Water Tower Budapest, Hungary

Balázs Schneider and Zsolt Rákosi

Perfect Asymmetry

Without doubt, one of the most vivid examples of a complex structure planned in 3D is the new water tower in Budapest. This building, with its unconventional appearance, is not just an important element in the Hungarian capital's water supply system; it is also a landmark for the utility company and for the Budapest district in which it is located.

The new water tower in Budapest is located in the southern part of the Hungarian capital. The district of Budafok, is characterized by constant building activity: more and more people are moving here and new real estate development projects are being launched in many places. However, as the population increased, the residents' water supply became a serious problem. As this part of the town lies on high ground, a decision was made to build a new water tower with a capacity of 3000 m³. It guarantees a smooth water supply service for the inhabitants of Budafok and its vicinity. The Budafok plateau is also a nature reserve, a fact that had to be taken into consideration when the structure was planned and built.

Graceful structure becomes a symbol

The Fővárosi Vízművek (The Water Works of Budapest) launched its project in 2002 with a nation-wide tendering process. Narthex Kft., led by chief architects Tamás Perényi and József Kolossa, won the tender. The jury described the office's work as a graceful structure, which – despite its size and industrial function – looks airy and unique and will become the new symbol of the water supply company.

Its unusual appearance is due to the asymmetrical construction. While the trunk of the tower has a traditional, symmetrical structure, the cup (or "head") is held in an eccentric position. For this reason, the tower has four pronounced cantilevers, which look like two symbolic hands holding a classically shaped, perfectly proportioned cup, a construction that integrates ideally into the landscape.

Facts and figures

Construction work began in the second half of 2003 and was completed at the end of 2007 by the 31.ÁÉCS Kft. construction company. The structure contains 3500 m³ of concrete along with 700 tons of reinforcing steel. The foundation is a cylindrical reinforced concrete body with a diameter of 19 meters. The trunk has a horseshoe-shaped ground plan and a maximum diameter of nine meters and is 24 meters high. The total height of the water tower is 42 meters.

The overall cost of the construction was about 5.6 million euros. This is no higher than the average cost of similar buildings around the word, but is more than had been initially calculated. One reason was the interruption to construction work lasting several months after completion of the trunk, while the scaffolding had to remain in place.

Experts founds

Mélyépterv Consulting Engineering Kft., under the leadership of József Thoma and László Mérei, was commissioned with the extremely demanding task of static planning. Thoma, who died in 2008, was one of the world's leading authorities in the field of water tower planning. He was involved in dozens of water tower planning projects in Europe and around the world. He also held patents for several technical solutions in water tower building.

Planning of the steel reinforcement was outsourced to Kokopelli Kft. This company realized that it is not possible to adequately design such a plan with a 2D system. Planning the reinforcement of the trunk and cup did not pose a serious challenge, as these are symmetrical elements of the structure. The difficult part of the job was to join these two elements with the cantilevers. Kokopelli Kft. therefore decided to bring on board two specialists for 3D planning with Allplan software: Zsolt Rákosi and Balázs Schneider. Both of them had already worked as experts and customer consultants for Nemetschek Hungary.

"Our task was to build up a 3D model that met the structural and technical requirements. As background information, we knew that the Water Works of Budapest had sold its hundred-year-old disused water tower of Margit Island, and wanted a new symbol for the company. Some people said it is not merely a building, it is a statue. I think they were right", explains Zsolt Rákosi.

The task of Rákosi and Schneider was to create a 3D model of the section above the trunk. For this, they overhauled the technical construction process. The original plan was to build the cup on the ground as a monolithic structure and later raise it into place. However, based on the results of the 3D model, the decision was made to build prefabricated cup sections and then put them together at altitude. “As the demand grows for unconventional buildings and structures, it is now impossible to prepare adequate plans without 3D modeling. I think that is the lesson we - and all engineers who want to work successfully nowadays - can learn from this project”, says Schneider.

As part of the new model they redesigned the “interface” structures between the trunk and the cup. They not only had to find suitable points in the reinforcement, which was difficult enough given the different diameters of the reinforcing steel rods, ranging from 20 to 36 millimeters. They also had to produce reinforcement drawings that could be understood and implemented by engineers and workers alike. The result was no ordinary concrete reinforcement but a special steel structure which had to be built up on site. It couldn’t have been planed without advanced, sophisticated 3D software such as Allplan.