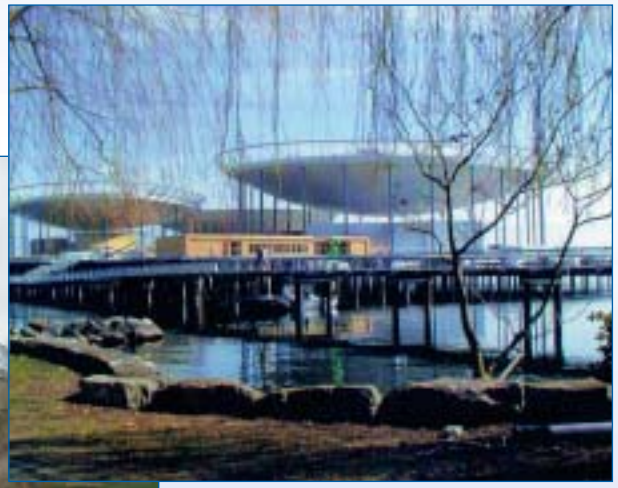
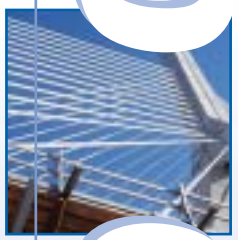
SCIA construction software

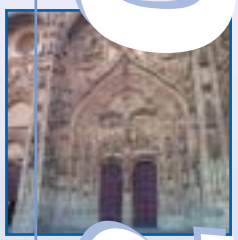
USER CONTEST
project book

2002

From Design to Realisation







SCIA construction software

USER CONTEST WINNERS

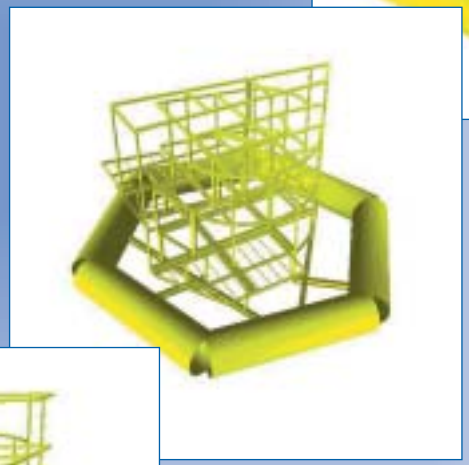
From Design to Realisation

WINNER

abt

What are the main activities of your company?

- Structural engineering
- Architectural engineering
- Civil engineering
- Construction management
- Installations



SCIA USER CONTEST 2002 WINNER

Living on water

ABT

consultancy for construction engineering
Arnhemsestraatweg 358
6881 NK Velp - The Netherlands
tel.: +31 (0)26 3683111
fax: +31 (0)26 3683110
www.abt-consult.nl
contact: R.W.S. Fielt
tel.: +31 (0)26 3683457
fax: +31(0)26 3683460
e-mail: r.field@abt-consult.nl

annual turnover: □16 700 000

number of employees: 200

Your Project

Technical data of the project

Project title:
Living on water
Physical Location:
Middelburg in the Province of Zeeland
Site owner:
WBU Walcherese Bouw Unie
Architect:
Architectuurstudio Herman Hertzberger
Engineering office:
ABT Adviesbureau voor Bouwtechniek te Velp
General contractor:
WBU Walcherese Bouw Unie
Location:
Middelburg in the of Province of Zeeland
Total weight of the steel structure:
+/- 75000 kg
Dimensions:
+/- 20 x 20 x 11 meter
Building costs:
+/- 450000 Euro
Building period:
2000

Short description of the project

Architectural design

The idea was to build in the Netherlands - land of water - houses on water. Just like the houseboats, but larger. The design of this house floating on the water is from architect Herman Hertzberger.
His first design was made in 1986 and thereafter developed till a villa with three levels. The location is Middelburg in the Province of Zeeland.

To make the house floating, it is placed on large pipes with a diameter of 2,2 meter and a wall thickness of 18 mm. These pipes are connected together to form a shape of a hexagon. On this hexagon, a frame of steel beams is connected to form a platform for the house. To reduce loading the house is made of a light steel structure with wooden floors and walls. The bridge to the wall is used to fix the house in position.

Structural aspects

The first idea from the architect was to make a triangle of pipes to float the house. But to stabilize the construction on the water, it was necessary to design a more equal form. This leads us to the hexagon.

The problem was to calculate the deformations while floating on the water. For that purpose the construction was based on springs. It is not only the horizontal and vertical deformation, but also the rotation, which is important, because of capsizing of the whole construction. That was the reason to use Esa-Prima-Win for three-dimensional structures.

After putting the whole structure in the computer is was easy to calculate deformations, rotations etc. in each loading situation. Also it was easy to use the output to calculate the Eigen Frequency.

Use of ESA-Prima Win

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

The problem was to calculate the deformations while floating on the water. For that purpose the construction was based on springs. It is not only the horizontal and vertical deformation, but also the rotation, which is important, because of capsizing of the whole construction.

A description of your experience with ESA-Prima Win when realising the project:

Using ESA-Prima Win gives us the opportunity to analyze the structure to find the deformations to calculate Eigen Frequency.

Modules used:

- Base
- 2D frame
- 2D grid
- Dynamic document.

Motivation of the jury

Technical level of the design & the calculations:
A good and & detailed analysis, for the calculation of the deformations while floating on water the construction was based on spring foundation.

Originality and prestige:
An uncommon and innovative project but ready for mass production?

Attractive & complete presentation:
Clear and concise presentation with all info needed & clear images.

Optimal use of the functionalities:
Appropriate use of the modules.

WINNER

What are the main activities of our company?

Civil engineering: all about static and construction

Your project:

Short description of the project:

Project title:
Max Planck Institute for Evolutionary Anthropology
Primate Research Center
"Primates house"

Physical Location:
Zoo Leipzig / Germany

Site owner:
Zoologischer Garten Leipzig

Architect:
Herbert Kochta BDA, Munich

Heating, air conditioning:
Bergbauer Ingenieure, Germering

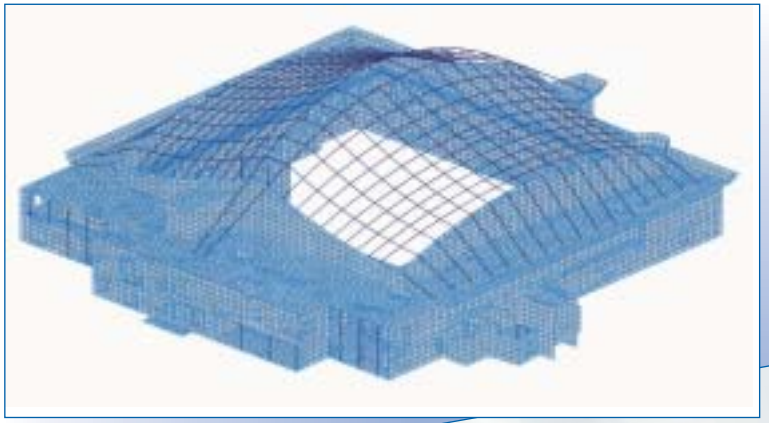
Electrical engineering:
Hildebrand + Hau, Muenchen/Dresden

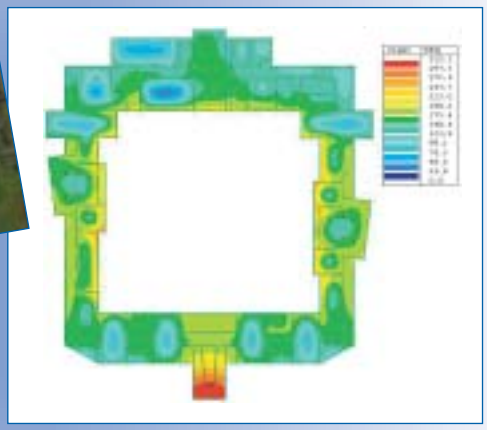
Civil engineering:
Ingenieurbuero Herrschmann GmbH & Co. KG, Munich

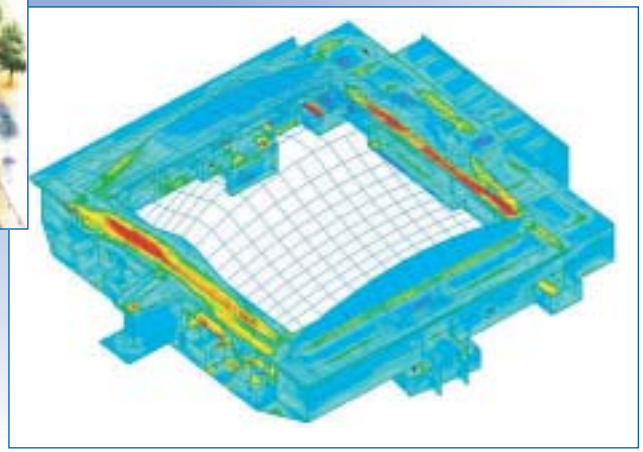
Max Planck "Primate Research Center"

Ingenieurbüro Herrschmann GmbH & Co. KG
Landsberger Strasse. 320
80687 Munich
Germany
tel: +49 (0)89 64.24.21 - 0
fax: +49 (0)89 64.24.21-31
http://www.herrschmann.de
contact: Sebastian Baumann
e-mail: Statik@herrschmann.de

annual turnover: □1 800 000 number of employees: 20







Supervision:
Ingenieurbuero Dieter Zinner & Sohn, Krailling
Building contractor:
Moll and STRABAG
Length/ width/height:
55 x 58 x 9,0 m (rectangular hall 42,0 x 42,0 m)
Volume:
33827 m³
Costs:
~ 14 million Euro
Time of erection:
1999 - 2000
Mass:
8459 t concrete, 47,2 t steel
Shape oh the roof:
two halves of a hyperbolic saddle-paraboloid
Roof coverage:
30 air pneus, ETFE-sheets (something like Teflon)
Materials:
concrete B25 and B35 (DIN 1045-1988)
steel St 37-2, St 37-3 and St 52-3 (DIN 17100)
Spiral strand 1 x 37 (DIN 3054), Ø17 mm, stainless steel
Fire resistance:
90 min. for the concrete, 0 min. for the roof
Foundation:
Sand soil with a very aggressive ground water a soil stabilisation with the CSV-method was needed

Why is this project important?

The project is a co-operation of the Max-Planck-Society and the Zoo Leipzig. The Max-Planck-Society established an institute for evolutionary anthropology and Prof. Dr. Tomasello from the USA was agree to lead the institute, if the primates house is accomplished until the year 2000. So the schedule of planning was really brief. Only because of the software, it was possible to consider the modifications from the architect during the planning.

Why is this project so special?

The Primates house Leipzig is the largest house for monkeys of the world. It is a tropical house with a natural airing. The house has a rectangular hall without any columns. It is the first monkey house where specially the scientists and the visitors can watch 60 monkeys (chimpanzee A, chimpanzee B, orang-utan, gorilla, bonobo) at the same time. The object of the draft was to create a building which has a natural look. So the building is put into the ground really deep and the upper part of the building is covered with a artificial rock.

Use of ESA-Prima Win

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

Because of the two steel arcs there is a very big horizontal force. And if you put the force only on the walls below, it is necessary to have some tension anchors for the foundation. But if you use the walls, the slabs and the torsional stiffness of the building, you will get an economic construction. To search for the really way of the stresses, there was a 3-dimensional finite elements structure necessary.

Description of our experience with ESA-Prima Win when realising the project:

Before we started the project we tested a lot of European and American finite elements software. But there was no program with which we can handle a really big structure and we can design the reinforcement according to DIN 1045-1988. All the other software was difficult to use or the different modules were not in one program. Only ESA-Prima Win works with a really good pre-processor and runs sturdy on the personal computer. We solved the calculation with the cholesky-solver (1st order and 2nd order) and there were no accumulation errors. And the difference between the sum of the loads and the sum of the reactions was very small.

Modules used:

- Base
- 3D Frame
- 3D Shell
- 2nd order Frame
- 2nd order FEM
- Physical non-linear conditions
- Steel Code Check (DIN 18800)
- RC Beams & Columns (DIN 1045)
- RC Plates & Shells (DIN 1045)

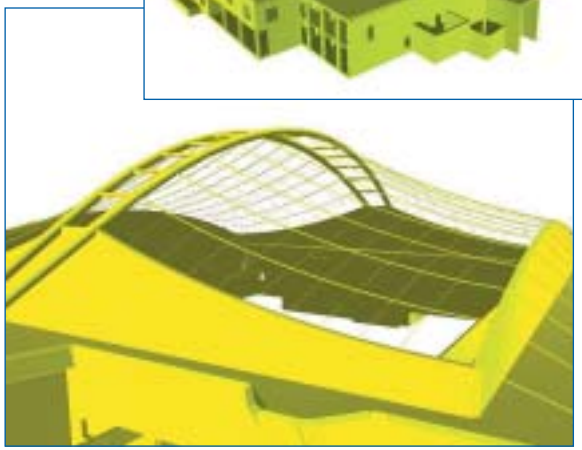
Motivation of the jury

Technical level of the design & the calculations:
Big reaction forces from the gigantic arch are "closed" by the surrounding ring.

Originality and prestige:
Realization of a natural environment for primates in a zoo with appropriate accommodation for animals, researchers & visitors.

Attractive & complete presentation:
All load cases explained, clear presentation of the occurring problems/difficulties.

Optimal use of the functionalities:
High tech & advanced use of software in a complex & large model, non-linear elements, 2nd order FEM calculation.



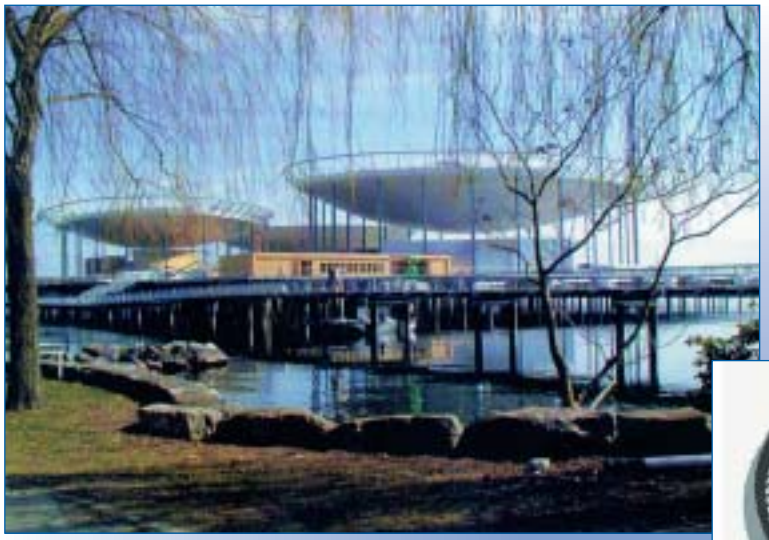
WINNER

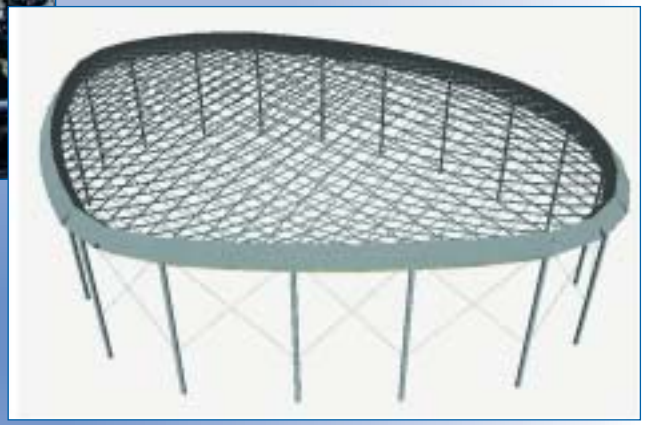
Votre Société

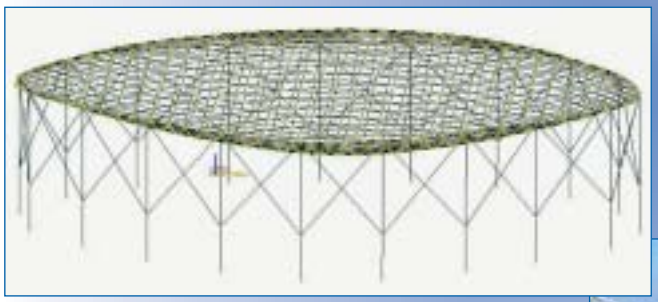
Société Holding basée à Lausanne, Filiales à Lausanne, Genève, Sion, Neuchâtel, Fribourg, Berne, Delémont, Paris, Lyon, Londres et bureau d'exécution à Alger
Assurance de la qualité: certification iso 9001 (1996)
Activités a l'étranger: conduite d'études et de projets dans plus de 35 pays

Spécialités

- Infrastructures et transports: 42 % (Tunnels ferroviaires et routiers, équipements électromécaniques et sécurité, voies de communication et ouvrages d'art.)
- Eau et environnement: 36 % (Stations d'épuration et assainissement, Audits environnementaux et sites contaminés, gestion et approvisionnement en eau potable.)
- Bâtiments complexes: 22 % (Centres d'enseignement et de recherches, Bâtiments industriels et administratifs, infrastructures hospitalières et hôtelières).







Expo.02 - Artéplage de Neuchâtel
Expertise du galet n°2

Bonnard & Gardel ingénieurs-conseils SA

BG

Avenue de Cour 61
CH-1007 Lausanne - Suisse
tel.: +41 (0)21 618.11.11
fax: +41 (0)21 618.11.22
http://www.bg-21.com/
Personne à contacter: Guido Roelfstra
e-mail: guido.roelfstra@bg-21.com

annual turnover: **CHF 32 900 000** number of employees: **180**

SCIA USER CONTEST 2002 WINNER

Votre projet:

Description du projet

Expo.02 est une exposition nationale qui se tient actuellement en Suisse durant l'été 2002. Les expositions sont réparties sur 4 sites différents. A Neuchâtel, 3 structures appelées "galets" ont été construits sur le lac.
Les galets sont des structures gonflables tendues sur un caisson métallique périphérique supporté par des piliers métalliques fondés sur des pieux. Le caisson de 1.8x2.4m repose sur 19 piliers ROR 470, espacés d'environ 10 m et contreventés par des croix métalliques. Vu en plan, le galet n°2 forme un "patatoïde" d'environ 70x55m

Le "ballon" est formé de 2 membranes d'1mm d'épaisseur (type IV) à l'intérieur desquelles est soufflé de l'air à l'aide de ventilateurs. Ceux-ci maintiennent en temps normal une pression intérieure de 250 Pa. En cas de fort vent, la pression monte automatiquement à 400 Pa pour augmenter la rigidité et la résistance. Deux systèmes de sécurité empêchent la pression de monter au-delà de 550 Pa.

Description du mandat BG

Pendant la construction des expositions, le galet n°2 s'est déchiré et BG a été mandaté comme expert pour déterminer la cause du sinistre et suivre les travaux de réparation.

Analyse des causes du sinistre

Il a très vite été évident que la membrane inférieure s'était déchirée au contact avec la tête d'un échafaudage qui avait été installé sous le galet.
Par contre, il est indiscutable que cet échafaudage fautif ne s'est pas déplacé vers la membrane. C'est donc la membrane qui s'est déplacée vers l'échafaudage.

Plusieurs hypothèses se sont présentées:
- contact lors du gonflage automatique de 250 à 400 Pa
- effet Venturi du vent entre la membrane et un des pavillons d'exposition qui forment une sorte d'entonnoir
- problème électromécanique et sur gonflage important

L'élément primordial de l'expertise était donc de voir:
- s'il y avait pu avoir contact entre la membrane et l'échafaudage à 400 Pa
- sinon, quelle pression intérieure est nécessaire pour établir ce contact, en fonction de la vitesse et de la direction du vent
- si un effet Venturi aurait pu attirer la membrane suffisamment vers l'échafaudage pour qu'il y ait contact
- quelle surpression était encore nécessaire, une fois le contact établi pour perforer la membrane.

Pour répondre à ces questions, nous avons utilisé ESA-Prima Win avec succès.

Utilisation de ESA-Prima Win

Nous avons utilisé 2 sortes de modèles:
- un modèle de câbles non-linéaires pour déterminer la déformation globale en fonction de la pression
- un modèle de membranes pour déterminer la surpression de poinçonnement

Modèle global

Etant donné la géométrie "patatoïde" et le comportement anisotrope des membranes, celles-ci ont été modélisées selon un réseau de câbles de rigidité EA, orientés selon les fibres du matériau (chaîne et trame).

La forme initiale des membranes a été calée sur les dimensions des plans de confection ainsi que sur les mesures initiales du géomètre. A partir de là, les déformations du ballon trouvées par calcul non-linéaire en grands déplacements. ESA-Prima Win s'est avéré très performant pour ce type de calcul complexe.
Sur base de calculs avec différentes pressions intérieures et différentes conditions de vent, nous avons pu dresser le tableau suivant et en tirer l'évolution de la distance entre la membrane et l'échafaudage fautif. Ces résultats de calculs ont pu être confirmés par des mesures de niveaux sur place après réparation du galet.
Il en ressort que pour le vent mesuré au moment du sinistre, la pression à l'intérieur du galet a du être supérieure à 1000 Pa pour qu'il y ait contact entre la membrane et l'échafaudage.
Nous avons ensuite vérifié l'effet d'un Venturi sur la déformation en augmentant la pression au-dessus du bâtiment formant "entonnoir". Il en est ressorti qu'il n'est pas possible d'imaginer un Venturi créant le contact, car lors du contact, les dépressions nécessaires correspondent à des vitesses d'air trop élevées qui, de plus, créeraient une surpression en sens inverse qui éloigneraient la membrane de l'échafaudage. Ces résultats ont également été confirmés par des mesures sur place après réparation du galet.

Modèle local

Afin de déterminer la surpression nécessaire à perforer la membrane, une fois le contact établi, nous avons modélisé la membrane ainsi que le tube de l'échafaudage incliné selon son orientation réelle par rapport à la membrane.
Un calcul non-linéaire nous a permis de déterminer qu'il fallait une surpression de 100 Pa pour perforer la membrane. La répartition des contraintes autour du tube de l'échafaudage ressemble parfaitement à la forme de la déchirure de la membrane observée sur place après le sinistre.

Conclusions

Etant donné l'aspect encore semi-confidentiel de l'expertise, nous n'entrerons pas en détail dans les conclusions des causes du sinistre, ce qui est de toute façon secondaire pour ce contest.

En résumé, ESA-Prima Win s'est avéré très efficace pour cette expertise et nous a permis de prouver la cause du sinistre. Les résultats des divers calculs non-linéaires se sont ensuite révélés précis lorsque plus tard, nous avons eu l'occasion de les comparer avec des mesures sur place effectuées sur le galet réparé.

Motivation of the jury

Technical level of the design & the calculations:
A combination of 2nd order membrane structure, non-linear cables & "Tension only" elements. Further a reconstruction of the load case that damaged the structure.

Originality and prestige:
Large inflatable load carrying structure.

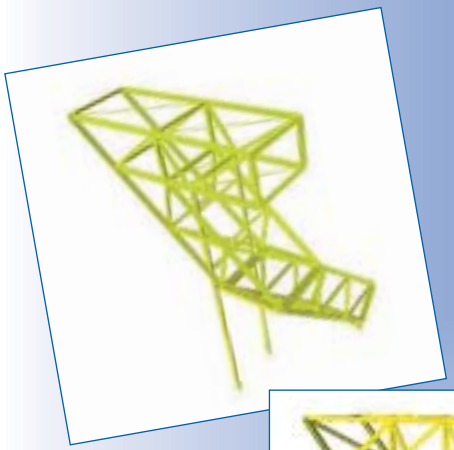
Attractive & complete presentation:
Clear and concise presentation with all info needed. A Concise report on a complicated technical problem.

Optimal use of the functionalities:
Correct & inventive use of the punching theory.

abt

What are the main activities of your company?

- Structural engineering
- Architectural engineering
- Civil engineering
- Construction management
- Installations



A periscope in Fochterloërveen

ABT

consultancy for construction engineering
Arnhemsestraatweg 358
6881 NK Velp - The Netherlands
tel: +31 (0)26 3683111
fax: +31 (0)26 3683110
www.abt-consult.nl
contact: G. Voorhoeve
e-mail: p.bulsink@abt-consult.nl
tel: +31 (0)26 3683457
fax: +31 (0)26 3683460

annual turnover: □16 700 000 number of employees: xxx

Your Project

Technical data of the project

Project title:
A periscope in Fochteloërveen.
Physical Location:
Fochteloërveen on the border of Province of Friesland & Drenthe.
Site owner:
Stichting Natuurmonumenten
Architect:
ir. D. de Haan
Engineering office:
ABT Adviesbureau voor Bouwtechniek te Velp.
General contractor:
Bouwbedrijf Doornenbal & Louwes te Appelscha.
Location:
Fochteloërveen on the border of Province of Friesland and Drenthe.
Total weight of the steel structure:
+/- 23000 kg.
Building costs:
+/- 230000 Euro.
Highest point:
+/- 17,5 meter.
Building period:
April 2000 - June 2000.

Short description of the project

Architectural design

In 1997 the foundation Natuurmonumenten decided to bring back the marshland of Fochterloo to its original state. The result is that the marsh is no longer accessible to visitors, so you can only look at it from the edge. For this reason one decided to build a tower.
In 1998 architect Dick de Haan († 1998) designed a tower with the shape of a big "7". A big periscope looking over the marsh. The lower part of the tower leans backwards to accentuate the shape of the trees. The upper part is like a telescope coming out of the woods. The bend in the leg turns over 90 degrees halfway, so it was necessary to place two large columns under the structure. To accentuate the periscope effect, the tower has been closed from the outside by wooden panels (Western Europe Softwood). And when you reach the top, the front of the periscope has a wall of glass to give the highest transparency. The highest point of the tower is about 17,5 meter. Not higher because the tower may not dominate the trees. When you are at the highest level, it gives you the feeling of looking over the marshland of Fochterloo like a hawk.

Structural aspects.

The idea was to build a structure with large prefabricated parts to avoid too much damage to the woods. For that reason the material that has been chosen is steel. So after making a concrete foundation, the tower can be build by placing big steel three-dimensional elements on top of each other. The wall has been built up with large wooden prefabricated panels, which can be attached to the steel structure after the erection. As mentioned the structure has been placed on a large concrete foundation block, which is supported by four prefabricated concrete piles.

The problem of this structure is the deformation. It is not only the horizontal and vertical deformation, but also the rotation, which is important, because of the slope of the median. That mainly was the reason to use ESA-Prima Win for three-dimensional structures. After the module "3D frame" the module "Steel Code Check (NEN 6770/6771)" was used, so it was easy to find out if the unity checks were OK.

After calculating the steel structure, the foundation block was calculated by using the module "2D plates" and the module "Analyse betonnen 2D elementen (NEN 6720)" to calculate the reinforcement. So it was easy to find out if and where a basic reinforcement was not enough.
To get a feeling on the deformation and rotations, different loading combinations were calculated. To calculate the rotations it was important to put the different levels of wind loads on different parts of the structure. Because the structure is like a hollow section, and torsion is a very big issue for the deformations, it was very important to design stiff frames on the most sensitive places of the structure. Using ESA-Prima Win gives us the opportunity to analyze the structure to find these sensitive places and after that to optimize the frames which are places in these locations.

Use of ESA-Prima Win

Description of the technical questions to be solved with ESA-Prima Win:
The structure is like a hollow section, and torsion is a very big issue for the deformations. So it was very important to design stiff frames on the most sensitive places of the structure.

A description of our experience with ESA-Prima Win when realising the project:

Using ESA-Prima Win gives us the opportunity to analyze the structure to find these sensitive places and after that to optimize the frames which are places in these locations.

Modules used:

- 3D frame
- Steel Code Check (NEN 6770/6771)
- 2D plates
- Reinforcement Design 2D elementen (NEN 6720)

What are the main activities of your company?

- Structural engineering
- Architectural engineering
- Civil engineering
- Construction management
- Installations

Your project

Technical data of the project

Length:
3 to 8 meters
Width:
3 to 8 meters
Height:
7 to 11 meters

The city of The Hague in the Netherlands gave the insurance company Aegon the opportunity to name a town square after themselves. The former Mariahoeve-plein, where the main office of the firm stands, now was renamed Aegonplein.

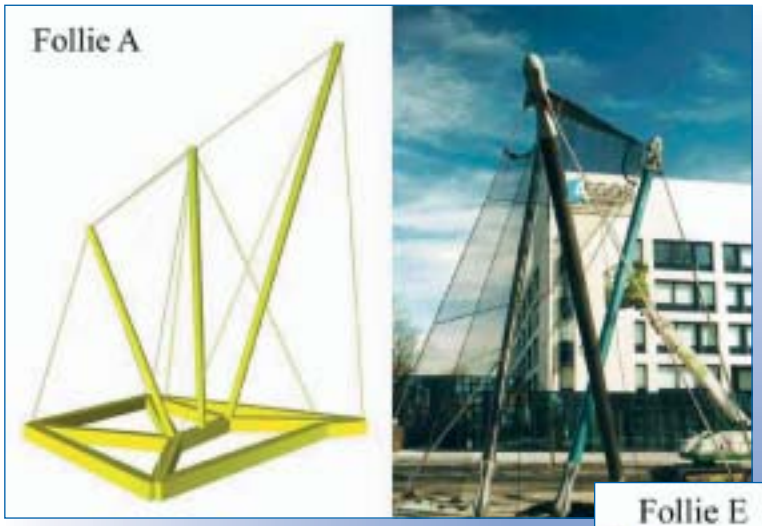
Follies Aegonplein

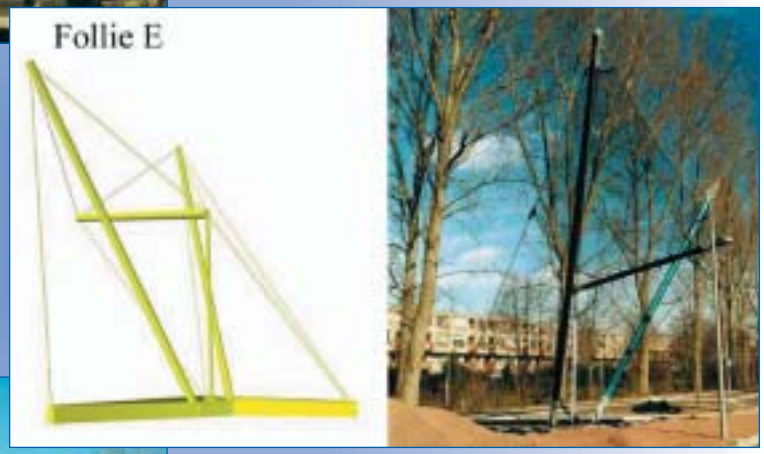
ABT

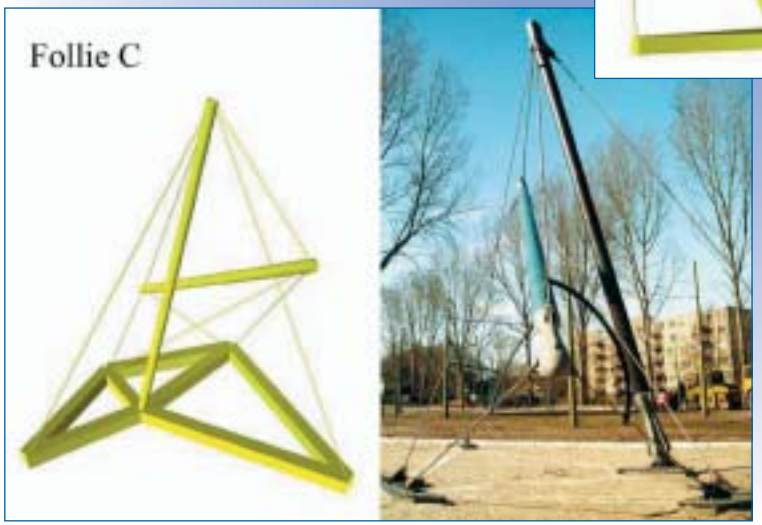
consultancy for construction engineering
Delftechpark 12
2600 AL Delft - The Netherlands
tel: +31 (0)15 2703650
fax: +31 (0)15 2703660
www.abt-consult.nl
contact: ir. R.H.G. Roijakkers
e-mail: r.roijakkers@abt-consult.nl
tel: +31 (0)15 2703675
fax: +31 (0)15 2703660

annual turnover: □16 700 000

number of employees: xxx







Aegon would in return participate in the renewing of the square. The landscape architects "West 8" from Rotterdam were asked to make a design for the town square. A part of their plan was to build six so-called "follies". These follies are large sails made out of gauze, stretched between steel cables and steel tubes. The gauze will be overgrown with vegetation in time.

The follies vary from a simple single mast with several stays to real tensegrity structures. A tensegrity can be described as an island of compression in a sea of tension. The element under compression (the tube) is held in place by cables. Each end of the tube must be secured by at least three cables under tension. The last word is very important: tension is needed to give the structure stiffness. Therefore the structure will have to be prestressed. If in a certain loadcase tension lacks in one of the cables, the tube end becomes instable. Some of the cables will lose there tension in some loadcases, but as long as three tensed cables on each tube end remain this is no problem for the structure. (The three tensed cables must also go in different directions: if one sees the tube from above, the cables must cover more than 180°).

Use of ESA-Prima Win

Technical questions in ESA-Prima Win:

The design process took quit some time. In this time several versions of ESA-Prima Win were used. The last version was 3.40. The gauze was not calculated, only the cables, the tubes and the foundation.

Some of the specific problems of calculating the follies are described below.

- The structure needs tension to function. This is not only valid for the real structure, but also for the calculation itself. If a structure is not stiff, the stiffness matrix will have a zero on the main diagonal. This means the equations cannot be solved. By introducing prestressing the zero on the main diagonal will be replaced by a value representing the initial strain in. This means the equations can be solved.
- The structure behaves non linear. With each (large) deformation the stiffness of the structure changes. With the Newton Rhapson procedure the stiffness matrix is recalculated after every iteration. This means that several iterations are necessary, each time with a slightly different stiffness matrix. The calculation is stopped when the structure reaches equilibrium. With some follies the load had to be applied in steps (increments), otherwise the deformations per iteration would become to great. The use of increments can help to keep the calculation stable.
- In some follies certain cables would lose there prestressing. As long as enough cables under tension per tube end remain this is no problem. The cable element is removed from the calculation when the element comes under compression.. If the cable is necessary for the stability of the structure, the calculation will stop. The structure is no longer stiff. This means that the level of prestressing has to be raised or that extra cables have to be added.
- With non-linear calculations superposing different load cases in post processing is not possible. The load is necessary to find the right equilibrium with the right structural stiffness. This means that non-linear load cases have to be made. The following loads were used: wind in three directions (x, y and z direction: +, 0 and -), permanent loads (+) en temperature loads (+, 0 and -). These loads can be combined in 3x3x3x1x3=81 load cases. To reduce the calculation time the number of load cases has to be minimized. This is done by first looking at load cases with the permanent load and only one variable load (load cases 1 to 10). The effect of this particular variable load on the maximum and minimum stress in the cables and on the foundation was studied. Then the worst variable loads for the structures were combined in some extra load cases.

Experience with ESA-Prima Win when realising the project:

The program makes it possible to calculate a tensegrity structure.

It was not necessary to model the gauze sails. I'm not sure if the sails could have been modelled using plate elements with the Newton Rhapson procedure for large deformations.

It is possible to model the sails by replacing them by numerous parallel cables. This will however greatly increase the calculation time. Removing the sails made the calculation faster, it sadly means that the loads on the cables had to be inputted by hand. I have simplified this by only looking at the projections of the sails in the three directions, not by calculating the proper direction perpendicular to the sail for each element.

In the first models in ESA-Prima Win I encountered some problems with the elements used. For example the output showed large shear forces in the cables, which could not be real. In a later model I found out that the rotations at the cable ends could no be correct.

All these problems were solved in later patches or new releases after having consulted SCIA. The models are very sensitive to changes. I found that the outcome of the calculations could vary when using different versions of ESA-Prima Win. In version 3.40 I suddenly had to use more increments to keep the calculation stable. The calculation engine of ESA-Prima Win had changes a bit, which was noticeable in the results.

Conclusion:

With these kinds of complicated and delicate structures one has to be very careful using a powerful tool such as ESA-Prima Win. You have to know what you want to find and what you expect to find. Calculation by hand is hardly possible, so when in doubt it is best to try to simplify the model to a level where you can understand and approve the results. Off course this is valid for all models in ESA-Prima Win, but it is specially important for the models were checking the results by hand is not possible.

The work on the follies has been completed in April this year. During erection the stresses in the structure have been measured to check the validity of the calculations.

The measurements confirmed the calculations. Now we only have to wait for the vegetation to grow on the gauze.

Modules used:

- 3d frame
- Dynamic document
- 2nd order frame
- Physical non linear conditions

What are the main activities of your company?

- Structural engineering
- Architectural engineering
- Civil engineering
- Construction management
- Installations

Theatre and congress centre Orpheus

ABT

consultancy for construction engineering
Arnhemsestraatweg 358
6881 NK Velp - The Netherlands
tel: +31 (0)26 3683111
fax: +31 (0)26 3683110
www.abt-consult.nl
contact: Ir. J.J.W.J. Houben
e-mail: j.houben@abt-consult.nl

annual turnover: □16 700 000

number of employees: xxx

Your Project

Technical data of the project

Owner:
Schouwburg Orpheus, Apeldoorn
Architect:
Architectuurstudio Herman Hertzberger, Amsterdam
Engineering office:
Adviesbureau voor Bouwtechniek bv, Velp
General contractor:
Draisma, Thomassen Dura, Apeldoorn
Length:
81,5 m
With:
58,0 m
Height:
10,0 m (under ground level)
Volume:
35000 m^3
Mass:
230.000 kN

Project description:

The Orpheus complex has a theatre, congress rooms and a number of facilities for these functions. A main part of the total complex is an underground parking garage of three underground levels and a deck that will be part of the public ground.

The level of floor -3 is 8,5 meter below ground level. The mean level of the groundwater is 4 meter below ground level, so the parking garage has to be build in the ground water.

First the wall of the parking garage has to be made from the ground level. The walls consist of a concrete diaphragm wall with a thickness of 62 cm. The bottom side of the wall is 13,7 meter below ground level. The wall will be anchored in the ground with grouted anchors. After the concrete has hardened the ground between the walls will be removed and the ground water will come up in the construction pit. At the total surface of the parking garage vertical grouted anchors will be placed into the ground to anchor the floor level -3. The anchors will be placed in a grid of 3 meters square. This floor consists of an under water poured-in-place concrete with a thickness of 1 meter in which the anchors will be fixed. When this not armoured concrete floor is hardened, the ground water will be pumped out of the construction pit. Than another floor of armoured concrete with a thickness of 0,5 meter will be poured-in-place on top of the floor with a thickness of 1 meter, and also in this floor the anchors will be fixed. At this stage there's an open construction pit of 8,5 meter deep. In this pit has to be made two parking-floors, with a deck on top of it. These three floors consist of pre-cast columns, beams and floors. This total pre-cast structure will be placed on the floor on level -3 on the bottom of the pit. When the floors are assembled, these floors will form the supports of the walls. The construction of the parking garage will start in week 37 2002.

