

Period Covered: April 1 through June 30, 2009 (Quarterly Report)

KSDOT Progress Report
for the

State Planning and Research Program

PROJECT TITLE: Construction of Crack-Free Concrete Bridge Decks, Phase II		
PROJECT MANAGER: Rodney Montney	Project No: TPF-5(174)	Project is: <input type="checkbox"/> PLANNING <input checked="" type="checkbox"/> RESEARCH & DEVELOPMENT
Annual Budget	Multi Year Project Budget \$975,000	
PROGRESS:		
<u>FIELD ACTIVITIES:</u>		
<p>A workshop on Construction of Crack-Free Concrete Bridge Decks was held at the Colorado Department of Transportation on June 10, 2009.</p> <p>Updated aggregate, concrete, and construction specifications are being finalized with KDOT for the bid of three new LC-HPC bridge decks in September 2009.</p>		
<u>LABORATORY ACTIVITIES:</u>		
<p>Research evaluating the effect of using lightweight aggregate for internal curing on free shrinkage continues. A second series of mixtures evaluating the use of a mineral admixture [Grade 100 granulated ground blast furnace slag (GGBFS)] in addition to lightweight aggregate was cast. The series included a granite control mix, lightweight aggregate with a 30% cement replacement (by volume) with GGBFS, lightweight aggregate with 60% GGBFS, a limestone control, limestone with 30% GGBFS, and limestone with 60% GGBFS. Each batch had a paste content equivalent in volume to that provided by 540 lb/yd³ of cement and a water-cement ratio of 0.44. The free shrinkage specimens are being evaluated using 7 and 14-day curing periods. Two more batches are planned to evaluate the use of a finer lightweight aggregate. One batch will be cast with the finer lightweight aggregate and granite. The second batch will be cast with the finer lightweight aggregate, granite and a 30% cement replacement with GGBFS. These batches will also have a paste content equivalent in volume to that provided by 540 lb/yd³ of cement and a water-cement ratio of 0.44.</p> <p>Trial batches for restrained shrinkage (ring) tests were cast this quarter. The batches had high paste contents to magnify the shrinkage detected during the test for different combinations of cementitious materials. The trial batches include a control mix with a cement content of 700 lb/yd³ and a water-cement ratio of 0.44 and a mix with 40% replacement of cement with Class F ash while keeping equivalent paste content as the control mix.</p> <p>A larger freezer unit for scaling evaluation will be purchased by the end of this quarter and durability evaluations (scaling, freeze-thaw and air-void system) on concrete mixtures containing Class F fly ash and SRA are expected to resume.</p>		
<u>LAB RESULTS:</u>		
<p>The test to evaluate the performance of restrained shrinkage (ring) specimens in a dry condition (humidity range of 35 ± 4%) was completed. No significant increase of strain development was observed, and crack formation was not always clear based on reading of the strain gages mounted on the rings.</p>		

ACTIVITIES PLANNED FOR NEXT QUARTER:

The 7th annual meeting of pooled fund participants for Phase II will be held at the Kansas City Airport Hilton on July 23, 2009. Details for the meeting have been sent to all representatives and interested parties.

The restrained shrinkage (ring) test will continue be evaluated and more batches will be cast to discern the sensitivity of the ring instrumentation for detecting time of cracking using high cement paste mixtures.

Two more series of free shrinkage specimens will be cast using the finer lightweight aggregate in combination with slag. All existing free shrinkage specimens will continue to be monitored.

A series of scaling and freeze-thaw specimens will be cast to evaluate the combined effects of Class F fly ash with the addition of a shrinkage reducing admixture (SRA) on concrete durability. Samples of the hardened concrete from this series will be evaluated by the Kansas Department of Transportation in accordance with ASTM C457 "Test Method for Microscopical Determination of Parameters of Air-Void System in Hardened Concrete – Procedure A: The Linear Traverse Method." Freeze-thaw evaluation will be performed in accordance to ASTM C666 "Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing – Procedure A".

KU will continue to work with KDOT and other partners to schedule LC-HPC bridge decks for Phase II of the project.

Project Personnel: David Darwin (Principal Investigator), JoAnn Browning (Co-Principal Investigator)

STATUS AND COMPLETION DATE

Percentage of work completed to date for total project is: 20%

 X on schedule behind schedule, explain:

Expected Completion Date: June 30, 2013