# 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 #**<br>*TPF-5(437)* | **Transportation Pooled Fund Program - Report Period:**<br>Quarter 1 (January 1 – March 31)<br>Quarter 2 (April 1 – June 30)<br>X Quarter 3 (July 1 – September 30)<br>Quarter 4 (October 1 – December 31) |
|---|---|
| **Project Title:**<br>Technology Transfer Concrete Consortium (TTCC) TPF-5(437) | |
| **Project Manager:**<br>Khyle Clute | **Phone:**<br>239-1471 **E-mail:**<br>khyle.Clute@iowadot.us |
| **Project Investigator:**<br>John Adam | **Phone:**<br>294-3781 **E-mail:**<br>jfadam@iastate.edu |

| **Lead Agency Project ID:** | **Other Project ID (i.e., contract #):**<br>Addendum 732 | **Project Start Date:**<br>2/5/20 |
|---|---|---|
| **Original Project End Date:** | **Contract End Date:**<br>09/30/2026 | **Number of Extensions:**<br>Incremental funding, 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 |
|---|---|---|
| $2,326,402 | $2,070,281 | 80 |

***Quarterly*** Project Statistics:

| Total Project Expenses This Quarter | Total Amount of Funds Expended This Quarter | Percentage of Work Completed This Quarter |
|---|---|---|
| $75,591 | N/A | 10 |

**Project Description:**

Increasingly, state departments of transportation (DOTs) are challenged to design and build longer life concrete pavements that result in a higher level of user satisfaction for the public. One of the strategies for achieving longer life pavements is to use innovative materials and construction optimization technologies and practices. In order to foster new technologies and practices, experts from state DOTs, Federal Highway Administration (FHWA), academia and industry must collaborate to identify and examine new concrete pavement research initiatives. The purpose of this pooled fund project is to identify, support, facilitate and fund concrete research and technology transfer initiatives.

The goal of the TTCC is to:

- Identify needed research projects
- Develop pooled fund initiatives
- Provide a forum for technology exchange between participants
- Develop and fund technology transfer materials
- Provide on-going communication of research needs faced by state agencies to the FHWA, industry, and CP Tech Center

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

- The Fall NCC meeting was held utilizing TPF-5(544) funds (see quarterly report)
- A contract for Lab services for cementitious materials & concrete mix consistency was completed with Braun Intertec. The TAC overseeing this project is led by Dan King at the CP Tech Center, with members: Todd Hanson, Iowa DOT; Jason Richins, Utah DOT; Dan Wadley, Kansas DOT; Maria Masten, Minnesota DOT; Eric Prieve, Colorado DOT; Tirupin Mandal, Wisconsin DOT; Dan Miller, Ohio DOT. Project description is attached.
- A steering committee for a project to examine the implementation of blended cements was formed at the NC2 workshop. TEAMs meetings continue to be held; notes from August meeting and committee are attached.

**Anticipated work next quarter (October - December):**

- Workshops for the state DOTs will continue under this pooled fund for the rest of 2025.
- Continued monitoring of the lab work on cementitious materials & concrete mix consistency.
- Continued refinement of project to examine the implementation of blended cements

**Significant Results:**

**See http://www.cptechcenter.org/ncc/TTCC-NCCMeetings.cfm**

**Circumstance 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).** N/A

## Evaluation of Effects of Portland Limestone Cement (PLC) Variability on Mortar Fresh Properties

### PROBLEM STATEMENT:

Production of Portland Limestone Cements (PLCs) has grown rapidly in the US since early 2022. PLCs now make up about 60% of the US cement market, and have nearly or entirely displaced Type I/II cements for everyday use in many regions.

The pavement construction and engineering communities have experienced several challenges in recent years, such as reduced reliability in achieving strengths and greater incidence of surface scaling. These challenges may be due to:

- Differences in water demand between PLCs and traditionally used cements, causing some batch plants to add water to adjust workability, leading to increased w/cm ratios.
- Differences in bleeding and setting causing finishing crews to prematurely finish or overwork concrete slab surfaces.

Other effects have also been suggested regarding differences in response to working temperature, admixture chemistry, SCM type, and other mixture proportion variables.

To address these concerns, the CP Tech Center is working to more thoroughly investigate the properties of PLCs, including the variability between different sources of PLCs, and the sensitivity of fresh and hardened concrete properties to this variability. The Technology Transfer Concrete Consortium (TTCC) pooled fund TFP-5(437) has agreed to devote funding to investigate the fresh properties of mortar mixtures prepared with PLCs to analyze how they vary with changing PLC sources, as well as interactions with mixture design parameters.

The aim of the work is to obtain ten PLCs, comprising cements from two different plants from each of five different cement manufacturers, and to conduct a phased testing program (see Tasks). The work only involves the testing, as analysis of the findings will be conducted by CP Tech Center staff.

### Tasks

The laboratory will be responsible for obtaining sufficient representative materials comprising cements from two different plants from each of five different cement manufacturers. Samples of Class F and Class C fly ash, and slag cement will also be required. Selection of, and contact with, the suppliers should be conducted in collaboration with CP Tech Center Staff. The sources of the cements will be kept anonymous.

