SCIA User Contest 2007
– EXCON vítězem v kategorii CAE Budovy

19. dubna zasedala mezinárodní porota složená z odborníků jak z oblasti akademické tak komerční, aby z celkových 99 přihlášených projektů určila vítěze v pěti soutěžních kategoriích:

Kategorie 1: CAD Architektura (Allplan Archnitektura)

Kategorie 2: CAD Vyztužování (Allplan Vyztužování a Allplan Prefa)

Kategorie 3: CAE Konstrukce (ESA)

Kategorie 4: CAE Budovy (ESA)

Katergorie 5: CAE Speciální projekty (ESA)

Do soutěže byla Ing. Jaroslavem Váchou přihlášena kreativní a technicky zajímavá stavba „Stanice Metra Střížkov – primární ocelová konstrukce“, které také v kategorii CAE Budovy zvítězila.

Ing. Jaroslav Vácha přebírá cenu – symbolický šek.

Více informací o soutěži a všech vítězích naleznete na http://www.scia-online.com/czh/newslist.html

Zpracováno 12.6.2007

EXCON a.s.

Address Sokolovska 187/203 • Praha 9, 190 00 (CZ)
Telephone +420 244 015 111
Fax +420 244 015 361
Contact Mr Ing. Jaroslav Vacha
Email vacha@excon.cz
Website www.excon.cz, www.excon.eu

EXCON STAVÍME NA PARTNERSTVÍ

WINNER WINNER WINNER WINNER WINNER

EXCON, a.s. started 1990 as a design studio focusing on structural analysis and dynamics of steel structures. Its initial development related to the boom in the telecommunication sector. In 1995, the company extended its business activities by engineering and contracting activities. New fields of operation were found after the telecommunication market saturation. At the end of 2002, the company acquired a facility in Hradec Králové producing of steel structures (former ZVU Chemie, today EXCON Steel, a.s.). In 2003, EXCON, a.s. entered the market as a residential developer and continues to look for other opportunities. Its original product - (steel structures -) has been developed for the entire term of the company existence.

About the Company

A great benefit of the company is the high rate of entrepreneurship demonstrated by search for new business opportunities, which are quickly transformed into activities of the company. The management applies strict ethical principles and a healthy approach to risk undertaking.

Vision

EXCON wants to be a professionally mature, dynamic company with modern management. Traditional activities of the company comprise design and supplies of steel structures. The company intends to consolidate its position in this area also on the joint European market. The company also intends to strengthen its position of residential developer in this strategic period.

References

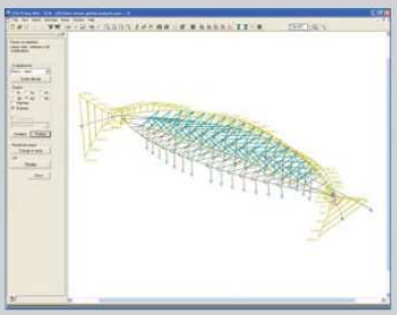
- Sazka arena Prague
- International power Opatovice, Power plant
- General reconstruction, Petřín look-out tower
- ...

Quote of the jury:
"The design and erection of this prestigious and eye-catching structure would not have been feasible without extensive and clever use of software"

Metro station Strizkov-Prague

The project regards the design of the primary steel structure of the metro station of Prague-Střížkov.
The new metro station Střížkov in Prague is designed and built as a special structure with a high esthetical level. The hall structure is about 160 m long, 42 m wide and 20 m high. Two crossed main hingeless arches with a span of 160 m are fixed to concrete pylons. The roof structure is suspended on the main arches by a system of prestressed rods and supported by columns around the roof. The major part of the members is a circumflex with a variable cross-section (the majority of the profiles are box welded from a plate thickness of 10-35 mm, except the columns, which are welded I profiles). The geometry of all parts is very difficult for the design, the manufacturing and the erection. The whole structure was built under direct supervision of the architect. The weight of the structure is about 950 tonnes.

Used software • NEXIS 32 (ESA-Prima Win)



Primary steel structure - Metro station Strizkov-Prague

Primary steel structure - Metro station Strizkov-Prague

Architect's vision

The new underground station Střížkov in Prague is designed and built as a special structure of a highly esthetical level. It is the 1st station of about 50 Prague metro stations, which is built as fully glassed-in. The roof level is about 5 m above ground space (the top of the structure is 20 m above ground space) and the tracks are positioned 7 m under the ground level.

