

IMd

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Organisation

IMd Raadgevende Ingenieurs is an organisation with a great core of highly qualified employees, who have been applying their experience, know-how and expertise for many years with regard to advising about, designing and working out main structures for buildings. At present the firm consists of 40 highly educated employees. IMd is completely independent and does not have any business links with manufacturers, suppliers, contractors, developers and other interested parties who could influence our impartial and independent consultancy.

IMd is a member of the Dutch association of consulting engineers (ONRI) and possesses the "quality management system" certificate according to NEN-AND-ISO 9001.

It is a firm where the internal communication proceeds smoothly and all employees are kept informed about the most recent developments.

In the almost 50 years that our firm has existed the quality of our service has always been a key issue. The most important characteristics of this service for us are:

- A good product that fits the budget of the client
- A product that fits the concept of the architect
- Creativity and ingenuity
- A flexible and service-oriented attitude

Projects

They vary greatly: from prestigious office complexes to pedestrian bridges, from houses to complex shopping centres, from alterations to new-housing and from simple and small to complex and large. Each project has its own charm and is a

constructive challenge. The projects are carried out at the request of property developers, government organisations, foundations, architects, contractors and private parties. This diversity in clients is made possible because of the independence of the firm of consulting engineers.

View IMd Raadgevende Ingenieurs

The view of IMd is that the success of a project largely depends on the first stage of the design process. The cooperation between architect, client, mechanical engineer and structural engineer is decisive in order to have a fine design in complex projects. In the preliminary design various alternatives are presented for the structure of a building. The advantages and disadvantages of every constructive alternative will then be discussed in the design team. Wishes of the client and architect, requirements in the field of building physics, possibilities regarding the technical installations: they all affect the choice of an optimal structural design.

In addition to the constructive design, IMd regards its role as a coordinating engineer as very important. In its existence IMd has built up a perfect reputation. In addition to the inspection of the basic principles of the drawings and calculations of suppliers of prefabricated concrete and steel constructions, the content of these elements is also assessed with great care. We ask the client to make it possible for us to carry out the consultancy work in a constructive way. In the end this will create the best result for the client.

Short Description

Building complex 'De Kop van Boulevard Zuid'

The project regards a complex and daring construction including a commercial area and two apartment buildings on top of it in the Feijenoord area of Rotterdam. The striking feature of the building complex is the 15 meter-measuring cantilevered façade, which reaches a height of approximately 50 meters. The complex' computational analysis of the façade, which has been outfitted with a large number of window openings, was carried out using 3D ESA-Prima Win. During the design process, extensive analyses were performed, in order to form a realistic estimate of the building's horizontal deformation. Aspects such as the subsidence of the Kedichem clay layer in the subsoil were also included.

Project Information

Owner: Celastian International, De Bilt
Architect: De Zwarte Hond, Rotterdam
General Contractor: Sprangers Bouwbedrijf, Breda
Engineering Office: IMd Raadgevende Ingenieurs B.V.

Construction Start: 01/01/2008
Construction End: 30/09/2009
Location: Rotterdam, Netherlands



Introduction

The Rotterdam Feijenoord area is the scene of action of the 'Kop van Boulevard Zuid' project. This project consists of a Media Markt store, with two apartment buildings - consisting of 6 and 13 storeys respectively - on top of it. The highest tower reaches approximately 50 meters, and is therefore, in terms of design, the most interesting. The 15 meter-measuring cantilever design is nothing short of spectacular. The position of the large number of window openings proved to be a complicating factor in the design of the cantilevered façade's supporting structure. In order to gain insight into the construction's adhesion, both a 2D- and 3D model were used for the entire tower, using ESA-Prima Win computational software.

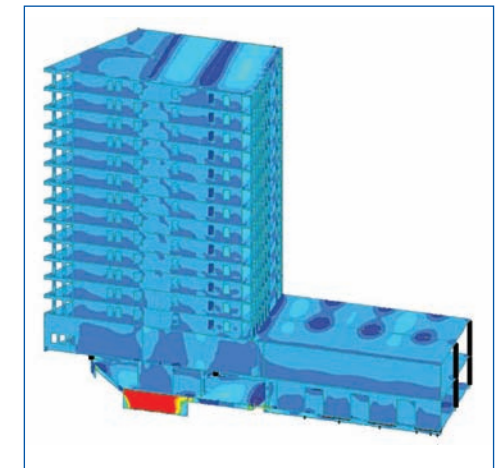
The project was designed by the architectural firm 'De Zwarte Hond', and is executed by the Sprangers building company. The complex consists of 61 apartments, 15 town houses, and a Media Markt store of 5.000 m².

Design

During the design process, the architect decided - after consulting IMd - to alter the initially rather common building construction, creating a complex and daring construction instead. At the store entrance, the corner column was removed, which gave a more open feel to the place. Aesthetically, the building improved spectacularly, by the creation of a

15-metre cantilever above the entrance. Furthermore, the number of wall slabs and columns was kept to a minimum in the store areas, which lead to a significant increase of space. The roof and the store's walls are used to ensure the stability of the two towers.

As is customary, the cantilever façade design was first processed at large, before turning into detail. Initially, simple manual calculations were carried out to determine the rough measures. Then, 2D computational models of the supporting walls were created, which were subsequently merged in a 3D model of the entire construction. The 3D computational model processed the one-way



Used software: ESA-Prima Win

stretching broad floor slabs as orthotropical slabs, in order to create the most realistic presentation of adhesion. At the cantilevered wall, the adjacent floors function as horizontal draw benches, and are reinforced accordingly.

Development and execution

One of the more complex aspects of the design is the horizontal deformation of the building. As a result of the cantilever, the vertical load presses eccentrically in comparison with the foundation's mass centre, which may cause the building to tilt. This effect is strengthened by the presence of the so-called Kedichem clay layer below the foundation pole-bearing sand package. This layer consists of relatively weak clay, which is prone to deform when experiencing high pressure.

In order to reduce the building's total rotation, the façade corbel is cantilevered on both sides during the preliminary construction phase, and vertically kept apart from the adjacent low-rise buildings. This way, the horizontal displacement is reduced tremendously, and during the preliminary construction phase, the wall will shift downwards in an almost straight line. Results that were measured during the construction showed that this approach indeed has the desired effect.



Building complex 'De Kop van Boulevard Zuid'

