Parametric bridge design – reinforcement design

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Abstract

Using BIM technology for the design process in the construction industry has become somewhat of a standard approach. For bridge design, various solutions offering geometric design functionality and data management facilities are available on the market. However, integrated solutions for seamlessly supporting the whole planning process are still a scarce commodity. The solution presented integrates architectural modeling, structural analysis, and sophisticated proof checking functionality in one package, where, based on a 4D architectural model, an analysis model is automatically derived, allowing for simulating the erection process in detail and investigating all relevant stress states. The focus of the paper is the reinforcement design of prestressed concrete sections, which is one of the most challenging tasks among the various requirements arising in the design process.

Keywords: bridge; BIM; concrete; prestressing; beam; cross-section; design; reinforcement; check; standard.

1 Introduction

BIM (Building Information Modeling) is a strategy to seamlessly perform and coordinate all required works arising during the design, construction, and operating phases of structural objects. This is achieved by using a detailed digital model of the structure as a central database, and procedures directly communicating with it, in all task settings throughout planning, construction, and lifetime.

Seamless data access and usability in all different planning and design tasks throughout the design and construction period is the key to effectiveness of the process. I.e., an intelligent data structure including all relevant design parameters instead of pure geometric description is required.

This parametrically described model can effectively form the basis for all required tasks, ranging from the geometrical layout of the structure and prestressing tendons, via structural analysis and construction process simulation, to sophisticated proof checking functionality with national design codes.

The solution includes many functions for different expert tasks required in the bridge planning process. Various aspects have already been previously presented in more detail [1]. In this contribution, we focus on the layout, design, and proof check of structural reinforcement.

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