Fly-Over Kerensheide, Netherlands | Engineering and consulting company Movares, Utrecht

Faster with Allplan

Stop and go or miles of traffic jams? These are problems that should soon be happening less in the Netherlands. Here, where the A2 from Amsterdam to Liege crosses the A76 from Aachen to Antwerp, there are plans to improve traffic flow by building a new two-lane feeder bridge. The engineering and consulting company Movares is managing to meet the tight deadlines thanks to an integrated, model-oriented approach using Allplan Engineering.

In order to get a handle on the constant traffic problems, the "spoedwet E" law was passed recently in the Netherlands. This law provides for the accelerated construction of neural traffic nodes. 30 freeway interchanges will be renovated as part of this project – including the Kerensheide interchange in the south of the country. Here, where the A2 from Amsterdam to Liege crosses the A76 from Aachen to Antwerp, there are plans to improve traffic flow by building a new two-lane feeder bridge. Construction will be extremely quick: with just a year for planning – construction started in February 2011 and is planned for completion in the middle of 2012. The project includes strict specifications that must be complied with. This is achieved through integrated, model-oriented project processing by engineering and consulting company Movares using the Allplan Engineering and SCIA Engineer software solutions from Nemetschek.

Constant movement

Formed 15 years ago from the Dutch state-owned track works company, Movares is an international specialist for mobility and transportation solutions. Movement is the main theme at Movares, and the 1,500-strong company also intends to be a mover and shaker in the way construction projects are managed. René Dorleijn, Head of the Building Information Management department at Movares, feels there is room for improvement here: "The construction process is still very fragmented and ineffective because information is constantly being changed. Our goal is to optimize cooperation with the consistent use of project information."

Movares has decided that Nemetschek solutions are the right tools for the job. The Munich-based software company has long been a pioneer in the area of BIM, pursuing a strategy of integrated, model-oriented project processing. With products that ensure consistent IT support throughout a construction project, Nemetschek has everything that the designers at Movares are looking for, says René Dorleijn: "We have used SCIA Engineer for our structural analyses for 15 years. Five years ago, we decided to start using Allplan Engineering because we shared a vision with Nemetschek: end-to-end planning with a joint building model using Building Information Modeling." The intelligent building model in Allplan serves as a central data pool from which all required analyses can be derived automatically. At the same time, the intelligent building model enables interdisciplinary cooperation between all members – including everybody from engineers to structural engineers and building material manufacturers.

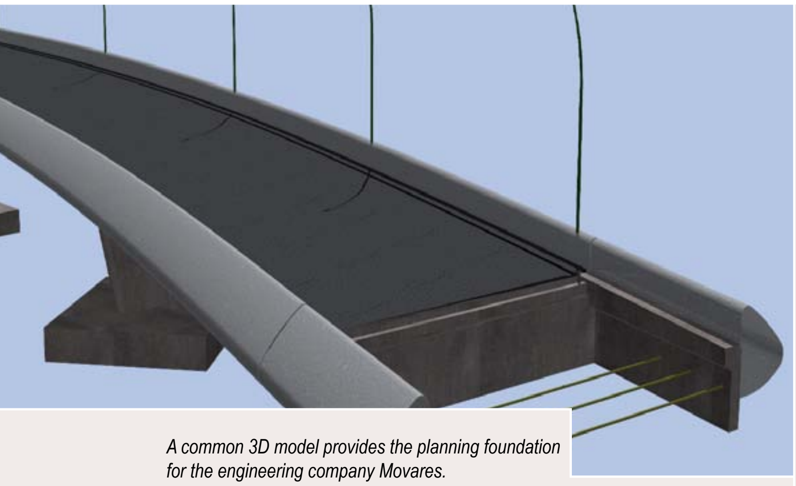
» We share a vision with Nemetschek: end-to-end planning with a joint building model using Building Information Modeling «

René Dorleijn, Head of Building Information Management at Movares

Seamless cooperation

The opportunities for end-to-end cooperation between the different parties were exploited to the full in the Kerensheide flyover project. This was the only way to meet the specific challenges of the project. Not only were particularly fast planning and completion called for. The bridge itself has a complicated shape. This is partly because the entire flyover is shaped like a double-curved arch, but mostly because the road surface itself was extremely difficult to design: While the asphalt surface has a constant thickness, the concrete surface between the supports is arched. The super elevation of the road surface represented another challenge. Load capacity also had to be optimized to compensate for the bridge's minimal dimensions (specified to prevent the bridge ruining the landscape): 23 meters wide, 1.60 meters high and just 10 conically-supported pillars along a length of 590 meters.

"We realized that we could only manage this project by taking an integrated approach. To ensure this, we worked closely with all partners to lay the proper foundations for seamless



A common 3D model provides the planning foundation for the engineering company Movares.

project workflow," says René Dorleijn. All those involved met regularly, including Movares, construction company Heijmans and concrete supplier Van Noordenne together with their CNC software provider LIC. They clarified which preconditions have to be met for an especially quick planning and design phase, followed by a seamless construction phase. Working together with the highly-competent experts from SCIA Allplan Support, they defined who would need which data over the course of the project.

