



TEKLA® Structures



TEKLA STRUCTURES IN PRACTICE:
**MARITIME CENTER VELLAMO,
KOTKA, FINLAND**





TEKLA Structures

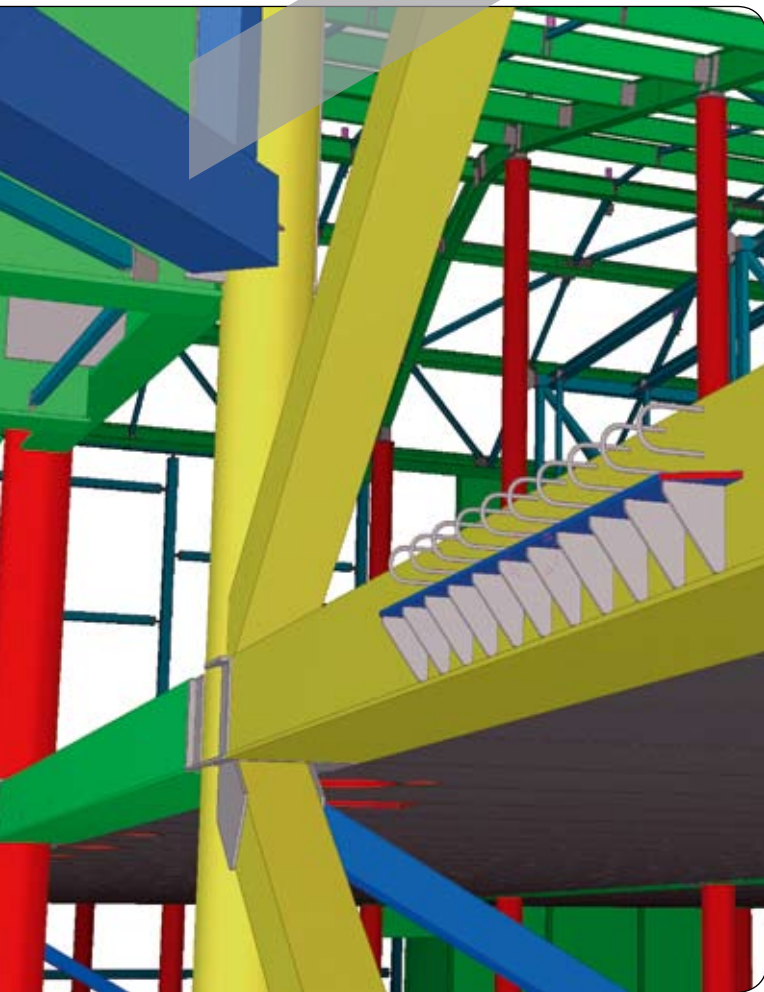
4D MODELING ENHANCES ON-SITE PRODUCTION CONTROL

Commissioned by the Finnish City of Kotka, the Maritime Center Vellamo at the old port of Kotka will be completed by the end of 2007. The center will accommodate two museums, and it will be an impressive landmark that brings to mind an image of waves in the sea. It was designed by Architects Lahdelma & Mahlamäki. The building frame is erected using the 4D-production model of Lemcon Oy, the main contractor. The model – that also includes an erection schedule – is based on a structural model created by Consulting Engineers Magnus Malmberg Oy using the Tekla Structures software.

TIGHT TIME SCHEDULE CALLS FOR EFFECTIVE SOLUTIONS

> The erection schedule of the geometrically demanding steel frame of Vellamo building and its associated fixtures was particularly tight because the original budget for the project was exceeded, and the need to raise additional funding caused a delay in starting the construction work. The steel frame, weighing over 2,000 tons, was designed, manufactured and erected in less than six months. The project management model was chosen because the project involves exceptionally many complicated structures whose detailed implementation required creating additional ideas when the work was already in progress.

