Period Covered: **July 1, 2007 through September 30, 2007**

KSDOT Progress Report
for the

State Planning and Research Program

PROJECT TITLE: Midwest Accelerated Testing Pooled Fund		
PROJECT MANAGER: Andrew Gisi, P.E., TAC Chair Richard L. McReynolds, P.E., Admin. Contact Dr. Stefan Romanoschi, KSU, PI	Project No: TPF-5(048) RE-0328-01	Project is: ____ PLANNING __X__ RESEARCH & DEVELOPMENT
Annual Budget (active projects) FY 2003: $ 267,302 FY 2004: $ 269,973 FY2005: $ 884,362	**Multi Year Project Budget**	

Progress:

FY 2003: The objective of this research is to compare the performance of an A7-6 clay subgrade soil stabilized with lime, fly ash, Portland cement and EMC2 (a commercial chemical compound marketed by Soil Stabilization Products Co.) using full-scale accelerated pavement tests at the Civil Infrastructure Systems Laboratory of Kansas State University. Four pavement sections were constructed during November and December 2002, all having the same four-inch thick asphalt concrete surface layer. The subgrade soil was stabilized to a depth of six inches with the aforementioned stabilizing agents. In total, 800,000 passes of a 30,000-lb dual axle were applied to the pavement with the lime-treated subgrade soil while 1,200,000 passes of a 30,000-lb dual axle and 800,000 passes of a 24,000-lb single axle were applied to the pavements with Portland cement and fly-ash treated subgrade soil. The pavement with the EMC2 stabilized base failed at approximately 50,000 load repetitions after exhibiting severe rutting and fatigue cracking. The asphalt concrete surface layer was removed and replaced with a four- inch PCC pavement, to allow continuation of testing of the pavement structure with the lime-treated base. Each of the three remaining pavements exhibited more than one half inch of rutting. The pavements with Portland cement and fly-ash treated soil exhibited cracking in the asphalt surface layer. The Portland cement stabilized section showed very similar performance to the lime-treated one. After 2 million passes, the pavement with the fly-ash stabilized soil showed more cracking than the pavements with Portland cement and lime-treated soils. The final report has been submitted for publication.

FY 2004: The objectives of this research are: a) to construct and evaluate thin PCC overlays on existing PCC and HMA pavements; b) to determine the parameters that effect the performance of these sections; c) to develop design input parameters and to modify/ enhance the existing design procedure (s) for thin PCC overlays. The objectives will be accomplished by conducting a full-scale accelerated pavement test at the Civil Infrastructure Systems Laboratory on two pavements with thin PCC overlays (white topping) on existing PCC pavements and two pavements with thin PCC overlays on distressed hot-mix asphalt (HMA) layers. Two thin white-topping pavements were constructed and tested first. The asphalt concrete layers were placed and compacted. Longitudinal and transverse saw cuts were done in the HMA layers to simulate severe cracking. Milling was then performed on the asphalt concrete layers, and the PCC overlay was placed. Accelerated loaded was then started and more than 2.0 million passes of a 26,000-lb single axle were applied. However, no visible distresses were observed with the exception of a single transverse crack in the 4-inch thick PCC overlay. The PCC pavements were placed and a repeated thumping load was applied at the joints to induce joint distresses. The distressed pavements were then shot blasted and the PCC overlays was poured and left to cure. More than 1,500,000 axle load repetitions were applied to these pavements. Both pavements exhibited transverse cracking. The post-mortem evaluation was done and the Finite Element analysis was conducted to estimate the critical response of the overlay was conducted. The final report has been submitted to the Technical Advisory Committee for review.

FY 2005: The objectives of this research are: a) to validate and calibrate the dynamic resilient modulus model used in NCHRP 1-37A for asphalt concrete mixes and to compare it with the field-measured modulus, for two mixes in each of the four Mid-West states; b) to validate the relationship used in NCHRP 1-37A between the dynamic modulus and pavement response; c)to validate the relationship used in NCHRP 1-37A between pavement response (strains) and pavement performance; d) to compare the performance of coarse and fine Superpave mixes; e) to validate and calibrate the Asphalt Pavement Analyzer (APA) as a screening tool for estimating rutting performance of Superpave asphalt mixes. To achieve these objectives, sixteen pavements will be constructed for this experiment and will be built in eight pairs. Four pairs will be 'fatigue cracking' experiments and will aim to verify the fatigue cracking properties of asphalt concrete. The remaining four pairs will be 'rutting' experiments and will aim to determine the rutting life of asphalt concrete pavements. In total, eight mixes will be used, two for each state. One 'fatigue cracking' and one 'rutting' pavement will be built for each mix. The work on this project started with the design of the pavement structures and the design of the pavement response instrumentation, (including sensors and data acquisition) and the construction of four pavement structures containing hot-mix asphalt (HMA) mixes that are representative of those used in Kansas. Accelerated loading (bi-directional) has been completed on all four Kansas pavement section and on two Missouri "rutting" pavement sections. The accelerated loading of the Missouri "fatigue cracking" sections is under way. The APA and Hamburg wheel tests on all Kansas and Missouri mixes have also been completed. Construction of the third set of four pavement sections, the Iowa pavement sections, is also under way.

BENEFITS

FY 2004: The results of this research will lead to improved practices related to the design and construction of thin-bonded concrete overlays on distressed PCCP and HMA pavements. This will finally lead to the optimized design and use of bonded concrete overlay technology and extended life of flexible and rigid pavements rehabilitated with this strategy.

FY 2005: The results of this research will provide valuable support for the calibration and implementation of the NCHRP 1-37A design model and will provide a database of pavement response and performance information valuable for verification of any mechanistic-empirical pavement design method. The results will also establish the fatigue and rutting behavior of fine and coarse Superpave mixes and will provide a screening tool for the rut-susceptible mixes.

SUMMARY OF ACTIVITIES EXPECTED TO BE PERFORMED NEXT QUARTER:

FY 2004: The first draft of the final report was submitted; the review is under way.

FY 2005: The accelerated pavement loading and the laboratory testing for material characterization will continue along with the construction of the last four pavement sections.

STATUS AND COMPLETION DATE

Percentage of work completed to date for total project is: 100% (FY2003) , 100%(FY2004) and 65%(FY2005)

_____ on schedule __X__ behind schedule, explain

FY 2003 project testing and reporting got behind schedule because of equipment repairs and modifications that were required on earlier experiments. Also, the cumulative number of passes of the double axle applied to the two pair of pavements was more than three times the number of passes estimated initially. FY 2004 project testing and reporting got behind schedule because of equipment modifications and the delay of FY2003 project. FY 2005 project is on schedule.

Expected Completion Date: _____September 30, 2008 (FY2005)