ALLPLAN BRIDGE
NEW FEATURES IN VERSION 2022

The new version Allplan Bridge 2022 introduc–es an additional modeling approach to easily and quickly create the accurate geometry of precast girder bridges. Many new functions have been implemented for this and can also be used more widely. Further new features include AASHTO LRFD9 design and code checking, and support user friendliness.

HIGHLIGHTS

With Allplan Bridge 2022 a further modeling approach is introduced. This new modeling approach is especially tailored for precast and steel girder bridges.

Users can create parametric 3D templates so that repetitive bridge elements, such as straight precast girders, have to be defined only once and then placed parametrically as many times as necessary.

IFC 4.3 for infrastructure construction has been added to the IFC schema. The IFC 4.3 schema enhances the previous structure of products and product types to better explain the taxonomy of a specific domain.

The implemented version of AASHTO LRFD 9 provides comprehensive design and code–checking of concrete bridges based on a sectional approach.

ADDITIONAL MODELING APPROACH SPECIALIZED FOR PRECAST GIRDER BRIDGES

The original parametric modeling approach in Allplan Bridge is based on geometries following a road or a bridge axis. However, for certain bridge types, such as precast girder bridges, the geome–try of the superstructure, especially in the case of precast girders, is not governed by the geometry of the axis but rather by the geometry of the sub–structure and their position along the axis.

Thus, a further modeling approach is intro–duced. This new modeling approach is especially tailored for precast and steel girder bridges. The straightforward definition speeds up the modeling process and allows users to generate an exact model with ease. Several new features were implemented to enable this workflow and there are many additional new features that not only simplify this workflow but can be used more broadly.

PARAMETRIC MODULAR MODELING AND CHANGE IMPLEMENTATION OPTIMIZED

To optimize the modeling process even further, not only for precast girder bridges, but actual–ly for any bridge type where bridge elements are being repeated, the new version of Allplan Bridge enables users to create and use para–metric 3D templates. In this way repetitive bridge elements, such as straight precast girders, have to be defined only once and then placed parametrically as many times as neces–sary. This speeds up not only the modeling alone but also the process of implementing changes. Two element types can be used in this way, "link girders" and "pier elements".

PRECAST GIRDERS: CONVENIENT, PRECISE AND RAPID MODELING

The basic geometry of a typical precast girder is normally linear — it is not directly governed by the geometry of the bridge or road axis but rather by the geometry of the substructure. And this is also how it can be defined in Allplan Bridge. Once the geometry of the substructure is modeled, the precast girder can be generated by using the new element type "Link Girder". For this, only two reference points per girder need to be prepared in advance — normally at the top of the substructure. Once they are selected the basic geometry of the girder is set and in the next step fulfilled with assignment of the corresponding section and tables or formu–las in case the section of the girder varies.

MODELING OF LINK GIRDERS WITH MANY VARIANTS

Link Girders are 3D linear elements posi–tioned between two 3D points. The 3D points are created by reference points defined in cross–sections used in girders or piers. These two 3D points define the local axis of the girder and from here on the general approach used
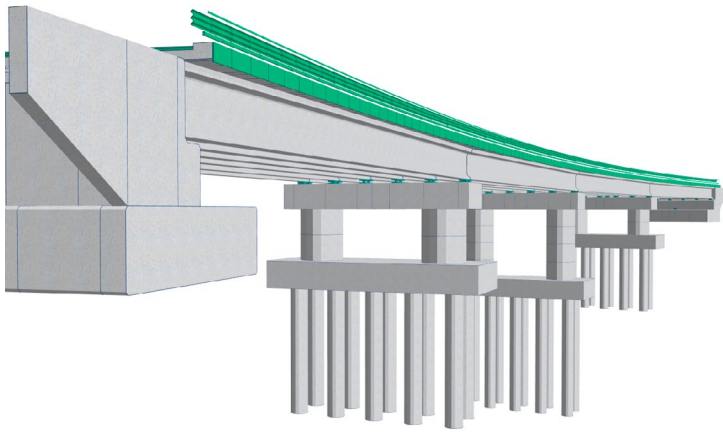
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Specialised modeling approach for Precast Girder Bridges
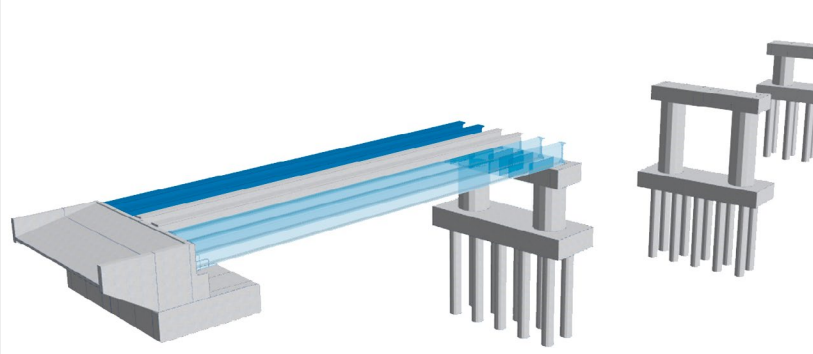
Create parametric 3D templates

in Allplan Bridge is applicable – an arbitrary cross–section can be assigned and, in this way, also any variation can be modeled. This allows users to use Link girders in many different ways, as mentioned already above, for precast gird–ers, steel girders, overhang supports, different bracings and many more.

FLEXIBLE AND PRECISE PLACEMENT OF PIERS

As of the new version piers can be positioned also relative to the axis, relative between two axes and relative between an axis and a girder. Furthermore, the offset from the axis can be either defined as a relative distance or it can be also defined as an absolute height. This gives the user the complete freedom to choose the input that is most suitable for them depending on the data provided or alternatively to input in a way such that the pier geometry will adjust correctly when implementing changes.
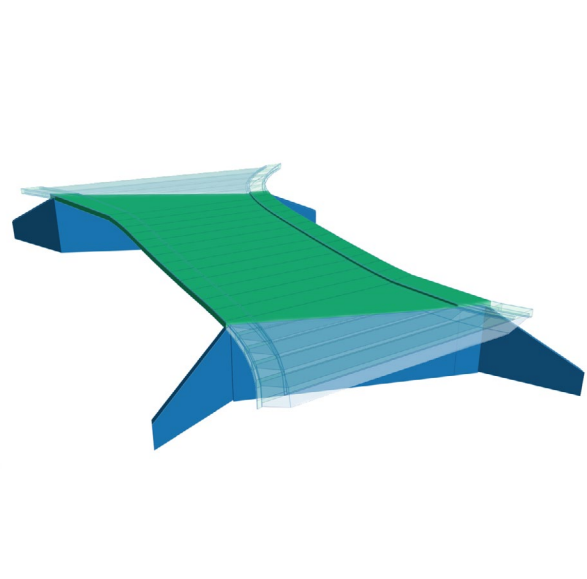
NEW TYPES OF STATIONS FOR MORE CONVENIENT DATA INPUT

To provide data input options even closer to the needs of our customers and their specific data requirements, new types of stations have been introduced for all element types, girders, piers, link girders and plates, for both, direct definition and for definition of templates. Now, in Allplan Bridge, the following types of stations are avail–
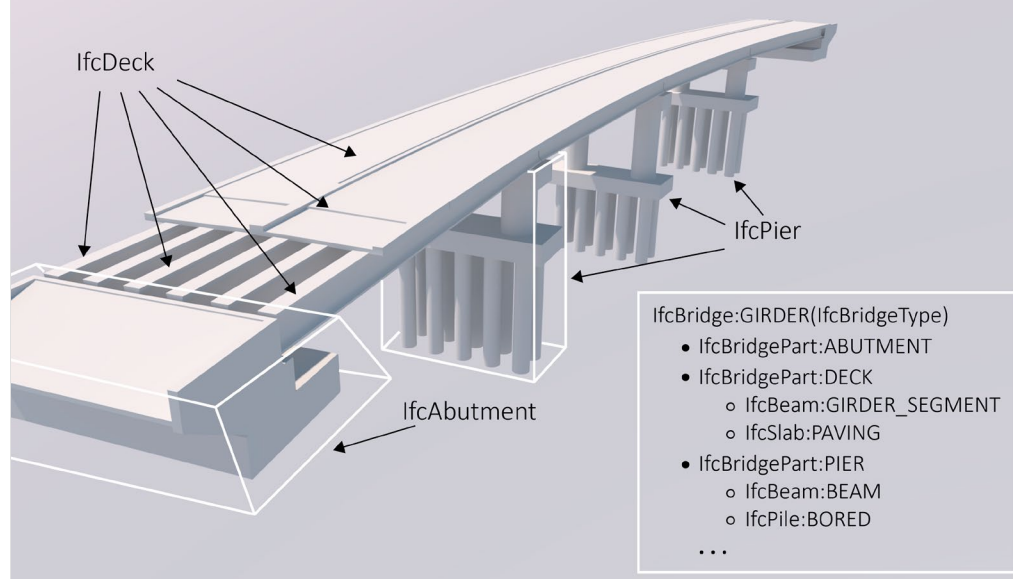
able: Local to the beginning of an element, local to the end of an element, global station, abso–lute height and relative station. This not only enables a user to adjust the input to the data that is at hand. Furthermore, the input can be defined in such a way, that if modifications need to be introduced in the model, the dependent and referenced bridge elements are automati–cally adjusted in a proper way.

