

Grontmij

Contact Michael Provost, Koen Meert
Address Meersstraat 138A
9000 Gent, Belgium
Phone +32 9 241 59 20
Email gent@grontmij.be
Website www.grontmij.be

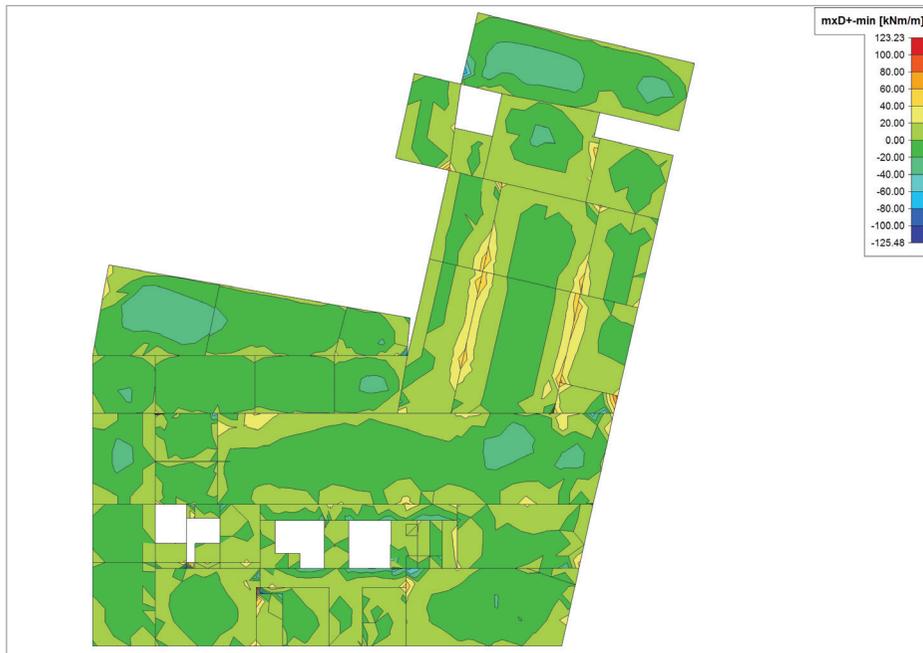


Grontmij is a multidisciplinary consulting and engineering firm for sustainable planning & design, transportation & mobility and water, energy & industry.

From a future-oriented vision, we provide quality advice and we design creative plans and projects. That way, we contribute to a better housing, working and living environment. It's our ambition to be the best sustainable consulting and engineering firm and to add value, from A to Z, to advice, study, design, engineering, execution and management of projects.

As a publicly listed company, we are active in 350 offices with some 11.000 experts in 50 countries, and we are leaders in Europe.

Grontmij operates within three business lines, namely: Water & Energy, Transportation & Mobility and Planning & Design. These reflect the long term external market drivers such as climate change, population growth and urbanisation across the world.



Software: ESA-Prima Win, Scia Engineer

Residential London Tower - Antwerp, Belgium

Project description

The project London Tower is the final project of the Amca site in Antwerp at the crossroads of the Italiëlei, Noorderlaan and London Straat. It is the largest residential tower of Antwerp with an aboveground height of 76 m (22 levels) and an underground depth of 10 m (3 levels). At the tower there is also an extension building with a height of two storeys.

Challenges

The tower needed to be built in a short period of time. Therefore some execution methods were proposed and developed. The most important was to use a sliding formwork for the central core of the building. This way of construction made it afterwards possible to execute the structural work of one floor (interior and exterior walls and floor slabs) in one week with only one freestanding tower crane with a height of ca. 85 m.

The stability of the building is ensured by the cooperation of the core with the concrete prefabricated walls that are separating the apartments and the outside walls. They are all connected by cast in place floor slabs.

Geometry of the tower

The maximum floor area is approximately 37.5 m by 18.5 m. From the tenth floor there is also a cantilever of 2.4 m. The typical floors consist of slabs with thicknesses ranging from 18 to 27 centimeters. The largest plates spans in two directions with a distance of approximately 13 m by 7.2 m.

The structural support system consists of a central core, a supporting façade wall as well as elements and concrete walls that are separating the apartments. The core is a long narrow section of 15.8 m by 3.8 m.

Foundations

Because of its location (close to the Scheldt River), the tower is subjected to upward water pressure of 7 to 8 m.

The entire tower is partly founded on 130 piles of 160 tons (length +/- 12 m) and on slurry walls at the perimeter of the underground levels.

To prevent damage to the adjacent buildings, the slurry walls were partly executed up to the layers of the Boom clay (27 m beneath the ground level) and a special drainage system was installed.

The upward pressure of the groundwater was taken by tension piles in the areas next to the tower.

The foundation plate has a thickness of 60 cm between the piles. The pile heads themselves and the thickened area below the core is 1.40 m thick.

3D modelling

Grontmij developed two different 3D models of the tower to consider the differences during assembly state and in final state.

Model A, is a model for the tower in the final state where the stiffness is ensured by the cooperation between core, floor slabs and the concrete walls.

Model B is a model in which the core is raised with a sliding formwork up till the roof. For this calculation, the entire tower was stripped and we checked which wall thickness and reinforcement needed to be adjusted in comparison to the final state. The resistance to wind needed to be ensured by the rigidity of the core itself. In addition, extra shoring were added between some walls because the walls were not yet connected by slabs during this construction stage.

The difference in compression between the core and columns (because of different geometry and concrete quality) and the creep were calculated to take them into consideration during the construction phase.

For the calculation of the reinforcement and deformation of the floor slabs, individual models of each floor slab were made and were compared to the results obtained from the 3D model.

Conclusion

Several tools from ESA-Prima Win were used for this model to easily control the results and use them for individual reinforcement calculations.

Residential London Tower

Antwerp, Belgium

Project information

Owner	AMCA
Architect	Christine Conix - S/VR (Storme/Van Ranst)
General Contractor	Interbuild - Vanhout - ABEB - CFE
Engineering Office	Grontmij Vlaanderen
Construction Period	From April 2008 to July 2010
Location	Antwerp, Belgium



Short project description

The London Tower is the largest residential tower of Antwerp with an aboveground height of 76 m (22 storeys), an underground depth of 10 m (3 levels) and a surface of 37.5 m by 18.5 m. The structural support system consists of a central slided concrete core, prefabricated outside walls, flat dividing prefabricated concrete walls and cast in-situ concrete slabs. The construction time was minimized by the use of a sliding formwork for the central concrete core. The building was entirely calculated with ESA-Prima Win using a general model for the final stage and a stripped model for the construction stage of the core.

