

## TRANSPORTATION POOLED FUND PROGRAM QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT):   FHWA  

### 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> <i>(i.e., SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX))</i>  TPF-5(150)	<b>Transportation Pooled Fund Program - Report Period:</b> <input type="checkbox"/> Quarter 1 (January 1 – March 31) <input checked="" type="checkbox"/> Quarter 2 (April 1 – June 30) <input type="checkbox"/> Quarter 3 (July 1 – September 30) <input type="checkbox"/> Quarter 4 (October 4 – December 31)	
<b>Project Title:</b> Extending the Season for Concrete Construction and Repair, Phase III – Guidance for Optimizing Admixture Dosage Rate		
<b>Project Manager:</b> Fred Faridazar (202-493-3076) <a href="mailto:Fred.Faridazar@dot.gov">Fred.Faridazar@dot.gov</a>		
<b>Project Investigator:</b> Lynette Barna (603-646-4503) <a href="mailto:Lynette.A.Barna@usace.army.mil">Lynette.A.Barna@usace.army.mil</a>		
<b>Lead Agency Project ID:</b>	<b>Other Project ID (i.e., contract #):</b> IAA DTFH61-08-X-30031	<b>Project Start Date:</b> IAA Effective Date Aug. 7, 2008
<b>Original Project End Date:</b> Period of Performance 45 months from effective date ( 7 May 2012)	<b>Current Project End Date:</b> same	<b>Number of Extensions:</b> zero

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	Total Percentage of Work Completed
\$325,000 proposed project cost <sup>1</sup> \$179,000 received to date	\$102,072	31% (based on project proposal)

Quarterly Project Statistics:

Total Project Expenses This Quarter	Total Amount of Funds Expended This Quarter	Percentage of Work Completed This Quarter
\$30,660	\$30,660	9%

<sup>1</sup> Phase III Extending the Season for Concrete Construction and Repair, Guidance for Optimizing Admixture Dosage Rates, Project Proposal, USAERDC-CRREL, submitted 2004.

## Project Description:

The purpose of the Phase III study is to develop tools and guidance to specify dosage levels of chemical admixtures used in antifreeze concrete to correspond with the varying weather conditions experienced at any job location. A user guide, including a series of design tables, will be developed describing admixture dosages to be adjusted for a specific level of protection. The guide will set dosage rates for general sets of conditions to provide a conservative level of concrete protection during the curing period. The dosage rates will account for the environmental conditions and concrete geometry. The guide will allow technicians to tailor mixture proportions and protective measures based on weather predictions for the first few days following concrete placement.

This quarterly progress report provides a summary of the effort expended and fulfills the reporting requirement in support of Interagency Agreement (IAA) DTFH61-08-X-30031, Modification 1 (signed 6 January 2009) between FHWA and the U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory (ERDC-CRREL), entitled *Extending the Season for Concrete Construction and Repair, Phase III – Guidance for Optimizing Admixture Dosage Rates*.

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

- **Project Update meeting.** A project update web meeting was held with FHWA on *Extending the Season for Concrete Construction and Repair*. The meeting reviewed the two previous TPF phases (Phase I – Establishing the technology and Phase II – Defining Engineering Parameters) up through this current phase, Phase III. The summary described the limitations of conventional cold weather concreting practices, as well as the solution and benefits provided by Cold Weather Admixture Systems (CWAS). Also discussed was the promising impact on improved durability – an important consideration for concrete exposed to freeze-thaw cycling – observed in the Phase I laboratory testing that included durability testing following ASTM C 666. The test specimens were concrete mixtures using combinations of chemical admixtures. Phase I produced eight CWAS concrete formulations capable of resisting freezing down to an internal concrete temperature of  $-5^{\circ}\text{C}$ . However, these admixture combinations for the concrete formulations are, at this time, limited to 'one-size-fits-all'. The current Phase III study addresses this limitation of 'one-size-fits-all' to provide users the ability to tailor the admixture combinations to meet the needs of the project at the job site based on forecasted weather conditions;
- **Presented at USACE Infrastructure Systems Conference (Atlanta, GA).** *Cold Weather Admixture Systems for Concrete* was presented during the Corps of Engineers (COE) conference. There were 1,500 attendees representing the COE involved in engineering and construction projects on Corps projects and Army Installations, and a number of contractors;
- **Part 2 – Develop design guidance.** Application of the interactions with energy balance equations was in progress during this quarter. This task examines the heat transfer characteristics of curing concrete subjected to freezing conditions. Input variables such as geometry, material layer and thickness, and concrete characteristics are being reviewed. Previous field data is being used as input parameters.

