

Eighteen new research studies were begun during 2005/2006 on a wide range of topics as highlighted below. For more information on these projects please contact the Kentucky Transportation Center or the staff person listed. These projects are being conducted for the Kentucky Transportation Cabinet.

Speed Estimation and Database Program (Study #06-305)



The objectives of the study are to: (1) evaluate the data sources for the HERS speed model and develop a streamlined procedure to generate input data for the model; (2) develop a methodology for estimating hourly speeds; (3) develop a windows-based speed database program that archives various speeds, either measured or estimated, and subsequently identifies a procedure to select the most appropriate speed to enter into the HIS; and (4) develop a GIS interface to display the speed map. This study builds upon the “Speed Estimation for Air Quality Analysis” (Planning Study No. 5) and investigates several data related implementation issues. The research findings

can be used for air quality analysis as well as for developing congestion performance measures. (Contact: Dr. Mei Chen, (859) 257-9262, mchen@engr.uky.edu) [Study Advisory Chair: Jesse Mayes]

High Level Benefit Cost Analysis (Study #06-306)



This project will focus on methods of using existing data to conduct a high level benefit cost analysis for a wide variety of projects. Its objective is to provide transportation officials with a tool to analyze a large variety of projects and better determine those projects to be given higher priority. This tool will not be used to determine the final priority order, but will rather serve to identify the potential benefit of diverse projects as a method of comparison based upon a range of factors. (Contact: Doug Kreis, (859) 257-4513 ext. 287, sdkrei01@engr.uky.edu) [Study Advisory Chair: Steve Ross]

Evaluation of the Effects of Diamond Grinding on PCC Pavement Performance (Study #06-310)



Diamond Grinding of PCC pavements is routinely used to restore the ride quality of concrete roadways. This type of treatment is done when the pavement structure is typically 15 to 20 years old. In recent years there has been concern that the process of diamond grinding has been detrimental to the performance of the pavement structure, due to the process of exposing the aggregate and paste structure of the pavement surface. This project will evaluate the performance of PCC pavements which have been diamond ground to those which have not been ground to see what effects there may be on overall pavement performance. (Contact: David Allen, (859) 257-4513, ext. 250, dallen@engr.uky.edu) [Study Advisory Chair: John Dade]

Tracking Best Management Practices Used by KyTC For On Site Erosion Control (Study #06-311)



The Kentucky Transportation Cabinet has the responsibility to the Department of Water Resources to implement and maintain best management practices when it is performing construction operations for building highways. The current approach is to use a Best Management Practices (BMP) Manual with the plan of attack on how erosion control will be done, and document with routine or event driven inspection reports. These reports are not sufficient documentation to demonstrate to Division of Water inspectors that erosion control is being accomplished to the desired standards. This research effort will develop the necessary tools required to develop and execute an acceptable erosion control plan for the responsible

parties. It will also identify and document available methods which may be used to achieve this plan. (Contact: David Allen, (859) 257-4513, ext. 250, dallen@engr.uky.edu) [Study Advisory Chair: Randall Thomas]

Develop Environmental Course Content for Construction Inspection Training (Study #06-312)



The Kentucky Transportation Cabinet has the responsibility to provide environmental inspections of their jobsites while performing construction operations for building highways. Although most inspectors are able to establish and maintain a good environmental friendly jobsite, it would be more effective to establish specific guidelines and procedures to ensure newer, less experienced inspectors would have the benefit of the more experienced inspectors. This research effort will determine the state of practice for training both within the Transportation Cabinet and in other state transportation agencies with regard to good environmental practices.

Training content will be developed to outline the best practices which should be utilized along with outlining the requirements of the various regulatory agencies. (Contact: David Allen, (859) 257-4513 ext 250, dallen@engr.uky.edu) [Study Advisory Chair: Randall Thomas]

Investigation of the Extended Use of (Ground Penetrating Radar) GPR for Measuring In-Situ Material Quality Characteristics (Study #06-307)



Ground Penetrating Radar (GPR) has been successfully used to measure pavement thickness greater than two inches at highway speeds. However, only until recently has the ability to measure pavement layer thicknesses less than two inches been possible with the advent of the 2.2 GHz. antenna. This study intends to focus on ground penetrating radar's ability to accurately measure any flexible pavement layer thickness at highway speeds. If ground penetrating radar proves to be a viable non-destructive pavement layer thickness testing device that can be deployed at highway speeds, thought should be given to revising the current pavement layer thickness testing specification. In addition to using ground penetrating

radar to measure pavement layer thickness, other applications such as measuring in-situ material quality characteristics will be explored. (Contact: Brad Rister, (859) 257-4513 ext. 246, brister@engr.uky.edu) [Study Advisory Chair: Steve Criswell]

Up-Date ESAL Forecasting Estimation Program for Superpave Pavement Design (Study #06-308)



The Equivalent Single Axle Load (ESAL) forecasting estimation program was first developed in 1999 to aid and assist pavement design professionals in the design of Superpave pavements. The process allowed designers to easily forecast ESAL's based on current traffic data. To date the program is still used by both pavement engineers at the Kentucky Department of Transportation and outside design consulting firms. However the underlying databases that are currently used in the ESAL forecasting program have not been up-dated since 1999. This project would pull together the five different traffic databases that are used in ESAL forecasting program and up-date them to today's standards.

(Contact: Brad Rister, (859) 257-4513 ext 246, brister@engr.uky.edu)

[Study Advisory Chair: Kong Ee]

Evaluation of Extended Truck Weight Impacts (Study #06-309)



A system of roadways in Kentucky has been designated which allows trucks hauling coal and coal by-products the ability to haul weights heavier than the current standard weight limits within the state. These vehicles are only permitted on routes which have been designated by the Kentucky Transportation Cabinet as being part of the Extended Weight Coal Haul Road System. This research study will evaluate the effects of these increased weights on pavement performance and bridge structures. In addition, the crash characteristics will also be evaluated on the extended weight routes. These performance measures will then be compared to a base system of routes which are not part of the extended weight route system.

(Contact: Clark Graves, (859) 257-4513 ext 248, cgraves@engr.uky.edu) [Study Advisory Chair: Chuck Knowles]

Stockpiling Hydrated Lime-Soil Mixture (Study #06-313)



On occasion stockpiles of materials that have been treated with hydrated lime, must be left on a project for future use. The objective of this study is to evaluate the quality of the treated stockpile material and whether or not it deteriorates over time. (Contact: Tommy Hopkins, (859) 257-4513 ext. 249, thopkins@engr.uky.edu) [Study Advisory Chair: Greg Kreutzjans]

Economic Costs of Low Seatbelt Usage in Kentucky (Study #06-315)



The objective of this study will be to determine how the cost of injuries sustained in traffic crashes affect Kentucky's state budget and how this cost could be reduced with increased seatbelt usage. Previous research has documented the effectiveness of reducing the severity of injuries in traffic crashes. However, the data have not been evaluated to determine the effect of increased seatbelt usage on Kentucky's state budget. This study will evaluate the economic impact in such areas as health care and welfare benefits for government programs such as Medicaid, Medicare or Workers' Compensation where the state budget is directly affected. An examination will be conducted to determine the impact of traumatic brain injuries (TBI) and spinal cord injuries (SCI) on both acute and long-term health care charges to Medicaid. Estimated savings expected due to TBI and SCI that would be prevented through a primary seatbelt law will be developed.

Overall medical costs will be associated with the vehicle occupant's use or non-use of safety belts. The report will document the impact on taxpayers and the government's economic costs of low safety belt usage in traffic crashes. Estimates will be made of the potential cost savings to Kentucky's state budget which would occur if a primary seatbelt law were enacted. (Contact: Kenneth R. Agent, (859) 257-4513 ext. 253, kagent@engr.uky.edu; [Study Advisory Chair: Boyd Sigler]

Investigate Low-Cost Safety Measures at Signalized Intersections (Study #06-316)



The objective of this study will be to investigate the use of low-cost countermeasures to reduce crashes at signalized intersections. Traffic signals are used to reduce traffic congestion and certain types of traffic crashes. However, in some instances, traffic crashes may not be reduced and some types of crashes may increase. Intersections with traffic signals at both high volume, urban locations and high speed, rural locations have been identified as high crash locations. The potential exists to address these high-crash signalized locations with relatively low-cost countermeasures such as additional signal heads or adding delineation to make the signal

heads more visible. The study will identify various types of low-cost safety measures and evaluate their cost and effectiveness. Intersections will be identified where the improvements could be installed. Various improvements will be monitored with data collected to evaluate their effect. The low costs associated with these measures should increase the opportunity of implementation. (Contact Kenneth R. Agent, (859) 257-4513 ext 253, kagent@engr.uky.edu) [Study Advisory Chair: Tom Napier]

Incident Management Strategic Plan Recommendations (Study #06-321)



This project will be a follow-up to the development of Kentucky's Incident Management Strategic Plan. The Plan was completed in June 2005 and contains a list of recommendations to improve incident management in the state. The purpose of this project will be to investigate several of the top recommendations and begin implementing some of those. Other recommendations may need further development to expedite their implementation. Part of this process may include identifying ideal locations and further developing the benefits and cost associated with implementation. The exact recommendations that will be the focus of this project will be determined with guidance from the Study Advisory Committee. (Contact: Monica Barrett, (859) 257-4513 ext. 256, mbarrett@engr.uky.edu) [Study Advisory Chair: Duane Thomas]

Remote Monitoring of Bridge Piers for Barge Impacts (Study #06-322)



The most critical and most vulnerable elements of the surface transportation system are the bridges. Kentucky has several key bridges carrying Interstate traffic across major rivers. One of the major ways that bridges can be damaged in Kentucky is through the impact of barges on bridge piers. The objective of this study is to equip a bridge over the Ohio River with technology to monitor the bridge piers for impact from a barge or flotilla. This project will enhance the security of the surface transportation infrastructure and will ensure that any potentially damaging impact to the bridge pier is detected quickly and responded to appropriately. (Contact: Issam Harik, (859) 257-4513 ext. 273, iharik@engr.uky.edu) [Study Advisory Chair: Bob Meade]

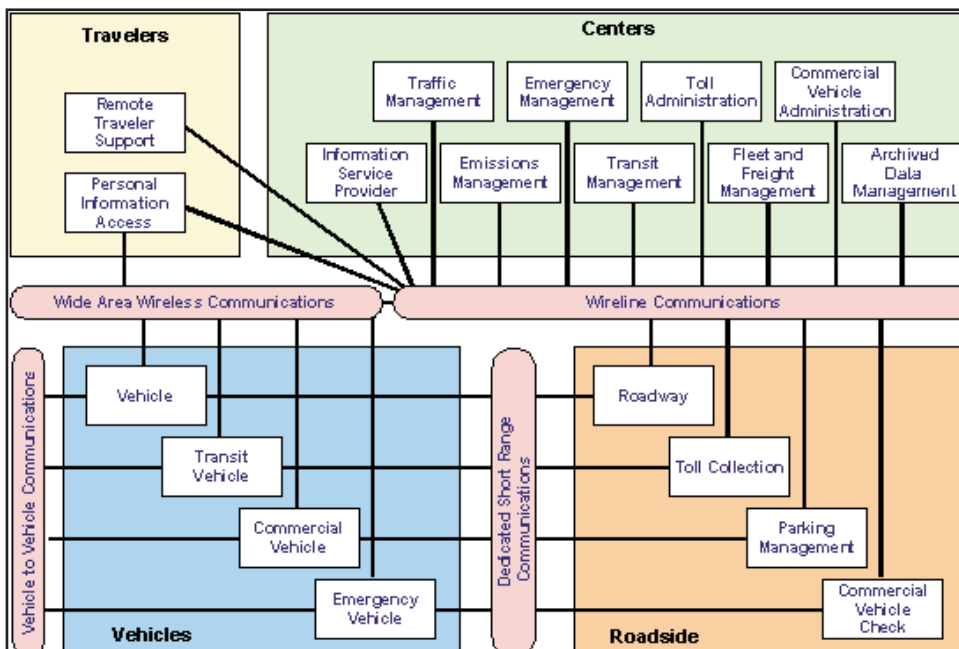
Evaluation of the Effectiveness of Pavement Rumble Strips (Study #06-319)