Technical questions to be solved

One of the technical questions which is solved with ESA-Prima Win is the performance of the armoured concrete floor with a thickness of 1 meter. There are many combinations made of the loads on this floor in the building stage and the final stage. This file handles about the final stage in which the loads out of the floors level -1 and -2 and the deck are active and directed downwards in combination with the upwards-directed pressure of the ground water.

The floor is placed on subsoil (spring support) which can only produce pressure. The floor can't pull on the ground. So the downwards-directed loads are supported bye the subsoil (spring support). Because the pressure under the columns will be higher than under the surface between the columns, the sub grade reaction modules is calculated to be higher. Under the nodes where the forces out of the columns are placed, a surface is defined with the higher modules of sub grade reaction.

In the total floor plate a grid of 3-meter square is defined in which the grouted anchors will be coupled. These anchors can only deliver a tensile force. It's not possible to attach a support in a node with only a tensile reaction force. To solve this problem an 'infinite' stiff member is placed between the floor and each node with the support. These members are marked with the non-linear function "only tensile force". In this way an "only tensile force node support" is created. The diaphragm wall is coupled with the floor and has also a linear spring support. The result is that becomes clear which part of the floor in the final stage is pressed on the soil underneath, and which part is anchored with the grouted anchors. The soil pressure can be determined, the tensile force in the anchors, the reaction on the diaphragm wall and the 2D stresses in the concrete to determine what armouring is needed. Also the deformations of the floor can be determined.

Use of ESA-Prima Win

Experience with ESA-Prima Win when realising the project:

ESA-Prima Win makes it possible to combine different non-linear supports into one file. A surface spring support with only pressure, a linear spring support with only pressure, and a self-defined node support with only tensile forces.

Modules used:

- Base
- Dutch language
- 2D Frame
- 2D Grid
- 3D Frame
- Document
- Physical nonlinear conditions (very important)
- 2D Plate
- 2D Wall
- 3D Shell

Quels sont les principales activités de votre société ?

Ingénierie et assistance technique.

Depuis sa création en 1969 à Dunkerque, le groupe ATEIM s'est développé régulièrement pour devenir leader dans son activité au Nord de la France. Il intervient aujourd'hui tant au niveau national qu'international. 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, les installations générales, le bâtiment.

L'expérience acquise, le savoir-faire, les moyens, les missions du groupe permettent de proposer une large palette de services dans les domaines de l'ingénierie, des études techniques, des études de produits et de la communication.

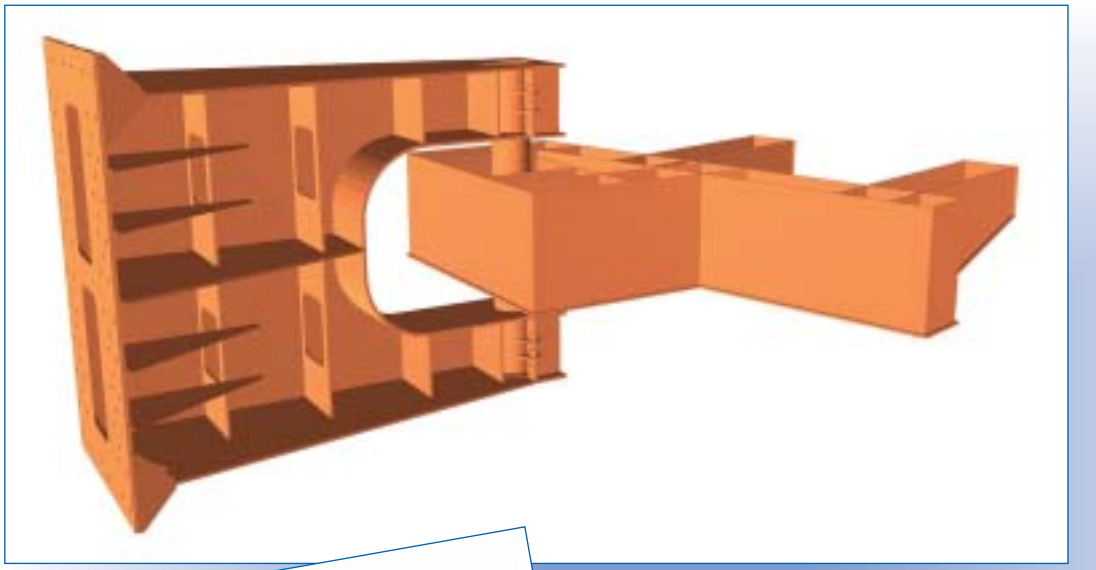
Situé en bordure de la Mer du Nord à Dunkerque, premier port maritime français. Au cœur d'une zone en liaison directe avec toute l'Europe.

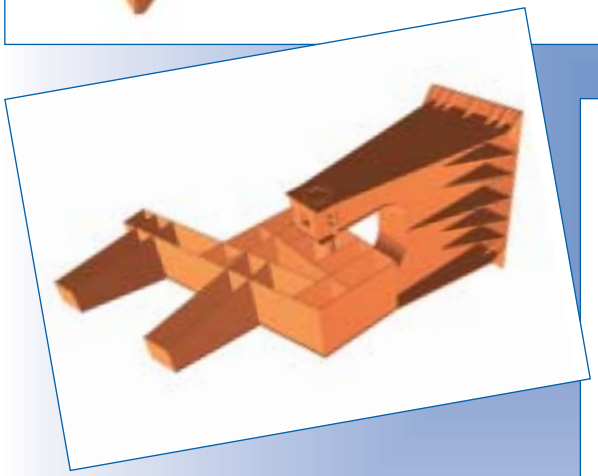
Support en col de signe de pivot

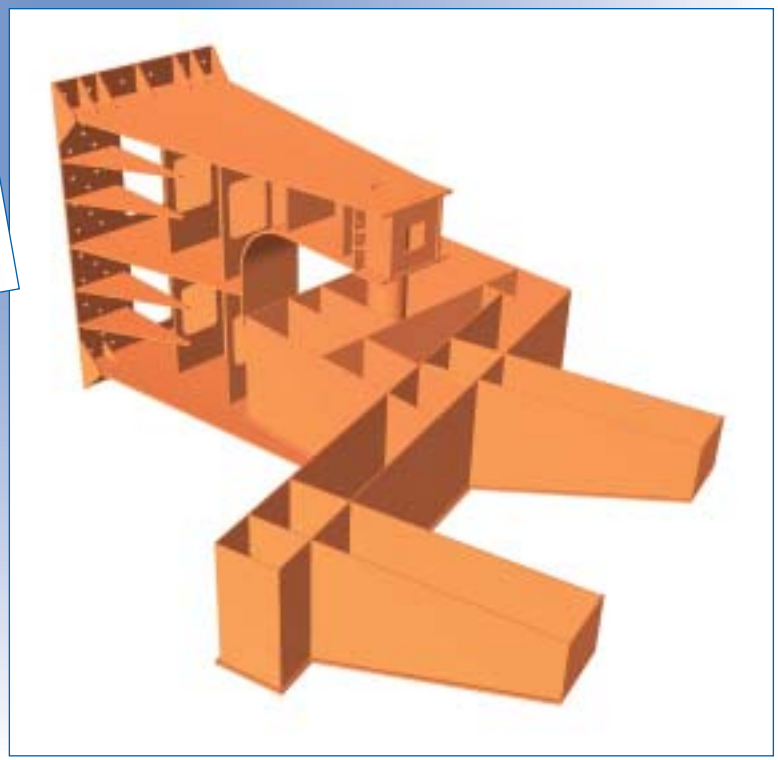
GROUPE ATEIM (DUNKERQUE)

Route Express 59430 FORT MARDYCK France
tél. +33 (0)3 28 24 34 00
fax +33 (0)3 28 60 18 93
e-mail: contact@ateim.fr
www.ateim.fr
Personne à contacter: Tikouirt
e-mail: ahcene.tikouirt@ateim.fr
tél: +33 (0)3 28.24.34.00
fax: +33 (0)3 28.60.18.93

annual turnover: □30 000 000 number of employees: 430







Le GROUPE ATEIM est situé à :

- 40 Km de Calais
- 45 Km du Tunnel sous la Manche
- 100 Km de l'aéroport de Lille- Lesquin
- 2h de TGV de l'aéroport de Roissy/Charles De Gaulle

Secteurs d'activités:

Sidérurgie- Métallurgie, Automobile, Bâtiment, Raffinage, Chimie, Installations générales, Industries du verre, Industries pharmaceutiques

Zones d'action:

Régionale, Nationale, Internationale

Votre projet

Fiche technique du projet

Longueur :
4.03 m
Largeur:
1.38m
Hauteur :
0.90m
Masse :
5.00 T
Nom du projet :
Support en col de cygne de pivot
Pivot support de gaine
Lieu de la construction:
Isbergues
Fait pour:
Ugine groupe Usinor
Architecte:
Ugine et Ateim
Bureau d'études:
Ateim
Entrepreneur général:
Langlet

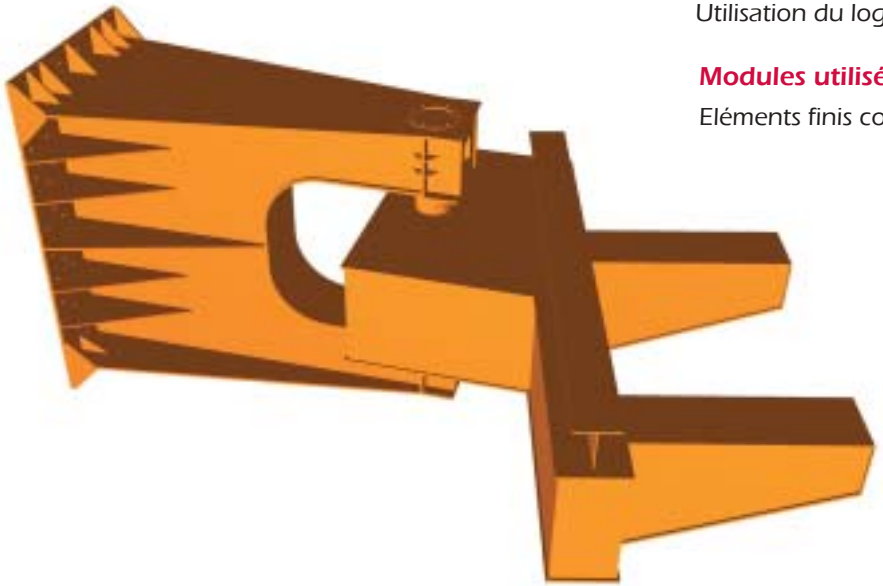
Les études sont faites en deux parties et en éléments finis. Le support du pivot est existant par contre le pivot est un ensemble neuf. Une augmentation de capacité dans des gaines est prévue:

- La première étude concerne le pivot seul, il reprend une gaine composée de deux éléments. Le pivot à une rotation de 120° autour d'un axe qui est solidaire du support.
- La deuxième étude concerne le support sur lequel est fixé l'axe de rotation et qui est encastré sur l'ossature principale du bâtiment.
- L'utilisation intensive du pivot pour permettre la rotation des gaines de 3.00 m de diamètre impose une vérification à la fatigue, et une étude en éléments finis permet de localiser les sollicitations en tout point du support. La localisation des contraintes dans les cordons de soudure nous permet de vérifier les soudures à la fatigue.

Qu'est-ce qui rend ce projet intéressant et important ?

Une modélisation tel que construit permet une approche très pointue sur les sollicitations et les déformations et ce mode de calcul nous permettait d'aborder le problème de fatigue en plus des vérifications des contraintes et des déformations.

Les contraintes positives et négatives en tout point des plaques nous permettent d'optimiser les renforcements éventuels.



Pourquoi est-ce un projet spécial ?

C'est la première fois qu'une vérification en éléments finis à été fait pour ce type de pièce.
Du fait que le pivot tourne sur un rayon de 120°, les actions sur le support dépendent de la position du pivot.
La masse du pivot et de la gaine qu'il supporte est de 22000 daN avec en plus un effet dynamique.
Le pivot est une pièce neuve, par contre le support est existant. Pour optimiser les renforcements éventuels une vérification en éléments finis était nécessaire.

Usage de ESA-Prima Win

Description des problèmes techniques résolus avec ESA-Prima Win:

A partir d'un support en mécano-soudé existant soumis a des sollicitations différentes de celles prévues initialement, la modélisation tel que construit en éléments finis nous permettait d'optimiser les renforcement éventuels.

Description de votre impression et expérience de l'emploi de ESA-Prima Win dans la réalisation de ce projet:

Utilisation du logiciel très convivial.

Modules utilisés:

Eléments finis coques et plaque

Quels sont les principales activités de votre société?

Ingénierie et assistance technique

Depuis sa création en 1969 à Dunkerque, le groupe ATEIM s'est développé régulièrement pour devenir leader dans son activité au Nord de la France. Il intervient aujourd'hui tant au niveau national qu'international. 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, les installations générales, le bâtiment.

L'expérience acquise, le savoir-faire, les moyens, les missions du groupe permettent de proposer une large palette de services dans les domaines de l'ingénierie, des études techniques, des études de produits et de la communication.

Situé en bordure de la Mer du Nord à Dunkerque, premier port maritime français. Au cœur d'une zone en liaison directe avec toute l'Europe.

Tourniquet porte poches d'aciérie

GROUPE ATEIM (DUNKERQUE)

Route Express 59430 FORT MARDYCK France
tél. +33 (0)3 28 24 34 00
fax +33 (0)3 28 60 18 93
e-mail: contact@ateim.fr
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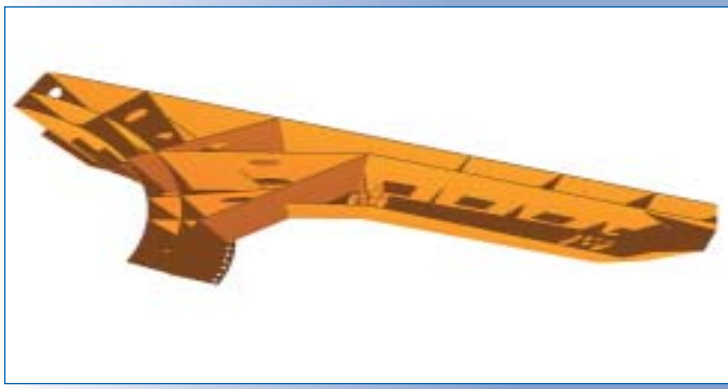
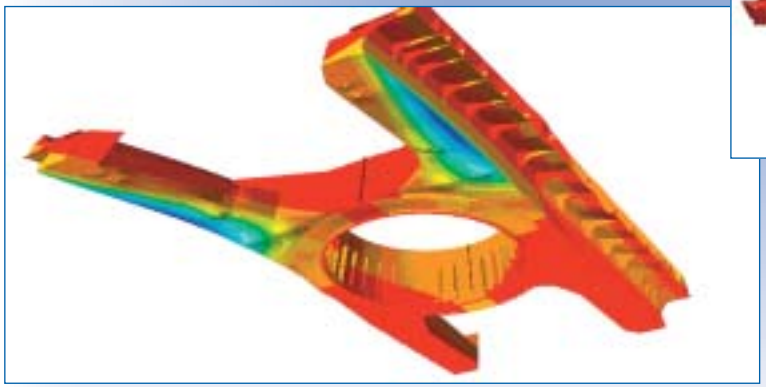
Personne à contacter: Tikouirt
e-mail: ahcene.tikouirt@ateim.fr
tél: +33 (0)3 28.24.34.00
fax: +33 (0)3 28.60.18.93

annual turnover: □30 000 000 number of employees: 430





Le GROUPE ATEIM est situé à:

- 40 Km de Calais
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Secteurs d'activités:

Sidérurgie- Métallurgie, Automobile, Bâtiment, Raffinage, Chimie, Installations générales, Industries du verre, Industries pharmaceutiques

Zones d'action:

Régionale, Nationale, Internationale

Votre projet

Fiche technique du projet

Longueur:
17.00 m
Largeur:
7.10 m
Hauteur:
3.55m
Volume:
428 m^3
Masse:
100 T
Nom du projet:
TOURNIQUET PORTE POCHES D'ACIERIE
Lieu de la construction:
SOLLAC DUNKERQUE
Fait pour:
SOLLAC groupe USINOR
Architecte:
SOLLAC
Bureau d'études:
ATEIM

L'étude est faite en éléments finis d'un ensemble mécano-soudé existant pour une augmentation de capacité:

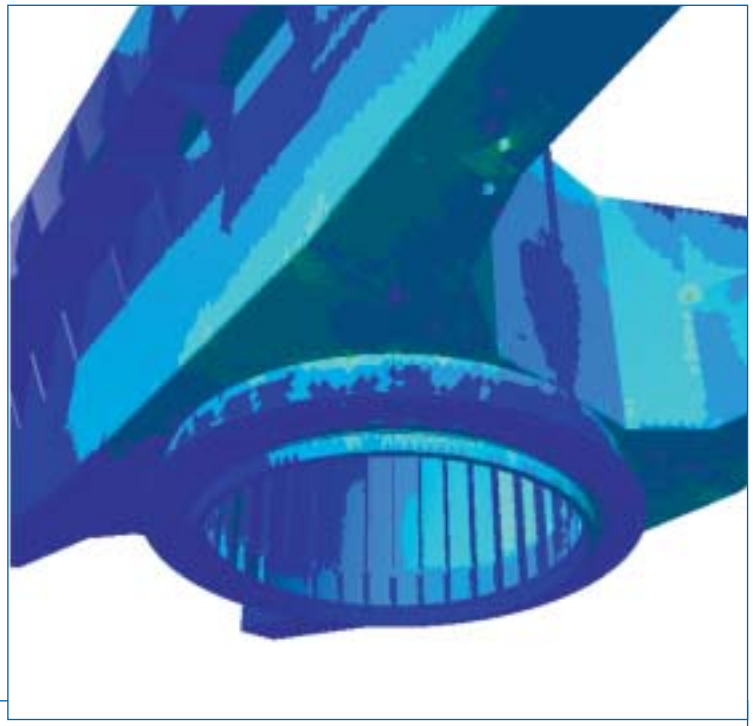
- L'utilisation intensive du tourniquet impose une vérification à la fatigue, et une étude en éléments finis permet de localiser les sollicitations en tout point du tourniquet.

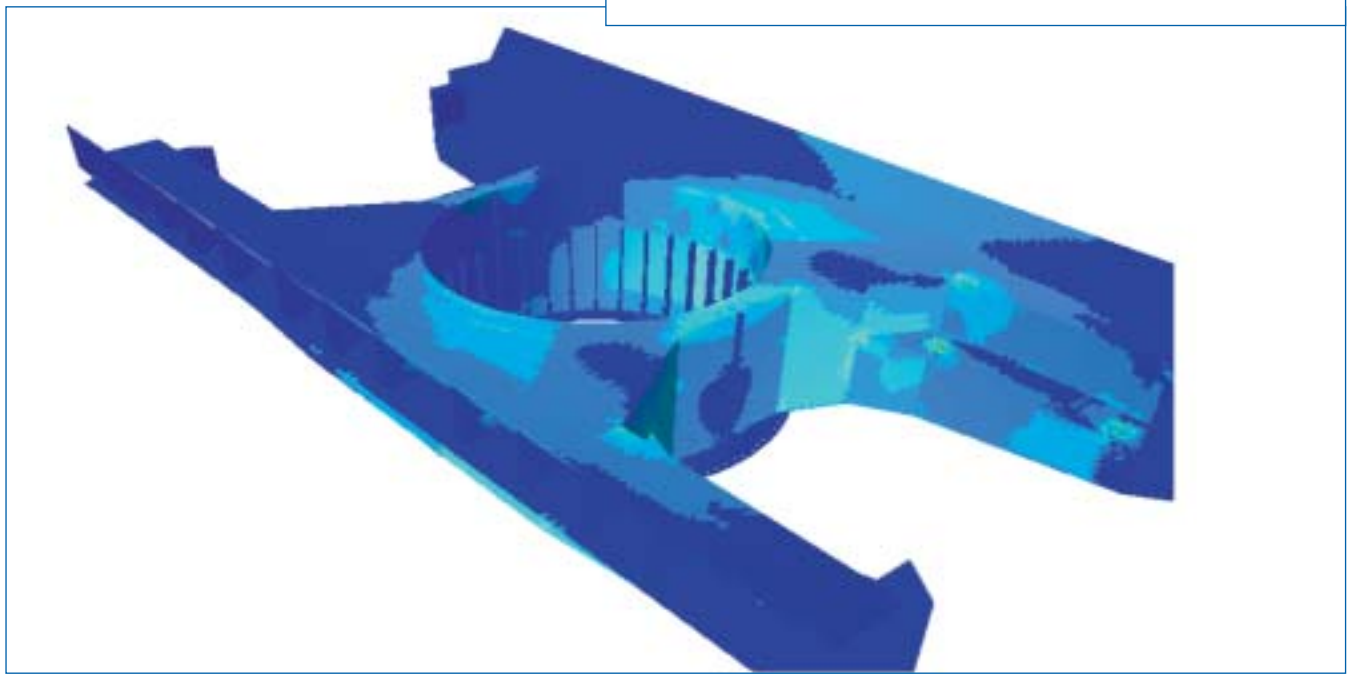
Qu'est-ce qui rend ce projet intéressant et important?

Une modélisation tel que construit permet une approche très pointue sur les sollicitations et les déformations et ce mode de calcul nous permettait d'aborder le problème de fatigue en plus des vérifications des contraintes et des déformations. Les contraintes positives et négatives en tout point des plaques nous permet d'optimiser les renforcements éventuels.

Pourquoi est-ce un projet spécial?

C'est la première fois qu'une vérification en éléments finis à été fait pour ce type de pièce.





CCAI

Quels sont les principales activités de votre société?

Civil Engineering

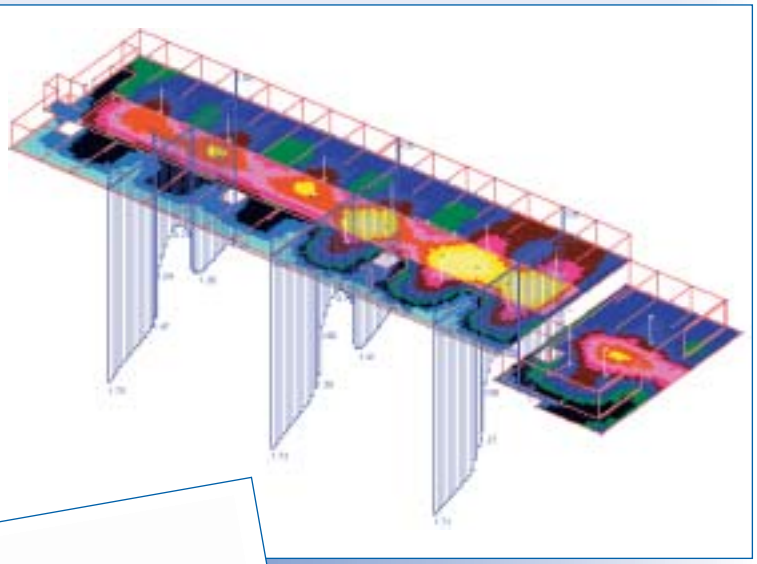
CCAI regroupent 3 bureaux d'ingénieurs et totalisent une vingtaine de collaborateurs internes et externes.
Fiechter Ingénierie SA
Bureau d'ingénieurs Michel Chatelain
David Perez Engineering
David Perez

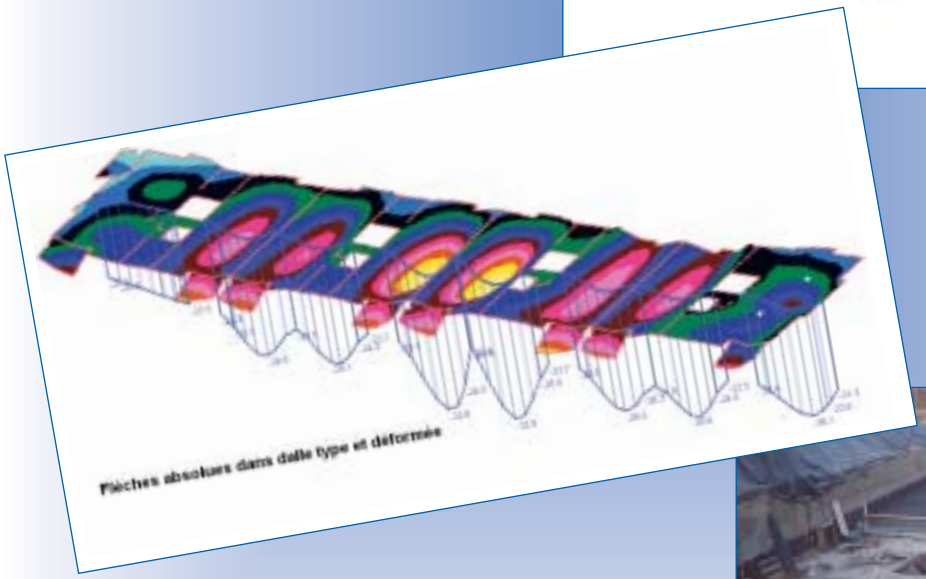
Position: Directeur des études et projets informatiques
Avec 19 ans d'expérience en calcul statique et de calcul sur ordinateur
Dont 5 ans d'expérience sur ESA-Prima Win

Votre projet

Fiche technique du projet

Lengeur:
60 m (immeuble)
Largeur:
15 m





Résidence Parc Mussard

CCAI

Centre de calcul pour Architectes et Ingénieurs
Rue François Perréard, 14
1225 Chêne-Bourg - Suisse
tel: +41 (0)22.349.38.69
fax: +41 (0)22.349.38.27
Personne à contacter: M. David Perez
e-mail: perezdavid@bluewin.ch
tel: +41 (0)78.707.36.15
fax: +41 (0)22.700.25.36

annual turnover: **N.A.**

number of employees: **20**

Hauteur:
28 m
Volume:
35'000 m^3 (avec garages et sous-sol)
Project titre:
Résidence Parc Mussard
Location:
25-31 chemin de Pont-Ceard VERSOIX GENEVE
Fait pour:
Soplaim S.A. - Planification Immobilière - Route de Malagnou 38 1208 Genève
Architecte:
ArchiMADE - Malcolm Burford Rte de Sauverny 58
1290 Versoix/Genève Tél. 022 779 08 79
e-mail: archimade@swissonline.ch
Bureau d'études:
Fiechter Ingénierie SA 14 rue François Perréard
1225 Chêne-Bourg Tél 022 349 38 69
e-mail: ingfiechter@swissonline.ch
Entrepreneur général:
D'Orlando

Qu'est-ce qui rend ce projet intéressant et important?

Immeuble No 29 - 10 appartements 60 pièces
Immeuble No 31 - 15 appartements 65 pièces

Utilisation de ESA-Prima Win

Description des problèmes techniques résolus avec ESA-Prima Win:

Un des points les plus intéressant de ce projet est que le bâtiment sur situe sur 3 niveaux de terrain différents. Les fondations sont toutes continues et liées entre elles à tous les niveaux. Il était important d'évaluer les conséquences sur la structure dues aux tassements différentiels du fait des grandes différences de masse entre chaque bloc de la construction. La déformée générale montre un effet "bras de levier" sur la partie haute qui subit un soulèvement au lieu d'un tassement !

Description de votre impression et expérience de l'emploi de ESA-Prima Win dans la réalisation de ce projet:

ESA-Prima Win révèle un problème qui pourrait être sous-estimé lors d'un calcul traditionnel sans programme de calcul par éléments finis. ESA-Prima Win permet grâce à ses outils de "rendering" de faire ressortir des détails révélateurs et peuvent ensuite être analysé exactement.

Remarque concernant le calcul:
Pour parvenir à la performance obtenue: 36'000 éléments 2D en 7 minutes! J'ai utilisé un Pentium IV 2,26 GHZ avec 512 Mo de mémoire sous XP pro

DUBERSEUIL & Cie

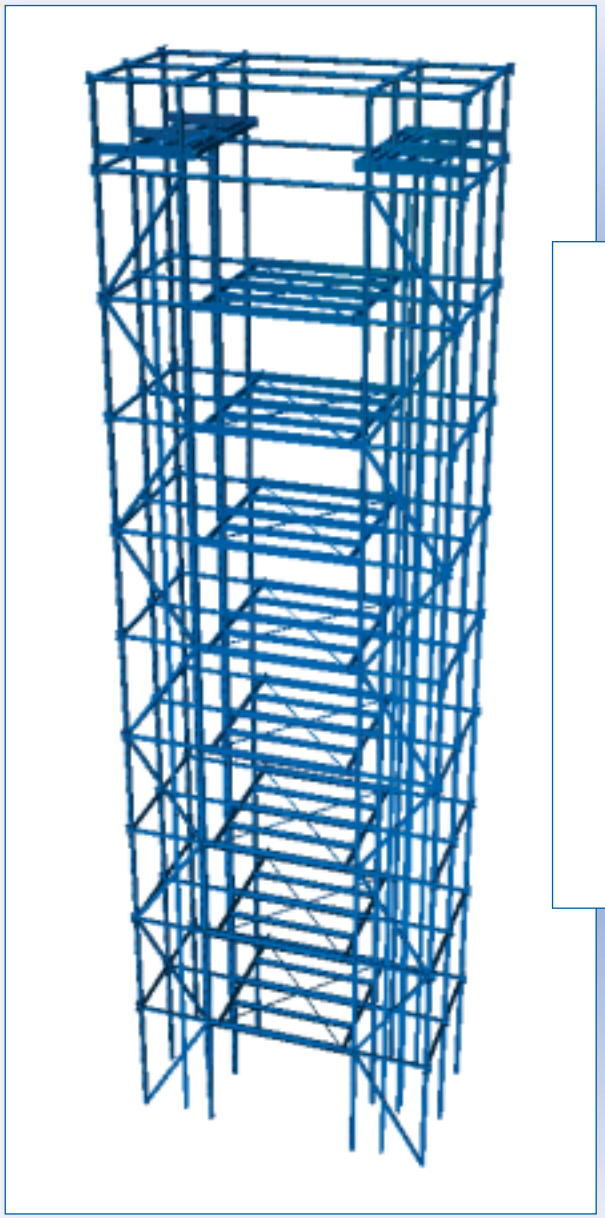
Activités

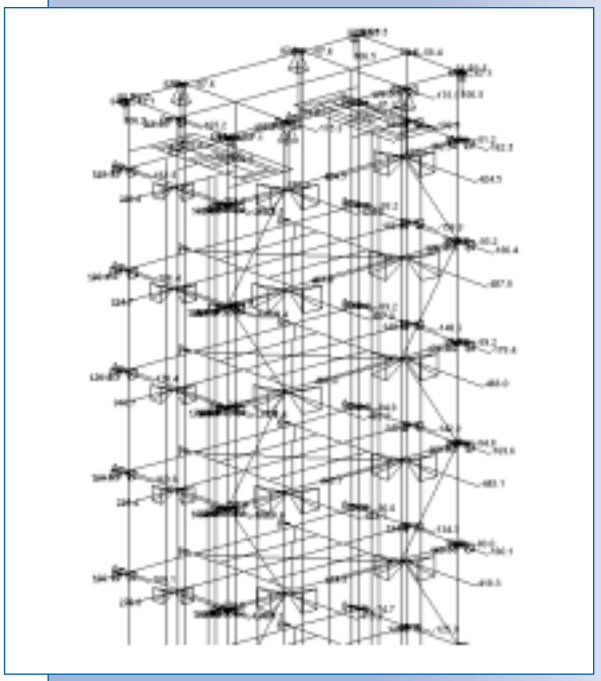
conception, calcul et dessin de charpentes métalliques

Votre projet

Le projet d'ossature métallique pour ascenseurs panoramiques a été réalisé cet été pour le compte de l'entreprise LAINE - DELAU située à Nanterre (93) en France. Le maître d'œuvre de ce projet est Monsieur Claude VASCONI.

Cet ouvrage fait parti de l'immeuble de bureaux PERISUD actuellement en construction au sud de Paris donnant sur le boulevard périphérique. Ce pylône est composé de 4 colonnes d'ascenseurs: 2 colonnes sont de chaque coté de l'ossature et séparées par des planchers intermédiaires. Ces ascenseurs permettent de desservir l'immeuble du rez-de-jardin jusqu'au septième étage. Les parois sont entièrement vitrées et l'ossature tubulaire apparente entre dans l'esthétique de la structure.





Ascenseurs panoramiques

Bureau d'études DUBERSEUIL et Cie
2, square les Clématites
95470 SURVILLIERS - FRANCE
Tél: +33 1 34 68 60 10
fax: +33 1 34 68 31 30
personne à contacter: Laurent Traulé
e-mail: DUBERSEUIL@wanadoo.fr

annual turnover: □230 000 number of employees: 4

Fiche technique du projet

D'une masse de 47 tonnes, cet ouvrage a pour dimensions:

Longueur:
10,57 m.

Largeur:
5,2 m.

Hauteur:
36,75 m.

Ce projet est réalisé en profils tubulaires sauf aux niveaux des planchers où sont employés des profils IPE. La géométrie a pu être exécutée rapidement grâce à la copie d'éléments. De plus, des modifications de structure ont eu lieu durant l'étude, me permettant ainsi de déplacer des éléments sans que le chargement disparaisse. La mise en charge de la structure a été réalisée suivant les réglementations en vigueur concernant les surcharges climatiques. Les efforts des ascenseurs nous ont été communiqués par l'entreprise OTIS.

Ce type de structure faisant également l'objet d'une analyse au second ordre, des éléments non linéaires travaillant uniquement en compression comme les poteaux ont été sélectionnés. Une étude du flambement des poteaux a également été effectuée.

Lors de l'étude de cette structure, j'ai fait appel à l'assistance ESA-Prima Win car certains résultats m'ont surpris, à savoir le déplacement vertical des poteaux dû à la compression. En effet, le chargement étant important, un léger tassement de mes poteaux s'est produit. Le support technique m'a aidé à comprendre ce déplacement qui finalement est normal.

Hypothèse de calcul

CHARGES

1 Charges permanentes
- Poids propre des éléments
- Toiture: vitrage 50 daN/m²
- Local poulie: caillebotis 30 daN/m²
  garde-corps 10 daN/m
- Façade: vitrage ép. 14 mm 35 daN/m²
  vitrage ép. 26 mm 65 daN/m²
  ossature secondaire 15 daN/m²
- Palier: bac collaborant + dalle ép. 12 cm 213 daN/m²
  chape ép. 3 cm 60 daN/m²
  revêtement marbre ép. 3 cm 84 daN/m²
  faux-plafond 20 daN/m²
  garde-corps en verre 30 daN/m
  luminaires + divers 8 daN/m²

2 Surcharges climatiques
- Neige: zone 1A
  altitude < 200 m
  pente toiture = 1 %
  Pn = 35 daN/m²
  coefficient neige extrême 1,71
- Vent: zone 2
  site normal
  q10 = 60 daN/m²
  hauteur H = 32,4 m
  ks = 1
  km = 1
  qH = 81,8 daN/m²

3 Surcharges d'exploitation
- Toiture: personnel 150 daN/m²
- Palier: personnel 250 daN/m²
- Local poulie: personnel 150 daN/m²
  P 21 1625 daN
  P 22 1150 daN
  P 23 3250 daN
  P 24 1500 daN
- Réactions cabine: Fk 4364,8 daN
  Fx 172 daN
  Fy 144,6 daN

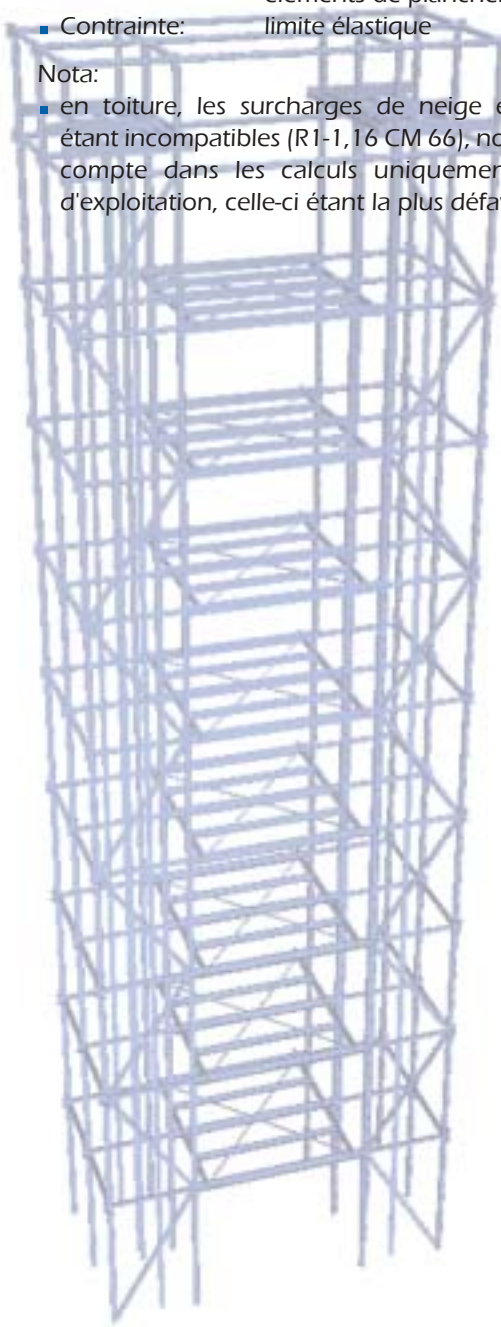
REGLEMENTS

- CM 66
- NV 65 modifiées 99

DEPLACEMENTS ET CONTRAINTE

- Déplacements: poteaux 1/350 ème
  éléments de plancher 1/300 ème
- Contrainte: limite élastique 23,5 daN/mm²

Nota:
- en toiture, les surcharges de neige et d'exploitation étant incompatibles (R1-1,16 CM 66), nous avons pris en compte dans les calculs uniquement la surcharge d'exploitation, celle-ci étant la plus défavorable.