DEFINE CUSTOM TREE YOURSELF FOR OPTIMIZED DATA MANAGEMENT

When it comes to the organization of data every user likes to organize their data in such a way that it is most reasonable. Now, Allplan Bridge also enables users to organize structural mem–bers in any order. The "Custom tree" supports multiple workflows. It is possible to use the initial navigation tree for generating structural members and to organize them arbitrarily in a subsequent step in the custom tree or to gener–ate structural members directly from the cus–tom tree. Because the tree item in the custom tree represents a link to the object in the initial navigation tree this allows the same member to be referenced multiple times. This enables users to organize the same data in two or more different ways, either in the same custom tree or in a new one – it is possible to have multiple custom trees.

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IfcDeck

IfcPier

IfcAbutment

IfcBridge:GIRDER(IfcBridgeType)
- IfcBridgePart:ABUTMENT
- IfcBridgePart:DECK
  - IfcBeam:GIRDER_SEGMENT
  - IfcSlab:PAVING
- IfcBridgePart:PIER
  - IfcBeam:BEAM
  - IfcPile:BORED
. . .

Skewed bridges   IFC 4.3 for enhanced project collaboration

SOLVING REAL WORLD ENGINEERING SCENARIOS FOR SKEWED BRIDGES EASILY

Frequently bridges do not span existing roads orthogonally but rather at a certain angle. This usually results that the beginning and end of such bridges are skew. The geometry of the skew section is not only governed by the cross-section normal to the bridge axis but also by the variation of the cross-section and elevation of the axis itself. This soon becomes complex to a further degree if the elevation and variations are not linear. Allplan Bridge 2022 provides a solution for these types of bridges. It consists of two steps. In the first step a template is generated where the geometry of the bridge with all the details is generated. In the second step the template is used for generation of the final geometry where only the position of the skew and the angle must be set.

CODE BASED DESIGN AND CHECKS ACCORDING TO EURO NORM EXTENDED

The Eurocode design and checks were extended with the brittle failure check based on the reduction of prestressing force method and detailing checks of soft and prestressing reinforcement. The tasks for ULS and SLS situations were merged into one common task. Therewith, design processes can be optimized.

IFC 4.3 FOR ENHANCED PROJECT COLLABORATION

For the use of the openBIM method a neutral data format is required, which plays a decisive role in the BIM workflow. IFC is often used in the construction industry. Now, IFC 4.3 for infrastructure construction has been added to the IFC schema. The IFC 4.3 schema enhances the previous structure of products and product types to better explain the taxonomy of a specific domain. In the domain of bridges, Bridge type and Bridge part type (facility part) are used with enhanced object types to represent respective bridge elements, such as Abutment, Pier, Deck, Foundation, Superstructure, Substructure and many more.

