TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): MICHIGAN DEPARTMENT OF TRANSPORTATION

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.

Transportation Pooled Fund Program Project # *(i.e, SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX)* TPF-5(363) [CY 2018]	**Transportation Pooled Fund Program - Report Period:** ☑ Quarter 1 (January 1 – March 31) ☐ Quarter 2 (April 1 – June 30) ☐ Quarter 3 (July 1 – September 30) ☐ Quarter 4 (October 1 – December 31)	
Project Title: Evaluation of 0.70 inch Diameter Carbon Fiber Reinforced Polymer (CFRP) Pretensioning Strands in Prestressed Beams		
Name of Project Manager(s): Matthew Filcek	**Phone Number:** 517-322-5709	**E-Mail** FilcekM@michigan.gov
Lead Agency Project ID: OR15-541	**Other Project ID (i.e., contract #):**	**Project Start Date:** April 18, 2017
Original Project End Date: September 30, 2020	**Current Project End Date:** September 30, 2020	**Number of Extensions:** 0

Project schedule status:

☐ On schedule ☑ On revised schedule ☐ Ahead of schedule ☐ Behind schedule

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
$358,733.00	$1,870.00	16

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
$1,870.00 and 0.50%	$1,870.00	16

Project Description:

MDOT has been working with Lawrence Technological University [in Michigan] for many years to develop carbon fiber reinforced polymer (CFRP) prestressed concrete beams. Recent research developments on demonstration projects have shown that 0.6 inch diameter CFRP strands have smaller nominal area and lower allowable capacity than steel 0.6 inch diameter steel strands; thus requiring more strands for a given design. This makes it difficult for bridge designers to find projects where we can fit enough CFRP strands in a beam to meet load carrying requirements.

Currently, 0.7 inch diameter CFRP strands are available; thus, making the use of CFRP pre-tensioning in pre-stressed beams more viable. The proposed research is necessary in order to evaluate the safe use of 0.7 inch diameter CFRP strands in a beam to meet load carrying requirements.

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

During this quarter, the research team worked on Tasks # 1, 2, 3, 4, 6, and 7 of the research project:

Task #1 Literature review: The research team continued to gather the necessary information and previous research work and is currently analyzing previous work and establishing key research points.

Task#2 Anchorage/tensile strength: The research team finalized testing 5-ft long test specimens under uni-axial test setup at ambient temperature. Test results were summarized and analyzed to verify CFCC mechanical properties including average tensile strength, tensile strain, and elastic modulus at ambient temperature.

Task #3 High temp/freeze-thaw: The research team continued to prepare 5-ft long test specimens and is currently finalizing the testing frames and the test setup for evaluating the performance of CFCC strands at high temperature and after exposure to multiple cycles of freezing and thawing. The first part of high temperature evaluation was completed. The CFCC stands were subjected to increase in temperature while being prestressed. The loss of prestressing force was observed with the increase in temperature.

Task #4: Creep/relaxation/prestress loss: The research team constructed the test frames for creep and relaxation testing and the test specimens are currently under continuous monitoring. In addition, the research team evaluated the loss of the prestressing force in 40-ft long CFCC strands anchored using three wedge anchors and coupler system. The loss of the prestressing system included the relaxation of the strands and the loss in the force due to seating of the anchors. Monitoring of the prestressing strands continued for 40 days.

Task #6 Precast beams under fire/freeze-thaw: The research team completed the construction of two full scale box beams prestressed with 0.7 in CFCC strands for fire testing. The research team has also built the formwork and is currently working on the reinforcement cages for two bulb T beams that, along with the constructed box beams, will be tested under load combined with a fire event according to ASTM E119 time-temperature curve. After construction of the bulb T beams, the research team will build the beam specimens that will be tested under 300 cycles of freezing and thawing according to ASTM C666.

Anticipated work next quarter:

The research team will continue to work on different research items according to the proposed work schedule. During the next quarter, it is expected that the research team will work on Tasks 1, 3, 4, 5, and 6 and will continue to share and discuss the test results with MDOT Engineers.

Significant Results:

Full-scale beams [Task #7]: Out of three full scale 40-ft long AASHTO I beams, the research team has completed the testing of two beams (with steel strands and with 0.7 in. CFCC strands). The research team is currently working on the instrumentation and testing of the third beam with 0.6 in. CFCC strands. The final testing and failure of the beam is expected to take place during the summer of 2018.

Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).

Potential Implementation: