



The digital twin bridges the gap between planning and execution

Allplan in Practice

HAVELLAND HIGHWAY: BIM FROM A SINGLE SOURCE

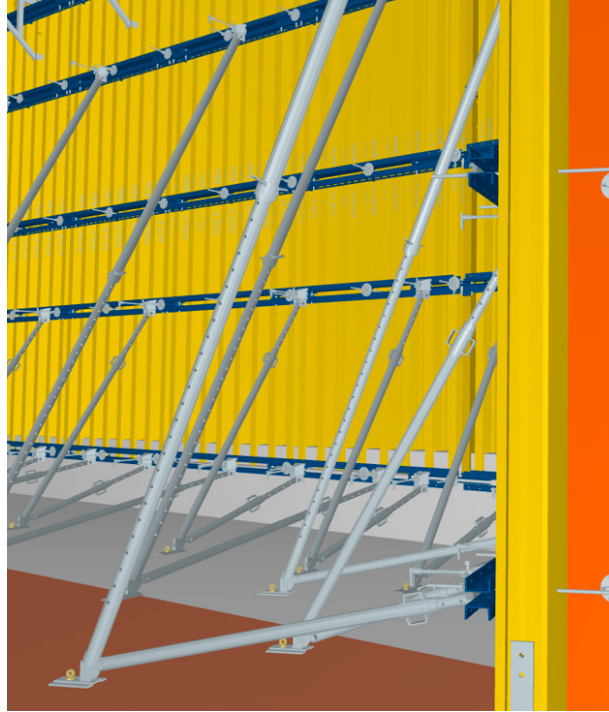
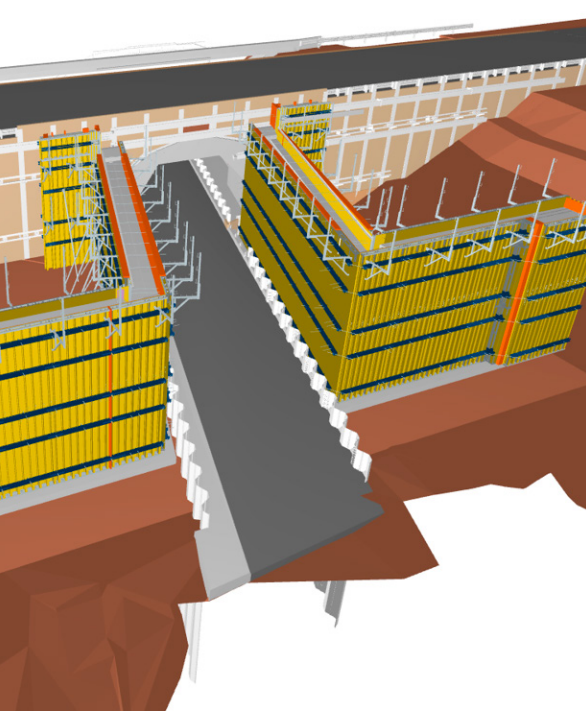
The Havelland Highway project is the first time that a complete section of construction has been carried out entirely with BIM from a single source – including maintenance. The planning was carried out using OPEN BIM.

According to the German Federal Government's phased plan for digital planning and construction, infrastructure construction in Germany must be carried out using the BIM method from 2020.

According to the BIM Master Plan in Federal Highway Construction, BIM-based planning, execution, operation and maintenance should also be part of the regular operation of highways and associated construction projects from 2025. To ensure that this plan actually comes to fruition, various pilot projects have been carried out throughout

Germany for several years in order to test and establish the model-based working method in a holistic manner.

