

Period Covered: July 1 through September 30, 2009 (Quarterly Report)

KSDOT Progress Report
for the

State Planning and Research Program

PROJECT TITLE: Construction of Crack-Free Concrete Bridge Decks		
PROJECT MANAGER: Rodney Montney	Project No: TPF-5(051)	Project is: <input type="checkbox"/> PLANNING <input checked="" type="checkbox"/> RESEARCH & DEVELOPMENT
Annual Budget	Multi Year Project Budget \$995,000	

PROGRESS:

Current work for Phase I of Construction of Crack-Free Concrete Bridge Decks includes the evaluation of the bridge decks that were cast in Phase I.

LABORATORY ACTIVITIES:

All laboratory work and evaluations for Phase I have been completed and are described in previous quarterly reports.

FIELD ACTIVITIES:

The annual crack surveys for Low-Cracking High-Performance Concrete (LC-HPC) bridges and corresponding control bridges in Kansas continued this quarter. Of the bridges surveyed in this quarter, an LC-HPC bridge constructed early in this project in Kansas City, KS showed a crack density of 0.06 m/m² at 44.1 months for placement 1 and a crack density of 0.125 m/m² at 43.5 months for placement 2. The placements for the corresponding control bridge in Kansas City, KS had higher crack densities of 0.261 m/m² at 44.2 months for placement 1 and 0.133 m/m² at 43.6 months for placement 2. Another LC-HPC bridge and the associated control bridge had crack densities of 0.11 m/m² at 19.2 months and 0.216 m/m² at 22.6 months, respectively. Three LC-HPC bridges were surveyed on the flyover from US 69 to west I-435 in Kansas City, KS. The bridge decks had crack densities of 0.079 m/m² at 21.2 months and 0.113 m/m² at 21.3 months (placements 1 and 2, respectively), 0.123 m/m² at 19.4 months, and 0.238 m/m² at 19.7 months. The corresponding control bridges, which comprise the flyover from US 69 to east I-435 in Kansas City, KS, had higher crack densities at younger ages: 0.366 m/m² at 19.7 months, 0.670 m/m² at 7.4 months and 0.142 m/m² at 8.6 months, respectively. One control bridge in Kansas City, KS had a very high crack density of 1.003 m/m² at 38.2 months for placement 1 and 0.277 m/m² at 32.6 months for placement 2, while the corresponding LC-HPC bridge showed a crack density of 0.012 m/m² at 34.8 months.

As anticipated, crack surveys completed for the bridge decks that were constructed for the city of Overland Park showed extensive cracking (0.341 m/m², 0.640 m/m², and 0.421 m/m² at 18.3, 13.7, and 13.3 months, respectively). Evidence of map cracking, plastic shrinkage cracking, and settlement cracking can be noted. This behavior correlates with poor construction practices observed during placement, including placing concrete with high slump, poor consolidation, using a finishing aid, and using excessive finishing that resulted in long delays before initiating curing.

Bridge decks that are younger than one year will be evaluated next year. Experience has shown that crack surveys of bridge decks that have not reached one year of age are not representative of their performance at ages of two years or greater.

The prestressed bridges in Linn County, KS were surveyed during this quarter. Two LC-HPC prestressed bridges had crack densities of 0.076 m/m² at 25.4 months and 0.298 m/m² at 20.9 months. The control prestressed bridge showed a crack density of 0.127 m/m² at 25.5 months, which was less than the crack density measured during the previous year's survey (0.177 m/m² at 14.4 months). The decrease in cracking is thought to be related to changing conditions in the prestressing steel and bridge camber. This trend will be monitored with future annual crack surveys.

ACTIVITIES PLANNED FOR NEXT QUARTER

Evaluation of crack surveys of LC-HPC and control bridge decks will continue this quarter.

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: 99%*

 X on schedule behind schedule, explain:

Expected Completion Date: March 31, 2010

*The project has been extended for an additional two years to allow the planned deck construction to be completed and the crack surveys to be conducted. The percentage of work completed will be held open at 99% for the balance of the project. Phase II of this project is now underway with funding from the KU Transportation Research Institute and the project has been approved for 100% SPR funding; TPF funding officially began on July 1, 2008.