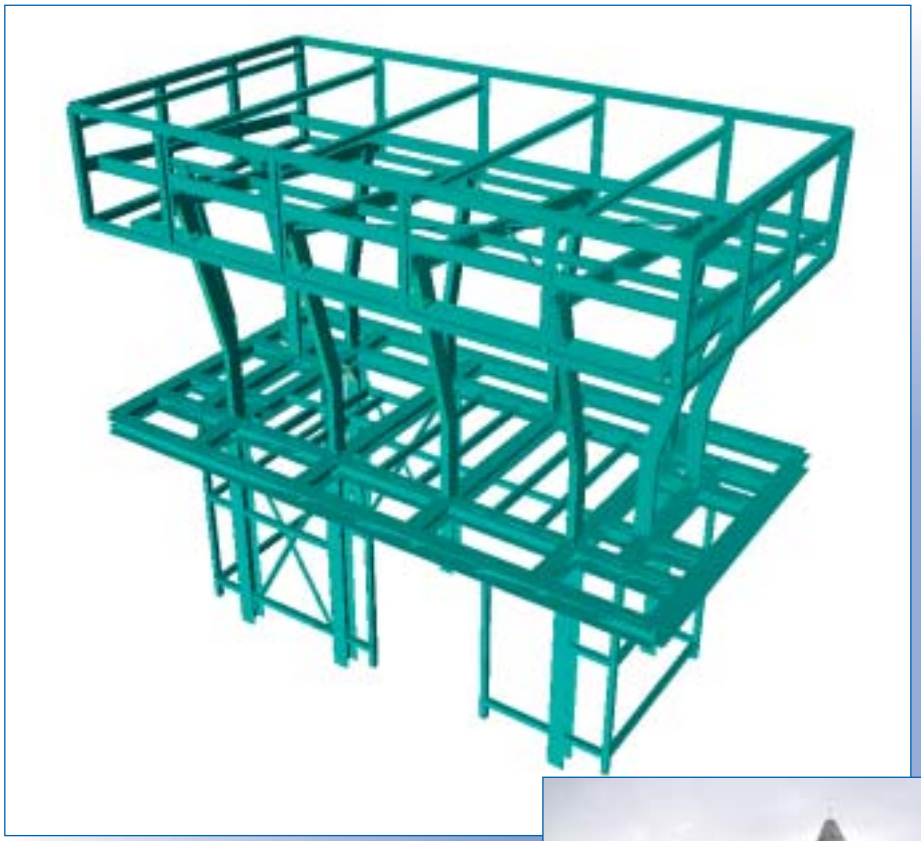
DUBERSEUIL & Cie

Activités

conception, calcul et dessin de charpentes métalliques

Votre projet

Le projet de la tour de contrôle a été réalisé en octobre 2001 pour le compte de l'entreprise SERFI située à Sarcelles (95) en France.
Cet ouvrage, entièrement démontable, est destiné pour des aérodromes régionaux dans les pays tropicaux (DOM - TOM, Madagascar, Asie du sud-est). Cette tour se trouve ainsi exposée à des risques de cyclones, et doit résister à des vents violents. L'effet du séisme, probable dans les lieux où sera édifiée la tour, a également été pris en compte dans les calculs.
Au rez-de-chaussée se trouve le local entretien et un escalier permettant l'accès à la salle de contrôle. Les parois de cette salle sont en panneau sandwich et en double - vitrage. Un chemin périphérique extérieur permet de faire le tour de la salle. Un accès en toiture est également prévu afin de permettre l'entretien des antennes et des panneaux solaires qui s'y trouvent.



Tour de contrôle

Bureau d'études DUBERSEUIL et Cie
2, square les Clématites
95470 SURVILLIERS - FRANCE
tél: +33 1 34 68 60 10
fax: +33 1 34 68 31 30
e-mail: DUBERSEUIL@wanadoo.fr
personne à contacter: Laurent Traulé

annual turnover: □230 000 number of employees: 4

Fiche technique du projet

D'une masse de 11 tonnes, cet ouvrage a pour dimensions:

Longueur:
7,7 m.
Largeur:
4,15 m.
Hauteur:
6,8 m.

Ce projet est réalisé avec des profilés courants du commerce. Cette structure, d'aspect confus, répond aux besoins des différents aménagements demandés et nécessite une partie dégagée, avec un minimum d'ossature pour permettre la visibilité de par son utilisation (salle de contrôle extérieur) La géométrie de la charpente a été étudiée pour répondre aux exigences du maître d'ouvrage. La mise en charge de la structure a été réalisée suivant les réglementations en vigueur.

Ce type de structure faisant l'objet d'une analyse au second ordre, des éléments non linéaires travaillant uniquement en traction comme les contreventements ont été sélectionnés. Selon les résultats, les profils de structure adéquats ont été mis en place pour répondre aux sollicitations.

Les assemblages ont été calculés indépendamment du logiciel ESA-Prima Win.

Aucun problème particulier n'a été rencontré lors de l'étude de cette structure.

Hypothèse de calcul

CHARGES

4 Charges permanentes
- Poids propre des éléments
- Toiture: bandeau:
  - bac acier 10 daN/m²
  - chemin d'accès:
  - caillebotis ép. 30 mm. 29,5 daN/m²
  - garde-corps 10 daN/m
  - appareils:
  - aérotherme 50 daN
  - panneau solaire 50 daN
  - couverture:
  - panneau sandwich ép. 80 mm. 14,7 daN/m²
  - faux-plafond 15 daN/m²
- Salle de contôle:
  - plancher:
  - platelage aluminium ép. 20 mm. 58 daN/m²
  - façade:
  - vitrage ép. 24 mm. 60 daN/m²
  - panneau sandwich ép. 100 mm. 14,3 daN/m²
  - chemin périphérique:
  - caillebotis ép. 30 mm. 29,5 daN/m²
  - garde-corps 10 daN/m

5 Surcharge climatique
- Vent: zone: 5
  - site: exposé
  - q10 = 120 daN/m²
  - hauteur H = 7 m
  - ks = 1,2
  - km = 1
  - qH = 134,3 daN/m²

6 Surcharges d'exploitation
- Toiture: chemin d'accès: 150 daN/m²
- Salle de contrôle:
  - intérieur: 250 daN/m²
  - chemin périphérique: 150 daN/m²

REGLEMENTS

- CM 66
- NV 65 modifiées 99
- PS 92

DEPLACEMENTS ET CONTRAINTE

- Déplacements:
  - en tête des poteaux: 1/250 ème
  - éléments de couverture: 1/200 ème
  - éléments de plancher: 1/300 ème
- Contrainte:
  - limite élastique: 23,5 daN/mm²

PARAMETRES SISMIQUES

- Classe d'ouvrage: classe B
- Zone de sismicité: zone Ib
- Classification du sol: site S1: sol de résistance mécanique moyenne en épaisseur inférieure à 15 m.
- Action sismique: coefficient de masse partielle f = 0,20 (article 6.21)

Nota:
- a construction étant située en milieu tropical, aucune surcharge de neige n'a été prise en compte dans les calculs.
- Conformément à l'article 8.1 des Règles PS 92, l'action du vent n'est pas prise en compte avec celle du séisme.

E.M.I.B.

What are the main activities of your company?

We cover a wide range of products and services in the field of antenna-installations. We supply nearly any component in a complete installation. From masts and towers, over feeders, connectors and grounding to the actual aerials (antennas). Furthermore is the actual installation of the components our long-time core business.
Based on nearly thirty years of experience we have an engineering service that designs all possible solutions for specific problems.
Our annual turnover now comes around 90 million BEF with an average of 20 employees of which 3 are telecom engineers, one construction engineer and one commercial engineer.

Markets:

As well home-market as in export, we have executed quite a lot of sites, as well turn-key as sub-contracted parts, in cellular phone projects, broadcasting projects, or any other RF based applications.

Mobile turn-key project sentinel (Senegal)

E.M.I.B.

Drabstraat 74
2640 Mortsel - Belgium
tel: +32 (0)3 449 20 74
fax: +32 (0)3 440 74 29
e-mail: info@emib.com
contact: Eddy QUINA
eddyquina@emib.com
tel: +32-(0)3-449 20 74

annual turnover: □2200 000

number of employees: **20**

Your project

Technical datanof the project:

Designed in
wind class II and EC3
Dimensions of triangle:
0,5m
Base section:
1m
Tower sections:
6 x 5,5m
Anti-twist section:
3m
Top section:
3m
Total:
1m + 6 x 5,5m + 3m + 3m = 40m
Guyed in three (3 x 120°)
Distance between base section and anchorage guys:
21m
Guys are to be placed under pre-tension, in compliance with calculation
Accessories:
The tower is designed to be used as a ladder
Fall protection system
Obstruction light
Interface dishes
Steel quality tower:
AE 235
Steel quality guys:
galvanised 1770N/mm²
Tower is galvanised in compliance with norm
Weight:
2000 kg (accessories included, foundation excluded)
Location:
Senegal - Gandiaye (180km from Dakar)

Mission:

Design, calculation, manufacturing and installation of a 40m guyed lattice tower at Gandiaye, to serve as an expansion of the Sentel mobile phone network (Dakar - Kaolack).

Rules for the design of the Lattice tower:

In compliance with the NBN B03-002-1 & 2 wind norms class II and EC3 for steelworks.
Dimensions of the terrain: 40m x 40m
Guyed 40m lattice tower in triangle with anti-twist system
Antennas on top of tower (2 dishes, 6kN & 7kN wind force)
Maximum deflection on top of 0,5°
Accessories:
Cable ladder
Fall protection system
Obstruction light
All calculations, for what the wind is concerned, are to be made manually in compliance with the NBN norms.

Use of ESA-Prima Win

Advantages:

- 3D (easy input of geometries)
- Physical non-linear conditions (simulation guys and pre-tension)
- 2-nd order frame (method Newton raphson)
- Fast calculation
- Easy output control
- Dynamic document
- Good graphical presentation
- Easy support access and fast feedback

Disadvantages:

- Manual calculation of the wind for lattice towers
- Characteristics of guys
- Pre-tension guys
- Maximum deflection in distance (no degrees)

Experiences with esa-prima win:

Started working with ESA-Prima win in April 2000.
The complete 3D design software offers easy input of all reality elements.
The more specific factors of the design can be discussed in cooperation with the support department of ESA-Prima Win, which results in a perfect simulation of the project.
The 3D software makes it easier to simulate the 4 wind directions (N, S, E & W).
Specific input of the characteristics of the guys are based on my personal experience. The first simulation of the pre-tension of the guys is based on my own experience. The final simulation results in a perfect pre-tension in the guys, which then again results in a perfect dimension of the guys.
The guyed lattice tower is calculated with the Newton Raphson method.
Easy output of the results of the calculation.
Easy control of the pre-tension of the guys.
Good graphical output of the results: The guyed lattice tower is actually shown on the screen in the way it will look in reality.
A major advantage of the program is the dynamic document: when changing an input, one click shows the difference in the document.
However, working with ESA-Prima Win made me discover some bugs in the program. These bugs have been corrected in the new releases.

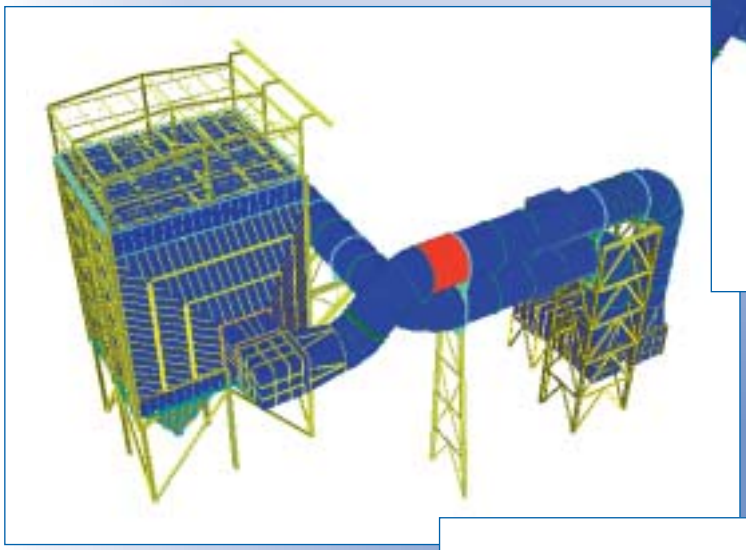
Modules:

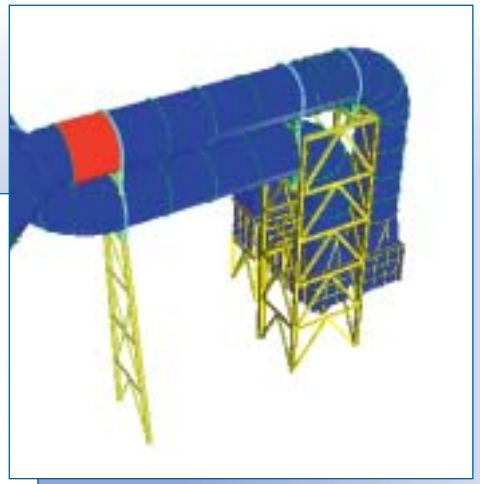
- 2D-frame
- 2D-grid
- 3D-frame
- Dynamic document
- 2-nd order frame
- Physical non-linear conditions

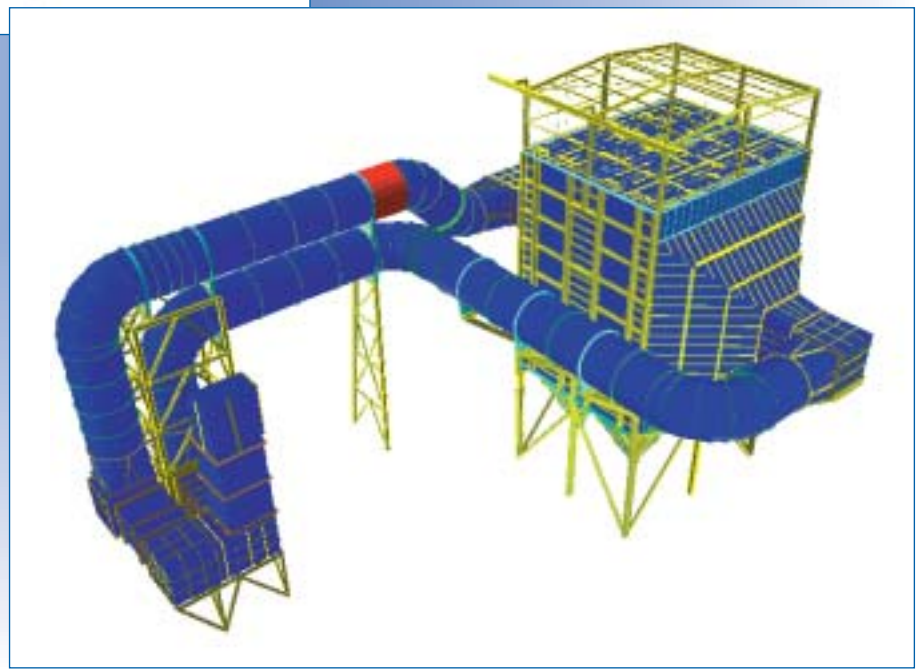
EST

Quels sont les principales activités de votre société?

La société E.S.T. doit sa création avec Michel LEVERT Ingénieur spécialiste des constructions métalliques à la suite de la vente de son bureau d'ingénieur conseil depuis plus d'une année.
Pratique du logiciel ESA-Prima Win depuis plus de 8 ans dans tous les modules de la construction métallique.
La société E.S.T. ne pratique que la spécialité d'Ingénieur Conseil Structures en acier, béton, bois avec des applications particulières en chaudronnerie-mécano soudure-structures verrières.
La société EUROPENNE de STRUCTURES et TECHNOLOGIES n'a pour effectif que son créateur, tous les calculs, toutes les conceptions, avec l'utilisation exclusive de ESA-Prima Win.







Chaudronnerie traitement des gaz de la raffinerie Total Fina Elf de Donges

EST

Européenne de Structures et Technologie
67, le Grand Pré Vert
38410 Saint Nizier d'Uriage - France
tel: +33.4.76.59.71.18
fax: +33.4.76.59.71.18
Personne a contacter: M. Michel Levert
e-mail: levertmichel@aol.com
tel GSM: +33.6.17.36.38.36
fax: +33.4.76.59.71.18

annual turnover: □305.000 number of employees: 1

Votre projet:

Fiche technique du projet

Longueur
37 m
Largeur
24 m
Hauteur
23 m
Project titre
Chaudronnerie traitement des gaz de la raffinerie Total Fina Elf de Donges
Location
Donges (France)
Fait pour
Total Fina Elf
Bureau d'inginerie
E.S.T.
Entrepreneur général
FLS Miljö (France)

Qu'est-ce qui rend ce projet intéressant et important?

Le projet en cours de réalisation consiste à la réalisation détaillée d'un ensemble de chaudronnerie pour le traitement des gaz pour le compte de la société FLS Miljö. Modélisation très complexe de la structure en 3D avec 17427 nœuds, 21652 éléments 2d, 5303 éléments 1D. Application remarquable du module 2D/3D en barres et éléments finis.

Utilisation de ESA-Prima Win

Description des problèmes techniques résolus avec ESA-Prima Win: voir ci-dessus

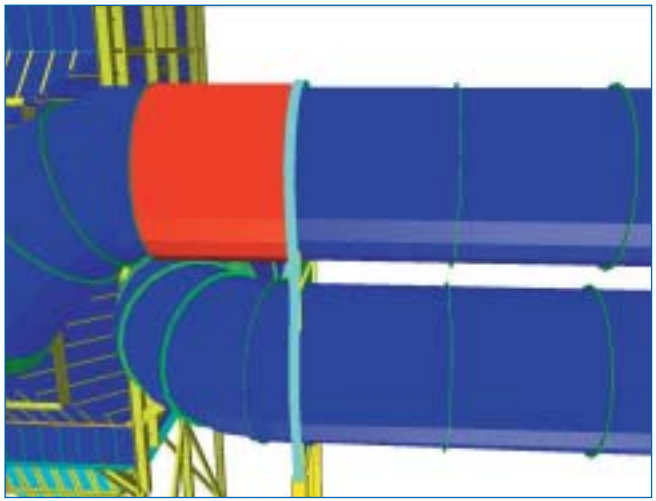
Modélisation très complexe de la structure en 3D avec 17427 nœuds, 21652 éléments 2d, 5303 éléments 1D.

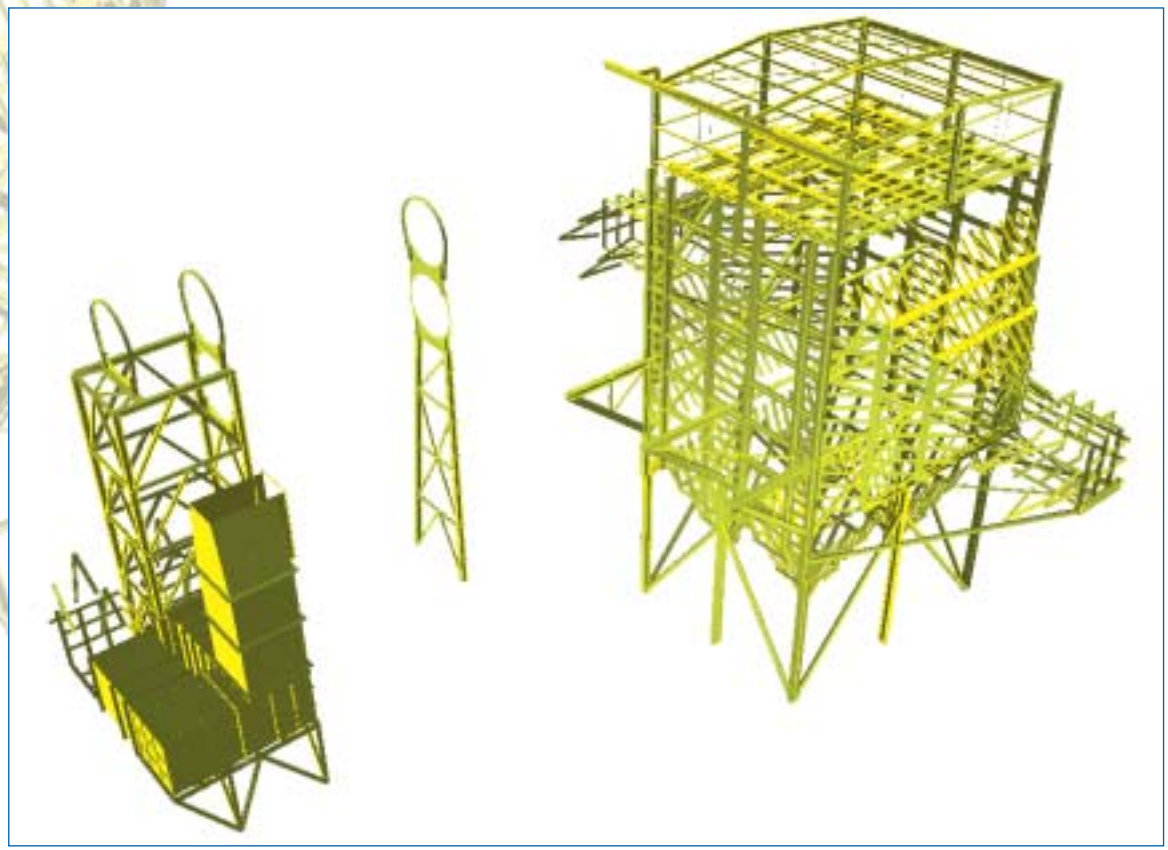
Description de votre impression et expérience de l'emploi de ESA-Prima Win dans la réalisation de ce projet

Modélisation néanmoins simple grâce à la facilité de saisie par macros1D (barres) et macros 2D (surface. Module "intersection" sans faille représentant un gain de temps important dans la création des intersections des éléments tubulaires.

Modules utilisé:

- Module 3D barres et éléments finis
- Calculs statique et dynamique
- Contrôle acier CM'66





Ingenieurs Associés

Votre société

Le groupe PIRNAY-INGENIEURS ASSOCIES se compose du bureau d'études PIRNAY SA créé en 1970 à Charleroi et du bureau d'études INGENIEURS ASSOCIES SA créé en 1977 à Bruxelles.
Il s'agit de sociétés d'études, bâties sur une équipe pluridisciplinaire, dont les activités s'exercent dans le domaine de la construction en général. La tâche du groupe est un travail de conception appliqué aux problèmes de stabilité.
Le groupe se compose d'Ingénieurs civils et industriels dont le rôle est de concevoir et de calculer les ouvrages projetés et de techniciens qui exécutent les plans des ouvrages en béton armé, charpentes métalliques, charpentes en bois, voiries et réseaux divers.
Le groupe assume également le contrôle des chantiers, la planification des travaux, les levés topographiques et les missions de coordination-sécurité.
Le groupe possède en outre des Ingénieurs spécialisés pour étudier les problèmes spécifiquement géotechniques, les rénovations d'immeubles, l'assainissement, la récolte et l'épuration des eaux.
L'application conjuguée de la géotechnique et des études

Stade du pays de Charleroi

Ingenieurs Associés
Avenue Wansart 12
B-1180 Uccle - Belgique
tel: +32 (0)2 375 18 42
fax: +32 (0)2 375.20.07
Persone a contacter : Gerard Thierry
e-mail: thierry.gerard@ingass.be

annual turnover: □2 618 number of employees: **30**

de structure permet d'aborder et de solutionner un grand nombre de problèmes, parmi lesquels:

- Génie civil: bâtiments de bureaux, de logements, commerciaux, hospitaliers, scolaires et publics;
- Constructions industrielles: aménagement, réaménagement et équipements urbains, travaux publics d'infrastructures routières, ferroviaires et fluviales;
- Travaux d'assainissement et de réseaux d'utilité publique.

Votre projet

Lorsque la ville de Charleroi vit sa candidature à l'Euro 2000 retenue, elle décida, plutôt que de construire hors ville un nouveau stade d'un coût quatre fois supérieur, d'agrandir et le moderniser, en le rendant conforme aux normes de sécurité fixées pour l'an 2000, le stade communal du Mambourg, hôte du Sporting de Charleroi.
Pour doter le Mambourg de 30.000 places assises requises pour y accueillir l'Euro 2000, on n'a conservé du stade primitif que la tribune d'honneur avec les business seats y aménagés il y a une quinzaine d'années (tribune 1) et les gradins inférieurs des tribunes situées derrière les buts (tribunes 2 et 4).
La vieille tribune debout de la rue de la Neuville a ainsi été remplacée par une nouvelle tribune assise à 3 niveaux de capacité de 13.000 places assises (tribune 3) et la capacité des tribunes situées derrière les buts a été doublée par la construction d'un deuxième niveau de gradins au-dessus des gradins existants.
Le terrain de jeu implanté sur un site urbain exigu, en oblique par rapport aux rues voisines, a imposé des solutions originales surtout dues au fait que les nouvelles tribunes s'inscrivent dans un plan trapézoïdal qui interdit les solutions classiques où les poutres en porte-à-faux qui supportent la toiture s'ancrent à l'arrière des gradins.
En cours d'étude, la Ville de Charleroi, confrontée aux griefs formulés par les riverains sur la hauteur de la grande tribune 3, a décidé de démonter, après l'Euro 2000, son troisième niveau de gradins pour le réinstaller au Vélodrome de Gilly et d'abaisser de près de 13 mètres, au moyen de 4 vérins, son imposante toiture, de près de 5000 m² et de plus de 5000 tonnes, à la hauteur de celles des tribunes voisines 2 et 4.
Ces contraintes ont conduit à suspendre les toitures des trois nouvelles tribunes à trois poutres métalliques en treillis, l'une longue de 120 mètres et haute de 8 mètres (tribune 3), les deux autres longues de 75 mètres et hautes de 5 mètres (tribunes 2 et 4), prenant appui sur 4 pylônes métalliques en treillis construits aux angles du terrain de jeu.
L'acier a largement été utilisé dans tout le projet: les structures portantes des escaliers, des planchers d'accès, des gradins supérieurs et des toitures des 3 tribunes (dont la tribune supérieure de la tribune 3 appelée à être démontée et remontée à Gilly après l'Euro 2000) possèdent également des structures métalliques en treillis qui prennent appui sur des colonnes tubulaires.
La structure métallique s'est imposée d'elle-même, dès lors que la réalisation en site urbain de poutres en béton de très grande portée n'était guère envisageable.
Le choix de la solution acier s'avéra encore plus incontournable lorsque la décision fut prise de démonter le troisième niveau de gradins de la tribune 3 et d'en abaisser la toiture de 13 mètres.
Les solutions « acier » ont permis de limiter le bruit et la poussière dans un quartier résidentiel contigu à une importante zône hospitalière.
En réduisant sensiblement le poids des ouvrages structurels par rapport à une solution béton, le choix de l'acier a considérablement réduit pour le quartier l'importance du charroi et les nuisances des engins de levage et de manutention.
Il a permis de réaliser le chantier en quinze mois, malgré l'arrêt de 6 semaines décrété par le Conseil d'Etat et les conditions climatiques extrêmement défavorables de l'hiver 1998-1999, sans jamais entraver l'utilisation du stade par le Sporting pour les matches de championnat.
Dans ce pays de vieille tradition sidérurgique, le parti architectural du Stade du Pays de Charleroi exprime bien par ses structures qui exploitent, dans un contexte particulièrement contraignant, toutes les ressources des structures tubulaires en treillis l'extrême légèreté et le caractère ouvert que seule pouvait apporter une solution « acier ».
Cette légèreté est confirmée par le galbe de la couverture des toitures en tôles nervurées cintrées autoportantes, dont l'épaisseur n'est que de 1,2 mm pour une portée de 10,60 m.
Vu les délais très courts imposés par le Maître de l'ouvrage pour l'étude et l'exécution de l'ouvrage, et la grande complexité du projet, l'utilisation d'un logiciel informatique de calcul s'est avéré indispensable. Le logiciel de calcul ESA-Prima Win a parfaitement rempli ce rôle.
Toutes les structures de gradins, passerelles d'accès et des toitures, ont été vérifiées sous charges statiques habituelles (neige, vent, surcharge fixes et mobiles) mais également en sollicitations dynamiques (foule en mouvement et vent).
Les simulations réalisées grâce au module de calcul dynamique du logiciel ESA-Prima Win ont fait apparaître que les toitures des tribunes 2 et 4 étaient trop souples par rapport à la structure des gradins en tête desquels elles s'appuient.
Il a donc fallu désolidariser les toitures des gradins par un dispositif de ressort et dashpot.
Ce dispositif très complexe a pu être parfaitement calibré grâce au logiciel.
L'utilisation du logiciel ESA-Prima Win a permis de vérifier toutes les contraintes ainsi que les déformations de la structure lors de toutes les phases extrêmement délicates de la descente de la toiture de 5000m^2.

SBM Wageneder GmbH

Your project

Technical data of the project

Length
18m (16,6m for transport on semi trailer/low loader)
With
6m (3m)
Height
4,3m (3,75m)
Mass
60.000 kg
Equipment:
Welded chassis consisting of plates and profiles, feed hopper, 2 vibrating feeders, vibrating grizzly, impact crusher, 2 belt conveyors, overbelt magnet, diesel generator set, electric and hydraulic equipment.

Crawler mounted crusher Remax 1311-11

SBM Wageneder GmbH

Arbeiterheimstraße 46
4663 Laakirchen - Austria
tel: +43 (0)7613/2771-0
fax: +43 (0)7613/2771-4
www.sbm-wageneder.at
contact: Helmut Wegenstein
e-mail: wegenstein@sbm-wageneder.at

annual turnover: ?

number of employees: ?

Why is this project important?

The Remax is a major product of SBM in sector mobile plants, about 15 units a sold till now. They do they work in whole Europe, so after sales problems are expensive and have to be avoided during the design studies.

Why is this project so special?

The calculated mainframe has to carry and to move the whole equipment. Extreme load cases are moving on hills, turning and operation of the plant. Most of the machines are vibrating, so dynamic effects must be considered.

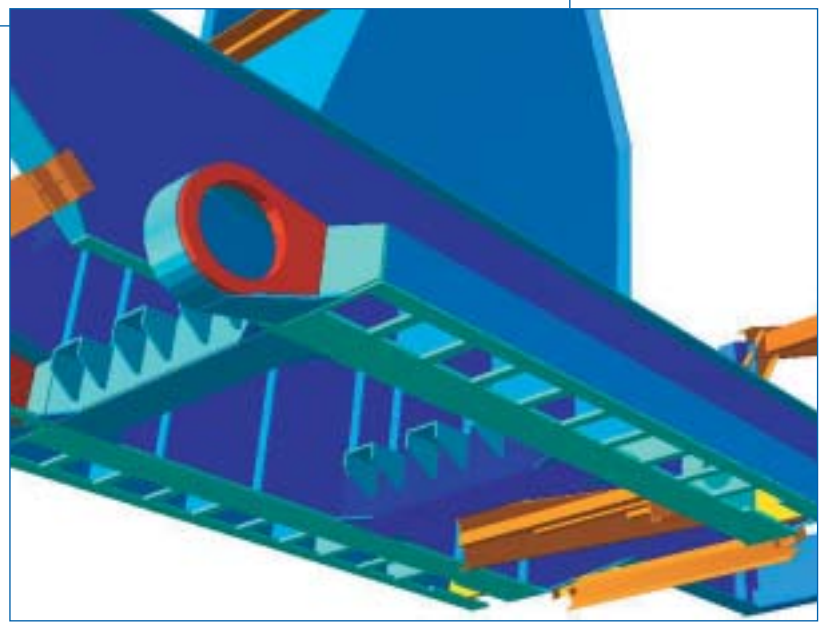
Use of ESA-Prima Win

Technical questions to be solved with ESA-Prima Win

The mainframe has to be strong but light, especially for load case turning the lateral forces very high. For calculation of the crawlerframe consisting of box profiles most of the construction has to be designed to get the right forces of the machines. Even the crusher is used as box to get the stability.

Experience with ESA-Prima Win when realising the project:

A high number of SBM-machines consist of plats and profiles and are situated on steel construction, so they could be calculated with EPW.



Your Company

SEGHERS better technology and life sciences has dedicated several decades to the development of key environmental technologies and life sciences.
The professional world recognises us as the technological meeting point and knowledge partner for clean energy, water treatment, animal nutrition and gene technology. More than one thousand scientists and engineers work worldwide to help SEGHERS better technology and life sciences make the environment and our lives better.
SEGHERS better technology for solids+air provides innovative turnkey solutions for the treatment of all types of industrial, municipal and hazardous waste, biomass and sludge. The SEGHERS waste-to-power plant constitutes a total solution for the transformation of these waste streams into clean energy with minimal environmental impact.
The total solution provided by a SEGHERS waste-to-power plant includes waste pre-treatment, multi-stage incineration, in-house boiler design, state-of-the-art flue gas cleaning & optimal process control. Our experts demonstrate their prowess in fields ranging from technology development to analysis, engineering, construction, and operations.

Seghers Sludge Pelletiser

SEGHERS Better Technology for Solids & Air.

't Hooft 1
2830 Willebroek - Belguim
tel: +32 (0)3 880.77.89
fax: +32 (0)3 880.77.98
www.seghersgroup.com
contact: Bart Gevaerts

annual turnover: **N.A.**

number of employees: **N.A.**

Our worldwide references emphasise the global nature of our company.
Experience gained from more than 100 completed installations provides the necessary resources for offering the total solution for the optimal treatment of a vast array of different waste streams.
Bart Gevaerts works at SOLIDS + AIR division as Design Engineer for the Mechanical Design Department and as Project Engineer

Your Project:

Description

The Seghers Sludge Pelletiser is a device developed to dry and palletise (make pellets) sludge.
This is principally done by transporting the sludge over trays, heated internally by thermal oil to typically 250 °C.
The device therefore consists of a vertical tower structure in which the trays are stacked.
Centrically a shaft which drives a scraping mechanism to transport the sludge is placed.
Typical data: nr of trays in 1 Pelletiser: up to 23
Diameter of tray:
5200/6200 mm
Weight of 1 tray:
7500 kg
Weight of driving shaft + scrapers:
30 tons
Weight of shell structure:
tons
Height of pelletiser:
up to 20 m

This design was firstly used at the BESOS-plant (Spain), for 4 Pelletisers of 17 trays each This means a total of 17*4 = 68 trays!

The shell structure of the Pelletiser

1. Structural design
Basic structure, which was designed using ESA-Prima WIN consists of a steel structure, covered by flat plating: this part carries the trays of the Pelletiser. Bottom part is a cylindrical and conical structure, supported on steel columns. On the central conical structure, the driving shaft and main drive is supported. A complete analysis model could be made because of the possibility in PRIMA WIN to make a combination of 2D, 3D and 1D elements.
Because a complete model was built during the design, this was a very interesting basis for making up scaling models (by very easily copying existing modelled structure and loadings) in later projects: eg. Model of 5200 pelletiser for BESOS-plant was upgraded to 6200 pelletiser for TAY plant (Scotland).

2. Loading data
Design of the device consists of calculation and evaluation of a number of load cases and their complex combinational effects:

- Own weight of shell structure
- Loading by trays
- Sludge loading on trays
- Internal pressure of the shell during operation
- Loading of bottom by shaft and main drive
- Wind loading during erection
- Temperature loading: shell structure obtains a higher temperature as column supports during operation, which leads to thermal stresses.
- Top loading: on top of pelletiser a hopper, sludge coater and thermal expansion tank are mounted

Using this model evaluation was made of deformations of plated structure, stresses in plates, stress concentrations at support-points ...

Thermal trays

1. Deformation characteristics of thermal tray
Design of the thermal trays is determined to a high degree by the amount of deformation (by own weight, thermal oil, loading of the tray with sludge).

This is investigated by means of a complete F.E.M. model to calculate, evaluate and minimise these deformations.

In 2000, a new design of thermal tray was made, and a test stand was built in workshop to measure the deformations of the tray; a very accurate agreement between realisation and calculations was found. Calculation of behaviour of the tray at operation temperatures was done by reducing the E-modulus of the material in the calculation and recalculation.

2. Thermal tray as pressure vessel
Since the tray is heated by thermal oil at a pressure of typically 3 bar, the tray actually is a pressure vessel. Therefore, during design, model of tray is also loaded with pressure-load case to calculate resulting stresses and obtain information on behaviour of stress-concentrations in the tray-structure. Corrosion calculations were easily possible by graphically selecting elements considered as being corroded, reducing their wall-thickness and recalculate structure.

Tray supports

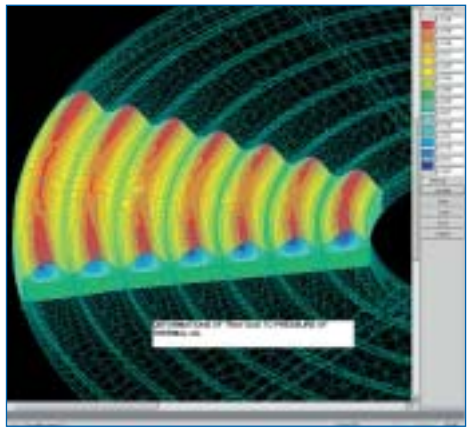
Because of the high importance of the very limited deformations of the trays, naturally also a very strict analysis is done on the tray supports.

Torque Reaction arm of main drive

A reaction arm balances the drive torque of the main drive. Due to the high mechanical power of the main drive and the low speed of rotation of the main shaft, this leads to high reaction forces to be distributed via the reaction arm. This arm is also designed by using a FEM model:

Use of ESA-Prima Win

- Pelletiser Shell structure: 3D shell + 3D frame
- EC3-code check
- Tray: 3D shell
- Supports: 3D shell
- Torque Arm: 3D shell



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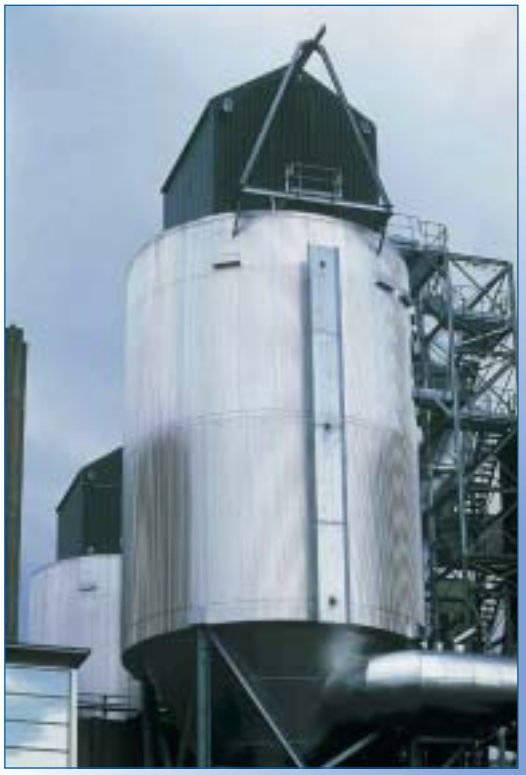
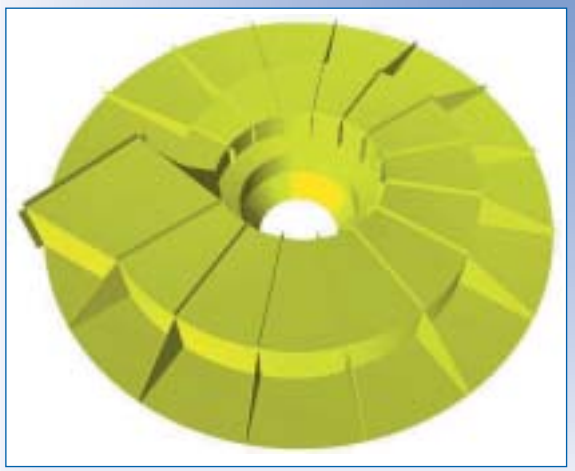
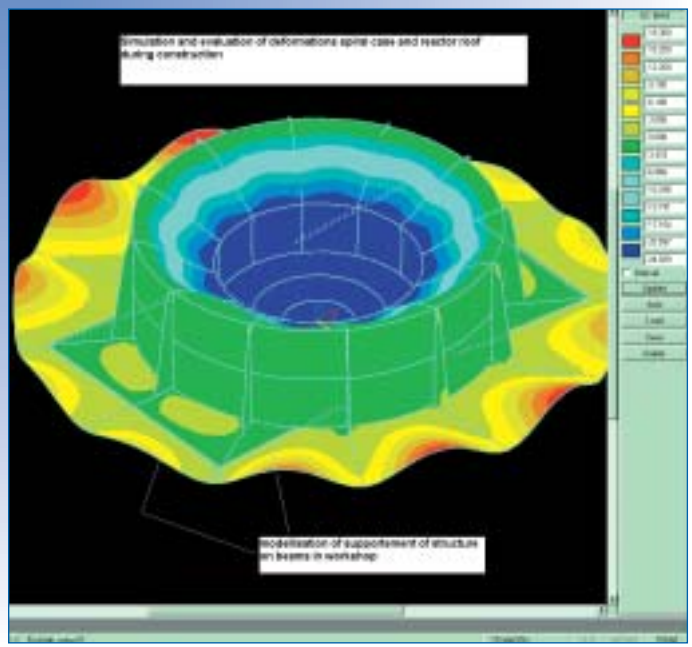






Reactor and structures for fluegas-cleaning

SEGHERS Better Technology for Solids & Air.

't Hooft 1
2830 Willebroek - Belguim
tel: +32 (0)3 880.77.89
fax: +32 (0)3 880.77.98
www.seghersgroup.com
contact: Bart Gevaerts

annual turnover: **N.A.**

number of employees: **N.A.**

Your Project:

Typical data:

Reactor dimensions:
Diameter: 9000 mm, Height cylinder: 10000 mm (incl. skirt)
Height cone:
9800 mm
Steel structure dimensions:
Height: 14400 mm, Base: 7700 mm x 6000 mm
Penthouse dimensions:
Height: 6200 mm, Base: 7800 mm x 4800 mm
Weight:
Ca. 70 tons
Design conditions reactor:
Pressure: -280...-300 mm H2O = 3 kN/m²
Operation temperature:
max. 250 °C
Possible slagging weight of lime:
ca. 40 tons
Overall height of global structure:
ca. 35000 mm

Design of Complete reactor structure

The total reactor-design consists of following parts:
1. Reactor shell structure
2. Reactor-roof with integrated spiral casing
3. Penthouse and platform on top of Reactor-structure
4. Reactor support skirt design
5. Reactor supporting steel structure

It was necessary to take design decisions in an early stage of the project; so we decided to start the design on different items simultaneously and models were made of the different parts, using approximate boundary conditions and loading assumptions. Because the actual structure acts as an integrated entity, the different parts were assembled one for a crosscheck calculation using the ESA-Prima Win option to load (sub) projects into an existing project: it is possible to "assemble" the different building parts, and simulate the complete design (wind transfer from penthouse to reactor, different support-stiffness of reactor-support due to asymmetrical steel structure, combination of wind load and pressure in reactor ...)

1. Reactor shell structure

For design of this structure use of both global and local axis systems was made to define loading (wind loading according to global axes, pressure in reactor according to local axes of 2D elements...) For evaluating results of calculation (stresses in 2D macros), different output calculation facilities were used: stress SigmaE for interpretation of stress concentrations, stresses SigmX, Sigm Y to make distinction between longitudinal and circumferential stresses in reactor, used to investigate buckling of reactor (comparison with analytically calculated buckling stresses). Behaviour of reactor in corroded conditions was simulated by graphically selecting elements (considered as corroded) and reducing wall thickness and recalculate structure. Behaviour of structure at higher temperatures was done reducing E-modulus in calculation model.

2.Reactor-roof with integrated spiral casing

To analyse the reactor roof and spiral case as a "plate-stiffened structure" we used the powerful possibility to combine 1D and 2D elements in 1 design: ribs on plates were used to model stiffeners on plates, using the option of eccentricity to make the most economical design possible.

To evaluate the reinforcing influence of the spiral case on the flat reactor-roof, an model of the spiral case was used.
Limitations were put on the deformation of the spiral case where the Atomiser is mounted. To evaluate the deformations of the roof +& spiral case in the workshop (support on 2 beams), modifications to the existing FEM model were made.

3. Reactor skirt design

We evaluated the rigidity of the design and the stress concentration (specifically the stress pattern) near the support points of the reactor.(using the nodal mesh refinement option in these nodes)

4. Penthouse and Support structure

The structures were designed using EC3. The complete model was used for the cross-check calculation, using actual force transfers in the reactor and penthouse-supports. The many possible load cases (wind in x, y direction, pressure in reactor, lime deposit in reactor cone, monorail loading of penthouse, loading of platforms of penthouse and support structure, insulation weight) this resulted in 596 EC3-combinations!
In 1 of the reactors it was not possible to use bracings; a 2nd order calculation was done, to get reliable info on sway/non-sway conditions.

5. Seghers Rotary Atomiser

Lime-milk is sprayed in the reactor using a distributor-plate turning at ca. 12000 rev/min. A critical design parameters of the axle is the "critical speed" (max. speed is limited by centrifugal forces). A simplified method of analysing this critical speed was done using a 1D-analysis of the axle this means evaluating deformations in the magnitude-order of microns!

It is fascinating how in one global design (Reactor with Atomiser) 2 totally different mechanical structures (Reactor structure 100 tons, with cm displacements and Atomiser with axle 15 kg, with micron-displacements) are met. Since however both structures behave according to the same laws of mechanics and the resulting mathematical analysis, the same design software could be used!

Extension of existing stairwell tower

To access the roof & penthouses, the existing stairwell had to be extended. (18600 mm to 29240 mm) and one of the stairwell towers was loaded by the 2nd outlet fluegas-channel of the reactor (weight: 9 tons). To design the necessary reinforcements to the structure as well as keep reactions to foundation allowable an "as-built" model was used.

Use of ESA-Prima Win

- 3D shell: For separate analysis of different parts of reactor
- 3D frame: For analysis of support structure and penthouse structure for simulation calculation of stairwell tower
- 3D shell + 3D frame: for cross-check calculations
- EC3 - check: For calculation of support structure and penthouse structure
- Non-Linearity: extra 2nd order calculation of the support structures

Your company

Tebodin EC is a Hungarian company of engineers and consultants, with know-how in a wide range of technological fields. Established in 1990 and is now employing a staff of more than 60 highly qualified people, offering engineering and consultancy services tailored to meet the clients requirements in Hungary & internationally. The last years Tebodin EC developed into one of the largest private engineering offices for industrial, commercial & telecommunication projects in Hungary. As the Hungarian partner of Tebodin Consultants & Engineers, one of the leading engineering consultancy companies from the Netherlands, Tebodin EC has access to an international network built up over 5 decades. As part of an international network with more than 2000 employees in 20 countries, we can provide global clients with global solutions tailored to the local requirements. Tebodin EC provides excellent services and opportunities for a variety of foreign investors. It covers various ranges of disciplines and guarantees an optimal approach satisfying highest Western standards. Apart from Hungarian, our employees are fully familiar with Western European, American & International Standards. As a specific asset they participate in Europe wide exchange of

Blast Furnace

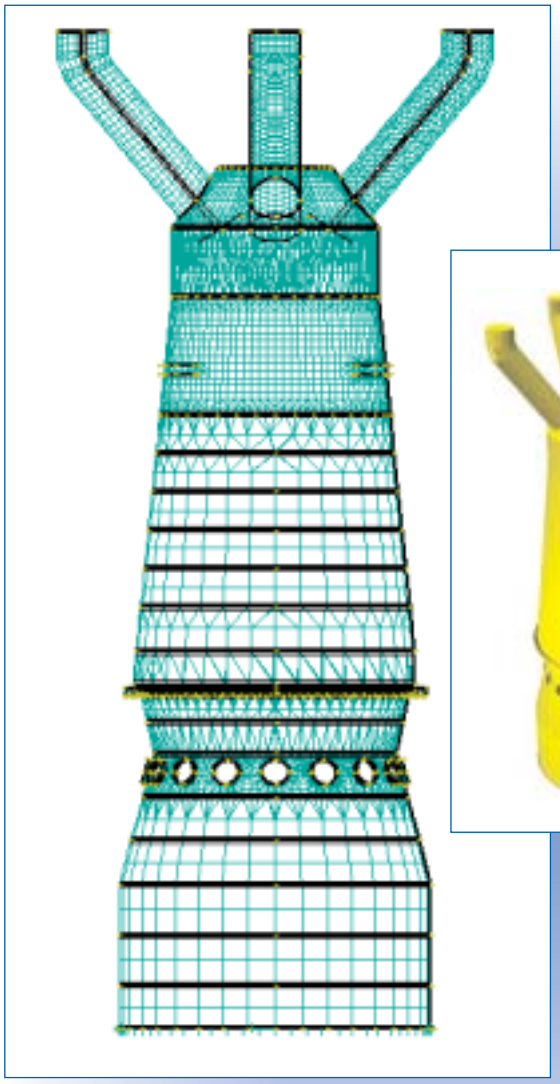
Tebodin EC Mérnökszolgálati Kft.

Tebodin EC Engineering Ltd.

H-1119 Budapest, Bikszádi u. 6/a
tel. +36 1 205-9601
fax: +36 1 205-9622
www.tebodin.com
Contact: Zoltan HORVATH
e-mail: ec@tebodin.hu

annual turnover: **N.A.**

number of employees: **65**



personnel between the Tebodin offices.

Services offered by Tebodin EC
- Consultancy, site selection
- Conceptual studies
- Project management
- Permitting
- Basic and detail engineering
- Tendering and procurement
- Construction supervision and Commissioning.

These are offered as single engineering or consultancy packages or on an EPC-Contract (Engineering, Procurement, Construction) or even turnkey basis.

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- Process Technology
- Power Plants
- Logistics
- Environment
- Automotive
- Telecommunications
- Steel and machine building
- Logistics and Manufacturing
- Buildings and Infrastructure: Construction, Architecture, Building physics, Installations, Transport, Estimating/Bid documents

One of the main activities of Tebodin EC is to provide the full range of services for new facilities for foreign investors in Hungary, specifically in the areas of industrial plants, commercial and logistics centres and infrastructural development.

Your Project:

The project covers a very old blast furnace in a Hungarian steel work factory in the town of Dunaujvaros, (built in 1960). The statical system of this furnace was so that the base concrete block on soil supported the lower part of the furnace and the furnaces is also supported at 1/3 of the height with a spring on the surface mantle.

A horizontal plate divided the two parts of the body. This plate functioned like a compensator, because the whole furnaces was heated of course and was supported in vertical direction on two different levels.
The furnace was rebuild in 1989 when every element of the furnace was removed and rebuilt exactly as before. More space around the furnace was needed and they simply removed the supporting structures without reinforcements of the body. Now the horizontal plate in the middle served as support of the upper part, turning the furnace into a self-supporting construction. It is interesting that the construction still stands with the changed statical system and the 40 mm thick middle plate. The steel work decided to remove the old furnace in 2001 and they build a new one. Satisfied with the old technology, the new furnace was built around the same kind of furnace. So they chose the same shape as before. Knowing that there were open questions about the earlier rebuilding, they commissioned Tebodin EC Ltd to do a stress analysis of the body of the furnace, to examine what point had to be reinforced for safe working over the next 10-15 years. We examined the whole furnace body and made a model from 2D members adding all the loads acting on the furnace.

Technical data of the project

Height:
Base on Level +1.50 m, Top on Level+37.47 m
Diameter:
11.576 m down, 10.43 in the middle, 4.28 m the throat
Weight:
368 tons
Material:
Steel Fe510: (Ultimate strength: 510 Mpa/Yield strength: 355 Mpa)
Thickness of the plates:
Lower part 40 mm, Upper part 30 mm, Upper truncated cone 40 mm
4 connecting smoke ducts
D=1891mm, t=25 mm on Level +36.0 m
16 pieces of oxygen blasting each
D=990mm, thickness of the rim is 40 mm on Level +12.20 m.
Loads:
Dead load of the structure by ESA-Prima Win, loads in the inside of the body simulated by changing thickness of brick and other insulation materials
Live load (long lasting/not long lasting):
according to the technology
Wind load:
acc. to the Hungarian Standard, acting on the body and connecting structures direct
Pressure inside:
1.5-2.5 bar
Temperature load:
temperature of the shell during work was measured by the plant & taken into consideration in two different load cases: Case 1: 12-60 °C, Case 2: 30-80 °C
Load Combination according to the Hungarian Standards
As a result of our analysis we could say that the stresses in the shell of the furnaces are nowhere bigger than the allowable limit. Some plate thickness had to be increased. The main problem was the above-mentioned horizontal plate; it was 40 mm before and had to be increased to 50 mm. The upper part of the body was made from 30 mm of plate before, but the part that connected to the horizontal plate was not strong enough, this part had to be reinforced too to 40 mm.

Use of ESA-Prima Win

Modules used
- Base module
- 3D shell
- Intersection

Experiences with ESA-Prima Win

As we wanted to make better and better model for this furnace we were keeping the point when we had to make intersections for different 3D members. We had not have the right module for it before, and we had to buy it, and the life was easy after that action. It was very comfortable to work with this module and I use it really very frequently for other projects too.
I have other remarks too. At that time we could not apply the temperature load with the value of °C, but with relative displacement of the member. This question is not a question any more, because it has been changed.
It would be useful if the local distributed load on a 3D member not only with one arrow would be marked but in the same form like the global loads.

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Flue Gas Duct and Supporting Structure

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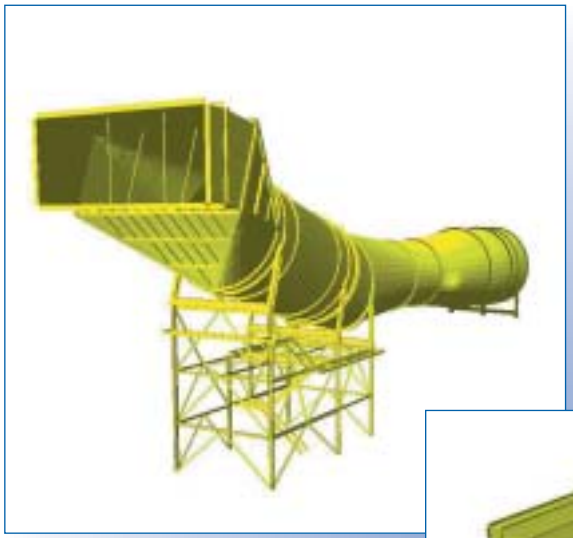

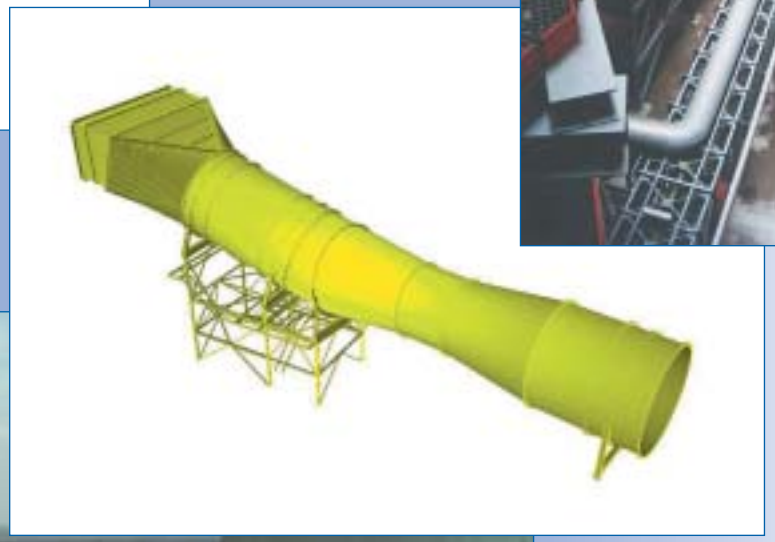

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Your Project:

The project covers a power plant in Gyöngyös in Hungary working with lignit (brown coal). The flue gas contains a high concentration of SO2 and the plant had to built a new desulphurization plant. The two absorbers (so-called washers) were built in the two cooling towers, where the flue gas is transported. The distance between the boiler houses and the cooling towers is ca. 300-400 m. Tebodin EC Ltd. had to design the entire system of flue gas ducts between the electro-filters and the washers in the cooling towers. Two washers where build and to each ones lead one flue gas duct (diameter 7400 mm.) In the entire project the 44 independent part of the duct are separated by compensators. The compensators are always above the supporting structures. The model shows a part of the flue gas ducts, directly before the washer. The system contains the duct and the supporting structure. There are two types of ducts in this model. The first type is supported by two structures (one is a theoretical support & one is the support given in the model). The other type is supported completely by the given structure. The first duct is located out of the cooling tower; and this part is loaded by wind. This duct also has a part where the cross section is smaller (D=5600 mm) than the others, because the duct has to pass between the columns of the cooling tower and the space is very narrow. The second part of the ducts are connected to the washers and the cross section is not circle but rectangle (11400x4600 mm). The ducts are insulated by 150 mm thick of mineral wool and coated by trapezoid steel plates. The ducts have fix points and the sliding supports are on the steel structures. The friction coefficient for sliding supports is 0,10 (applied for calculated supporting forces of the dead weight) The supporting steel structures are "latticed" structures with platforms and stairs to access the supports of the ducts.

Technical data of the project

Height:
Centre line of the ducts between the legs of the cooling tower is on level 11.46 m, Centre line of the instep to the washer is on level 19.10 m

Diameter:
7400 mm

Thickness of the plates:
8 mm (7 mm design thickness + 1 mm for corrosion)

Total weight for the whole project:
ducts 2800 to, and the steel structure is 800 to

Designing time:
From February 1998 to August 1999.

Material:
S235JRG2 acc. DIN-EN 10025 (Yield strength:235 N/mm^2, Allowable stress at working temp. (190 C°) is 163 N/mm^2

Loads:
Dead load of the structure by ESA-Prima Win
Dead load of the corrosion's thickness and insulation and covering: 0.38 kN/m^2
Dead load of grating of the platforms: 0.30 kN/m^2
Live load on platforms: 3.50 kN/m^2
Wind load: basic wind pressure is 1 kN/m^2 (Shape factor according the rules of the owner)

Pressure in the duct:
+4.00 kN/m^2 / -2.00 kN/m^2

Temperature load:
190 C° inside, 175 C° outside of the stiffeners

Friction coefficient:
0.10

Combination of loads according to DIN 18800
Stress & stability analysis acc. to DIN 18800 Part 1 for supporting steel structure. The buckling of the shells and plates of the ducts can be examined by hand according to DIN 18800 Part 3 and 4.
In the model we can see the maximal stresses in the plates and shells of the ducts (never bigger than 163/1.1=148 N/mm^2), the checking of stresses and buckling of the stiffeners and steel supporting structures, From the model we can estimate the expectable deformation of the duct in the connection point with the washer and could suggest the necessary over lifting of the duct.

Use of ESA-Prima Win

Experiences with ESA-Prima Win

The results given by ESA-Prima Win are the same what we measured on the site in the reality. The deflections of the ducts were exactly the same what we had calculated with the program. It would be useful if the different part of the model could be got different colors. And also at rendering not the whole construction e.g. legs, beams, stairs, plates has the same color, but we can choose different ones.

Modules used:
- Base module
- 3D shell
- Steel Code Check acc. DIN

TECHNUM

Your Company

Technum NV is een multidisciplinair en onafhankelijk studie- en adviesbureau met ervaring en expertise in sterk gediversifieerde activiteitsdomeinen.Technum levert diensten aan overheid, industriële en dienstverlenende bedrijven, projectontwikkelaars, internationale instellingen, ... voor elk voorkomend project, enkelvoudig of multidisciplinair en in elke projectfase.Wij beschikken over de nodige capaciteit, deskundigheid en creativiteit om opdrachtgevers een gespecialiseerde en totale begeleiding te garanderen in tal van domeinen.

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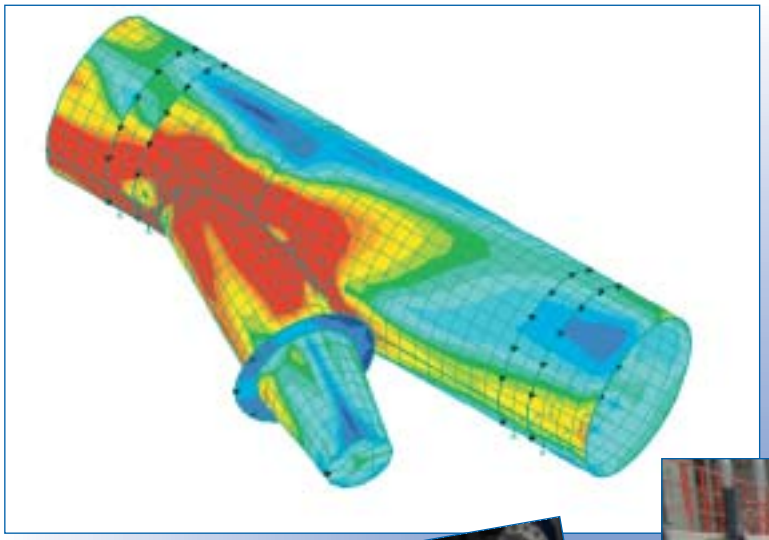
Infrastructuur

- Wegen, straten en pleinen



Studie van 2 buisverbindingen

Technum Flanders Engineering nv

Wilrijkstraat 37 bus 1
2140 Antwerpen - Belgium
tel.: +32 3 270 92 92
fax: +32 3 270 92 68
contact person: Dieter Rabaut
DIR@technum.be

annual turnover: □2 070 000 number of employees: **N.A.**

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- Omgevingsstudies
- Leefbaarheidsstudie

Project management
- Construction Management
- Build, own and transfer (BOT) projecten
- Build, own, operate and transfer (BOOT) projecten
- Turnkey projecten
- Programma- en projectmanagement (PPM) operaties
- Technische bijstand bij uitvoeringsprojecten

Your Project

Studie van twee buisverbindingen

Modellering met eindige elementen methode

Deze studie omvat het bestuderen van twee buisverbindingen onder inwendige druk. Het eerste deel van de studie onderzoekt de vervormingen en spanningen zoals uitgevoerd, het tweede deel zoekt een oplossing om spanningen en vervormingen tot aanvaardbare grenzen te reduceren.

De staalkwaliteit van de buizen is S235, met een minimum vloeigrens van 235 N/mm² en een treksterkte van minimum 360 N/mm².
De eerste verbinding is een buis met diameter 600mm, met wanddikte 6mm, die onder een hoek van 30° aansluit op een buis diameter 1000mm, met een wanddikte van 10mm.
De tweede verbinding is een buis met diameter 600mm, met wanddikte 6mm, die onder een hoek van 30° aansluit op een buis diameter 800mm, met een wanddikte van 8mm.

Beide verbindingen worden belast met een inwendige werkdruk van 9 bar, en een testdruk van 16 bar.
De verbinding werd gemodelleerd met het eindige-elementen-pakket ESA-Prima Win (elementen met een gemiddelde afmeting van 100mm)

Uit de studie van de buisverbinding zoals uitgevoerd komen volgende zaken naar voor:
1 Overschrijding van de elastische spanning over grote delen van mantelomtrek van hoofdbuis en aansluitende buis. (De rode zones duiden de overschrijding van de vloeigrens aan bij een inwendige druk van 16 bar.)
2 Vervorming van de opening van de buisverbinding. (De boven en onderzijde van de opening wijken naar buiten door trek in de buismantel.)
3 Vervorming van de doorsnede van de hoofdbuis ter plaatse van de straub-verbindingen. (Het ovaliseren van het gat doet de aansluitende buis DN600 uitwijken, dit uitwijken veroorzaakt een vervorming van de doorsnede van de hoofdbuis DN1000/DN800.)

De oplossing is gezocht in het plaatsen van verstijvingschotten op de hoofdbuis, nabij de straub-piping joint, en op de verbinding.
De oplossing houdt rekening met de drie hoger beschreven effecten:
1 De spanningen blijven beperkt tot de vloeigrens over de twee buismantels. Lokaal blijven piekspanningen bestaan ter plaatse van de binnenhoek van de aansluiting. Hoewel deze de vloeigrens ruim overschrijden, kunnen deze toch aanvaard worden. Een zeker plastische vervorming is toelaatbaar mits deze laatste begrensd wordt (zie 2. en 3.)
2 De vervorming van de opening van de buisverbinding wordt ingesnoerd door drie verstijvingschotten op de verbinding.
3 De doorsnede van de hoofdbuis ter plaatse van de straub-verbindingen wordt vormvast gehouden door toevoeging van een verstijvingring.

Use of ESA-Prima Win

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

Waar is er spanningoverschreiding, hoe vervormt het geheel.

Modules used:

3D Shell, Intersection

ZT-Büro Kiesl

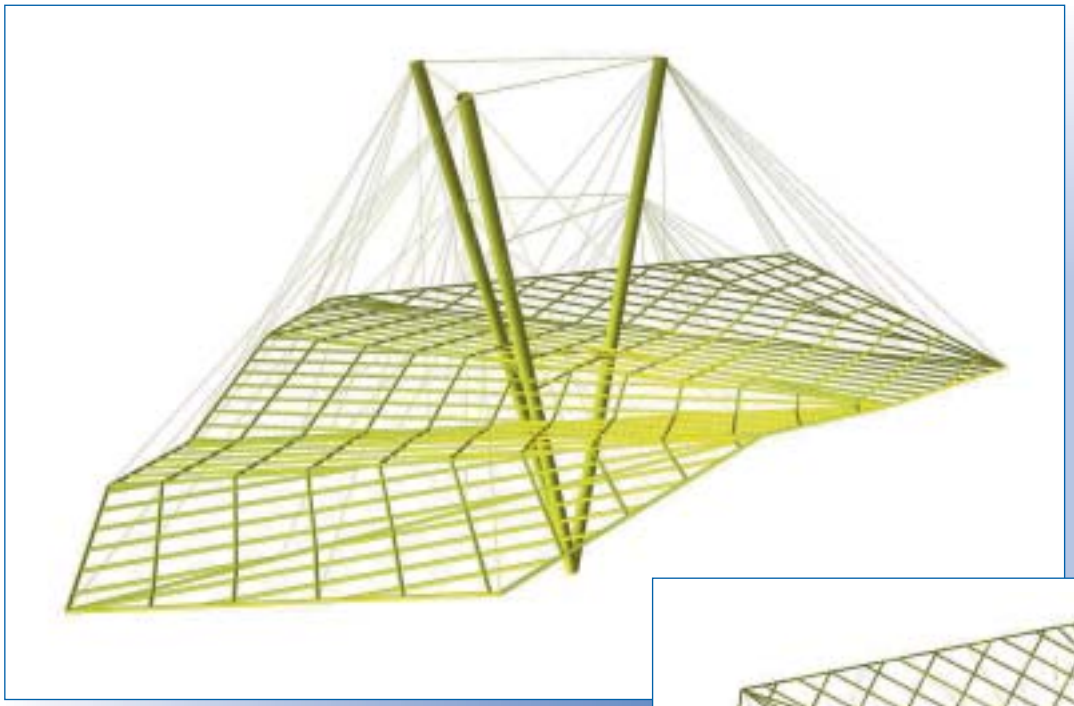
Betätigungsfelder: Planung und Berechnung von Förderanlagen und Sonderstahlbauten
Entwurf und Berechnung von Antriebselementen (Getrieben und Kupplungen)

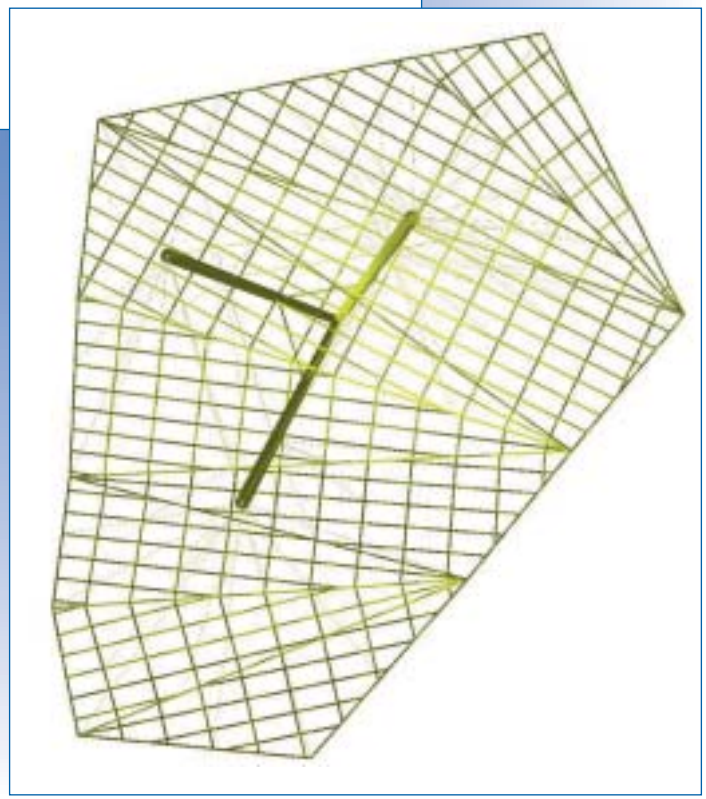
Ihr Projekt

Aufgabenstellung: Es soll eine Fläche von 1500 m² zwischen zwei Bürogebäuden für Veranstaltungs-möglichkeiten überdacht werden.

Als Bedingungen vom Arch. Büro wurde folgendes übernommen

- Geometrie
- 3 Pylone
- Seilabspannungen (ca. 70 Stk. / Pylon)
- Abspannung in den Gebäudekern
- Tragkonstruktion für das Glas aus Rohren Dm. 160 mm
- Glasfläche muss begehbar sein
- Belastung aus Wind + Schnee 3 kN/m²





Vordach mit Dachschräge

ZT-Büro Kiesl

Meindlstraße 40
4030Linz - Österreich
tel.: +43 664 53 11 540
fax: +43 732 310049 14
contact persohn: Kiesl

annual turnover: □45 000

number of employees: 1

Die Arch. Vorgabe das die Glasflächen ungleichseitige Dreiecke sein sollen sind aus Kostengründen bzw. aus Konstruktivengründen der Knoten nicht berücksichtigt worden.

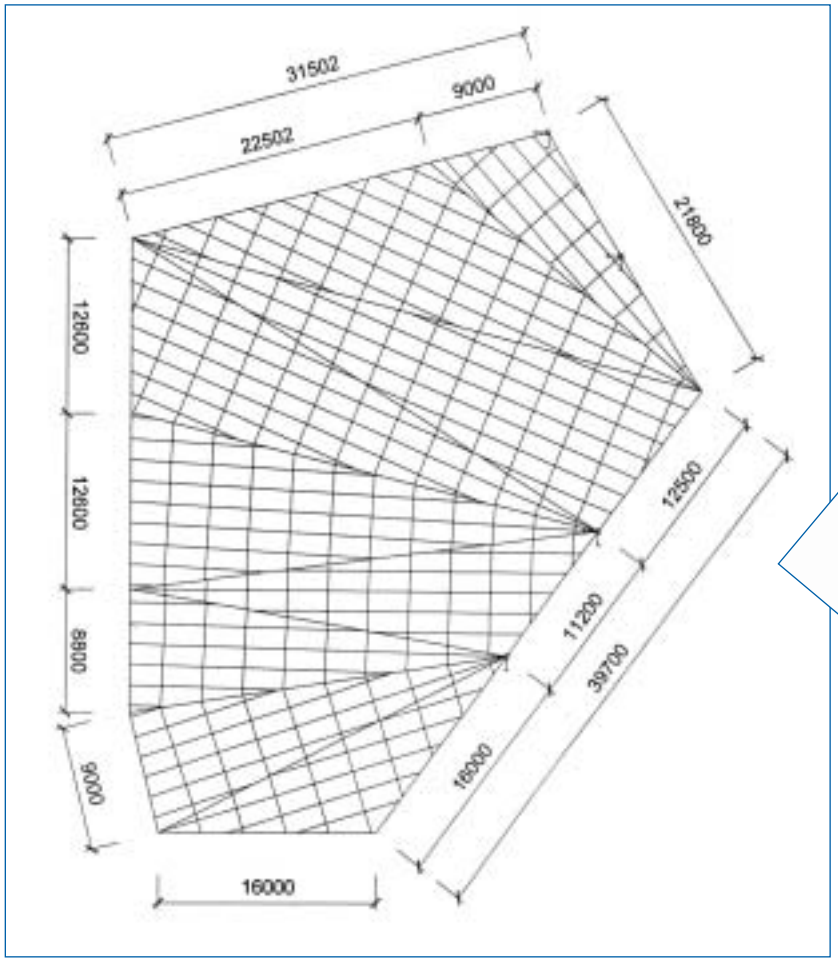
Die Ausarbeitung bei unserer Studie ergab eine rechteckige Flächeneinteilung von 1,5 x 3 m.

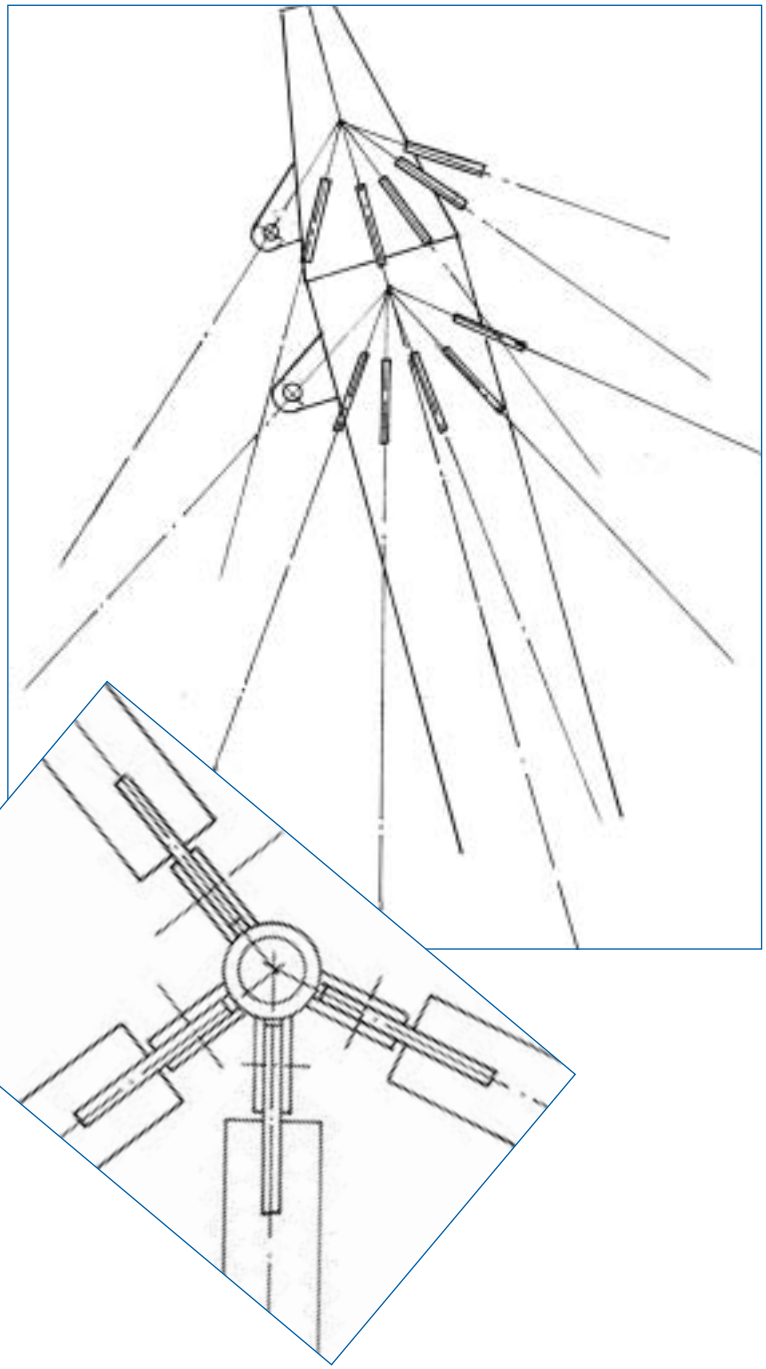
Auf dieser Basis ergibt sich:

- Rechteckige Glaszuschnitte von 1,5 x 3 m
- Im Randbereich nur Schrägschnitte im Glas
- Unterkonstruktion aus Rohren Dm. 159 mm mit verschiedensten Wandstärken
- Fertigungsfreundliche Schraubkonstruktion der Knoten
- Schleifende Schnitte bei den Konten sind ebenfalls ausführbar
- Pylonfußkonstruktionen mit einer Grundplatte
- Seile aus galvanverzinkten Drähten, mit Gabelfitting und Gabelspannschloß für Justierung

Konstruktionsgewicht:
136 to Stahlbau
3 to Seile

Baukosten mit Glas:
□1 500 000,–





Your company

- Structural engineering
- Architectural engineering
- Civil engineering
- Construction management
- Installations

Your project

Technical data of the project

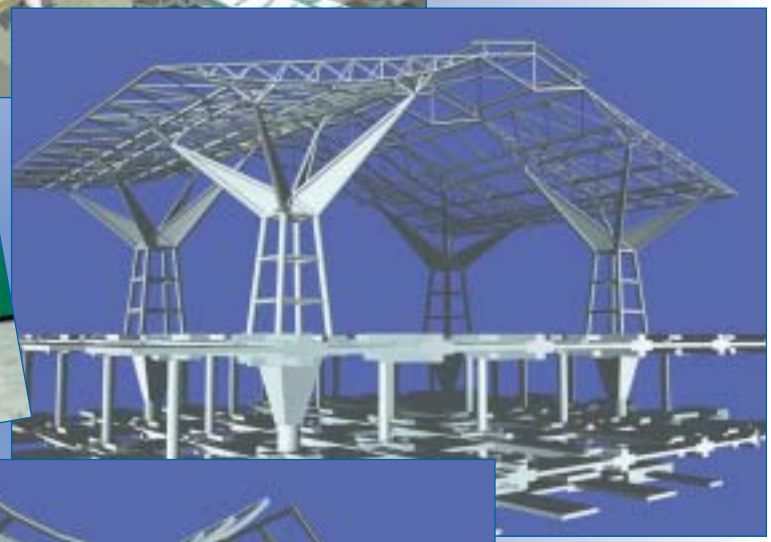
Project title:
King Abdulaziz International Airport

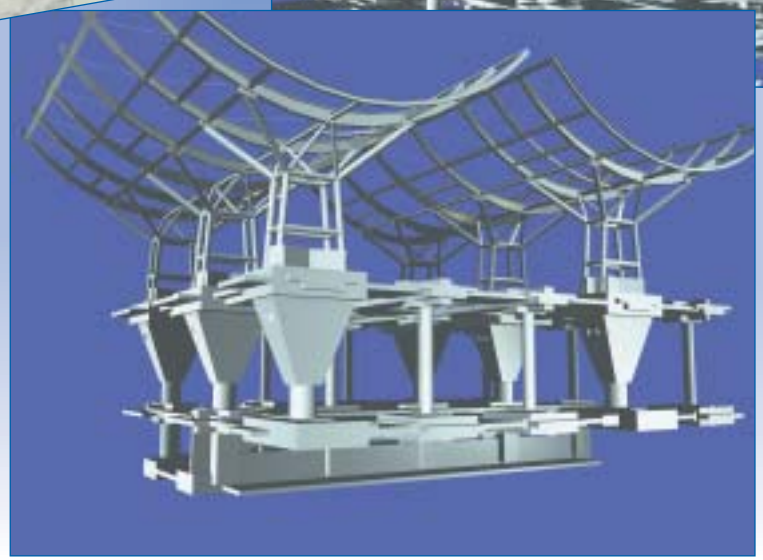
Physical Location:
Kingdom of Saudi Arabia - Jeddah

Site owner:
Kingdom of Saudi Arabia; Ministry of Defence and Aviation and Inspectorate; General Presidency of Civil Aviation

Architect:
NACO

Engineering office:
ABT adviesbureau voor Bouwtechniek





King Abdulaziz International Airport

ABT

consultancy for construction engineering
Arnhemsestraatweg 358
6881 NK Velp - The Netherlands
tel: +31 (0)26 3683111
fax: +31 (0)26 3683110
www.abt-consult.nl
contact: P.A. Bulsink
e-mail: p.bulsink@abt-consult.nl

annual turnover: □16 700 000

number of employees: 200

General contractor:
at this moment the contractor is unknown
Realisation:
2005

Why is this project important?

