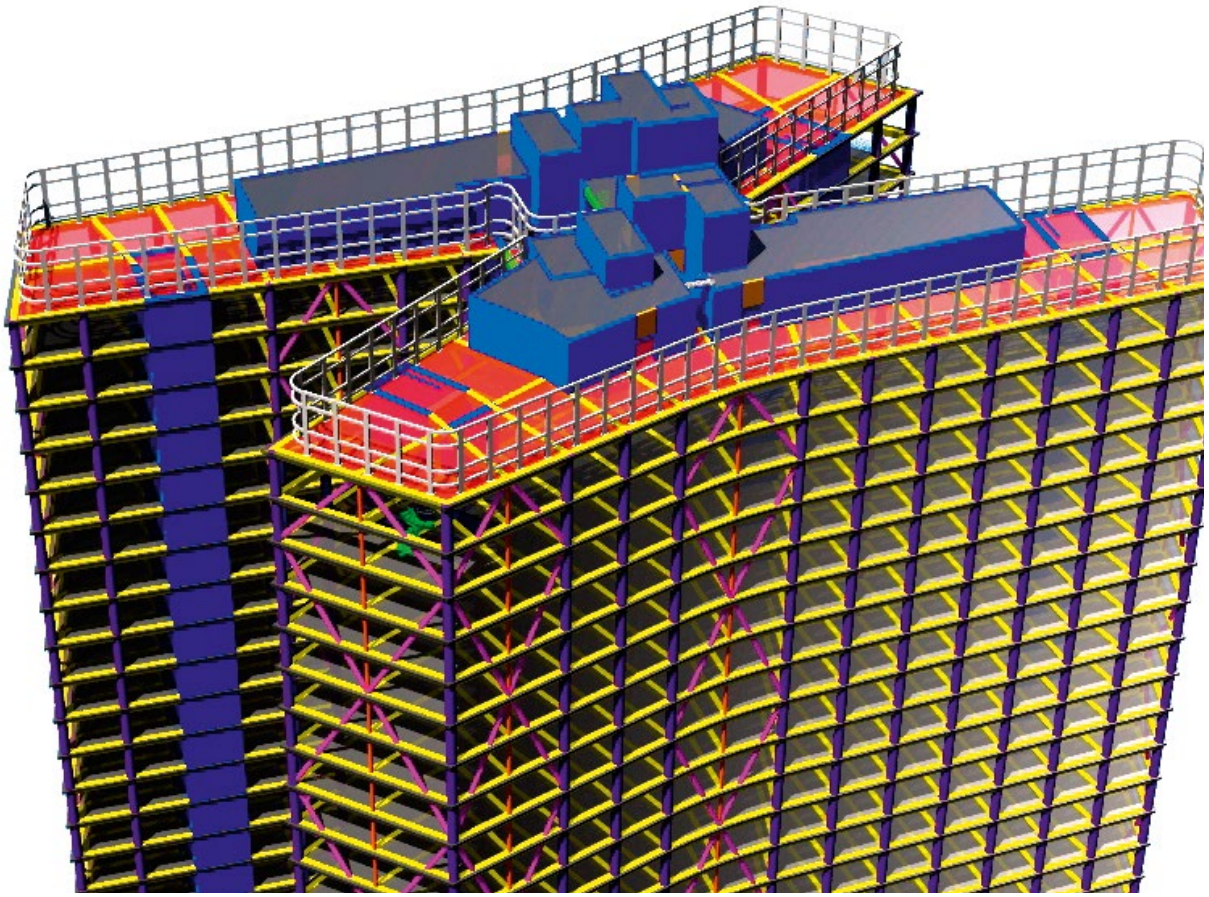


Orchidea Tower, Bucharest, Romania

Allplan in practice

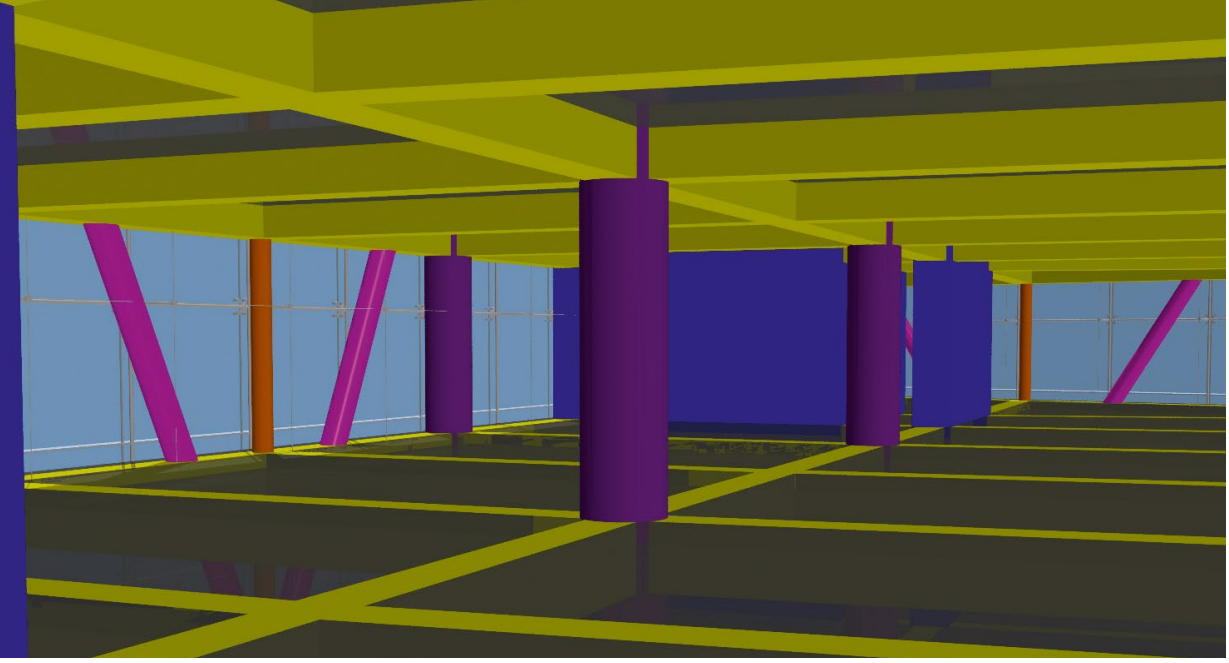
BIM FOR MAXIMUM SECURITY

For engineers to retain an overview in a project the size of Orchidea Tower in Bucharest, with 19 stories above ground and 3 below, working with 3D models is practically a must.

If it is also necessary to make a building like this earthquake-proof, the task is particularly complex. Bucharest engineering office Inginerie Structurala uses the Building Information Modeling working method, as well as the software Allplan Engineering and Scia Engineer.

In Bucharest, a red dot is not a good sign: It indicates buildings that are particularly under threat from earthquakes. If a new building is constructed in Bucharest, planning must not only take account of the usual requirements relating to building form, functionality or costs; resistance to earthquakes is an additional factor that designers need to bear in mind.

Bucharest engineering office Inginerie Structurala is also well equipped to meet this task: with Building Information Modeling (BIM) and the Allplan Engineering and Scia Engineer solutions, the Romanian civil engineering company is able to realize an end-to-end planning process that integrates all aspects, including resistance to earthquakes.



