Period Covered: April 1, 2006 through June 30, 2006

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, cement and EMC2 (a commercial chemical compound commercialized by Soil Stabilization Products Co.) using a full-scale accelerated pavement test at the KSU Civil Infrastructure Systems Laboratory. 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 four different stabilizing agents. In total, 800,000 passes of the 30,000 lbs dual axle were applied to the pavement with lime treated embankment soil while 1,200,000 passes of the 30,000 lbs dual axle and 800,000 passes of the 24,000 lbs single axle were applied to the pavements with cement and fly-ash treated embankment soil. The pavement wit the EMC2 stabilized base has failed at approximately 50,000 load repetitions after exhibiting severe rutting and cracking. The asphalt concrete surface layer was removed and replaced with a four inch PCC pavement, to allow the continuation of testing of the lime treated base pavement structure. Each of the three remaining pavements exhibited more than 0.5 of rutting, the pavements with cement and fly-ash treated soil exhibited cracking in the asphalt surface layer. The cement stabilized showed very similar performance to that of the lime treated embankment. After 2 million passes, the pavement with fly-ash stabilized soil showed more cracking than the pavements with cement and lime treated soils. Drafting of the final report is in the last stage.

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 on existing PCC and two pavements with thin PCC overlays on distressed HMA layers. The two thin white-topping pavements were constructed and tested first. The asphalt concrete layers were first placed and, compacted. Longitudinal and transverse saw cuts were performed in the HMA layers to simulate severely cracked layers. Milling was then performed on the asphalt concrete layers and the PCC overlay was placed. Accelerated loaded has started; more that 2.0 million passes of the 26,000 lbs single axle were applied to date but no visible distresses have been observed with the exception of a single transverse crack in the 4 inch thick overlay. The PCC pavements were placed and distresses using thumping load applied at the joints. The distressed pavements were shot blasted and the PCC overlays was poured and left to cure. More than 1,500,000 axle load repetitions have been applied to these pavements. Both pavements exhibited transverse cracking. The post-mortem evaluation will be finalized and the Finite Element Modeling to estimate the response of the overlays will be conducted.

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 HMA mixes representative for those used in Kansas. Accelerated loading (bi-directional) was applied first to the four pavements; the "rutting" pavements, tested at 35°C, exhibited more than 0.75 inches of rutting after 400,000 passes of the 23,000lbs single axle. Loading is under way for the "fatigue cracking" pavements

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 use and design of bonded concrete overlay technology and extended life of flexible and rigid pavements rehabilitated with this method.

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 rut-susceptible mixes.

SUMMARY OF ACTIVITIES EXPECTED TO BE PERFORMED NEXT QUARTER:

FY 2003: The first draft of the final report is in preparation and should be submitted for review.

FY 2004: The postmortem evaluation of the thin whitetopping pavements and the finite element analysis will be finalized. The first draft of the final report on this project will be prepared.

FY 2005: The accelerated pavement loading and the laboratory testing for material characterization will continue.

STATUS AND COMPLETION DATE

Percentage of work completed to date for total project is: 99% (FY2003) , 90%(FY2004) and 20%(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 time 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, 2006 (FY2003), December 31, 2006 (FY2004) and March 31, 2008 (FY2005)