With its effective visualization, the building information model is an excellent tool for planning installation. The roof structures of Vellamo consist of several structural solutions of exceptional diversity. Of these, elements like shell slabs, sheets





> *“A WELL-FUNCTIONING PRODUCT MODEL IS LIKE THE MUSICAL SCORE FOR A SYMPHONIC ORCHESTRA – IT CONTROLS ALL THE ACTIONS OF THE ORCHESTRA AND ENSURES THAT EVERYONE PLAYS THE SAME TUNE.”*

and cavities were modeled. “The product model enables much more efficient viewing and installation planning of frame structures compared to 2D plans, because a building frame of this complexity is difficult to visualize using 2D plans alone,” says Project Engineer **Teemu Nivell** of Lemcon. “Viewing the details of joints in the model brought much more knowledge to the process than browsing through a bundle of drawings,” he adds.

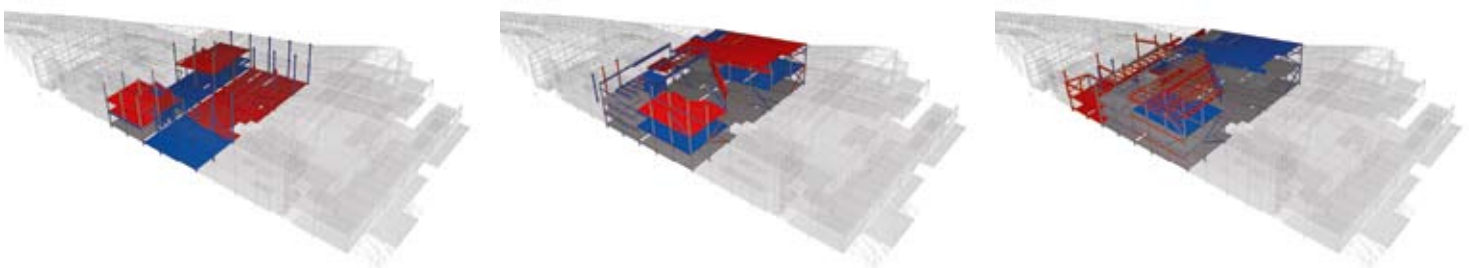
QUICKER WORK PLANNING

> “Planning of work, for example the installation order, is quicker using the building information model than by studying the 2D prints – in particular with a building of such geometrical complexity,” Project Engineer **Matti Partanen** of Lemcon adds. “In a site like Vellamo, there are a vast number of steel structure drawings, but the model has a specific function that makes it easy to find the manufacturing drawings of any part. The model also makes it easy to create a list of the elements of a certain block or section, so that the entire construction chain of design, manufacture, delivery and installation sequence can be planned. The list will contain all the necessary details of individual elements, such as weight,

profile dimensions and installation number. The list can also be complemented with an installation schedule to make planning the logistics and production at the manufacturing plant easier than it would be using 2D drawings.”

STRUCTURAL MODEL AS THE BASIS FOR 4D MODELING

> The 3D structural model created by Consulting Engineers Magnus Malmberg Oy, the company responsible for structural design, using the Tekla Structures software was the basis for the 4D model used by the main contractor that was supplemented with design and installation schedule details and included all technical information required for manufacturing and installing the frame structures. The production schedule of H-Steel Oy Ltd, the steel workshop supplying the building frame, was also linked to the same frame model. This way, the construction site was kept up to date regarding the status of design and manufacture. “The model reduces the amount of on-site checks required, warns in advance of any disruptions, and enhances schedule planning and control,” Matti Partanen describes.