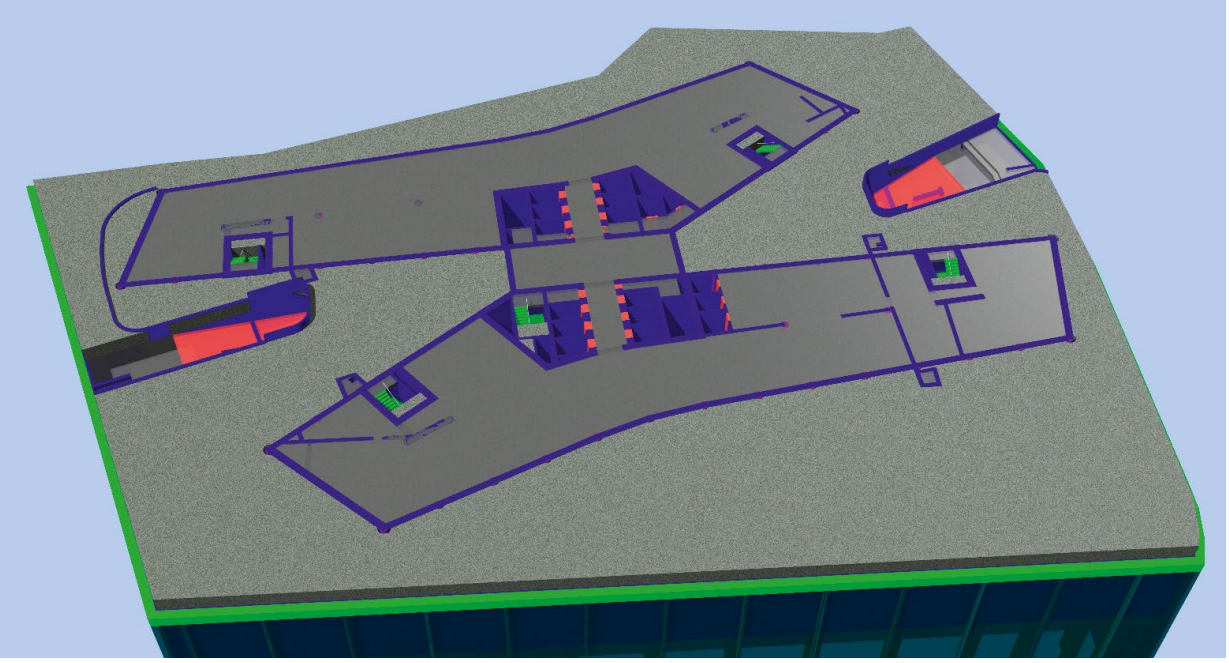
"It is a matter of course for us to use the BIM building model as the basis for all project phases and disciplines. It's simply the most efficient way of working," explains office owner Diana Zagaican.

Inginerie Structurala was founded 11 years ago and boasts an impressive repertoire: from single-family homes, office buildings and churches through to typical engineering structures such as tunnels or bridges. In these projects, the office, with its staff of 15, either designed the buildings, provided consulting services (including geotechnical aspects) or was involved as a surveyor. For project planning, the engineers have been using Nemetschek software for the past five years. A choice that Diana Zagaican and her employees are more than satisfied with: "With its solutions, Nemetschek offers the best integration across all project phases and all aspects of planning and design. Allplan's accuracy, flexibility and excellent user friendliness hugely facilitates project processing."

POSSIBILITIES FULLY EXPLOITED

The designers make full use of the possibilities of end-to-end, BIM-oriented planning: the building model in Allplan serves as a data pool from which the required project data is generated automatically at any time and for any discipline. All aspects of a building relating to design, function, structure and technology are also simulated for the model and harmonized. "With BIM, the building client ultimately receives a building of particularly high quality, because at all times the best decision is made for every aspect," says Diana Zagaican, summarizing the advantages. The civil engineers have also used this type of integrated project planning in Orchidea Tower, a high-rise building with a floor plan in the shape of a butterfly, which will be built in Bucharest on the bank of the Dambovita river. In this project Inginerie Structurala was responsible for structural design, structural calculation and seismic calculations.