Tests will be conducted directly on the PLC powder (Task 1) as well as on mortar mixtures prepared from each PLC (Tasks 2-6). The mortar mixtures will be prepared according to the following baseline parameters:

- Fixed fine aggregate source and gradation
- Sand/cementitious ratio = 3:1
- w/cm ratio = 0.45
- No SCM replacement
- No air-entraining or water-reducing admixtures
- Mixing temperature = 70°F

### Task 1 – Characterize Cements (10 samples)

Conduct the following tests on each of the 10 cements:

- X-ray fluorescence (XRF) in accordance with ASTM C114
- Thermogravimetric analysis (TGA) in accordance with ASTM C1872
- Particle size distribution (PSD) using laser diffraction

### Task 2 – Effect of w/cm (30 samples)

Conduct the following tests on mortar mixtures made with each of the 10 cements prepared at varying w/cm ratios of 0.40, 0.45, 0.50:

- Water demand (mortar slump) in accordance with ASTM C1810
- Bleed in accordance with ASTM C1741
- Set time using calorimetry in accordance with ASTM C1753
- Early hydration rate up to 72 hours in accordance with ASTM C1753
- Rate of stiffening using mini-slump in accordance with FHWA method (Taylor 2006)

### Task 3 – Effect of supplementary cementitious material (30 samples)

Conduct the same tests on mortar mixtures made with each of the 10 cements prepared with 20% Class F fly ash, 20% Class C fly ash, or 30% slag cement.

### Task 4 – Effect of water reducing admixture (30 samples)

Conduct the same tests on each of mortar mixtures made with each of the 10 cements prepared with 2 Type A WRA or 1 Type F WRA at a fixed dose in the middle of the manufacturers' recommended dosage rates.

### Task 5 – Effect of mixture temperature (20 samples)

Conduct the same tests on each of mortar mixtures made with each of the 10 cements prepared at 50 and 90˚F. Curing temperature will be 70˚F

### Task 6 – Combined effects (12 samples)

Conduct the same tests on each of the following combinations using mortar mixtures prepared with 20% class C fly ash at 90˚F. Selection of the PLCs and WRAs to test in Task 6 will be based on the findings from the first 5 tasks in discussion with CP Tech Staff and NC2 PLC Task Force.

Consideration may be given to additional testing based on the results of the testing program, and will be negotiated after Task 6 is completed.

### Reports

- A draft data file shall be submitted when Tasks 1 through 5 are completed.
- A draft data file shall be submitted when Tasks 6 is completed.
- A laboratory report describing the materials used, the tests conducted, the proportions used and the test results shall be submitted at the completion of the work.

# NC$^2$ Blended Cements Steering Committee Meeting

**August 19, 2025**

Attendees

| | First | Last | Organization | E-Mail |
|---|---|---|---|---|
| x | Maria | Masten | Minnesota DOT | maria.masten@state.mn.us |
| x | Whitney | Wise | Wyoming DOT | whitney.wise@wyo.gov |
| x | Lieska | Halsey | Nebraska DOT | Lieska.Halsey@nebraska.gov |
| x | Jason | Mellons | Tennessee DOT | Michael.J.Mellons@tn.gov |
| x | Richard | Mulcahy | Massachusetts DOT | Richard.Mulcahy@dot.state.ma.us |
| x | Mike | Praul | FHWA | michael.praul@dot.gov |
| | Robert | Spragg | FHWA | robert.spragg@dot.gov |
| x | Jerod | Gross | Snyder and Associates | jgross@snyder-associates.com |
| x | Larry | Sutter | Sutter Engineering | sutter.engineering@gmail.com |
| x | Tom | Van Dam | WJE | tvandam@wje.com |
| x | Dan | King | CP Tech Center | deking@iastate.edu |
| x | Peter | Taylor | CP Tech Center | ptaylor@iastate.edu |
| x | Leif | Wathne | CP Tech Center | lwathne@iastate.edu |

Maria and Larry provided an update on cement company responses to the letter. There have been three additional responses since the last meeting. So far, several companies have shared mill certs (but none of the other requested data), one company has provided the requested data for just the past year, and one company (National Cement) shared all of the requested data. The majority of companies have not responded to the letter. Just one company has indicated they will not share any information; Larry hopes they will at least share their mill certs.

Given the limited amount of information collected so far, Maria and Larry's presentation at the Fall NC2 meeting will likely just be an overview of the goals of the program and a status update. Representatives of 5 or 6 cement companies are currently registered for the meeting, along with representatives of ACA and several other industry associations.

Maria and Larry proposed sending an official follow-up email to the cement companies to try to gather more data, and to simultaneously reach out to them individually to see if they can work through any particular questions or concerns these companies may have. The steering committee agreed this approach sounded reasonable. The target date for sending the official follow-up email will be after the Fall NC2 meeting.

Larry also reiterated that there is a planned second stage to this effort to collect information from state DOTs, contractors, and other affected stakeholders. The committee will need to resume its efforts to formulate a list of questions to ask. There will also be an opportunity to have further discussions with the larger group of state DOT representatives in the states' only meeting at the Fall NC2 meeting. (Notably, there was very little discussion of Type IL cement at the recent AASHTO COMP meeting, and no real opportunity for Larry or Maria to discuss the efforts of this steering committee.)

Before the next meeting, Maria and Larry will develop a template for the questions that will be asked to state DOTs representatives, which can be shared at the Fall NC2 meeting.