Second International Interactive Symposium on Ultra-High Performance Concrete
Extended Abstract (no paper submission)

Performance of Proto-type UHPC Link slab on a MDTA Overpass Steel Bridge

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Bridges
Full scale test/ Prototype

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Extended Abstract

Many early-day overpass bridges across the highway in the State of Maryland were designed as multiple simple-span bridges with either steel or prestressed concrete girders. Maryland Transportation Authority (MDTA) plans to upgrade those overpass bridges with link slab connections since joint failures are common problems of bridges in the United States. Unlike continuous bridges without expansion joints over the superstructure, link slab can be used to eliminate these desk joints by making the deck continuous while keeping girders as simple spans. Ultra-High-Performance Concrete (UHPC) is one of the candidate materials of link slab in this proto-type upgrade project. In the link slab connection study, bearings under the steel girders are designed to allow both rotation and longitudinal movements, thus minimizing the negative moments transferred between spans and the forces imparted to the connection. It is expected that if any cracking were to occur in this detail, it would be tightly spaced and would limit any water ingress to the structure elements below.

In order to evaluate the performance and detect cracks caused by bending of UHPC material, wireless strain gauges are used during the third point bending test in the material lab. However, considering the field condition, these same wireless strain gauges are supposed to function normally when they are embedded both under the wearing surface and above steel girders. In this study, strain gauges are improved by attaching on thin steel plates then installed before concrete pouring. By calibrating with several types of strain gauges that attached to the surface, strains measured by the embedded strain gauges attached on steel plates could closely represent the true strains. The lab test also includes cyclic loading to simulate moving loads in the field. By assigning cyclic bending load based on the third point bending test, the ultimate failure signals from strain gauges and the ductile performance of UHPC in the field could be verified. With these experiments, several finite element analyses of the pilot bridge had done and those results are critical in the field monitoring for link slab system condition assessment.