An improved overview with 3D

2D initial drafts were followed by 3D versions. Foundations, supports and abutments were designed using free-form solids. When modeling the concrete section, the designers at Movares used the functions of Nemetschek's Bridge Modeler (BTM). In this way, creating the bridge structure in 3D was very simple.

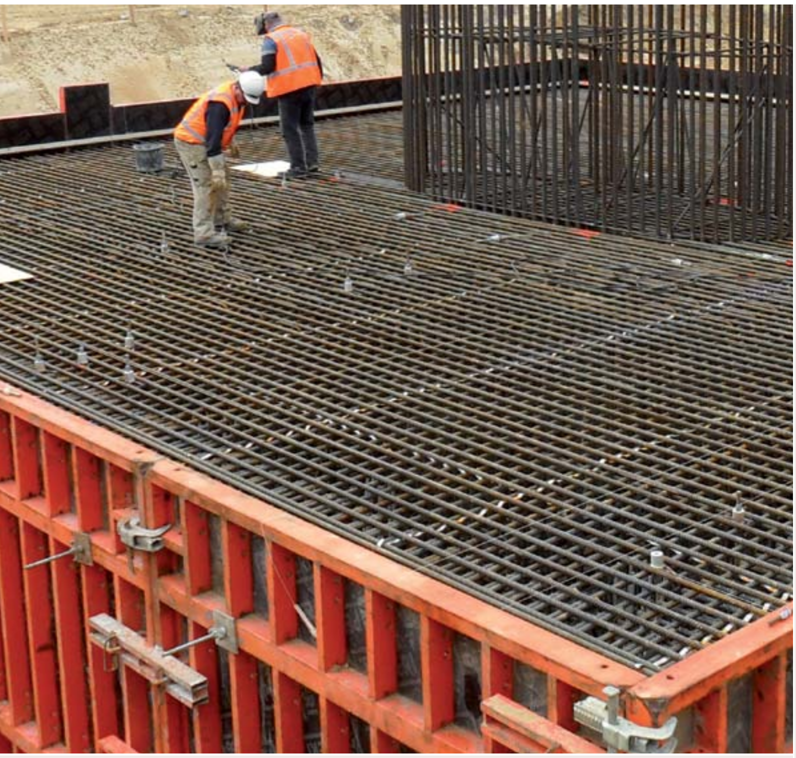
Work in 3D was particularly helpful when designing the complex road surface. "We were able to examine the structure for all sides. The different arch forms running along different axes in particular were much easier to check and optimize in the 3D model than would have been the case in a two-dimensional display," says Frank Burm, head of the flyover project at Movares.

At all times, designers were also able to automatically generate the latest views and sections of the bridge. Each modification only had to be entered once to be included automatically in all design documents. This significantly accelerated structural analysis in SCIA Engineer as the design documents required for structural designers were generated directly from the model – ensuring access to consistent and up-to-date data. Calculations are even performed simultaneously during the design phase.

Complex reinforcement design

The reinforcement design was also created completely in 3D in Allplan Engineering. "This would not have been possible in 2D, as several complex reinforcements had to fit together without collisions," says Frank Burm. In addition to the double-curved road section, the Kerensheide flyover also has concrete end edges on both sides, which both follow an arc and are rounded off at the ends as the feeder transitions to the road surface.

Moreover, the large distance between supports means that prestressed concrete must be used. This means that prestressed steel also had to be incorporated into an already-minimized design in very little space. But that wasn't all: to reduce the overall weight of the construction, the design



positioned concrete-encased polyethelene blocks at regular intervals. The reinforced steel could not pass through these blocks, of course.

Full integration from the design phase to the manufacturing phase has proved very successful for the flyover project. As a result, the reinforcing steel elements matched requirements precisely, with hardly any rejects. As most potential errors could be identified during the design phase, the project has experienced hardly any delays. Construction work continues at a good pace and according to plan. It looks like traffic jams may soon be a thing of the past at Kerensheide.

The project in brief: The engineering company Movares has dedicated itself to Building Information Modeling (BIM), employing this technology with great success in its latest project, the construction of a two-lane feeder bridge near Kerensheide. Model-oriented working with Allplan Engineering and SCIA Engineer also ensured that tight deadlines were met in a project which, simultaneously, involves a complicated bridge design. This is partly because the entire flyover is shaped like a double-curved arch, but mostly because the road surface itself was extremely difficult to design: While the asphalt surface has a consistent thickness, the concrete surface between the supports is arched. The super elevation of the road surface represented another challenge. And, no less important, the load capacity of the structure also had to be optimized to absolute minimize dimensions, thus limiting any impairment of the landscape in as far as possible.

Focus:
Building Information Modeling – Civil Engineering

Software used:
Allplan Engineering/SCIA Engineer

Project data:
Client: Rijkswaterstaat
Design: February 2010
Construction time: since Februar 2011
Structural completion: scheduled for mid-2012
Building volume: around 19,000 m^3