

RESEARCH PROBLEM STATEMENT

DATE: 09/06/2018	PROJECT AREA: Design
-------------------------	-----------------------------

TITLE: Connections Between Adjacent Concrete Bridge Sections using UHPC

PROBLEM STATEMENT:

Using prefabricated bridge sections for bridge construction provides opportunity for cost savings, reducing construction time, simplifying the construction process, and improved safety. Prefabricated bridge elements are typically used for accelerated bridge construction (ABC). Prefabricated bridge elements are manufactured at precast concrete plants under controlled conditions to ensure quality and then shipped to the bridge site. Connections between adjacent bridge elements are made using concrete grout placed in the gap formed between the adjacent bridge elements at the construction time. Current methods typically use normal strength concrete, however these connections often incur cracking. Consequently, these connection details need to be improved. Using ultra-high performance concrete (UHPC) provides an alternative approach. UHPC has a much higher compressive/tensile strength than normal strength concrete and therefore is able to prevent cracking. In addition, the higher concrete strength allows for shorter reinforcing steel development lengths, which translates to reduced connection lengths and narrower closure pours.

OBJECTIVES:

Develop details and guidelines for ARDOT to use UHPC at connections between adjacent prefabricated bridge elements. The UHPC connection should have a greater strength and durability than the structural elements that are being connected.

Investigate UHPC strength as a function of time to ensure adequate material strength at the time live loading is initially applied with ABC construction.

Develop a locally designed non-proprietary UHPC mix specifically for connections.

FORM OF RESEARCH IMPLEMENTATION AND RETURN ON INVESTMENT:

Use UHPC at a bridge connection during construction at a bridge using prefabricated bridge sections.

Develop details and guidelines for UHPC connections.

Conduct a benefits / cost analysis to examine the benefits of UHPC connections compared to conventional normal strength concrete connections.

Developing an ARDOT non-proprietary UHPC mix that is equivalent to the commercially available proprietary UHPC versions will significantly reduce connection costs. Proprietary versions range in cost between \$2500-\$3500 / yd³, whereas raw constituents in non-proprietary versions cost \$800 / yd³.

Estimated Project Duration: 24 Months

PREPARED BY: Ernie Heymsfield & Cameron Murray

AGENCY: University of Arkansas

PHONE: **REVIEWER:** Kim Romano

Standing Subcommittee Ranking <u>2/3</u>	Advisory Council Ranking <u>11/37</u>	Statement Combined with Statement Number(s) _____
---	--	--