One of these is the „A 10/A 24 readiness model“, also known as the Havelland highway. Part of this project, a large section of the A 10 is being widened to six lanes between the Pankow interchange and the Neuruppin junction, and part of the A 24 is being rebuilt. One section of the A 24 is the actual BIM pilot project. The special aspect: It is the first



The embedded formwork planning in the construction sequence simulation complements the conventional construction schedule. The 4D simulation made it possible to accurately assess the space for the supporting formwork between the shoring and the auxiliary leaf.

project in which the services of planning, execution and maintenance with BIM are all in one (with the project company Havellandautobahn GmbH & Co. KG). In this OPEN BIM project, the technical office of Wayss & Freytag Ingenieurbau AG was commissioned with the design and execution planning, corresponding to service phases 3, 4 and 5 according to HOAI, for two engineering structures.

TWO ENGINEERING STRUCTURES: NEW BRIDGE REPLACEMENT AND NOISE BARRIER

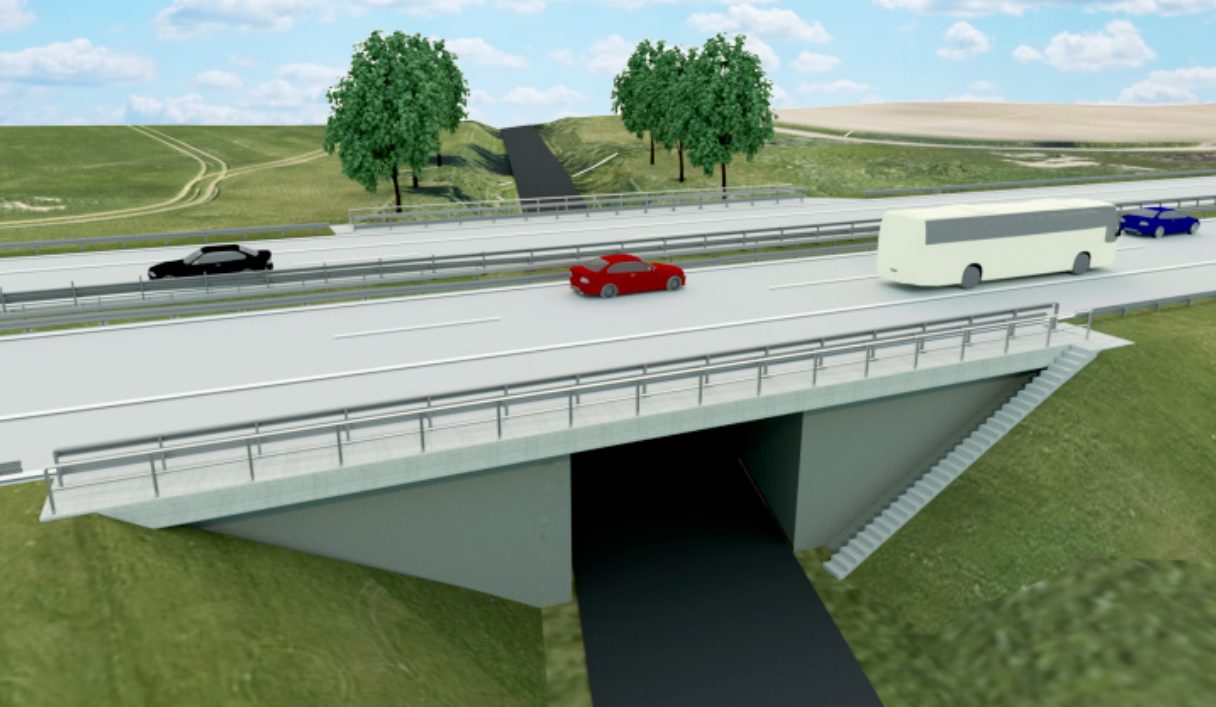
The section of the A24 to be implemented using BIM has a length of 5,500 meters and includes two new service stations as well as two engineering structures. The latter are a replacement bridge over the Kuhhorst-Linum local road (Structure 2) and a 265-meter-long Noise Barrier (X-X). For both, Wayss & Freytag Ingenieurbau AG were initially responsible for the preparation of a design and subsequently for the execution planning including formwork, reinforcement, setting out, overview and detail plans as well as for the as-built documentation with the construction changes.

