 2nd phase has recently been started and the office building will be realized later on. The most interesting part of this project is the size of it and the division in several phases. This raises several constructive, technical and design challenges. By using the 3D drawing methods of Allplan all occurring problems have been located and dealt with in an early stage.

Project Information

Owner: Amsterdam West-As Vastgoed v.o.f.
Architect: Dam & Partners Architecten
General Contractor: n/a
Engineering Office: Adams Bouwadviesbureau

Construction Start: 01/07/2006
Construction End: n/a
Location: Amsterdam, Netherlands



Introductie

Amsterdam groeit en zal voorlopig alleen maar blijven groeien. Daarom is er in Amsterdam een grote behoefte aan woningbouw. Naast de bouw van woningen op IJ-burg worden overal in de stad grote woningbouwcomplexen geplaatst. Zo komt er ook aan het Koningin Wilhelminaplein, op een oud parkeerterrein in de buurt van het Rembrandt Park, een nieuw woningbouwcomplex. Het totale project bestaat uit 335 appartementen in 14 bouwlagen met bedrijfsruimten op de begane grond en een kantoorgebouw van 15 bouwlagen hoog. Het geheel staat op een tweelagige ondergrondse parkeergarage van 170 bij 65 m.

Het totale plan wordt in drie fasen gebouwd. De eerste fase is voltooid in 2007. De tweede fase is onlangs in uitvoering gegaan. Het kantoorgebouw wordt in een derde fase uitgevoerd.

Het interessante aan dit project is de omvang en de verdeling in meerdere fasen. Dit geeft een aantal constructieve en tekentechnische problemen. Door gebruik te maken van de 3D tekenmethode binnen Allplan zijn deze problemen vroegtijdig gesignaleerd en opgelost. Aangezien het een project is dat veel repetitie kent, is door systematisch te werken met Allplan veel tijd bespaard. Door deze systematiek kunnen we op het werk een gezonde marge realiseren.

Uitwerking

Bij de uitwerking van het project is op een aantal punten voordeel gehaald uit het gebruik van Allplan. Op de volgende punten zijn bij dit werk speciaal gelet. De eerste uitdaging is de hoogte van het gebouw. Doordat het gebouw 14 bouwlagen hoog is komen er in de keldervloer grote poeren; deze variëren van 2 paalspoeren tot zelfs 9 paalspoeren. In de uitvoeringsfase zijn ook nog kraanpoeren opgenomen in het ontwerp. Omdat de faseverdeling in de kelder en de verscheidenheid aan poeren voor een aantal wapeningsproblemen zorgen, is ervoor gekozen om de wapening van de kelder in 3D uit te voeren. Door gebruik te maken van een 3D model dat we voor al onze projecten uitwerken in Allplan is de wapening eenvoudig ingetekend. Hierdoor kunnen we met één druk op de knop controleren of de opgegeven wapeningshoeveelheden in de ontwerpfasen kloppen met de benodigde wapening in de uitvoering. Door deze manier van wapenen kan de tekenaar duidelijk zien waar de knooppunten liggen en of alles goed is afgewapend. Verder is gebruik gemaakt van Scia Engineer om de gecompliceerde betonportalen op de begane grondvloer te berekenen. Deze portalen brengen de krachten uit de bovenbouw over naar de kelderwanden. Een tweede uitdaging is de opdeling in fasen van het project. Door slim gebruik te maken van de lagenstructuur van Allplan kon één model toch opgedeeld

worden in verschillende fasen. Zo ontstond een model dat aan de ene zijde al op uitvoeringsniveau was en aan de andere zijde nog maar een voorlopig ontwerp was. De opdeling in fasen zorgt vooral voor problemen in de kelder, hier loopt de ruimte namelijk door over alle drie de fasen. Hogerop is de opgave minder groot, omdat daar de faseovergang kan worden opgevangen met een dilatatie wand. In de kelder zijn echter wel voorzieningen nodig. Vooral de combinatie van waterdruk met vloerdilataties zorgen voor uitdagingen. Wanneer bijvoorbeeld de vloer onder fase 1 verder zakt dan de vloer onder fase 2, zal er een sprong komen in de keldervloer. Om dit te voorkomen worden in de vloer cret-deuvels toegepast. Deze zorgen ervoor dat de vloeren niet in hoogte kunnen verschuiven ten opzichte van elkaar.

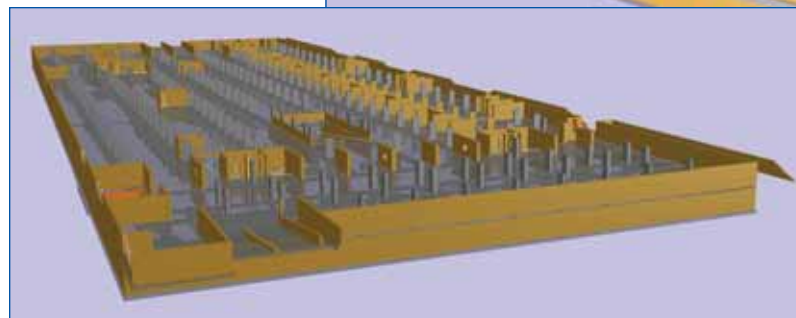
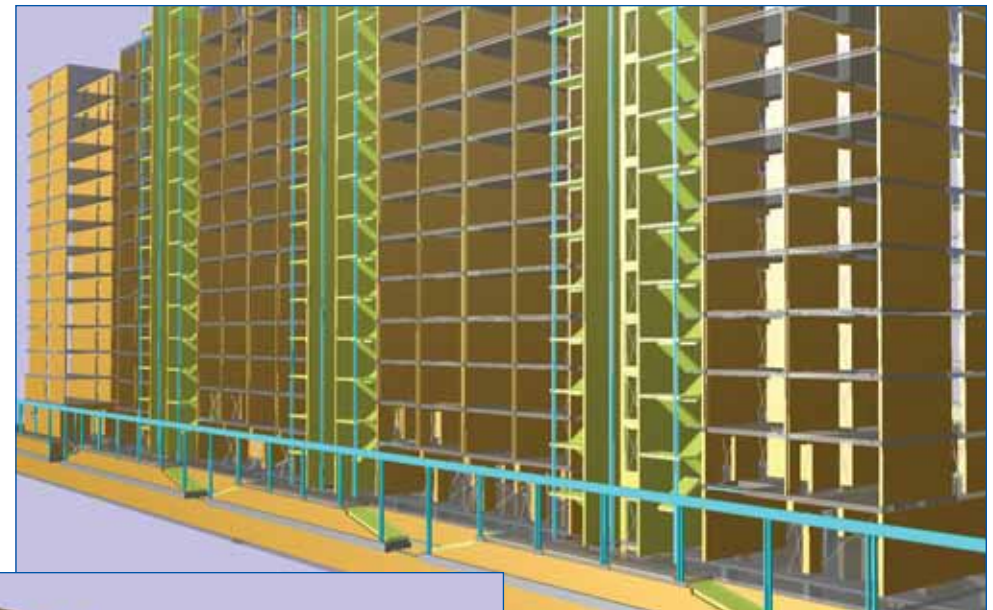
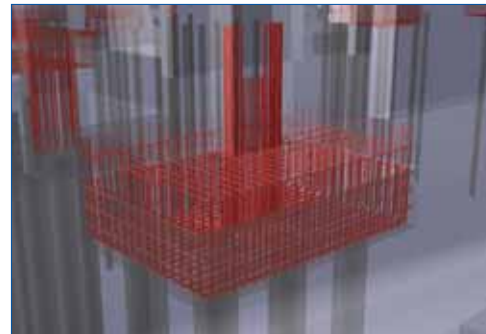
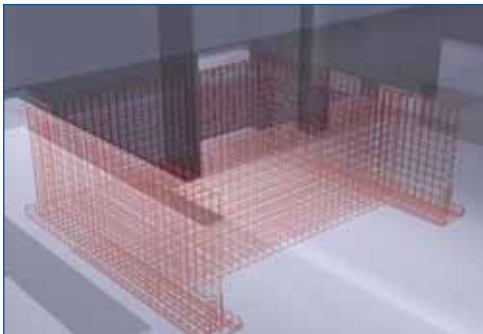
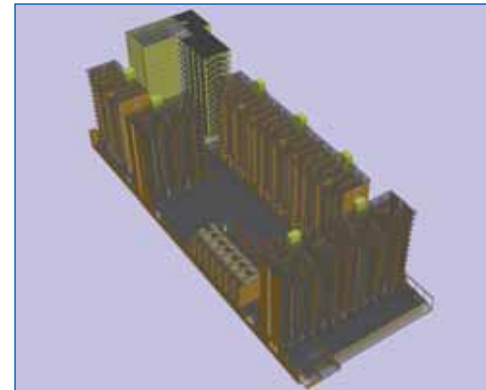
De appartementsgebouwen zijn allemaal identiek. Door hier slim mee om te gaan bij het ontwerpen

en uitwerken van de constructie kan het project snel en goedkoop worden uitgewerkt. Wanneer een appartementsgebouw van onder tot boven is uitgewerkt is het een kwestie van kopiëren en bijpoetsen. De lagenstructuur van Allplan geeft hiermee veel structuur in het werk aan.

Conclusie

In een relatief korte tijd is een volledig project opgezet waaruit alle benodigde informatie is gehaald. We denken aan wandaanzichten, onderleggers voor details en bekisting voor wapening. Dit voorkomt dubbel werk en minimaliseert de kans op fouten. Hierdoor is de werksnelheid waarmee gegevens worden verwerkt verhoogd. Doordat het project volledig in 3D is uitgewerkt krijgen alle partijen een duidelijk beeld van de constructie.

Appartementen complex Wilhelminahof, Amsterdam



Artec Architekten

Contact Gerd Kaut
 Address Haspelstrasse 20
 35037 Marburg, Germany
 Phone +49 6421-210600
 Email artec@artec-architekten.de
 Website www.artec-architekten.de



Artec Architekten

Firmengeschichte

Seit nunmehr 20 Jahren bereichert Artec Architekten mit regionalen und überregionalen Projekten die Architekturszene. Büroinhaber Dipl.-Ing. Architekt Gerd Kaut und seine Mitarbeiter haben mittlerweile über 270 Projekte unterschiedlichster Art und Größe erfolgreich abgeschlossen.

Aufgabenfelder

- Wohn- und Geschäftshäuser
- Büro- und Verwaltungsbau
- Industriebau
- Altbauanierungen
- Schulbauten
- Sporthallen
- Innenausbau

Philosophie

- Höchster Anspruch an Qualität der Planung
- Ressourcen- und energieschonendes Bauen
- Ganzheitliche Betrachtungsweise unter Einbeziehung aller Interessen
- Ständige technische Weiterentwicklung und Weiterbildung

Organisationsübersicht

Das Unternehmen beschäftigt aktuell

- 3 Dipl.-Ing./Architekten
- 1 Bauingenieurin (Teilzeit)

- 2 Bauzeichnerinnen
- 1 Bauzeichner (Teilzeit)
- 1 Assistentin Bürocontrolling und Korrespondenz
- 1 studentische Mitarbeiterin

Firmen-Kerngeschäft

Planung und Realisation von Hochbauten.

Ausrüstung

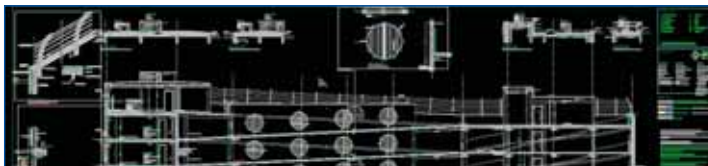
GLASER -isb cad-, VectorWorks, Artlantis Render, Photoshop, InDesign, Illustrator

Zielgruppen

- Industrie
- öffentliche Auftraggeber
- Investoren

Referenzen

- Neubau Produktionshalle Firma Seidel, Fronhausen
- Hoppe, Stadtallendorf
- KMW, München
- Landesbank Rheinland-Pfalz
- Schenck, Darmstadt
- Deutsche Vermögensberatung, Frankfurt
- ...



Short Description

Building with two faces in Marburg

The project was to conveniently fill in an empty building space. In response to the heterogeneous surroundings was designed a building with two faces: on the one side residential and commercial, on the other side a multi-level car park. These two faces are noticeably recognizable by the different facades. The characteristics of the foreshore are large-scale windows and natural stone. The coloured balustrades of glass bring a lively, exciting and pleasant change in the neighbourhood. On the backside, the horizontal curtain-walling offers a fascinating playing of light and ramps. The parking space on the access ramps is also highly efficient. We also followed the guidelines to built resource- and energy-efficiently: the parking garage is naturally aerated and exposed for the larger part.

Project Information

Owner: Aachen Münchener Lebensversicherung AG
Architect: Dipl.-Ing. Architekt Gerd Kaut
General Contractor: n/a
Engineering Office: n/a

Construction Start: 16/07/2007
Construction End: 08/05/2008
Location: Marburg, Germany



Bauherr: Aachen Münchener Lebensversicherung AG
 Ort: Bahnhofstraße 20, 35037 Marburg, Germany
 Bauzeit: 10 Monate
 Übergabe: Mai 2008
 Grundrissfläche: 21,5 m*58,0 m
 Anzahl der Wohneinheiten: 9
 Anzahl Stellplätze im Parkhaus: 216
 Ladenfläche: 116qm



Unser Objekt befindet sich in einem Sanierungsgebiet mitten in der Universitätsstadt Marburg. Auf Grund des Abbruchs eines alten Gebäudes entstand eine Baulücke, die es sinnvoll zu bebauen galt. Durch die Unterfangung mit Hochdruckinjektion war es möglich, unmittelbar an die vorhandene Nachbarbebauung anzuschließen. Unser Entwurf spricht eine eigenständige Architektursprache als Antwort auf das heterogene Umfeld. Es entstand ein Gebäude mit zwei Gesichtern. Auf der einen Seite Wohn- und Geschäftshaus, auf der anderen Seite Parkhaus. Von außen sind die Unterschiede sofort durch die Fassadengestaltung zu erkennen. Merkmale der so genannten Vorderseite sind die großzügigen Verglasungen und der Naturstein. Die Ladenzone im Erdgeschoss ist hoch verglast. Die Wohnungen in den drei darüber liegenden Geschossen sind an der Fassade durch große Fenster gekennzeichnet, die vom Sandstein umrahmt sind. Durch die farbigen Glasbrüstungen an Treppenhaus und Wohnungen strahlt das Gebäude noch mehr Lebendigkeit aus und bietet eine spannende Abwechslung zu den Nachbargebäuden der Bahnhofstraße.

Auf der anderen Seite, zur Furthstraße hin, zeigt sich das zweite Gesicht des Gebäudes. Hier bietet das Parkhaus interessante Einblicke. Der horizontale Fassadenvorhang lässt schon bei Tag erahnen, welches spannende Schauspiel aus

Used software: GLASER -isb cad-

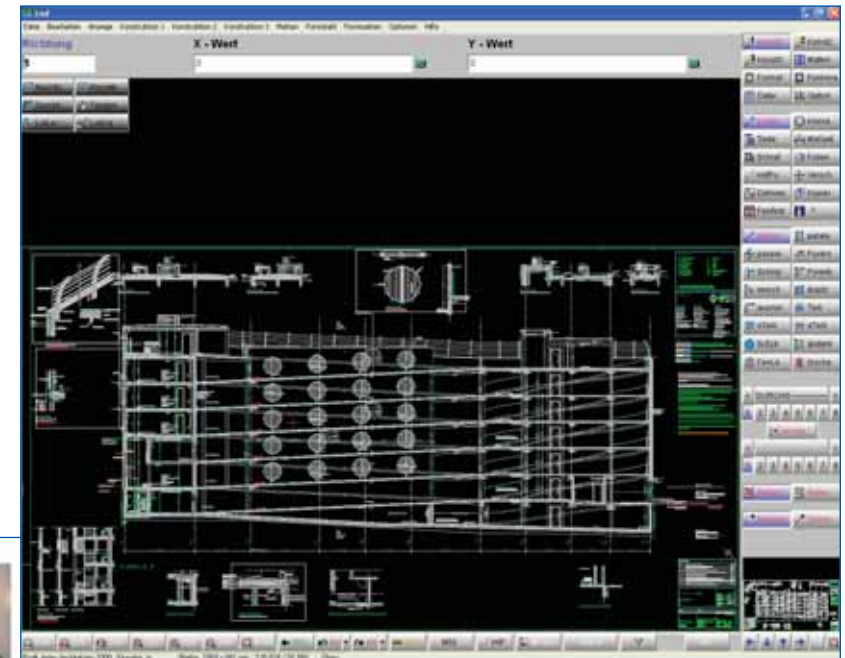
Rampen und Licht sich bei Dunkelheit zeigt. Wie durch einen Schleier, der zwischen die Brandwandscheiben gespannt ist, ist die Gebäudegliederung nur schemenhaft erkennbar.

Die durchdachte Planung bietet aber nicht nur optische Reize. Hoch effizient ist das mögliche Parken auf den Auffahrtsrampen. Die Stahlbetonkonstruktion besteht im gesamten Parkhaus aus schiefen Ebenen und Rampen. Eine Besonderheit sind auch die sieben Behindertenparkplätze. Von ihnen aus bewegt man sich komplett barrierefrei zum und vom Fahrzeug weg. Elektrische Türöffner im Bereich dieser Parkplätze erleichtern die Wege. Auch unser Grundsatz des ressourcen- und energieschonenden Bauens wurde hier eingehalten: durch die offene Fassade wird das Parkhaus zum Großteil natürlich belüftet und belichtet. Zu guter Letzt bietet das Dach eine einmalige Aussicht auf das hügelige Marburg.

Verwendung von GLASER -isb cad-

Das Programm wurde für sämtliche 2D-Zeichnungen eingesetzt. Durch die logische Struktur und den Aufbau des Programms konnte das schwierige Projekt schnell und übersichtlich gezeichnet werden. Auch bei den oft erforderlichen Planänderungen unterstützte GLASER -isb cad- den Prozess durch seine Flexibilität. Die überlegte Programmoberfläche ermöglichte ein zügiges Konstruieren.

Praktisch ist auch die Möglichkeit, JPEGs zu den 2D-Zeichnungen dazu laden zu können. Durch Photos auf den Plänen wurde zum Beispiel der gewählte Materialeinsatz den Bauherren und allen am Bau Beteiligten sofort ersichtlich.



Heesakkers Beton b.v.

Contact Leon Megens
 Address Retselseweg 11
 5473 HC Heeswijk-Dinther, Netherlands
 Phone +31 413-291602
 Email info@heesakkersbeton.nl
 Website www.heesakkersbeton.nl



In 1958 startte Jos Heesakkers in de Baron van de Bogaerdelaan te Heeswijk-Dinther een betonfabriekje. Hij vervaardigde vooral voor de agrarische sector tegels en roosters.

Jan Heesakkers zette samen met zijn broer Ton het bedrijf van hun vader in 1978 voort. Allebei hadden ze als opleiding een staalachtergrond. Jan had zich verdiept in de tekenkamer en met hun bouwkundige opleiding waren ze klaar voor de toekomst; al gauw stroomden de eerste opdrachten binnen.

Omwille van enkele grote opdrachten (onder meer het maken van wanden en kolommen voor voederfabriek Meulemans te Ravenstein en Goossens meubelhal in Erp) werd naarstig gezocht naar extra productieruimte in de buurt. Bij de firma Nelissen & van Gerwen in Heeswijk-Dinther werd in 1981 een hal gehuurd waarin de productie verhoogd kon worden.

In 1984 ging Jan Heesakkers alleen verder en werd de BV opgericht. Hij zag op tijd in dat het met de roosters en tegels een aflopende zaak was. "Ik ging daarom op zoek naar een product waarvoor behoefte was in de bouwmarkt. Ik merkte al snel, dat het in deze tijd van massaproductie in de bouwwereld moeilijk was om aan de wel in iedere bouw voorkomende, van de normale afmetingen afwijkende betononderdelen te komen".

"Je moet dan denken aan trappen, balkonplaten, galerijplaten, afdekbanden, dorpels en gevelbanden", aldus Jan Heesakkers.

Door de snel stijgende vraag naar prefab betonelementen werd in 1984 een nieuwe productiehal met kantoor gebouwd op het bedrijventerrein "Retsel" te Heeswijk-Dinther. De koerswijziging van producten als tegels en roosters naar speciaal op maat gemaakte producten voor de bouwwereld bleek een gouden ingreep. Tussen 1984 en 1989 groeide Heesakkers Beton BV zo snel dat er opnieuw uitgekeken werd naar een nieuwe locatie.

In 1989 werd met de bouw gestart van een nog groter complex op het industrieterrein "Retsel" op de Morgenstond 8.

In 1990 werd het nieuwe pand door de moeder van Jan Heesakkers officieel geopend en in gebruik genomen.

In 1996 treden Arjan Heesakkers (huidige algemeen directeur) en Barend Stephan (huidige technische directeur) toe tot het bedrijf.

In 2003 treedt Ron Heesakkers toe tot het bedrijf.

Begin 2008 werd de nieuwe productielocatie aan de Kenedylaan 7A te Veghel in gebruik genomen.

In november 2008 was de verbouwing van de Retselseweg gereed. De modelmakerij (zowel staal als hout) is danig uitgebreid en het kantoorgedeelte is bijna verdubbeld.

Office building ACSI with a "Doric and Corinthian" look

The project regards an office space with an impressive façade. The objective of the client was to get a building with moulded columns, socles, capitals, tympanums (rectangular and bowed), gutters, ridge beams, all with a 'sandstone' Doric and Corinthian character. The impressive columns with a height of about 7 metres are completed with a mighty triangular tympanum on the top; this unity forms the eye-catching entrance of the building. The chosen 'sandstone' colour for the entrance is very determining for the grand appearance of the building.

With this project, Heesakkers Beton B.V. of Heeswijk-Dinther has more than complied with the demands of Bouw- en Aannemingsbedrijf J.C. van Kessel B.V.

Short Description

Project Information

Owner: ACSI Touroperating B.V.
Architect: Van Kessel Architectuur
General Contractor: Van Kessel Architectuur
Engineering Office: Heesakkers Beton

Construction Start: 13/08/2005
Construction End: 01/05/2006
Location: Andelst, Netherlands



Kantoor en bedrijfsruimte ACSI te Zetten-Andelst. "Dorische en Korinthische look" langs de A-15 nabij Zetten-Andelst.

Langs de A-15 nabij Zetten-Andelst is een pand, bedoeld als kantoor en bedrijfsruimte, tot stand gekomen dat alle verwachtingen totaal heeft overtroffen. Doelstelling was het pand van een gevelaanzicht te voorzien van geprofileerde kolommen voorzien van sokkels en kapitelen, timpanen (in rechthoekige en gebogen vorm), goot- en daklijsten met een "Dorische en Korinthische" uitstraling, geheel in een "zandsteen look", die gebruikelijk is bij de traditionele bouwwijze in zandsteen.

Heesakkers Beton B.V. uit Heeswijk-Dinther is door Bouw- en Aannemingsbedrijf J.C. van Kessel B.V.

benaderd om hiervoor een passend gevelbeeld te ontwikkelen.

Door de imposante kolommen (hoogte ca. 7,10 m) met een bovengelegen driehoekige timpaan ter hoogte van de entree is de kleur zeer bepalend voor de uitstraling van het gebouw. Na veelvuldig overleg met de aannemer is, na diverse bemonsteringen, de juiste kleurstelling tot stand gekomen.

Vanwege het feit dat Heesakkers Beton B.V. in 2004 een bewuste keuze heeft gemaakt voor het tekenprogramma Allplan van Nemetschek Scia, zijn alle vorm- en wapeningstekeningen dan ook met behulp van Allplan Engineering getekend. Door de mogelijkheid om in enkel eenvoudige stappen van 2D naar 3D tekeningen over te stappen, zijn moeilijke constructieve knoop- en



Used software: Allplan Engineering

bevestigingspunten makkelijk controleerbaar. Met zeer veel zorg en tijd heeft Heesakkers Beton B.V. de mallen van de geprofileerde kolommen voorzien van sokkels en kapitelen, timpanen, goot- en daklijsten in eigen beheer vervaardigd.

Na overleg met alle partijen zijn de verschillende elementen verder uitgewerkt in productietechnisch uitvoerbare onderdelen. Hierbij zijn bewuste keuzes gemaakt in het opdelen van de gevel in losse elementen om een kwalitatief hoogwaardig eindproduct te krijgen.

De losse onderdelen zijn in de complete gevel telkens verder uitgewerkt om onderlinge constructieve koppelingen goed te kunnen plaatsen.

Zo zijn de kolommen opgebouwd uit een sokkel, kolom en kapiteel welke onderling aan elkaar gestort zijn d.m.v. gaines en stekken. De instortvoorzieningen

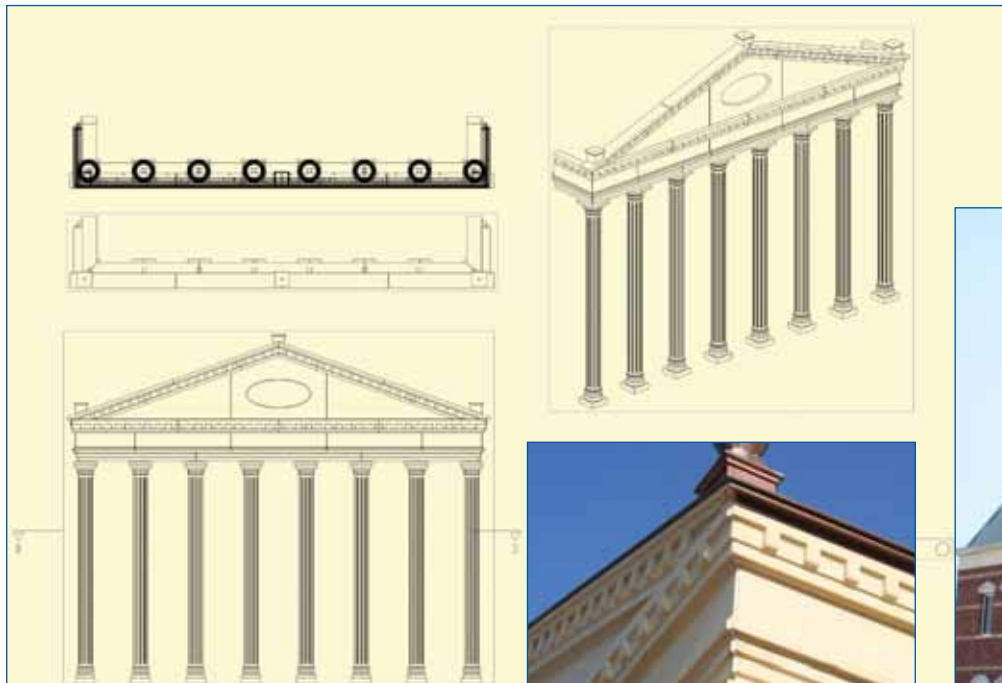
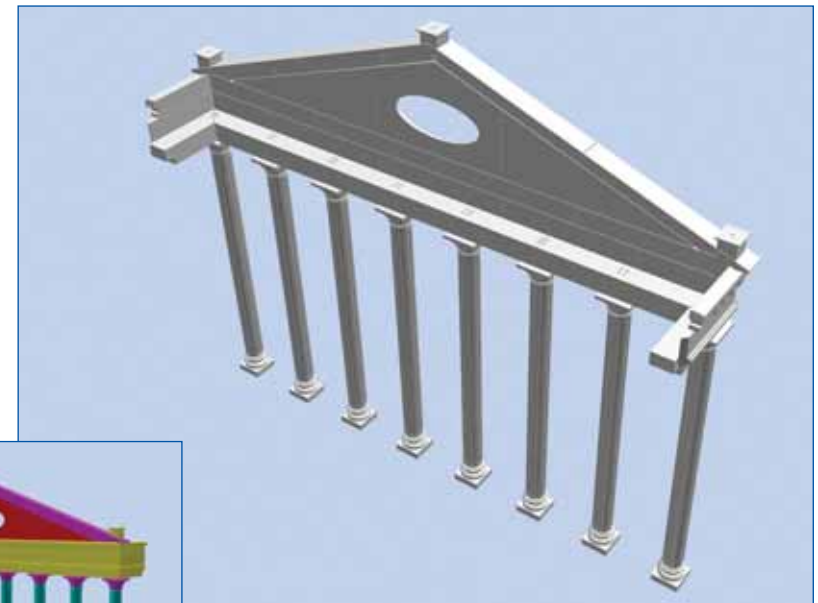
en gaines zijn zo geplaatst dat in de uiteindelijke gebruikssituatie deze niet meer zichtbaar zijn. Dit principe hebben we over de hele gevel door kunnen voeren.

