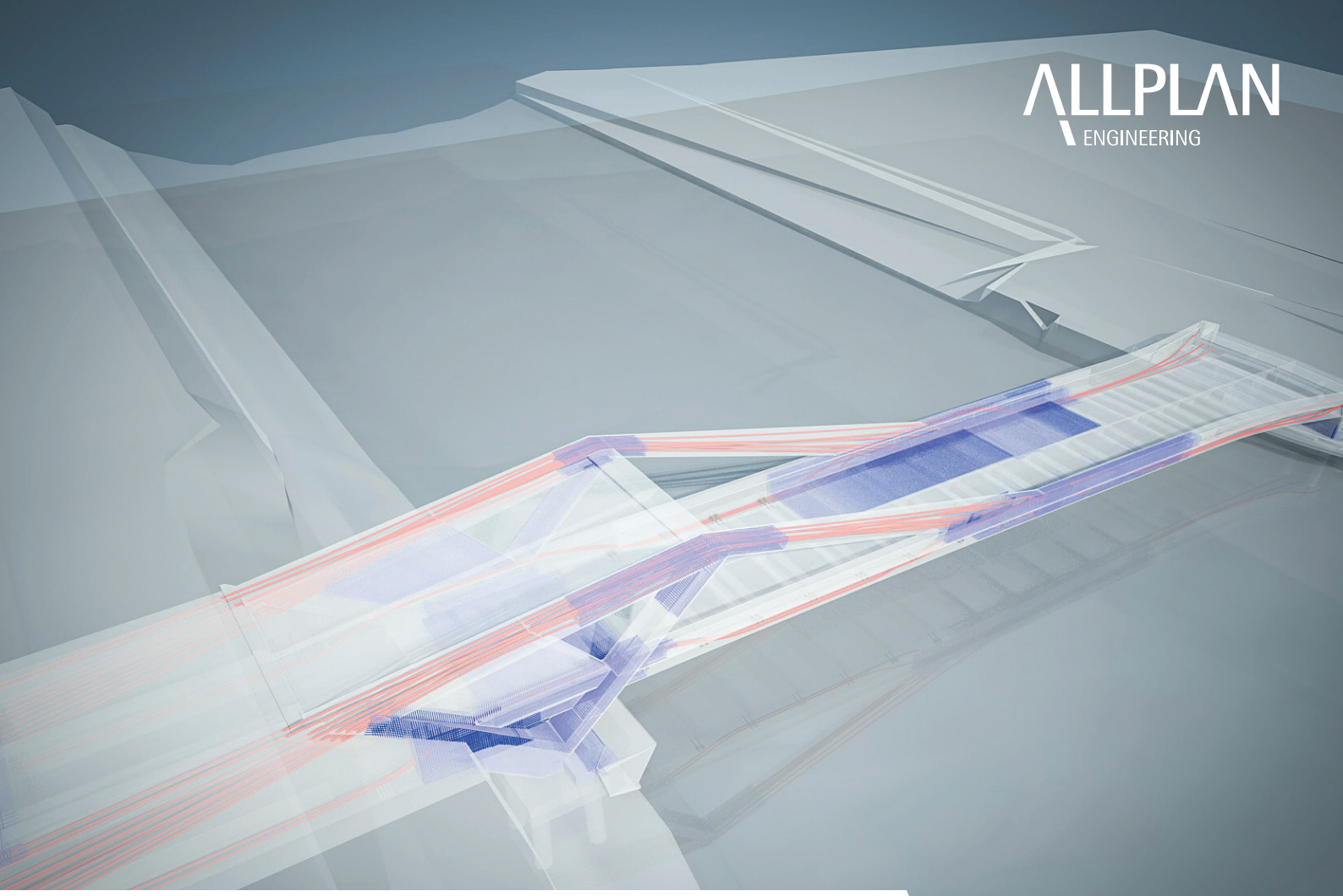


ALLPLAN ENGINEERING IN PRACTICE

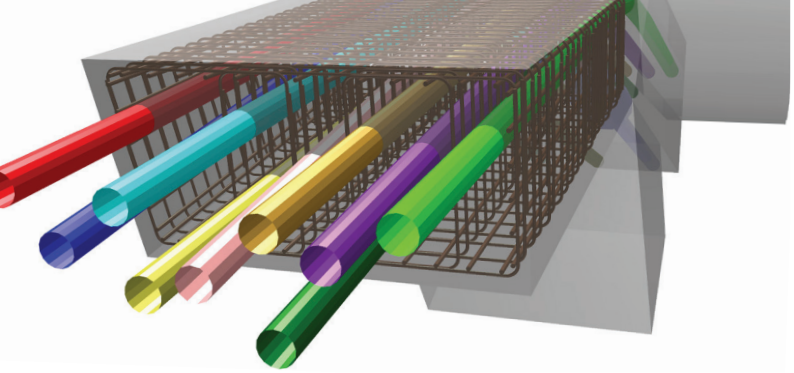
Overcoming boundaries

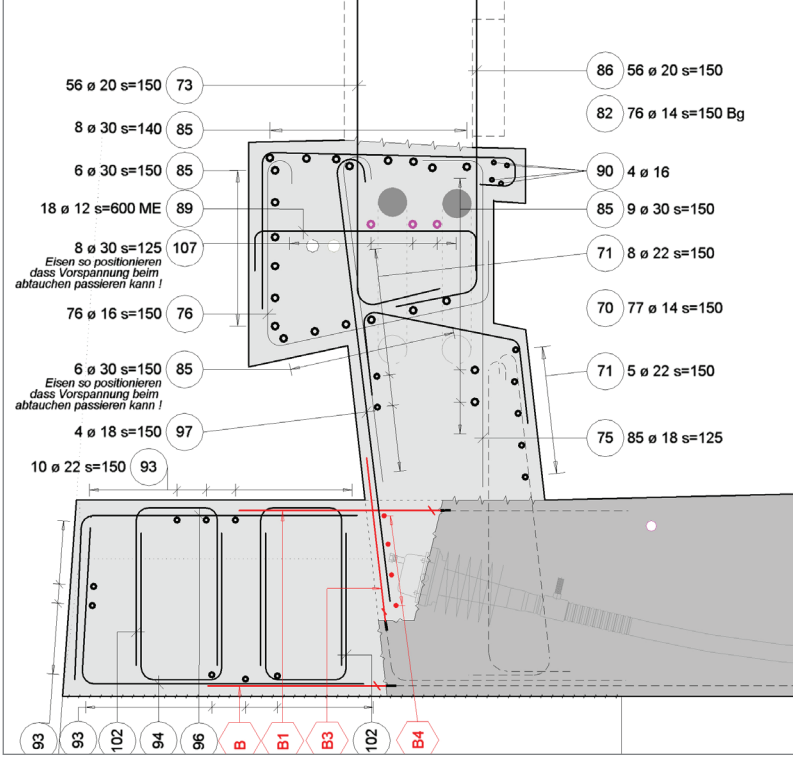
Aare Bridge, Olten (SO) Switzerland

Olten has a new landmark: the Aare Bridge, which was given over to traffic in April 2013 as part of the "Olten Region Relief" (Entlastung Region Olten, ERO) project. Thanks to the 3D visualization, the planning association commissioned to manage the project were able to show that the main intersections of the static system could meet all requirements relating to the installation of reinforcements and pre-tensioning measures, despite their minimal dimensions. The planning association for the "maya" project chose a bold approach as its competition entry for the new Aare Bridge: With a width of just under 104 meters, the structure spans the river without supports. The planning association's proposal in May 2005 therefore won the competition, in which a total of 69 projects were entered. The team that came first was formed of engineering firms Bänziger Partner AG (Baden) and ACS-Partner AG (Zurich), as well as architect Eduard Imhof (Lucerne) and landscape architects David und von Arx (Solothurn). They were commissioned by the canton of Solothurn to project manage and supervise the construction of the new bridge structure.

