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.

Transportation Pooled Fund Program Project # *TPF-5(368)*	**Transportation Pooled Fund Program - Report Period:** Quarter 1 (January 1 – March 31, 2021) Quarter 2 (April 1 – June 30, 2021) X Quarter 3 (July 1 – September 30, 2021) Quarter 4 (October 1 – December 31, 2021)

Project Title: Performance Engineered Concrete Paving Mixtures		
Project Manager: Khyle Clute	**Phone:** 515-239-1646	**E-mail:** khyle.clute@iowadot.us
Project Investigator: Peter Taylor	**Phone:** 515-294-9333	**E-mail:** ptaylor@iastate.edu

Lead Agency Project ID:	**Other Project ID (i.e., contract #):** Addendum 629	**Project Start Date:** 10/1/17
Original Project End Date:	**Current Project End Date:** 12/31/2022	**Number of Extensions: PFS**

Project schedule status:

X 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
$2,230,000	$1,795,108.04	NA

Quarterly Project Statistics:

Total Project Expenses This Quarter	Total Amount of Funds Expended This Quarter	Percentage of Work Completed This Quarter
$9,360.02		

Project Description:

Concrete for pavements has historically been specified and field controlled around acceptance criteria that do not relate well to durability (slump, air content, strength). Paving concrete specifications need to be built upon engineering properties that directly relate to good field performance. With the recent advancements in research knowledge on failure mechanisms, and the parallel development of better tests, this is possible.

A review of many current and new specifications has found that they are still largely based on strength, slump, and air, which provide limited correlation with the mechanisms of pavement failure currently observed. The need for change in the way we specify concrete, especially concrete for paving mixtures, is becoming increasingly apparent as mixtures become more complex through a growing use of a range of chemical admixtures and supplementary cementitious materials. Traffic loadings continue to increase, more aggressive winter maintenance practices are implemented, and demand increases to build systems more quickly, cheaply, but with intent for increased longevity.

Tasks include:

- Task 1: Implementing What We Know
- Task 2: Performance Monitoring and Specification Refinement
- Task 3: Measuring and Relating Early Age Concrete Properties to Performance

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

For Quarter ending September 30, 2021

- The Iowa DOT has agree to serve as the lead state for Phase 2 of the TPF 5(368) and CP Tech staff continues movement towards project development.
- Team activities, calls with agencies and contractors are focused on continuing to encourage shadow testing, data collection and analysis, a construction specification incorporating PEM language, pilot projects and state/industry implementation. Calls were made to Idaho, Arkansas, Tennessee, Maine and Kansas.
- The PEM team continues to collaborate with FHWA's Mobile Concrete Technology Center (MCTC) in providing training, assistance and PEM Open Houses. Unfortunately, this activity has been delayed due to various of COVID 19 travel restrictions. FHWA has successfully initiated on-line test demonstration/training through the MCTC. It remains the PEM Team's intent to provide all participating SHAs one opportunity for local training. Those states not yet receiving training include Georgia, Illinois, Maine, Ohio, and Pennsylvania. We have contacted those states and are in discussion to see what training needs they have. We will then select the appropriate format and schedule training dates and formats.
- As part of training requests, members of the PEM research team and FHWA provided a workshop in Nashville on August 23 & 24 to members of the Tennessee Department of Transportation. The CP Tech Center met virtually with the Arkansas Department of Transporation on July 27.
- As in the past, PEM team members are on-call to respond to inquiries from pooled fund member SHAs and contractors/producers, providing guidance about testing and response to field issues.
- Through the FHWA Cooperative Agreement, the PEM team is targeting a precision and bias testing event for SAM, Box and VKelly in Ames as soon as travel restrictions allow. We have also agreed with FHWA on a plan for precision and bias work on resistivity that Jason Weiss will be coordinating with various laboratories. These activities will assist in moving forward with full standardization of the PEM tests.

