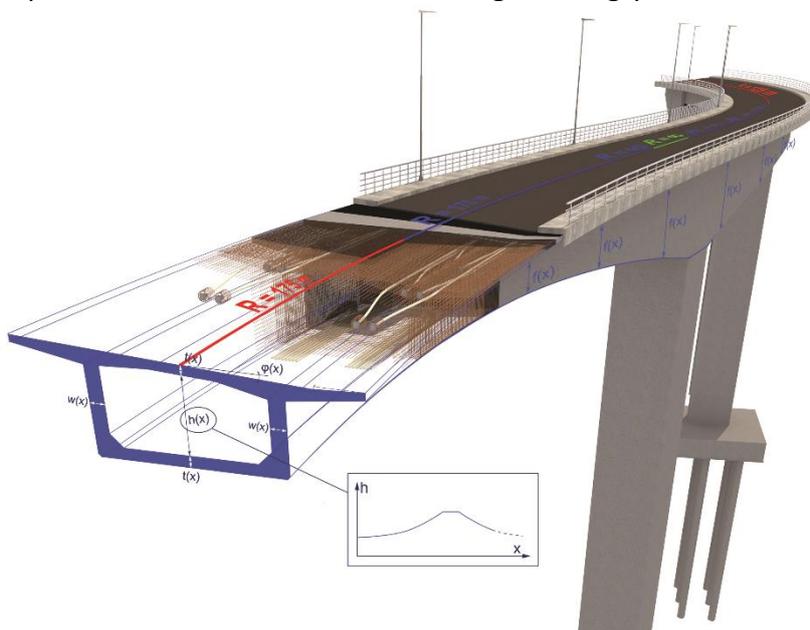## Manage Design Changes Easily

BIM (building information modelling) is a catchword currently resounding throughout the land. The application in bridge engineering is relatively new, however, the basic strategy of defining a concise information model of the bridge opens the door to the possibility of enormously easing the bridge management. The idea is to use the digital model throughout the whole design process and furthermore for maintenance and refurbishment purposes during lifetime. I.e. this option may also essentially ease the management of inevitably occurring intermittent design changes.

The crux of a good BIM solution is in fact the conception of the database, which must provide a simple and compact description of the model geometry even if it is very complex. It must allow for applying modifications with a minimum of required intervention by the user. I.e. a geometry description via coordinates of a huge amount of points and lines is not at all sufficient.

In this context new Bridge modelling functionality has recently been developed by ALLPLAN Infrastructure in Graz, which describes the whole bridge geometry including superstructure and substructure via governing parameters, relationships between them as well as tables and formulas with application rules. These parameters, relations and rules are directly stored in the database and used whenever the model is opened for viewing, applying modifications or detailing. This model is called a "parametric model".

The parametric model considers the alignment and the profile of the road. The superstructure cross-section of the bridge as well as its variation along the axis is parametrically described. Even complex geometries including doubly curved alignment and variable cross-sections are described easily with few alphanumeric parameters and stored formulas, making model configuration and modification quick and efficient.

Variations along the alignment are entered and described by tables or formulas and can include dependencies such as sub-alignments and cross-sections. Typically, the user defines the standard cross-sections together with variation rules, and this information will be used by the new modelling functionality ALLPLAN Bridge for accurately establishing the transition along the alignment whenever the model is loaded for further processing.

Substructure members such as bridge abutments and piers are generated using the same principle. To minimize the input procedure, the individual objects are related to vertical axes which are defined in relation to the superstructure. This allows for automatic adjustment of the substructure when the superstructure is modified.

This parametric model description guaranties an intelligent and consistent 3D Bridge model, where continuity between the different members is automatically kept when geometry modifications are applied at individual positions. The entire bridge geometry is automatically updated if the alignment and/or cross-sections are modified, including repositioning of abutments and piers. If only a certain structural member is modified, the directly linked elements will be recalculated such that the modification fits into the overall concept.

The new functionality considerably helps to manage inevitable changes that occur during the design process. The modifications are applied at their points of origin, and all other linked members are automatically updated.