The objective will be to determine the safety benefits of shoulder and centerline rumble strips, and provide recommendations for future applications. Kentucky has formalized a policy on the use of shoulder rumble strips with a Special Note from the Division of Design in 1995 indicating that they are required on new and reconstructed roadways. Specifications regarding rumble strips on resurfaced roadways can be found in the 2004 Standard Specifications for Road and Bridge Construction, Section 403 Production and Placement of Asphalt Mixtures, Subsection 403.03.08 Rumble Strips. The Federal Highway Administration issued Technical Advisory T 5040.35 in 2001 titled "Roadway Shoulder Rumble Strips". This document provides information on state-of-the-practice for the design and installation of shoulder rumble strips and provides guidelines for their use on appropriate rural segments of the National Highway System. Issues remain on the overall effectiveness of rumble strips used in various applications. Shoulder rumble strips are now used on a widespread basis; however, centerline rumble strips have only recently been used in selected locations. In addition, applications of "in-lane" rumble strips have been made that serve as a means to prevent lane departures for two-lane roads. Additional analyses will be performed to evaluate the effectiveness of centerline rumble strips that have been installed on sections of

the Daniel Boone and Mountain Parkways. Before and after analysis, as well as control section procedures will be used with a focus on the frequency of head-on and other opposite-direction collisions. Durability of rumble strips related to the construction processes (rolled versus milled) will also be evaluated. Guidelines for these situations will be developed. (Contact Jerry G. Pigman (859) 257-4513 ext 252, jpigman@engr.uky.edu) [Study Chairperson: Duane Thomas]

Update Kentucky's Statewide ITS Architecture (Study #06-320)



Kentucky's ITS Business Plan was completed in September of 2001, and the Statewide Architecture was completed in September of 2002. Both products need to be updated. Much of the information gathered for those products is now four to five years old. Additional technologies have been deployed, and plans have been revised at regional and statewide levels. Newer versions of the National ITS Architecture and the Turbo Architecture software have been released. The National Architecture now includes additional market packages, subsystems, terminators, and information flows that need to be incorporated into the Statewide Architecture. The principal

objective of this project is to update Kentucky's ITS Business Plan and Statewide Architecture. This update will reflect changes to the inventory of existing projects and the list of recommended projects. It will also bring Kentucky's Statewide ITS Architecture into conformity with the latest version of the National ITS Architecture. (Contact: Joe Crabtree, (859) 257-4513 ext. 241, crabtree@engr.uky.edu) [Study Advisory Chair: Leon Walden]

Traffic Control for Emergency Responders (Study #06-317)



The objective of this study is to develop a training course to guide emergency responders controlling traffic during a roadway crash and subsequent clearance. Emergency responders, with the exception of law enforcement, are provided limited or no training in traffic control, but often have to perform such duties. The Manual on Uniform Traffic Control Devices contains guidelines for control of traffic through incident management areas that should be followed for the safety of responders and motorists.