The bridge bears a single-spanned cantilever beam with a trough section. Both main supports simultaneously form the side guardrail system and soundproofing, spanning the River Aare with a width of 88.50 meters. The supports are suspended from the tunnel portal using pre-tensioned concrete sails, making the portal structure a static part of the bridge. Around 40 meters of the adjacent cut-and-cover tunnel acts as a counterbalance for the tension in the portal. A concrete shed covers the portal area and provides soundproofing and a stable balancing system. Pre-tensioned cross girders are arranged between the bridge's main supports which support the carriageway slab. These act as simple beams with a span width of between 13.60 and 17.50 meters.

Planning was carried out in a 3D model using Allplan when the competition project was being developed. Just like later in the implementation phase, engineering firm Bänziger Partner AG developed the formwork plans, whilst ACS-Partner AG was responsible for the static design and the development of reinforcement and pre-tensioning plans. As Rudolf Vogt, co-owner of ACS-Partner, explains, the Aare Bridge was the first project that he and his staff developed in 3D: "Looking back, I can say that it was the perfect project to benefit from 3D modeling as the basis for both the formwork plans and the reinforcement and pre-tensioning plans." However, he also points out how important it is that the designers who have been entrusted with this task possess good spatial awareness: "Because bringing the spatial structures into the two-dimensional implementation plans requires a high level of understanding in this regard," says Rudolf Vogt, based on his experience. So that the 3D





data sharing between both engineering firms worked perfectly, the software settings needed to be coordinated with one another beforehand. "Once these conditions have been met, it will work perfectly," explains Rudolf Vogt.

"With Allplan's approach to 3D models, we were able to guarantee the correctness of the geometry for formwork, reinforcement, and pre-tensioning and construct all components neatly."

Rudolf Vogt, member of the management board, ACS-Partner AG

The main challenge for reinforcement and pre-tensioning was at the highest point of the structure: The longitudinal beams (which act as a link to the cut-and-cover tunnel), the angled support (which stands on the abutment), and the concrete sail (which braces the bridge's longest support) come together here on both outer sides. These construction parts are not only reinforced for strength, but are also pre-tensioned and come together in a knot, which therefore becomes the element under the greatest stress in the overall structure. Despite the high level of stress, the planners wanted to keep the dimensions as small as possible and were therefore required to prove the feasibility of the proposed design for this knot to the client and the testing engineer. "Thanks to the visualization in the 3D model, we were able to prove the feasibility of the dimensions for the knot we selected with reinforcement and pre-tensioning," explains Rudolf Vogt. Furthermore, a sample knot that was true to size was created on the construction site to check that everything would work in the final version. "Our conclusion as far as feasibility is concerned was therefore also confirmed on site," adds Rudolf Vogt.

For bridge construction engineer Rudolf Vogt, one thing is clear: "The reinforcement and pre-tensioning plans for this level of complexity in the structure could only be tested in the 3D model." It is only thanks to the spatial representation that its possible to see into the relevant part of the structure in order to detect missing reinforcements or incorrect joint lengths, for example. But it is not just Rudolf Vogt who appreciates the benefits of 3D; the iron layer also managed much better on the construction site thanks to the spatial visualizations shown on the plans. "We reproduced individual details in 3D in both the formwork plans and the reinforcement and pre-tensioning plans and thereby gained some very good results," reports Rudolf Vogt.

PROJECT INFORMATION AT A GLANCE

Focus: Structural design planning from draft to implementation
Software used: Allplan Engineering
maya planning association:

- Bänziger Partner AG, Baden (general management)
- ACS-Partner AG, Zurich
- David & von Arx Landschaftsarchitektur, Solothurn

Client:

- Amt für Verkehr und Tiefbau (Department for Transport and Civil Engineering), canton of Solothurn

Project data:

- Planning start date: 2005
- Construction start date: 2008
- Completion: 2014
- Length including portal area: 140.00 m
- Width: 15.60 m
- Bridge area: 2200 m²
- Height above the River Aare: approximately 5 m