These are all particularly demanding tasks given the size of the building, with an effective area of 77,000 square meters over 3 levels below ground and 19 above. Planning was made more problematic by the difficult structural conditions: on the one hand because of the poor quality of the ground close to the river, but above all because of the risk of earthquakes, which had to be taken into consideration in the calculations. The engineers took account of the unfavorable ground conditions by designing the entire subterranean area of the building as a stiff box. The floor slab also rests on 216 foundation piles each measuring 150 centimeters in diameter, which are planted around 18 meters deep into the earth. An 80-centimeter thick wall made of waterimpermeable concrete, surrounding the entire subterranean part of the building, ensures the underground levels are dry. The over-ground building is a combination of steel and reinforced concrete elements: all piles are concrete-filled steel pipes, while all girders are made of reinforced concrete. The building is reinforced by steel pipe crosses each over six floors.



SIMPLE WORKING IN 3D

From the very beginning, this complex structure was modeled by Inginerie Structurala with Allplan in 3D, using special templates from Scia Engineer designed for steel and concrete construction. No problems were encountered in 3D design: "Allplan enables highly intuitive work in 3D. Not just because of the ease of use, but also because the model appears on the screen in several view windows. As a result, you always have an overview," says Diana Zagaican. This was particularly important given the size of the Orchidea Tower project: "Where conventional project processing uses lines, circles and dots, 3D modeling of structures and reinforcement in Allplan provides a much better understanding of the building, and reveals design errors very early on." At the same time, all the required documents are available quickly: plan layouts, views, sections and details of the structure, reinforcement and formwork, as well as visualizations and presentation documents, were generated directly from the building model and were consistent and up-to-date.

ROUND-TRIP ENGINEERING

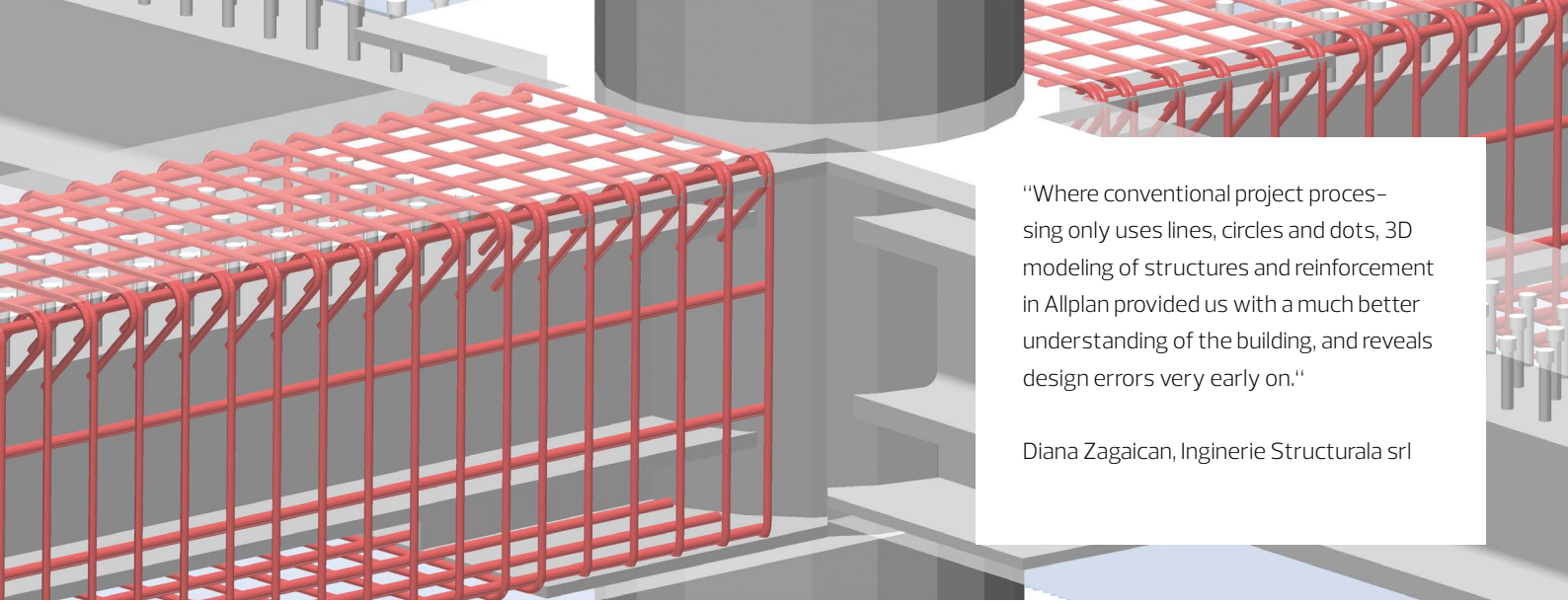
The data from the building model was also used across all phases – from the draft, shell and reinforcement design and structural calculation through to the seismic calculations. The building model acted as a virtual prototype that all designers could assess, analyze and modify according to their own requirements. Renewed manual input of data was not necessary, eliminating the risk of data being copied incorrectly. In line with the concept of "Round-Trip Engineering" the civil engineers also achieved seamless, bidirectional interaction between CAD planning and structural analysis. Component objects and their intelligence were transferred from Allplan to the calculation system Scia Engineer, optimized in a number of stages and then transferred back to Allplan. The structural analysis system was linked to the corresponding component objects in Allplan, thereby guaranteeing the consistency of data on both sides.

