Maastower - Rotterdam, The Netherlands

Software: Scia Engineer

With the height of 165 m, the Maastower in Rotterdam, the Netherlands, is currently the tallest building in Benelux. The roof level is at +157.65 m.
The Maastower is situated IN the Maas river. A part of the river has been specially dammed up to make room for the tower.
The Maastower has two underground parking layers. On the ground floor and first floor levels there are the main entrance, the entrances to the parking garages, the distribution area, a grand café, meeting facilities and a restaurant. An access ramp runs through the restaurant and the main entrance hall to provide access to the 10-level parking garage for public use above first floor level.
The office area starts from level 12, and level 12 itself has an archive area and fitness area. The entire floor area of the Maastower is approximately 65,000 m².

Stability is provided by a facade tube, which is formed by the bearing prefab facade elements. This facade tube collaborates with the in situ core, which houses 4 elevators for low-rise (up to the 30th floor) and 3 elevators for high-rise (30th up to 44th floor).

The high foundation pressure compresses the compressible soil layers between NAP -35 m and NAP 50 m, which causes a dish-like settlement of approx. 140 mm underneath the building. The interaction between the structure of the building and deformation of the subsoil has been analysed and predicted meticulously.

It is important to investigate the dynamic behaviour for high-rise projects. The Maastower easily meets the demands as set in NEN6720. It is not sufficient, however, to just meet NEN6720. Zonneveld ingenieurs also analysed the twist vibrations and superposed these on the translation vibrations.
Subsequently, the predictions for the vibration comfort were calculated with the Eurocode and ISO4352.
Both methods of calculating showed that the dynamic behaviour is well within the set limits.
The predicted accelerations do not exceed 0.15 m/s2, which is sufficient for an office building.

Wind played an important role in the design of the canopy above the main entrance at the front of the building. An Scia Engineer model of the canopy was made in close cooperation with the architect. The final design of the canopy in steel and glass was also largely based on this Scia Engineer model.

The facade elements have been assembled in half-brick bond. This caused less complex connections and offers great advantages in the structural binding.
An alternative load path for a potential calamity could therefore fairly easily be shown.
The facade also transfers a large part of the vertical load. Combined with wind load and settlement of the subsoil, this leads to large internal pressure in the lowest building layers.
The thickness of the walls has been based on this internal pressure.

Use of Scia Engineer

The entire main bearing structure has been designed with the finite element program Scia Engineer.
The concrete walls and floors have been entered as 2D elements. The concrete beams and the steel structure have been designed with 1D bar elements. The foundation piles have been entered as springs.
With the calculation model, the entire force distribution of the main bearing structure has been analysed and the forces have been determined for the following engineering process. The reinforcement of the prefabricated elements was checked with the results of the Scia Engineer model.
The 3D model was also the basis of the calculations for the construction phase of the project. The 3D Scia Engineer model also analysed and calculated the influence of the settlement in the deeper soil layers (“laag van Kedichem”) on the forces in the main bearing structure.
For the canopy in steel and glass, a separate Scia Engineer model was made to analyse the influence of wind and accordingly adjust the final design/shape of the canopy.

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Zonneveld ingenieurs b.v. was founded in 1981 as an office specialised in structural engineering. Over the past thirty years, the company has gained a lot of experience in a wide variety of projects. The management consists of five very experienced consulting engineers. All (approx. 30) employees are highly qualified and have extensive experience.
Nowadays, Zonneveld ingenieurs is a specialist in high-rise and inner-city redevelopment.
Zonneveld ingenieurs is a precursor in the field of sustainability and when it comes to using BIM.
A few of the most significant reference projects are:

- Ministries of Justice and the Interior, The Hague
- City Hall, Utrecht
- PGGM Bulding, Zeist
- Music Palace, Utrecht
- City Hall, Nieuwegein

Project information

Owner	Skandinaviska Enskilda Banken (SEB)
Architect	Odile Decq Benoit Cornette, Paris - France with Dam & Partners Architecten, Amsterdam - The Netherlands
General Contractor	Besix Nederland Branch, Barendrecht - The Netherlands
Engineering Office	Zonneveld ingenieurs bv, Rotterdam - The Netherlands
Location	Rotterdam, The Netherlands
Construction Period	04/2007 to 12/2009

Short description | **Maastower**

The Maastower (165 m) is currently the tallest building in the Netherlands. Part of the Maas river was ‘reclaimed’ to make room for the Maastower. One of the issues the construction had to deal with was settlement of the subsoil. The 3D Scia Engineer model was used to analyse and calculate the influence of the settlement in the deeper soil layers (“laag van Kedichem”) on the forces in the main bearing structure.
Another special feature is the canopy over the main entrance. The Scia Engineer model helped shape and design the canopy.
Stability is provided by a facade tube, which is formed by the bearing prefab facade elements. This facade tube collaborates with the in situ core. The facade elements have been assembled in half-brick bond. This caused less complex connections and offers great advantages in the structural binding.