Naast de entreepartij hebben we ook de timpanen en onderdorpels voor alle buitenkozijnen geleverd. De kleur van de onderdorpels zijn op verzoek van de architect aangepast aan de afwijkende kleur van de stenen die in de gevel terugkomen.

De timpanen zijn daarentegen uitgevoerd in onze standaard lichtgrijze beton om deze duidelijker in de gevel naar voor te laten komen.

Heesakkers beton B.V. heeft met deze zandkleurige Dorische en Korinthische look een passende invulling gegeven aan het verwachtingspatroon van de opdrachtgever.

Kantoor en bedrijfsruimte ACSI te Zetten-Andelst



H. Katzenberger

Contact Thomas Forejtek
Address Weinbergstr. 4
2201 Gerasdorf, Austria
Phone +43 676 83595350
Email forejtek@katzenberger.com
Website www.katzenberger.com



KATZENBERGER
Beton- und Fertigteilwerke Ges.m.b.H.
Weinbergstr. 4 • A-2201 GERASDORF bei WIEN

Das Unternehmen

Die H.Katzenberger Beton- und Fertigteilwerke GmbH ist seit über 80 Jahren ein österreichisches Familienunternehmen. Das innovative Unternehmen ist Mitglied der Syspro-Qualitätsgemeinschaft Betonbauteile e.V.

Das definierte Unternehmensziel ist die Fertigstellung von Präzisionsbauteilen aus Beton auf höchstem Niveau zu gewährleisten.

Die Unternehmen der Katzenberger Beton- und Fertigteilwerke GmbH fertigen umweltschonend mit modernster Technologie in automatisierten Anlagen mit fehlerfreier Robotersteuerung und schnellem Produktionsablauf.

Die Fertigung erfolgt sowohl just-in-time als auch auf Kundenwunsch maßgeschneidert.

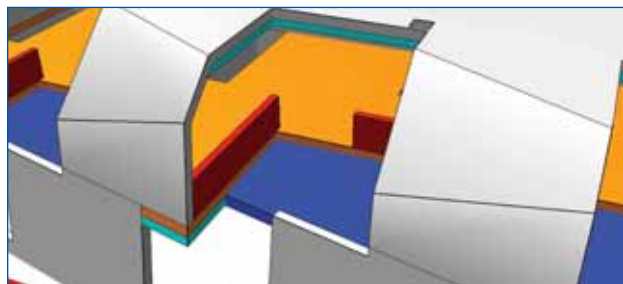
Die gesamte Formensprache zeitgemäßer Architektur nimmt Gestalt an - in kompromissloser Qualität bei kostengünstiger Konstruktion. Jede erdenkliche Geometrie und jedes noch so komplexe High-Tech-Bauteil ist problemlos und in kürzester Zeit und in baustellengerecht zusammengestellten Logistik-Paketen verfügbar.

High-Tech-Planung und Fertigung

Alle Vorgänge eines Auftrages werden durch Computereinsatz unterstützt. Ein Schwerpunkt dabei ist die Planung unserer Fertigteile mit Allplan Precast. An über 20 Arbeitsplätzen planen wir unsere Fertigteile und Halbfertigteile. Die Grundlagen unserer Planung sind Pläne von Architekten oder Ingenieuren, sehr häufig in Entwurfsqualität.

Unser Leitgedanke der Planung heißt den Schwierigkeiten der Ausführung zuvorzukommen. Dies ist umso wichtiger, da wir aus unserer Planung heraus direkt die Daten für die automatisierte Produktion, die Logistik und Abrechnung liefern. So liefern wir mit Allplan Precast Daten für das Werk um automatisiert Schalen, Bewehren und Betonieren zu können.

Mit Schnittstellen von Allplan Precast beliefern wir unser ERP-System mit Daten für die Produktions- und Lieferplanung, Warenwirtschaft, Arbeitsvorbereitung, Expedient und Fakturierung.



Casa Cascada

Short Description

From the architectural plan, to millimetre-precise production and assembly. The formwork and architectural plans were the first challenges. The plans for this geometrically sophisticated top floor were nearly impossible for the builders to realise. It was only the 3D planning, which shed some light and formed the basis for the further planning.

From the model, we developed the illustrations and plans, needed for consulting with structural engineers and building developers. Two main aspects determined the planning of precast parts:

- The engineering design, which was determined by the assembly sequence,
- A comprehensible illustration of the planning.

After this, the formwork and reinforcement plans for production were just a matter of routine.

Project Information

Owner: SEG
Architect: D.I. Albert Wimmer
General Contractor: STRABAG Ag
Engineering Office: Kollitsch+Stanek Ingenieure

Construction Start: 2005
Construction End: 2007
Location: Wien, Austria



Bei dem Wohngebäude Casa Cascada, die Namensgebung kommt von der „Wasserfall Treppe“, wurden über 6000 m² Fertigteile geplant und verbaut. Nach den Doppelwänden und Elementdecken vom KG bis zum 4.OG wartete das Dachgeschoss. Dieses stellte mit seiner außergewöhnlichen Architektur für eine Konstruktion in Doppelwänden (!) eine außergewöhnliche Herausforderung dar. Eine komplexe Geometrie mit schrägstehenden polygonalen Wänden musste millimetergenau aufgearbeitet werden.

Vom Plan zum 3D Modell

Im ersten Schritt habe ich die vorhandenen Pläne in ein brauchbares 3D-Modell überführt. Aus diesem Modell sollten dann alle technischen Detaillösungen abgeleitet werden. Angesichts der komplizierten Geometrie ist man mit einer zweidimensionalen Darstellung weder in der Lage, räumliche Wirkung anschaulich zu vermitteln, noch ist man sicher ob es überhaupt gelingt, die Fertigteile fehlerfrei zu planen.

In diesem Stadium erwies sich unsere 3D - Arbeitsweise mit Allplan Precast als ideal. In kürzester Zeit konnte ich 3D-Bilder vorgelegen, und alle Details des Rohbaus für jeden transparent machen. Das Ziel war hierbei nicht die fotorealistische Darstellung des

Gebäudes sondern die plastische Darstellung der komplizierten Wand - und Deckenkonstruktion. Mit diesen Unterlagen ging ich in Planungsgespräche.

Die technische Infrastruktur beachten

Unumgänglich ist eine interdisziplinäre Zusammenarbeit mit Architektur und Gestaltung, Statik, Haustechnik, Logistik, Montage, und natürlich der Bauleitung. Dies ergibt für Halbfertigteile Anforderungen hinsichtlich genereller Herstellbarkeit, Bewehrungsführung und Betoniermöglichkeiten. Bei der Planung von Fertigteilen sind all diese Parameter (im Voraus!) zu beachten, und mit den Beteiligten abzustimmen. Dies ist eine weitere Herausforderung die neben der reinen Technik verlangt, dass unmissverständlich kommuniziert wird.

Mit meinem Laptop und Allplan Precast wurden vor Ort Baubesprechungen geführt, das Modell, Vorgehensweisen und Details besprochen. Erst dann bin ich in die detaillierte CAD Bearbeitung eingestiegen. Die Komplexität möchte ich an einigen Beispielen darstellen:

Innen- und Außenhaut einer schrägstehenden Wand sind nicht deckungsgleich. Schneiden sich schrägstehende Wände – hier beliebig im Raum, ohne rechte Winkel – so ergeben sich weitere schwierige geometrische Verhältnisse. Ein Fertigteil

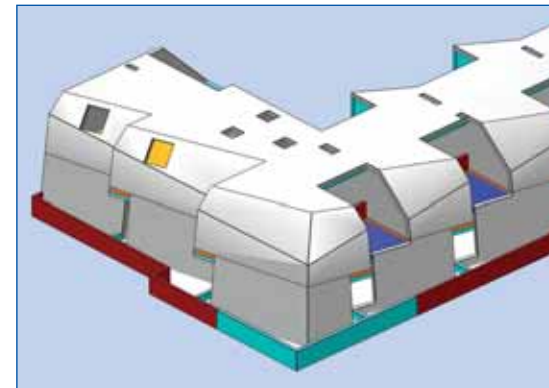
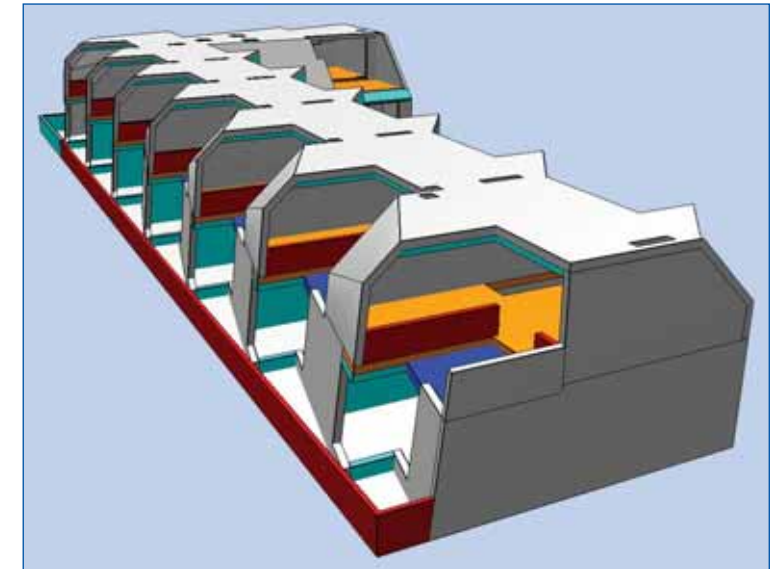
auf dem Schaltisch benötigt allerdings eine exakte Kontur. Sie muss stimmen, denn Anpassungen wie es beim Schalungsbau im Ortbeton üblich ist, sind nicht möglich. Aus dem 3D Modell habe ich mir alle relevanten Kanten unter der Berücksichtigung von Fugen und anderen Randbedingungen in die Konturen für die Fertigteile überführt und damit sichergestellt, dass der Zusammenbau passt.

Selbstverständlich brauchen wir für die Produktion und Montage Pläne. Letztendlich sind dies auch die Dokumente die geprüft und freigegeben werden. Hier hat sich dann gezeigt, dass es unmöglich ist, auf Basis von Plänen sicherzustellen, dass die Passgenauigkeit gewährleistet ist. Man hätte ein Modell bauen müssen. Ein Achsabschnitt der Dachgeschosskonstruktion wurde zum Prototyp erklärt und ohne jede Beanstandung errichtet, danach konnten wir die Fertigung fortsetzen. Das Allplan Modell hat auch auf der Baustelle stark zur Übersichtlichkeit beigetragen. Aber nur zu wissen, wo das Fertigteil steht, ist zu wenig. Selbstverständlich benötigt man die genaue Lage im Grundriss, darüberhinaus Angaben mit Höhenkoten und Winkeln, geeignete Schnitte und Darstellung von Gratverläufen. Diese Informationen kann man wirtschaftlich nur mit einer 3D Planung zusammentragen. Mehrmals wurden Ungenauigkeiten der 2D Konstruktion von anderen Planern aufgedeckt und korrigiert. Unser Erfolg war, dass die Montage reibungslos lief, und der verantwortliche Polier ausschließlich auf unsere Pläne „baute“.

Den Leitgedanken unserer Planung, den Schwierigkeiten der Ausführung zuvorzukommen, konnten wir eindrucksvoll untermauern.



Casa Cascada - Fertigteile im Dachgeschoß



Kirchdorfer Fertigteilholding

Contact Robert Schauer
 Address Industriestrasse 28
 2601 Sollenau, Austria
 Phone +43 664/1253526
 Email robert.schauer@kirchdorfer.eu



MABA
 FERTIGTEILINDUSTRIE

Unternehmensprofil

Die MABA ist die Leading Company innerhalb des Kirchdorfer-Konzerns als, führender Hersteller von hochwertigen Betonfertigteilen. In ihren Kernkompetenzen strebt MABA die Technologie- und Marktführerschaft an.

- Maba Jahresumsatz 2007: 48 Mio. €
- Konsolidierter Jahresumsatz der Mabagruppe 120 Mio €.
- Firmengründung: 1925
- Mitarbeiter: 317

Produkte und Dienstleistungen Betonfertigteile für:

- Hochbau: Keller, Hausrohbau, Treppe, Rotop®-Stützen, Winkelstützmauern
- Verkehrswege/Bahnbau: Delta-Bloc® Betonleitwände, Lärmschutzelemente, Spannbetonschwellen, Fahrleitungsmaste, Bahnsteigkanten, Gleisplatten

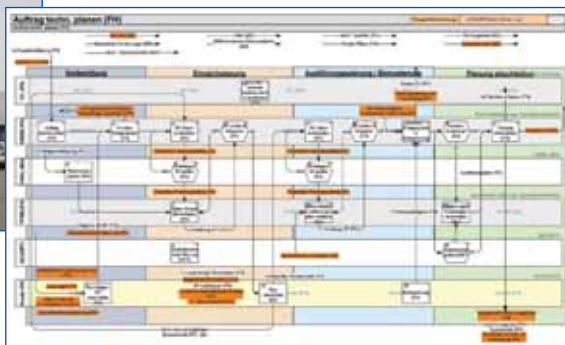
- Tiefbau: Kollektoren, Schlitzrinnen, Rechteckdurchlässe, Tübbinge, Pressrohre, Großserien nach Kundenwunsch
- Elektrobau-Telekommunikation: Hausanschluss- und Zählerböcke, Werbe/Funk/Beleuchtungs-Maste

Beteiligungen

Beteiligungs- und Tochterunternehmen in Österreich, Tschechien, Ungarn, Rumänien, Türkei und Serbien

Geschäftsleitung

DI Dr. Bernhard Rabenreither
 Dir. Mag. Erich Frommwald



Automation project

The project regards a series of 14 semi-detached houses; each house has a usable space of ca. 125 m², a cellar, 3 terraces and a garage with a shed. Our contribution does not relate to an architectural or precast project, but it shows how our company, manufacturer of prefab parts, is able to complete any project by means of an industrialized planning process with a high level of profitability. Our construction process covers everything: from the architectural planning (e.g. plans for the authorities and execution plans) over the prefab planning (such as workshop plans and lists of elements) up to the supply to the robots and the links to the ERP system. Scia software was used to realize this high automation degree which has led to an efficient work process and a "flawless" planning.

Short Description

Project Information

Owner: MABA Fertigteilindustrie
Architect: n/a
General Contractor: n/a
Engineering Office: n/a

Construction Start: 03/2006
Construction End: 10/2006
Location: Austria



Projektbeschreibung

Unser Beitrag bezieht sich nicht auf ein konkretes Architektur- oder Precast Projekt, sondern zeigt, wie man als Fertigteilwerk ein beliebiges Projekt mittels eines industrialisierten Planungsprozesses mit einem hohen Maß an Wirtschaftlichkeit abwickeln kann. Wir haben für unser Unternehmen einen Konstruktionsprozess geschaffen, der ohne Medienbrüche, beginnend bei der Architekturplanung (wie Behörden- und Ausführungspläne) über die Fertigteilplanung (wie Produktionspläne und Stücklisten) bis hin zur Maschinenanspeisung und Anbindung an das ERP-System alles abdeckt. Dieser hoher Automatisierungsgrad erlaubt es bei enormer Effizienz eine „fehlerfreie“ Planung zu realisieren.

Den wirtschaftlichen Nutzen dieses Konzeptes spiegelt der Planungsanteil wieder, der im Hochbau (Architektur- inkl. Fertigteilplanung) unter 2% des Umsatzes liegt.

Dazu bedarf es zweier Grundlagen

Einen detaillierten Planungsprozess

Damit die einzelnen Abläufe effizient und qualitätsgesichert ablaufen, wurden diese in einem QM-Handbuch dargestellt und beschrieben. Dieses regelt die Zusammenarbeit und Abläufe innerhalb der Planungsabteilung und die Schnittstellen zu den angrenzenden Bereichen (Vertrieb, Bestellung,

Produktion) und gibt sehr wohl auch Inhalte und Darstellungen vor. So ist auch sichergestellt, dass der Planungsinput (Auftrags- und Projektbeschreibung) und der Planungoutput (Pläne, Stücklisten, Maschinendaten) immer eine konstante Qualität aufweisen. Dieses Tool verwaltet weiters alle im Prozessablauf benötigten Checklisten, Formblätter und Dokumente und diese stehen natürlich jedem Mitarbeiter an allen Standorten, immer in der aktuellen Version, zur Verfügung. Auch die Qualifikation neuer Mitarbeiter bezüglich des firmenspezifischen Ablaufes ist in relativ kurzer Zeit möglich.

Ein Gebäudemodell (BIM)

Damit alle relevanten Informationen, die wir in weiterer Folge benötigen, digital erfasst werden können, wird ein Gebäudemodell als Abbild des Bauvorhabens erstellt. Der Konstrukteur arbeitet nicht direkt am Plan, sondern bauteilorientiert und die erforderlichen Pläne (Behörden-, Ausführungs- sowie Produktionspläne) sind eine „automatische“ Ableitung des Modells.

In der Architekturplanung wird das virtuelle Modell mit allen seinen geometrischen Ausprägungen (Wand, Decke, Öffnungen, Fenster- und Türmakros...) erstellt.

Auch Einbauteile, wie Elektrodosen, Sanitärmodule, usw. .. werden räumlich im Modell platziert. Diese Einbauteile und weitere Konstruktionsteile sind Bestandteil einer, über 1000 Teile umfassenden

Used software: Allplan Precast

firmenspezifischen Bibliothek, welche je Bestandteil bauteilbezogene Kennungen, wie Artikelnummer, Bestelleinheit, Beschreibungen etc. bis hin zu Produktionsdaten enthält.

Der Architekturplaner legt somit den Grundstein für die Fertigteilplanung und Produktion. Dieses erfordert eine entsprechende Qualifikation der Mitarbeiter in Kombination mit einem sehr gut konfigurierten Bürostandard.

Unser Konzept und somit die Grundlage einer Industrialisierten Planung ist, dass immer an einem gemeinsamen Datenmodell gearbeitet wird, welches bereits in der Architekturplanung erstellt und immer weiter ergänzt wird, bis da hin, dass am selben Gebäudemodell in der Fertigteilplanung elementiert wird. Somit bildet das Datenmodell letztendlich auch die Grundlage für die Arbeitsvorbereitung, die Produktion, die Maschinenanspeisung und das ERP-System.

Die daraus entstandenen Vorteile und Wirtschaftlichkeit liegen auf der Hand:

- Gesamtheitliche Zeitersparnis:
Trotz eines etwas höheren Planungsaufwandes in der Architekturplanung, gibt es eine enorme Einsparung in der Fertigteilplanung, da das Modell mit der Vielzahl seiner Ausprägungen (Fenster, Aussparungen, Elektro, Sanitär...) nicht neu erstellt werden muss, sondern ohne Kontrollen übernommen werden kann.
- „Fehlerfreie“ Planung:
Ein Modell → eine Wahrheit.
In der Architekturplanung lassen sich Konstruktionsfehler frühzeitig erkennen und weiters gibt es durch die ganzheitliche Lösung keine Schnittstellen zwischen Architektur-, Ingenieurbau und Fertigteilplanung, die zu Übertragungsfehlern führen können. Auch bei der Datenübergabe an die Produktion und an das ERP sind Fehler ausgeschlossen.
- Zu jeder Zeit konsistente Informationen:
Jeder abgeleitete Plan, sowie jede Listenauswertung stellt zu jeder Zeit den aktuellen Ist-Stand dar.
- Effizient Ändern:
Da Änderungen immer am Gebäudemodell durchgeführt werden, kann ohne weiteren Aufwand wieder ein Architektur- oder auch ein Elementplan ausgegeben werden.

Fazit

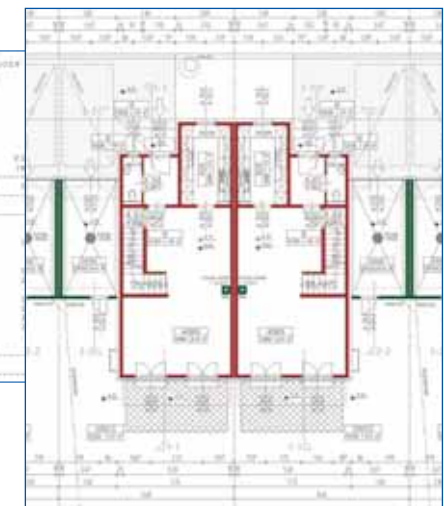
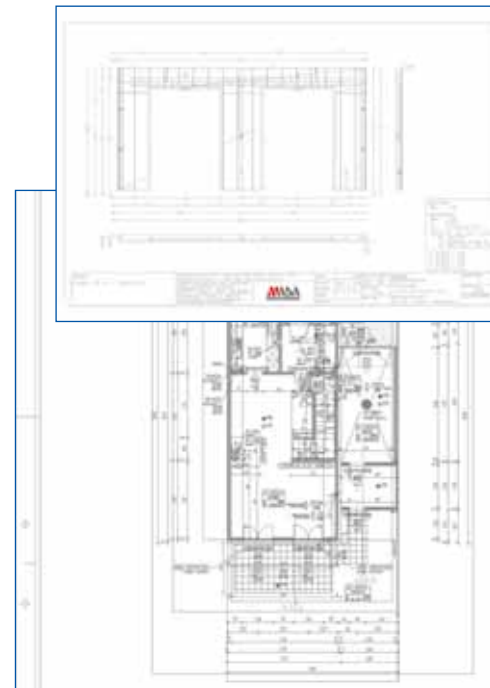
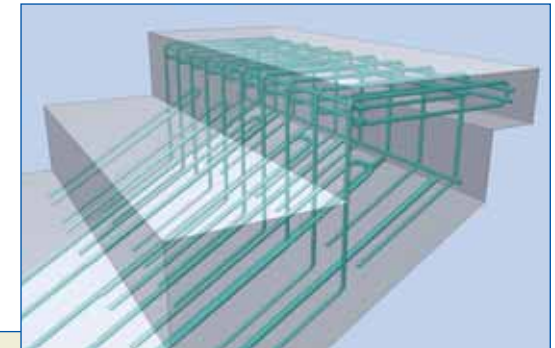
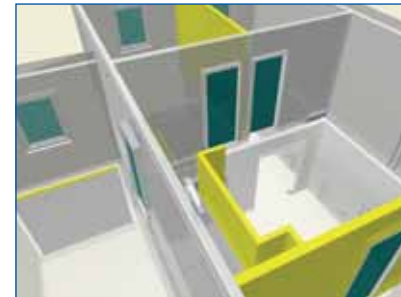
Durch einen sehr gut organisierten Planungsablauf und dem entsprechenden Know-How eines Softwarepartners ist es heute möglich, bereits in der Architekturplanung intelligente Einbauteile, wie z.B. Elektrodosen mit der Sicherheit zu platzieren, dass diese, ohne weitere Bearbeitung, bestellt, lagerichtig im Element eingebaut und richtig abgerechnet werden.

Daten zum Projektbeispiel

Reihenhäuser Tribuswinkel, Leopold Fuhrmann Gasse

- Es handelt sich um 14 Häuser in geschlossener Bauweise.
- Baubeginn war März 2006.
- Baufertigstellung und Übergabe im Oktober 2006.
- Die Reihenhäuser wurden auf Parzellen mit einer Größe von ca. 250 m² bis 300 m² Grundstücksfläche errichtet.
- Jedes Haus verfügt über zwei Geschosse EG und OG mit einer Wohnnutzfläche von ca. 125 m², einem Keller, drei Terrassen und einer angebauten Garage mit Geräteraum.

Industrialisiert Planen



MUCKINGENIEURE

Contact Walter Muck
 Address Maria-Ward-Str. 9
 85051 Ingolstadt, Germany
 Phone +49 841 / 973 59 59
 Email wm@muck-ingenieure.de
 Website www.muck-ingenieure.de



Wir sind ein überregional tätiges, leistungsfähiges Ingenieurbüro für Tragwerksplanung, das ständig nach der Entwicklung und Anwendung neuer innovativer Technologien in der Tragwerksplanung strebt. Dies geschieht mit dem Ziel, in enger Zusammenarbeit mit dem Architekten nach wirtschaftlichen und gestalterisch wertvollen Tragwerkslösungen für den Bauherren zu suchen und diese zu realisieren.

Unsere Lösungsvorschläge:

- Tragwerksanalyse auf neuestem Stand der Technik mit modernsten Berechnungsmethoden-
- Optimierung der Konstruktion durch Vergleichsberechnungen und Suchen von Alternativlösungen- Tragwerkskonstruktion mit modernster CAD-Software und Computertechnik
- Berücksichtigung wärme-, schall- und brandschutztechnischer Belange vom Beginn an
- Anwendung neuer innovativer Technologien in Statik und Konstruktion
- Bauüberwachung und Qualitätskontrolle
- Konstruktionsentwicklung am 3D-Modell
- Farbige Ausführungsunterlagen und präzise Details für einen reibungslosen Bauablauf und Fehlervermeidung

Tragwerksplanung ist:

- Durch frühzeitigen Kontakt mit dem Architekten optimal auf das Projekt abgestimmte Konstruktionen zu ermöglichen
- Kostenbewusstes Denken und Handeln
- Tragwerksanalysen in Hinblick auf Wirtschaftlichkeit, Gestaltung und Ökologie
- Bauphysikalische Überlegungen in das Gesamtkonzept der Konstruktion mit einfließen zu lassen

- Einsatz modernster Computeranlagen und CAD-Software
- Fotorealistische Darstellung der Konstruktion am 3D-Modell

Das Bewehrungssystem BAMTEC® - Kurzinfo

Mit MUCKINGENIEURE, Marktführer in Deutschland in der Anwendung der BAMTEC® -Bewehrungstechnologie, erreichen Sie Betonstahleinsparungen von mehr als 20 % und um bis zu 90 % reduzierte Verlegezeit für Flächenbauteile im Stahlbetonbau.

