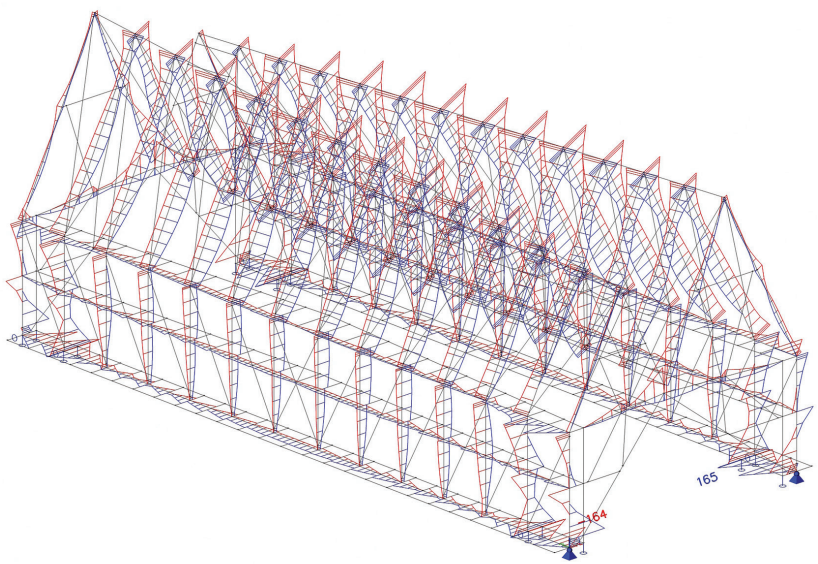
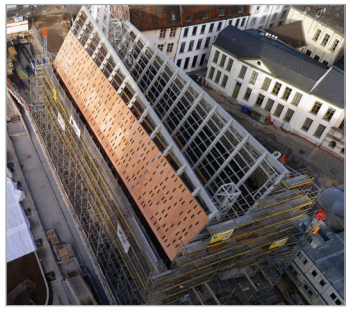
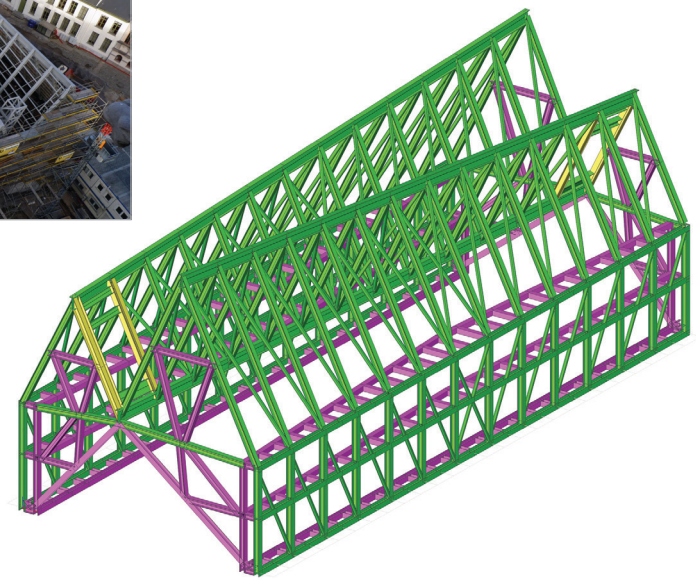
City Hall “Kobra” - Gent, Belgium







Software: Scia Engineer

Introduction

In the redesign of the central squares “Korenmarkt” and “Emile Braunplein” and nearby streets in Ghent, a City Hall had to be designed. The hall is the central, eye-catching feature of the masterplan.A steel structure of about 40 m x 15 m, the hall is set on top of four concrete pylons at the corners. The façade and roof are covered with wood both externally and internally. The roofs and the long façades have been given an extra cover of glass panels above the wood.
The roof consists of two ridges and a gutter in the middle, but it is slightly diagonal, so the façades at the front and the back have two asymmetrical tops. This asymmetry refers to the façade of the City Hall and has a proportion that is close to the golden ratio of Da Vinci. Since both of the façades are identical (not mirrored but rotated), the building has achieved a symmetrical shape which feels very asymmetrical. This accentuates the strictness.
Through the wooden surface, small rectangular windows give out, making for a very strong effect especially on the inside.