### Quarterly Cumulative Project Expenditures

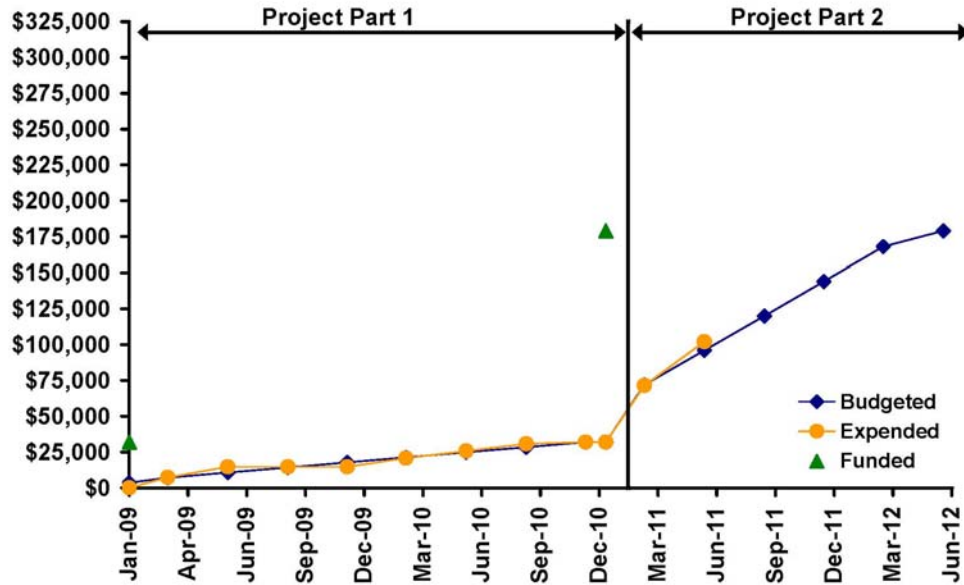


Figure 1. Cumulative project expenditures updated for 2<sup>nd</sup> Quarter (April-June 2011) shown by quarter from January 2009 when initial funding for Part 1 was confirmed.

An estimated project timeline for Part 2 of the project is given in the table below. The vertical red dotted line indicates which task is currently under way. Application of the energy balance approach will continue during the 4<sup>th</sup> quarter of Fiscal Year 2011.

Table 1. Part 2 – Develop design guidance project tasks identified and estimated percent completion for Fiscal year 2011 3<sup>rd</sup> Quarter. (Red dotted line indicates current quarter).

Task	Estimated % Completion	FISCAL YEAR 2011				FY2012			
		2nd QTR	3rd QTR	4th QTR	1st QTR	2nd QTR	3rd QTR	4th QTR	
T1. Apply energy balance approach to layered concrete system at low temperature conditions	40	█	█	█					
T1.1 Conduct analysis using heat transfer basics	30		█	█					
T1.2 Use previous field data as input	30		█	█					
T1.3 Vary input conditions	0			█					
T1.4 Identify knowledge gaps	0			█					
T2. Develop relationships based on admixture dosage	0			█					
T2.1 Vary admixture dosages	0			█					
T2.2 Optimize admixture dosage rate	0			█					
T3. Draft design guidance report	0				█	█	█	█	
T3.1 Submit final report	0							★	
T4. Quarterly progress reports	33		◇	◇	◇	◇	◇	◇	

#### Anticipated work next quarter:

- Part 2 – Develop design guidance. Task 1 and associated subtasks. Application of energy balance approach. This effort will continue during the next quarter to continue analyzing key interactions. Information gained from previous field work will be used to develop practical guidance to aid the user community in tailoring admixture dosages.

#### Significant Results:

The report for Part 1 of the project is available at:

[http://www.crrel.usace.army.mil/innovations/cold\\_weather\\_concreting/antifreeze\\_admixtures/ending\\_the\\_season.html](http://www.crrel.usace.army.mil/innovations/cold_weather_concreting/antifreeze_admixtures/ending_the_season.html)

**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).**

Nothing to report at this time.