TEKLA STRUCTURES IN PRACTICE:
PANORAMA TOWER, ESPOO
The Panorama Tower construction site was located in the middle of an existing commercial center in Espoo, Finland, and was therefore a challenging project for logistics alone. During the project, a number of new functions were utilized in the building information modeling (BIM) environment implemented in the structural design to seek efficiency in both the site functions and building cost factors.
The 76-meter-high Panorama Tower, located in Espoo, Finland, is an office and business building consisting of three building sections, the highest of which has 19 floors. The total area of the building is 23,600 m², of which ca. 16,100 m² is office space and 1,600 m² business space. The building has a steel column and beam frame, the bracing frame structures are made of concrete, and the lightweight façades are largely made of glass. The building was finished in March 2008.

- **Owner**
  Varma

- **Owner’s consultant**
  Pöyry CM Oy

- **Architectural design**
  Larkas & Laine Oy

- **Structural engineering**
  Pöyry Civil Oy

- **HVAC and electrical engineering**
  Pöyry Building Services Oy

- **Project management**
  A consortium of NCC and Skanska

- **Delivery of steel parts for the frame**
  Ruukki

- **Foundation casting and cast in place**
  Sierak Oy

- **Lightweight façade elements**
  Ruukki

- **Supplementary steel structures for the façade**
  Teräsnyrkki Steel Oy
The structural engineering of the Panorama Tower business center was largely based on 3D modeling. Pöyry Civil Oy used the Tekla Structures software for structural engineering, and Ruukki, the supplier of the steel frame parts, also successfully utilized the building information model created with the software.

The model was also utilized in the analysis and design of the buildings. Staad software, integrated into Tekla Structures, was used to perform design analyses related to the building's stability and horizontal displacement accelerations to support other design calculations.

In addition, a 4D model, which also contained schedule information, was used to visualize the project in negotiations and site meetings. As a new item of development, separate models of the terrain surrounding the building and the pit excavated under the building were created and included in the model that was then shared between project participants.
RELIABLE MODELING HELPS TO AVOID MISTAKES

Thanks to the use of modeling, serious mistakes were completely avoided in the project as the measurement environment was absolutely reliable," explains Kari Lassila, Project Manager at Pöyry Civil Oy. "The highly visual model-based design and the possibility to combine models made information exchange easier, decreased the number of errors, and helped to coordinate the design work throughout the project. The greatest benefit was gained in data transfer between project parties, as Ruukki, for instance, designed the structural steel components by modeling. In addition, model-based design helped us to stay on the challenging schedule."

Pöyry, responsible for structural engineering, used Tekla Structures to create a virtual 3D model of the foundation and frame structures of Panorama Tower as early in the process as possible. This model also included existing structures of the driveway and service traffic tunnels of the nearby Sello shopping mall, which remained underneath the building and needed to be taken into account in the design. Due to the cost factors of steel and the fire endurance class requirements for the building, concrete was selected in the draft stage as the frame material in the 3D model. It was later replaced with steel. "The information model was exchanged both ways between Pöyry and Ruukki, which helped to quickly implement the changes in the frame type and launch fabrication, and finally to deliver the structures to the site as scheduled. At Pöyry, the biggest job was to implement the changes caused by choosing steel, which were thinner than the concrete beams, in the floor and roof hollow-core slab sets," says Lassila.

Ruukki, supplier of the steel frame, carried out their own design with Tekla Structures, based on the transfer model from structural engineering. The frame model was also updated back to the main structural model several times as the design work progressed. This method of operation ensured the compatibility of the structures and a flawless process from fabrication to assembly. A similar method was used for designing the lightweight steel façades delivered by Ruukki, as well as the façade structures for the Sellopark parking house, which belonged to the same project.
LASER-SCANNED TERRAIN MODEL ADDED TO THE STRUCTURAL MODEL

> Another groundbreaking feature in the Panorama Tower project was laser-scanning the excavated pit and the previously constructed tunnels underneath the building and transferring the surface model from the scan to the structural model created with Tekla Structures to verify the positions of the excavation and the tunnels. The building exceeded the plot boundary at some points, and the structures were forming obstacles under the pedestrian street, for instance. The as-built excavation data from the structural model can be used in planning and implementing these changes in structures.

