

**Development of Innovative Short-Span Bridge System Using UHPC Formworks**

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Bridges/ABC  
Full-scale Testing

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**Extended Abstract**

The superior mechanical properties of Ultra-High Performance Concrete (UHPC) such as high compressive and tensile strength has allowed its application for innovative bridge systems. High early strength gain and durability of UHPC makes it a viable choice for Accelerated Bridge Construction application. Recent studies have shown feasibility of UHPC as stay-in-place formwork for different bridge elements. In this research, an innovative structural system using stay-in-place UHPC formwork is proposed for short-span bridge super-structure and an experiment is designed to investigate its structural performance. In this approach, UHPC is prefabricated into an efficient formwork for both construction and structural performance. These forms consist of a series of semi-circular sections spanning longitudinally between the supports. After these prefabricated modules are positioned, reinforcement cage is placed inside, and they are filled and topped with normal concrete. The UHPC layer provides durability and protection for the cast-in-place concrete while improving the structural performance.

The research objectives are to optimize the use of UHPC for these elements, assessing the feasibility of construction, and structural performance of the composite section. A parametric finite element model was developed to optimize the shape and section of these elements for different span lengths. Based on the results of parametric study, a full-scale 20-foot span single-module

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specimen was constructed and monitored under actual conditions. The specimen was load-tested after monitoring strains and deflections for more than two months. The construction and test set-up of the specimen is shown in the figure below.

In this presentation the summary of parametric and optimization study, the construction details and monitoring of the prefabricated UHPC module, and structural performance of the composite section are provided. It is anticipated that the outcomes of this study will be used for proposing design and construction specification for short-span bridges using prefabricated modular UHPC formworks.



*Figure - Construction and test set-up of specimen at Florida International University.*