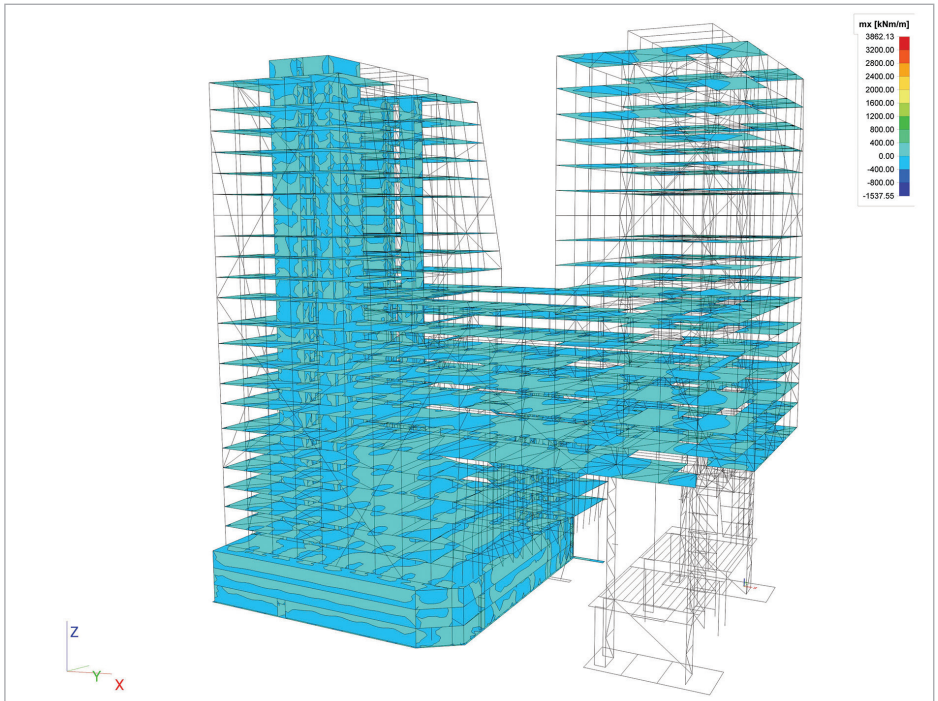
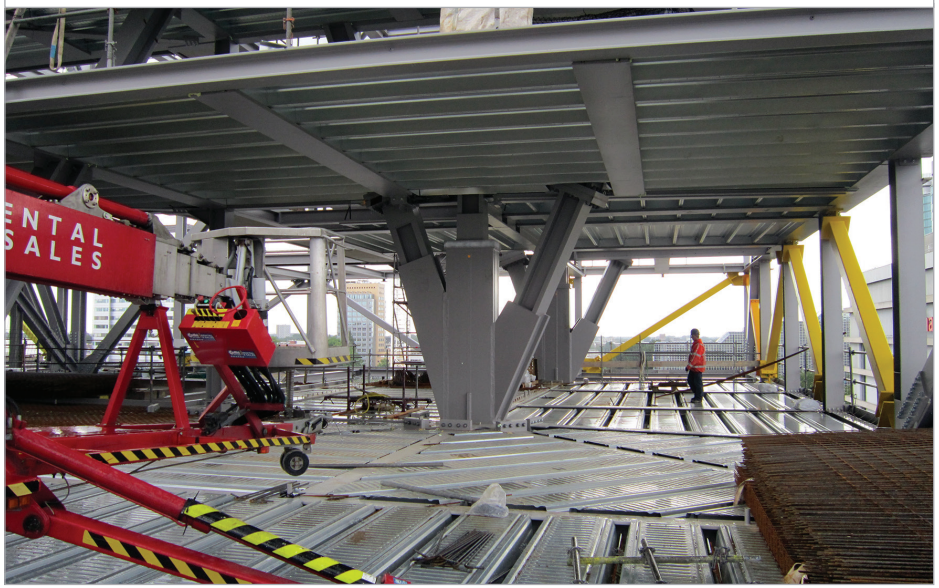
City Hall - Utrecht, The Netherlands





