

Breijn B.V.

Customer Success Story

Client: ProRail

AutoCAD® Civil 3D®

Autodesk® Revit® Structure

Autodesk® Navisworks® Manage

Design is our core business. Autodesk BIM solutions help us create higher-quality, more constructible designs. It is a perfect fit.

—Leo Molenbroek
Construction Engineer
Breijn B.V.

A Perfect Fit

Breijn uses Autodesk BIM solutions to help design and simulate construction of a replacement railroad bridge.



Water-level rendering of the Linge River Bridge. Image courtesy of Breijn B.V.

Project Summary

Breijn B.V. prides itself on its speed, flexibility, and innovation. With more than 300 professionals, this Dutch firm is the civil engineering department of Heijmans Infrastructure and part of Heijmans N.V., one of the largest construction companies in The Netherlands. In keeping with its commitment to innovation, Breijn has been using Autodesk building information modeling (BIM) solutions on almost every new project since 2007.

One of the firm's recent BIM projects is the design of a replacement railroad bridge over the Linge River. The original bridge, built in 1860, was heavily damaged during World War II and replaced by a temporary bridge. ProRail—the Dutch railway authority—is now replacing this “temporary” bridge.

The Challenge

“ProRail wanted a cost-effective replacement bridge, with minimal disruption of rail service during its construction,” recalls Cristian Otter, senior designer at Breijn. The existing bridge is a 40-meter single-span steel bridge. ProRail wanted a concrete bridge for maintenance and durability. “Current

construction regulations only accommodate a concrete span of 21 meters, so our design proposal featured bridge pillars to support the weight,” explains Otter. “But since the bridge and railway is being used during construction, those pillars had to fit under the existing structure.” Breijn needed precise coordination of the existing structure and the new design, and a carefully crafted demolition/construction plan.

The Solution

“With the help of Autodesk BIM solutions, we developed a design that met our client’s requirements for aesthetics, cost, and constructability,” says Otter. Breijn used Autodesk model-based solutions for design, evaluation, coordination, and construction simulation of the bridge. “We are building all the foundation structures in place and prefabricating the new bridge decks,” says Leo Molenbroek, construction engineer at Breijn. “So we created as-is infrastructure models and to-be design models to help coordinate our design and simulate the demolition and reconstruction of the bridge.”

Breijn uses Autodesk BIM solutions to help coordinate infrastructure design and construction.

Model Existing Conditions

Breijn used AutoCAD® Civil 3D® software to help leverage existing GIS, rail alignment, and survey data. The designers imported this data to create a model of the existing earthworks and rail alignment. “Using geographic data to establish accurate groundwater levels, we were better able to analyze and calculate the amount of underwater concrete needed for the abutments,” says Otter.

The next step was to import this existing topography into Autodesk® Revit® Structure software to support the precise modeling of the existing bridge and its foundations—helping create an infrastructure model of existing conditions. “The existing bridge will stay in place until demolition, and we have to build around it,” says Molenbroek. “So it is crucial that our design reflects the exact locations of the existing structure and the railroad tracks.”

Coordinate New Designs

Referencing the infrastructure models, Breijn began the design of the new bridge. The team used Revit Structure to design the new foundations and structure and Civil 3D to model the new alignments and grading. “BIM was vital for this integrated design,” says Otter. “Being able to combine and visualize the bridge, the railroad, and the earthworks in a more seamless design environment enabled us to check the feasibility and constructability of our design very early on.”

Breijn also utilized Autodesk® Navisworks® Manage software to aggregate the as-is and to-be models for clash detection. “Throughout the design process, we used the software to help identify and resolve design conflicts,” says Otter. “This was particularly important for checking the clearance between the top of the new bridge pillars and the bottom of the existing deck.”

Simulate Construction

Bridge construction will culminate in a 90-hour period when rail service is halted, the existing deck demolished, and the new concrete decks placed on the bridge pillars. The team used Navisworks Manage to help integrate the construction schedule with the models, to plan and simulate the demolition of the existing structure and the construction of the new features. “For example, when we ran a 4D simulation of these critical 90 hours, there were still some pieces of the old bridge just hanging there. We had forgotten some demolishing tasks on the schedule,” recalls Molenbroek. “Thankfully we were able to find and fix these types of issues before they impacted construction.”

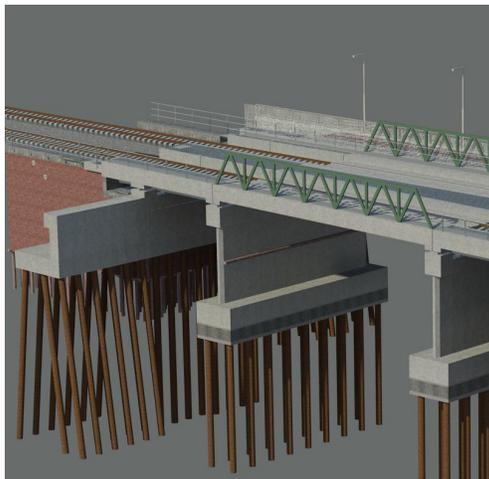
The Result

Impressed with Breijn’s innovative bridge pillars design, ProRail awarded the \$8.7-million design and construction contract to Heijmans. The bridge is currently under construction, and the team is looking forward to the 90-hour finale with confidence. “Design is our core business,” says Molenbroek. “Autodesk BIM solutions help us create higher-quality, more constructible designs. It is a perfect fit.”

For more information, visit www.autodesk.com/civil-infrastructure and www.autodesk.com/bim.



Rendering of the Linge River Bridge as seen from the river’s bank. Image courtesy of Breijn B.V.



Rendering of the replacement railroad bridge. Image courtesy of Breijn B.V.

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—Cristian Otter
Senior Designer
Breijn B.V.