Development of Rapid Retrofit UHPC Based Solution to Repair Damaged Flexural Members

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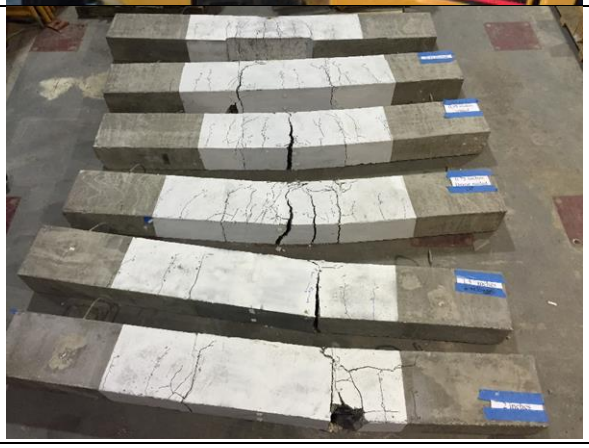
Extended Abstract

The bridge structure elements are exposed to severe environmental conditions which causes reduction in service life and durability that may require repair and retrofit. In this project, thin shells of Ultra High Performance Concrete (UHPC) are used to retrofit damaged portions of bridge elements. UHPC shells are beneficial for protection against deleterious environmental conditions. The application of these shells is suited for retrofitting due to easy installation, design for variety of shapes, increasing the strength of element, and reducing time and cost.

In this project, thirteen beam specimens were tested under three-point flexure tests for verification of the proposed retrofitting method. These test beams included an undamaged, damaged and retrofitted beams in different configurations. The damage scenarios in beam are simulated by varying concrete and steel area loss. The test variables include shell thickness, configuration and interface between UHPC and regular concrete. The configuration of additional UHPC shell was either applied flushed or an unflushed surface. The preparation of interface was done by sand blasting and use of mechanical connectors.

The results of the beam tests show that the UHPC shell concept to repair damaged bridge element is a promising concept. A comparison of retrofitted beams shows an increase in the flexure capacity of the beam compared to damaged beams. Retrofitting of beams prepared with sand blasting provided adequate bond between UHPC shell and regular concrete. Based on experimental results,

a numerical and analytical study will be used to find the most feasible detail for UHPC shell. Currently additional test is developing on deck retrofitting to validate methodologies for real life application and provision of design recommendations for retrofitting with UHPC shells.



Retrofitting beams

Retrofitting T-section deck