PROJECT INFORMATION AT A GLANCE

- **Focus:** Building Information Modeling – Structural/Civil Engineering
- **Software used:** Allplan Engineering, Scia Engineer

PROJECT DATA

- **Client:** EUROPOLIS ORHIDEEA BC
- **Architects:** BEHF Ebner Hasenauer Ferenczy ZT – Austria
- **Civil engineers:** INGINERIE STRUCTURALA SRL
- **Construction company:** MIMO Group
- **Construction start:** Not yet defined
- **Floors:** 19 above ground, 3 below ground
- **Height:** more than 80 meters
- **Effective area:** 77,000 m^2



"Where conventional project processing only uses lines, circles and dots, 3D modeling of structures and reinforcement in Allplan provided us with a much better understanding of the building, and reveals design errors very early on."

Diana Zagaican, Inginerie Structurala srl

SAFE EVEN IN AN EARTHQUAKE

The dynamic and structural calculations were carried out with Scia Engineer, with the focus not only on calculating the limits for load capacity and fitness for use, but also on determining the behavior of the structure in an earthquake. "During an earthquake, there is strong interaction between the ground and structure, in which the building starts to oscillate depending on the structure of the ground, type of support system, ductility and resistance of the installed materials," explains Diana Zagaican. Structural designers simulated this behavior in the model, looking at the building as a whole, that is with the floors both below and above ground.

The building calculations were carried out taking account of seismic effects and the interaction between ground and structure using an finite element (FE) calculation based on the Winkler method. The structural designers calculated several earthquake loads each with different behavior between ground and structure, on the basis of which Inginerie Structurala then proposed various building designs. The building client selected the option with the best cost-effectiveness. Thanks to integrated project processing with Allplan, everyone was satisfied: The building client received a building that met the requirements, planners were able to work particularly effectively, and users will be safe: Their building will never attract a red dot.

ABOUT ALLPLAN

ALLPLAN is a global provider of BIM design software for the AEC industry. True to our "Design to Build" claim, we cover the entire process from the first concept to final detailed design for the construction site and for prefabrication. Allplan users create deliverables of the highest quality and level of detail thanks to lean workflows. ALLPLAN offers powerful integrated cloud technology to support interdisciplinary collaboration on building and civil engineering projects. Around the world over 500 dedicated employees continue to write the ALLPLAN success story. Headquartered in Munich, Germany, ALLPLAN is part of the Nemetschek Group which is a pioneer for digital transformation in the construction sector.

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