PARTNERS IN 4D MODELING OF MARITIME CENTER VELLAMO:



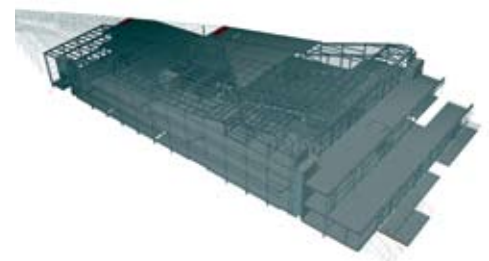
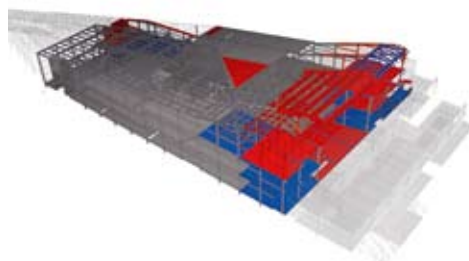
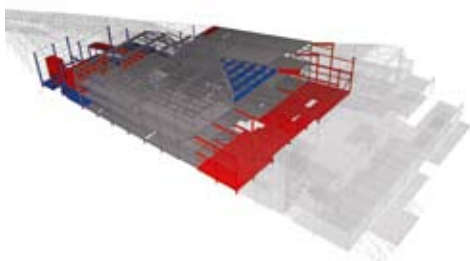
Lemcon Oy is an international project construction company and part of the Lemminkäinen Group. The company has completed projects in over 60 countries. The current focus of operations is on North and South America, China, India, Russia and Europe. In Finland, the company is an important player in the fields of project management, sports facility construction projects and demanding engineering projects.
www.lemcon.fi



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The building information model containing detailed construction element data can also be utilized by other parties in addition to the project management, such as the steel workshop H-Steel Oy Ltd that supplied the steel frame in this project. According to **Jukka Suomi**, the contractor segment Product Manager of the Building and Construction business area of Tekla who assisted in the modeling work, "a well-functioning building information model is like the musical score for a symphonic orchestra – it controls all the actions of the orchestra and ensures that everyone plays the same tune". In the future, the modeling of structural data can be used more frequently and extensively in the implementation and management of construction projects, in the scheduling of installation work, erection of the frame, building technology and even in property maintenance. There are many possibilities to benefit from, and there is a belief in the industry that modeling will become general practice over the next few years.

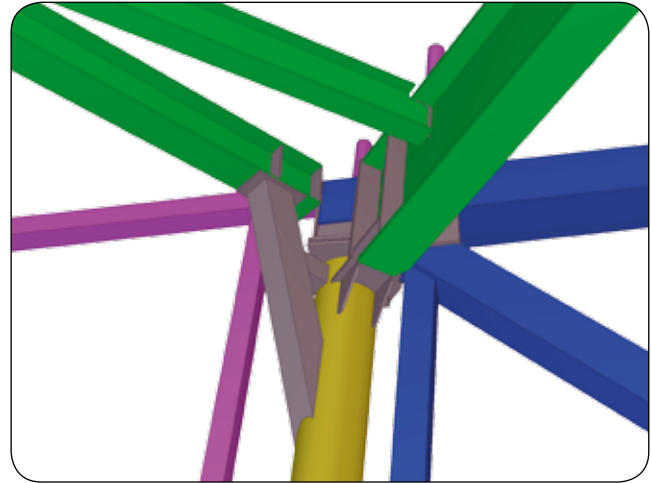


"The model allows much more efficient viewing and installation planning of frame structures compared to 2D plans."

– Teemu Nivell, Lemcon Oy

"The model also makes it easy to plan the entire construction chain of design, manufacture, delivery and installation sequence."

– Annikki Karppinen, Lemcon Oy



BUILDING INFORMATION MODELING IS BECOMING THE INDUSTRY STANDARD

> Development Manager **Annikki Karppinen** of Lemcon expects that the parties to construction projects need to learn to work together before building information modeling really establishes itself as an industry norm. Teemu Nivell basically agrees: "The model should be deployed earlier in the projects. As early as at the time when agreements are concluded for design work, it pays to consider whether the project is one where modeling will improve quality control, speed up the construction process, reduce design errors and make tendering calculations easier. Before starting the project, it is a good idea to have a joint meeting to agree on how the model is to be used, what the common rules of engagement are, and to ensure that as many people as possible know how to use the modeling software."