The whole station area has a length of more than 120 m is without internal columns. The idea of the architect was that the glass hall of the station will shine at night to the open up to the neighbourhood and daylight will throw light on the boarding point.

Characterization of the main structure

The hall structure is about 160 m long, 42 m wide and 20 m high. Two main crossed hingeless arches are fixed to concrete pylons (each supported by 26 PCs of capsule anchor M64, length 1300 mm). The variable box profile of the main arches is 1,5 x 1,5 m high and 1,5 x 3,0 m in the supports; it is welded from plates with a thickness of 20-35 mm. The span of the arches is 160 m; the crossed point is about 10 m from the anchoring. Arches are joint together by 3 connecting beams (three-dimensional beams of about 20 m of length).

The roof structure is suspended on the main arches by two systems of prestrained bars. The 1st system is called short bars and has great static function (profile M48 from stainless steel S460). The 2nd system is called long bars (profile M30 from stainless steel S460). For a reduction of the tension in the long bars are used special springs (with a press capacity of 180 kN, the press is transformed into tension by a special cage). The system of bars is prestressed.

The roof structure consists of horizontal arches, middle beams, trusses and purlins. Twisted curves of horizontal arches (welded box profile) border the roof area and are supported by a system of columns. In the apparent axis of structure is the middle beam (welded box profile about 130 m length and vertical curved). The system of lateral trusses each 6 m is sited between the middle beam and the horizontal arches. Glass roofing is supported by a system of purlins. The columns round about the roof are in the shape of the Y letter (welded I profile). The majority of the structure is designed with steel S355 (prestressed bars from stainless steel S460). The geometry of all parts is very difficult with regard to design, manufacture and erection, because the majority of edges are circumflex. The weight of the structure is about 950 t.

Static analysis

- The design of the main structure was very difficult. The major part of all members is a welded box profile with a variable cross section. Only one edge is a straight line (upper flange of trusses), all other edges are circumflex (in the best case it is a circle, in the worst case a general spline without formula).
- For the 1st step of the calculation of internal forces was used the 3D linear module Nexis (ESA-Prima Win). For the structure design more then 20 load cases were considered (and more than 700 combinations). The model of the structure has more than 800 nodes and 1000 members, the number of the profiles is higher than 40. For extreme combinations internal forces were calculated by the nonlinear module (prestressed rods without press). Extreme internal forces (results of linear and nonlinear calculations) were used for the detailed profile design. The majority of profiles are welded box category 4 by EN 1993 (with local buckling for compression members or compression flanges of bent members). This type of profiles was designed with Nexis software. For the design of the stability of the members, the stability module Nexis calculated the buckling lengths. The stability calculation was made for the final structure, whereas the main arches were stabilized by a system of prestressed bars. The stability calculation was made also for the main arches during erection (without the positive influence of prestressed bars). Separately were designed connection beams by the nonlinear module Nexis (all members of connecting beams were designed fully in the Nexis system).

Erection and rods prestressing

- The main arches were mounted with parts of a length of max. 24 m and a weight of max.40 t using erection supports. The most difficult part of the mounting was the setting of anchor parts with cross-parts and next the closing of arches by quoins. During the last phase of the mounting of the arches, the geometry was corrected by hydraulic presses because of the changing temperature. After the mounting of the main arches, the erection supports were demounted.
- After this, the roof structure (horizontal arches, middle beam, trusses and columns) was mounted using erection supports under the middle beam. After completion of the roof structure, the rods were mounted. For the pressurising of the short bars, the middle beam was elevated about 40 to 130 mm by hydraulic presses. In this case, short bars were activated (at night, when the temperature was about 15 degrees). In the afternoon of the same day (when the temperature was higher then 30 degrees) the structure picked up from presses and bars were prestressed about 70% of needed value (if the temperature would be only 10 degrees, the bars would be prestressed up to 100%). The 2nd step was prestressing of the long bars. These bars were prestressed by mounting depressing strings (in the right calculated value of the depression). After unblocking of the strings, long bars were prestressed on the right value. The 3rd step was prestress short bars to 100% of needed value by technotensioner Macalloy.
- Geometry and internal forces were calculated by the Nexis system for the erection correction during the whole mounting and prestressing process. Erection of this very important structure (weight 950 t) was done from the 15th of March to the 20th of August.