Assignment

Our mission was to calculate the steel structure and design it through to execution. The mission was later enlarged to include the calculation of the wood, the inox glass supports and the glass panels.

When calculating the steel structure, the “fun” lay in the fact that the asymmetrical structure generated certain forces that had to be controlled to maintain the straight line of the long façades.
The ridge-beams and the gutter-beam were a help, but the frame-working of profiles over the two ridges and the scupper were essential in the stability of the structure. The frames are supported by frames in the long façades containing adjustable cables. The side forces on the façades were taken by the horizontal Vierendeel-frames. The front façades were designed as a close web of profiles, as a solid structure.Given that the façades are open, there were a lot of cases of wind in which each had an influence on another part of the structure.

On the steel structure, on top of steel purlins, wooden girders were assembled. A multiplex with cutouts for the 1,550 little square windows was placed on these wooden girders. On the multiplex, on top of a waterproof layer, twills in tropical hardwood (afrormosia) were fixed with afrormosia planks in between, to create a smooth wooden surface. The calculation of the wood and the connections was another engineering challenge.
On the afrormosia twills, inox supports were fixed. These support the glass panels. In the interior of the hall, oak planks were assembled on wooden girders.
One challenge was to create the bottom of the gutter like a straight sharp knife. Another was to design the fixations in a way that achieved fire-resistance.
For all the individual parts - the steel structure, multiplex, afrormosia, oak, inox supports, and the glass panels and square windows - we made the stability calculations, while we also made the production drawings. By working this way, we were able to adjust each component to each other.
The fire-resistance of the structure was another important consideration.

Application of Scia Engineer

A structure like this can only be calculated by a complete 3D-model. In this way the total influence of all external loads can be considered and the global stability can be calculated, with the accompanying deformations, as also the details of connections.
Because of the very specific and strict architectural design the freedom in stability-design was very limited and one of the main challenges was to make the structure possible to assemble.

The module in Scia Engineer was also very useful to determine which profiles has to be treated with fire-resistant paint.

Stabilogics

Contact Eddy Hermans
Address Stationsstraat 162
3150 Haacht, Belgium
Phone +32 16 60.99.92
Email eddy@stabilogics.be
Website www.stabilogics.eu

Stabilogics is an engineering bureau with great experience in stability-calculations.
Since its foundation in 2000 we are growing and are now a team of 13 people. This makes us very flexible and able to anticipate very fast what the best solution for requested projects is. With this team of experts we are also able to design and calculate very big projects. We have experience all over the world and are able to produce designs in accordance with most standards and codes: Eurocode, with all European national annexes, British standards and others. We have always put the execution of the building as the top priority. We work from design to execution, producing workshop-drawings of steel- and concrete-structures. To avoid problems on the building-site we ensure that the structure can be assembled and erected as we have designed. The strict preparation and further processing along with the great eye for details lead to efficient and smooth execution on site.
With the help of Scia Engineer (all modules), complemented with self-written calculation-programs, our calculations are supported with accuracy and speed.

Project information

Owner	Stad Gent
Architect	Robbrecht & Daem / Van Hee
General Contractor	Besix
Engineering Office	Stabilogics
Location	Gent, Belgium
Construction Period	12/2010 to 09/2012

Short description | **City Hall “Kobra”**

The project fits the masterplan for the redesign of the central squares in the city centre of Ghent.
The building is the eye-catching centrepiece of the project. It will be used for several events organised by the City of Ghent. Under the building, there is commercial space occupied by businesses such as cafés and restaurants.
The design is strongly symmetrical with two ridges and asymmetrical front-façades.
The hall is formed with a steel structure on concrete pylons and is covered with wood and glass.
Stabilogics conducted the calculation for the complete structure through to execution. This included the processing of the drawings for the production of steel, wood, inox and glass.