The number of passengers travelling by plane increased enormous last decade. In no time you can go over all the world. The increasing number of people flying demand an airport that can do its job. The existing airport is too small for the capacity & the management decided to extend the existing airport.

Why is this project so special?

The extension to the International Airport is really huge. The project combines the enormous size of the extension & eye for detail. The designers succeeded their mission: develop an airport where it is lovely to be. The extension is realized in a number of project teams because of the size of the project All teams worked together for one goal: to develop a beautiful airport in Jeddah. This asked a big effort of all these team members. For better structural design the project is divided in 5 parts.
A short introduction to the different parts will be given:

Part I New terminal buildings

The new terminal buildings are situated east & west of the existing South Terminal Building. Layout has been derived from the existing terminal as well as the Concourse and Connectors. The "column grid" of the new buildings is 12x8m^2, (existing building: 12x12m^2). The building consist of a ground & 1st floor and a split-level basement for the luggage handling. The spatial roof system of the Connectors is extended over the central part of the new building. The rest of the building is covered with shell structures shaped identically as the existing building.

Part II Concourse

The Concourse is approx. 1,370m long and 40m wide and comprises a large public space on the 1st level & a mezzanine with travelators of about 9m wide. Ground level is used for airside operations, & some technical rooms. Under the Concourse a tunnel is build to uses the installations. Characteristics of the architectural design are the spatial roof structure, the open public areas, the length and the repetition. The longitudinal column distance is 12mx 12m. On ground level these large column distances provides space for baggage trolleys, trucks, busses etc. The main grid of columns under the 1st floor is 6 to 8m in cross section.

Part III Connectors

The layouts for the roof and floors have been derived from the construction of the Concourse. The width of one Connector is 216m at the Concourse end & 68m at the terminal buildings and. In cross section the width is about 138m. The roof height is about 33m.
Underneath the Connector the "concourse tunnel" is connected to the basements underneath the terminal buildings. The (lowered) ground level & 1st level connect to the corresponding floors of the terminals. The roof of the Connector reaches its highest point at the side of the Concourse and it lowest point at the side of the terminal buildings, so it does not connect at the same level to the higher terminal roof. Using the same principles of the Concourse, an enormous space is created.

Again, the aesthetics of the architecture and the construction are intertwined.

Part IV Parking garages

At landside of both Terminal Building 1 and Terminal Building 3 a parking garage is planned. Each parking garage consists of three levels. The height is 3.50m. Layout and structure of both garages are equal but mirrored. The garage is divided in 2 parts; resp. 108x152m and 72x152m (ramps not included). These parts are separated by a 20m wide "pedestrian promenade underground tunnel' that connects the parking & the terminal buildings. On each parking level the two parts of the garages are connected by 3 traffic bridges and 2 smaller pedestrian bridges which cross under the promenade. At both sides of the garages a ramp is designed to enter or leave the parking. The ramps are designed for one way traffic but allow 2-way traffic in cases of emergency. The columns are placed in a grid of 18x8m, Based on the dimensions of the parking places (5.5x2.67m) & the width of the traffic lanes (7m) between them. So a column-free parking zone has been created.

Part V Existing South Terminal Building

The existing terminal building is a concrete structure with concrete shells as roof. The grid system of the building is 12x12m2. The building comprises a ground and 1st floor & mezzanines on the 2nd floor. Luggage handling tales place in the basement. The building will be incorporated in the total design of the Basic Project. This will include adjustments to the existing structures.

Use of ESA-Prima Win

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

The problem we solve in ESA-Prima Win was to study and to calculate the way forces are running through the design of the construction. So by modelling we had to decide if things are possible or not. Really special at the design process were the earthquake loads.

A description of your experience with ESA-Prima Win when realising the project:

ESA-Prima Win was a key player in the design process. Our engineers used ESA-Prima Win from the first sketch of the architect till the last calculation in the design process. When modelling our ESA-prima Win calculation models we used a lot the opportunity to exchange digital information with the architects. So, it really worked quick this way and the answers for the construction could be given in a fast way!

Modules used:

- Base
- 2D frame
- 2D grid
- 3D frame
- Dynamic document

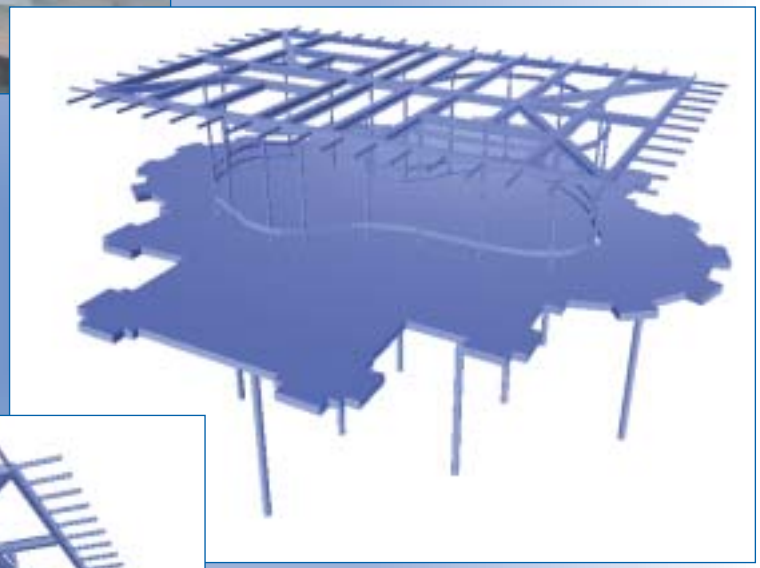
Your company

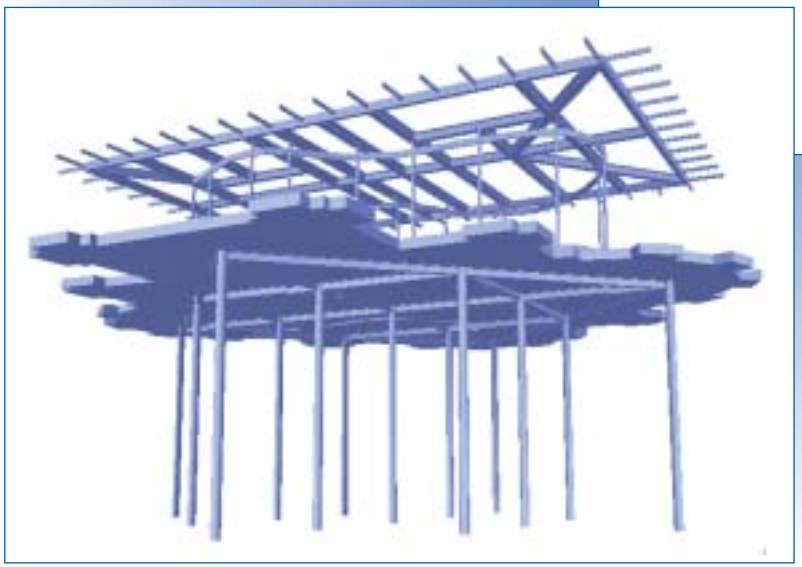
- Structural engineering
- Architectural engineering
- Civil engineering
- Construction management
- Installations

Your project

Technical data of the project

Architect:
Mecanoo, Delft
Structural engineer:
ABT Consulting Engineers, Delft (ir. P. Luyendijk)
Length X With:
Ca. 18m x 8m
Height:
Ca. 5,8m
Maximum cantilever:
Ca. 5m
Area:
Ca. 115m^2





RC Chapel

ABT Consulting Engineers

Delftechpark 12
Delft - The Netherlands
tel: +31 (0)15 2703611
fax: +31 (0)15 2703660
www.abt-consult.nl
contact: ir. Peter Luyendijk
e-mail: p.luyendijk@abt-consult.nl

annual turnover: **16.7 million** number of employees: **200**

Dates:
Design: 1998, delivery: 2001
Photographs:
Christian Richters, Peter Luyendijk
Other publications:
Architectural Review nov. 2001
L'Architecture d'aujourd'hui nov.-dec. 2001
De Architect jul.-aug. 2001
Bouw nr. 11 nov. 2001
Dutch yearbook of architecture 2002

The catholic cemetery of St. Lawrence in Rotterdam dates from de mid nineteenth century. It was designed as a campo santo, an Italian field for the dead; the cemetery is focused around a central chapel, surrounded by radiating paths. The cemetery chapel stands on a site of an old neo gothic church dating from 1869. Owing to the poor sub ground on which it was build, the original chapel gradually tilted over until danger of collapsing. In 1963 the chapel was replaced with a new tepee-like structure on the existing under croft, covered in copper. This too became unstable and now, the third chapel on this site was designed with new foundations.

The routing through the chapel evinces confidence in the continuity of life. You carry the deceased into the chapel, pause a while for reflection in a quit, contemplative space and then exit the chapel, all in one, smooth movement. The space is organic in form, shaped by an unbroken, sinuous wall, raised seventy centimetres above the ground. The intense blue inner surface of this wall bears passages from the Requiem in many languages, a reflection of the multicultural Rotterdam community served by this Catholic cemetery.
Above the space the roof floats like a curved sheet of paper. The golden ceiling is washed from below by artificial light while an opening in the ceiling admits a shaft of daylight. The chapel stands on a plateau of gravel within the contours of its neo-gothic predecessor. Two inlaid stone floors indicate the respective positions of the priest and the mourners.

Because of the former problems with the foundations, the choice was made not to fill the contours with sand and then start building the chapel but to leave the old cellar area open. This means the piles reach until 3m above base level and have also a stability function. Therefore steel piles were used.
Above the piles a grid of steel beams support the reinforced concrete floor.
Finally this solution was too expensive and replaced by a sand filled contour, and a concrete floor on steel piles only under the chapel area.

The chapel is made of a steel structure consisting of round columns (o114mm), supporting the steel beams (IPE400) of the roof. To reduce the thickness of the roof on the edge IPE120 profiles are used. Because of the light zones above the floor and below the ceiling, and because of the curved walls, a cross bracing was not possible to stabilize the chapel.

Therefore a framework was made of the columns together with the two curved UNP200 profiles.

The whole construction is designed with EPW.

The contours of the concrete floor and the façade are imported from an Auto Cad drawing of the architect. For tendering some construction drawings were made by printing the renderings en floor plans on scale.

All the necessary calculations are done with EPW:

- Pile reactions
- Forces and displacements of the concrete floor (reinforcement is calculated with ABT-software)
- Forces and displacements of the steel construction
- Unity checks on the steel beams and columns
- Stability calculations due to the wind loads

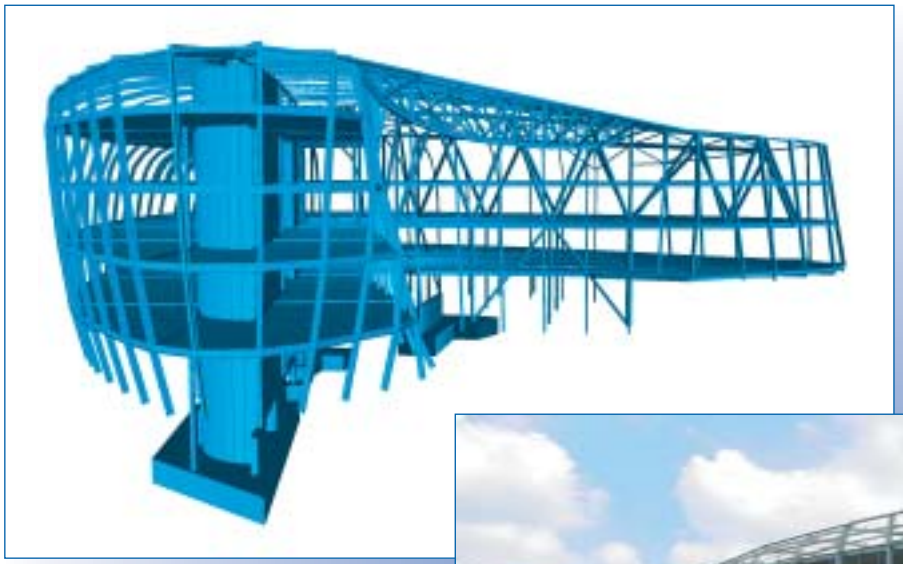
What are the main activities of your company?

- Structural engineering
- Architectural engineering
- Civil engineering
- Construction management
- Installations

Your Project

Technical data of the project

Project title:
Town hall Alphen aan de Rijn
Physical Location:
Alphen aan de Rijn
Site owner:
Alphen aan de Rijn
Architect:
Erick van Egeraat associated architects
Engineering office:
ABT adviesbureau voor bouwtechniek bv
General contractor:



Town hall Alphen aan de Rijn

ABT

consultancy for construction engineering
Arnhemsestraatweg 358
6881 NK Velp - The Netherlands
6800 AB Arnhem - The Netherlands
tel: +31 (0)26 3683111
fax: +31 (0)26 3683110
www.abt-consult.nl
contact: R.W.S Fielt
e-mail: r.fielt@abt-consult.nl

annual turnover: □16 700 000

number of employees: 200

Alphen aan de Rijn

Length:
107 m

Width:
63 m

Height:
20 m

Why is this project important?

The importance of this project lies in its function of town hall, which should be embodied by the building. With the town hall the local authority indicates the intended quality and ambition of the future development of the town heart. The building must be open and inviting and it should be functional and kind to its customers. Also of great importance is the internal design of the public area, which should be in harmony with both the new and the old city centre.

Why is this project so special?

This project is made special by the shape of the different parts of Pallet, SCO-roof and sloping back of the building. Flowing rooflines and slim connecting structures create structural shapes that are only to be made visible by spatial computer models.
The complex geometry of the building has been imported into AutoCAD, from the computer programme Mechanical Desktop used by the architect. After some adaptations and additions, this geometry has been read into the calculating package ESA-Prima Win, that is used by ABT. This link was ideal. For this project, the possibility of importing a DXF-file was a very powerful feature. Without this, it would have been almost impossible to put the very complex structure (with nearly no repetition!) into ESA-Prima Win, without doing months of dull work.
The geometry appeared complex to such an extent that it was agreed upon to take the main dimensioning of the architect as a starting point. These complex shapes make it necessary to fix this model at the start with the specifications completed. This then asks for a higher level of detailing by the designing parties.
It is clear that this design produces complex calculations. All eccentricities and complex geometry's create complex calculations both for main as for detailed computation.

Use of ESA-Prima Win

Modules used:

- 3D Frame
- 3D Shell
- Steel code check

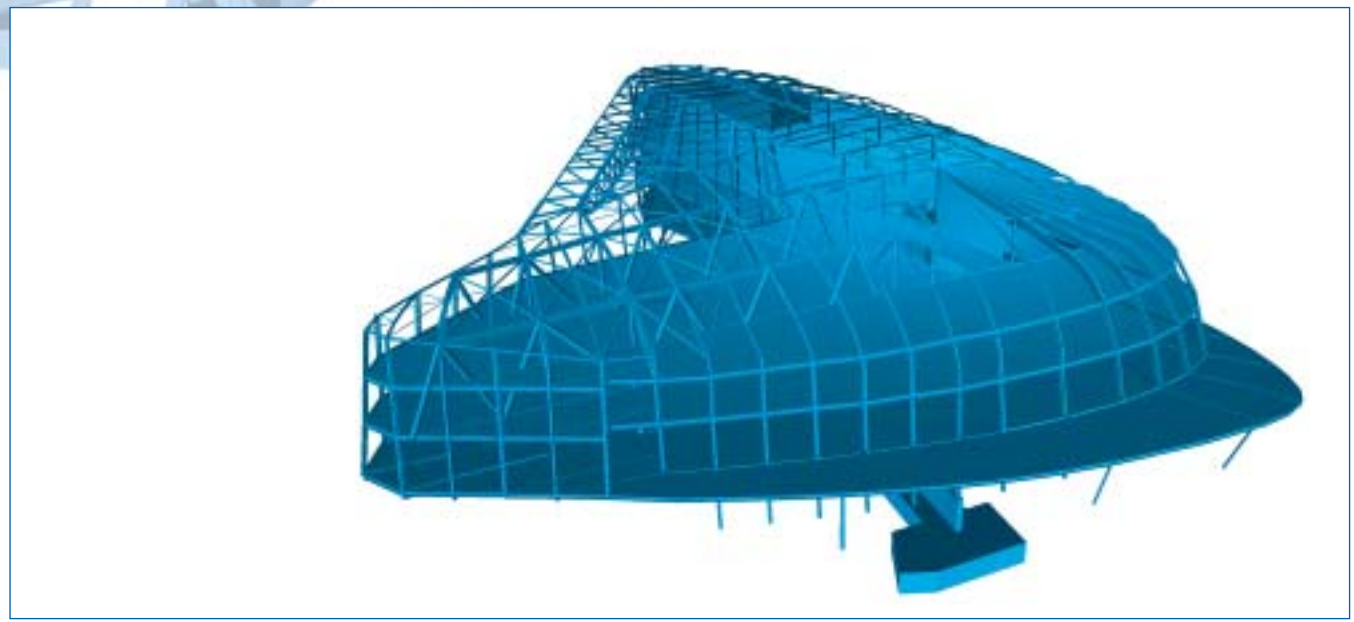
Description of the technical questions to be solved with ESA-Prima Win:

The complexity of the structure made it virtually impossible to calculate it in 2D. All of the columns in the facades have different (and differentiating, due to the BLOB-architecture!) angels, thus introducing all different kinds of horizontal forces on the structure. The influence of these forces, plus the important structural behaviour of the whole building together, made it necessary to use ESA-Prima Win. ut the model has also been used for studying possibilities. For example, the deformations of the large cantilever with the two large steel trusses had to be reduced, due to the glass facade. Furthermore the influence of the atrium being absent during construction-phase was something that had to be studied.

A description of your experience with ESA-Prima Win when realising the project:

As said above, ESA Prima Win was a necessary design- and study-tool for this project. With it's user-friendly interface, and shear endless possibilities, it proofed to be a worthy, powerful and indispensable (for this project) FEM-application.

- Birds view of structure.
- Frontal view, atrium-roof
- Side view, with clear look on cantilever and trusses
- Side view of Pallet, with on the left side adjacent the SCO-roof, taken from the start of the car-parking entrance.
- Rear-view, construction of 1st floor
- Rendered picture from architectural design, side view, complete building (left pallet, middle SCO-Roof)
- Rendered picture from architectural design, front view, with view on atrium and cantilever.



Your company

The four core activities of ARCADIS are: Infrastructure, Buildings, Environment and Telecommunications

Your Project

Technical data of the project

Project title:
Gerechtsgebouw Zwolle (Courthouse Zwolle)
Physical Location:
Zwolle, the Netherlands
Site owner:
Rijksgebouwendienst
Architect:
Gunnar Daan Doeke van Wieren, Oosternijkerk
Engineering office:
ARCADIS Bouw en Vastgoed, Den Haag
General contractor:
not decided yet
Length:
140 meters
Width:

Courthouse Zwolle

Arcadis Bouw en Vastgoed BV

Gevers Deynootweg 93
Postbus 84319
2508 AH Den Haag - The Netherlands
tel: +31 (0)70 358 3583
fax: +31 (0)70 354 6163
www.arcadis.nl
contact: ir. A.M. de Roo
e-mail: a.m.roo@arcadis.nl
contact: Ing. H.M.F. Beertsen
e-mail: h.m.f.beertsen@arcadis.nl

annual turnover: □850 000 000 number of employees: **8500**

15 meters

Height:

42 meters

Volume:

44.000 m^3

Mass:

approximately 160.000 kN

Why is this project important?

The existing courthouse in Zwolle dates from the 1970's and was designed by Jo Kruger. It has a very monumental design and a beautiful travertine façade. For a number of years now the existing courthouse is too small to facilitate all its functions and personnel. A design contest was held between five architects to expand the existing building with an additional 20.000 m^2 of various functions.

The winning design by Gunnar Daan was partly chosen because it respects the existing design and cleverly locates part of the new floor area above the existing building instead of next to it. This project is important because it is the main element on which a new city plan of the surrounding area "the Haaglanden" is based.

Why is this project so special?

Te decision of the architect to locate part of the expansion above the existing building created a large challenge for the structural engineer. After studying several possibilities, a design was chosen in which a cantilevered structure of 52 meters hangs above the existing building. A similar volume on the other side balances this load. The total structure is carried by two sets of diagonal pylons, which are connected at the top by a tensile element. The office building stands on the "bridge deck" which is suspended from the pylons using massive tie-rods.

Use of ESA-Prima Win

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

One of the largest design challenges of this structure is how to control the displacements, both during and after construction. The overall structure is relatively flexible and the displacements due to dead load and live load are quite large. Another important aspect is that the construction phasing has a significant impact of the resulting displacements and internal member forces. During the construction stage the vertical displacements of the bridge deck are controlled at set times by using jacks at the bottom connection of the tie-rods. The calculation of the necessary jack force and the influence on the rest of the structure are an important design consideration. By using the option of active/non-active elements of ESA-Prima Win it's possible to calculate the necessary jack forces with only the elements that are present at the time of construction. Using fictional temperature loads simulates the loads of the jacks. The jack-procedure can be modelled as an individual load-case. This procedure makes it possible to use just one overall model for all load cases and load combinations, and thereby saves a lot of time because it is not necessary to "manually add" results from several computer models for each construction stage.

The option of active/non-active elements was also used to model elements that are not active during construction but only during the actual useful life of the structure. This is for instance the case for the concrete slab of the bridge deck. This floor is cast at the end of the construction phase because during the jack-procedure the additional stiffness would create problems. In the end situation the floor is necessary for the stability of the wind forces and is therefore introduced in the model in the final situation and only active under wind-loads, temperature loads and live loads.

Another important design aspect is the serviceability under wind loads. Because of the large cantilever over the existing buildings the maximum acceleration under wind gusts has to be checked carefully. By using the module 'Dynamics" from ESA-Prima Win was possible to get an accurate estimate of the eigenfrequencies of the structure and their corresponding eigenmodes. The foundation piles are modelled as bi-linear elements in order to guarantee proper modelling of the forces in the foundation blocks.

The second-order effects of the structure are difficult to check with a simple calculation. The extension of the tensile-elements is not subjected to second-order effects so the normal enlargement factor n/n-1 would yield over conservative results. By using the advanced structural analysis model (non-linear, p-delta effect) these complex calculations were successfully carried out.

A description of your experience with ESA-Prima Win when realising the project:

Due to the complexity and the dimensions of the structure, a very detailed 3-D model had to be developed. As mentioned previously, some specific functions, such as time dependent active elements and foundation models were primordial to model properly this structure.

ESA Prima Win seemed at this time the most suitable software to use as it had the options needed as well as a really user-friendly graphical interface, which is very helpful when working on such structure. Moreover, the few examples files displayed on the web site allow a very fast learning of the basis of the program.

The linear, non-linear and dynamic analyses were performed in a fashionable time. The results were obtained in a very clear manner and once again the graphical interface helped to give a rapid first evaluation of the structure behaviour. The possibility to extract specific results in different formats was a very useful tool to investigate the output with software such as Math lab and Excel. Finally, the new updates of the program were very much appreciated, as new options, such as section analyses, were available.

The only problems encountered were related to the display of the output relative to the shell elements. Those graphical results did not always display properly, and made the use of shell elements sometimes unpractical. I would like to acknowledge all the persons working at the ESA Prima Win help desk for their technical support, their enthusiasm and their kindness. They have been of great help to exploit the many options of this software.

Modules used:

- Base
- Pre processor
- Advanced structural analyses
- Steel and concrete design: section evaluation (forces and moments), steel code checks, shell analyses
- Universal: intelligent document, international languages

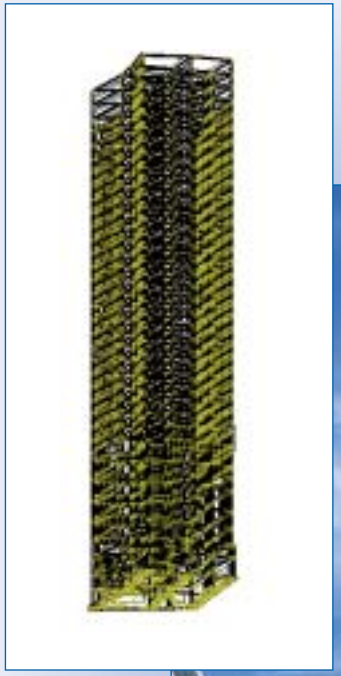
Your company

Infrastructure, Buildings, Environment, Communications.

Your Project

Technical data of the project

Project title:
Tower Admirant
Physical Location:
Eindhoven, The Netherlands
Site owner:
Heijmans-IBC Vastgoedontwikkeling
Architect:
Dam & Partners Architecten, Amsterdam
Engineering office:
Arcadis Bouw en Vastgoed bv, Eindhoven
General contractor:
Heijmans-IBC Bouwgroep, Best
Length:
40 m
Width:
20 m
Height:



Tower Admirant

Arcadis Bouw en Vastgoed BV

Postbus 330
5600 AH Eindhoven - The Netherlands
tel: +31 (0)40 265 4954
fax: +31 (0)40 243 9190
www.arcadis.nl
contact: Ir. Marcel van den Eijnden
e-mail: m.a.a.Eijnden@arcadis.nl

annual turnover: □850 000 000 number of employees: 8500

105 m (above ground level, -7 meters below ground level)

Volume:

65.000 m^3

Mass:

360 MN

Functions:

-2, -1 (subsoil levels):	storage, installation, entrance underground parking
0, entresol:	shops
1, 2, 3, 4:	offices
5-30:	apartments, penthouses at top-level

Why is this project important?

This project is a multiple-use tower in the inner city of Eindhoven. It combines the entrance to an underground parking, shops, offices and apartments. With a height of 105 meters it will be the tallest building in Eindhoven.

Why is this project so special?

The different functions each have their own type of construction. The entrance to the underground parking causes a large gap in the base of the structure. The shops and offices have high arcades with large columns and the living quarters have a scattered pattern of windows. The combination of these different construction-types makes a program like ESA Prima Win very useful.

Use of ESA-Prima Win

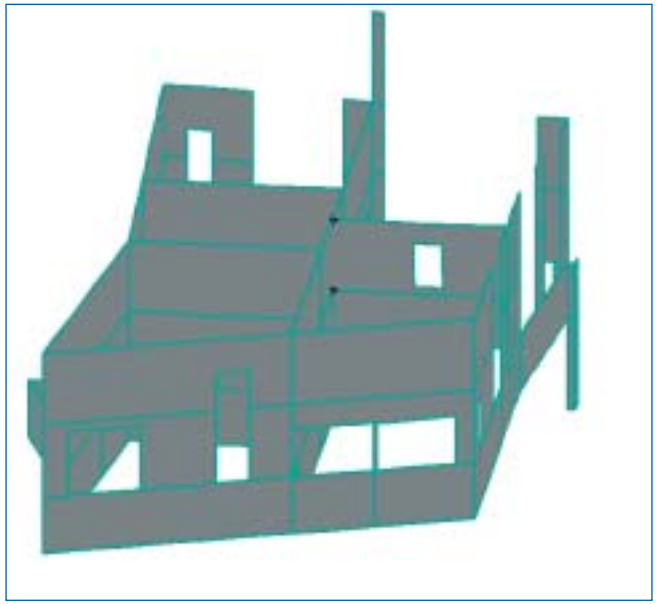
Description of the technical questions to be solved with ESA-Prima Win:

The main-construction of this tower combines the stiffness of the core with the stiffness of the façade (core-tube system).
The core itself is too slender to supply enough stiffness to the building. For this reason the core is connected to the façade by outrigger-walls.
These outrigger walls can't be placed on each floor. The forces from these outriggers differ from level to level. The forces from these outriggers have to be spread into the façade. This was complicated by the scattered pattern of windows in the façade. ESA 3D-shell gives the opportunity to analyse the membrane forces in this complex structure.

On the lower levels the architect wants to create a classic and inspiring entrance with large arcades. The spread forces in the façade at the apartment-levels have to be concentrated into the large columns of the arcades. Only a finite element program (3D Shell) can accurately calculate the ratio of the forces in the columns.
The forces on the foundation-piles can easily be obtained by drawing a plate with a pattern of supports. By moving the supports it is possible to optimise the foundation and to make sure that each foundation-pile takes the load that it is designed for.

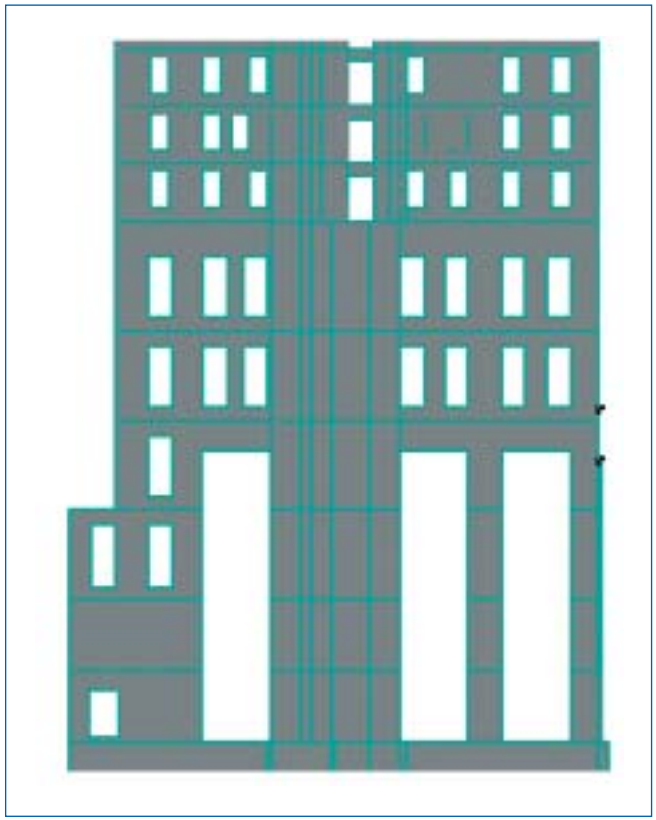
A description of your experience with ESA-Prima Win when realizing the project:

ESA Prima win gives an excellent opportunity to analyse the distribution of forces in the walls and columns. It gives an accurate estimation of the deformation of the structure due to the wind-forces. After the model is completed you get an integrated total design of the construction. The only difficulty is to adapt the structure to changing architectural demands during the design-process of the tower.



Modules used:

- Base
- 2D Frame
- 2D Grid
- 3D Frame
- 2D Plate
- 2D Wall
- 3D Shell
- Physical non-linear conditions.



ESM

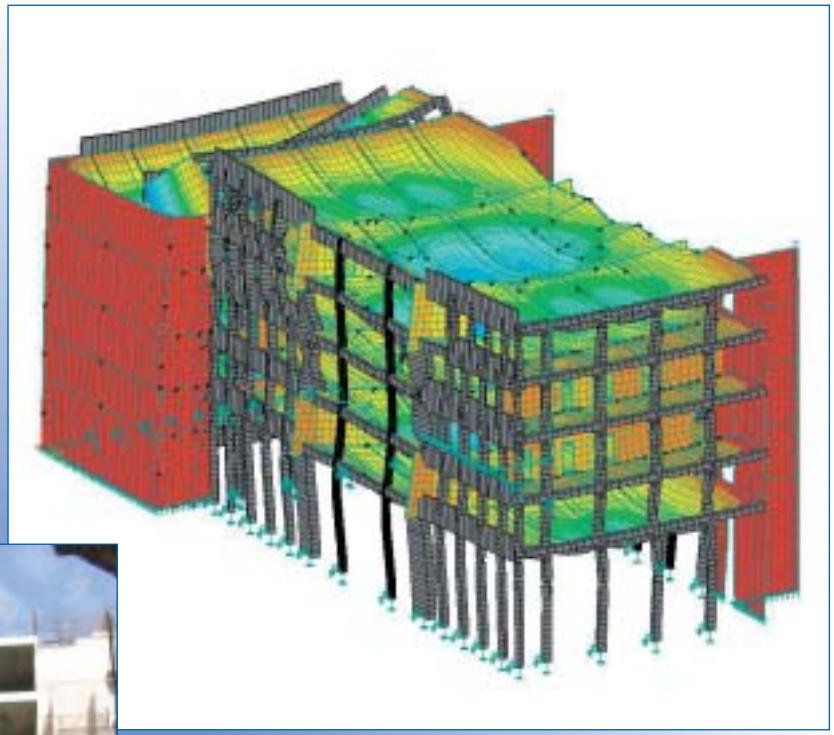
Quels sont les principales activités de votre société?

Structures, ouvrages d'art, bâtiments, génie civil, cours d'eau

Votre projet:

Fiche technique du projet

Nom du projet:
Bâtiment administratif de prestige en Europe de l'Est
Lieu de la construction:
Europe de l'Est
Fait pour:
Mabetex General Contractor Lugano Suisse
Architecte:
Mabetex General Contractor Lugano
Bureau d'études:
Mabetex General Contractor Lugano
ESM - Ruppen Ingénieurs SA 1870 Monthey comme expert pour optimaliser la construction, effectuer la modélisation générale 3D de la partie centrale et de la partie latérale, calculs aux 2ème ordre, etc



Bâtiment administratif de prestige en Europe de l'Est

ESM - Ruppen Ingénieurs SA
Rue du Coppet 14
1870 MONTHEY - Suisse
tél: +41 (0)24 475 70 10
fax: +41 (0)24 475 70 19
www.esm-group.ch
personne à contacter: RUPPEN Hervé
e-mail: sarl.hruppen@bluewin.ch

annual turnover: **SFr. 1 350 000** number of employees: **12**

Entrepreneur général:
Mabetex General Contractor Lugano
Longueur:
99 mètres
Largeur:
57 mètres
Hauteur:
45 mètres béton armé, 94 mètres au sommet de la coupole
Volume:
180'000 m^3
Masse:
- 28'000 m^3 de béton
- 3'600 t. d'acier avec s2,0 limité à 4'000 kg/cm^2
- 34'000 m^2 de dalle
- 3'300 m^1 de sommiers
- 102'000 m^2 de coffrage

Qu'est-ce qui rend ce projet intéressant et important?

- l'ampleur du projet, la structure statique relativement complexe
- les portées des voiles (27 mètres avec ouvertures et très grandes charges) et des sommiers (21 mètres) sans appuis intermédiaires
- une salle de 57 mètres de longueur, 27 mètres de largeur, 11 mètres de hauteur située au rez-de-chaussée et surmontée de 5 étages + d'une coupole
- sa construction tout en béton sans précontrainte
- Les conditions locales: terrain de mauvaise qualité qui a exigé le battage de 1610 pieux préfabriqués en béton armé (30x30 cm, longueur de 6 à 10 m.) de 60 t. de charge admissible chacun et des variations de températures de -50°C à + 35°C
- 1'000'000 m3 de remblais sur le pourtour de la construction

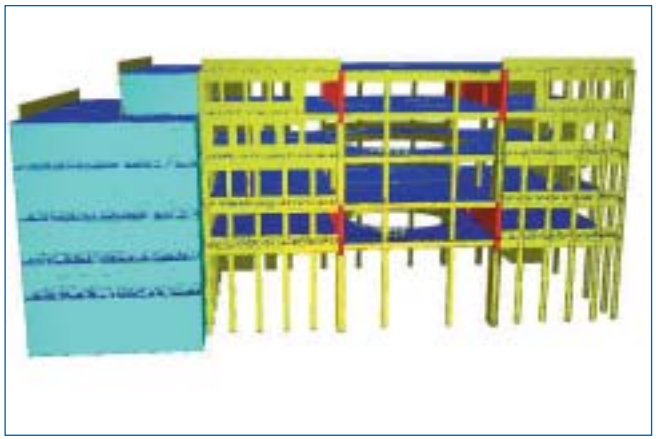
Pourquoi est-ce un projet spécial?

- Les déformations dues aux portées exceptionnelles des voiles et sommiers, sans appuis intermédiaires, engendrent une redistribution importante des efforts (dalles, sommiers, piliers, voiles) jusqu'à 20 % différentes de celles calculées avec des programmes 2D ou des calculs manuels.
- pour la zone centrale, la prise en compte (calcul) d'une plastification (de plus de 50%) des efforts dans les angles de cadres piliers-sommiers des étages supérieurs nécessaire en raison des tassements centraux (déplacements selon z-) beaucoup plus importants (pas de porteurs au rez) que les tassements sur le pourtour (beaucoup de piliers sur tout le pourtour et sur toute la hauteur)
- La prise en compte (calcul) d'une redistribution des efforts des moments sur appuis des dalles sur sommiers (plastification env. 30 %) permettant d'optimaliser les quantités d'acier, d'améliorer le comportement en service de l'ouvrage (fissuration) par une meilleure répartition des armatures inférieures et supérieures dans les dalles, de couvrir sans frais supplémentaires les variations des charges de service pouvant survenir entre les différentes zones du bâtiment, d'augmenter la sécurité structurale de l'ouvrage à consommation égale d'acier d'armature.
- des réactions d'appuis d'env. 1'750 t. effectif sur les piliers de 11 mètres de hauteur du Rez
- limitation de la contrainte admissible des aciers d'armature à s2,0 = 4'000 kg/cm2 = maximum admis par le pays où s'érige cette construction
- prise en compte (calcul) du vent pouvant varier entre 150 et 200 km/h.
- prise en compte (calcul) de l'effet d'un séisme d'intensité réduite correspondant à la zone 2 de la norme suisse SIA 160/1989
- façades structurelles auto portantes verre-aluminium évitant de reporter sur la structure béton l'effet des grandes variations de température extérieure

Emploi de ESA-Prima Win

Description de votre impression et expérience de l'emploi de ESA-Prima Win dans la réalisation de ce projet:

- malgré le temps nécessaire, impression favorable car ce programme permettent des cas de charges, des possibilités de modélisation et des types de calcul que nous n'avons pas trouvé chez d'autres fournisseurs de logiciels semblables
- Utilisateur depuis env. 15 ans ou plus = voir par RDV des programmes SCIA structures



EST

Quels sont les principales activités de votre société?

