

**NEW ENGLAND TRANSPORTATION CONSORTIUM  
QUARTERLY PROJECT PROGRESS REPORT**

**A. PROJECT NUMBER AND TITLE:**

NETC 13-1: Development of High Early-Strength Concrete for Accelerated Bridge Construction Closure Pour Connections

**B. PRINCIPAL INVESTIGATOR(s) & UNIVERSITY(s):**

Sergio F. Breña (PI) – University of Massachusetts Amherst  
Scott A. Civjan (Co-PI) – University of Massachusetts Amherst

**C. WEB SITE ADDRESS** (*If one exists*):

**D. START DATE** (*Per NETC Agreement*): **September 01, 2014**

**E. END DATE** (*Per NETC Agreement*): **April 02, 2016; August 31, 2016 (amended)**

**F. ANTICIPATED COMPLETION DATE: January 14, 2017**

A no-cost extension was requested to January 14, 2017. This extension is to allow conducting other project activities that were delayed because of the time shrinkage tests were taking. Without knowing if the shrinkage performance of the selected mixes was acceptable, the project team could not move on to other testing activities.

**G. PROJECT OBJECTIVES:**

To develop and validate concrete mixtures capable of developing high early strength without detrimentally affecting their long-term durability. The mixtures are for use in projects using accelerated bridge construction methods.

**H. REPORT PERIOD:** July 1, 2016 – September 30, 2016

**I. ACCOMPLISHMENTS THIS PERIOD:**

*Task 1: Literature Search*

- Performed literature review as necessary to obtain research reports and technical papers to assist in further development of mix design trial batches.

*Task 3: Develop Mix Design*

- Running ring shrinkage tests to understand behavior of mix designs; will modify based on results
- The volume of paste to volume of voids ratio was adjusted to improve the consistency of trial batches
- A pilot study was performed to understand the effects of high range water reducer addition rates
- Aggregate sizes were blended at specified ratios to reduce the gap grading of the coarse and fine aggregates
- The curing temperature was increased, and the compressive strength was measured to quantify the effects

*Task 4: Test Mixture*

- The slump test (AASHTO T119 / ASTM C143) or the spread test (ASTM C1611) was performed on each trial batch depending on the workability of the concrete mixture.
- The air content test, pressure method (AASHTO T152 / ASTM C231), was performed on concrete mixtures developed through trial batches.

- The compressive strength was tested for each trial batch at 12 hours and 24 hours (ASTM C39)
- The shrinkage test (AASHTO PP 34-99) was performed on selected concrete mixtures developed through trial batches. These tests are conducted on batches reaching target strength gain and workability.
- Design of the setup for the bar pullout test (ASTM A944) is still progressing, and fabrication of formwork for concrete specimens used in the bar pullout test (ASTM A944) has started

**J. PROBLEMS ENCOUNTERED (If any):**

No problems encountered.

**K. TECHNOLOGY TRANSFER ACTIVITIES:**

No technology transfer activities were performed.

**L. STATUS BY TASK:**

*Task 1: Literature Search – 85% complete*

*Task 2: Develop Mixture Design Specification – 35% complete*

*Task 3: Develop Mix Design – Trial batches have been developed; may need slight adjustments –90%*

*Task 4: Test Mixture – Experimental test setups are being designed and prepared (45%)*

**M. PERCENT COMPLETION OF TOTAL PROJECT: 65%**

**N. ACTIVITIES PLANNED FOR NEXT QUARTER:**

*Task 1: Literature Search*

- Continue literature search as required.

*Task 2: Develop Mixture Design Specification*

- Adjust existing concrete mix design specifications based on feedback from the NETC Project Technical Committee, trial batch results, and feedback from the PCI Bridge Tech Committee.

*Task 3: Develop Mix Design*

- Adjust concrete mix design and perform select short and long-term tests on additional trial batches as required by results of further testing.

*Task 4: Test Mixture*

- Complete design and fabrication of bar pullout test (ASTM A944) setup.
- Begin the full-scale mockup test setup design to be used for the large-scale specimen representing a longitudinal concrete bridge deck joint.
- Perform bar pullout test (ASTM A944) on concrete mixtures developed through trial batches and compare to results.
- Perform the bar pullout test (ASTM A944) and the ring shrinkage test (AASHTO PP 34-99) on normal strength concrete to compare with test results of high-early strength concrete mix designs
- Fabricate freeze-thaw specimens using concrete from trial batches to be sent to DOT lab to be tested (ASTM C666)

**O. FINANCIAL STATUS:**

**As of:** September 30, 2016

**Total Project Budget:** \$ 174,923

**Total Expenditures:** \$ 135,066

**Note: This report should not require more than 2-3 pages & should be e-mailed to the NETC Coordinator so as to arrive no later than three (3) working days after the end of each calendar quarter.**