Organigramm

MUCKINGENIEURE besteht aus dem Inhaber, Herr Dipl.-Ing. (FH) Walter Muck, 5 Ingenieuren, 15 externen Konstrukteuren und 4 internen Konstrukteuren. Im Bereich Verwaltung arbeiten 5 Personen.



Office buildings of Schmidt-Seeger, Beilngries

Short Description

In order to design the entrance hall, which reaches over two stories, without columns, two pre-stressed girders were planned in the ceiling of the upper floor.

The 3D planning enabled us to coordinate the laying of the reinforcement with the pipes of the heating and the ventilation system in an optimal way. It also allowed for an exact construction of the tendons and a collision-free positioning of the corresponding reinforcement.

The 3D planning also supported us in the planning of the hanging prefabricated-cladding panels. Thus a detailed developed view at the vertically inclined joist and horizontally inclined wall could be generated very quickly.

Project Information

Owner: Schmidt-Seeger GmbH
Architect: Boesel Benkert Hohberg Architekten
General Contractor: August Spreng GmbH & Co. KG
Engineering Office: MUCKINGENIEURE

Construction Start: 01/03/2008
Construction End: 2009
Location: Beilngries, Germany



Kerndaten

Bauherr: Schmidt-Seeger GmbH – Maschinentechnik
 Bauort: Beilngries; Landkreis Eichstätt (Oberbayern)
 Baubeginn: März 2008
 Architekt: Boesel, Benkert, Hohberg; München
 BGF: 3070 m²
 BRI: 12400 m³
 Bausumme: ~5 Mio. €

Projektbeschreibung

Bei dem vorliegenden Bauvorhaben handelt es sich um den Neubau eines Verwaltungsgebäudes bestehend aus Erdgeschoss, vier Obergeschossen und einem Dachgeschoss, einer Eingangshalle bestehend aus Erdgeschoss und einem Obergeschoss und einem Übergang zur bestehenden Produktion. Die beiden Gebäude sind im Bereich des Kernes miteinander verbunden. Das Obergeschoss der Eingangshalle erstreckt sich nur über ca. die Hälfte des Gebäudes. Die andere Hälfte der Halle ist zweigeschossig-hoch. Das Dach der Eingangshalle wird im Bereich des Kernes von einem Lichtband durchbrochen. Um die Eingangshalle im Inneren stützenfrei zu bauen, spannt je ein Spannbetonträger am Rand des Lichtbandes über die volle Gebäudelänge. Der Eingangsbereich wird mit vorgehängten Sichtbeton-Fertigteillfassadenplatten verkleidet und mit Halben Fassadenplattenanker

befestigt. Die tragende Konstruktion des Verwaltungsgebäudes besteht aus massiven punktgestützten Deckenplatten, Kernwänden und Stützen aus Beton, ebenso besteht die Eingangshalle aus massiven Deckenplatten, Spannbetonträgern und Wänden aus Beton.

Für eine Fluchtsituation wurde an dem Gebäude ein Stahl-Balkon mit Überdachung vorgesehen, die mit einem speziellen Sonnenschutzsystem ausgerüstet wird. Als System für dieses Vordach werden bewegliche Sonnenschutzlamellen der Fa. Colt Solar verwendet. Der Anschluss des Kragträgers an die Stahlbetondecke wird an einer Stahlplatte mit zwei angeschweißten Bewehrungsstäben und einem einbetonierten Stahlträger HEA100 befestigt. Die Fluchttreppe wird ebenfalls als Stahlkonstruktion ausgeführt.

Durch die Baugrundverhältnisse des Grundstückes (Bodengutachten liegt vor) erfolgt die Gründung des Gebäudes über eine durchgehende Bodenplatte, die auf Pfählen gelagert ist.

Aussteifung

Die Gebäudeaussteifung des Verwaltungsgebäudes findet über den Treppenhaus- und Aufzugskern statt. Die Übertragung der horizontalen Kräfte von den auszusteienden Bauteilen (Stützen) zu den aussteifenden Bauteilen (Wände im Kern) erfolgt über eine 36cm Dicke Stahlbetondecke mit

Bauteilaktivierung. Für die Behaglichkeit im Sommer steht ein spezielles Kühlsystem bereit. Sie erlaubt die Zwischenspeicherung von Nachtkälte in den Geschossen (Bauteilkühlung). Die Be- und Entlüftung der Büroräume erfolgt ebenfalls über speziell in die Massivdecke eingelegte Rohrleitungen.

Die Aussteifung der Eingangshalle wird in 2 Bereiche geteilt:

Im 1. Bereich (nördlich) können die Horizontallasten nur von der Decke über dem Obergeschoss und der Bodenplatte weitergeleitet werden. Zur weiteren Aussteifung werden die Längswände und die schräge Wand im Eingangsbereich herangezogen.

Im 2. Bereich (südlich) dienen die Längswände und die Kernwände zur Aussteifung.

Spannbetonträger

Der Spannbetonträger spannt über 23 m, die mit jeweils am Auflager übereinanderliegende Spann- und Festanker der Firma Suspa vorgespannt werden. Analog des Momentenverlaufes eines Einfeldträgers wurden die Spannglieder in der Ansicht parabelförmig

angeordnet. Wegen der Umlenkkräfte der Spannglieder mussten diese in Feldmitte nebeneinander angeordnet werden, dadurch ergab sich, dass die äußeren Glieder ebenso in der Draufsicht parabelförmig angeordnet werden mussten.

3D-Planung

Die gesamte Schal- und Bewehrungsplanung werden mit Allplan 2008 unter Nutzung von IBD-Ingenieurbau erstellt.

Alle Einbauteile wie Halfenschienen, Dübelleisten oder Bewehrungsanschlüsse sind im 3D-Modell berücksichtigt. Über die Möglichkeiten der Auswahl verschiedener Zeichnungstypen und Plansets konnten wir extrem schnell Schal- bzw. Bewehrungspläne in nahezu fotorealistischer Darstellung einfach aus dem 3D-Modell ableiten.

Büroverwaltungsgebäude Schmidt-Seeger in Beilngries



PKB MERONK sc.

Contact Andrzej Meronk
 Address Al. Grunwaldzka 212, 80-266 Gdańsk, Polen
 80-266 Gdańsk, Poland
 Phone +48 58 768 5000
 Email am@gd.pl
 Website www.meronk.pl / www.isbcad.pl



History of the Company

Our structural engineering consultancy company was established in 1994. We first and foremost design structures in steel, wood and reinforced concrete.

The company has designed many structures for the hotel, housing and commercial industry. We are a well known firm in Poland with a good reputation and have alliances with some big architectural consultancy offices in the country.

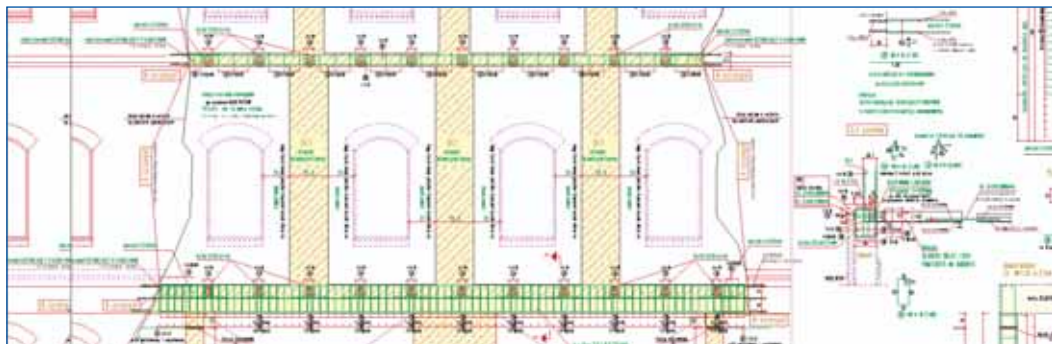
The company is located in the middle of Danzig. We have 15 CAD workstations and implement modern design software. Our offices are also equipped with modern printing facilities. All our projects have been designed and detailed with the software of GLASER -isb cad-, AIA, Allplan, AutoCAD, RoboBat and ABC.

The owner of the company has 23 years of experience in structural design, six of them gathered in Germany. He has worked in a concrete precast firm, on some construction projects and for years in structural design consultancy firms in the past. He has been involved in the design and detailing of

about 400 building structures, design and detailing of 3.500.000 m² of semi-precast lattice girder (filigran) slabs for over 4.000 projects.

The design of the semi-precast lattice girder slabs in filigran method is in conformity with the quality assurance systems documented in ISO 9002.

In the design and detailing of semi-precast lattice girder slabs, we have cooperated with many production facilities in the northern region of Poland. At the moment we design about 60.000 m² of lattice girders every month for about 50 to 60 projects.



ALFA Shopping Centre, Bialystok, Poland

Short Description

The project regards a shopping centre in Bialystok that has been built on an underground garage with about 600 parking spaces. The total surface area of the development is about 80.000 m². The design consists of a plate and column system, based on monolithic and brick walls with steel prefabricated construction fragments. All slabs are made of semi-precast lattice girders. The total area of semi-precast slabs is about 60.000 m²; about 7.000 of them are irregular. It took about 12 months to produce these slabs. Adapting this new complex to existing structures is unique in Poland. Normally older buildings are demolished but nowadays they are placed under the protection of the historic buildings council. The town of Bialystok and the designers involved have respectfully implemented a historic building and a new commercial space.

Project Information

Owner: Andrzej Meronk
Architect: Maciej Kuryłowicz - APA - Warsaw - Poland
General Contractor: JWK - Gdańsk - Poland
Engineering Office: PKB MERONK sc.

Construction Start: 10/12/2006
Construction End: 10/06/2008
Location: Białystok, Poland



The building has an underground garage with about 600 parking spaces. The total surface area of the development was about 80.000 m². The design consists of a plate and column system, based on monolithic and brick walls, with steel prefabricated construction fragments. All slabs were made of semi-precast lattice girders. The total area of semi-precast slabs developed was about 60.000 m² about 7.000 of them being irregular. It took about 12 months to produce the lattice girder slabs.

The major challenge posed by this project was adapting the newly designed structure to the facade of an existing prehistoric building (ca. 1.900). In order

to protect the stability of the existing structure and as a basis for the basement of the new building a pile wall of about 6 m high and 5 m away from the existing structure was erected. After finishing the basement and upper floors the roofing was designed in steel and glass.

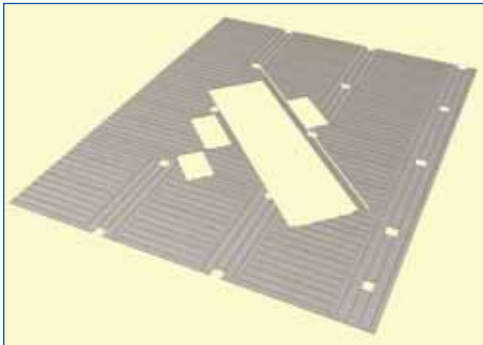
The facade of the existing structure e.g. adjoining walls, roofing etc. was also reinforced to grant stability. After stabilising the facade it was restored, staircases were added and lifts were implemented. The building of the new ALFA complex to adapt to existing structures is unique in Poland. Normally such old building are demolished. Such old



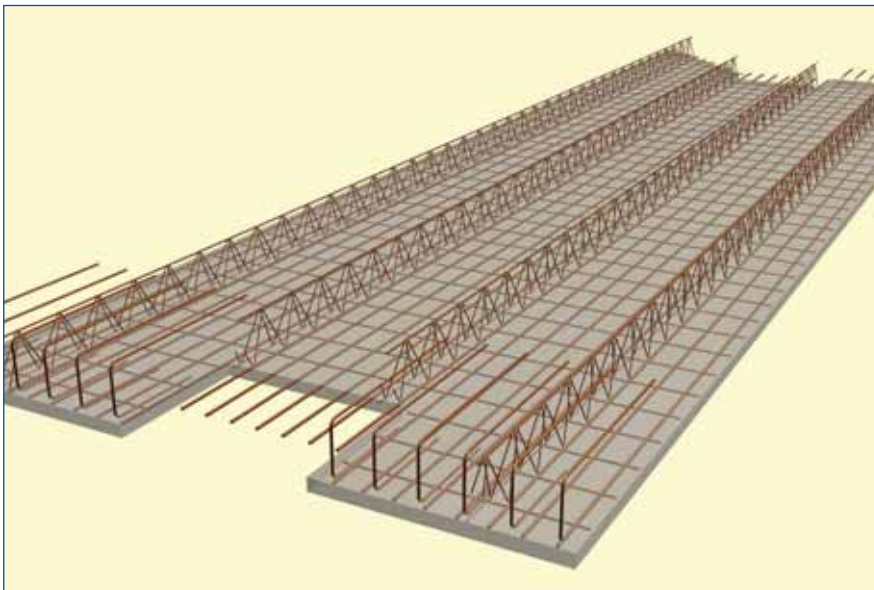
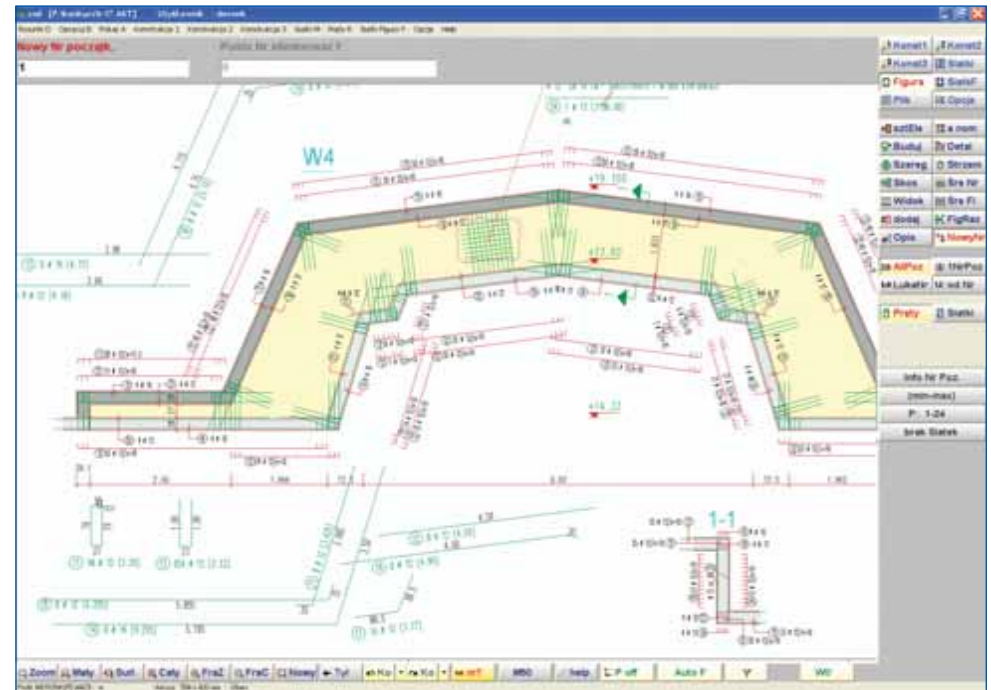
Used software: GLASER -isb cad-, Allplan Engineering

existing structures have now been placed under the protection of the warden of monuments. The town of Bialystok and the designers involved have gained respect for implementing the use of a historic building thus making this project exemplary of how existing prehistoric buildings can be utilized for contemporary or commercial functions.

The facade of the ALFA Center was also designed to reflect that of the existing building using modern technology. About 150 individual pieces of the facade were prefabricated. This made it possible to preserve the monumental character of the facade.



ALFA Shopping Centre, Bialystok, Poland



Prefaco n.v.

Contact Dirk Smeyers
 Address Hoeksken 5A
 9280 Wieze, Belgium
 Phone +32 53 76.73.73
 Email d.smeyers@prefaco.be
 Website www.prefaco.be



Drie solide ondernemingen uit de bouwwereld bundelen hun krachten tot een succescombinatie met onbeperkte mogelijkheden. Maessen, Marmorith en Omnidal, drie spelers die elk reeds jaren hun sporen verdienen op de markt van prefab beton, hebben hun krachten gebundeld.

Als fabrikant willen wij klaarstaan om u de beste producten en diensten aan te leveren in een optimale prijs-kwaliteitverhouding, om steeds technologisch het beste antwoord te geven op de vragen van onze klanten. Kwalitatief hoogstaande prefab betonproducten en bouwinnovatieve oplossingen aanreiken, daar gaan we voor.

Als aparte ondernemingen vervulden we deze opdracht al jaren met verve. Deel uitmakend van dezelfde groep, de Ierse CRH holding, hebben we elkaar leren kennen en van elkaars sterke punten geleerd. Die synergie heeft geleid tot een intensieve samenwerking. En dat concretiseert zich vandaag in één uithangbord: Prefaco.

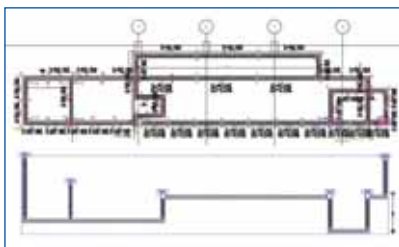
Eén aanspreekpunt voor al uw prefab producten. De kracht van onze groep manifesteert zich op meerdere vlakken. Zo werd het pallet van de producten die wij u kunnen aanbieden heel wat breder. Als enige speler in België zijn we in staat een

totaalpakket in producten en structuren voor elke ruwbouw aan te bieden:

- Vloeren, breedplaten, AirDeck en voorgespannen welfsels
- Wanden, holle en volle wanden en Evergreen
- Betonelementen, kolommen, balken en trappen
- Kalkzandsteen

One stop shopping! Eén enkel aanspreekpunt doorheen het hele ruwbouwtraject. Prefaco maakt het u een stuk eenvoudiger. Hoe minder partijen, hoe beter de afstemming van de opeenvolgende bouwfasen. De samenwerking leidt er ook toe dat we specialisten zijn in elk van de verschillende productdomeinen. Onze knowhow maakt ons tot uw beste partnerkeuze, ook wanneer u opteert om met ons samen te werken voor een welbepaald product. Overal in het land snelle levering gegarandeerd. Vier vestigingen, geografisch verspreid over het land. Vier keer meer kans om specifieke productie-eisen op te vangen, vier keer meer kans om sneller op uw vragen in te spelen. Die flexibiliteit maakt Prefaco zo bijzonder.

Die geografische situatie laat ons toe om u te beleveren vanuit de fabriek die daartoe het meest geschikt is en u bijgevolg de snelste en meest gunstige leveringsvoorwaarden aan te bieden.



Short Description

Precast production unit, Tournai (BE)

Our sister company Schelfhout n.v. enlarged its production capacity of silix panels by building a new plant in Tournai near the existing plant of Prefaco.

The whole structure is built with precast elements from companies of the Crh-holding: Prefaco, Ergon and Schelfhout n.v.

Prefaco was responsible for the design and the production of the hollow walls, slabs, beams and columns of the several cisterns of the production plant.

Allplan Precast was used intensively for the design and the production of the hollow walls in connection with Allplan Engineering to fit all the precast elements in 1 structure.

Project Information

Owner: Schelfhout n.v. (Crh)
Architect: Crh
General Contractor: Jean-Pierre Van Renterghem (Crh)
Engineering Office: Prefaco n.v. - Wieze

Construction Start: 01/02/2007
Construction End: 01/08/2007
Location: Tournai, Belgium



Ons zusterbedrijf Schelfhout n.v. heeft haar capaciteit van silixpanelen vergroot door een productie-eenheid in Doornik (Tournai), naast de productiehal van Prefaco, op te richten. Verschillende bedrijven van de Crh-holding Prefaco (Houthalen-Wieze), Ergon (Lier), Schelfhout (Kinrooi) hebben de koppen bij elkaar gestoken om de volledige ruwbouw met uitsluitend prefab elementen in een recordtijd op te trekken.

Prefaco heeft hierbij de taak op zich genomen om de diverse putten en citernes in prefab te ontwerpen met behulp van holle wanden - hetgeen een snelle en waterdichte oplossing biedt – gecombineerd met predallen, balken, kolommen, ... om 1 structuur te bekomen. De productie-eenheid van holle wanden en predallen bevindt zich reeds in Doornik, waardoor de aanvoer haast ogenblikkelijk was.

Drie grote eenheden moesten ontworpen worden: het waterreservoir, put A-B en put C. Ieder had zijn eigen specifieke kenmerken om een volledige structuur in prefab te bekomen.

Het waterreservoir, bevat meer dan 450.000 liter water dat gebruikt wordt voor de productie van de silixpanelen. De wanden werden ontworpen in Holle Wanden, vermits deze ook de eigenschap bezitten van waterdicht te zijn. Tevens bevatten deze wanden de nodige wapening om de grond- en waterdruk op te vangen. Met Allplan Precast was de klus heel vlug geklaard, gezien de eenvoud van deze structuur.

Aangezien Prefaco ook moest instaan voor de predallen, balken en kolommen van dit bassin, werd ook Allplan Engineering aangewend. Zo werden alle balken en kolommen met de nodige wapeningsstaven voorzien en werden de aansluitingen nauwlettend in 3D gevisualiseerd en aangepast. Op deze manier konden alle aansluitingen, zowel van de holle wanden als van de andere te fabriceren prefab elementen, aangepast worden voor een vlotte productie, aanvoer en montage.

Daarnaast werd Allplan eveneens aangewend om alle wapeningsnetten en -korven uit te tekenen, op te meten en in productie door te geven.

Tenslotte werden ook de predallen met Allplan in kaart gebracht, zodat de volledige prefab structuur als 1 geheel kon bestudeerd worden. Alle buizen voor elektrische en waterleidingen werden op voorhand voorzien en vervolgens tijdens de productie ingebouwd.

Dankzij deze methode, werden de monteurs van alle onaangename verrassingen gespaard en verliep de montage vlot en efficiënt.

Put A-B is een collector van zand en grind dat door vrachtwagens aangevoerd wordt om vervolgens via een transportband de betoncentrale te bevoorraden.

Ter hoogte van de losplaats van de vrachtwagen, werd de put in drie fasen opgebouwd. Eerst werden

de hoge wanden (diepste gedeelte) geplaatst. Vervolgens werden 2 balken getekend en ontworpen om steun te bieden aan de opstanden die op deze balken rustten. De balk aan de linkerkant verdient een speciale vermelding. Deze moest namelijk aangesloten worden met de holle wand waardoor het een moeilijke opgave was om deze in prefab te realiseren. Dankzij de ruime ervaring van onze projectleider werd op basis van de tekeningen uit Allplan de balk geprefabriceerd en vervolgens 90° op de werf gekanteld zodat er alsnog een perfecte aansluiting ontstond tussen wand en balk aan de hand van uitsluitend prefab elementen!

In laatste instantie werden de lage opstanden in holle wanden geprefabriceerd, gemonteerd en tenslotte opgestort om een volledige structurele eenheid te bekomen.

Put C was een totaal andere uitdaging. Deze doet dienst als collector van silex die vervolgens via een transportband naar de ophaalbak van de betonmenger getransporteerd wordt.

Gebonden aan specifieke eisen nam deze put grillige vormen aan omwille van de aaneenschakeling van verschillende kamers en niveaus. Het was voor het studiebureau van Prefaco dus een hele uitdaging om alle wanden in holle wanden te ontwerpen en uit te voeren.

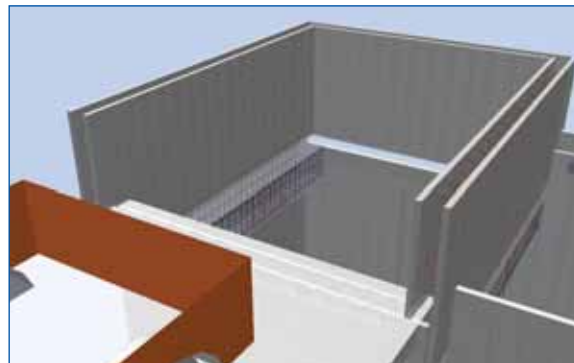
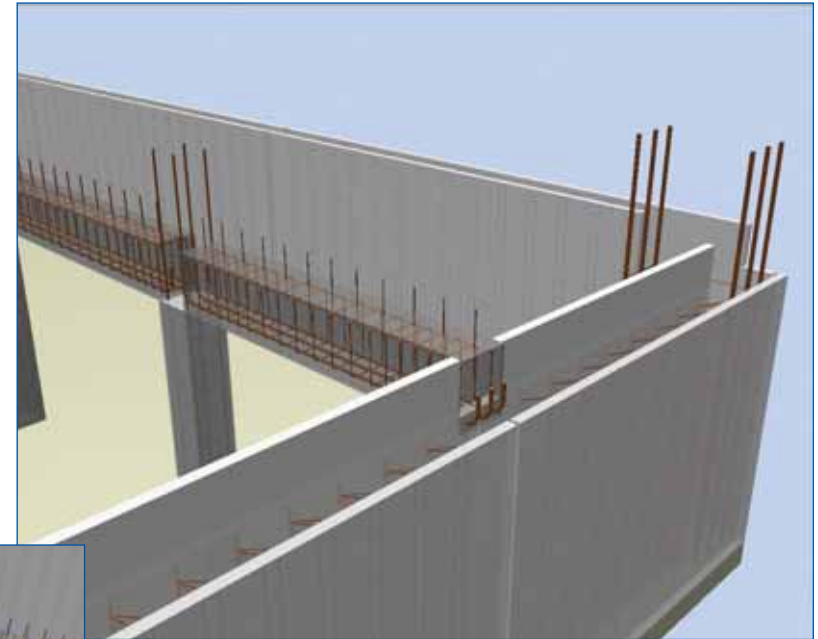
Met behulp van Allplan konden echter verschillende snedes en 3D-aanzichten aangemaakt worden om de juistheid van de structuur te achterhalen.

Dankzij de eigenschap van de holle wand, waarbij iedere schil haast onafhankelijk van de andere zijn

eigen vorm kan aannemen, werden ze aan de hand van Allplan Precast nauwkeurig in vorm gebracht en vervolgens bewapend volgens de richtlijnen van de stabiliteitsingenieur.

Niet alleen de productie, maar vooral de montage werd in een recordtempo uitgevoerd zonder enig probleem bij de aansluitingen.