La société E.S.T. doit sa création avec Michel LEVERT Ingénieur spécialiste des constructions métalliques à la suite de la vente de son bureau d'ingénieur conseil depuis plus d'une année. Pratique du logiciel ESA-Prima Win depuis plus de 8 ans dans tous les modules de la construction métallique. La société E.S.T. ne pratique que la spécialité d'Ingénieur Conseil Structures en acier, béton & bois avec des applications particulières en chaudronnerie-mécano soudure-structures verrières.
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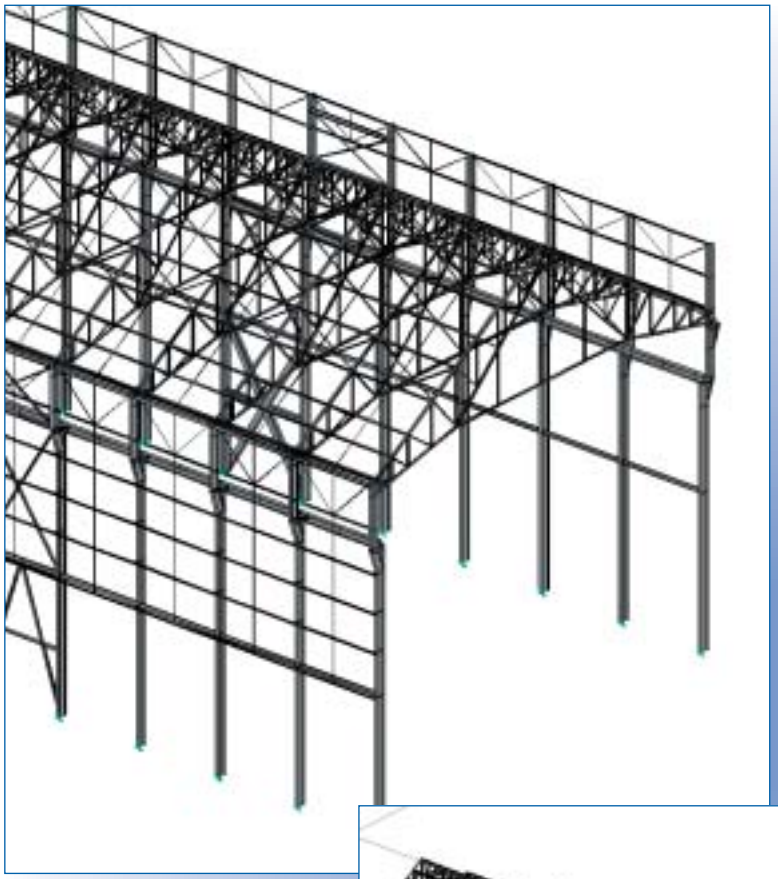
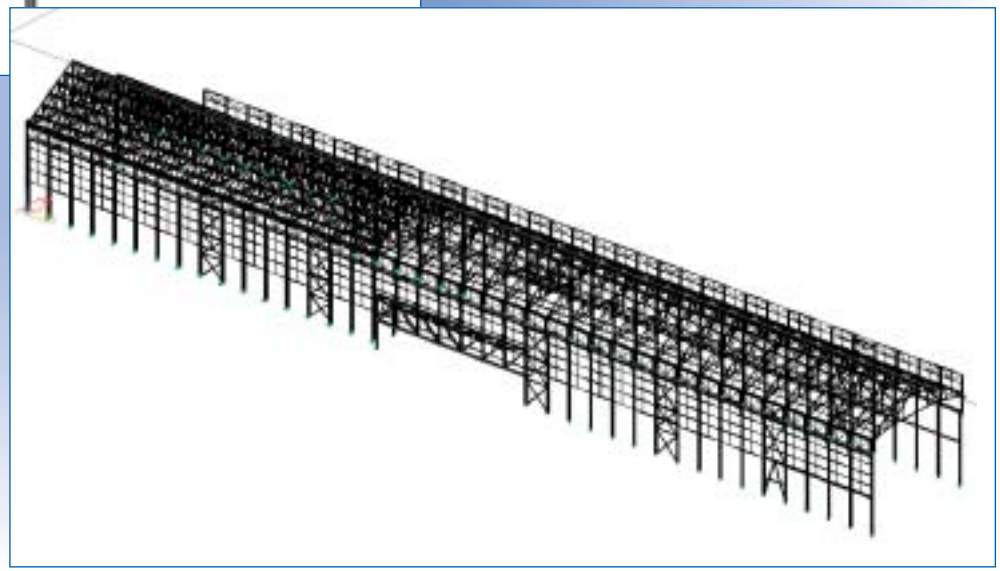
Votre projet:

Fiche technique du projet

Project titre:

Expertise halle avec deux ponts roulants à grande vitesse





Halle avec pont roulant - expertise

EST

Européenne de Structures et Technologie
67, le Grand Pré Vert
Saint Nizier d'Uriage
38410 - Saint Martin d'Uriage - France
tel: +33.4.76.59.71.18
fax: +33.4.76.59.71.18
Personne a contacter M. Michel Levert
levertmichel@aol.com

annual turnover: □305 000

number of employees: 1

Lieu de la construction:
Château-Feuillet (France)
Fait pour:
Pem Electro-métallurgie
Bureau d'études:
E.S.T.
Entrepreneur général:
PEM
Longueur:
196 m
Largeur:
29 m
Hauteur:
28 m
Masse:
516099 kg (seulement profils acier)

Qu'est-ce qui rend ce projet intéressant et important?

Ce très important projet représente l'expertise d'une construction existante, réalisation en deux phases dans les années 1926 et 1953.
Réalisation d'une HALLE de longueur 195m de portée 24m de hauteur 20m avec circulation de deux ponts roulants à grande vitesse de force 20t avec bennes de chargement.
Cette construction doit son utilisation dan une usine PEM en électrométallurgie pour le stockage des matières premières

Pourquoi est-ce un projet spécial?

Optimisation très complexe d'une structure existante avec le respect rigoureux de la conception de l'acier à l'époque de la réalisation , 18465 éléments 1D et 8367 nœuds . On remarquera la précision extrême de la modélisation.

Utilisation de ESA-Prima Win

Description des problèmes techniques résolus avec ESA-Prima Win:

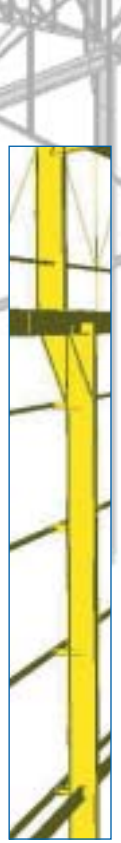
L'expertise demandait un respect rigoureux de la conception (voir différents types de sections dans le projet). L'influence des ponts roulants devait être prise en compte en détail.

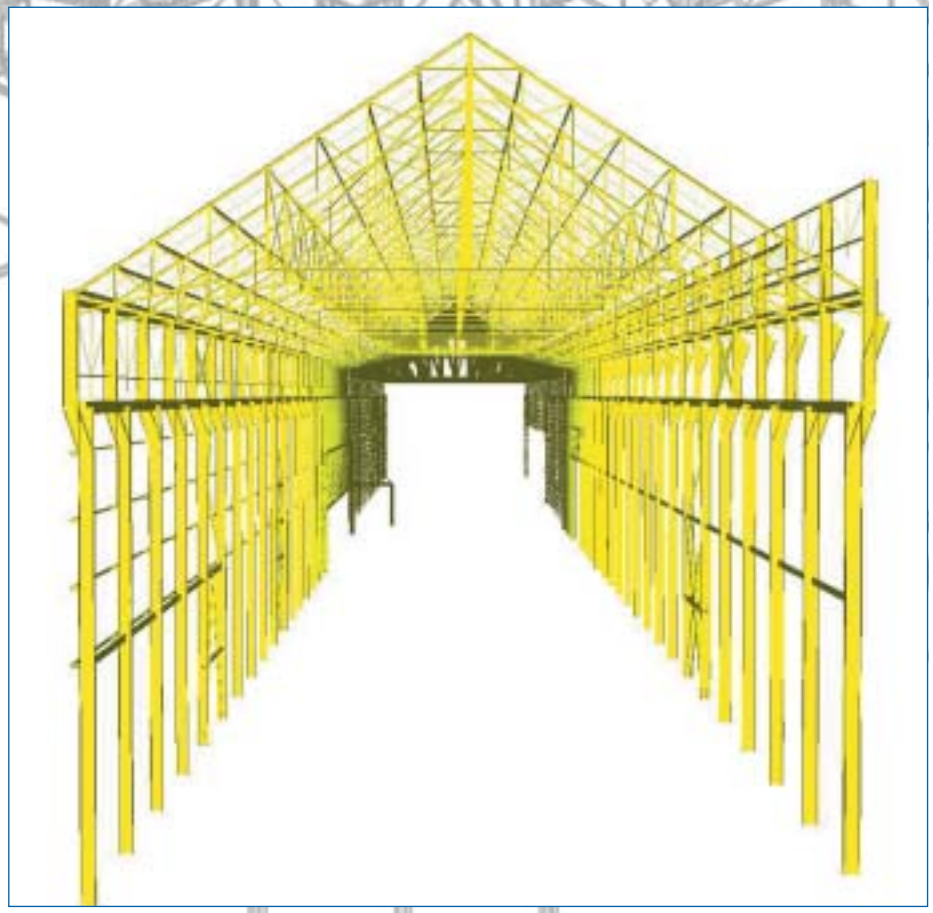
Description de votre impression et expérience de l'emploi de ESA-Prima Win dans la réalisation de ce projet:

Optimisation très complexe et complète de la structure grâce aux fonctionnalités puissantes de modélisation de ESA-Prima Win.

Modules utilisées

- Eléments barres 3D.
- Calcul statique.
- Contrôle acier CM'66





EST

Quels sont les principales activités de votre société?

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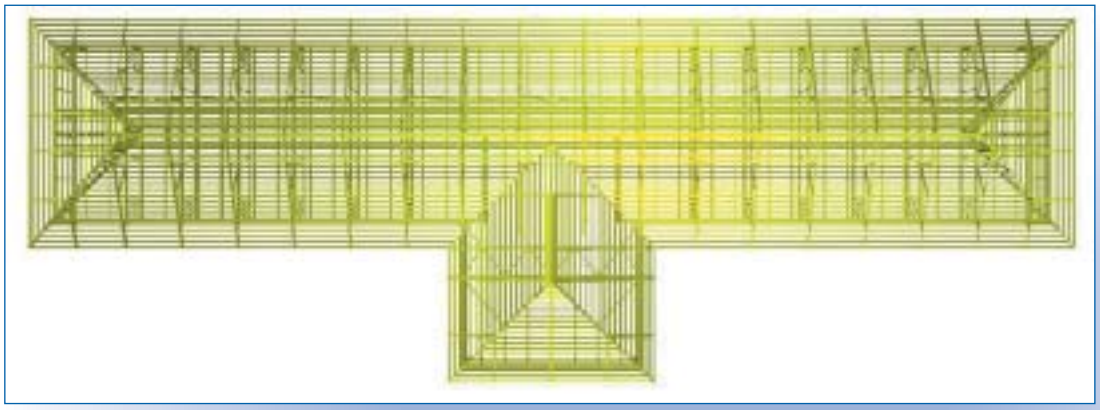
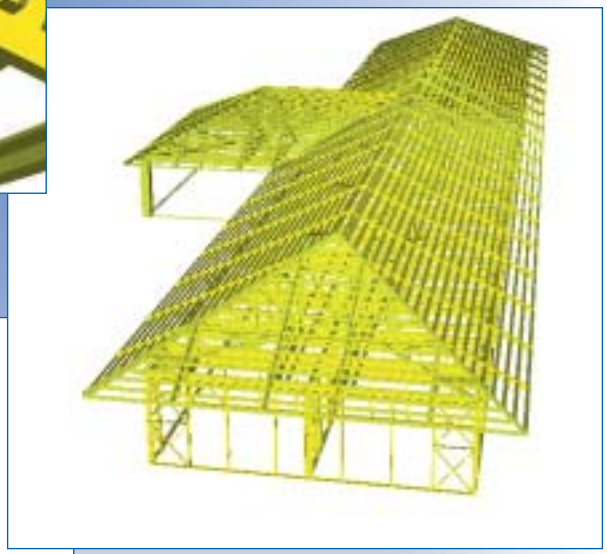
Votre projet:

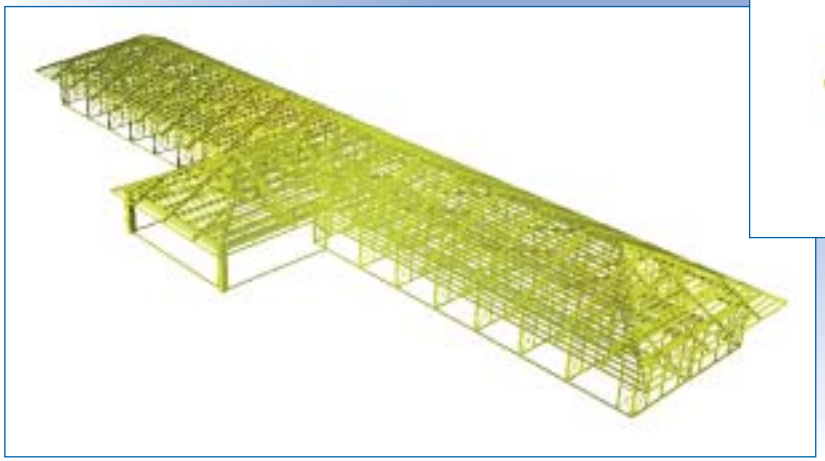
Fiche technique du projet

Project titre:

Immeuble hôtel avec profils à âme mince de Profil du FuturLieu de la construction: Château-Feuillet (France)







Immeuble hôtel avec profils à âme mince

EST

Européenne de Structures et Technologie
67, le Grand Pré Vert
Saint Nizier d'Uriage
38410 - Saint Martin d'Uriage - France
tel: +33.4.76.59.71.18
fax: +33.4.76.59.71.18
Personne a contacter M. Michel Levert
levertmichel@aol.com

annual turnover: □305 000 number of employees: 1

Location:
Dijon (France)
Fait pour:
EMC Petit'Dej
Bureau d'études:
E.S.T.
Entrepreneur général:
Profil du Futur
Longueur:
54 m
Largeur:
19 m
Hauteur:
6 m
Masse:
19770 kg (seulement profils

Qu'est-ce qui rend ce projet intéressant et important?

Le projet en cours de réalisation consiste à la construction d'un immeuble HOTEL. Toute l'élaboration est basée sur le concept STYLTECH de PROFIL DU FUTUR avec uniquement des profils à ame mince (paf).

Pourquoi est-ce un projet spécial?

Optimisation du projet avec 5172 éléments 1D et 2657 nœuds, calculs en 3D avec non linéarité pour les calculs des stabilités.
Ce projet ouvre une grande application pour l'utilisation de l'acier dans le logement.

Utilisation de ESA-Prima Win

Description des problèmes techniques résolus avec ESA-Prima Win:

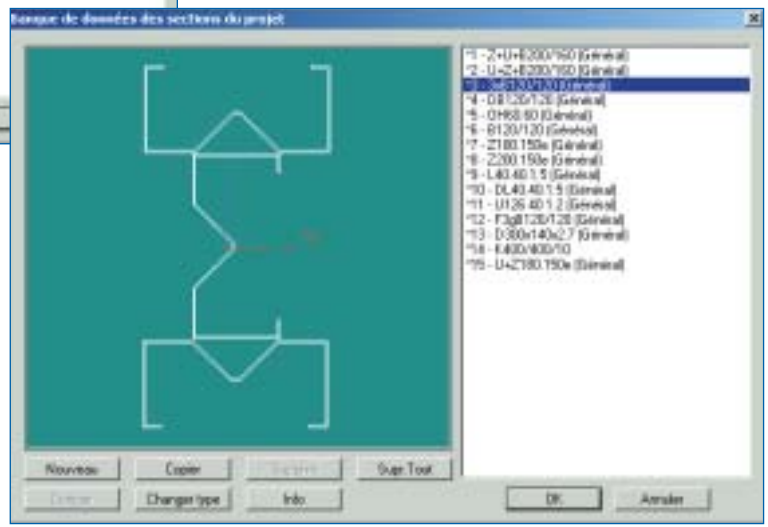
Modélisation des différentes sections (voir copies écran). Etude des nœuds aux arêtiers.

Description de votre impression et expérience de l'emploi de ESA-Prima Win dans la réalisation de ce projet:

Optimisation du projet avec 5172 éléments 1D et 2657 nœuds, calculs en 3D avec non-linéarité pour les calculs des stabilités. Emploi poussé du module "section graphique" pour saisir les sections spécifiques; le calcul automatique des propriétés présentait un gain de t très important.

Modules utilisées

- Module 3D barres.
- Calculs statique et dynamique
- Calcul non-linéaire
- Contrôle acier EC3 (sections minces classe 4)



EST

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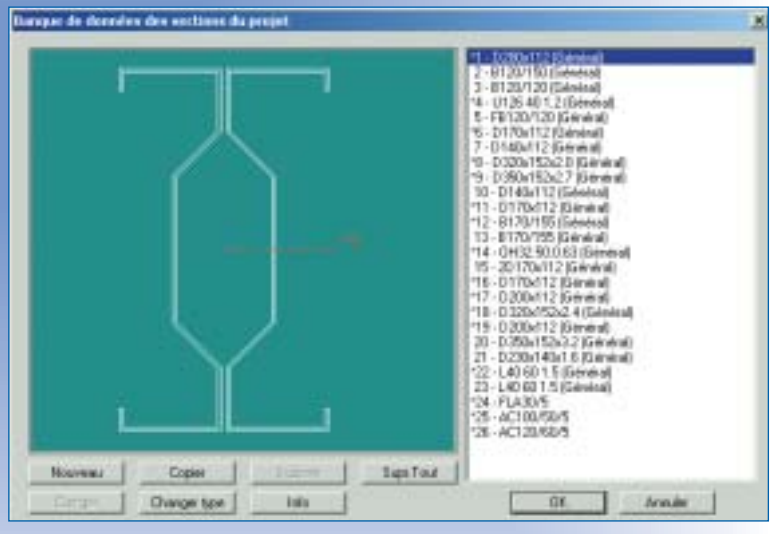
Votre projet:

Fiche technique du projet

Project titre:

Résidence Logements par concept Styltech (Profil du Futur)



Résidence Logements

EST

Européenne de Structures et Technologie
67, le Grand Pré Vert
Saint Nizier d'Uriage
38410 - Saint Martin d'Uriage - France
tel: +33.4.76.59.71.18
fax: +33.4.76.59.71.18
Personne a contacter M. Michel Levert
levertmichel@aol.com

annual turnover: □305 000 number of employees: 1

Location:
Luz Saint Sauveur (France)
Fait pour:
Hameau Pyrenées 2000
Architect:
Henry-Charles Ferry
Bureau d'études:
E.S.T.
Entrepreneur général:
Profil du Futur
Longueur:
122 m (longuer développée °
Largeur:
10 m
Hauteur:
29 m (max)
Masse:
141.000 kg

Qu'est-ce qui rend ce projet intéressant et important?

Structure sur le concept STYLTECH de PROFIL DU FUTUR , réalisation avec uniquement des profils métalliques à ame mince (paf).

Pourquoi est-ce un projet spécial?

Structure basée sur les profils minces (Profil du Futur) avec contrôles en stabilité (EC3 classe 4) et calculs sismiques. Plusieurs sections ont été modélisées de manière graphique en important la forme au format DXF.
Taille du projet: optimisation avec 21568 éléments et 10898 nœuds.

Utilisation de ESA-Prima Win

Description des problèmes techniques résolus avec ESA-Prima Win:

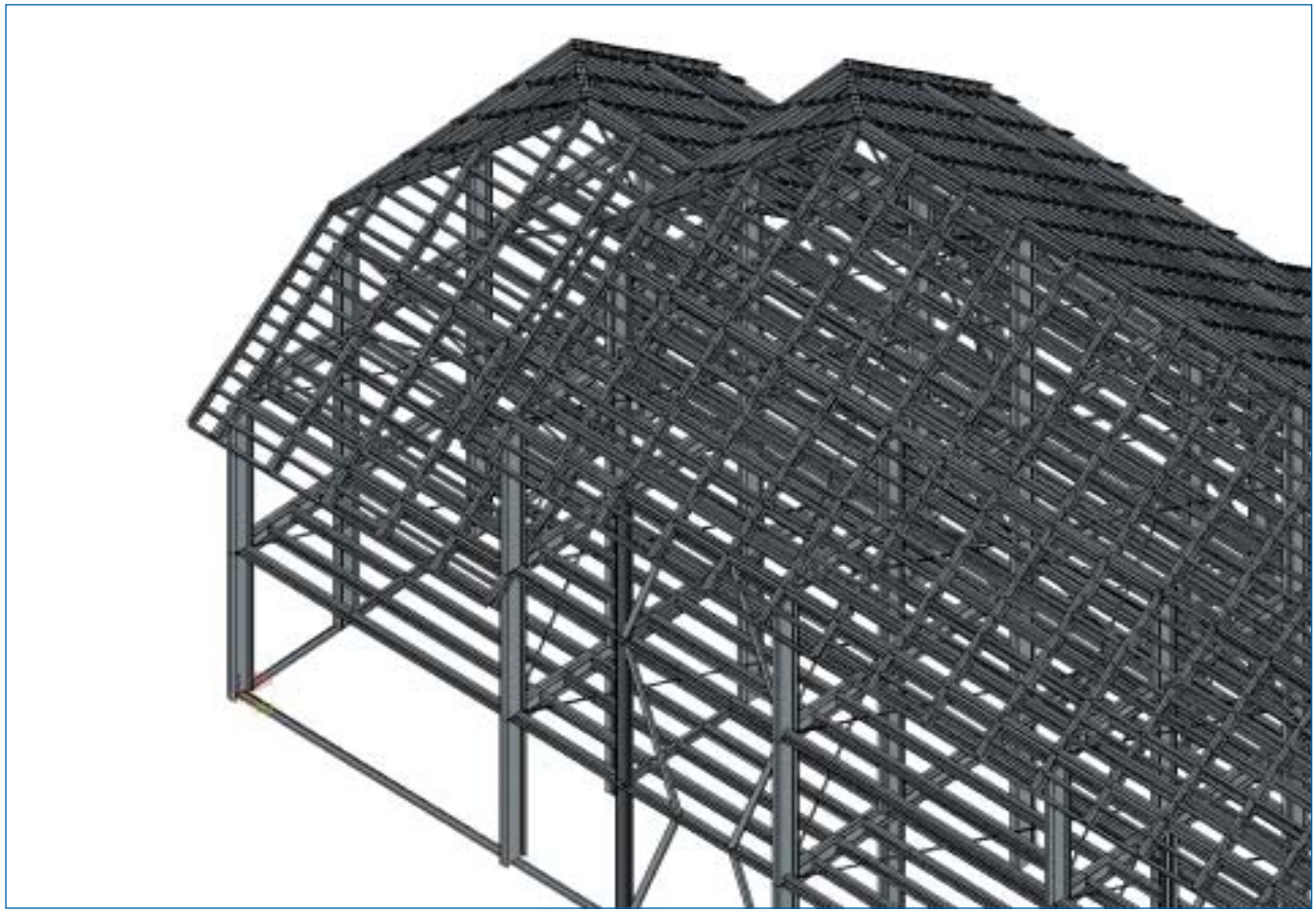
Précision de modélisation de la structure. Contrôle des sections minces (classe 4). Calcul dynamique de la structure.

Description de votre impression et expérience de l'emploi de ESA-Prima Win dans la réalisation de ce projet:

Modélisation puissante de la géométrie. Sections facilement reprises par DXF. ESA-Prima Win est le seul programme du marché qui calcule les sections en classe 4 selon les Eurocodes 3.

Modules utilisé

Module 3D barres.
Calcul statique, stabilité, EC3 (acier - classe 4), dynamique, sections graphiques.



Ingenieursgroep Romkes BV

Your company

In het zuidwesten van Friesland vindt u een middelgroot Ingenieursburo, ingenieursgroep Romkes B.V.
Het bedrijf houdt zich bezig met het berekenen en tekenen van constructies in de ruimste zin van het woord. We denken daarbij aan staalconstructies met name, en het vervaardigen van produktietekeningen met behulp van het Strucad pakket, we denken dan aan het berekenen van betonconstructies, schilvloeren, grondmechanica en overige te berekenen onderdelen. In principe werken we met een kleine 20 personen, allemaal HTS opgeleide jongens en we houden ons bezig met alle mogelijke vormen van woningbouw en utiliteitsbouw. Detailbouw tot windturbines.

Your Project:

Technical data of the project

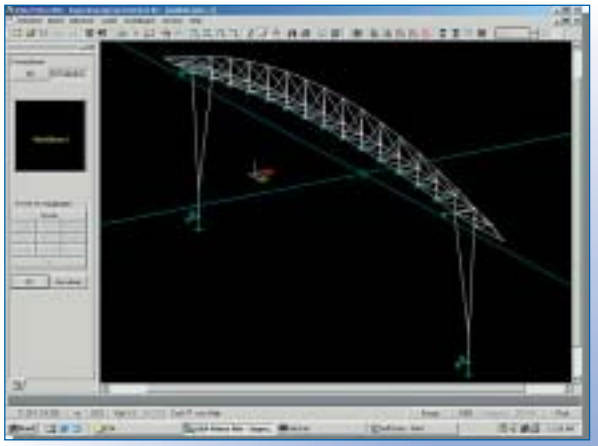
Project title:
Uitbreiding Stadion Galgenwaard
Physical Location:
Galgenwaard

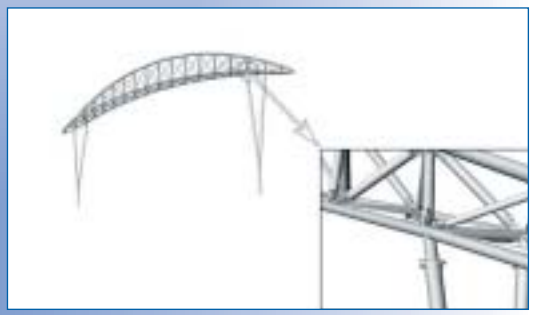
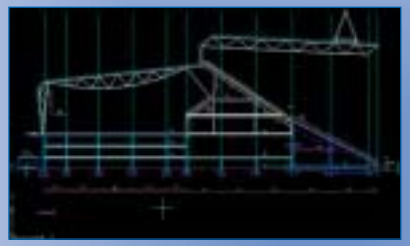
Uitbreiding Stadion Galgenwaard

Ingenieursgroep Romkes BV
Industrieweg 7
NL-8521 MB Sint Nicolaasga
Nederland
tel: +31 0513-432228
fax: +31 0513-432536
contact: S. Romkes
e-mail: post@ingenieursgroepromkes.nl

annual turnover: **N.A.**

number of employees: **20**






Engineering office:
ingenieursgroep Romkes B.V.
Hoogte:
7 meter
Ronding:
4 meter
Totaal:
10 meter
Gewicht:
200 ton,

Als lid van het bouwteam bestaande uit Bouwbedrijf Midreth uit Mijdrecht, Bureau Swarts & Jansma en Hardstaal uit Lemmer, waren wij als constructeur betrokken bij de bovenbouw van Galgenwaard Utrecht. In 1999 gestart met de Noordtribune was nu Zuid aan de beurt. Het totaal aantal extra zitplaatsen bedraagt ca. 20000 en het gehele project zal zijn afgerond in de loop van het jaar 2003.

Uiteraard is het gehele project doorgerekend met het pakket ESA-Prima Win van SCIA, waar wij nu onze speciale aandacht op richten is het hoofd vakwerkspant. De totale constructie met een lengte van 137 meter heeft een vrije overspanning van 105 meter. Het totale gewicht van het spant bedraagt 200 ton en het spant is volledig opgebouwd uit een buizenstructuur. Gegeven is een 3D model van het hoofdspant met zijn specifieke randvoorwaarden en een aantal belastinggevallen. Deze belastingen komen voort uit uiteraard eigen gewicht en permanente belastingen in en van het spant en uiteraard uit de belastingen van de onderhangende vakwerkspanten.
Belastinggevallen

- Eigen gewicht.
- De permanente belastingen uit het dakvlak dat op de spanten wordt gemonteerd.
- De sneeuwbelastingen.
- Uiteraard de wind in de lengterichting van het spant, waarbij rekening gehouden is met de geprojecteerde oppervlakten en de richtlijnen uiteraard van NEN 6702 specifiek voor deze buisconstructies.
- Naast wind van links uiteraard wind van rechts als specifiek belastinggeval.
- Wellicht niet direct op deze open structuur van toepassing, toch als volledigheidshalve ingevoerd, onderdruk en dat heeft meer te maken met de direct achter deze tribune geplaatste sporthal die toch wellicht een kleine invloed heeft op de totale structuur waardoor zodanig dit belastinggeval is gegenereerd.
- Naast onderdruk uiteraard overdruk.

Veel belangrijker dan onderdruk en overdruk voor deze structuur was uiteraard zuiging en druk op het dakvlak. De zuiging en deze factoren zijn mede bepaalt in overleg met uiteraard de gemeente Utrecht en studies van bureau Stoel en Borculo hebben bijgedragen aan de vaststelling van de overdruk en onderdrukwaarden, zuiging en druk op het dakvlak. Dit zijn bijzonder kritische belastinggevallen.
Naast zuiging ook druk op het dakvlak, een die in dit geval specifiek voor de helling van het dakvlak die groter is dan de zuiging op het dak.
Ter completering uiteraard windwrijving op het dakvlak. En windwrijving op het vakwerkspant zelf is een specifiek belastinggeval.

In overleg met bouwbedrijf Midreth is een soort montageplan gemaakt, waarbij in de eerste situatie, in eerste instantie een aantal spanten werden gehangen en het was van belang om te kijken wat er gebeurde met het hoofdspant ten tijde van het hangen van de eerste vier spanten. Vandaar deze specifieke belastingsituatie.
Het bijzondere van dit spant, was de wijze van montage en de wijze van productie. In principe zijn het een aantal segmenten van circa 15 meter lang, die doormiddel van pen en gatverbindingen met elkaar zijn verbonden. Daarbij was onoverkomelijk het feit dat gatspeling van invloed zou zijn en we hebben het pakket ESA-Prima Win kunnen gebruiken om de invloed van de gatspeling doormiddel van de niet lineaire berekening te kunnen bepalen, zodat we de vervormingen konden beheersen. In de praktijk bleek dit tot een nauwkeurigheid van 80% te kloppen.
Dat dit uiteraard voor de permanent c.q. eigen gewicht geldt, mag duidelijk zijn. Op het moment dat het eigen gewicht van een spant werd toegelaten, betekende het de eliminatie van de gatspeling. Vandaar dat de eerste fase berekening niet lineair elastisch geschiedt, waarbij uitsluitend permanent gewicht en eigen belastingen die op dat moment op het spant aanwezig waren, werden uitgevoerd. Dit gebeurde met het aanvinken van het niet lineaire deel waarbij gatspeling van toepassing werd verklaard.
De overige belastinggevallen, en uiteraard combinaties werden vervolgens lineair elastisch uitgerekend, en de som van de totale vervormingen bestond uit een niet lineair deel en een lineair elastisch deel en door het niet lineaire deel te elimineren kregen wij een perfect beeld voor de uiteindelijke vervorming van het spant.

Usage of ESA-Prima Win

Een perfecte weergave van de spanningscontrole waarbij de grafische weergave bijzonder effectief werkt, groen is goed net als bij een stoplicht, rood is fout en blauw is eigenlijk een constructeur onwaardig bij materialen oneconomisch zijn of worden toegepast. Het is een klein fragment over de complete spanningscontrole, alle combinaties werden meegenomen. ESA-Prima Win construeert perfect.
Met 2 achthonderd tons kranen van de firma van Zeumeren mammoet, is het hoofdspant uiteindelijk geplaatst, de berekende vervorming was 180 mm waarvan bleek dat na metingen 156 mm op te treden. Deze theorie en praktijk klopten perfect met elkaar.
Na een spannende dag, waarbij het spant geplaatst werd binnen een uur kon verder worden gegaan met het invullen van de rest van de kapconstructie bestaande uit het onderhangen van de vakwerkspanten. Ook tijdens de, en na de montage van het spant zijn steeds metingen uitgevoerd, waarbij het gedrag van de totale structuur beheerst kon worden en gesteld kan worden dat zeker door de hulp en met behulp van het programma ESA-Prima Win gesteld kan worden dat de praktijk en theorie elkaar konden volgen. Met de hand is dat eigenlijk niet uit te voeren, zeker waar dat gaat om de elastisch niet lineaire toestanden zoals de gatspelingen.
Last but not least, het is een klein onderdeel van het totale galgenwaard gebeuren, op dit moment wordt aan oost en west gerekend, eigenlijk een kopie van de zuidkant en we gaan op vertrouwde voet verder met het pakket ESA-Prima Win ik ben uiterst tevreden over de manier van invoeren, de gebruikersvriendelijkheid is een bijzonder sterk punt van het pakket.

Statik projektant

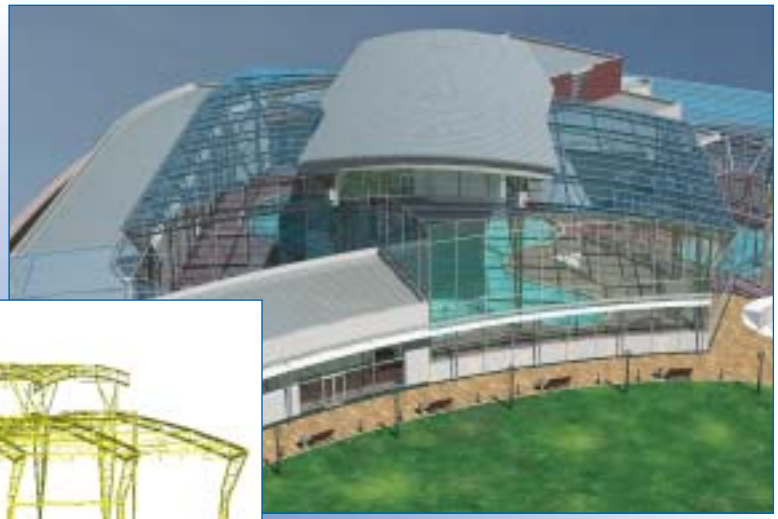
Your company?

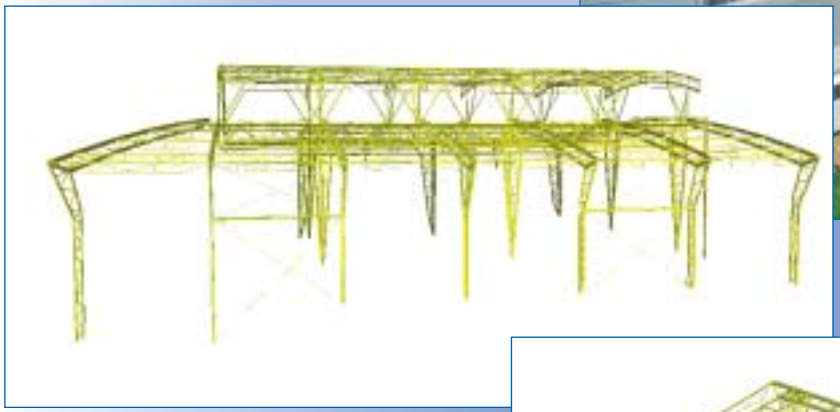
Design of the static of residences and commercial buildings
Diagnostics of bearing constructions
Technical consulting

Your Project:

Short description of the project:

Project title:
Red, White, Folk spa, swimming pool and the facilities SLK Turcianske Teplice
Physical Location:
The area of spa, Turcianske Teplice, Slovakia
Site owner:
Slovak Spas, a. s.
Architect:
Ing. arch. Peter Dunajovec A. A. and team
Engineering office:
Ing. Tichy Dusan
General contractor:
Slovak Spas, a. s.





Red, White, Folk spa, swimming pool and the facilities

Statik Projektant
Ing. Tichy Dusan

Dolne Rudiny 3
010 01 - Zilina - Slovakia
tel: +42141/7649-304
fax: +42141/7649-304
contact person: Ing. Tichy Dusan
e-mail: dusant-sp@telecom.sk

annual turnover: **N.A.**

number of employees: **N.A.**

Technical data of the project

The bearing constructions of the objects Red pool with supporting buildings and supporting buildings of the swimming pool are from brick walls and reinforced concrete ceiling constructions. The connecting object of the entrance hall and the swimming pool hall are from steel construction. Steel constructions are designed as welded from steel tubes of circular and square cross section. The roof span of the Folk spa is solved by open timber construction with gable roof. The base of all objects is designed on flat base.

All objects are one-storey buildings with height up to 14m. The usable area of the complex of the buildings is 3100m^2 from which the pool hall takes 1160m^2 and the entrance hall takes 306m^2.
The entrance hall has dimensions: 22.5x21/6x6m and weight: 8,000kg
The pool hall has dimensions 38x34x14m and weight 51,000kg.
Currently, the first stage of the construction is in progress- the Red pool with supporting buildings whose realization project has been prepared.
The second and third stage of the construction; the remaining building is prepared in scope of the project for building permit and preliminary static calculation of the elements of the two dimensional elements of the pool hall.

The entrance hall:
The entrance hall has pent shape. It is designed from truss parallel frames; joint anchored into the basis and the object Red pool. The frames are spaces by 6-2x7.2m. The truss purling welded on the frame is spaced by 3m. The outer cover is made from glass.

The pool hall:
The pool hall is three aisle arch shaped. The middle arched part is vertically shifted by 2.2m. The pool hall is designed from transverse and longitudinal truss half-frames length 12m. The transverse half-frames are spaced by 5x6m. They are put into the base on one side and joint set on the longitudinal frame on the other side. The middle arched mesh is from transverse arched and truss girders spaced by 6m and longitudinal parallel truss girders spaced by 3m. The mesh construction is set on supports joint anchored into the longitudinal frames. The longitudinal frames are designed as spatial truss three-part frames, which are joint anchored into the basis. The longitudinal frames are spaced by 12 and 11,7m. The external cladding of the pool hall is from glass.

Why is this project important and special?

The project is a unique solution of thermal spas as pistina- a pool with an open bed set on a thermal water spring. The objects form a united whole of thermal spas together with a swimming pool being filled with thermal water and the necessary supporting buildings. They are interconnected and connected to the existing buildings.

Use of ESA-Prima Win

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

The calculation of the bearing constructions

A description of your experience with ESA-Prima Win when realising the project:

I have positive four year long experience in using NEXIS.
I would like to see some improvements on the programs including a more precise calculation of the buckling lengths of the supporting bars, a possibility of freeing the contact of wall and ceiling elements because of onesided exertion of the contact forced / stressed. I would like to receive better quality of the works with modul Project for drawing plans.

