

UHPC Overlay at Three Bridge Interchange in Elsmere, DE

William A. Geschrei, P.E. – Vice President, Whitman, Requardt and Associates, LLP
801 South Caroline Street, Baltimore, Maryland 21231 USA, Phone: 443-224-1530
Email: wgeschrei@wrallp.com

Zachary M. Gabay, P.E. – Senior Project Engineer, Whitman, Requardt and Associates, LLP
801 South Caroline Street, Baltimore, Maryland 21231 USA, Phone: 410-246-3437
E-mail: zgabay@wrallp.com

Bridge Rehabilitation Involving Machine-Paved UHPC Overlay

Extended Abstract

The 'Elsmere UHPC Bridge Overlay' project features three Delaware Department of Transportation (DelDOT) owned bridges: BR1-600, BR1-601, and BR1-604 located within the SR 141 and SR 2 interchange near Elsmere, DE. Elsmere, DE is a few miles west of Wilmington, DE. BR1-600 and BR1-601 each have a 180 ft. long two-span continuous steel superstructure. BR1-604 has a varying length (average approximately 80 ft.) simple-span steel superstructure.

The three bridges were constructed in 1973 and the steel superstructures are in good condition. However, two aging original bridge decks and one prematurely delaminating LMC overlay at the interchange (BR1-600 only) require rehabilitation to ensure long term serviceability. In addition, the bridges have failing transverse roadway joints and previously reconstructed abutment end diaphragms, and significant areas of spalled and delaminated concrete at the abutment stems.

This rehabilitation project will repair all defective concrete components, relocate the transverse abutment bridge joints away from the bridge superstructures (i.e., 'deck over'), and seal and protect the bridge decks with an UHPC overlay. The objective of the rehabilitation is twofold: increase the remaining service life of the bridge and reduce future maintenance costs (and resulting traffic impacts).

DelDOT is sensitive to traffic impacts at this interchange, increasing the complexity of this project beyond the scope of using a new and promising UHPC overlay material and placement method. Traffic studies on ramp closure durations, detour signage, and road-user costs were analyzed as critically as overlay-specific interests: deck preparation techniques, machine-paver capabilities, and UHPC on-site batch production.

As such, the UHPC rapid strength gain offers a critical advantage to the project schedule. The maintenance-of-traffic (MOT) plan dictates bridge construction staging on the SR 141 mainline, a collector-distributor road, and a ramp, at the interchange. The MOT phases and construction schedule were developed to minimize traffic disturbances and facilitate UHPC placement in more moderate fall and spring temperatures for easier workability, placement, finishing, and curing.

The UHPC overlay material will be placed in two thicknesses averaging 2 7/8" at BR1-600, where an existing overlay will be removed, and 1 1/4" at BR1-601 and BR1-604.

Construction is set to begin in early Calendar Year 2025 and all project work will be completed by the end of the year.

