

## HAFENSPITZE HOTEL AND OFFICE BUILDING, DÜSSELDORF



### Hafenspitze Hotel and Office Building Düsseldorf

The new Hafenspitze, designed by SOP Architekten, stands on the point between the commercial harbour basin and harbour basin A in Düsseldorf's Media Harbour. The ensemble of buildings consists of two 65 m high reversed towers standing side-by-side and behind them, a 7-storey office building. The buildings are connected to one another by their two basement floors, which house the car parking, storage areas and plant rooms. A single-storey flat-roofed structure spans the space between the two towers. Inside are restaurants and conference rooms, the accessible roof deck has been turned into a garden. Above the 6<sup>th</sup> storey, the towers project around 16 m outwards, which placed unusual demands on the structural engineering, not least because the architects envisaged the projection with no visible means of support.

The projection was achieved by means of two diagonal struts in the internal axis of each building, in the form of staggered walls on each storey. These are, in turn, borne by two massive buttresses, which transmit the load down into the foundations. Due to the enormous loads here, both the diagonal struts and the buttresses were cast from high performance concrete in strength class C80/95.

In order to conduct the vertical loads from the external axes into the diagonals, the roof loads were carried up to roof level by means of diagonal ties, where they are centred in the middle of the building by approximately 3 m high steel reinforced concrete supports. As these were not available until the skeleton had been completed, the cantilever arm of each building had to be supported during the construction phase. All of the columns in the area of the cantilever arms had to function as compression members during this phase. The definitive structural support was only activated once they had been sunk using hydraulic presses.

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#### Client

Projektgesellschaft Hafenspitze mbH & Co. KG

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#### Location

Düsseldorf, Germany

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#### Architects

SOP Architekten

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#### Technical Details

GFA: 60,000 m<sup>2</sup>

Height: 65 m

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#### Services provided by Schübler-Plan

Structural engineering: HOAI phases 1 to 6

Verification of zone 1 seismic safety

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### **Finite Element Modelling**

In order to determine the load spread on the individual foundation members, comprehensive 3-dimensional FE models of the towers, including the foundations, were worked up. The foundation moduli were determined iteratively in cooperation with the soil specialists. Not only the settlement of each of the pile displacement curves was taken into account, we also considered the mutual influence of the foundations as the result of a settlement calculation. We also used the FE models in later stages of the project, e.g. for the calculations of the foundations, the structural calculations and to determine expected distortion.