The laser scan of the Panorama Tower foundations has already been studied in a thesis on building technology at the Helsinki University of Technology. The objective was to investigate the applicability of laser scanning as the only as-built dimensioning method for determining the position and shape of an excavated foundation pit for new building under normal site conditions. This study also addressed benefits gained from a 3D volume model created with laser scan at the different stages of a building project and throughout the building's lifetime.

The point cloud produced by the laser scan can be used for creating quick cross-sections and calculating rough volumes directly at the site. The triangular network of the pit can be transferred to Tekla Structures in pieces. Concerning the pit, the benefits of the scan data in the model include the exact backfill and concrete volumes and the number of form panels for the foundation base. During the lifetime of the building, the scan data provide comprehensive as-built information for repair and alteration work. According to the study, laser scanning is a fast as-built dimensioning method and, within certain limits of accuracy, it can be used to create dimensionally accurate documentation. When selecting the as-built dimensioning method, the desired quality for the measurement of the building's actual dimensions and the utilization of the as-built data during the building's entire life time must be emphasized.

PÖYRY INVESTS IN BIM

> "At Pöyry Civil Oy, using building information modeling for structural engineering requires strong investment and dedicated training from the company and employees," says Heikki Solarmo, Vice President of the company.

"BIM was introduced in the field of forest industry, traditionally a strong field of construction at Pöyry, a good time ago. Since then, its benefits have proven so successful in all areas of construction at Pöyry that we have made the decision to move into model-based design in structural engineering as well."

"In addition to the accuracy of the structures and improved design process, the concept is strongly expanded by integration between different design areas within our Group, and additional functions for quantity surveying and scheduling offered by the project owner services of the software," continues Solarmo.
“The features of the model associated with the building’s lifetime are an increasingly important part of the delivery to the client. Pöyry Civil Oy has previously concentrated on the modeling of industrial buildings, so for us, the Panorama Tower project was a natural expansion of modeling to the area of office and business construction,” states Solarmo.

**BIM BOOSTS RUUKKI’S SUPPLY CHAIN**

> Ruukki has a long tradition in building information modeling, explains Timo Alanko, head of Ruukki’s engineering department. The model is used for managing the supply process. It also forms the basis for the development of processes and Ruukki’s whole supply chain. The model also makes it possible to link scheduling with product information and in this way improves schedule management in projects. BIM improves the quality of building. For instance, dimensional errors within plans have been almost completely eliminated, according to Alanko.

> “As BIM becomes more common, its benefits increase at the same time. Information exchange between project parties, as well as data synchronization, becomes increasingly important. Because of this, neutral formats for data transfer should be developed so that information from different parties, possibly stored in different formats, could be brought to common use. To avoid overlapping modeling functions, modeling carried out by the parties should be documented and the information content of the models unified,” states Alanko.

**BIM IS BECOMING GENERAL PRACTICE**

> The model-based planning of Panorama was pioneer work, according to Pöyry. “We now have the capacity to perform the entire design process in 3D, if the client so desires,” says Heikki Solarmo, Vice President of Pöyry Civil Oy. “Even though there still is a lot of room for development, the benefits of modeling are already obvious.”

In today’s building projects, building information models are being utilized in scheduling assembly, frame erection, and building engineering, as well as property maintenance. There are many possibilities to benefit from, and modeling is quickly becoming general practice.

*At the Panorama site, Espoo, October 2007, from left to right: Harri Makkonen, Kari Lassila and Asko Miettinen (Pöyry), Sarah Korhonen (Tekla), Petri Dolgov, Keijo Jylhä, Matti Suonio, Pirjo Paasonen and Jarmo Jääskeläinen (Pöyry), Elja Kontturi (Tekla).*
Tekla Structures – Intelligent modeling

> Tekla’s model-based software products make customers’ core processes more effective in building and construction and infrastructure management. Tekla Corporation has area offices and partner organizations worldwide. International operations account for more than 80% of net sales. Founded in 1966, Tekla is one of the longest operating software companies in Finland.

> Tekla’s technology creates new business opportunities for the construction industry. The most advanced building information modeling (BIM) solution on the market includes an accurate, dynamic and data-rich 3D environment. The highly detailed as-built digital structural models generated with Tekla Structures software enable effective visualization and management of the project. Effectively integrating model and non-model-based software solutions allows using the building information model in collaborative workflows. Tekla Structures users can streamline the design, fabrication, and construction processes, ultimately ensuring the highest level of constructability in project delivery. Tekla Structures encompasses specialized configurations for structural engineers, steel detailers and fabricators, concrete detailers and manufacturers, and construction companies.

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