

BG Ingénieurs Conseils

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The BG group...

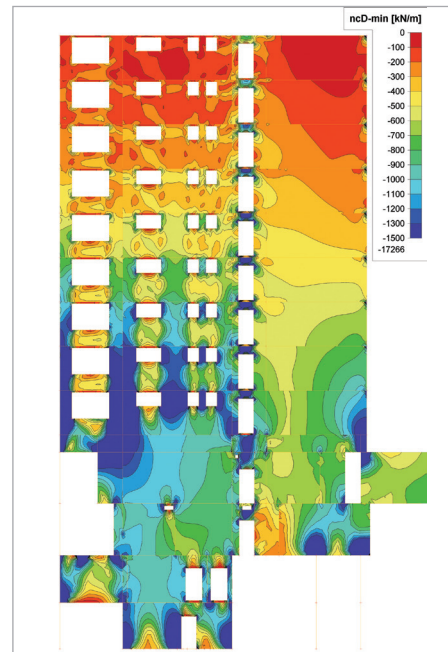
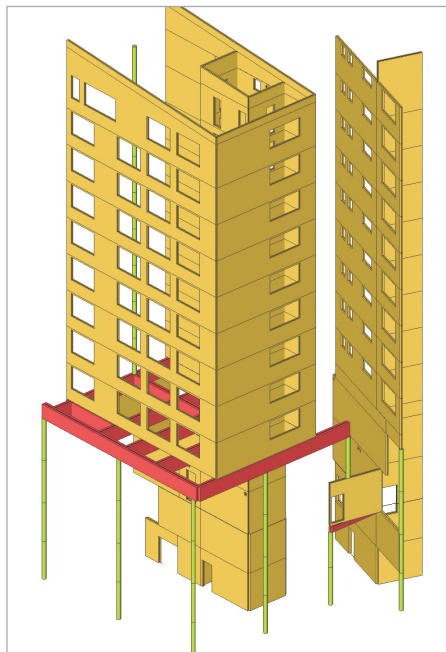
... is a firm of consulting engineers operating on an international level whose objective is to help its clients build a sustainable living environment. United around strong corporate values, BG staff represents a remarkable collective intelligence able to provide simple answers to the complex issues arising from our planet's development.

Services provided

The 500 strong staff provides extensive services in the fields of infrastructure, environment as well as buildings and energy. BG's excellence is

renowned in developing complex and challenging multidisciplinary projects, where its in-house competence in project management, risk assessment and optimum use of resources is a decisive factor.

Operating as a general contractor, BG takes responsibility for all engineering services - from the initial analysis of project requirements through to commissioning - including all aspects of project design and implementation.



Software: Scia Engineer

Villa-les-bains - Montreux, Switzerland

The idea for this high-specification building on the shores of Lake Geneva came about in 2005. Following the granting of planning permission in 2007, the project was left on hold for two years, and ground-works weren't started until March 2009, with the completion of building shell and core expected in early 2011.

Project description

This multi-use building on the lake shore is squeezed into a tight site with an irregular geometry. The lower floors are surrounded by the famous Montreux Casino, a villa dating from 1900, the promenades along the lake shore and a road.

The building is split into a north zone and a south zone, linked by a 2.460 m² private car park. In the north zone the podium is completed by a second level of car park as well as two levels above-ground (commercial and residential) above which rise two nine-storey towers. In the south zone two smaller towers, each of five storeys, rise above the underground car park.

The area for commercial use is 430 m² and the 33 high-specification apartments each have areas of between 160 and 200 m².

Structural concept

Various problems were encountered during the design of this project. The site constraints (complex geometry, surrounding buildings, and basement slab at lake level) required the use of various geotechnical works for both permanent and temporary works, including bored piles, king post walls, ground anchors, underpinning, and mini-piles.

The superstructure design is particularly complicated for the following reasons:

- Slender structural elements (18 - 20 cm wall thicknesses, 23 cm slabs spanning 9 m x 7 m)
- Interaction of elements with varying stiffnesses
- Seismic stability - Montreux is located in the seismic zone 2 (medium risk) according to SIA, the Swiss design codes
- Few vertical elements
- Discontinuity of vertical elements - the load-bearing tower facades, off-set from the podium walls and columns, are supported on a series of 24 down-stand

transfer beams. This transition level allows the load transfer from the tower facades through to a different structural geometry in the podium.

The consequence is a high reinforcement density, demanding the use of self-compacting concrete and a mixture of solutions in reinforced concrete, composite steel-concrete and post-tensioning.

The static model used has been validated by on site measurements of the transfer beam deflections.

The use of Scia Engineer

Building on our experience over many years, the 3D program Scia Engineer was crucial for the design and construction of this project.

In particular, the offset in the vertical structure of the towers and the four levels of the podium in the north zone, as well as the influence of element stiffness, would be impossible to resolve in 2D.

We established several models. The complete model, encompassing the north and south towers, gave a global vision of the project and its complexity.

Separate models were then created to study the north and south buildings independently, aiming to reduce both the size of the model and the processing time.

We studied the behaviour of the buildings under seismic loadings both using the response spectrum method and also the replacement force method. The latter was used for the final calculations.

The walls and slabs comprised shell elements, and we made use of the program's automatic reinforcement design.

Scia Engineer is very useful for structures of this level of complexity, in particular by:

- Easily spotting delicate areas
- Reducing design time
- Keeping a global vision of a complex load take-down
- Helping to calculate bracing requirements.

With a 2D program it would not have been possible to design this project.

Project information

Owner De Rham SA - Nurestra SA
 Architect BPF Architectes et Associés SA and Atelier d'architecture Jaunin SA
 General Contractor Dentan Frères SA
 Engineering Office Consortium BG Ingénieurs Conseils and Daniel Willi SA
 Construction Period From March 2009 to March 2011
 Location Montreux, Switzerland



Short project description

This project concerns a multipurpose, high-specification building, hemmed in by buildings on both sides and the shore of Lake Geneva to the south. It is separated into 2 zones, connected by a private car park, covering 2.460 m². In the north zone, the podium is completed by a 2 second car park level and 2 floors aboveground, on which two 9-storeyed towers are built. In the south zone, the single storey car park is situated below two 5-storeyed towers. The total usable surface area is 12.600 m². The design of this building has overcome the constraints of a difficult site, and also a complex, non-orthogonal geometry with many load transfers.

