

This topic is “practice ready.” Yes No

Infrastructure Enhancement Utilizing Ultra-High Performance Concrete Bridge Deck Overlay

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Abstract

A large number of the nation’s bridges is rated as structurally deficient or functionally obsolete and requires immediate retrofit measures. A retrofit solution that is fast, cost-efficient, and reliable is needed to tackle this problem. Since bridge deteriorations typically start with deck cracking due to traffic loads and worsen by the freeze and thaw cycles, an alternative solution to prevent this is to apply a layer of thin ultra-high performance concrete (UHPC) layer on top of the normal concrete (NC) bridge deck. Since UHPC has a higher tensile strength and low permeability, cracking as well as water and chloride ingress can be minimized, which in turn will elongate the lifespan of the bridge. In this study, the thin UHPC overlay concept was successfully implemented on a county bridge in Iowa involving local contractors, state and county engineers, and material suppliers. The bridge overlay was continuously monitored and thus far, there has been no significant issue found. Three concrete slabs with and without the UHPC overlay were also tested in the laboratory. The results showed that UHPC overlay increases the stiffness and strength of the slab and provided that the minimum surface roughness at the UHPC-NC interface is satisfied. It was also found that the use of steel rebars at the interface is not effective to resist the negative moment that may occur at the supports.

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