Voor een prefab holding zoals Crh is er niets zo boeiend als een nieuw prefab fabriek te mogen oprichten met eigen ontworpen en geprefabriceerde stukken. Prefaco heeft een grote bijdrage kunnen leveren dankzij het multidisciplinaire softwarepakket Allplan. Zo heeft Prefaco in een mum van tijd het totaal concept van holle wanden, kolommen, balken, predallen, met de daarbij behorende wapeningsnetten en -korven, kunnen uittekenen en in productie gegeven. Dankzij deze boeiende ervaring die we opgedaan hebben, is Allplan nu een betrouwbare 'partner' geworden om ook de projecten van onze klanten mee uit te werken en te prefabriceren.



Van Den Berg Beton BV

Contact Benny Littelink
 Address Postbus 81
 8100 AB Raalte, Netherlands
 Phone +31 572 346777
 Email ben.littelink@vandenbergbeton.nl
 Website www.vandenbergbeton.nl



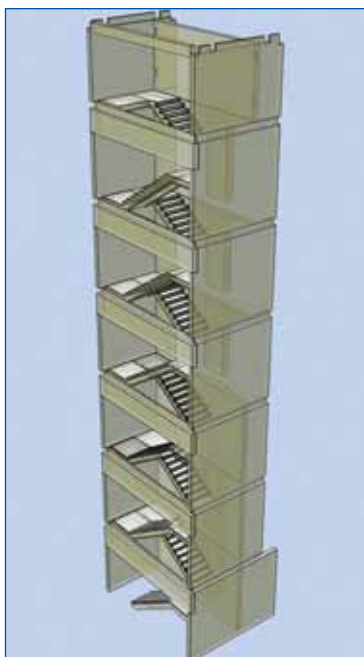
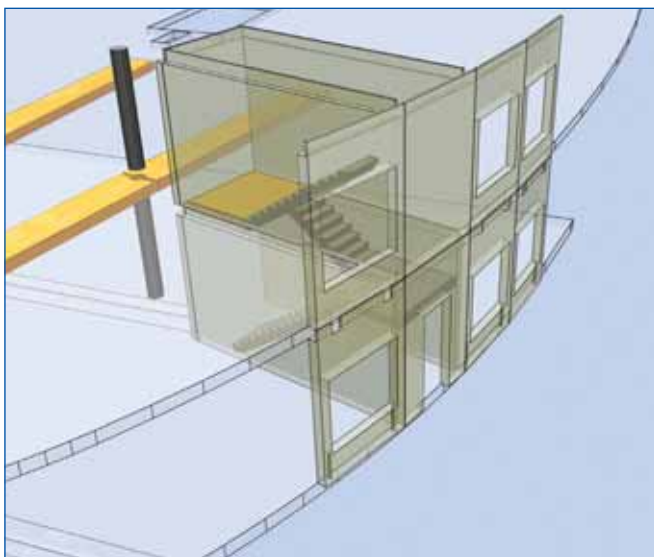
vandenBergBetonElementen bv

Van den Berg Beton b.v. bestaat sinds 1933. In de loop der jaren is de productie doorontwikkeld en al weer vele tientallen jaren is van den berg beton een volwaardige fabrikant van constructieve prefab betonelementen (kelders en bouwelementen). Met 60 medewerkers, een eigen modelmakerij hout en staal, eigen wapeningscentrale en eigen betonmortelproductie (geheel ZelfVerdichtendBeton) zijn we een serieuze partij!

Alle producten worden onder KOMO/KIWA certificaat vervaardigd en geleverd. Omdat we alle kennis en kunde in huis hebben kennen we korte

lijnen, snelle afstemming en zekere kwaliteit. De projecten waarop van den berg beton levert variëren van nieuwbouw van een woning (kelder) tot de complete constructie van scholen, ziekenhuizen en appartementengebouwen (wanden, kolommen, balken, trappen, balkons galerijen).

Op het gebied van kelders is inmiddels een assortiment van ruim 100 standaardmaten (met standaardmallen) opgebouwd. Daarbuiten kan elke gewenste andere maat gemaakt worden. Op het gebied van projectmatige elementen is het aantal variaties eindeloos.



Short Description

Oval building 'Woman Child Centre'

As soon as Contractor van Wijnen Eibergen had been chosen to build the new part of the hospital, 'vandenBergBetonElementen bv' was contacted to produce all the prefabricated concrete elements. It took 3 months to design and engineer all the specific elements: floors, walls, stairs. Within this process the qualities of Allplan were used to their full extent, specifically to create 3D overall drawings of the whole building to check all the separate elements. The production started in January 2008 and by the end of June all elements were produced and transported to the site.

Project Information

Owner: Medisch Spectrum Twente
Architect: I.A.A. Architecten Enschede
General Contractor: Van Wijnen Eibergen BV
Engineering Office: Stael Partners Twente

Construction Start: 01/07/2007
Construction End: 01/03/2009
Location: Enschede, Netherlands



In opdracht van de Raad van bestuur van het MST (Medisch Spectrum Twente) is een structuurplan ontworpen voor de nieuwbouw en uitbreiding van het ziekenhuiscomplex, waarbij tegelijkertijd het parkeerprobleem moet worden opgelost. Tevens is ook de opdracht gegeven voor een nieuw te ontwikkelen hartkliniek.

Het huidige ziekenhuis heeft twee vestigingen in Enschede die met elkaar verbonden zijn door middel van een loopbrug. Het uitgangspunt van het plan is een topziekenhuis te ontwerpen dat is uitgerust met de modernste technieken.

Het 'Vrouw Kind Centrum' wordt een ovaalvormig gebouw bij het ziekenhuis aan de Haaksbergerstraat. In dit bijzondere centrum is alle medische zorg voor vrouw en kind samengebracht. De kinderartsen en gynaecologen houden er hun spreekuren. Er komen verloskamers waar zwangere vrouwen kunnen bevallen. Er worden kraamsuities gebouwd, waar vrouwen die net een baby hebben gekregen samen met hun partner en hun kindje kunnen verblijven. Er zijn afdelingen waar zieke kinderen en te vroeg geboren en zieke zuigelingen worden verpleegd. Met alles is rekening gehouden, zodat de zorg voor vrouw en kind optimaal is.

Bij de bouw van het 'Vrouw Kind Centrum' zijn veel partijen betrokken. Een aantal jaren geleden zijn de eerste plannen ontstaan op initiatief van een aantal artsen en afdelingshoofden van de huidige afdelingen

gynaecologie en kindergeneeskunde. Nadat er toestemming is gegeven om dit centrum op de locatie Haaksbergerstraat te bouwen is er een ontwerpfase gestart waarbij uiteindelijk voor het ontwerp van IAA-architecten is gekozen. Hierna werd een aanbestedingstraject gestart waarbij bouwbedrijven gevraagd werden offertes uit te brengen. Zo heeft ons ziekenhuis uiteindelijk besloten de opdracht te geven aan bouwbedrijf Van Wijnen.

Het adviesbureau R.T.B. Van Heugten zorgt voor het programma van eisen op het gebied van elektra, water en technische installaties. Ook schakelt de aannemer andere bedrijven in die gespecialiseerd zijn in het afbouwwerk, schilderwerk en het plaatsen van de vaste inrichting zoals bijvoorbeeld keukens, wc's en badkamers.

Deze werkzaamheden worden allemaal zorgvuldig in een uitgebreide planning vastgelegd zodat elk bedrijf weet wanneer er werkzaamheden moeten worden uitgevoerd. Zo kan bijvoorbeeld het schilderbedrijf pas aan de slag nadat de binnenwanden zijn geplaatst en het bedrijf dat wachtkamermeubilair levert kan pas komen nadat de vloerbedekking is gelegd.

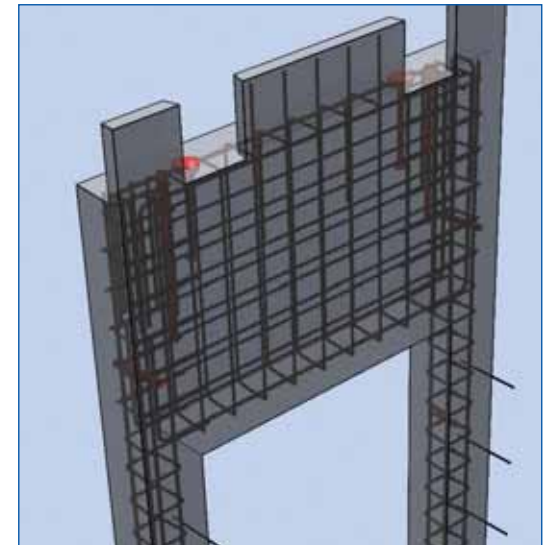
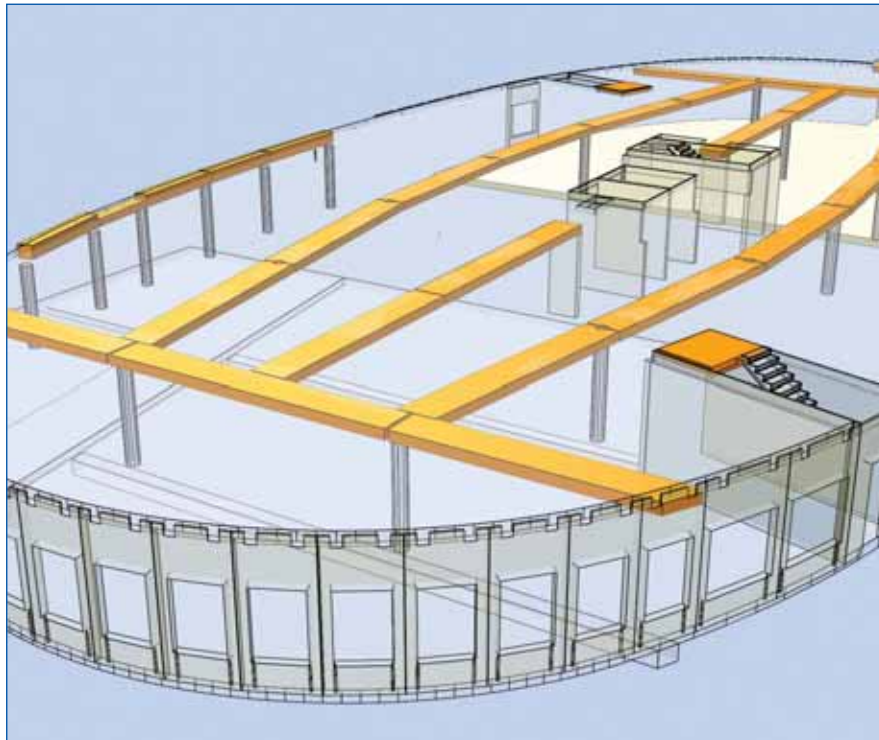
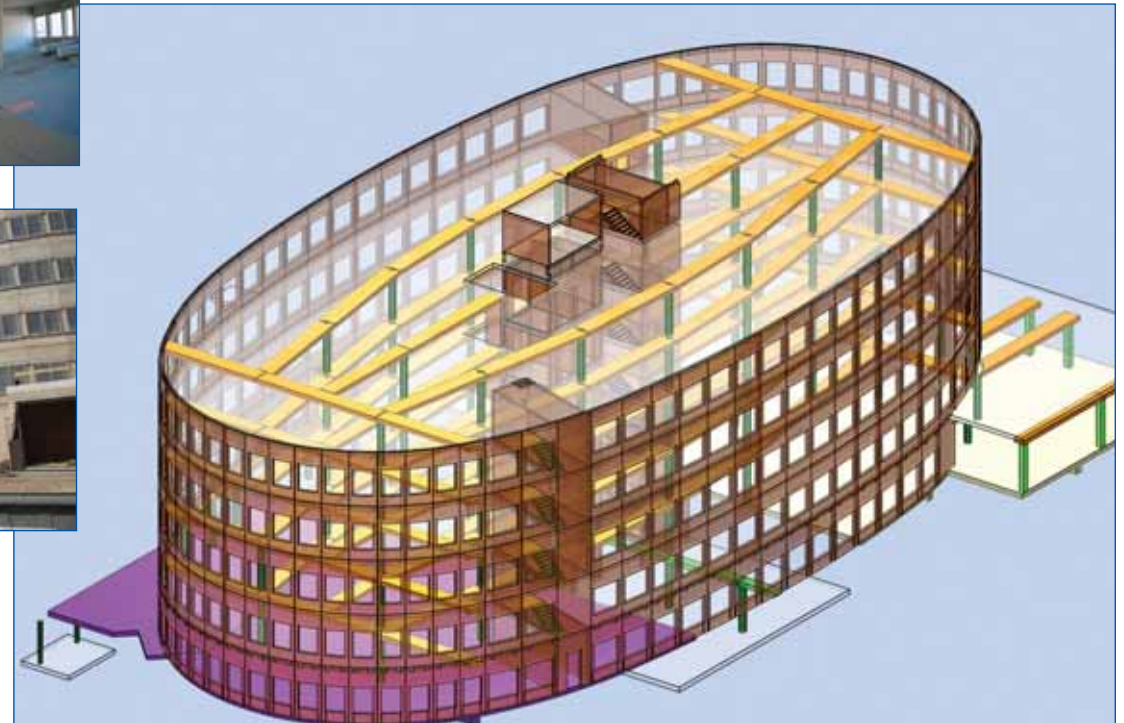
De constructie van dit 'Vrouw Kind Centrum' wordt hoofdzakelijk uitgevoerd met prefabricated betonelementen en deze worden geproduceerd en geleverd door 'vandenBergBetonElementen BV' te Raalte. Het ontwikkelen en tekenen van deze prefabricated

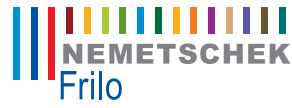
betonelementen gebeurt met Nemetschek Allplan Engineering.

In dit tekenpakket is het mogelijk alles in 3D te ontwikkelen. Ook het tekenen van wapening is volledig in Nemetschek Allplan Engineering geïntegreerd. Hierdoor is het mogelijk dat alle problemen die zich bij constructies en wapening voor kunnen doen, onmiddellijk zichtbaar worden en direct kunnen worden opgelost.

Enkele cijfers

- In totaal zijn er 750 prefab betonelementen verwerkt met een totaal van 1360 m³
- In deze prefab is 185.000 kg wapeningsstaal verwerkt
- In de prefab buitengevelelementen zijn ruim 300 houten stelkozijnen in de betonfabriek aangebracht
- Alle prefab is door ongeveer 170 vrachtwagens naar de bouwplaats getransporteerd.





Structural analysis. System. Service.

We have been developing software for you for more than 30 years. Intuitive navigation, quick results and the latest design codes contribute decisively to your success. That is what we offer. Systematically. With service. www.frilo.de

Gatehouse 5, Container Terminal 4 in Bremerhaven, Fritz-Dieter Tollé Architekt BDB



CAD für den konstruktiven Ingenieurbau

CAD for civil engineering



... www.isbcad.de

GLASER -isb cad- Programmsysteme GmbH
Am Waldwinkel 21 · D-30974 Wennigsen
Tel. +49 5105 58920 · Fax +49 5105 82943
info@isbcad.de · www.isbcad.de

Category 7: CAD Engineering, Engineering work and special structures

Engineering work and special structures such as bridges, tunnels, dams, tanks, silos, towers etc. made of concrete (cast-in-place or precast), steel, compound or mixed materials. Of particular interest are projects that distinguish themselves through an innovative design process (e.g. building information modelling) and that emphasize on efficient manufacturing and erection. Assessment criteria: innovative design process, level of difficulty, size of project, design originality, fitness for manufacturing and erection.



Tauw

Contact Ivo Oomen
Address Australielaan 5
Postbus 3015
3502 GA Utrecht, Netherlands
Phone +31 302 82 48 13
Email ivo.oomen@tauw.nl
Website www.tauw.com

WINNER



Creating sustainable solutions for a better environment

Tauw is an independent European company in the field of environmental consultancy, spatial development, civil engineering and the monitoring of environmental quality. We want to contribute to sustainable solutions for a better environment.

We advise, design and measure in order to develop, improve and maintain the physical environment, natural environment and the infrastructure.

Tauw has offices in the Netherlands, Belgium, France, Germany, Spain and Italy. Through our participation in the CAT Alliance Tauw can be deployed worldwide. In multidisciplinary teams we are working on projects for a broad range of clients: public authorities, private companies and non-governmental organisations.

Dedicated consultants

Tauw is a firm of dedicated consulting engineers who are independent, open and innovative. We attach great importance to working on projects for government and industry for a more attractive, cleaner and sustainable environment. We are committed to solutions that contribute to this end.

In addition to technical solutions we reflect on and test our clients' assignments in a social context. We advise our clients with regard to their own clients.

Our professionals deliver top quality and have the experience, skills and craftsmanship to successfully complete projects and manage processes. Tauw has created a business environment that enables our staff to develop on a personal and professional level.

Tauw's vision is that the best solutions come from passionate cooperation at an early stage of the planning process. That is why we work from regional offices across Europe, close to our clients, using our knowledge of the local context.

Our services

To meet the needs of our clients we have a comprehensive range of services, products and expertise:

- Contaminated land management, including soil remediation
- Water management and engineering, including rural development
- Environmental management and engineering, including waste management
- Civil engineering and infrastructure
- Spatial planning and site development, including brownfield regeneration
- Strategic consultancy and studies, including process and project management



Extension and renovation 'Katwijk pumping station'

Short Description

In order to provide enough capacity for the pumping station, a fourth pump will be built next to the present pumping station. In this way the design and the superstructure of the storage pumping station, dating from 1954, will be preserved. In addition, the existing diesel engines will be replaced by electro-motors and several renovation activities will take place. When the operations are finished, there will be four, electromotor-driven, hydraulically identical, pump units.

Project Information

Owner: Hoogheemraadschap van Rijnland
Architect: Aletta van Aalst & partners BV
General Contractor: GMB
Engineering Office: Tauw BV

Construction Start: 01/04/2008
Construction End: 01/01/2011
Location: Katwijk, Netherlands



Quote of the Jury

"This project distinguishes itself by the complex geometry and the large scale of the structure. The software has been used in an ideal manner for the complete design process: from the initial 3d model to the fully detailed reinforcement drawings. The benefits of BIM are also strongly manifested in the project."

'Olim hic ostium Rheni' ('Here was once the mouth of the river Rhine')

The Katwijk pumping station plays a crucial role in the water management of the Rijnland Water Board. Therefore the Water Board has decided that this pumping station will be the first of their four main pumping stations to be adjusted to present-day requirements and equipped with modern techniques. Tauw will sign for the design and project management. Since Tauw is in charge of both the design and the project management, unforeseen circumstances during implementation can be responded to optimally.

In 2011 the Katwijk pumping station must have the capacity to discharge 75 m³/s into the sea in periods of large-scale excess water at high sea water levels. Now this is only 54 m³/s. Under normal circumstances the pumping station should be able to discharge 94 m³/s to sea. In this respect Rijnland also expects to be able to store water in the near future at the water storage locations in the Haarlemmermeerpolder and the Nieuwe Driemanspolder near the city of Zoetermeer during severe precipitation.

The measures to be taken are necessary in order to cope with the climate changes. More precipitation, urbanization with increased paved surfaces and sea-

level rise as well require actions.

In order to provide enough capacity for the pumping station, a fourth pump unit will be built next to the existing pumping station. The substructure and the superstructure of this storage pumping station, dating from 1954, will be preserved and reused. In addition, the existing pump drives (two diesel engines and one electric motor) will be replaced by new electro-motors and several renovation activities will take place. When the operations are finished, there will be four, electromotor-driven, hydraulically identical pump units.

Fish migration

For the upstream fish migration facilities are made both at the pumping station and at the outer discharge sluice. The downstream migration will take place via the pumps. Because of the large impeller passage and low impeller speed fish injury hardly can take place.

Allplan application

3D-Model

In view of the complexity of the design geometry it was decided to create the drawings in 3D. During the earlier design phases of the pumping station all drawings had been rendered in Autocad. During these phases it

soon became obvious that in the implementation phase drawing had to be done in 3D. 3D-Modelling has several advantages:

- A more insightful design is rendered, since the designer can clearly visualize what the design will look like "in reality". Consequently, bottlenecks within the design can be traced and solved much earlier.
- Sections and views can be generated quickly and accurately at random places.
- Since an indirect interface continues to exist between the created views / sections and the 3D-model, changes can quite easily be carried out correctly anywhere.
- By reinforcing in 3D the risk of errors can be reduced here as well. From the 3D-reinforcement model reinforcement drawings can be generated easily and quickly, if required including reinforcing bar bending schedules.

The plan drawings were imported to model of the pumping station. In this way the drawings could be used to create the 3D volumes. In this project we mainly worked with '3D-Modelling', because it consists of complex concrete forms. Since we were working in the detail engineering phase, the number of modifications were limited to applying and/or adjusting recesses, and further working details.

Building components

First of all a 3D-overview was made of the entire design. The entire design was subdivided into building components, and each building component was given a name. In the 3D-overview it can easily be seen where each component is located in the overall picture. Each building component is rendered by means of an isometric view. During implementation this has frequently turned out to be very illustrating.

As soon as the model was finished, the (concrete) quantities could be presented by means of the 'List Generator'. Each building component is automatically listed with the correct name, isometric reproduction and concrete quantity.

Shell

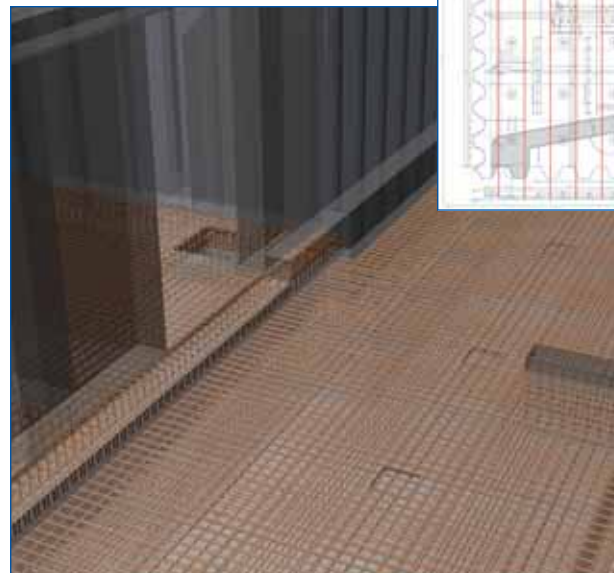
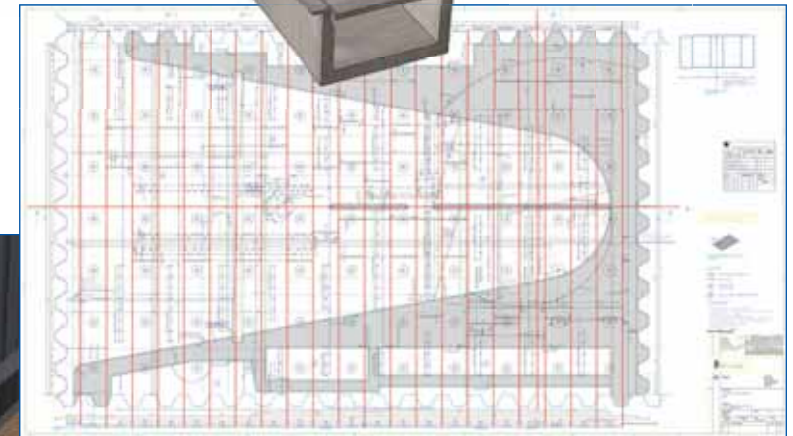
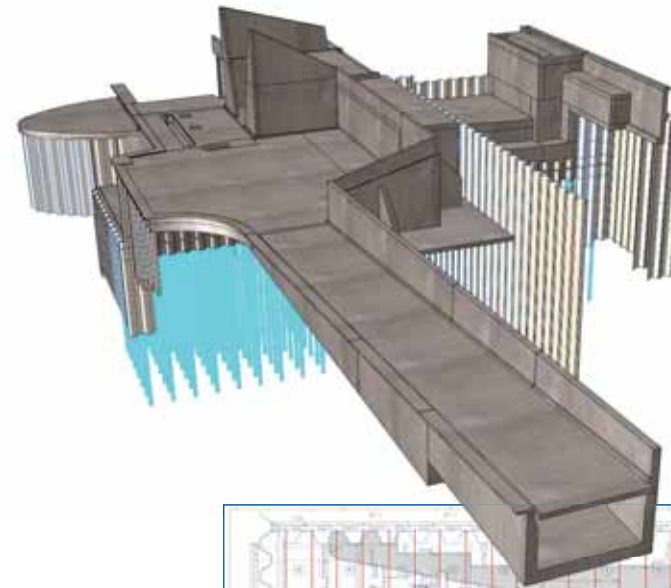
After the entire model had been finalized, views, sections and further working details were generated. Today Allplan BIM 2008 has a host of solutions to render views and sections. In the case of the Katwijk pumping station, we employed the 'Shell' method. One project staff member was appointed for the model as Model Administrator, who carried out modifications to the model. In this way operations could proceed smoothly. By working with several formwork models, more staff could work on the project simultaneously. In addition, clear agreements were made with regard to the file set structure. The current 'Building Structure' would have been an even more perfect method, but this only became available in the Allplan BIM 2008.

Delivery of drawings

In addition to the standard delivery of hard copy drawings, the contractor requested digital files such as *.pdf and *.dwg. The conversion of drawings into the requested files was simple, without data loss.

Besides delivering standard form- and reinforcement drawings, as the contractor is used to, Allplan has made it possible to deliver a 3D-PDF, which creates a finer visual image of the ultimate design and its feasibility.

www.grootingemalen.nl
www.tauw.com



Royal Haskoning

Contact André Schröder
Address Barbarossastraat 35
Postbus 151
6500AD Nijmegen, Netherlands
Phone +31 24-3284366
Email a.schröder@royalhaskoning.com
Website www.royalhaskoning.com

NOMINATION



Royal Haskoning

Royal Haskoning is een onafhankelijk, wereldwijd opererend, adviesbureau. De basis van onze onderneming werd in 1881 gelegd. Inmiddels zijn we uitgegroeid tot zo'n 4300 professionals. Opererend vanuit een technische achtergrond, bestrijken wij met onze adviesdiensten het brede veld van de interactie tussen de mens en zijn omgeving.

Onze betrokkenheid met onze opdrachtgevers komt voort uit ons enthousiasme om gezamenlijk duurzame oplossingen te realiseren in een complexe, steeds veranderende maatschappij. De expertise en ervaring van onze specialisten in uiteenlopende vakgebieden verzekeren u dat alle technische, logistieke, juridische, organisatorische, bestuurlijke, sociale, milieutechnische en economische aspecten van uw project nauwkeurig worden bestudeerd, om vervolgens met praktische oplossingen te komen.

