Period Covered: July 1 through September 30, 2004 (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: ____ PLANNING ___X__ RESEARCH & DEVELOPMENT
Annual Budget	**Multi Year Project Budget** $950,000	

Progress:

A letter was sent to participating state representatives soliciting candidates for research bridge decks to be constructed using the proposed research specifications. To date, one nomination has been received from Missouri and two have been received from South Dakota. Minnesota has indicated that they will nominate two bridge decks.

Kansas has identified 12 low cracking deck projects, along with 9 control decks. Meetings have been held with representatives from KDOT materials research and bridge divisions on July 27 and August 16, 2004 to finalize the materials and construction specifications for the September letting of the first two research bridge decks. The first two research bridge decks will be constructed in northeastern Kansas along with a companion bridge deck that will be constructed using traditional material and construction specifications. A presentation was made on August 31, 2004 at the pre-bid conference for the September letting regarding the goals and details of the new specifications. The PowerPoint presentation file was made available to KDOT.

Work has continued in the laboratories. Two series of free shrinkage tests are underway. The first series compares free shrinkage of concrete specimens (70% aggregate content, 0.45 W/C ratio) cured for different periods of time. Twelve specimens were cast using Type I/II cement, with three each of the specimens cured for 3 days, 7 days, 14 days and 28 days. Another batch of 12 specimens was cast using Type II coarse ground cement and subjected to the same curing regimens. Shrinkage data has been collected for approximately 60 days. The second series compares two different types of high range water reducers, Glenium 3000NS and Rheobuild 1000. Glenium is a polycarboxylate-based water reducer and Rheobuild is a naphthalene-based water reducer. For Glenium, four batches were cast, one batch with no Glenium, and three batches with low, medium, and high quantities of Glenium. The quantities were determined based on the manufacture's recommended dosages. The same approach was used for Rheobuild.

In addition to free shrinkage specimens, the second ring test program was initiated. Program 2 consists of nine concrete batches, which include typical MoDOT and KDOT mixes, a mix with coarse-ground Type II cement, Type I/II cement mixes cured for 3, 7, and 14 days, a mix with shrinkage-reducing admixture, a mix replacing limestone coarse aggregate with quartzite, and a mix with only 497 lb/yd^3 of Type I/II cement. The mixes contained 535 lb/yd^3 of cement, except the MoDOT, KDOT and 497 lb/yd^3 mixes. All had a w/c ratio of 0.45 except the MoDOT and KDOT mixes. Three restrained rings, three free shrinkage prisms, and three permeability specimens were cast for each mix. The concrete rings have an inside diameter of 12.75 inches, a radial thickness of 2.25 inches, and a height of 3 inches. After over 70 days of drying, no cracking has been observed.

The permeability specimens are under test. They have been cured, their surfaces have been prepared by sandblasting, and they are currently being ponded with 3% salt solution according to [AASHTO T259-80 Resistance of Concrete to Chloride Ion Penetration]. Practice specimens are also being ponded with a high concentration salt solution for the purpose of practicing the coring and sampling procedures.

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

SUMMARY OF ACTIVITIES EXPECTED TO BE PERFORMED NEXT QUARTER:

The third research bridge deck to be constructed in Kansas will be let on December 15, 2004. The project team will continue to work with KDOT to refine the material and construction specifications and disseminate the information to the bidders. Bridge deck candidates from the state representatives in the pooled fund project will continue to be sought.

Future plans in the laboratory include comparing the free shrinkage of specimens cast using quartzite, granite, and limestone coarse aggregate, as well as comparing the free shrinkage of concretes made with different mineral admixtures. Guidelines for optimizing the aggregate gradation will be drafted during this quarter. Results from the free and restrained shrinkage tests will continue to be evaluated.

STATUS AND COMPLETION DATE

Percentage of work completed to date for total project is: 30%

___X___ on schedule _____ behind schedule, explain:

Expected Completion Date: _____March 31, 2008