

## 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, 2021) Quarter 2 (April 1 – June 30, 2021) Quarter 3 (July 1 – September 30, 2021) X Quarter 4 (October 4 – December 31, 2021)	
<b>Project Title:</b> Development of a Design Guide for the Structural Design of Ultra High Performance Concrete		
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<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
\$179,213	\$145,349.11	65%

Quarterly Project Statistics:

Total Project Expenses This Quarter	Total Amount of Funds Expended This Quarter	Percentage of Work Completed This Quarter
\$28,677.34		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:**

Task 1 - FHWA was chosen to test the last set of specimens due to them introducing a new test machine. However, there was an unexpected delay in testing the samples due to a concern about the aluminum plates being not fully affixed to some of the samples. The cause for this issue is being investigated. The tests are scheduled to be completed by the end of January 2022.

Task 2 - The casting of several specimens for the new task has been completed. The specimen sets with different fiber types have not been prepared. Testing of two sets of specimens has also been completed. Different fiber types have been collected from various vendors, including steel, PVA and non-metallic, high-strength fibers.

**Anticipated work next quarter:**

Testing of the specimens from the first task is planned to be completed by the end of January. Next, the final document will be updated and submitted for journal publication with approval from TAC. Specimens with different types of fibers will be cast, and testing of all the remaining specimens is planned for the next quarter. Results of the specimens will be analyzed.

**Significant Results:**

The testing procedure showed an 80% success rate for a set of specimens with a combination of carbon-nano fibers and steel fibers, collectively representing 2% equivalent fibers. A larger multi-cracking phase was observed in these specimens compared to specimens with only 2% steel fibers. The results will be further evaluated and analyzed for different phases of the tensile test response.