- The AASHTO COMP (Committee on Materials and Pavements) met for their annual meeting, virtually during the first two weeks of August. PEM tests were topics of discussion and action during the meetings of TS 3c- Hardened Concrete and TS 3b – Fresh Concrete**.** PEM Team member Cecil Jones reports that the committee voted to send the following standards to ballot as full standards:
    - PP 84 (Standard Practice for Developing Performance Engineered Concrete Pavement Mixtures)
    - TP 118 (SAM to correct a procedural error from last year's ballot)
    - TP 119 (Uniaxial resistivity)
    - TP 137 (Box test).
- A special AASHTO Task Force has been discussing "Concrete Resistivity and the Formation Factor" to address comments and look at TP 358, TP 119 and PP84 standards to assure proper terminology and address issues related to conditioning methods and geometry corrections.
- As part of the Technology Tuesday webinar series, the CP Tech Center and FHWA presented "Advancements in Performance Engineered Mixtures (PEM's)" on September 14, 2021.
- NCE has continued collecting pavement samples from SPS-2 sites. Oregon State University and Oklahoma State University will provide lab testing and analysis of LTPP data and cementitious materials suspected for MRD.
- Oregon State University has tested sample cylinders for porosity and formation factor from Maine Department of Transportation.
- Provided update to the PEM website, incorporating paving project sites in Wisconsin that included PEM testing and research.

Anticipated work next quarter:

- CP Tech and Snyder and Associates will continue visits with each SHA and industry representation to assure that we are providing program/assistance that addresses their needs and objectives.
- The state and industry visits will also help us to develop interest in a future TPF initiative that will continue support for PEM implementation and further work in the area of improving paving process beyond the mix, further enhancing concrete pavement performance.
- The discussions will also include a review of the SHA specification summary table for possible updates regarding the practice of the PEM principles and specification updates. https://intrans.iastate.edu/app/uploads/sites/7/2020/07/PEM-State-Spec_Reviews-Table-2020-07-02.pdf
- Collect, review and process 2020 and 2021 shadow test data using the PEM data entry spreadsheet. Synthesize the information and make it readily available to all TAC members and interested parties.
- Visit with the PEM TAC to identify and define current and future needs for training of SHA, private engineering and industry. We intend to develop and propose a PEM training program for future advancement of state/industry preparedness.
- Schedule and present the one-day engineering level PEM workshop to interested agencies and industry. The intended audience is the group of central office and district SHA materials and construction engineers who will be directly responsible for guiding the PEM implementation in their state. We will also explore the concept of offering the webinar in a multi-day format.
- Provide general outreach and assistance to SHAs and industry as requested/needed.
- Encourage SHAs to consider additional shadow testing for upcoming projects and share test data with the research team.

- Further discussion about the value of developing model PEM construction specifications in cooperation with FHWA with SHAs and Industry.
- Continue work work with AASHTO to move tests forward to full standards.
- Develop webinar on updated resistivity testing.
- Develop webinar on SAM testing to include the latest test updates.
- Continue to collect pavement samples from SPS-2 sites and related lab testing for comparison with current PEM test protocol.

Significant Results:

We continue to see increasing interest and commitment to the PEM Initiative and the improvement that implementation promises for long term performance of concrete pavements. The PEM Team is reconized as a resource to agencies and industry regarding the PEM approach. We are hearing from states, local paving groups, the national associations and individual contractors who are stepping forward to participate in shadow testing projects. Several SHAs are moving toward development of construction specifications, QC strategies and expanded data analysis. This illustrates continuing progress on our journey to PEM implementation. The team is moving forward to gather and synthesize data, new and old, that will help to confirm applicability of key tests to PEM objective. Finally, we are moving forward to define the next phase of PEM for concrete pavements, thinking beyond the mix and related tests.

Circumstances affecting project or budget (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).

TAC members

Praul, Mike & Bob Conway / Federal Highway Administration
Baer, Patricia / Pennsylvania Department of Transportation
Richard Bradbury / Maine Department of Transportation
Covay, Jeff / Arkansas Department of Transportation
Dennis, Dan / New York State Department of Transportation
Hanson, Todd / Iowa Department of Transportation
Hodges, Darin / South Dakota Department of Transportation
Hunter, Brian / North Carolina Department of Transportation
Krstulovich, James / Illinois Department of Transportation
Lim, S. David / California Department of Transportation
Masten, Maria / Minnesota Department of Transportation
Wadley, Dan / Kansas Department of Transportation
Mellons, Jason/Tennessee Department of Transportation
Miller, Dan / Ohio Department of Transportation
Parry, Jim / Wisconsin Department of Transportation
Prieve, Eric / Colorado Department of Transportation
Johnson, Daryl / Oklahoma Department of Transportation
Staton, John / Michigan Department of Transportation
Waters, Jason / Georgia Department of Transportation
Wielenga, Craig / Idaho Transportation Department