"Models allow a reduction in the amount of time-consuming routine work, and the time thus saved can be used for tasks that produce more added value," Karppinen continues. "The details of quantities, for example, are required for almost everything in a construction project: for cost and schedule control, procurement, work planning, manufacturing and for determining the degree of completion. Quantity management using models saves time that can instead be used, for example, for investigating alternative design and implementation solutions. Since 3D plans are much more illustrative than 2D drawings, any errors, ambiguities and problems in the plans can be detected early, before they cause any further problems on site. Further, the combination model of different areas of construction design is an excellent tool for integrating different plans."

"When the parties to the project – designers, contractors, materials and element suppliers – increasingly learn to work with building information models, we can expect an improvement both in the efficiency of building design, construction and maintenance processes and in the standard of quality that these processes produce. Better data management also produces better information for the decision-making of property developers and helps ensure that the outcome of the project meets the objectives set by the property developer."



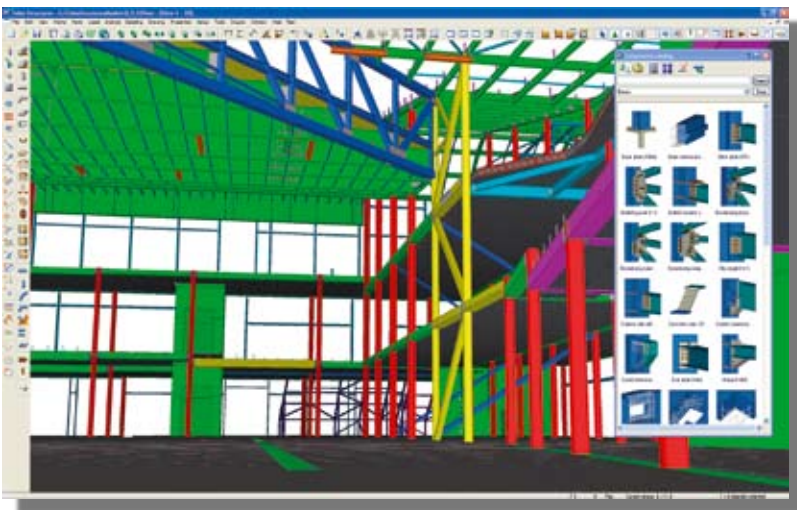
TEKLA STRUCTURES – THE OPEN AND INTELLIGENT DESIGN SOLUTION

> Tekla Structures is the building information modeling tool that can be integrated with other design and production control software used in building and construction. It enables the creation and management of accurate 3D structural models regardless of the material or the complexity of the structure. It is a solution that covers the entire process from conceptual design to detailing, manufacturing and construction site management. The data stored in the model can also be used in the planning of production. After the building is completed, the data in the model can be used, for example, in the maintenance of the property and in repair and alteration work.

The structural model produced using Tekla Structures can be used in planning the timetable for the installation of the frame, to guide the installation work and manufacturing, and in planning logistics. It provides the basis for creating a structural component-specific installation plan, from which both the manufacturers and designers of product parts can extract schedule information to guide their own production.

After the building has been erected using a virtual model, all the project participants can see real-time schedule and implementation data directly in their own models. Thus, project management can monitor the status of installation work and manufacturing directly from the model. When changes occur, the data can be updated automatically in all the relevant model, for example, via the Internet. The model can also be used on site for calculating quantities, reporting, and, for visualizing plans.

Tekla Structures' collaboration and information management applications are based on the leading modeling technology developed by Tekla Corporation. The same model can be used to produce analysis and planning results, and drawings and reports. The participants in the building project can use a shared, up-to-date structural model during all the phases of the project. This minimizes errors and the overlapping of work stages, which results in even faster implementation and delivery of projects as well as significant cost savings. The quality of the construction will also improve. Tekla Structures is used in the construction industry in more than 80 countries.



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