Modules used:

- 3D beam and shell elements
- Physical non-linear calculation (only compress the supports, the function of the supports, only tension in the beams, maximum strength in the beams, limit force in the beams)
- Dynamical seismic
- The ribs in concrete plates
- Dimension modules, concrete, steel
- Absence

Your company

The practice

Formed in 1990 Robson Liddle Partnership has offered a wide range of consulting services to both the public and private sectors of the industry. The practise has expertise in Structural Engineering, Civil Engineering, Highways structures, Geotechnical and Environmental engineering including contaminated land. Based in Exeter the Partnership has undertaken work for Clients throughout the United Kingdom and over the years has gained experience on a wide variety of projects involving development of particularly difficult sizes. The practise employs chartered Structural, Civil and Geotechnical Engineers, Geologist and associated support staff. A particular benefit for our Clients is our ability to deal with developments from pre-purchase through ground investigation to completion of projects including the design and detailing of structures. A number of medium and high rise structures have been designed for the luxury housing market, many with underground car parks and retail elements, together with a variety of commercial and industrial developments. In addition major geotechnical investigations have been completed for consortium groups

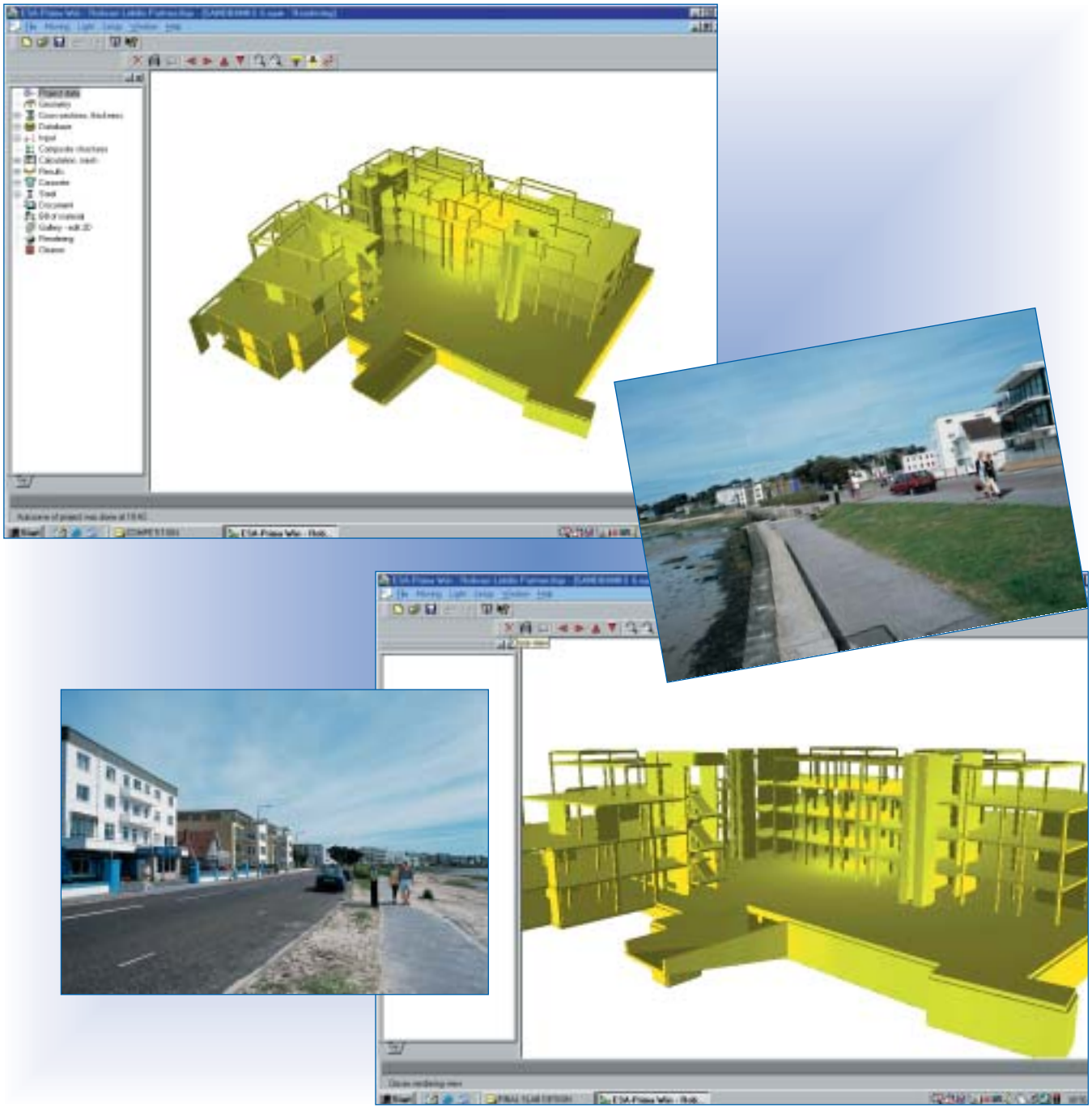
Sandbanks

Robson Liddle Partnership

Field House
8 Richmond Road
Exeter EX4 4JA UK
tel.: 01392 498473
fax: 01392 498475
http://www.robsonliddle.com/
contact: Mike Mottershaed
mail@robsonliddle.com

annual turnover: **N.A.**

number of employees: **N.A.**



and developers of new town areas. The practise has developed an expertise in engineering solutions to a whole range of technical problems associated with building on both brown and green field sites.

Residential Developers

Robson Liddle Partnership offers a special service tailored to the needs of housing developers, particularly national house builders offering high quality and bespoke luxury apartments and houses.

Services Include:
Rapid appraisal of site viability prior to purchase; Appraisal of foundation requirements; Preparation of standard house type portfolios/ NHBC type approval; Design of sub-structure and super-structure, piled, raft, standard foundations and specialist foundations; Design of low rise and high rise/ mixed developments; Design of roads/ sewers and highway structures including bridges; Design of surface water storage tanks, lakes and lagoons.

Historic Buildings/ Refurbishment/ Expert Witness Service

From domestic structural survey and loss adjusters work to the design of major building refurbishments the practise has established a range of experience.

Services Include:
Structural surveys of existing buildings including preparation of defect schedules; Design and repair schemes for historic/ listed buildings; Design and detailing of structural requirements for major building conversions/ change of use; Design of underpinning systems and repairs; Design and repair scheme for pre-fabricated housing e.g. cornish units, woolaway houses etc; Expert witness work for lawyers, loss adjusters or housings developers.

Commercial

The practice is involved in a wide range of buildings for many branches of industry. These include shopping malls, nightclubs, warehousing, laboratories, research and development facilities, retail and mixed development schemes.

Services Include
Feasibility studies for refurbishment and new build; Feasibility studies for major projects including comparison of options; Detailed design of steel, concrete, composite and space structures; Detailed design of piled, raft or traditional foundations; Preparation of tender and contract documents; Service to contractors as part of design and build team; Design of roads/ sewers and major civil engineering works; Design of pumping stations, storage lagoons and balancing ponds.

Geotechnical, Environmental and Urban Regeneration

The practice employs a full range of staff with experience in geology, geotechnics and ground engineering. This includes experts involved with the regeneration of contaminated land and brown field sites.

Services Includes
Desk studies and pre-purchase land appraisa; Trial pitting, boreholes, rotary coring, dynamic probing etc.; Mining assessment; Gas monitoring; Contamination testing/ interpretation; Appraisal and determination of remediation for contaminated land; Slope stability analysis; Groundwater monitoring assessment; Full geotechnical investigation, testing and interpretative reporting with recommendations for the successful development of sites.

Your project

Sandbanks is a prestigious development of 24 luxury apartments arranged on four storeys with a basement (five storeys). The Sandbanks is situated on the shoreline of Poole Harbour, Dorset (southern England).
It is a very significant and prominent site as it is only one of a few remaining sites along this stretch of coastline. It is believed that land prices here are about the fourth most expensive in the world with London, Tokyo and Manhattan leading the way.
The development comprises of 3 blocks:

1 West Block
Five storey concrete frame i.e. flat slabs, columns, podium slab and basement.

2 South Block
As west block but the basement covers only about 35% of the floor area.

3 East Block
This is a two storey traditional build and has not been analyzed on ESA-Prima Win.

In both west and south blocks the third floor is a lightweight steel frame. The plan size of the south and west blocks is 51m x 51m arranged in an 'L' shape and has a total of 5 storeys, with the basement being 3.0m below ground level. The total mass of the two blocks is 7546 Tonnes. The site has a high ground water table and therefore positive and negative load cases had to be considered on the basement slab in both ultimate and serviceability conditions. A crack width check was carried out on the basement walls and slab (crack width 0.15mm) similar to BS8007 - Design of Concrete Structures for Retaining Aqueous Liquids. We purchased the non-linearity module for this project to analyse the basement slab/ foundations. The slab had a negative (upwards) pressure and therefore we were inducing large tensile forces into piles when analysed linearly and therefore with the non linear module these forces were re-distributed to a point with large downward forces, hence tension piles are not used and will reduce the cost of foundations. As a novice with ESA-Prima Win and only being my second project using this software I have found it to be a long learning process. But with the assistance of 'CADS' and the 'help menu' I feel fairly confident to tackle further projects. I have been particularly impressed with the clarity of the printed output and the level of information given at the design stage. We also have 'links' to 'CADS' design software modules, the column designer 'link' is excellent whilst we still experience a few problems with the link to 'CADS' beam designer. We have also had limited success using the 'exclusive' option in the variable load cases. The modules we are already using have greatly improved our design productivity. One area that caused difficulty of input and analysis was the various steps in the floor slabs. We are now ready to invest in the module that would overcome this problem after we have seen the benefits of ESA-Prima Win.

What are the main activities of your company?

Design and engineering firm specialising in bearing steel structures of civil and bridge engineering, sport halls, shopping centres, supermarkets and bearing steel structures for technological plants. Elaboration of structural analysis and drawings of bearing steel structures for realisation and consequent shop drawings.

Your Project

Technical data of the project

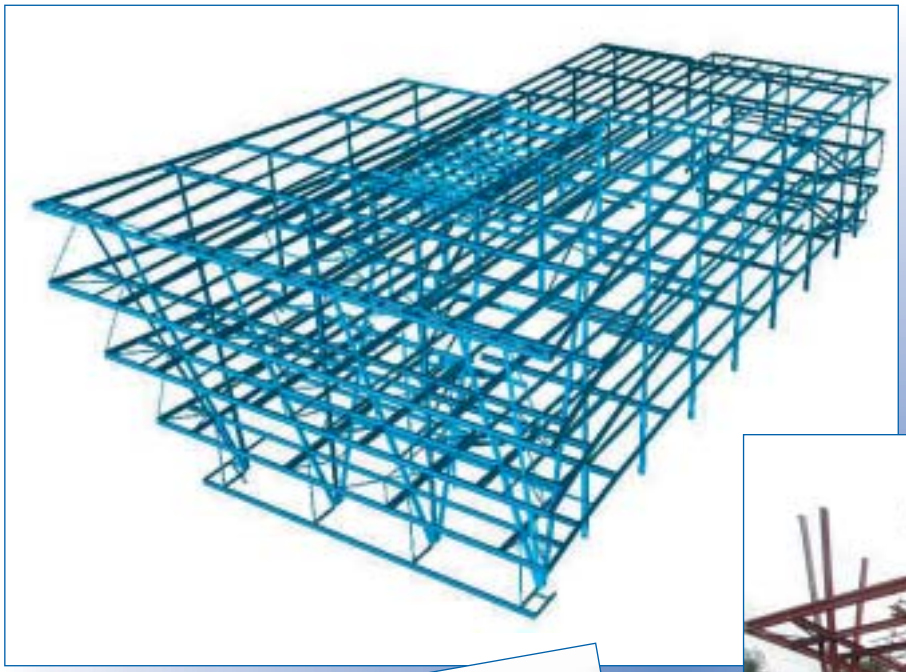
Project title:
Administration Building
Physical Location:
Hadovka - Prague
Site owner:
CECOPRA a.s., Czech Republic
Architect:
Kopa s.r.o., Slovakia
Engineering office:
Atelier Rena, Pardubice, Czech Republic

Administration building

SOLiDUS s.r.o.

Slikova 40
169 00 - Prague
Czech Republic
tel: +420 (0)2 33350586
fax: +420 (0)2 33358446
Website Address: www.solidus-ok.cz
Vladimir Tichy
VladimirT@solidus-ok.cz

annual turnover: **CKZ 2 500 000** number of employees: **N.A.**



General contractor:
FCC a.s., Prague, Czech Republic
Length:
52m
With:
27m
Height:
17m
Volume:
14 500m^3
Mass:
136 000kg of steel + 30 000kg of ribbed sheets.

Why is this project important?

The building is located on one of the main streets of Prague connecting airport with downtown. It will be very visible and will dominate at this part of the city.

Why is this project so special?

The new steel structure is to be connected to existing reinforced concrete frame structure and utilize stiffness of this structure up to 2nd floor. On the roof of concrete part of building was erected steel frame structure several years ago. This structure will become a part of a new steel structure but it must be strengthened due to new loads. Several problems have occurred within the work over the steel design. The claim was bolted connections of members and possibility of floor after floor assembling (no continuous columns), shape of bearing steel structure (pyramid turned upside down), no fixed-end anchorage on existing concrete frame structure (only hinges) and big forces in anchorage.

Use of ESA-Prima Win

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

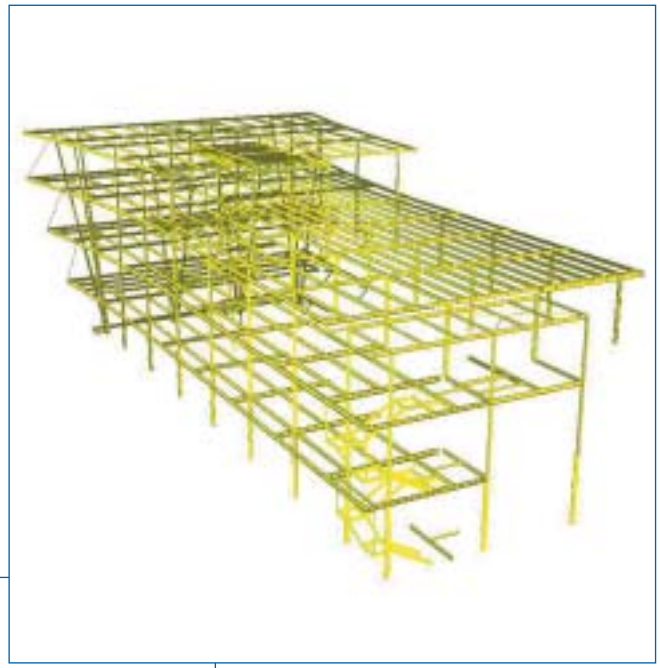
The first problem was the geometry of designed steel structure. Using of DXF files created in AutoCAD solved this one. The other one was a static diagram of structure and its stiffness regarding the claims for assembling.

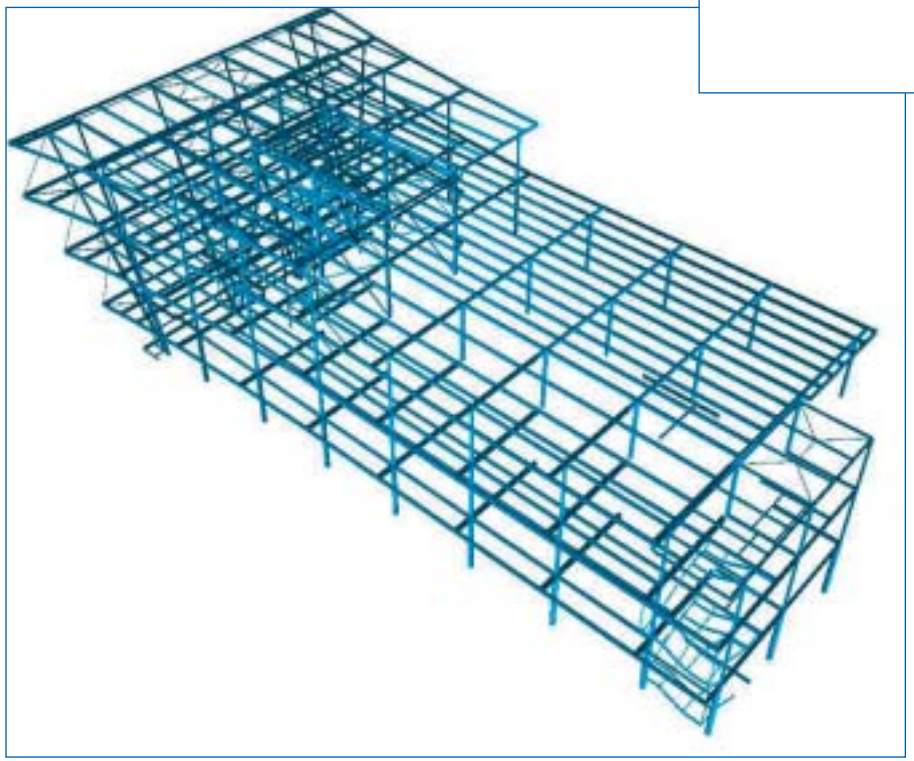
A description of your experience with ESA-Prima Win when realising the project:

I would say that my experience with ESA-Prima Win is long enough (over 10 years now) and the fact that I am a faithful user means my satisfaction with software. There was no surprise for me when realising the project. I appreciate a flexibility of the program and its fastness. There are some details I would welcome but nothing fundamental.

Modules used:

Nexis 32 release 3.30.09, P3D, DO1, OP

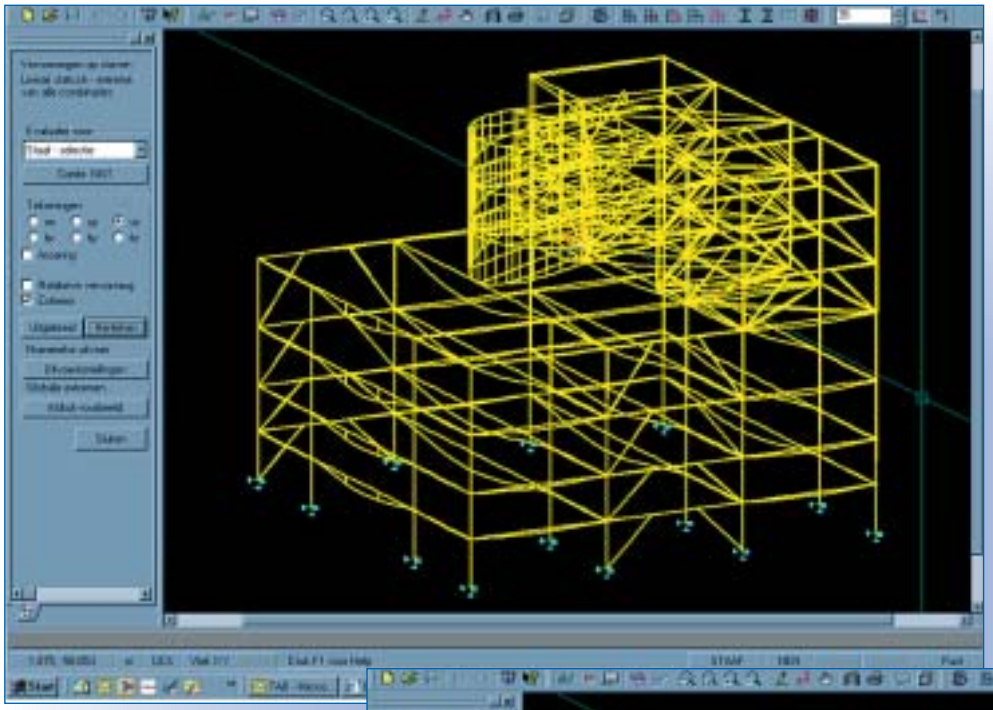


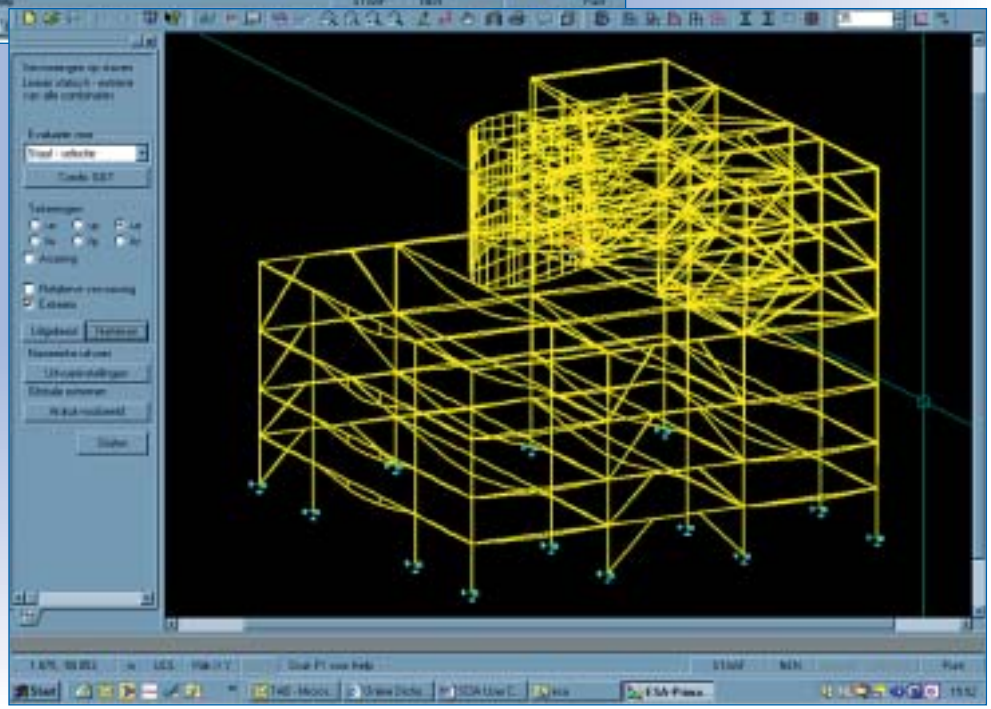


TAB technisch adviesbureau

Your company

The following two companies have done the static design of the project:





Olympic Main Press Center

Ingenieursbureau Zonneveld b.v.

Max Euwelaan 23
3062 MA - Rotterdam
The Netherlands
tel: +31 (0)10 4528888
fax: +31(0)10 4529550
http://www.zonneveld-rotterdam.nl

annual turnover: **N.A.** number of employees: **N.A.**

TAB n.v.

Beversesteenweg 612
8800 - Roeselare
Belgium
tel: +32 (0)51 431200
fax: +32 (0)51 431250
http://www.tab.be
contact: Roger Moortgat
e-mail: Rmoortgat@tab.be

annual turnover: **N.A.** number of employees: **N.A.**

Ingenieursbureau Zonneveld b.v. Is involved in many different activities. It has a vast experience with non-residential building and housing, and is no stranger to infrastructure building and renovation building. The (approx. 40) employees are highly qualified in technical skills and can rely on a vast amount of experience.

TAB started as an advice office for undertakers and steel constructers and these roots can still be found in the fact that we design structures, which are economical while keeping in mind the practicability. TAB can offer you an impressing range of analyzing power and experience. We are confident that we can offer the most optimal solution to any problem. The last few years TAB has specialized in FEA and particularly in the design of structures in earthquake regions and design and follow up of the rough structure from start to end. The (approx. 8) employees are highly qualified in technical skills and can rely on a vast amount of experience.

Your Project.

Technical data of the project

Project title
Olympic Main Press Centre (MPC).
Physical Location
Athens - Greece.
Site owner
ATHENS 2004.
Architect
K. Kyriakides and associates S.A.
Engineering office
Karanikolas-Zoyopoulos-Papadopoulos Ltd, commissioned by Joint Venture Michaniki s.a.
General contractor
Technical Union s.a.

The building is a 44.000 m² expansion of the existing congress center "Helexpo". The whole complex is approx. 65.000 m². The building contains conference halls with a capacity of up to 800 persons. The conference part has 5 building layers aboveground with a free span of 27,0 m. In all, a steel structure of approx. 4.000 tons of steel will be applied.

After a thorough research as to the earthquake loads, so called "eccentric bracings" will be applied in the design. These elements for the stability combine a large stiffness with a favorable plastic behavior.

Because of the importance of the building complex, the Greek government has determined the earthquake load to be 0,24 g (in stead of 0,16 g). There is also a stiffness demand. The frequency must be higher than 1,25 Hz. An intensive design process made it possible to meet both demands.

Why is this project important?

The Main Press Center (MPC) is the headquarters for the 5,500 written and photographic Press covering the 2004 Olympic Games in Athens. It will be located within walking distance from both the International Broadcast Center and the Athens Olympic Sports Complex, which will host nine out of the 28 Olympic sports being contested at the Games. Housed in a complex of three multi-level buildings taking up an area of more than 52,000 square meters, the MPC will comprise:

- A lobby area: help desk, banking services, travel agency, post office, message office, news desk, courier service, general store, technology store, pharmacy, and hairdresser.
- Press conference rooms

The MPC will commence operation four weeks prior to the Opening Ceremony and will continue for up to four days after the Closing Ceremony (13 July - 3 September 2004). Two weeks before the Opening Ceremony, it will become operational on a 24-hour basis. In the MPC, the written and photographic Press will enjoy making use of a wide range of facilities and services, including:

- KODAK film-processing laboratory.
- Photo Work Area: workstations, photo helpdesk, photo-transport office and lockers for photographers.
- Press Work Room: workstations with pay telephones, competition-results pigeonholes, results printing, help desk, INFO 2004 terminals.
- Rental Agency space
- Catering: dining hall (international food court setting) and VIP dining area.
- Service Center: central help desk for Rate Card assistance.
- INFO 2004 - the Games INFO system.
- Ticketing services for the accredited press.

Use of ESA-Prima Win

ESA-Prima Win has been chosen for different reasons:

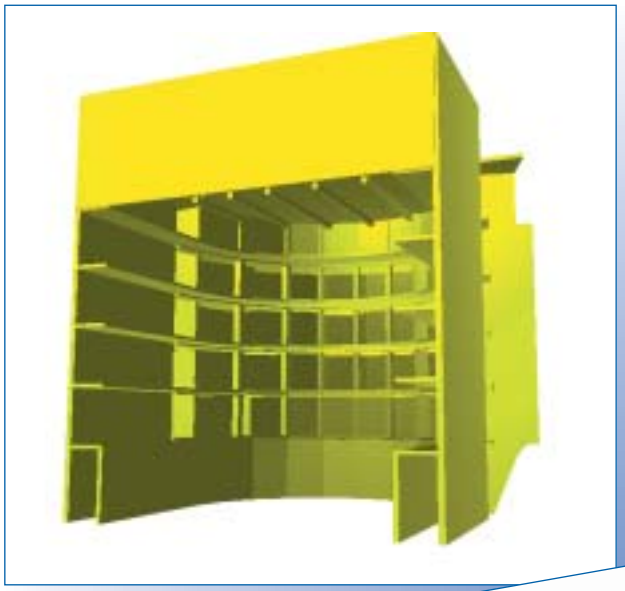
- The geometry of the buildings is quite complicated therefore a user-friendly interface was a must.
- Existing 3D CAD files could be used to quickly generate parts of the structure.
- Quite early in the design it became apparent that the asked for stiffness would be the predominant design factor. On the other hand we wanted an economical structure and at the same time one that demonstrated a favorable plastic behavior. Therefore it was very important to be able to quickly introduce modifications in the design and calculate the implications.

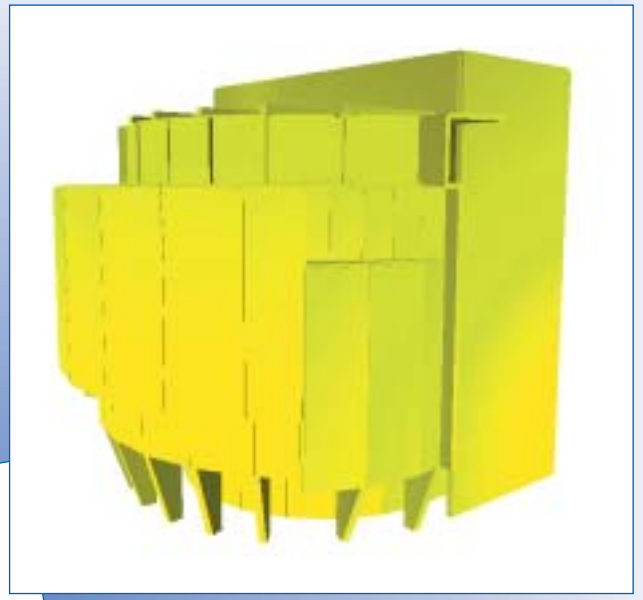
ESA-Prima Win turned out to be an instrument very well suited to achieve the above-mentioned goals. We think that without the use of ESA-Prima Win it would not have been possible to do the design within the very short delay we disposed of.

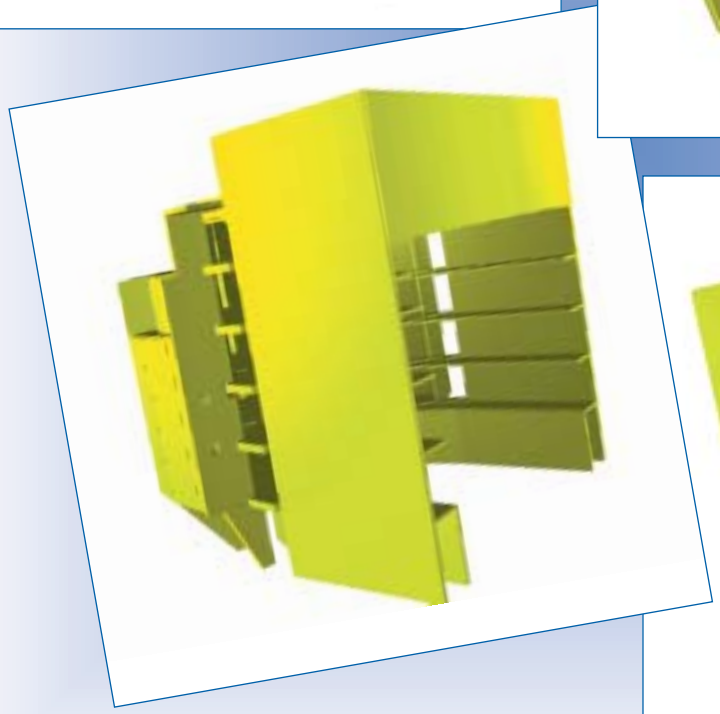
Your company?

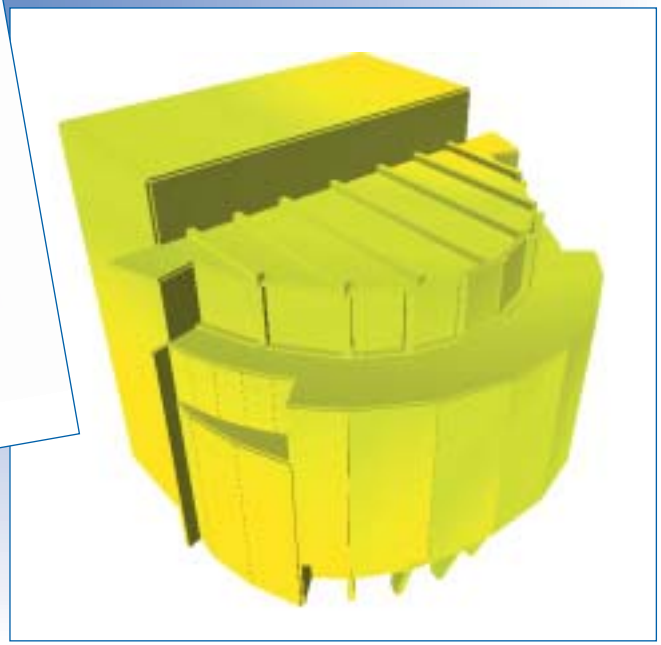
Design of buildings, infrastructures and environmental projects.
Specialization and disciplines:

- Geotechnics, foundations;
- Stability and structures;
- Renovations, demolition and repair technologies;
- Fire safety and protection;
- Environment, treatment of contaminated soils and water;
- Hydraulics and sanitation;
- Building physics;
- Electricity;
- Telecommunication, multimedia and information technology;
- Electromechanical equipment (HVAC);
- Medical equipment;
- Technical maintenance management.









Royal Flemish Theatre

Verdeyen-Moenaert

Kerselarenlaan 15
1030 - Brussels
Belgium
tel: +32 (0)2 743.12.80
fax: +32 (0)2 743.12.89
Website Address: www.ellyps.com
contact: Sarah Hollander
E-mail: shollander@vmic.be

annual turnover: □2 700 000 number of employees: **35**

Your Project

Technical data of the project

Project title
Koninklijke Vlaamse Schouwburg
Physical Location
KVS, Lakensestraat, Brussels
Site owne
City of Brussels
Architect
A.2R.C and B.O.A.
Engineering office
Verdeyen-Moenaert
General contractor
Willemen, Verstraete & Verhelst
Length
55m
With
25m
Height
26m
Volume
40220m³
Mass:
difficult to estimate: as we are dealing with an historical building

Why is this project important?

This project concerns the renovation of the Royal Flemish Theatre in the center of Brussels and the construction of a second building nearby. The modernization of the KVS (Royal Flemish Theatre) and the construction of a new building fits into an ambitious scheme devised to provide the KVS and its company with the state-of-the-art facilities needed to produce top-quality performances. The restoration program covers all parts of the facades, roofs and exterior balconies in keeping with the original design by Jean Base (1887), as well as the remaining facade of the former arsenal (1780). The entrance hall, the foyer, and the grand staircase are also being carefully restored. Rebuild in 1958 within the existing building, the present auditorium no longer caters to current requirements in terms of stage design and visual comfort, so it is due to be demolished and replaced by a new one. The new hall has a capacity of 500 seats. The internal organization plays on the contrast between the oldest sections of the building and a mysterious object that might resemble a cocoon. Standing apart from the existing walls, the object will be separated from the foyer by an atrium criss-crossed by catwalks, extensions of the exterior passage, providing access to the theatre. This intervention restores the continuity that previously existed between the exterior passages and the inner spaces. From a technical point of view, the reinforced concrete structure of the new auditorium is conceived to be completely independent from the existing building. The modeling of this structure was done using ESA-Prima Win.

Use of ESA-Prima Win

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

The model of the reinforced concrete theatre hall was made during the construction phase and gives us the answer to different technical questions.
First of all, the 3D finite elements model enables us to estimate the influence of the eccentricity brought into the concrete structure by the geometry of the 4 levels of balconies. More precisely, we wanted to know the importance of the generated traction forces into the two symmetrical concrete walls. The traction forces have to be retaken in the foundation that is a screen of secants piles.

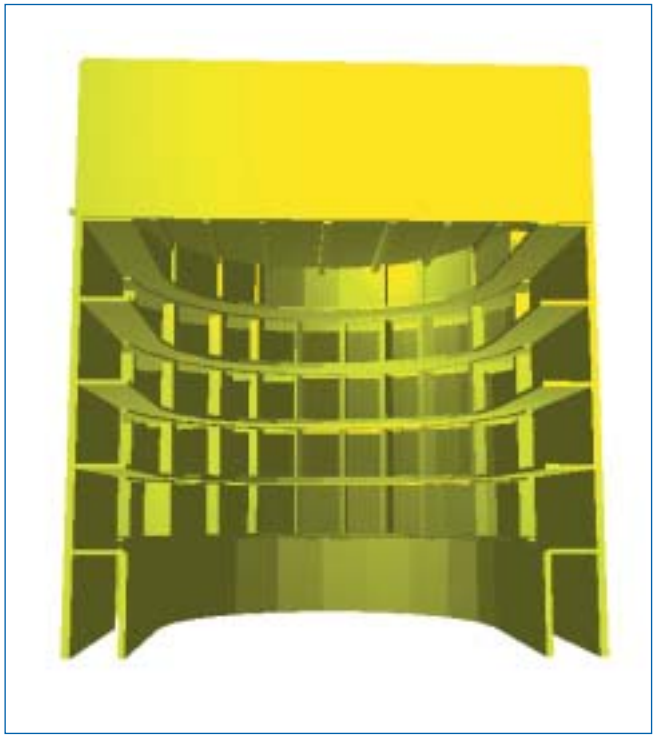
Secondly, acting as a load takedown model, it was easy to obtain the loads on the foundations.
Finally, the reinforcement of the columns, beams and slabs can now be designed using the calculated axial force, bending moment and shear force diagrams. Deflections can be controlled as well.

A description of your experience with ESA-Prima Win when realizing the project:

The introduction of the basic 2 dimensional geometry was done using the DXF interface. The interface was really appreciated, as we are generally disposing of the 2D Cad file before we start making the ESA-Prima Win model. After all, the geometrical part was the most intensive one: controlling if there were no double nodes, no overlaps, controlling the thickness of the 2D Macros. It is difficult to have a good view on the model. The load input consists of surface loads (2D distributed loads), some nodal and line loads (free loads) were used. The supports are vertical node supports. Once the structure being calculated, the results were easy to obtain and seemed to be realistic. Although, at some points non expected high stress concentrations are found due to discontinuities of the geometry, which is fair enough.

Modules used:

standard ESA-Prima Win modules



EST

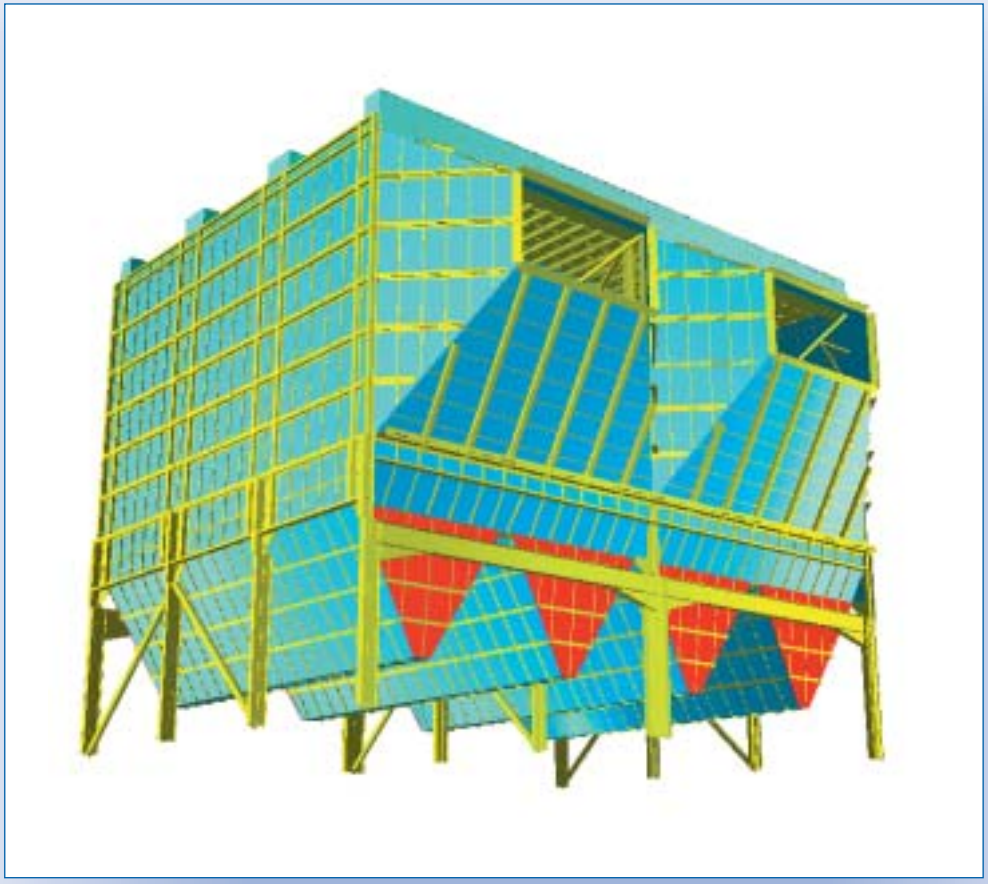
Votre société

La société E.S.T. doit sa création avec Michel LEVERT Ingénieur spécialiste des constructions métalliques à la suite de la vente de son bureau d'ingénieur conseil depuis plus d'une année. Pratique du logiciel ESA-Prima Win depuis plus de 8 ans dans tous les modules de la construction métallique. La société E.S.T. ne pratique que la spécialité d'Ingénieur Conseil Structures en acier, béton & bois avec des applications particulières en chaudronnerie-mécano soudure-structures verrières.
La société EUROPENNE de STRUCTURES et TECHNOLOGIES n'a pour effectif que son créateur, tous les calculs, toutes les conceptions, avec l'utilisation exclusive de ESA-Prima Win

Votre projet :

Fiche technique du projet

Project titre:
Caisson électrofiltre - expertise et vérification
Lieu de la construction:
Dunkerque (France)
Fait pour:



Caisson électrofiltre - expertise et vérification

EST
Européenne de Structures et Technologie
67, le Grand Pré Vert
Saint Nizier d'Uriage
38410 - Saint Martin d'Uriage
France
Tel: +33.4.76.59.71.18
Fax: +33.4.76.59.71.18
Personne à contacter M. Michel Levert
levertmichel@aol.com

annual turnover: □305 000 number of employees: 1

Sollac - Usinor

Bureau d'études:

E.S.T.