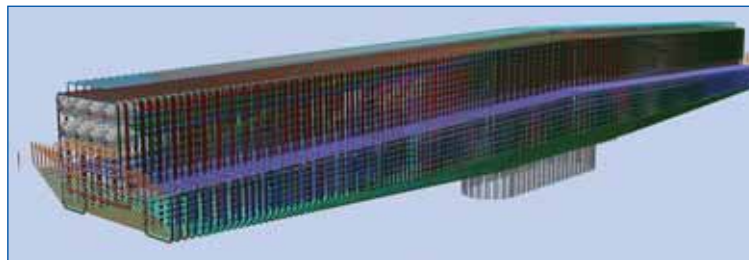
Royal Haskoning heeft diverse vestigingen, projectkantoren, dochterondernemingen en partners over de hele wereld. Daardoor kunnen wij op alle belangrijke markten ter plekke multidisciplinaire en geïntegreerde diensten aanbieden. Gecombineerd met onze persoonlijke dienstverlening dragen wij

zo op een effectieve wijze bij aan een succesvolle voorbereiding, uitvoering en exploitatie van uw projecten en programma's.

Witteveen + Bos

Witteveen+Bos levert advies- en ingenieursdiensten voor projecten in de sectoren water, infrastructuur, ruimte, milieu en bouw. Typerend voor onze werkwijze is de multidisciplinaire projectaanpak. Onze opdrachtgevers zijn overheden, het bedrijfsleven, industrie en verschillende soorten samenwerkingsverbanden. Wij bedienen hen vanuit acht vestigingen in Nederland en vier in het buitenland.

Onze bijna 800 medewerkers zijn specialisten die al hun kwaliteiten kwijt kunnen in hun werk. Partnerschap is voor hen het sleutelwoord. Partnerschap met hun opdrachtgevers en met Witteveen+Bos. Ook persoonlijke en inhoudelijke ontwikkeling staan centraal want ons werk vraagt steeds om nieuwe kennis en nieuwe verantwoordelijkheden. Witteveen+Bos is een bedrijf waar medewerkers zich thuis voelen, waar kwaliteit hoog in het vaandel staat en dat graag een stapje extra zet, niet alleen voor de opdrachtgevers maar ook voor onze medewerkers.



Short Description

Highway 'Westrandweg' Amsterdam

The project "Westrandweg" is one of the biggest infrastructural projects near Amsterdam. The new highway with a length of 10 kilometres contains 11 new fly-overs; amongst them a real work of art, the longest fly-over that has ever been realized in the Netherlands with a length of 3,3 km.

To design this fly-over with 81 support points, which spans up to 47,5 meter, which has a width of 28 meter and only has one column, was required a very specialized team of design engineers. Both Scia Engineer and Allplan Engineering were used to make a final and detailed design.

Project Information

Owner: Rijkswaterstaat (Noord Holland)

General Contractor: van Hattum en Blankevoort / KWS Infra / Boskalis

Engineering Office: Royal Haskoning / Witteveen + Bos

Architect: Zwarts en Jansma

Construction Start: 2009

Construction End: 2012

Location: Amsterdam, Netherlands



Westrandweg Amsterdam KW520, langste verkeersviaduct van Nederland (3,3 km)

Rijkswaterstaat heeft als opdrachtgever recentelijk twee grote infrastructurele projecten uitgegeven: de tweede Coentunnel en de Westrandweg, beide gelegen aan de westzijde van Amsterdam, beide als design en construct. Twee projecten die aan elkaar gekoppeld zijn, maar in verschillende contracten op de markt zijn gebracht.

Na een periode van (voor)ontwerp en prijsvorming heeft Combinatie Westpoort, een aannemerscombinatie bestaande uit van Hattum en Blankevoort / KWS Infra en Boskalis, begin 2006 de opdracht voor de aanleg van de Westrandweg gegund gekregen. Hierbij heeft de ontwerpcombinatie Royal Haskoning en Witteveen + Bos het ontwerp verzorgd. Dit betrof een multidisciplinair ontwerp waarbij waterhuishouding, ecologie, geluidsschermen en ontwerp van de viaducten onder system engineering is uitgewerkt. Het project dient gereed te zijn in 2012.

Het project Westrandweg

De Westrandweg is een verbinding tussen de (nieuw aan te leggen tweede) Coentunnel (A10) en knooppunt Raasdorp (A5-A9). Het tracé van circa 10 kilometer met 2 x 2 rijstroken met vluchtstrook wordt hoog gelegen aangelegd en behelst daarom een groot aantal viaducten. In totaal 11, waarvan er één uitspringt, namelijk KW520 met een lengte van 3,3 kilometer. Dit langste verkeersviaduct van Nederland kruist het Westelijk Havengebied van Amsterdam. Het viaduct kent in totaal 81 steunpunten waarvan 3 landhoofden, 18 portalen en 60 steunpunten die op één kolom rusten. In totaal wordt circa 100.000 m² dek gelegd met door Spanbeton speciaal ontwikkelde prefab liggers.

Ontwerp KW520

Voor het ontwerp van dit immens lange kunstwerk is een team van ontwerpers, constructeurs en geotechnici ingeschakeld die met verschillende Nemetschek software oplossingen het ontwerpproces



heeft doorlopen. De vormgeving, die werd opgegeven door de architect (Zwarts en Jansma), bepaalde in grote mate de complexiteit van het ontwerp: een 28 meter breed viaduct met overspanningen tot 47,5 meter op een enkele kolom met een breedte van maar 6 meter.

Met behulp van Scia Engineer is elk van de 81 steunpunten ontworpen in een 3D model waarbij 1D staaf elementen (pijlerbalk) gecombineerd zijn met 2D plaelementen (kolom en poer). De keuze om het geheel in 3D uit te werken is gemaakt om de invloed van de fundering met geringe afmetingen te ontwerpen en het dynamische gedrag te beschouwen. Een aantal steunpunten is onderhevig aan tweede orde effecten.

Pijlerbalk

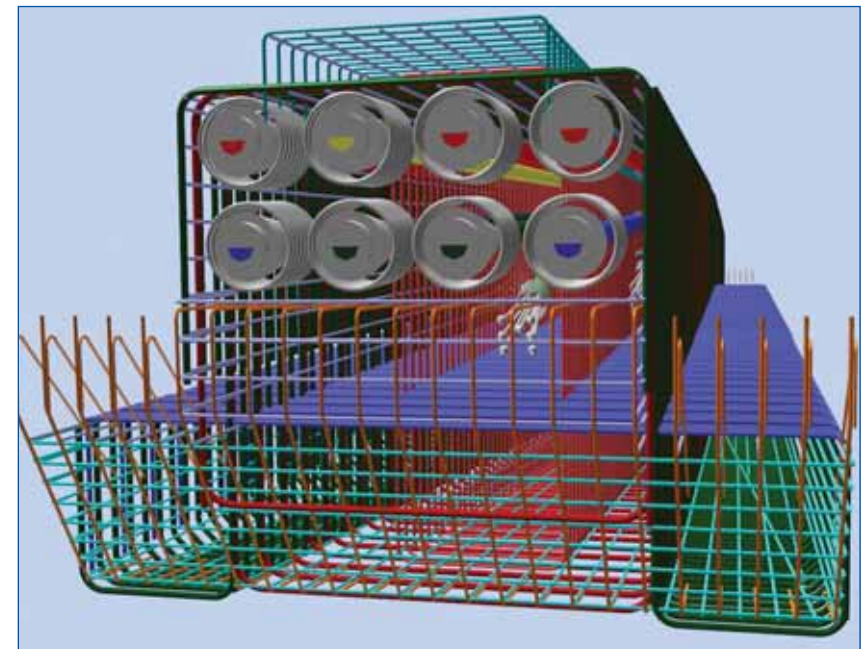
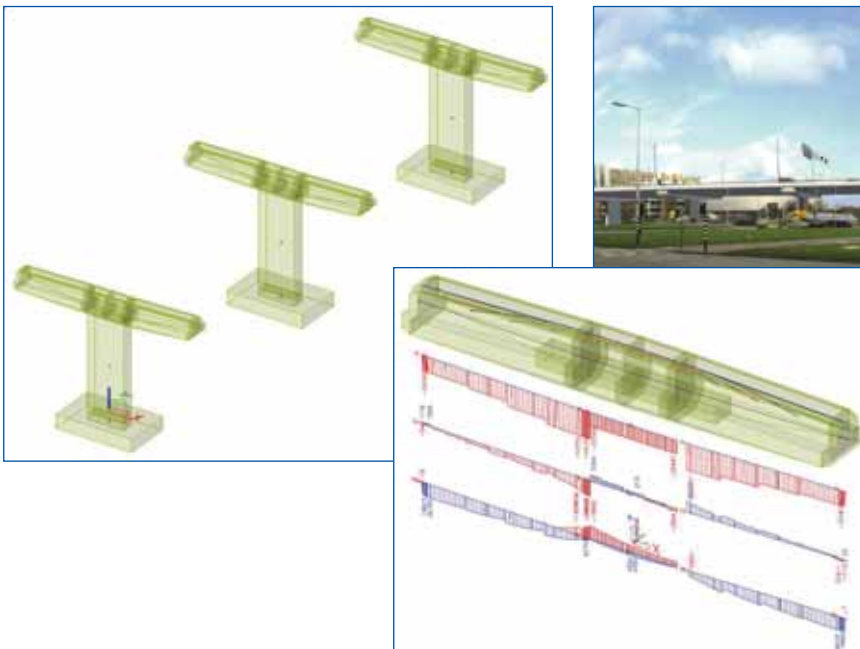
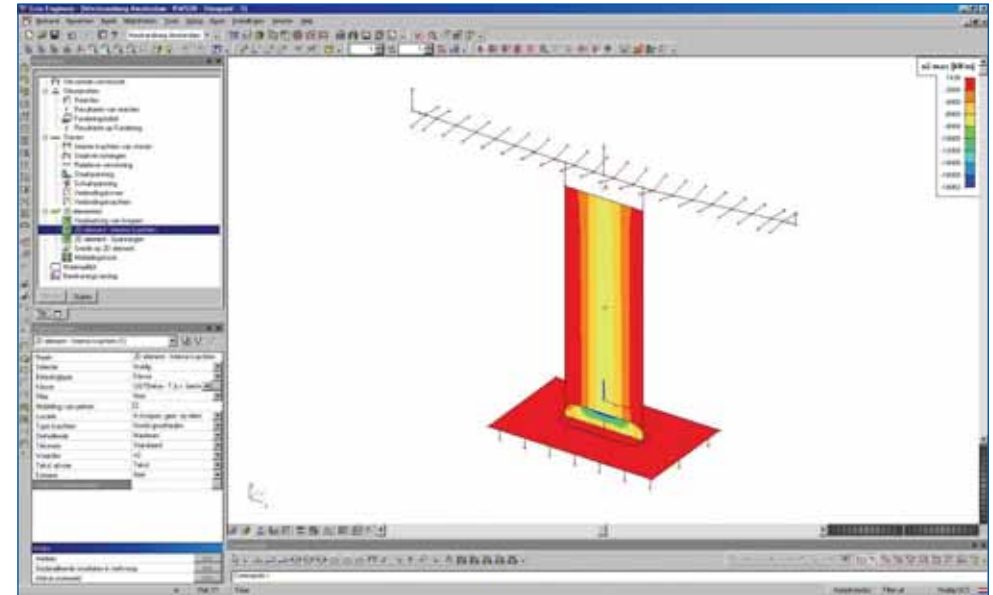
De wapening in de poer en de kolom zijn vrij traditioneel. Dat kan allerminst gezegd worden van de voorgespannen pijlerbalken die qua vorm in alle richtingen anders is. Zonder de mogelijkheid van Allplan Engineering zou het (bijna) onmogelijk zijn geweest om alle voorspanning samen met de wapening in de balk te integreren. Vanwege ruimtegebrek moesten enkele voorspanelementen naar beneden worden afgebogen en worden voorzien van blindankers. In de maatgevende

doorsnede zijn in totaal 13 kabels met 19 strengen voorspanning aanwezig. Aan de kopzijde zijn vanwege het ruimtegebrek slechts 8 spankoppelingen voorzien.

Met behulp van Scia Engineer is de voorgespannen pijlerbalk met een tijdsafhankelijke analyse doorgerekend. Hierbij is de gehele bouwfasering meegenomen zodat een controle van de balk op alle momenten van het bouwproces mogelijk was. Voor het detailontwerp van de pijlerbalk (o.a. console en inleidende krachten v.d.d. voorspanning) is gebruik gemaakt van elementen die enkel druk kunnen opnemen (esas.44). Door middel van een niet-lineaire berekening wordt de krachtsafdracht in de constructie, inzichtelijk gemaakt. Hiermee is in het ontwerp rekening gehouden.

Fundatie

Een groot aantal steunpunten van KW520 zijn gefundeerd op prefab betonpalen. Vanwege ondergrondse infrastructuur- en omgevingscondities worden een gering aantal steunpunten gefundeerd op Fundexpalen. Het paalpuntniveau is berekend met een MSerie software oplossing van Deltares: MFoundation.



DAEWOO E&C

Contact Young Chang
Address Kumho Asiana First Tower
57, Sinmunno 1-ga, Jongno-gu
110-713 Seoul, Korea, South
Phone +82 51 970 3025
Email youngchang@dwconst.co.kr
Website www.daewooenc.com

NOMINATION



DAEWOO E&C
BasisSoft, Inc.



Daewoo E&C

After its establishment in 1973, Daewoo E&C has been one of the industrial leaders in the fields of civil engineering, contracting, housing projects, and power plants. This leadership has been based on its exceptional technical know-how and outstanding corporate managerial skill.

Having completed numerous projects in over 40 different countries, including the Americas, the Middle East, Africa, and South East Asia, Daewoo E&C has earned a strong reputation for the Korean construction industry around the world. Based on its technical expertise, the company is currently pioneering new markets and expanding its overseas business activities.

The sky's our limit, and we will continue to compete against the very best to prove ourselves as a leading global construction firm. Through our vision to become 'a global E&C leader that creates a beautiful future', we are determined to do our best in creating a market-leading global construction company.

With 29 branches in Asia, the Middle East, Africa, Europe and the U.S., Daewoo E&C ranked the 32th

among the top 50 global engineering contractors picked by ENR in 2006, succeeding in joining the top 50 list for 3 consecutive years. Daewoo E&C is working on numerous construction projects in over 30 countries around the world involving oil & gas infrastructure, power plant, civil structure, and building construction.

BasisSoft, Inc.

BasisSoft, Inc was established in Mar, 1994 in Seoul, Korea. It started with 8 employees, and has grown into a company with staff of 14, mostly Civil Engineers.

BasisSoft, Inc is a software supplier which also provides engineering services for geo-technical, structural analysis and simulation projects. Nowadays, we are focusing on development of a construction management and design software and are also planning to provide an Engineering Service Business through Internet as a Venture Company.

Our mission is to be the best engineering solution provider from plan, design and analysis to VR simulation.

Construction of Ship Repair Yard and Dry Dock Complex at Duqm Port, Oman

Short Description

A shipyard and dry dock complex is proposed in conjunction with the plan for building a New Port and breakwater at Duqm in the Al Wusta Region of the Sultanate of Oman. This complex will provide vessel repair and berthing facilities for vessels of various size and type up to maximum vessel tonnage of 350,000 DWT and will also provide accommodations for workers and guests.

The overall size of this project is about 1,000,000m² at Duqm Port. Major works include construction of two dry docks, marine structures including outfitting quays, workshops and plants, administrative buildings and associated various mechanical and electrical facilities.

Project Information

Owner: Ministry of National Economy, Oman
General Contractor: JV of Daewoo Engineering & Construction / Galfar Engineering / Contracting
Engineering Office: Daewoo Shipbuilding & Marine Engineering Company

Architect: n/a
Construction Start: 01/06/2008
Construction End: 31/12/2011
Location: Duqm Port, Oman



General information

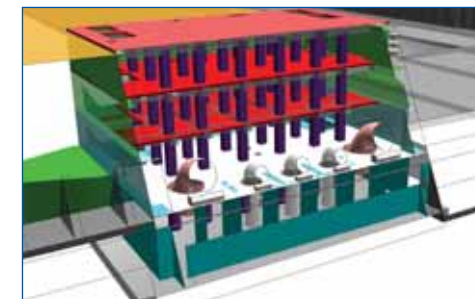
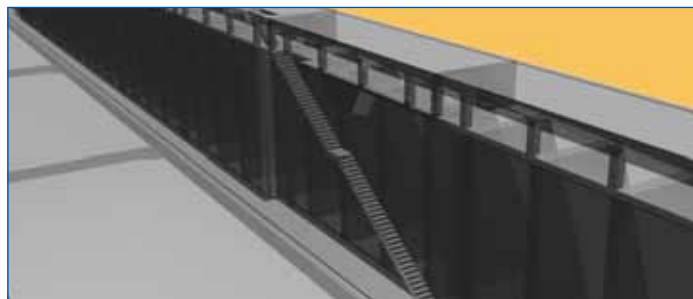
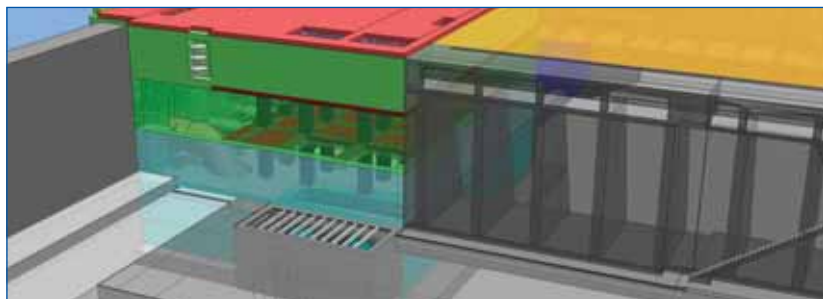
The Ministry of National Economy of Oman planned to develop a dry dock ship repair yard as part of the Duqm port under construction 600 km southwest of the capital Muscat. The facility which includes two docks will serve international navigation and repair vessels including Ultra-Large Crude Carriers (ULCC). The Ministry of National Economy and Daewoo Shipbuilding and Marine Engineering Company (DSME) signed an agreement in 2006 to form a new company, named the Oman Dry-dock Company to operate and manage the facilities over a period of 10 years.

The dry docks and a floating dock will be designed by Daewoo Shipbuilding and Maritime Engineering Company. Royal Haskoning in association with Khatib & Alami are the master plan consultants. This project is phase 3 of a three-phased program

which comprises: marine works (phase 1) and land-side and infrastructure facilities (phase 2). Duqm port will be the fourth major port in Oman, alongside Port Sultan Qaboos, Salalah Port, and the Port of Sohar. Phase 3 covers the construction of two 410m long docks, 2.8 km of quay wall which will incorporate the dry docks, 1.1 million sq. m of paved area including a cofferdam, crane foundations, lay-down area, workshops, accommodation and office buildings. The two dry docks together (1+2) with the pumping facilities (3) form the heart of this project and consist of massive reinforced structures.

Challenges

Because the construction schedule is very tight, Daewoo E&C needed a solution that would enable them, during the design phase itself, to detect and resolve the potential construction issues. As Daewoo



Used software: Allplan Engineering

E&C wanted to use Allplan for this project, another challenge became clear: this was going to be the first big project designed with Allplan in South-Korea. While South-Korea is still rather conservative towards the use of BIM (building information modelling), Daewoo E&C decided to continue with Allplan. A partnership was created with BasisSoft, Inc. to manage this project with Allplan within a 3 month deadline, starting November 1, 2008. During this period, BasisSoft, Inc. stayed in close contact with Nemetschek for technical support and consulting.

The project in Allplan

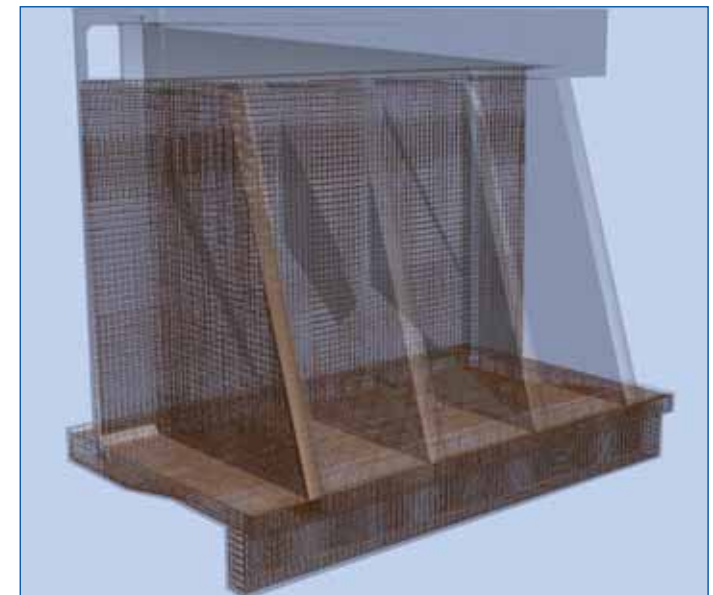
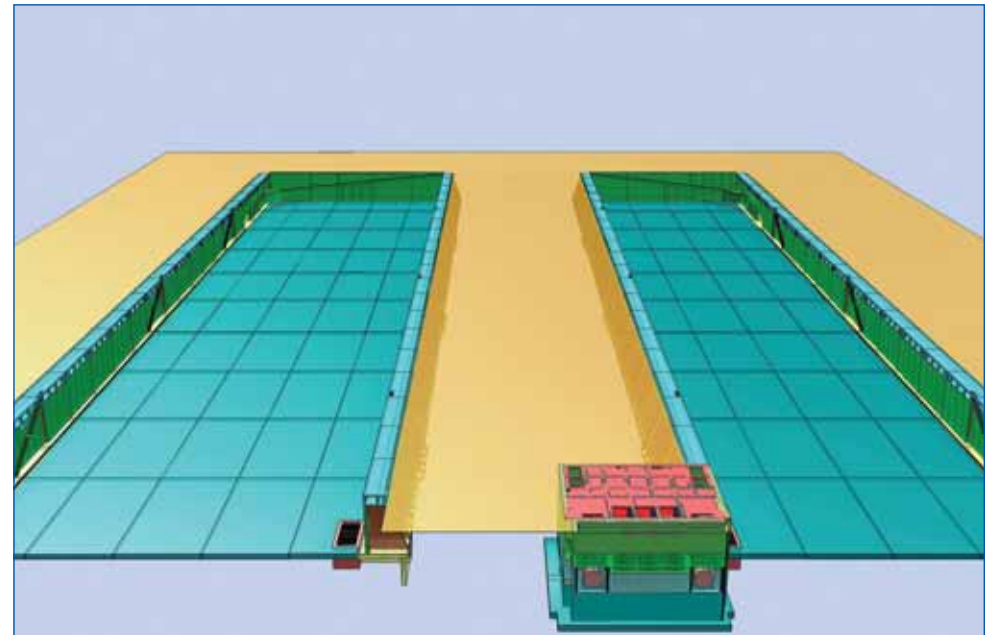
- The building structure was used to create a clear arrangement of all the construction parts.
- All structures of the dry docks and pump room were modelled as 3D objects, and all of them have been fully fitted with 3D reinforcement. The availability of the 3D reinforcement model was a clear advantage for the engineers creating the 2D rebar sketches, it allowed them to gain insight in specific parts of the structures where clashes occurred. A lot of these clashes are simply non-existent in a 2D environment and would be easily overlooked.
- Tonnages and volumes have been deducted directly from the 3D model. Bar bending schedules and summaries have been automatically created from the 3D reinforcement.
- At the same time, all construction drawings were derived from the 3D model with reinforcement using the shell module, and designed according to Korean standard.

This approach made it possible to inspect conflict zones, to identify design and calculation flaws, and to make the necessary corrections before the actual construction will start. Because all information is produced directly from the 3D model, changes and adaptations don't have an impact on the time needed to calculate tonnages, volumes and rebar schedules.

All this work has been finished on January 31th, 2009, and all the drawings and data have been sent to the construction yard in Oman for inspection.



Construction of Ship Repair Yard and Dry Dock Complex at Duqm Port, Oman



Iv-Infra b.v.

Contact R. Ermstrang (Iv-Infra b.v.)
 Address Fultonbaan 30
 3439NE Nieuwegein, Netherlands
 Phone +31 30 602 30 30
 Email nieuwegein@iv-infra.nl
 Website www.iv-infra.nl

NOMINATION



Iv-Groep

Iv-Groep is opgericht in 1949 en staat op plaats 11 in de ranglijst van Nederlandse ingenieursbureaus. Het bedrijf vormt een holding waarin marktgerichte divisies zijn opgenomen op de gebieden Bouw, Maritiem, Water en Milieu, Olie en Gas, Industrie en Infrastructuur.

Iv-Infra

Het ingenieursbureau Iv-Infra is een zelfstandige eenheid binnen Iv-Groep. Zij levert ingenieursdiensten zoals ontwerp, engineering, advies en projectmanagement, voor het realiseren en onderhouden van infrastructuurle werken in binnen- en buitenland.

Iv-Infra is actief in zes sectoren

- Ruimtelijke inrichting
- Betonnen kunstwerken
- Stalen en beweegbare bruggen
- Havens & waterwegen
- Beheer & onderhoud
- Spoorwegen

De projecten zijn divers, van lead engineer in een D&C contract tot directievoering voor een gemeente. De buitenlandse projecten hebben meestal betrekking op de specialismen van Iv-Infra zoals beweegbare bruggen en sluizen. Voorbeelden zijn een aanbiedingsontwerp voor een stormvloedkering in New Orleans en de roldeuren voor de nieuwe sluizen in Panama.

Er werken ruim 150 mensen bij Iv-Infra, verspreid over drie vestigingen (Papendrecht, Nieuwegein en Amsterdam). Naast de ontwerpende disciplines heeft Iv-Infra professionals in dienst in de volgende ondersteunende disciplines: risicoanalyse, systems engineering, ruimtelijk meten, monitoring van constructies, directievoering en toezicht en geotechniek.



Pedestrian bridge, Bleiswijk

Due to the increasing amount of traffic it was necessary to upgrade the main road from 2x1 driving lanes to 2x2 driving lanes in order to lessen congestion on the road. This congestion is mainly caused by the development of industrial terrains, large-scale housing projects and a clock auction area. Besides the pedestrian bridge, new viaducts tunnels are also being built. The eye-catching pedestrian bridge is situated near the clock auction area. It is a concrete bridge with a total span of approximately 44,7 m, a width of 3,4 m and a height of 0,75 m. It consists of 2x3 prefabricated flights of stairs, separated by landings, and an in-situ prestressed bridge planking above the road.

This is all supported by concrete columns, which in turn rest on a concrete foundation supported by piles. The total volume of the structure is approximately 225 m³. The bridge railings consist of curved banisters with in between layered safety glass. The railing itself incorporates a LED-strip.

