

**TRANSPORTATION POOLED FUND PROGRAM  
QUARTERLY PROGRESS REPORT**

Lead Agency (FHWA or State DOT): IOWA DOT

**INSTRUCTIONS:**

*Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.*

<b>Transportation Pooled Fund Program Project #</b> TPF-5(366)		<b>Transportation Pooled Fund Program - Report Period:</b> Quarter 1 (January 1 – March 31, 2022) Quarter 2 (April 1 – June 30, 2022) xQuarter 3 (July 1 – September 30, 2022) Quarter 4 (October 4 – December 31, 2022)	
<b>Project Title:</b> Development of a Design Guide for the Structural Design of Ultra High Performance Concrete			
<b>Project Manager:</b> Jim Hauber Brian Worrel		<b>Phone:</b> 239-1393 239-1471	<b>E-mail:</b> james.hauber@iowadot.us brian.worrel@iowadot.us
<b>Project Investigator:</b> Sri Sriitharan		<b>Phone:</b> 294-5238	<b>E-mail:</b> sri@iastate.edu
<b>Lead Agency Project ID:</b>	<b>Other Project ID (i.e., contract #):</b> Addendum 618	<b>Project Start Date:</b> 6/15/17	
<b>Original Project End Date:</b> 5/31/18	<b>Project End Date:</b> 10/31/2022	<b>Number of Extensions:</b> Pooled fund project – yearly budgets	

On schedule       On revised schedule       Ahead of schedule       Behind schedule

## Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Total Percentage of Work Completed
\$239,528	\$187,413	65%

## Quarterly Project Statistics:

Total Project Expenses This Quarter	Total Amount of Funds Expended This Quarter	Percentage of Work Completed This Quarter
\$2,543		5%

**Project Description:** Ultra-High Performance Concrete (UHPC) has been recognized as a choice of material for mitigating bridge infrastructure challenges as well as to introduce innovative construction projects. In recent years, the use of UHPC has gained momentum in bridge projects across the country. However, formal structural design guidance for this material does not exist in North America, and therefore a comprehensive effort is required to formulate recommended design guidance so that the application of this material can be broadened.

The overall objective of this study is to facilitate advancement in the state-of-the-practice for UHPC in the US highway sector, which will include development of a design and construction guide specification. These advancements will also focus on other critical needs that are currently hindering the wider use of UHPC

A Steering Committee will be formed for this Pooled Fund Project. This Steering Committee can include contributing entities and will be led by the host State. The tasks are:

1. Coordinate meetings amongst committee members with the goal of study execution and information dissemination.
2. Provide guidance on national level advancement efforts.
3. Develop and prioritize research needs statements.
4. Develop, verify, and/or standardize test methods for assessment of UHPC material properties.
5. Complete structural performance-related research as necessary to develop greater knowledge of structural behavior.
6. Complete construction-related research as necessary to develop greater understanding of optimal construction processes.
7. Coordinate, share, and advance existing special provisions for the use of UHPC in highway construction projects.

**Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):**

**Progress This Quarter:**

Testing of samples with different fiber types was completed. Different fiber types included polyvinyl alcohol (PVA) fibers, Polyoxymethylene (POM) fibers, Hooked-end (HF) steel fibers, Cem-Fil mini bars (glass) fibers, Hybrid-composite (HC) fibers, and carbon-nano (CN) fibers. For PVA fiber test series, two lengths of 0.75 and 0.5 in. were used in combination with steel fibers. Also, POM and CN fibers were used in combination with steel fibers. HF, HC and glass fibers were used at 2% fiber volume. The only remaining testing is the specimens with POM and steel fibers combination.

**Anticipated work next quarter:**

Testing of final set of specimens is planned for this month. The results of the specimens will be analyzed and reported. A second journal article is prepared and will be shared with the TAC.

**Significant Results:**

The testing procedure showed an 80% success rate for all different fiber types. The average tensile strengths of specimens obtained from specimens with combination of steel (1%) and pva (1.5%) are comparable to strengths of specimens with 2% steel fibers. Specimens with HC fibers at 2% volume shown a strength 30% lower than those with 2% steel fiber specimens, but produced larger multi-cracking phase and four times the localized cracking strain. Addition of carbon nano fibers also shown a larger multi-cracking phase. The test results will be further evaluated and analyzed for different phases of the tensile test response.