Software: Scia Engineer

The new City Hall in Utrecht, the Netherlands, is currently under construction immediately next to and partly above the new Central Station terminal in Utrecht. Since Utrecht Central Station is the busiest train station in the Netherlands, it is a unique and complex location. The south tower of the building is situated directly above the new public transportation terminal, which is also currently under construction. It is supported by 5 main columns, which run through the bus terminal area on ground level and run through the Central Station on raised ground level.
The northern part of the building starts on ground level but the main entrance is situated on raised ground level. The north tower has a large void over 6 storeys, which borders a large curved glass facade on the south side. This curved facade is connected to the floors with a lattice girder, spanning approx. 26 m. Vertically, the entrance façade is fully suspended from the walkway construction on level 6/7.
The offices start from the 1st floor upwards. Throughout the building there are a large number of voids and inner areas. A parking basement of 3 levels will be situated underneath the north tower.

The main bearing structure consists of 3 concrete cores, a steel structure and structural exterior walls (steel structure). Above ground level, there are no dilatations and the superstructure is a single whole 'unit'. Therefore, the entire construction provides the stability for the building.
The core walls and basement walls will be poured in situ. From the ground floor upwards, the exterior walls will be built as a steel construction. These exterior walls consist of columns, girders and diagonals. Together, these elements provide stability in the exterior walls.

The floors consist of hollow core plates, of which most have a reinforced compression slab. This slab works as a diaphragm, which divides the horizontal forces within the floor between the different stability elements (concrete cores and steel structure). The reinforcement in the compression slab is therefore oriented in 2 directions. Through the use of starters connected to the steel (girders) and the openings in the hollow core plates and the reinforcement, a structural connection is created between the steel structure and the floors.
In the places where the compression slab does not have sufficient capacity, openings for dowels will be made in the hollow core slab.
In the places where it is not possible to make a compression slab (locally), steel tie elements will be used to obtain sufficient structural cohesion.
The diagonals and lattice girders which transfer the loads are characteristic of the building's architecture. The detailing of the nodes (column-girder-diagonal) must be done within the framework as drawn by the architect.
The foundation floor is 300 mm thick and has been poured in situ. Underneath the columns of the north tower, the footings are 1,500 mm. There are also footings at the location of the 5 main columns of the south tower, with an average thickness of 2,500 mm.
The piles for the foundation are round Fundex grout injection piles with the dimensions of 520/670 mm and round Tubex grout injection piles with the dimensions of 762/950 mm. The level of the base of the piles varies between 26 m –NAP and 31 m –NAP.

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 3D model was also the basis of the calculations for the construction phase of the project.
The entrance facade was designed with a 3D Scia Engineer calculation model. This model helped analyse how this facade would behave with different load cases compared to the main bearing structure and how detailing should be adapted accordingly.

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zonneveld ingenieurs®

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	Municipality of Utrecht
Architect	Kraaijvanger bv, Rotterdam, Netherlands
General Contractor	Boele & Van Eesteren, Rijswijk, The Netherlands
Engineering Office	Zonneveld ingenieurs bv, Rotterdam, The Netherlands
Location	Utrecht, The Netherlands
Construction Period	09/2010 to 2014

Short description | City Hall

The new City Hall in Utrecht is currently under construction immediately next to and partly above the new Central Station terminal in Utrecht, the Netherlands.
The south tower of the building is supported by 5 main columns, which run through the bus terminal area on ground level and through the Central Station on raised ground level.
The north tower has a large void over 6 storeys' high, which borders a large curved glass facade on the south side.
The entire main bearing structure has been designed with the finite element program Scia Engineer. The Engineer model has been used to analyse the entire force distribution of the main bearing structure and determine the forces for the following engineering process. It was also the basis of the calculations for the construction phase of the project. The entrance facade was designed with a 3D Scia Engineer calculation model, to analyse its behaviour and adapt details accordingly.