Short Description

Project Information

Owner: Provincie Zuid-Holland
Architect: Marcel Booi (Iv-Infra b.v.)
General Contractor: BAM Wegen, onderaannemer VOB
Engineering Office: Iv-Infra b.v.

Construction Start: 01/09/2007
Construction End: 30/09/2009
Location: Bleiswijk, Netherlands



Verkeersgroei / Verkeersveiligheid

Uit verkeersmodelberekeningen blijkt dat de verkeersintensiteit op de N 209 in de periode 2001 - 2010 ongeveer verviervoudigt ten noorden van de Rijksweg A12 en verdubbelt ten zuiden van de Rijksweg A12. Dit komt door uitbreiding en/of realisatie van onder meer het glastuinbouwgebied, bedrijventerreinen, vinexlocaties en veilingen. De huidige vormgeving van de N 209 (Nieuwe) Hoefweg zorgt voor een aantal knelpunten waardoor de capaciteit onvoldoende is om het verkeer tijdens de spits filevrij te verwerken. Daarnaast voldoet de provinciale weg voor zowel snel als langzaam verkeer niet aan het concept 'duurzaam veilig'. Er is geen rijbaanscheiding, fietsers kunnen niet ongelijkvloers passeren, landbouwverkeer moet gebruik maken van de hoofdrijbaan bij de kruising met de Rijksweg A12 en er gebeuren relatief veel verkeersongevallen op de aansluiting met de Rijksweg A12. Daarbij is ook de spoorwegovergang een gevaarlijk punt.

Verbreiding

Zowel ten noorden als ten zuiden van de Rijksweg A12 wordt de N 209 (Nieuwe) Hoefweg verbreed in westelijke richting. De N 209 wordt ontworpen als een 2x2-strooks weg.

Beschrijving werkzaamheden

Het ontwerp voor het traject N 209 (Nieuwe) Hoefweg kan opgedeeld worden in drie stukken.

Werkzaamheden ten zuiden van de A12 (werkzaamheden provincie)

- Verbreding van de N 209 aan de westzijde van de bestaande weg
- Reconstructie aansluiting veilingen/Anjerweg op de N 209
- Aanleg voetgangersbrug
- Nieuwe aansluiting Laan van Mathenesse
- Aanleg parallelweg met deels vrijliggende fietspaden

Aansluiting van de N 209 op de A12 (werkzaamheden Rijkswaterstaat)

- De N 209 gaat met een viaduct over het spoor en de A12 heen
- Nieuwe aansluiting zuidzijde op de A12
- Aansluiting noordzijde op de A12 door half klaverblad
- Reconstructie A12
- Bouw overkluizing leidingentracé

Aanleg fietstunnel: onder het spoor en de A12 door (werkzaamheden ProRail).

**Werkzaamheden ten noorden van de A12
(werkzaamheden provincie)**

- Verbreding van de N 209 aan de westzijde van de bestaande weg
- Verlegging aansluiting Zoetermeerselaan
- Huidige aansluiting Kruisweg op de N 209 ter hoogte van de Zoetermeerselaan vervalt. Daarvoor in de plaats komt ter hoogte van de Kruisweg/Voorlaan een tunnel onder de N 209
- Nieuwe aansluiting Verlengde Australiëweg voor de ontsluiting van Oosterheem
- Aanleg parallelweg met deels vrijliggende fietspaden

De voetgangersbrug

De voetgangersbrug maakt dus deel uit van de werkzaamheden ten zuiden van de A12. Het betreft het weggedeelte nabij de veilingen in Bleiswijk.

De hoofdoverspanning van deze voetgangersbrug bestaat uit een ter plaatse gestorte statisch onbepaalde voorgespannen prismatische ligger met als overspanningen ca. 17,5 m en 26 m. De dwarsdoorsnede varieert in hoogte van 300 mm aan de zijkant tot 750 mm in het midden, met een parabolisch verlopende onderzijde, bij een breedte van 3,40 m. De steunpunten worden gevormd door 3 stuks wandpijlers met een doorsnede van 600/800*1800 mm, met een ronde beëindiging, die via poeren op betonpalen zijn gefundeerd. De hoofdoverspanning is opgelegd op rubberblokken en voor calamiteiten geborgd met een fixatieconstructie.

Ter plaatse van de eindsteunpunten wordt door middel van 2 x 3 trappen en 2 x 2 bordessen het niveauverschil tussen het brugdek en het maaiveld overbrugd. De trappen worden prefab gewapend uitgevoerd. De doorsnede van de hoofdoverspanning wordt ook gebruikt voor de trap. De bordessen rusten telkens op een kolom Ø600, gefundeerd op een 3-paalspoer. Het einde van de trappen wordt gefundeerd op een sloof met 2 palen.

Het totale volume van de betonconstructie van de brug, exclusief funderingspalen, komt uit op circa 225 m3.

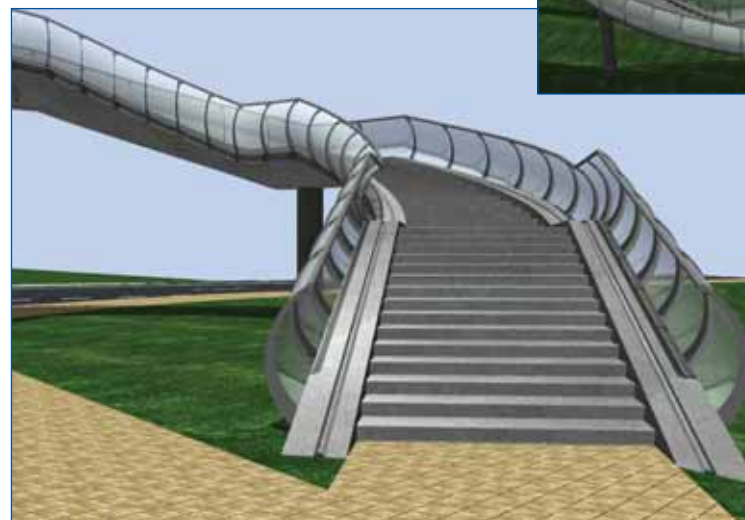
Aan de zijanten van het dek en de trappen wordt een leuning gemonteerd. Deze bestaat uit gebogen leuningstijlen. Tussen deze stijlen wordt gelaagd

veiligheidsglas gemonteerd. In de leuning zelf komt een LED-strip-verlichting.

Qua ontwerp zet de nabij gelegen HSL-lijn de toon. De reconstructie van de N209 moest derhalve aansluiten op de uitgangspunten die daarvoor gebruikt zijn om zo een eenheid in vormgeving te krijgen. De voetgangersbrug zal de meest in het oog springende constructie worden en aan de vormgeving hiervan is daarom ook veel aandacht besteed.

Om een sluitend definitief ontwerp van de voetgangersbrug te realiseren en om mogelijke conflicten of knelpunten te ondervangen is gekozen voor een uitwerking in Allplan. Hierbij is voornamelijk gebruikt gemaakt van het 3D modelleren. Het modelleren binnen Allplan was op zich niet zo moeilijk. De grootste uitdaging lag in de aansluitingen van het dek op de trappen en ook in de aansluiting van de kolommen op het brugdek. Dit was dermate complex dat dit met ons standaard CAD-pakket vrijwel niet te doen zou zijn geweest.

Uiteindelijk is samen met de architect zo een brug ontworpen en gevisualiseerd zodanig dat de verdere detaillering niet meer tot verrassingen kan leiden.



Voetgangersbrug N209 Nieuwe Hoefweg

BubbleDeck Benelux BV

Contact R. Plug
Address Admiraal Banckertweg 22
2315 SR Leiden, Netherlands
Phone +31 71 521 03 56
Email mailbox@bubbledeck.nl
Website www.bubbledeck.nl



Het bollenplaatvloersysteem van BubbleDeck® wordt op de markt gebracht door BubbleDeck Benelux. Een organisatie die beschikt over hoog opgeleide en ervaren technisch adviseurs die op projectniveau mee kunnen denken en creatief adviseren over architectonische, bouwkundige en constructieve aspecten, evenals over bouw- en uitvoeringstechniek en alle kostenaspecten daarvan. Bovendien kennen zij als geen ander alle mogelijkheden van vlakke vloersystemen en zijn daardoor een gewaardeerde partner in alle fasen van de ontwikkeling en realisatie van bouwprojecten.

Onze dienstverlening geschiedt vanuit een moderne netwerkstructuur. Dat wil zeggen dat BubbleDeck Benelux nauw samenwerkt met gespecialiseerde ingenieursbureaus voor engineering. De focus van BubbleDeck Benelux is om voor klanten een optimale toepassing van het BubbleDeck® vloersysteem te realiseren, waarbij wordt voldaan aan alle eisen aan kwaliteit en levertijd binnen de overeengekomen financiële randvoorwaarden.

De waardering vanuit de markt voor het BubbleDeck® vloersysteem kwam na de introductie in 1997 al snel tot uiting door middel van de volgende onderscheidingen:

- Nominatie Bouwprijs 1999 ter gelegenheid van de Internationale Bouwbeurs
- Nominatie Milieuprijzen voor de Industrie 1999
- Eervolle vermelding Stubeco Uitvoeringsprijs 2000 (tezamen met BAM Utiliteitsbouw)
- Rijnland Innovatieprijs 2000

Op de Betondag 2001 ontving BubbleDeck® uit handen van de voorzitter van de Algemene Voorschriften Commissie Beton (AVC Beton) van de

CUR het eerste exemplaar van CUR-Aanbeveling 86 "Bollenplaatvloeren". Dit rekenvoorschrift bevat de aanvullende en afwijkende bepalingen op NEN 6720:1995 (VBC 1995), speciaal voor het BubbleDeck® vloersysteem.

Bij tal van universiteiten en hogescholen worden op projectbasis studiebegeleiding en gastcolleges gegeven. Tevens is BubbleDeck® een gewaardeerde gast voor het geven van gerichte presentaties en voorlichting bij architecten- en ingenieursbureaus, calculatie- en bouwmanagementbureaus en aannemers.

BubbleDeck® is door de unieke combinatie van eigenschappen een spraakmakend innovatief vloersysteem dat op slimme en efficiënte wijze wordt samengesteld uit op maat vervaardigde vloerelementen. Waar de architect en de constructeur een eenvoudige oplossing zoeken voor de vormgeving van de draagkrachtconstructie, biedt BubbleDeck® uitkomst. Het resultaat: efficiënt en kosteneffectief bouwen met een maximale meerwaarde voor de gebruiker!

Besparing op materiaal en volledig hergebruik zijn onderscheidende eigenschappen van BubbleDeck® en flexibel indelen van gebouwen is vanzelfsprekend met dit vlakke vloersysteem. Verwarming en koeling van gebouwen, gepaard aan energiebesparing, zijn mogelijk door toepassing van de bollenplaatvloer op maat, voorzien van de nodige installatietechniek.

Car Park Sint Antonius Hospital, Nieuwegein

Short Description

Since many years, the Sint Antonius hospital in Nieuwegein has had a problem with parking facilities. Architects and engineering firm De Jong Gortemaker Algra proposed a car park of 32.000 m² split up in seven construction stories. The original design was done with hollow core slabs and concrete beams. Because of this system spans were needed up to 15.6 x 10.4 meter. Slabs and beams together, gave a construction height of 1 meter. For this reason BubbleDeck® was an exceptional alternative as this solution without the beams brought the maximum construction height to only 390 mm. This finally resulted in an additional storey and an extra park space of ca. 5.000 m².

Project Information

Owner: n/a

Architect: De Jong Gortemaker Algra

General Contractor: Ballast Nedam Zuid

Engineering Office: Bartels Ingenieurs voor
Bouw & Infra

Construction Start: 01/11/2007

Construction End: 31/10/2008

Location: Nieuwegein, Netherlands



Het Sint Antonius Ziekenhuis in Nieuwegein had al jarenlang een groot parkeerprobleem. Architecten- en ingenieursbureau De Jong Gortemaker Algra ontwierp hiervoor een parkeergarage van 32.000 m² in zeven bouwlagen. Als bouwsysteem werd gedacht aan kanaalplaten op prefab betonbalken. Vanuit het parkeersysteem volgde echter een kolomafstand van 15,6 x 10,4 meter. En dat zou betekenen dat balken en vloeren samen tot 1 meter hoog zouden worden. Daarom werd aan BubbleDeck® gevraagd om met de bollenplaatvloer een alternatief te bieden.

De bollenplaatvloer is een vlakke vloer, op basis van een betonschil van 70 mm dikte met gewichtsbepalende kunststof bollen in de neutrale zone van de vloer. De vloer kan in alle richtingen overspannen, zodat de belasting altijd wordt afgedragen naar de dichtstbijzijnde kolommen. In feite is een bollenplaat-



vloerelement een stukje van een vrijdragende vlakke plaatvloer. Het vloerelement is daarom voorzien van zowel de constructieve onder- als ook de bovenwape-ning, waartussen de kunststof bollen zijn geklemd. De vloerelementen worden in het werk tot een constructief samenwerkend geheel gemaakt door middel van koppelstaven en -netten en het opstortbeton.

Rookafvoer

Door het achterwege laten van de betonbalken kon met de bollenplaatvloer binnen de maximale bouw- hoogte een extra parkeerlaag worden gerealiseerd. Dat betekende 5500 m² extra. Ook voor de commerciële exploitatie van de garage pakte dat gunstig uit. Doordat de vloerhoogte beperkt blijft tot 390 mm was zelfs circa 150 mm extra vrije hoogte haalbaar per bouwlaag. Daarbij is de parkeergarage door het vlakke plafond ook zeer overzichtelijk geworden. Ook was het laten vervallen van de betonbalken gunstig voor de rookafvoer, die zeer kritisch was vanwege de combinatie van groot oppervlak en natuurlijke ventilatie via een half-open gevelconstructie.



Used software: Allplan Precast

De vloerconstructie van de parkeergarage is overigens niet alleen aan de onderzijde vlak, maar ook aan de bovenzijde. BubbleDeck® maakt handig gebruik van het feit dat een betonvloer in het midden altijd doorbuigt. Juist op dat punt worden dus de putjes voor waterafvoer aangebracht. Daardoor kan ook wateraccumulatie nooit een rol gaan spelen.

Twee varianten

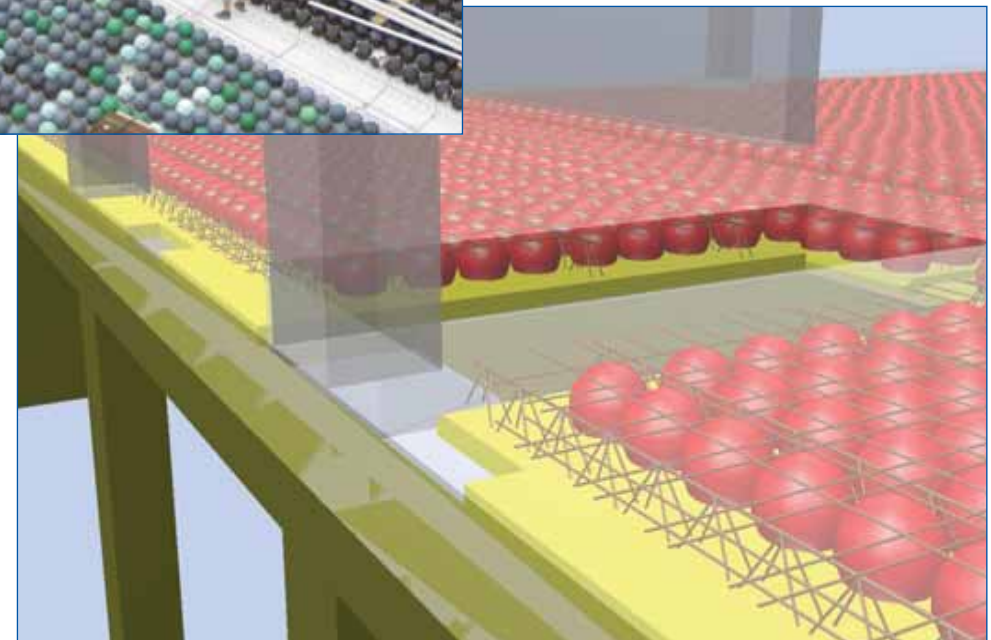
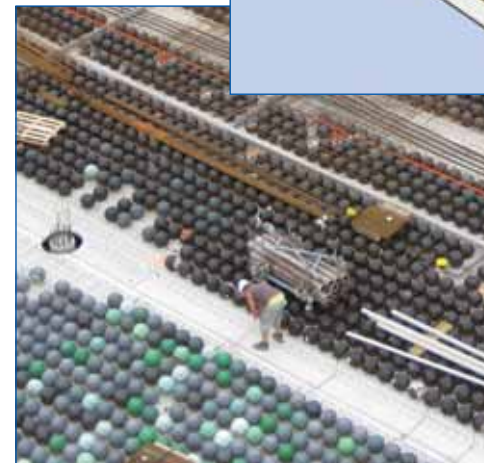
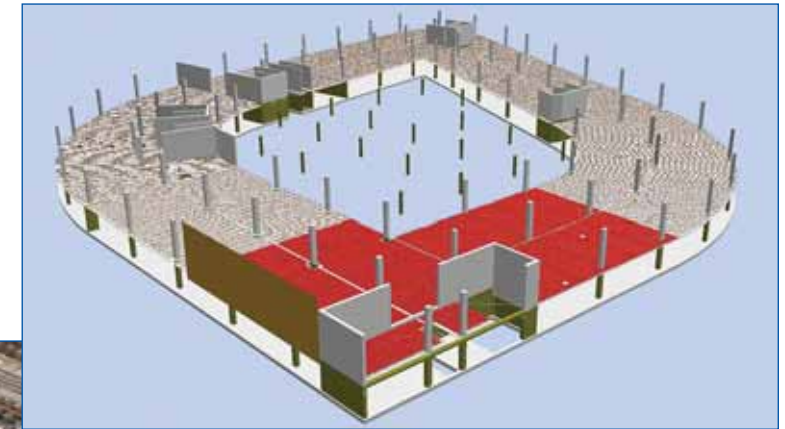
BubbleDeck® rekende de vloer door in twee varianten: één met traditionele wapening en één met voorspankabels (voorspanning zonder aanhechting) van kolom naar kolom. In overleg met bouwer Ballast Nedam Zuid is de variant met voorspanning gekozen. De reden daarvoor was puur economisch: de hoge staalprijs maakte het interessant om fors te besparen op de kilo's wapeningsstaal. Dat de vloer zonder voorspanning ook iets dikker zou zijn (450 mm), was niet van belang omdat ook dan de extra parkeerlaag nog steeds haalbaar was. Het is de eerste keer dat BubbleDeck® deze voorspanning zonder aanhechting toepaste in zijn vloersysteem. Dit werd uitgewerkt in samenwerking met Dywidag Systems International DSI.

Aangestorte vloerranden

Het bouwsysteem werd nog verder geoptimaliseerd door te werken met in de fabriek aangestorte vloerranden. Daardoor hoefde geen randbekisting te worden gemaakt en kon steigerloos worden gebouwd. Het is de tweede keer dat BubbleDeck® dit systeem toepast. De eerste keer was bij de bouw van het RACM in Amersfoort, waar de aannemer een net wilde spannen direct langs de vloer om te voorkomen dat er bouwmaterialen op het spoor terecht zouden komen.

Deze aangestorte vloerrand benutte BubbleDeck® ook voor het wegwerken van de koppen van de voorspankabels. In de buitenkant van de randbalk zijn daarvoor sparingen opgenomen, die na het aanspannen van de kabels worden voorzien van een prefab deksel en vervolgens van bovenaf worden volgegooten met gietmortel. Een deel van de spankabels is voorzien van een blindverankering, die in het beton is ingestort.

De parkeergarage is uiteindelijk niet gebouwd in het ontworpen strakke stramien van 10,4 meter. De exploitatie is namelijk bij Q-Park terecht gekomen en die organisatie kiest voor parkeren onder een hoek van 15 graden. De plaats van de kolommen is daarop aangepast. Dat kon in het bollenplaatvloersysteem ook gemakkelijk doordat deze vloer niet aan één overspanningrichting is gebonden. Daardoor zijn kolommen redelijk vrij te plaatsen op die plekken waar ze qua parkeren het beste passen. De maximale kolomafstand is overigens wel 10,4 m gebleven.



Franz Oberndorfer GmbH & Co KG

Contact Wolfgang Gigelleitner
Address Lambacher Strasse 14
4623 Gunskirchen, Austria

Phone +43 7246 72 72
Email w.gigelleitner@oberndorfer.at
Website www.oberndorfer.at



OBERNDORFER
DIE ZUKUNFT DES BAUENS

Die Philosophie hinter der Zukunft des Bauens

Oberndorfer, das sind 90 Jahre Firmengeschichte vom Familienbetrieb zum modernen Industrieunternehmen mit ungebrochener Entwicklungsdynamik. Heute prägt Oberndorfer mit seinen innovativen Produkten und Problemlösungen die Zukunft des Bauens.

Mit nunmehr 8 Standorten haben wir an Kundennähe gewonnen und sind zu einem der führenden Beton-Fertigteilbau Unternehmen Österreichs aufgestiegen.

Wir verfügen über innovatives Know – how und einen der modernsten Maschinenparks Europas, aber unsere Unternehmensphilosophie ist dabei ganz einfach geblieben:

Bestens ausgebildete und kompetente Mitarbeiter verfolgen jeden Tag mit Innovation, Qualitätssicherung und absoluter Termintreue nur ein Ziel: Den Erfolg unserer Partner und die Zufriedenheit ihrer Kunden nachhaltig zu sichern!

Mit unseren 8 Standorten in ganz Österreich sind wir immer in der Nähe unserer Kunden. Als Komplettanbieter und Systemlieferant im Bereich Betonfertigteile haben wir unsere Produktionsstätten jedoch voll vernetzt. Durch die zentrale Auftragssteuerung und die flexiblen Produktionsanlagen haben wir so auch komplexe Bauvorhaben voll im Griff.

Seit der Gründung im Jahre 1912 sind wir stetig gewachsen, in der Zwischenzeit beschäftigen wir in den 8 bestehenden Standorten an die 900 Mitarbeiter und erwirtschaften einen Umsatz von ca. €145 Mio.

Unsere Produktpalette umfasst:

- Elementdecken
- Vorgespannte Elementdecken
- VSD® Spannbetonhohldielen
- Hohlwandssysteme
- Konstruktive Fertigteile

Die Planung unserer Aufträge erfolgt über die gesamte Produktpalette in der CAD Software der Fa. Nemetschek Allplan Precast 2005.



Winding staircase in exposed concrete

The emergency stairway sets a striking symbol on the even clean lined façade on the Office-Campus-Gasometer. Like a campanile, the eye-catching structure extends up to the sky. With a diameter of 5.16 m and a height of more than 20 m, this precast structure nevertheless appears slim, in front of the large structures.

In order to meet the quality requirements for the engineering design and the exposed concrete, utmost precision and a great deal of experience in precast construction were necessary.

It was all the more simple to realise the specified architecture in virtual components and the production and the changes in configuration of reinforcements were also easier to develop using 3D illustrations.

Short Description

Project Information

Owner: Office – Campus – Gasometer
Architect: Soyka / Silber / Soyka
General Contractor: Östu-Stettin
Engineering Office: KS Ingenieure ZT GmbH

Construction Start: 2005
Construction End: 2007
Location: Vienna, Austria



Als Subunternehmer wurde die Fa. Oberndorfer mit der Lieferung der erforderlichen Stahlbetonfertigteile beauftragt. Unter anderem wurde den Architektenwünschen entsprochen und Wendelstiegen in den verschiedensten Ausführungen geliefert. Zu den gewendelten Innenstiegen kamen des weiteren auch gewendelte Außenstiegen mit inkludierter Brüstung in Sichtbetonqualität zur Ausführung.

Die besondere Herausforderung war in diesem Fall der Schalungsbau, die Bewehrungsführung und das Einbringen des Betons. Nach einer kurzen Entwicklungsphase haben wir uns für die im folgendem beschriebene Produktvariante entschieden.

Projekt Beschreibung

Schon im Vorfeld war uns bewusst, dass die Herstellung dieser Stiegen mit ihrer Brüstung in Sichtbeton eine ganz besondere Herausforderung für unser Werk darstellt.

Die wichtigsten Parameter waren eine massive Schalung für die exakte Passgenauigkeit der Fertigteile, ein leistungsfähiger Beton sowie erfahrenes Personal. Es war uns auch bewusst, dass aufgrund der Schalungsgeometrie und des hohen Bewehrungsanteiles der Beton nur in SCC – Ausführung einwandfrei verarbeitbar ist.

Nach statischer Bemessung wurde SCC 30/37/B2/GK16/F73 verwendet. Um dem enormen Betondruck und der Auftriebskraft von 5 m³ SCC standzuhalten, musste die Schalung aus 10 mm dicken Stahlblechen mit vielen zusätzlichen Versteifungen angefertigt werden.

Weiters waren für das Öffnen und Schließen der Schalung 30 Stk. Klappschlösser, mehrere Keile und zusätzliche Gewindestangen erforderlich.

Die Betonbringung im Werk erfolgte über eine Kübelbahn, danach in einen Betonkübel mit Rührwerk, von dort über ein Füllrohr in die Mittelsäule der Treppe, durch die Trittstufen und weiter aufsteigend in die Brüstung. Nur der oberste Brüstungsteil wurde von der anderen Seite befüllt. Das Stückgewicht der Fertigteile liegt bei ca. 12,5 Tonnen.

Selbst das Ausschalen, die Lagerung, aber auch der Transport erforderten viel Fingerspitzengefühl und Erfahrung.

Je zwei Fertigteile bilden ein Geschoss und jedes Geschoss ist über einen Steg aus Ortbeton mit dem Gebäude verbunden.

Die Stiege führt über sechs Geschosse, mit einem Durchmesser von 5,16 m, sie hat die Funktion einer Fluchtstiege und ein Gesamtgewicht von ca. 150 Tonnen. Zur Wintersicherheit wurde auf den Stufen ein beheizbarer Fliesenbelag aufgebracht.