Chapter 6I addresses emergency road occurrences, natural disasters, or other unplanned events that disrupts traffic flow and identifies a specific color (black legend on fluorescent pink) for warning and guide signs used for temporary traffic control. Unfortunately, many responders are unaware of these guidelines. Deliverables from the study efforts will be workshop materials and a presentation suitable for use in training a wide range of incident responders. Workshop contents will be condensed into an “Incident Response Traffic Control Handbook” for quick-reference applications. Separate materials will be developed in a train-the-trainer form. By developing this training, the safety of those responders working on-scene, as well as the traveling motorists near the scene, will be improved. A secondary benefit of providing training for incident responders will be the potential for improved traffic flow and decreased delay resulting from highway crashes and other incidents. *(Contact Jerry Pigman, (859) 257-4513 ext 252, jpigman@engr.uky.edu) [Study Advisory Chair: John Crossfield]*

Development of a Traffic Sign Inventory System (Study #06-318)



The objective will be to develop a prototype sign inventory system for application by the Kentucky Transportation Cabinet. A system is not currently in place to inventory traffic signs in Kentucky. A sign inventory database would be beneficial for those responsible for maintenance and management of signs. The overall safety provided the driving public could benefit from an efficient inventory system that increases an agency's knowledge of existing signs. In addition, a comprehensive inventory and mechanisms for updating the inventory could reduce the potential for liability associated with outdated, inappropriately placed, or missing signs. Software is available for this kind of inventory; however it can be expensive and would lack the specific features that could be developed in-

house. It is intended that the system will serve as the model for expansion to a statewide inventory and management system for signs. This system will permit the Transportation Cabinet to track and monitor the number, location, and condition of signs that fall under their responsibility as part of the state-maintained roadways. Development of the sign inventory will be compatible and coordinated with other inventory and asset management tools presently being employed by the Transportation Cabinet. *(Contact: Eric R. Green, (859)-257-4513 ext 254, egreem@engr.uky.edu) [Study Advisory Chair: Amos Hubbard]*

Improved Safety of Workers During Highway Construction and Maintenance (Study #06-323)



Accidents in construction work-zones are caused by a combination of factors and this problem has been studied several times under the title Work Zone Safety. There is also a great concern for the safety of construction and maintenance workers while they do highway work. There is certainly potential for injuries to workers by the traveling public; however, there are many other worker safety issues that have been identified by government and industry groups, such as: Safety Management (organizational commitment), Materials Handling (overexertion, repetitive motion, sprains and strains), “Struck-By” Accidents (worker run-overs and back-overs), Fleet Safety (on the road vehicle accidents), and Safe Equipment and Machinery Operations.

Many enhancements can be attained through improved project safety management practices during construction and maintenance operations on highways. The main objectives of this study will be to: 1) identify best safety practices used for workers on highway construction projects, and 2) identify best safety practices for workers on highway maintenance projects. The study objectives will be accomplished through the following tasks: 1) literature search and review past studies on highway work-zone safety, construction worker safety and maintenance worker safety; 2) survey other state transportation agencies regarding their practices for improving worker safety for construction and maintenance projects; 3) case studies of highway construction and maintenance projects to determine which methods and techniques most effectively improve worker and public safety. (Contact Donn E. Hancher (859) 257-1864, 859-338-3472, hancher@engr.uky.edu) [Study Chairperson: Vibert Forsythe]

Sampling of Reports Published in 2005

KTC-05-02	Review of Traffic Provisions of KRS/KAR and Kentucky Drivers Manual
KTC-05-03	Kentucky Geotechnical Database
KTC-05-04	Examination of Economical Methods for Repairing Highway Landslides
KTC-05-06	Safety and Capacity Evaluation for Interstates in Kentucky
KTC-05-07	Speed Estimation for Air Quality Analysis
KTC-05-08	Development of Kentucky’s Highway Incident Management Strategic Plan
KTC-05-09	Evaluation of Auto Incident Recording System (AIRS)
KTC-05-14	Innovative Rapid Construction/Reconstruction Methods

For a copy of the prospectus covering these studies or general information regarding the Kentucky Transportation Center, contact:

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