A slender pedestrian bridge made of textile reinforced concrete

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Summary

The pedestrian bridge over a state road in Albstadt, Germany, had to be torn down due to immense corrosion damages of the steel reinforcement. The design of the new bridge allows a slender construction, thus, the new composite material textile reinforced concrete (TRC) is used. By using textiles made of non-corrosive materials like alkali-resistant glass rovings, concrete covers can be reduced to a minimum of only some millimetres to minimize the cross-sections.

The paper describes the design, structural analysis and load-bearing behavior of a 100 m long pedestrian bridge subdivided into six prefabricated TRC parts, each offering a maximum length of 17.20 m and a maximum span of 15.05 m. The 3.21 m wide cross-section, which is a T-beam, has a height of only 43.5 cm resulting in a slender bridge construction with a slenderness ratio of only H:L = 1:35.

Keywords: Textile reinforced concrete, TRC, pedestrian bridge, slender, light-weight, large-scale

1. Introduction

Fig. 1: Former pedestrian bridge in Albstadt, Germany (Photo by Groz-Beckert Group)

Existing pedestrian bridges made of steel reinforced concrete often show damages caused by the corrosion of the reinforcement. The concrete covers of those constructions were designed in accordance with former standards, but are too small with regard to the required corrosion protection of steel reinforcement against carbonation and chloride ingress. The corrosion of the steel reinforcement leads to cracks and spalling of the concrete. These damages cause optical detractions on the one hand, and a reduced load-bearing capacity of the construction on the other. The consequence is that these structures have to be improved by cost-intensive actions or replaced by new structures. One example of an older pedestrian bridge, which is damaged by corrosion of the reinforcement, is the pedestrian bridge over a state road in Albstadt, Germany, Fig. 1. Due to the immense corrosion damages, this bridge had to be torn down and has actually been replaced by a new bridge.

The aim of the design of the new bridge was a slender fair-faced concrete superstructure fulfilling demands on a frost resistant construction. Thus, the innovative composite material textile reinforced concrete (TRC) was chosen as construction material instead of the commonly used steel

https://doi.org/10.2749/222137810796024033