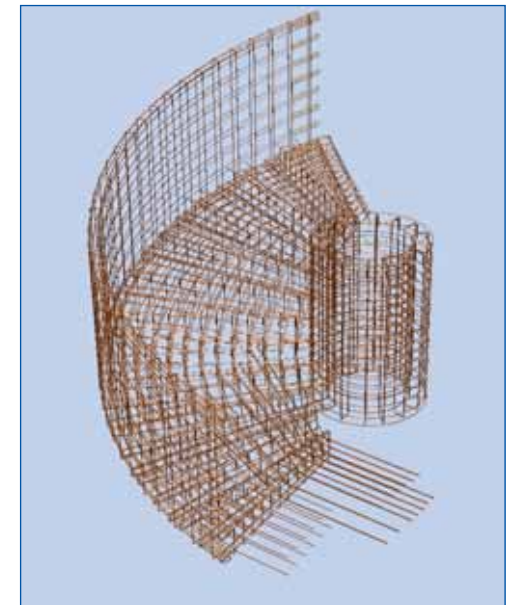
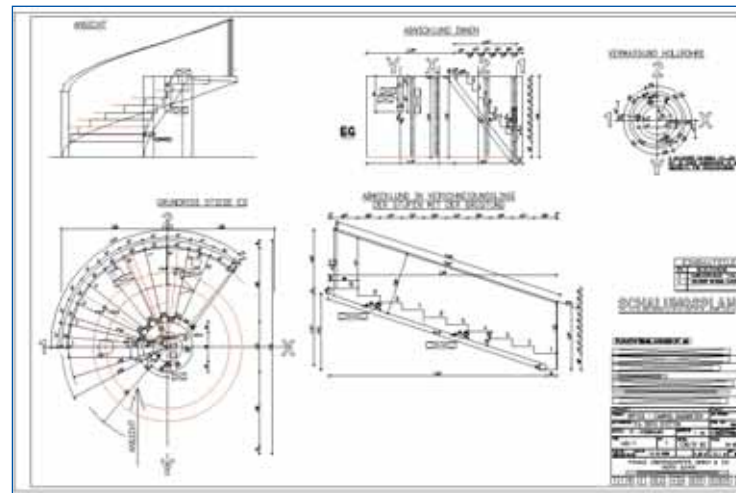
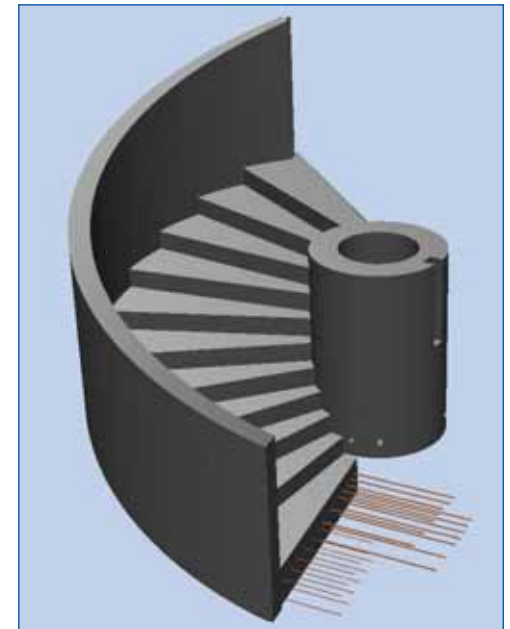
Die Bilderfolge

Alte Baukunst und moderne Architektur – mit Sicherheit kein Widerspruch

Ortbetonanbindung über sechs Geschosse

Schon der Schalungsplan lässt die Herausforderung an einen aufwändigen Schalungsbau aus Stahl erkennen.

3D – Modell mit Bewehrungsführung aus Allplan. 3D – Gesamtmodell und Ausschnitt



Ingenieurbüro für Bauwesen Manz

Contact Michael Manz
Address Uracher Str. 39
72525 Münsingen, Germany

Phone +49 7381 500020
Email info@ingbuero-manz.de
Website www.ingbuero-manz.de



Als erfahrenes Ingenieurbüro setzen wir die Entwürfe zu jedem geplanten Bauvorhaben im Bereich des Massivbaus, Holzbaus, Stahlbetonbaus und Verbundbaus in die Ausführungsplanung um, beraten hinsichtlich einer rationellen und wirtschaftlichen Ausführung und erbringen alle erforderlichen Nachweise für die Standsicherheit, Gebrauchstauglichkeit und Dauerhaftigkeit.

Hierbei gilt es, die Konstruktion unter Berücksichtigung von Gestaltung, Materialien, und Funktion auszubilden und zu optimieren.

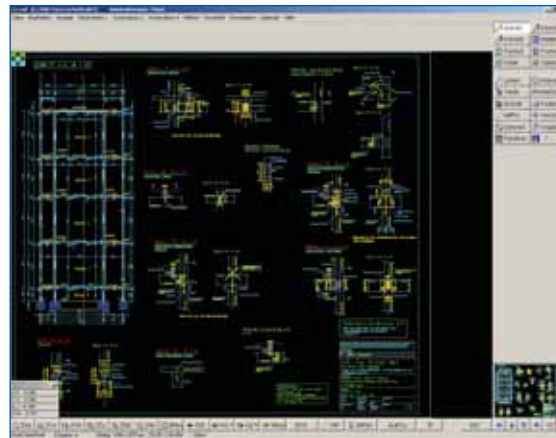
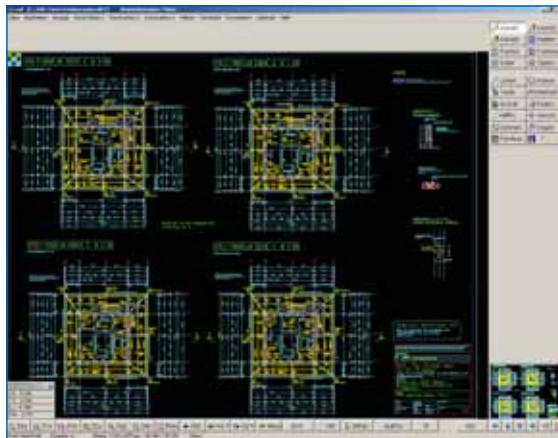
Wir sehen unsere Aufgabe darin, durch frühzeitige und intensive Zusammenarbeit mit den anderen Planungsbeteiligten einen umfassenden Beitrag zur gesamten Planungslösung zu leisten.

Dabei steht für uns bei jedem Projekt Wirtschaftlichkeit, Qualität und Termintreue stets im Vordergrund.

Unser Team besteht aus zwei Ingenieuren und zwei Konstrukteuren.

Tätigkeitsschwerpunkte:

- Konzeptentwicklung für die Konstruktion (Tragwerksplanung)
- Erstellung von Vorberechnungen für die Kalkulationsphase
- Statische Berechnungen n. HOAI §65; Leistungsphase 1 - 9
- Ausführungsplanung und Erarbeitung von Detailpunkten
- Massenermittlungen und Ausschreibung
- Wärmeschutz-, Schallschutz- und Brandschutznachweise
- Sicherheits- und Gesundheitsschutzkoordination in der Planungs- und Ausführungsphase
- Objektüberwachung



Publicity tower for the New Diez Palace, Rheinland Pfalz

Short Description

The New Diez Palace, or Neues Schloss Diez as it is named in German, is a completely unique project, never carried out before. The building, measuring 100 metres long, 26 metres wide and 23 metres high, is expected to be available for private and business functions and open for visitors and participants of cultural events in 2009.

This project regards more precisely the realization of a tower building, with the purpose to make publicity for the new palace. The tower is a wooden construction that will be dismantled after the opening of the palace. The base of the tower is 10 x 10 m and it has a height of 24 m; in the building there is 500 m² of space available for offices, presentation and information areas. A total of 4 building layers represent the floors of the Diez Palace.

Project Information

Owner: Neues Schloss Diez, Marcus Frey
Architect: Jasmin Ellger
General Contractor: Fa. mkc GmbH
Engineering Office: Ingenieurbüro für Bauwesen

Construction Start: 02/2008
Construction End: 04/2008
Location: Diez, Germany



Im Zuge der Realisierung des Projekts „Neues Schloss Diez“ wurde in Diez bei Limburg an der Lahn (Rheinland-Pfalz) ein Werbeturm realisiert. Auf einer Grundfläche von 10.00 m x 10.00 m ist ein ca. 24 Meter hoher Turm entstanden, der mit insgesamt 500 m² nutzbarer Fläche Baubüro, Präsentationsfläche und Anschauungsobjekt zugleich ist. Insgesamt vier begehbare Etagen wurden errichtet, die den späteren Stockwerkshöhen des Schlosses entsprechen.

Der Kern des Turmes, in dem die Räume untergebracht sind, hat eine Abmessung von 6.00 m

x 6.00 m und eine Geschosshöhe von jeweils 5.00 m. Die Erschließung der einzelnen Räume erfolgt über die Stockwerkstreppen und umlaufenden Balkonen mit einer Breite von 2.00 m.

Der Turm wurde als reine Holzkonstruktion in der Feuerwiderstandsklasse F60 realisiert. Der Turm soll nach Beendigung der Baumaße demontiert werden und ggf. an einer anderen Stelle wieder aufgebaut werden.

Die Tragkonstruktion besteht aus einer Holz-Skelettkonstruktion aus Nadelholz und BS-Holz, die Decken wurden als Leimholzdecken ausgeführt.



Used software: Frilo Statics, GLASER -isb cad-

Der Lastabtrag der horizontalen Lasten erfolgt durch Streben und Riegel in den einzelnen Wandelementen. In den Bereichen mit Wandöffnung, an denen keine Streben eingebaut werden konnten, werden die Horizontallasten durch die Ausbildung der Geschossdecken als Scheiben in die benachbarten Wände eingeleitet. Die Anschlüsse der Streben erfolgte mittels Versatz und ausgenagelten Lochblechen.

Die Gründung erfolgte mit kraftschlüssig miteinander verbundenen, umlaufenden Stahlbetonriegeln unter den Stützen. Auf diese Weise werden die Zugkräfte aus dem Kragmoment der Windbeanspruchung direkt eingeleitet. Die Wände mit einer Zwischendämmung aus Mineralwolle sind außen mit einer Holzschalung aus Fichte versehen und innen mit Gipsfaserplatten beplankt.

Zur Reduzierung der Bauzeit wurden je Stockwerk jeweils neun Wandelemente mit einer Breite von zwei Metern im Werk der ausführenden Holzbaufirma komplett vorgefertigt und mittels sechs Sattelzügen angeliefert. Durch diesen Ablauf konnte zudem auf ein Arbeitsschutzgerüst verzichtet werden. Die einzelnen Wandelemente wurden mit dazwischenliegenden Geschossstützen, die zum Abtrag der Zugkräfte bzw. der Normalkräfte dienen, miteinander verbunden. Die schubfeste Verbindung der Wände untereinander wurde mittels schräg angeordneter Vollgewindeschrauben ausgeführt. Die Montagestöße der einzelnen Stützen in den Geschossen zur Aufnahme der Zugkräfte wurden mit geschlitzten Stahlblechen und Stabdübeln konzipiert. Die Verankerung der untersten Stützen im Fundament erfolgte ebenfalls mit Schlitzblechen und Stabdübeln bzw. Passbolzen. Für die Einleitung der hohen Zugkräfte in die Fundamente und zum Ausgleich von Toleranzen wurden die Schlitzbleche mit den einbetonierten Stahlplatten verschweißt.

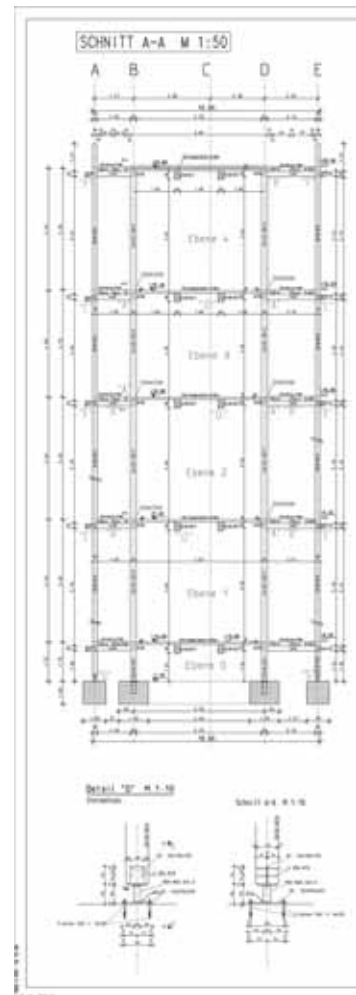
Der umlaufende Balkon wurde aus vier Elementen je Geschoss vorgefertigt und am Kern und den äußeren Stützen mit Schlitzblechen und Stabdübeln befestigt. Dabei wurden sämtliche Knotenpunkte mit einer gewissen Distanz montiert, um Wasseransammlungen zu vermeiden und die Dauerhaftigkeit der Konstruktion zu erhöhen.

Die komplette Konstruktion wurde in der Holzart Fichte ausgeführt. Obwohl es sich um ein temporäres

Bauwerk handelt, wurde besonders viel Wert auf die Dauerhaftigkeitsanforderung und auf den konstruktiven Holzschutz gelegt.

Sämtliche Verbindungen wurden so konzipiert, dass der Turm jederzeit mit relativ geringem Aufwand demontiert werden kann.

Für die Vorfertigung der einzelnen Elemente im Werk wurden vier Wochen benötigt. Die Montagezeit auf der Baustelle mit dem Innenausbau betrug durch den hohen Vorfertigungsgrad trotz einer schlechten Wetterperiode mit Sturm nur fünf Wochen.



RAUTER Fertigteilbau GmbH.

Contact Wolfgang Rauter
Address Niederwölz 71
8831 Niederwölz, Austria
Phone +43 3582 8534
Email w.rauter@rauter.at
Website www.rauter.at



Our factory for precast concrete elements is located in Niederwölz/Styria (Austria).

During almost 60 years of development and taking into account the geographical location, the company has specialized in the production and, if required, the mounting of precast concrete elements and precast specialities (architectural precast) for all kinds of building and civil engineering projects.

The size of the company's premises is 35.000 m² with a total of 10.825 m² of factory buildings. The yearly turnover is around 10 million EUR, generated by an average of 90 employees.

The production facility consists of four factory buildings where all-season production in high quality is fabricated. A single element may weigh up to 32 t and have a length of up to 28 m.

500 m² of tilting tables are available for the production of slab shaped elements as well as 100 running meters of a steel formwork for the production of bar shaped parts.

Many different options regarding surface finishing and colouring are available.

Our wood shaper, with 5-axis technology allows precise and economic production of wooden moulds. You find selected examples of precast elements produced with such moulds on our web page.

The versatile and customized possibilities of the precast production allow fabrication at short notice and with on time delivery.

Our team of experts and sales representatives are always ready to develop the best technical and economical solution for our customers.



Skywalk - glass-steel bridge, Vienna

Short Description

The Skywalk - emerging as winning project out of a two-step architectural competition is an enclosed glass-steel bridge.

The three-part bridge consists of concrete foundations with reinforced concrete columns, a steel structure and a glass enclosure. The bridge is 4.5 m wide, 11 m high and more than 120 m long, with a part of 10.5 m crossing through the pillar of the old city-rail viaduct.

The bridge crossing the Heiligenstädterstrasse provides a barrier-free connection between the Guneschgasse in the 19th district of Vienna and the station building Spittelau of the underground line U6/U4 in the 9th district.

Project Information

Owner: Stadt Wien
Architect: Bulant & Wailzer
General Contractor: Porr Projekt und Hochbau AG
Engineering Office: n/a

Construction Start: 01/07/2006
Construction End: 30/08/2007
Location: Vienna, Austria



Bridge for pedestrians and cyclists

The Skywalk – emerging as winning project out of a two-step architectural competition is an enclosed glass-steel bridge.

The three-part bridge consists of concrete foundations with reinforced concrete columns, a steel structure and a glass enclosure. The bridge is 4.5 m wide, 11 m high and more than 120 m long, with a part of 10.5 m crossing through the pillar of the old city-rail viaduct.

The bridge crossing the Heiligenstädterstrasse provides a barrier-free connection between the Guneschgasse in the 19th district of Vienna and the station building Spittelau of the underground line U6/ U4 in the 9th district.

Not only did this connection bring benefits to the users of public transport facilities, due to the structural

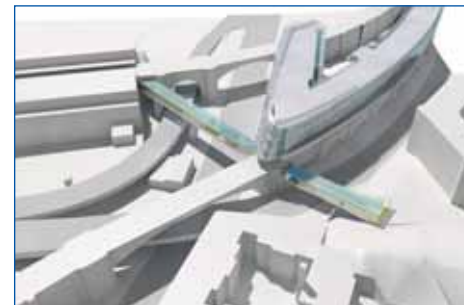
separation from the station building the bridge can be used around the clock by pedestrians and cyclists.

The bridge is reacting to this by changing its height and it's wideness in accordance of the necessary height over the crossing streets and the elements with them it is connected.

The bridge is completely glazed and naturally ventilated, as protection against different weather circumstances. The space is characterised by the elliptical steel frames of the supporting construction similar to a pergola.

The concept is strictly formed by 3 horizontal elements the concrete columns, the main construction in steel beams and the glazing, getting lighter to the sky. The interior space has a dynamic shape.

The main form was developed to be able to cross different other streets with the minimum headroom,



Used software: Allplan Precast

by keeping necessary ramps of the floor useful also for handicapped people. The government of the municipality of Vienna sees in this project one of the important steps to support and promote the circulation in the city for pedestrians and bicyclists and to reduce the motorized traffic and its harmful pollutions.

The mould for the sophisticated structure of the columns was a new challenge for our team. At first glance the architectural drawings (elevations and sections) did not clearly show the actual shape of the columns.

The column, composed of triangular surfaces revealed its optical and volume related properties only after a model had been produced by the CAD-design department.

All data, derived from the 3-dimensional model was subsequently important information for the preparation of the offer.

Dimensions of column

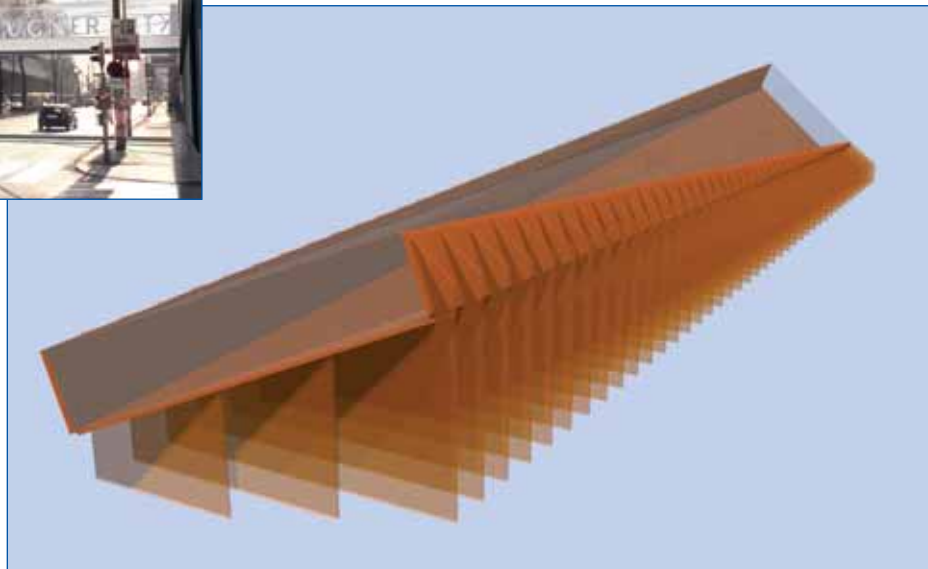
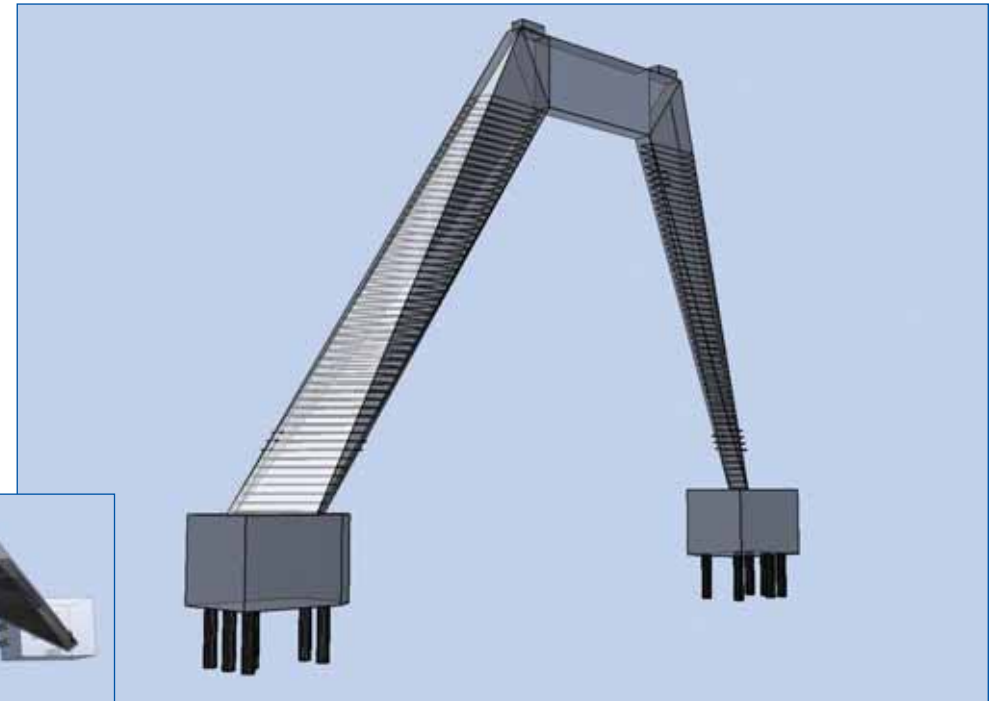
- Length: 13 m
- Cross section: 2.3 x 1.5 m
- Weight: 22 t

The two columns consist of around 3 metric tons of reinforcing steel and 18 m³ concrete.

The transport was performed on time with company owned trucks over a distance of 233 km to Vienna. Due to the local traffic situation, the mounting of the columns had to be managed in a fixed time frame between 10 p.m. and 6 a.m.

Even though similar works had been carried out many times before by our team, it was additionally challenging since the whole operation took place during night hours. Long before traffic started again, our high-quality work was completed on time.

Skywalk - glass-steel bridge, Vienna



Systembau Eder GmbH & Co KG

Contact Thomas Gföllner
Address Bruck 39
4722 Peuerbach, Austria
Phone +43 7276/2415
Email t.gfoellner@eder.co.at
Website www.eder.co.at



Zukunft Bauen.
EDER

Firmengruppe im Detail

Seit mehr als 70 Jahren gehört das Ziegelbrennen zum Kerngeschäft des in Bruck bei Peuerbach (Oberösterreich) ansässigen Unternehmens. Die Firmengruppe Eder umfasst neben den Ziegelwerken in Peuerbach und Weibern vier Transportbetonwerke in Oberösterreich, die Systembau Eder mit Fertiggellern, Fertigtreppen sowie konstruktiven Betonbauteilen und Hohlwandssystemen für den industriellen Hochbau sowie einen eigenen Fuhrpark. Das Liefergebiet umfasst Oberösterreich, Salzburg sowie das angrenzende Niederösterreich und Wien.

Im Ausland ist Eder mit einem modernen Ziegelwerk in Freital bei Dresden (D) und mit einem Werk für Stürze und Ziegeldecken in der Nähe von Budweis (CZ) präsent. Das Unternehmen ist zu 100% im Besitz der Familie Eder und beschäftigt rund 200 Mitarbeiterinnen und Mitarbeiter in Österreich sowie weitere 50 im Ausland.

Die Geschäftsführung liegt bei den Brüdern Dipl.-Ing. F. Josef Eder, Mag. Johannes Eder und DI (FH) Walter Eder.

Firmenchronik, Geschichte

1897 wurde mit der Gründung der Ziegelei in Bruck der Grundstein für die Firma Eder gelegt.

Die Eltern der heutigen Seniorchefin pachteten 1938 die Ziegelei Bruck, die damals auf eine Produktion für ca. 50 Häuser ausgelegt war und erwarben sie später. Mit dem Eintritt von Dipl.-Ing. F. Josef Eder in das elterliche Unternehmen wird 1989 die Systembau

Eder GmbH mit der Produktion von Fertiggellern und Fertigtreppen gegründet.

Dem gestiegenen Personalaufwand der Systembau wird mit einem Büroanbau 2003 in Peuerbach Rechnung getragen und 2005 geht eine neue Produktionshalle für Fertigtreppen und Sonderfertigteile in Neumarkt-Kallham in Betrieb.

Zum jetzigen Zeitpunkt beschäftigt die Unternehmensgruppe Systembau Eder 100 Mitarbeiter.

Philosophie

Die Brüder Eder sind darauf bedacht unter Nutzung der modernsten Anlagentechnik eine effiziente, umweltverträgliche Produktion zu garantieren. Durch eine laufende Weiterentwicklung sollen Baustoffe der höchsten Qualität in Verbindung mit dem besten Service angeboten werden.

Weiters wird ein hoher Anspruch auf die Qualität der Planung und Ausführung gelegt.



Renovation of the historic "Steyrdurchbruch" bridge

Short Description

The project regards the renovation of the 100 year old bridge "Steyrdurchbruch", which leads to a powerplant. In 2008, the project won the first prize of the Upper-Austrian Historic Buildings Council. The bridge needed renovation because of technical needs and for the imminent centennial celebration. The conditions for the reconstruction of the pillars at the ends of the bridge, the ornament panels and columns have been re-created, as authentic as possible, in precast concrete parts. The surface processing in relation to the former "Steinputztechnologie" concrete and specific design elements took place under the strictest standard of the Monument Protection Authority. This project clearly demonstrates which possibilities in terms of precast planning and execution exist and that the company Systembau Eder converts them at the highest technical level in all areas.

Project Information

Owner: Energie AG Oberösterreich
Architect: Mauriz Balzarek
General Contractor: Alpine Bau
Engineering Office: Leonardino

Construction Start: 01/03/2007
Construction End: 01/06/2008
Location: Kraftwerk Steyrdurchbruch,
Molln, OÖ, Österreich



Sanierung der Straßenbrücke zum Kraftwerk mit Lichtsäulen (Kandelaber), Pfeilern und Ornamenttafeln. 2008 hat dieses Projekt den oberösterreichischen Landespreis für Denkmalpflege gewonnen.

Auf Grund verschiedener Erhaltungsarbeiten (oberflächliche Ausbesserungen ohne Berücksichtigung der Steinputzbearbeitungsstrukturen wie Stocken und Scharrieren) sowie Beschädigungen durch Lastkraftwagen und verschiedenster Umbau- und Erweiterungsarbeiten

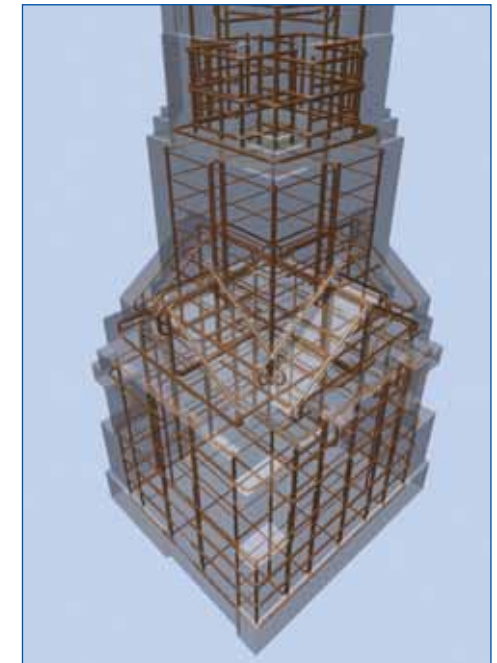
Geschichte

Die Kraftwerksanlage wurde auf Grund der möglichen Energiegewinnung durch Wasserkraft (anstatt Holz und Kohle) im Jahre 1908 fertig gestellt. Geplant wurde die Anlage von dem Otto Wagner Schüler Mauriz Balzarek. Bei der Ausgestaltung der Brücke spielte Steinputz (Aufbringen als hydraulischer Mörtel bzw. steinmetzmäßige Bearbeitung nach dem Erhärten) wie bei vielen Bauwerken dieser Zeit eine charakteristische Rolle.