This new schema is supported by both Allplan Engineering and Allplan Bridge since ALLPLAN plays an important role in BuildingSmart. It allows the bridge structure to be more easily broken down. Further, it includes descriptions for object type, geometry, and materials. All this improves the quality of the IFC model and results in smoother BIM Coordination and Collaboration in bridge projects between all involved parties.
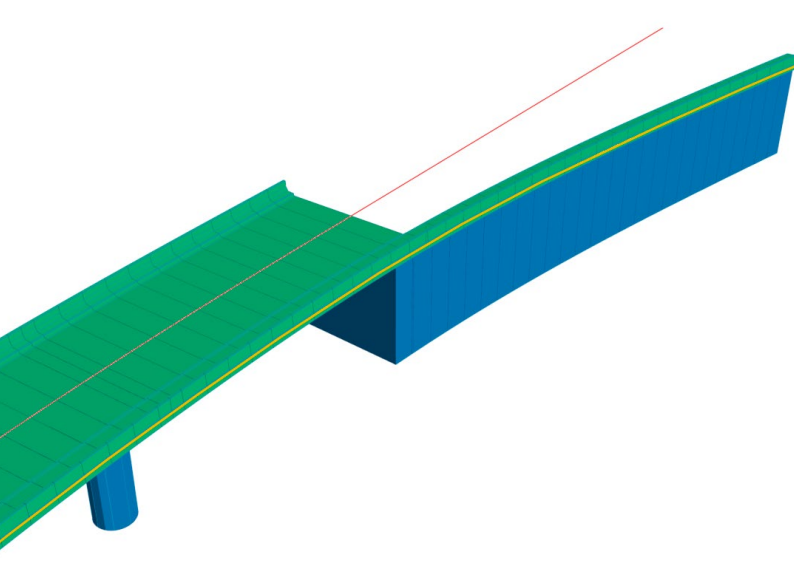
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Modeling even more conveniently using „Accompanying axis"
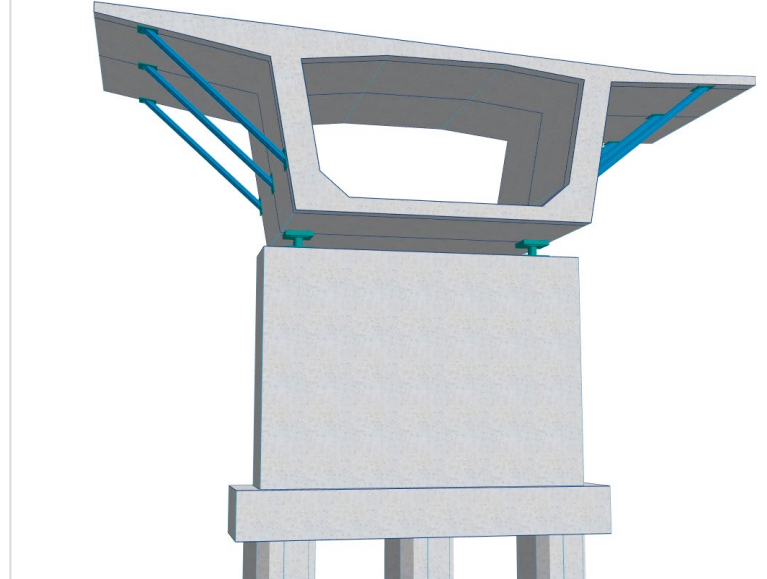
Pythonpart visualization / Modeling of link girders

MODELING EVEN MORE CONVENIENTLY USING "ACCOMPANYING AXIS"

In Allplan Bridge "Accompanying axis" represents an axis that is parametrically offset to the main axis. It is defined by a constant or variable offset (distance) in the horizontal and vertical direction relative to the main axis. With this it is possible to model, with ease, bridges that have an axis which is in a certain relation to the road axis. Furthermore, using this functionality side curbs can be modeled in a more comfortable way. Allplan Bridge is also often used for modeling of other structure es, for example retaining walls. With the "Accompanying axis" modeling of such structures becomes even more convenient.

AASHTO LRFD 9 FOR REINFORCEMENT DESIGN AND CODE CHECKING

The implemented version of AASHTO LRFD 9 covers strength limit states, service limit states, and fatigue limit state of reinforced and prestressed sections with the check of some detailing rules for designed reinforcement. This provides comprehensive design and code-checking of concrete bridges based on a sectional approach. The overall process takes over previously calculated internal forces based on the construction schedule considering creep and shrinkage calculations based on AASHTO functions. They are applied on a section with time-dependent material and cross-sectional properties. This means that concrete hardening in time is considered as well as the state of the section (active prestressing tendons, subtraction of ducts or grouting).

FURTHER NEW FEATURES

"Bloss-Curve", Spline transition in Table definition, Undo & Redo, Pythonpart visualization... there are many further new features that significantly improve the interaction with the product. One of them is "Undo & Redo", a feature that was perhaps gratuitous due to parametric data description but is now available for maximum user convenience.

Current system requirements can be found at allplan.com/info/sysinfo

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