Structure 2 is designed as a single-span structure consisting of two partial structures with superstructures as solid slab cross-sections. The reinforced concrete superstructures are supported

by concrete joints on flat-founded box-type abutments. The structure is being built using the in-situ concrete method. The superstructure will be built on ground-supported falsework, such that the traffic area on the local road below the structure during construction is to be kept free. Accordingly, the highway traffic will be diverted over two construction periods with a change of directional traffic from two to one directional lane in the construction area. An acoustic study shows active noise protection measures in this section to comply with the emission limits. For this reason, the aforementioned Noise Barrier X-X is to be newly erected at the Linumer Bruch service station between construction kilometers 225+246 and 225+511.

DEMANDING PHASE – DESIGN AND EXECUTION PLANNING

The construction of a new bridge structure, at the same location and during ongoing operation, places special demands on phase planning and thus also on design and execution planning. 4+0 traffic routing during construction, both on the existing structure and later, on the new structure, requires precise sequence planning and consideration of special geometric dependencies. This concerns both the existing structure and the planning of the central longitudinal shoring as well as both construction sections of the new Structure 2.



Visualization in the availability model of the A10 / A24.

IMPLEMENTATION WITH ALLPLAN: MODELING UP TO LOIN 500, SMART- PARTS AND PLAN DERIVATION

The basis for the design was a point cloud, on the basis of which the as-built model of the existing bridge structure and the terrain model were generated, taken into account and integrated in the further design. Since model-based processing corresponds to the standard workflow in the engineering office, Allplan was used to model both the design and the execution model in the required Level of Information Need (LOIN) 200 and 400 respectively in 3D without any problems. The handover model for the operation and maintenance phase has a LOIN of 500.

The planning of the central longitudinal shoring was done with the help of Allplan SmartParts. Thanks to these parametric tools, the sheet piles, anchors, walers and steelwork could be optimally positioned for the construction phases in accordance with the various construction sequences – and, above all, without any conflicts. Thanks to SmartParts, adjustments and changes could be implemented quickly.

“The actual execution planning, whether in 2D or 3D, has proven itself in decades of use in our technical office,” says Thomas Grubert, Head of Technical Office, Wayss & Freytag Ingenieurbau AG. The creation of the design and execution planning, in particular the general arrangement drawings, was basically done from the 3D model. Some details, such as guide drawings, were supplemented in 2D. Sectional derivations from the model could be generated quickly and precisely.

Subsequent changes to the model were also automatically transferred to the plan derivation. All the reinforcement runs – regardless of whether they were normal or complex – could be developed precisely, clearly and without conflict using the 3D reinforcement planning in Allplan. Thanks to the model, the basis for the formwork planning was already provided, which was used by the subcontractor Doka for the formwork concept.



Team meeting for the Havelland freeway project

OPEN BIM: PROBLEM-FREE INTEGRATION OF THE ALLPLAN MODEL

"As the project had to be carried out using OPEN BIM, independent of the supplier, smooth interaction between different software solutions was of paramount importance. The model-based method of working was able to highlight both spatial and schedule collisions early on in the project. The model created in Allplan could be integrated into the federated overall model without any problems," says Thomas Tschickardt, BIM manager of the A10/A24 Havellandautobahn working group and Competence Area BIM Management, Wayss & Freytag Ingenieurbau AG. Similarly, 4D construction sequence planning could be created without any problems on the basis of the Allplan model. The creation of the corresponding features in the individual model elements was implemented directly in Allplan. Using the IFC interface, the Allplan data could be exchanged via the BIM coordination software DESITE MD pro and linked to the schedule from MS Project. Due to a rule-based link between the geometric model and the schedule, it was also possible to update the link to a new index in a very short time, even in the case of planning changes and updates.