Der Hauptabnehmer für den Strom bzw. Eigentümer dieses Baus war die Fa. Portland Cementwerk Kirchdorf Hofmann & Comp. 1977 wurde das Kraftwerk von der Energie AG (vormals OKA) übernommen.

Grund der Sanierung, Details

Die anstehende Jubiläumsfeier zum 100-jährigen Bestehen war Anlass für eine umfassende Sanierung der Brücke.



Used software: Allplan Precast

wurde der Originalzustand in seiner optischen Erscheinung verändert. Die Sanierung einiger Bauteile war auf Grund des Bauzustandes nicht mehr möglich und erforderte eine Neuerrichtung.

Die betreffenden Lichtsäulen, Ornamenttafeln (mit Jahreszahl) und Pfeiler wurden werkseitig in Fertigteil-Bauweise nachgebildet und auf der Baustelle montiert. Die ornamental gestalteten Betonbrüstungen wurden vor Ort saniert.

Zur Ausführung kamen 4 Lichtsäulen mit Ornamenttafeln, die aus jeweils 5 Fertigteilen (Abdeckplatte, Säule, Grundkörper, Brüstungskörper, Ornamenttafel) zusammengesetzt wurden. Diese wurden auf der Baustelle untereinander bzw. mit der Brücke kraftschlüssig verbunden, bzw. die Montagefugen geschlossen. Weiters wurden 5 Pfeiler hergestellt und montiert.

Diese neuen Fertigteile wurden zwischen den vorhandenen Betonbrüstungen mit äußerst geringer vertikaler und horizontaler Montageluft versetzt.

Bedeutung des Projektes, Besonderheiten

Die Herausforderung bzw. Schwierigkeiten spezifisch für dieses Projekt waren:

1. Denkmalsgeschütztes historisches Bauwerk
2. Spezielle Sichtbeton-Anforderung
3. Oberflächenbearbeitung der Fertigteile in Hinblick auf die damalige Steinputztechnologie bzw. der Architektur von Steinputz
4. Anforderungen an die Oberflächenbearbeitung wie bei einem Steinmetz, Bildhauer, Stukkateur (Stocken, Scharrieren, glatte Oberflächen an den Rändern, Sandstrahlen...)
5. Anspruchsvoller Schalungsbau
6. Montage

Unter diesen Umständen bzw. der sehr hohen gestellten Anforderungen in allen Bereichen wurde dieses Projekt bereits im Vorfeld für unsere Mitbewerber uninteressant.

Arbeitsablauf

Da für dieses Projekt keine Bestandspläne vorhanden waren, wurde nach dem Abtragen der zu ersetzenden Säulen, Pfeiler und Ornamenttafeln auf der Baustelle bzw. im Fertigteilwerk Naturmaßnahmen durchgeführt.

Speziell die Jahreszahl musste exakt (1:1) in das Zeichenprogramm übernommen werden.

Für eine für den Bauherrn optimale Darstellung des Projektes wurden sämtliche Fertigteile in 3D gezeichnet und ebenso planlich dargestellt. Die Aufträge wurden mit der CAD-Software der Firma Nemetschek, Version Allplan 2005 bzw. Allplan Precast 2008 bearbeitet.

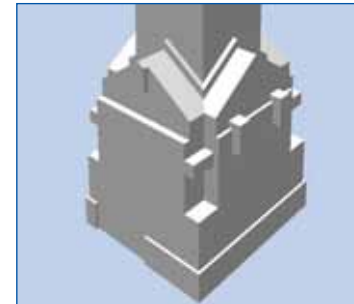
Die Schalung einiger Fertigteile musste mittels CNC-gefräster Negativschalungen hergestellt werden. Die Oberflächenbearbeitung der Fertigteile erfolgte unter strengster Vorgabe des Denkmalschutzamtes und wurde zu vollster Zufriedenheit unseres Kunden durchgeführt.

Da keine sichtbaren Montagehilfen (Anker, Hülisen) gestattet waren, wurden die Fertigteile zum Teil mittels Vakuumtechnik montiert.

Schlussfolgerung

Dieses Projekt zeigt deutlich, welche Möglichkeiten im Fertigteilbau hinsichtlich 3D-Planung, Schalung, Montage, Oberflächenbearbeitung bzw. Sichtbetonbauweise bestehen bzw. bei der Firma Systembau Eder auf höchstem technischen Niveau in allen Bereichen umgesetzt werden.

100 Jahre Steyrdurchbruch; Sanierung Brücke, Austria



Witteveen+Bos / TCE

Contact Jeroen Reessink
Address Postbus 186
8440 AD Heerenveen, Netherlands

Phone +31 513 64 18 30
Email jreessink@hotmail.com
Website www.witteveenbos.nl



Witteveen+Bos and DE-Consult: together TCE. Two independent engineering companies have joined forces for railway infrastructure project under the name Transport Consultants and Engineers (TCE).

Witteveen+Bos is leading in the Netherlands in the areas infrastructure, water, construction and the environment and as a Dutch company understands the particular characteristics of the Dutch country. The German DE-Consult is best known as a specialist in railway infrastructure, with extensive international expertise in the areas of track design and railway operation. TCE is recognized by ProRail and is authorized to carry out track related design work for track and above ground structures, safety, traction and power facilities (overhead wires) and concrete and steel constructions.

TCE offers a complete railway infrastructure service package for integral projects. Our specialist, with their experience, technical know-how and expertise, are capable of the professional management of a complex railway infrastructure project from the first concept to the commissioning of the system.

Complete package of services

With its expertise and years of experience in the development of rail, tram, metro and regional transport and its knowledge of local town and district transport, TCE is capable of developing a tailor-made transport system for any client.

Project teams

TCE's project teams involve closely cooperating specialists in various rail-oriented disciplines, reinforced where necessary with other specialists from Witteveen+Bos and DE-consult. Our approach

focuses on short lines of communication with the client, flexible working methods and open communication. Working in small teams makes us an attractive employer and provides plenty of opportunity for personal development. As a well willing cooperating company TCE has proved to be an outstanding partner for contractors to realize competitive projects.

High-profile projects

- The railway zone in Delft.
- The Heart of Dieren, where the existing railway line and secondary road running next to it were laid in a sunken trough and tunnel respectively.
- Extension of the railway track between Utrecht and Vleuten (VLARK). TCE worked as a designing partner for contractor Van Hattum & Blankevoort.
- Prior to the commissioning of the IJzeren Rijn (Iron Rhine), TCE handled the route memorandum / the environmental impact assessment and the preparation of the finalised route plan.



Railway Underpass Klinker Hoogezand-Sappemeer

Short Description

The project regards an underpass of a width of 20 metres, giving place to a road track, a bicycle track and a pavement. The railway underpass was constructed to open up the newly built quarter Vosholen and to create a non-conflicting crossing. The tunnel consists of a hundred meters long ramp with a viaduct for an overhead road and a railway viaduct for two rail tracks. In short, for this project Allplan Engineering again proved his benefits. With almost the same effort as with 2D designing we created clear, intelligent and faultless communication documents. These visualizations, drawings, list of amounts and bending schedules have also lead to the success of the whole project.

Project Information

Owner: ProRail / Gemeente Hoogezand-Sappemeer
Architect: Gemeente Hoogezand-Sappemeer
General Contractor: BAM Civiel Noordoost
Engineering Office: TCE

Construction Start: 01/09/2007
Construction End: 01/11/2008
Location: Hoogezand-Sappemeer, Netherlands



Figures

- Concrete: 1750 m³
- Reinforcement: 240.000 kg
- Weight of the railway viaduct (which has been shifted): 740.000 kg

Introduction

To open up the newly built quarter Vosholen and to create a non-conflicting crossing, the local authority of Hoogezand-Sappemeer has decided to construct a railway underpass. The project has been put in the market by a Design&Construct contract and has been acquired in February 2007 by contractor BAM Civiel Noordoost. The contractor asked TCE to design the railway underpass. The tunnel consists of a hundred meters long ramp with a viaduct for an overhead road and a railway viaduct for two rail tracks. The railway traffic has been taken out of service for a weekend to shift the railway viaduct into the final position. In October 2008 the underpass has been opened.



Construction

Railway viaduct

The railway viaduct consists of a concrete construction with a foundation of round steel piles filled with concrete (tubex). The rails have been glued into the special gutters, which have been made into the concrete deck. By choosing for the principle of lining the rails, instead of the standard construction with a base of ballast, the total construction height is reduced to a minimum. Reverse aspect of this solution is the need for a special transfer construction between the relatively flexible rail track on the ballast bed, before and after the railway viaduct, and the rigid construction on the bridge. Through double transfer slabs a reliable and safe construction has been created.

Underpass

The width of the underpass is about 20 metres and gives place to a road track, bicycle track and a pavement. The foundation of the construction consists of precast concrete piles. Concrete walls provided with a longitudinal bar create the vertical ground shoring at the entrance ramps. This longitudinal bar forms a whole with the bars on the sheet pile walls downstream at the deep underpass segment. A gabion construction at the west side and a grass slope at the east side create an underpass with natural image.

Designing with Allplan Engineering

Yet in the first tender stadium the designers of TCE used the force of the Allplan software. To make a valid proposition the initiator required a visualisation of the underpass. In a short time the underpass has been designed for a visualisation. Not only the rendered product turned out to be very valuable, even the simplified model has been clarified a lot of difficult details. So some risks are reduced in an early stadium.

Like in previous projects has been expired, 3D designing creates a lot of benefits in several stages and for various users: from initiative to build phase, for politicians and bar benders.

3D designing decreases the distance between design and construction. An important benefit of a Design&Construct contract is the one to one relationship with the contractor. Arrangements for form and reinforcement solutions were made before starting the detail phase, like the segmentation of curves, bar lengths and forms. First of all difficult corners were made obvious and after that submitted to the contractor. Together we created a sober and effective solution. The drawings for the concrete formwork are provided with an isometric view, which results in a drawing that is more 'alive'.

No contractor wants irritating surprises at any moment, but certainly not in an out of service period. Before this period the contractor has to make a very accurate planning and he has to correspond this with the initiator. Unfortunately, design failures cause a lot of stagnation and irritation on the building scene. To reduce the risk of derailment the tolerances for gluing the rails into the concrete are very small. Reasons enough to design with care and choose for 3D engineering software. The 3D model was also sent to the shifting-contractor Freyssinet. To calculate the amount of concrete and thus the weight of the construction is just one press on the button.

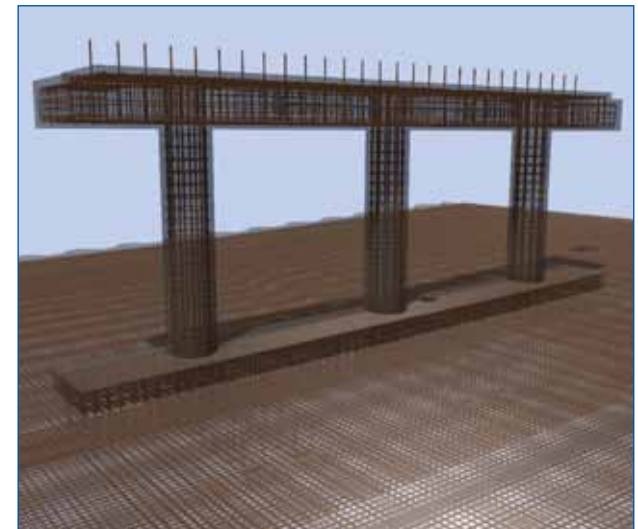
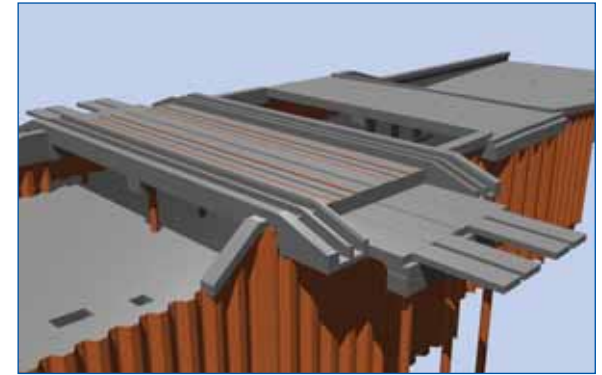
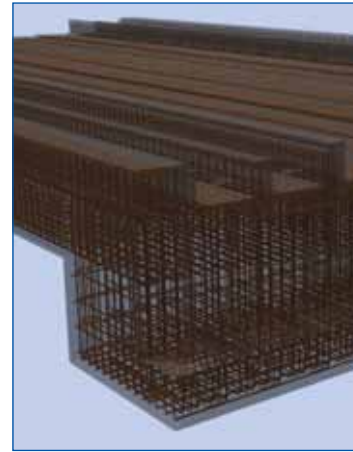
TCE has used the Allplan software to design the reinforcement. Complex forms were made clear to anybody with a 3D visualisation and amounts can be easily showed and put in lists. For this project we did not use a direct controllable connecting with the bending machine, because it was not recorded in the contract. Anyway, the bending schedule on the drawing did create a lot of benefits. It was used as a control document, it is easier to compare different proposals (filter at diameter, bending shape, etc...) and the waiting time at the bend-

ing factories reduces, because the bending schedule is already present.

There are less negative experiences with 3D designing. Habituation is the most important one; the step from 2D to 3D thinking can be experienced as difficult, but it is even a very exciting step. Another disadvantage is the time that takes to complete the first drawing, which often is a very important milestone. But, as soon as the 3D model has been finished, drawings can be extracted easily and very fast. An enormous benefit is that the cross sections and the views match and that they are intelligent among themselves.

In short, for this project Allplan Engineering again proved his benefits. With almost the same effort as with 2D designing we create clear, intelligent and faultless communication documents. These visualizations, drawings, list of amounts and bending schedules have also lead to the success of the whole project.

Railway Underpass Klinker Hoogezand-Sappemeer



Witteveen+Bos

Contact Sander ten Pas
Address Leeuwenbrug 8
7411 TJ Deventer, Netherlands
Phone +31 570 69 77 69
Email pass@witteveenbos.nl
Website www.witteveenbos.nl



Witteveen+Bos provides consultancy and engineering services for projects in the following areas: water, infrastructure, environment and economics. A multidisciplinary project approach characterises our way of working. Our clients are governmental, commercial, and industrial, including various types of joint ventures and public private partnerships. We serve them from eight offices in the Netherlands and four offices abroad.

For our 750 employees partnership is the key word: partnership with their clients and with Witteveen+Bos. Personal development is also a key issue because our work constantly demands new expertise and new responsibilities. Accountability to our clients is important to us. Our employees (at the same time our shareholders) share this sense of responsibility.

High-profile projects

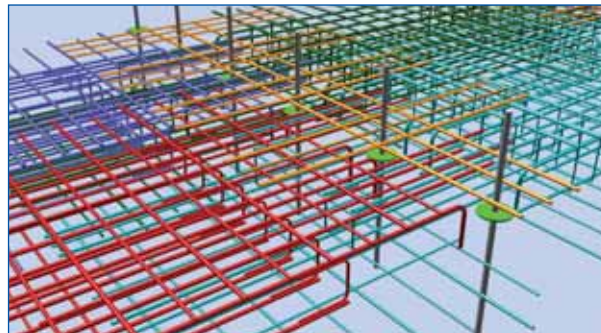
Examples of high-profile projects where Witteveen+Bos has been involved are the north-south metro line in Amsterdam, the development of man-made islands for oil and gas winning in

the Caspian Sea, a 350 hectare land-reclamation project in Sochi, an island in the shape of Russian Federation, known as Federation Island, the Amsterdam-west sewage water purification project, construction of the Delft railway tunnel, development of systems to allow the passage of fish alive at pumping-stations, the master plan for the centre of Amsterdam International Airport, various large and divers contracts in Central and Eastern Europe and a large number of projects in the Netherlands and abroad.

Innovation

Innovation in projects has been one of the most important foundations of the success of Witteveen+Bos.

A few examples of innovative developments are the social costs and benefits analysis, 'Chartered Dutch safety levels', 'Partners for Roads', UV water treatment in Andijk and Berenplaat, the decontamination of soil at railway yards and the first Reinforced Underwater Concrete Floor a permanent function.



Tunnel 'Ringvaart'

The project regards a tunnel consisting of two traffic tubes, separated by an emergency tube. Each traffic tube is provided with a two lane road. The sections are constructed in an open pit consisting of sheet pile walls and an underwater concrete floor. However this construction principle is well known as 'cut and cover', some innovations are applied as well. Instead of a traditional (temporary) underwater concrete floor, a reinforced underwater concrete slab is applied. This structure has a permanent function and will not be provided with a separate concrete slab on top of it. As a result of this construction method, construction time is shorter, the number of foundation piles is reduced by half and construction costs are lower.

Short Description

Project Information

Owner: n/a
Architect: m. Izendooren
General Contractor: Alliantie-N201
Engineering Office: Witteveen + Bos

Construction Start: 01/01/2007
Construction End: 01/01/2011
Location: Aalsmeer, Netherlands



Introduction

In the vicinity of the Dutch national airport 'Schiphol', local economic growth already leads to congestion of traffic on both highways as provincial roads. In the near future, the area will be used for further development as European 'Greenport', which will lead to further increase of traffic.

The present provincial road N201 crosses the villages Uithoorn and Aalsmeer. By the foreseen traffic growth, the road becomes increasingly a barrier for both villages. This is unacceptable, regarding the living conditions of the inhabitants. Therefore, the provincial road will be diverted around both villages, and be suited for future economic development.

In 2005, the Province 'Noord-Holland' launched a 'Design and Construct' tender for the mayor part of the project. It comprises 8 kilometres provincial road, several viaducts and a tunnel, length 1400 metres, crossing the drainage and shipping canal of the Haarlemmermeer-polder, in which Schiphol Airport is located.

Originally, Witteveen+Bos advised the contractor (Heijmans and Boskalis) for the tender design. Since the contract is awarded, the contractor and the client started an Alliance in order to optimise both process as design. From start, Witteveen+Bos is involved in the Alliance and provides design works for all construction stages of both tunnel, road works and viaducts.

Tunnel 'Ringvaart'

The tunnel consists of two traffic tubes, separated by an emergency tube. Each traffic tube is provided with a two lane road. Due to its covered length, safety installations such as ventilation equipment, camera surveillance and lighting will be installed. Also the tunnel will be equipped with an operating facility.

Presently, the northern part, crossing the canal, is completed. By the end of 2008, the navigation channel of the canal will be repositioned in order to build the southern part. The sections are constructed in an open pit consisting of sheet pile walls and an underwater concrete floor. However this construction principle is well known as 'cut and cover', some innovations are applied as well. Instead of a traditional (temporary) underwater concrete floor, a reinforced underwater concrete slab is applied. This structure has a permanent function and will not be provided with a separate concrete slab on top of it. As a result of this construction method, construction time is shorter, the number of foundation piles is reduced by half and construction costs are lower.

Reinforced Underwater Concrete Floor

Because of its permanent function, the underwater concrete floor will be reinforced. Therefore prefabricated reinforcement cages are installed at a maximum depth of 10 metres below the water surface. Together, the reinforcement cages provide

the slab with sufficient strength and durability to withstand all possible loads during its lifetime of 100 years. To assure optimal interaction, each reinforcement cage laps with its 'neighbour'.

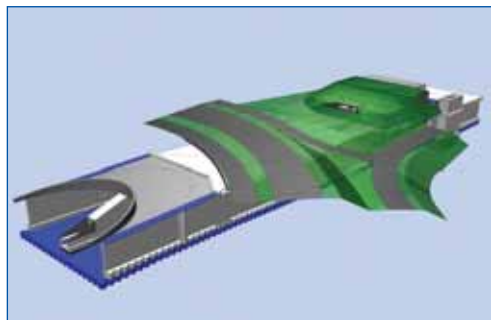
As a result of the construction method, it is important to provide room for several construction tolerances. The cages are installed on top of a steel frame, supported by sheet pile walls and tension piles. However this frame can be installed quite accurately, deviations such as the exact pile location (x,y), position of the reinforcement elements (x,y,z), excavation level (z) and concrete cover (z) must be taken into account.

Regarding the tolerances and the necessary interaction, all reinforcement elements must fit like a puzzle. In co-operation with the contractor (Heijmans-Boskalis), it is decided to use Allplan for both cage design, prefabricated production and to arrange the exact construction sequence. The manufacturer of the reinforcement cages is using the digital Allplan model as well.

By the end of 2008, three compartments, each 75 metres long, were successfully built. In 2009 another three compartments will be constructed.

Use of Allplan Engineering

The tunnel is located in the western part of the Netherlands. The landscape consists of several

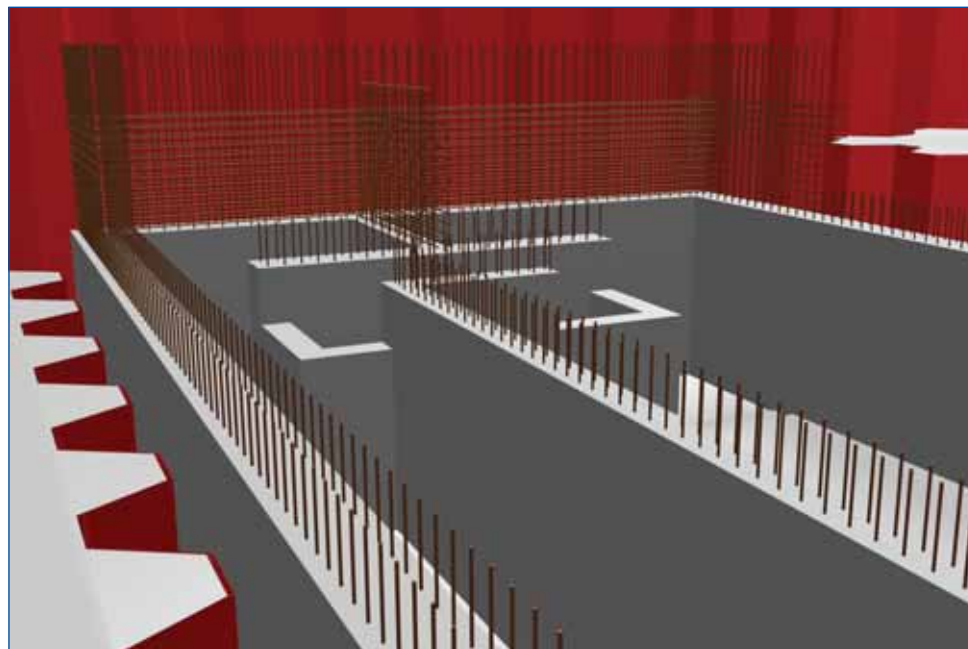


polders, about 4 metres below sea level. The tunnel crosses the drainage and shipping canal (Ringvaart) of the Haarlemmermeerpolder, which has a water level almost equal to sea level. Also, the tunnel connects the Haarlemmermeerpolder with an adjacent polder. Because of these important preconditions the tunnel acts as a water barrier during its lifetime and also during construction.

To ensure its water-retaining function, the design of the tunnel has to be checked for all types of contingencies, especially during construction. By designing the tunnel in Allplan 3D, it was relatively easy to find all possible leaks and adjustments of the design could be applied efficiently. All tunnelsections, 57 in total, the service buildings and the drainage sumps are added to the model. Also the 3D model of the roadworks is inserted in the Allplan model in order to check all interfaces with difficult roadcrossings (curved both horizontally and vertically). Finally, the reinforcement is added to the model and the construction-drawings are extracted. The digital model is also used by the reinforcement manufacturer for direct production of the reinforcement. As a result, mistakes by information transfer are being minimised.

Summary

- Total tunnel length: 1415 m
- Covered section: 800 m
- Open cut: 625 m
- Internal width: 20 m (2 x 9 + 1 x 1.35 service and safety gallery)
- Internal height: 6,1 m
- Number of drawings: 200 (general arrangement), 200 (reinforcement)



We would like to thank each participant for making this Nemetschek Engineering User Contest and impressive book possible.
Congratulations to all participants, being in this book is certainly a considerable and worthwhile achievement, offering you a unique opportunity to present your skills and know-how to an international public.

The Nemetschek Engineering Marketing Team

Nemetschek Engineering Group



Allplan Scia Frilo Glaser

All Nemetschek Engineering companies are assembled under an umbrella structure, named Nemetschek Engineering Group.

The participating companies and their product brands are: Nemetschek Allplan (Allplan Engineering), Nemetschek Engineering (Allplan Precast), Nemetschek Scia (Scia Engineer, Scia Steel), Nemetschek Frilo (Frilo Statics) and Glaser (Glaser -isb cad-).

The product portfolio covers solutions for engineering analysis and design, CAD modelling, precast automation and steel fabrication.

This is the 6th edition of the User Contest; this book gathers 122 competing projects with a project description and plenty of images to provide easy reference and illustration of the software use. The contest covers seven categories of projects, from the design of constructive elements up to the detailing of special structures in reinforced and prestressed concrete. In each category there is one winner and three nominees. In addition, the jury awarded an extra prize to a winner chosen from all the contestants. The participants are from a total of 14 countries, each participant could use his own language to describe the project with a summary in English.

We wish you great pleasure in reading the book.

Nemetschek Allplan

Konrad-Zuse-Platz 1 • D-81829 München

Tel: +49 89 92793-0 • Fax: +49 89 92793-5200

info@allplan.com • www.allplan.com

Nemetschek Engineering (Precast)

Stadionstrasse 6 • A-5071 Wals-Siezenheim

Tel: +43 662 854111 • Fax: +43 662 854111610

info@nemetschek-engineering.com • www.nemetschek-engineering.com

Nemetschek Scia

Industrieweg 1007 • B-3540 Herk-de-Stad

Tel: +32 13 55 17 75 • Fax: +32 13 55 41 75

info@scia-online.com • www.scia-online.com

Nemetschek Frilo

Stuttgarter Straße 36 • D-70469 Stuttgart

Tel: +49 711 81002-0 • Fax: +49 711 858020

info@frilo.de • www.frilo.de

GLASER -isb cad-

Am Waldwinkel 21 • D-30974 Wennigsen

Tel: +49 5105 5892-0 • Fax: +49 5105 82943

info@isbcad.de • www.isbcad.de