Entrepreneur général:

Entreprise SPEIC Groupe Vinci

Longueur:

25 m

Largeur:

25 m

Hauteur:

20 m

Masse:

1000 t (ossature)

Qu'est-ce qui rend ce projet intéressant et important?

La construction représente le plus grand caisson ESP en France, poids de l'ossature 1000t. Expertise pour le compte de SPEIC groupe VINCI

Pourquoi est-ce un projet spécial?

Le projet a nécessité une précision très complexe dans la modélisation de la structure existante.

Utilisation de ESA-Prima Win

Description des problèmes techniques résolus avec ESA-Prima Win

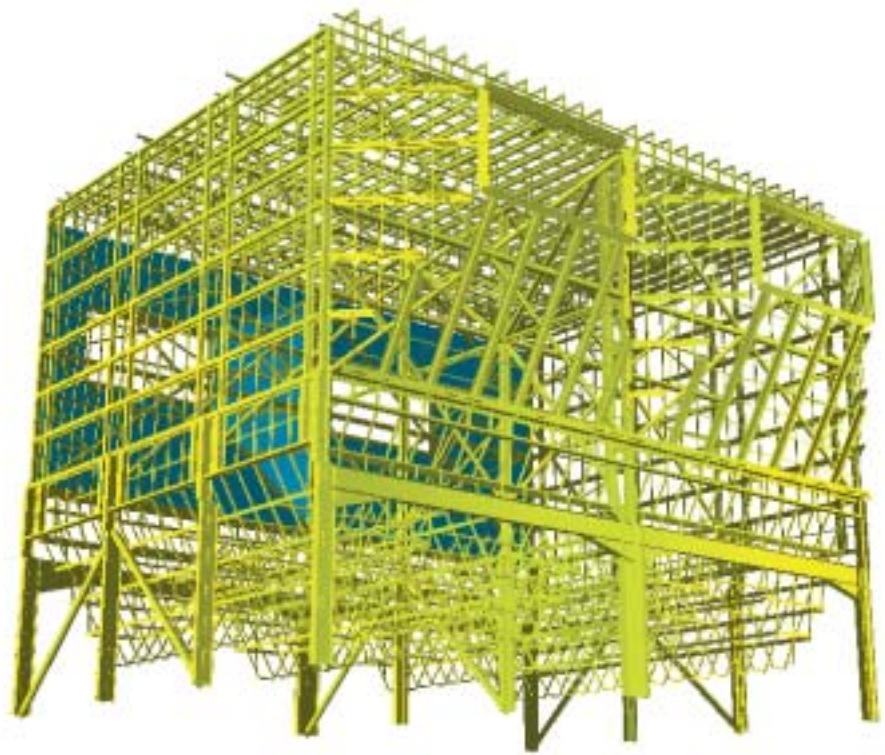
Le projet a nécessité une précision très complexe dans la modélisation de la structure existante.

Description de votre impression et expérience de l'emploi de ESA-Prima Win dans la réalisation de ce projet

La modélisation d'une telle structure complexe était très simple dans ESA-Prima Win, grâce aux fonctionnalités des blocs et macros barres et éléments finis. Idem pour l'exploitation des résultats. Pour info: optimisation et calcul en 3D avec 38207 nœuds, 40011 éléments 2D , 18777 éléments 1D.

Modules utilisé

Modélisation barres et éléments finis 3D.
Contrôle des tassements.
Calculs statique et dynamique.
Contrôle acier CM'66

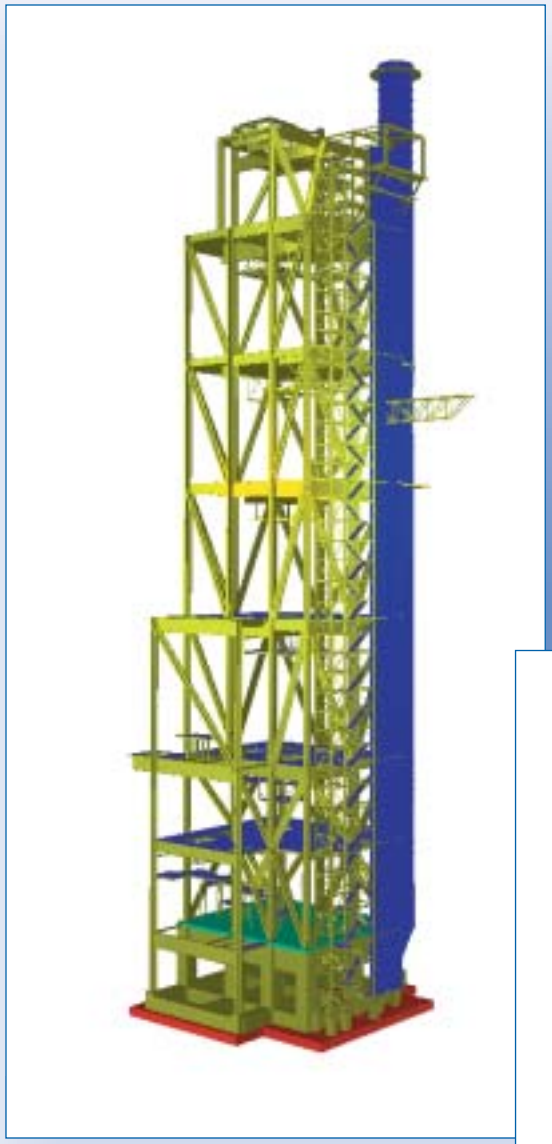


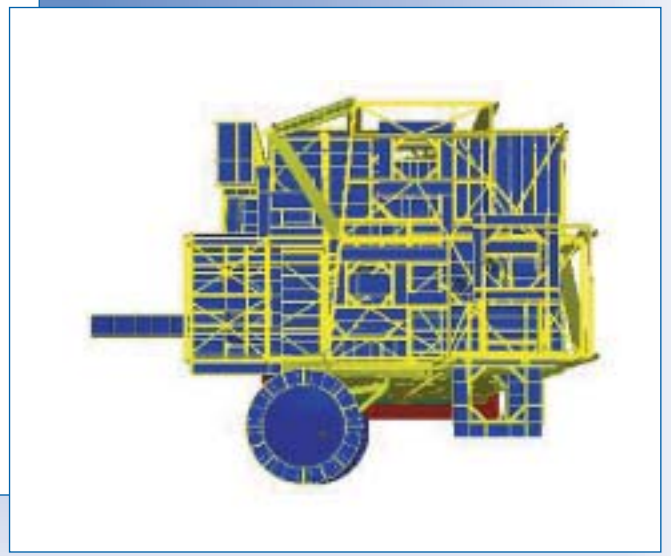
EST

Votre société ?

La société E.S.T. doit sa création avec Michel LEVERT Ingénieur spécialiste des constructions métalliques à la suite de la vente de son bureau d'ingénieur conseil depuis plus d'une année. Pratique du logiciel ESA-Prima Win depuis plus de 8 ans dans tous les modules de la construction métallique. La société E.S.T. ne pratique que la spécialité d'Ingénieur Conseil Structures en acier, béton & bois avec des applications particulières en chaudronnerie-mécano soudure-structures verrières.

La société EUROPENNE de STRUCTURES et TECHNOLOGIES n'a pour effectif que son créateur, tous les calculs, toutes les conceptions, avec l'utilisation exclusive de ESA-Prima Win





Dopol-Tower cimenterie Egypte - concept Polysius

EST

Européenne de Structures et Technologie
67, le Grand Pré Vert
Saint Nizier d'Uriage
38410 - Saint Martin d'Uriage
France
Tel: +33.4.76.59.71.18
Fax: +33.4.76.59.71.18
Personne à contacter M. Michel Levert
levertmichel@aol.com

annual turnover: □305 000 number of employees: 1

Votre projet :

Fiche technique du projet

Project titre:
Dopol-Tower cimenterie Egypte - concept Polysius
Lieu de la construction:
Ameria (Egypte)
Fait pour:
Cimpor (Portugal)
Bureau d'études:
E.S.T.
Entrepreneur général:
Polysius (France)
Hauteur:
130 m
Masse:
Poids de l'ossature 2000t poids total en chargement 19000t .

La structure très complexe du projet constitue la version 6 d'un ensemble DOPOL-TOWER pour une industrie cimenterie en Egypte. Sur la base d'un concept POLYSIUS. La construction en cours de réalisation a une hauteur totale de 130m, réalisation en acier et béton sur sol 'élastique' calcul avec non-linéarité.

Qu'est-ce qui rend ce projet intéressant et important?

Ce projet a nécessité une très grande précision dans la complexité de la modélisation.

Pourquoi est-ce un projet spécial?

Optimisation de la structure en 3D avec 9241 éléments 1D 16961 éléments 2D et 17582 nœuds.
Modélisation de la structure avec éléments 1D et 2D, modélisation de tous les ensembles annexes en chaudronnerie en éléments 2D.
Utilisation de ESA-Prima Win

Description des problèmes techniques résolus avec ESA-Prima Win:

Structure en acier et béton sur sol 'élastique' calcul avec non-linéarité. Ce projet a nécessité une très grande précision dans la complexité de la modélisation. Modélisation de la structure avec éléments 1D et 2D, modélisation de tous les ensembles annexes en chaudronnerie en éléments 2D. Optimisation de la structure en 3D avec 9241 élément 1D 16961 éléments 2D et 17582 nœuds .

Description de votre impression et expérience de l'emploi de ESA-Prima Win dans la réalisation de ce projet:

ESA-Prima Win s'est montré l'outil idéal pour la modélisation complexe et complète du projet.

Modules utilisées

- Barres et éléments finis 3D.
- Calculs statique et dynamique
- Calcul 2ème ordre
- Contrôle acier AISC - ASD

Dipl.Ing. Ivan Guba

Your project:

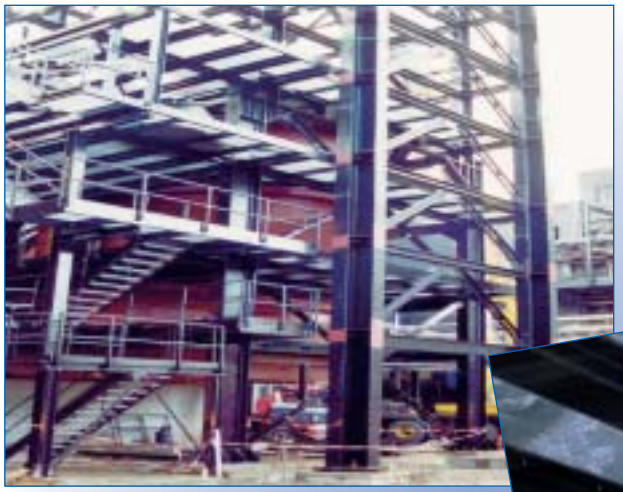
Technical data of the project

Project of 160 t heavy steel structure under the Secondary Combustion Chamber & Steam Boiler and Flue Gas Cleaning to Port Nyborg - Danmark, Kommunekemi Line F1, where the Steel structure was mounted during January to July 2002. Presentation consists of I prepared the Static Calculation and Workshop Drawings of Steel Structure.

Description of STEEL STRUCTURE

The steel structure consists of 4 main columns and 4 auxiliary columns, connected through with horizontal beams on levels of relevant platforms as well as with cross-bracings.

Its purpose is to support secondary combustion chamber (SCC) on platforms +12,345 a 28,920, and to carry service platforms on elevations +4,000, +6,380, +9,450, +12, 555, +15,150, +18,650, +21,850, +24,350, +28,920, +32,050 a +33,750 m. At the same time it bears live load on platforms and forces caused by wind and snow. Horizontal leading of the SCC movement caused by thermal expansion and



Heavy steel structure under the Secondary Combustion Chamber

Dipl.Ing. Ivan Guba

Miletièova 70
821 09 -Bratislava
Slovakia
tel.: +421 903 469873
Fax: +421 2 53416692
contact: Ivan Guba
e-mail: iguba@nextra.sk

annual turnover: **N.A.**

number of employees: **N.A.**

contraction during start-up and shutdown is also taken by the structure. The steel structure is designed as self-supporting static system, which creates stable unit due to its dam walls and rigid beam grid on every platform level, able to transfer horizontal and vertical forces into foundations. The structure creates one independent expansion block.
The steel structure is mostly open, with the exception of wall cladding between elevations +9,450 and +18,650, which is stiffened by auxiliary columns and cross-bracings. Protection wall is also made on elevation ±0,000 on three sides of the structure up to the height of +4,000 m.
Main footprint dimensions of the structure are given by axes A, B, 1, and 2: 7,30 x 6,60 m. Auxiliary columns for supporting of extra platforms between elevations +9,450 and +18,650 are in the intersection of axes A, B, 1´, 2´ in the distance 3,450 m, resp. 2,450 from main axis 1, 2
Access to relevant platforms is enabled via side steel stairway. Stair beams are made of rolled steel beams, steps are made of galvanised gratings.

Description of the Parts of STEEL STRUCTURE

Columns are made of broad-flanged rolled beams HEB. There are erection joints on two elevations of the structure. Most loaded points are stiffened with transverse beams. Four anchoring bolts with T-heads anchor the structure into the foundations. Transversal beams are made of open-section rolled steel beams. The beams are partly supported or hanged into diagonal cross-bracings in the fields between columns. Parts are connected with bolts in the erection phase. The beams are secured against yawing with transversal beams in the pitch of 1 m max., the latter serving also as supports for galvanised grid covering of platforms. Diagonal cross bracings are made of pairs of open-section rolled steel beams. Connection to columns and beams is made through steel sheet flanges and bolts. Platform beams are made of system of rolled steel beams. Platforms are covered with hot dip galvanised gratings fixed to platform beams with fixing elements. The platform edges not protected with cladding walls are equipped with kick plates and railings. Two tracks for SCC access doors are fixed to platforms on elevations +15,150 a +28,920. Auxiliary stairs are made in the area of several platforms, thus connecting relevant platforms. The roof of cladded part of the structure is made of tear-drop steel sheets with thickness of 6 mm at the elevation of +18,650. The steel stairway is opened to the wind. Minimum width of the stairs is 800 mm and maximum slope is 45°. Stairs between relevant platforms are made of sloped steel U-shaped beams. Stair steps are made of galvanised gratings fixed with bolts. Resting platforms are equipped with kick plates and railings on the edges.

Description of the method of Static calculation

Static calculation is prepared with software IDA-PRIMA - integrated graphic computing system for static calculation by finite element analysis (FEA). It enables complex linear, non-linear, dynamic and stability design of any structure created by bars. Sizing of elements is in accordance with standards listed above.

Deformations of the nodes

The text enclosure C pages 1-50 (plastic index sheet No. 7) shows deformations of selected nodes in relevant load case combinations, the same in graphic enclosure F (plastic index sheet No.). The nodes were selected in all four corners on each platform elevation.
Horizontal deformation in x, y direction should not exceed 1/500 of node elevation above support (of the structure as whole) acc. to 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 axes x, y, z. At the evaluation on page 52 it is shown, that the node with most extreme deformation is node No. 633 with deformation 55,8 mm in axis y. Since the nozzle is at the elevation of 28,920 m above the support, its deformation should be no more than 28920/500 = 57,9 mm, which is acceptable. Since the columns in the x-axis posses larger modules of inertia, the deformations are much smaller in this direction.

Deformations of bars

The text enclosure C page 53 (plastic index sheet No. 7) shows extreme deformations selected from all bars in steel structure, the same in graphic enclosure F (plastic index sheet No.). Since printed output for each bar will be extremely large, deformations of selected bars are also in graphic enclosure F (plastic index sheet No. 10) - mostly beams bearing the SCC. In this case, maximum deflection should be no more than 1/250 of beam length (about 26,5 mm) acc. to recommended limit deformations in ENV 1993-1-1:1992, Eurocode 3, which was met in each case.

Holland Railconsult

What are the main activities of your company?

1 Beheersing en beveiliging
2 Tractie- en energiesystemen
3 Architectuur, bouwtechniek en installaties
4 Civiele Techniek
5 Verkeer en vervoer
6 Baan- en spoorwegbouw
7 Projectmanagement
8 Ruimtelijke inpassing en conditionering
9 Instandhouding

Your Project

Technical data of the project

Project title:
Nieuwe ingangsluifel van station Uitgeest.
Physical Location:
Uitgeest, Nederland.
Site owner:
Provincie Noord Holland.

De nieuwe ingangsluifel van station Uitgeest

Holland Railconsult

Leidseveer 10
3511 SX - Utrecht - Nederland
tel: +31 (0)30 265.55.55
fax: +31 (0)30 265.55.62
www.hr.nl
contact: ing. P.J.H. de Bliek
e-mail:pjhdebliek@hr.nl

annual turnover: □128 000 000 number of employees: 1500

Architect:
ing. H.K. Woltjer.
Engineering office:
Holland Railconsult.
General contractor:
Nog niet bekend.
Length:
31 meter.
With:
19 meter.
Height:
9.92 meter.
Mass:
57.000 kg (staal)
58.000 kg (glas en aluminium dakbedekking)

In plaats van het huidige stationsgebouw komt er in Uitgeest een ingangsluifel in de vorm van een stalen tafelconstructie met de afmeting 31 x 19 meter en 6 meter boven maaiveld.
Voor het constructieve ontwerp van de ingangsluifel is rekening gehouden met belastingen door het eigen gewicht van de constructie, met wind, met sneeuw en met persoonsbelasting.
De eigen frequentie van de luifel bedraagt slechts 0,8 Hz , omdat dit zo laag is wordt er een vergrotingsfactor gebruikt die de belastingcombinaties (zowel de UGT als de BGT) vergroot met een factor 1,4. De constructie moet dus voldoen aan een 1,4 maal zwaardere belasting dan gebruikelijk.

De 10 kolommen van de constructie zijn gelijk verdeeld over de west- en oostzijde, en hebben de afmeting Æ 355,6 x 30 mm voor de hoekkolommen en daartussen Æ 355,6 x 8 mm. Aan de westzijde zijn de kolommen ca 6 meter hoog en aan de oostzijde ca 9 meter hoog omdat deze verdiept staan in de fiets/voetgangerstunnel.
Voor de 21 meter grote overspanning worden als hoofdliggers gebruikt HE 650A-profielen. De koppelingen tussen de kolommen worden verzorgd door liggers HE 550A.

Als dwarsdragers in het dakvlak worden liggers HE 220B gemonteerd, die eveneens als kipsteunen fungeren voor de hoofdliggers. Schijfwerking van het dakvlak wordt verzorgd door een windverband dat aangebracht wordt tussen de buitenste hoofdliggers/koppelingen en de goot.

De fundering aan de westzijde zijn betonnen poeren waarop de 5 kolommen momentvast aangesloten worden. De twee buitenste poeren zijn op 2 prefab betonpalen gefundeerd, de andere 3 op een enkele paal. Aan de oostzijde maakt de fundering deel uit van een betonnen bakconstructie waar ook de trap deel van uit maakt en de keerwanden.

Om het uiterlijk te krijgen van gelijke kokerliggers worden de liggers bouwkundig afgewerkt met multiplex dik 12.5 mm. Met een afschot van 1 : 50 wordt gelaagd floatglas gemonteerd in de vakken tussen de hoofdliggers, koppelingen en de dwarsdragers. De glasplaten zijn tweezijdig ondersteund door glasprofielen evenwijdig in richting van het afschot van het dak, haaks daarop kitnaden aanbrengen tussen de glasplaten. Een glasplaat heeft een afmeting van ca 1,75 x 0,8 m2 en een gewicht van ca 50 kg, zodat deze te tillen is door 2 personen.
Het visueel dichte deel van de overkapping wordt zowel aan de onder- als aan de bovenzijde afgewerkt met een aluminium beplating.
In de omranding van het dakvlak komen in totaal 6 goten, 2 over de lange zijde van de luifel en 4 over de korte zijde. Hemelwaterafvoeren komen op de vier hoeken en worden bevestigd in de hoekkolommen.

Why is this project important?

Omdat het een nieuw station is voor Uitgeest.

Why is this project so special?

Als constructie is het speciaal vanwege de afmetingen en de bijzonder lage eigen frequentie. Vanwege deze lage eigen frequentie werd een vergrotingsfactor in rekening gebracht waarmee de belastingen zijn verhoogd.

Use of ESA-Prima Win

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

1 Sterkte optimalisatie.
2 Stijfheid optimalisatie.
3 Eigen frequentie optimalisatie.

A description of your experience with ESA-Prima Win when realising the project:

5 jaar ervaring.

Modules used:

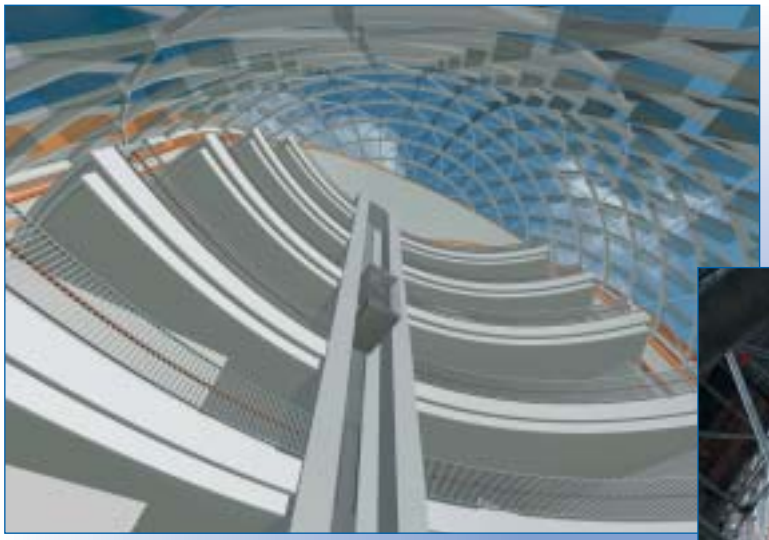
- Base
- 2de orde FEM
- 2D Frame
- 3D frame
- 2de orde Frame
- Stability Frame
- Dynamics Frame
- Physical non-lineair conditions
- Physical non-lineair Frame (steel)

Stoel Partners
Ingenieursbureau voor bouwtechniek

Your company:

Stoel Partners Zwolle werkt graag aan bijzondere projecten. Voor ons als adviseur constructies is de koepel van het nieuwe hoofdkantoor van de Frieslandbank qua ontwerp en constructie een technisch hoogstandje.

De Frieslandbank gevestigd te Leeuwarden heeft in 2000 het startsein gegeven voor de bouw van een nieuw hoofdkantoor. Het gebouw bestaat uit een min of meer traditioneel kantoordeel opgebouwd uit prefab gevelelementen, kolommen, vloeren en balken, en een koepelconstructie met een diameter van 27 m en een hoogte van42 m.
Binnen de koepel bevinden zich een 9-tal verdiepingsvloeren alsmede een grote vide over de volle hoogte van de koepel.
De bovenste koepelvloeren dragen op een aantal zelfstandige steunpunten zonder gebruik te maken van de drie ribben van de koepel. De 7e, de 8e en de 9e verdieping draagt zijn belasting middels een 3-dimensionale staalconstructie af naar de onderliggende betonconstructie.
De koepel zelf is een volledig vrijdragende



Masterplan Frieslandbank te Leeuwarden

Stoel Partners bv

Haydnstraat 2
Postbus 30177 8003 CD Zwolle
Tel.: +31 38 - 4554600
fax: +31 38 - 4554609
www.stoelpartners.nl
Cornelis Bergsma
cba@stoelpartners.nl

annual turnover: **N.A.**

number of employees: **N.A.**

staalconstructie welke draagt op een drietal ribben. Mechanisch gezien kan de koepelhuid worden vergeleken met een hoepelrok waarbij de hoepels worden gevormd door horizontale stalen buizen met een diameter van 200mm en de huid door de diagonale trekstangen en het glas.

De horizontale en verticale belastingen uit de koepelhuid worden hierdoor volledig zelfstandig overgebracht op de drie ribben van de koepel.

De drie ribben zijn uitgevoerd als een driehoekig stalen vakwerkspant en steunen in horizontale zin tegen de in de koepel aanwezige vloeren en dragen verticaal op de drie koepelpoten.

Het verloop en de afdracht van de belastingen zijn in beeld gebracht door gebruik te maken van een 3D computermodel. Het gebruik van ESA-prima Win gaf ons inzicht in de meest optimale opzet van de constructie en heeft het mogelijk gemaakt het materiaalgebruik te minimaliseren.

Your project

Het gebouw bestaat uit twee delen. Het eerste gedeelte is het kantoorblok die uit vijf verdiepingen bestaat met een in het werk gestort betonen schacht. Het kantoorblok kent geen kelder. Het andere gedeelte is de koepel die gedeeltelijk op het nieuw te bouwen kantoorblok komen te staan en op de bestaande gebouwen. Deze koepel bestaat uit negen verdiepingen inclusief de verdiepingen van het kantoorblok en heeft ook een kelder die aansluit op de kelder van de bestaande gebouwen. De koepelverdiepingen word bekleed met glas om een doorzichtige geheel te vormen. De glas gevel draagt zijn belastingen vertikaal af op drie kolommen en horizontaal op de vloeren van de koepelstructuur. In de koepel komt er een vide voor die de volle hoogte van de koepel beslaat.

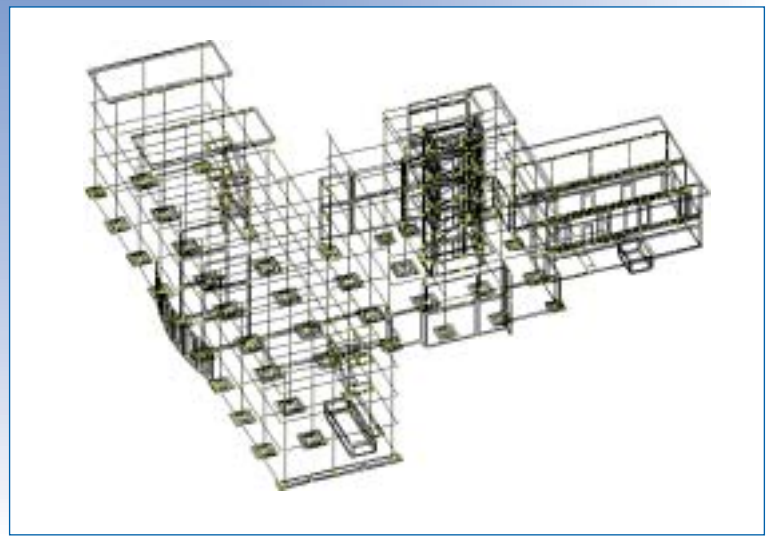
Stabiliteit

De stabiliteit van het kantoorblok wordt verzorgd door een in het werk gestorte betonen kern tussen de assen N, S, 9 en 13. Deze kern loopt door tot de dakvloer. De stabiliteit van de koepel wordt verzorgd door de wand op as A tussen assen 1 en 12, de schacht van de panoramalift op as A tussen assen 9 en 12 en de schacht van de bestaande lift op assen B t/m D. Door de hoge stijfheid van de vloeren, met 60mm druklaag in het kantoorblok en in het werk gestorte beton in de koepel, worden de schachten en wanden evenredig naar stijfheid belast.

TESAR consult

You company

Our engineer's office specializes in complete design and stress analysis of concrete structures (both of reinforced and pre-stressed concrete) and of steel structures. We carry out design including foundations. Organization form is a consortium of five independent designers that share the same office and aims. Staff is comprised of up to three/four AutoCAD drafters, hired in dependence to the extent of particular contract. As a relatively small office we often cooperate as a subcontractor to major engineer's offices - for instance long-term cooperation with ABB Lummus Global. In branch we are involved for more than 40 years and our specialists have experience from work in abroad - Germany, France, Italy, Iraq, Syria. As an independent office we exist from September 1992. Our leading professionals acted as consultants and reviewers of diploma works at Technical University in Brno. One of designers is former professional programmer that participated in programming of software that preceded ESA Prima Win and his present software PNNP enables us gain more from outputs of EPW. Number of structures we designed are situated in area's with serious effects of undermining, earthquake effects (India, Iraq) and we designed also



Hospital in Kromeriz

Tesar Consult

Cihlarska 32
602 00 Brno
Czech Republic
tel.:+42 5 41218685
fax:+42 5 41245636
http://www.tesar.cz
Karel Tesar
email: tesarc@nextra.cz

annual turnover: **N.A.**

number of employees: **N.A.**

structures substituted to extraordinary effects - blast load in chemical plants. As we participated in projects of structures situated in several countries (The Netherlands, India, Iraq, Russia, Germany, Czech Republic) we are able to design structures folowing local standards or EC2, EC3, EC7 codes and American or British standards.
We are members of several professional associations, most of all of CACE where we worked in several comities. Below are mentioned some latest projects we participated in and in which we successfully used ESA Prima Win.

Your project

Project of new pavilion. Multi-storey concrete frame (made of pre-cast elements) based on shallow foundations supported by "effective subsoil model". Design reflects an attempt to include into computation model also such parts as stairs, relaxation basins, lift-supporting construction etc. instead to common time more consuming practice to model their action onto the main construction as an additional load. Our engineering's office carried out complete stress analysis of new pavilion in hospital in Kromeriz town using program package ESA Prima Win (IDA NEXIS 32) version 3.01.04 during the year of 1998. Civil engineering part designed LT Project Brno, main contractor was company Mandak Kromeriz. The structure consists of two parts - pavilion itself and connection part to existing pavilions. New pavilion has four floors of plan shape of letter T. Three flors are overground, one floor is underground. Load bearing structure is formed by multi-storey space frame made of concrete precast elements of LOB system (frame beams with internal hinges - Vierendel system). This enabled us to divide new pavilion only into two expansion units (expansion joint is situated in intersection line of perpendicular parts of the structure). Connection part forms the third expansion unit. Floor slabs are formed mostly by precast pre-prestressed elements and in some parts by cast in situ reinforced concrete slabs of Filigran system. Shallow foundations are formed by precast footings and cast in situ footing strips. To assemble construction mostly from precast elements enabled to reduce the time of construction at building site itself which was very important for regular function of the hospital. In order to reduce latteral earth pressure to underground perimeter walls we used stiffening of backfill with several layers of geotextilies which enabled us to use common masonry instead of cast in situ concrete for these walls. Connection part is formed by two floors - one is underground the other overground. Underground floor is formed by concrete cast in situ construction U-shaped in cross section with walls and bottom 400mm thick. The ceiling over the underground floor is formed by pre-stressed pre-cast elements supported at one end by perimeter concrete wall and on the opposite side by intermediate masonry wall. In overground floor the vertical bearing elements are one perimeter and intermediate masonry wall and the remaining perimeter wall is substituted with 5 steel columns of circle cross section diameter 198mm that support steel beam of [ ] 280 shape. Durinng construction the intermediate vertical columns were from architectural point of view changed to V shaped ones. Roof is formed by cast in situ concrete slab of Filigran system that is from both sides sloped 5% towards the intermediate wall.

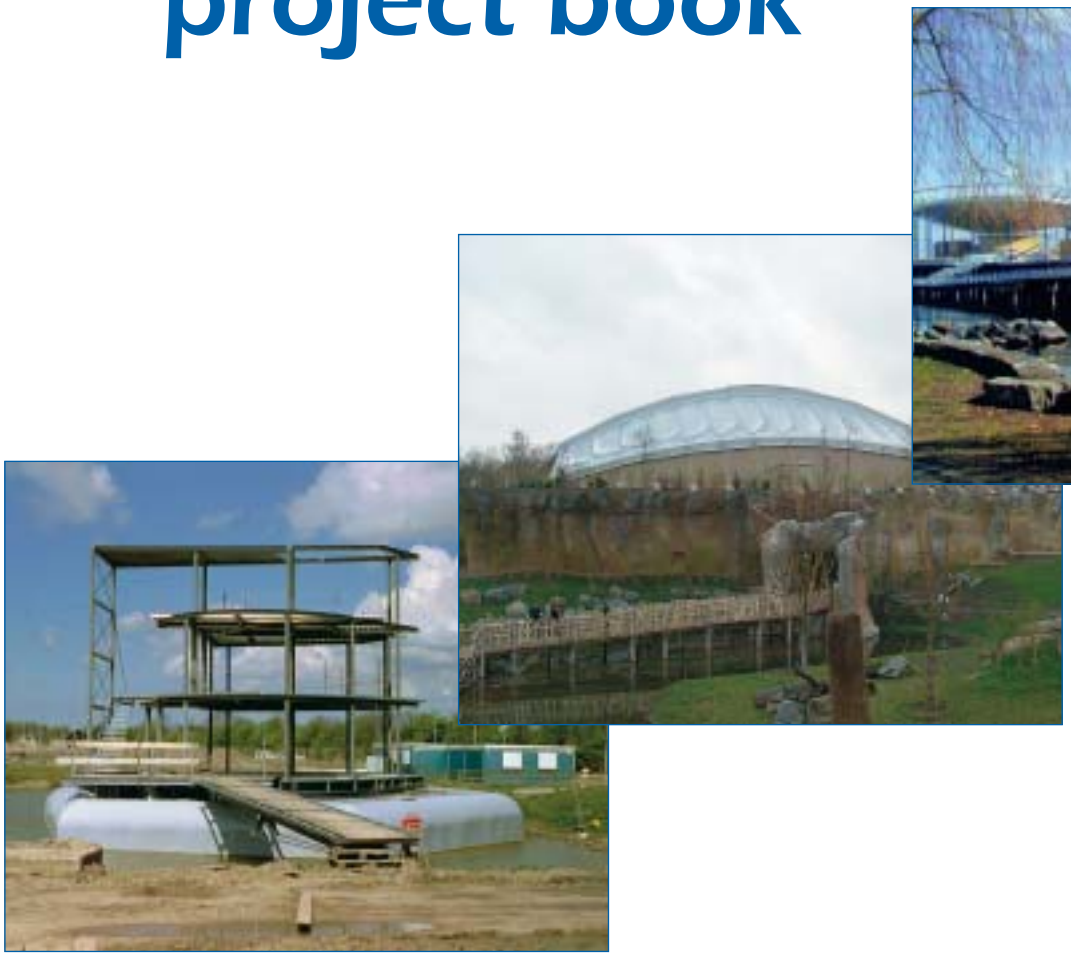
STRESS ANALYSIS

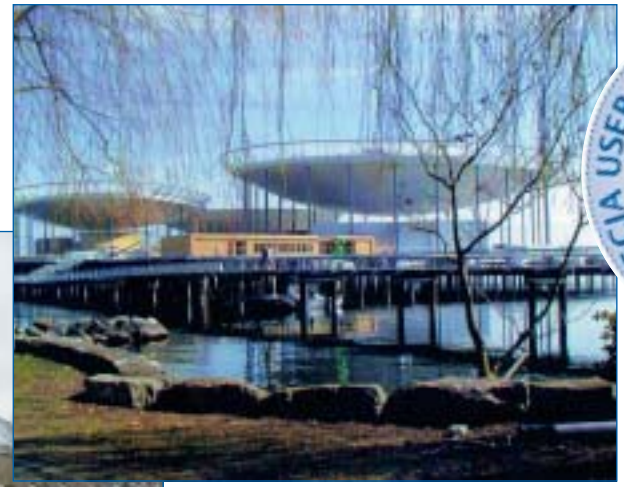
The construction was in ESA Prima Win modelled as shell XYZ supported by "effective subsoil model". Prevailing bearing material is reinforced concrete. In connection part is also used steel as is described on the previous page. In some cases are masonry and glass used as panel materials. Design reflects an attempt to include into computation model also such parts as stairs, relaxation basins and pits, lift-supporting masonry/concrete construction acting simultaneously as anchor bay for expansion unit 2, masonry anchor walls for expansion unit 1, underground perimeter masonry walls subjected to lateral soil pressure, overground glass walls subjected to wind pressure etc. and evaluate their contribution to behaviour of the whole construction and simultaneously gain more precious idea of internal forces in these construction parts.
Construction was modelled together with layered subsoil represented by "effective subsoil model" corresponding to geological survey report. Proper characteristics of subsoil model, coefficients C1, C2x, C2y, were obtained by iteration - several recalculation of the construction until certain criteria are not fulfilled. This subsoil model supports footings and foundation beams - 2D stepped macros and foundation plates of connection part, basin and pits - 2D macros. Beams of frame construction were modelled with real cross sections (with boots etc.). Where needed the beam elements were placed eccentrically into construction. Floor slabs from cast in situ concrete were modelled as 2D macros. Floor slabs from pre-cast elements were implemented only as loads.
During checking and proportioning reinforced concrete slabs and walls we appreciated post processors for 2D macros. On the other hand up to now we miss post processor for check of 1D elements subjected to combination of biaxial bending and axial force.
Activating/deactivating parts of construction was very useful function of EPW both while inputting data and when checking the outputs. Without this function it is not possible to keep view over the designed construction. We enjoyed also possibility to model construction in several parts with further joining them into one final model. This speed up the work and again enables keeping overview. Very useful was also to model the geometry of the construction in AutoCAD primarily with further export to EPW.

ESA-Prima Win and International Projects

The exchange of documentation is now practically only in the electronical form (hard copy is mostly issued only one time for the contractor and one time for the local authorities respectivelly to fulfill law demands). As we recently participated in the projects situated in different countries we saw that the international spread software for exchange of calculation documentation in all countries available for designer, client, contractor and local authorities is Microsoft Word. Up to now the EPW document have to be exported into .rtf format and then imported into Word. Because final Word calculation documentation always comprises frames, company logo, different headers and footers it is necessary carry out reformating of imported EPW document. Finally we look forward for new improvements in package that is from our point of view good solution for such designers as our engineering's office is.

USER CONTEST 2002
project book





The SCIA User Contest was hold in the period June - September 2002.

All projects were submitted on the dedicated website, using the SCIA software for project document management on the Internet: **www.smartproject.be**

The Jury was composed of Prof. Dr. Dirk Vandepitte and Prof. Ir. Yvan Verbaekel of the University of Leuven, Belgium.

The prizewinners and the user contest project book have been made public at the press conference in Frankfurt on 19th November 2002.

SCIA construction software

From Design to Realisation

SCIA Group nv
Industrieweg 1007
B - 3540 Herk-de-Stad
Belgium
tel.: +32 (0)13.55.17.75
fax: +32 (0)13.55.41.75
e-mail: info@scia.be
website: www.scia-online.com