BIM IN THE OPERATION AND MAINTENANCE PHASE

In accordance with the specifications according to the client information requirements (CIR) and the BIM execution plan (BEP) – which were prepared in consultation with the A10/A24 Havellandautobahn working group (Wayss & Freytag Ingenieurbau AG and HABAU Hoch- und Tiefbaugesellschaft m. b. H.) – important semantic features for the operation and maintenance phase were already defined in the planning phase. Through the BEP, the tasks, responsibilities and interactions of each organization regarding BIM information and building information models are defined. Due to the rapid development in all areas of digital design and construction, the BEP is a "living" document that is continuously updated during the course of the project.

This dynamic information includes, for example, information that is required according to the central construction database SIB-Bauwerke. Accordingly, the design models are supplemented with construction-related changes and information (for example, the concrete used and its characteristic values). In this way, two BIM use cases can be implemented in the operation and maintenance phase on the basis of the models of Structure 2 and Noise Barrier X-X created in Allplan: 1. visualization of the



Havelland freeway
construction site

maintenance measures and 2. of the condition values according to the "Additional Technical Contract Conditions" of the road construction of the A10/A24 highway.

When visualizing the planned maintenance measures, the individual maintenance measures and associated information are displayed and located on the structure information model in the BIM contract section. Among other things, this is intended to identify possible traffic disruptions and avoidable traffic obstructions as well as any need for optimization in the planning of measures to save time and costs.

The "Additional Technical Terms of Contract" (ZTV) and "Guidelines for the A 10/A 24 Availability Model" define the functional requirements and thus form the basis for the maintenance of the contracted section. They define, among other things, the condition survey and assessment to be carried out, the functional requirements (condition and damage characteristics) of the plant components to be met, and the implementation of maintenance measures.

PROJECT INFORMATION AT A GLANCE

- > **Focus:** Infrastructure construction
- > **Software used:** Allplan AEC

Project data:

- > **Client:** DEGES Deutsche Einheit Fernstraßenplanungs- und -bau GmbH
 - > **Design and implementation planning:** as-built documentation with changes to construction: Wayss & Freytag Ingenieurbau AG
 - > **Service phases:** 3, 4 and 5
 - > **Formwork concept:** Doka GmbH
 - > **Start of construction:** 2018
 - > **Planned completion:** probably 2023
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"Planning with Allplan is a very good starting point for further BIM applications. Communication with other software packages works without any problems. The Allplan model was an integral part of the federated overall model."

Thomas Tschickardt, BIM Manager of the A10/A24 Havelandautobahn working group and Competence Area BIM Management Wayss & Freytag Ingenieurbau AG, Thomas Grubert, Head of Technical Office Wayss & Freytag Ingenieurbau AG

THE CUSTOMER

Wayss & Freytag Ingenieurbau AG is mainly active in the German civil engineering market as well as in international tunneling. In addition to civil engineering and tunnel construction, Wayss & Freytag is known for its comprehensive competencies in the fields of special civil engineering, highways,

construction within existing structures and environmental technology. The company's projects are characterized by convincing civil engineering performance and professionalism, and are carried out with high standards and a focus on quality, work safety and adherence to schedules..

ABOUT ALLPLAN

ALLPLAN is a global provider of BIM design software for the AEC/O industry. True to our "Design to Build" claim, we cover the entire process from the first concept to final detailed design for the construction site and for prefabrication. Allplan users create deliverables of the highest quality and level of detail thanks to lean workflows. ALLPLAN offers powerful integrated cloud tech-

nology to support interdisciplinary collaboration on building and civil engineering projects. Around the world over 500 dedicated employees continue to write the ALLPLAN success story. Headquartered in Munich, Germany, ALLPLAN is part of the Nemetschek Group which is a pioneer for digital transformation in the construction sector.

ALLPLAN GmbH

Konrad-Zuse-Platz 1
81829 Munich
info@allplan.com
allplan.com