



## Building geometry and structural system

- Building period: 2012
- Height dimension: 25 m
- Overall length: 40 m
- Overall width: 47 m

## Design software

The structural analysis was prepared using a 3D model with Scia Engineer software.

## Excavation

The site is situated within a residential area. The excavation was designed with steel shoring embedment due to the bedrock.

## Foundations

The foundations combine 900 mm- and 1,200 mm-diameter bored piles embedded into the bedrock and a foundation slab 350 mm thick. A “white tank” waterproof concrete system designed to resist hydro pressure from ground water is used in the basement.

## Load

The design loads conform to EC and National Annex: Apartments 1.5 kN/m<sup>2</sup>, staircase 3.0 kN/m<sup>2</sup>, commercial area 2.5 kN/m<sup>2</sup>, parking 2.5 kN/m<sup>2</sup>

## Structure and design process

Assessing the real behaviour of a load bearing structure, including its response to variable soil properties, requires several successive calculations with different modifications of input data. It is not convenient to create the structural model in one step including the different properties of the load bearing structure, subsoil, materials and methods of founding. However, such a solution is possible by using the Additional Module “Soilin” with an analysis of the upper structure and subsoil.

The basic principle of structural calculation consists of two steps. The structure is primarily supported with fixed supports without the influence of geological conditions. The results of the first step of the structural analysis were only comprised of the reactions in the

supports. The subsequent step determines the stiffness of the point supports (piles) for cases of a pre-defined settlement with the flexible supports. The geological layers according to the geological survey were assigned for the shallow support of the base slab. The actual calculation introduces iteration. Starting iteration is for the default input parameters C1x, C1y, C1z, C2x, C2y. The number of iterations depends on the compensation contact stress under the base slab for the specific properties of soil. It usually requires about 10 iterations and several iteration cycles. The results of the calculation are the internal forces in the base plate that are needed for the design of the reinforcement and the distributed reactions to the piles.

## Structure

The main bearing structure is contained with reinforced concrete columns and walls. The class of concrete is C30/37 XC1. Border walls with a thickness of 200 mm and elevator walls were designed for the rigidity of the buildings. The floor slab was designed with a reinforced concrete slab with a thickness of 280 mm, locally supported by columns.

A significant interior radial concrete column with dimensions of 450 mm x 450 mm was designed for the interior staircase. The storey landing was designed with a cantilever slab.

## Conclusion

Scia Engineer also allowed for the preparation of several structural alternatives. There were more designs in the process of the work according to the client's and the architect's demands and Scia Engineer made it possible to alter the structure very easily. The real deflections of the structure were measured on-site, and the results were very near to the calculated deflections.

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Atelier P.H.A. was founded in 1990.

P.H.A. deals with design tasks, preparation and implementation of investment projects and engineering activities, and is an expert in the field of construction and real estate investments. P.H.A. participates in opinions carried out on structures after the 2002 flood, opinions on the condition and measures taken on load-bearing structures in industrial, high-rise apartment buildings and apartment building regeneration, opinions on the impact of emergency situations - like fires and flooding - on load-bearing structures, and in building passports during reconstruction etc.

PHA can follow up on international projects in accordance with most standard codes: Eurocode, Fema-350, UBC97, СНИП and other specific national codes. Structure designers participate in professional seminars, as well as structural engineering meetings and conferences, and lectures, and their contributions are published in professional newspapers.

## Project information

Owner	Atelier P.H.A. Ltd.
Architect	Ing. arch. Ondřej Gattermayer
General Contractor	P.H.A. Inc.
Engineering Office	Atelier P.H.A. Ltd.
Location	Prague, Czech Republic
Construction Period	05/2012 to 02/2013

## Short description | Residential Building “Na Santince”

The residential building “Na Santince” is a proposed new development of P.H.A., a.s. The building consists of 6 storeys above grade and 3 storeys below grade.

The above grade part of the building includes 25 residential flats and two commercial suites. The access is through an arbour, which emphasises (or delineates, defines) the building’s street facade. The two top storeys are unique due to the indented facade that enables the construction of spacious terraces with a unique view of the historic part of Prague and the residential area Hanspaulka. The parking and technical services are situated in the underground.

