

Period Covered: July 1 through September 30, 2007 (Quarterly Report)

KSDOT Progress Report  
for the

## State Planning and Research Program

PROJECT TITLE: Construction of Crack-Free Concrete Bridge Decks		
PROJECT MANAGER: Richard L. McReynolds, P.E.	Project No: TPF-5(051)	Project is: <input type="checkbox"/> PLANNING <input checked="" type="checkbox"/> RESEARCH & DEVELOPMENT
Annual Budget	Multi Year Project Budget \$950,000	

### PROGRESS:

#### **Construction Activities**

Three crack surveys were conducted this quarter. The first took place on July 27, 2007 for a monolithic (conventional) bridge in Emporia, KS. The crack density recorded for the deck was  $0.229 \text{ m/m}^2$ . The second survey, also on a conventional bridge, was conducted on August 10, 2007 for the control of the third LC-HPC bridge constructed in Kansas. This deck had a crack density of  $0.297 \text{ m/m}^2$  on the east side (first placement), and  $0.036 \text{ m/m}^2$  on the west side (second placement). For comparison, the crack density of the third LC-HPC bridge constructed in Kansas was  $0.003 \text{ m/m}^2$ , with only five small longitudinal cracks observed – all at the west end of the bridge where the final loads of concrete were late in arriving. The third survey was completed on August 13, 2007 for the control bridge of the fifth constructed LC-HPC bridge in Kansas. This bridge deck had a crack density of  $0.332 \text{ m/m}^2$ .

The qualification slab for the Minnesota bridge was cast with good results on August 23. Construction of the deck is planned for this fall. The qualification slab for the sixth LC-HPC bridge to be constructed in Kansas was placed on September 14, 2007. This placement went smoothly. The qualification slab for the seventh LC-HPC bridge to be constructed in Kansas was completed September 26, 2007. Construction of both Kansas decks is scheduled for early October 2007.

#### **Annual Meeting, Construction Conferences, and Workshops**

The annual meeting for participants of the pooled fund study took place in Kansas City, MO, on August 2, 2007. Representatives from eleven states, the City of Overland Park, KS, FHWA, and other interested parties received updates on laboratory and construction activities, as well as plans for Phase II of the study. A CD of the meeting materials was sent to all attendees of the meeting, as well as all participating states. Pre-construction conferences (each for a difference deck) were held in Olathe, KS on September 12, 2007, in Louisburg, KS, on September 14, 2007, and again in Olathe, KS on September 26, 2007. A post-construction conference for the fifth LC-HPC bridge deck constructed in Kansas was completed on September 28, 2007. Workshops were held in four states during the past quarter: Idaho, Mississippi, Missouri, and Montana.

#### **Laboratory Activities**

Work continues in the materials laboratory. A series of free-shrinkage and strength specimens were cast to determine the combined effects of class F fly ash and a shrinkage reducing admixture (SRA). The previous series, which focused on the combined effect of class F fly ash (20% and 40% replacement) and low absorption aggregate (granite), indicated mixes containing fly ash exhibited higher shrinkage than the control batch that contained 100% Portland cement. The new series repeated the previous with the addition of  $0.64 \text{ gal/yd}^3$  of SRA. The goal is to develop low-shrinkage mixes with fly ash.

The experimental setup for the restrained rings tests has been completed. A series of ring tests using a standard KDOT mix (602 lb/yd<sup>3</sup> of cement and a 0.44 water-cement ratio) was cast with matching free shrinkage and strength specimens to validate test procedures.

The evaluation of lightweight aggregate for use as an internal curing agent continues. Two sources of aggregate and six different gradations are being evaluated for aggregate properties and workability in a concrete mix design.

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

**ACTIVITIES PLANNED FOR NEXT QUARTER:**

A series of restrained rings tests examining different water-cement ratios (0.45, 0.42, 0.39, 0.36) combined with class F fly ash (20% and 40% replacement) and low absorption aggregate (granite) will be cast. Scaling and freeze-thaw specimens will be cast to examine the effect of granulated ground blast furnace slag (GGBFS). The evaluation of lightweight aggregates will continue.

At least three LC-HPC bridge decks will be placed in the next quarter. Pre-construction and post-construction conferences will be held in conjunction with each phase of the placement of LC-HPC bridges.

Workshops are planned to be held in Indiana, Michigan, and Oklahoma during this quarter.

**STATUS AND COMPLETION DATE**

Percentage of work completed to date for total project is: 90%

  X   on schedule        behind schedule, explain:

Expected Completion Date:   March 31, 2008