Focus on Research

December 1994 Volume 2 • Issue No. 5

*"**Focus on Research** updates engineers and technicians on items of interest upcoming in active TxDOT research projects."*

Study Assessing Design vs. Posted Speed Relationships

The incompatibility of design speed vs. posted speed for phased highways in Texas has long concerned TxDOT traffic engineers. Because the problem can affect highway operations and safety, as well as agency liability, TxDOT began to investigate the extent of this traffic operations problem.

In Project 0-1465, *Compatibility of Design Speed and Posted Speed for Phased Highways,* the researchers evaluate existing state, federal, and municipal government policies for establishing regulatory speed zones on highways having design speed limitations. In addition, the project evaluates other states' policies and any legal precedence for establishing regulatory speeds in excess of design speed. The researchers are also interviewing design engineers at various agency levels.

This project will concisely state the relationship of design speed to operating speed and posted speed. Developing guidelines based on concerns, experiences, and liability issues will result in a reasonable, useful, and defendable document for the department. This project started in September 1994 and will terminate in August 1995.

Area 3 — PD: Wallace Ewell, P.E., Fort Worth
Researcher: Dr. Kay Fitzpatrick, TTI

Project 7-1997

UTA Project To Improve TxDOT's Pavement Distress Data Collection

In its statewide collection of pavement distress data, TxDOT deploys various instruments and sensor devices, each housed in separate vehicles and operated by different personnel. Because the type of data obtained by such equipment varies, field units are required to make multiple passes over the same surface. To increase efficiency and accuracy, TxDOT has undertaken to combine the various data collection devices — among them the Surface Dynamics Profilometer, the SIometer, and the Automated Road Analyzer (ARAN) — into one data collection system.

This combining of devices is the objective of Project 7-1997, *Implementation of Intelligent Bus System for Distress Measurements.* In this University of Texas at Arlington study, the researcher is also testing various sensors for use in developing better distress measurement systems, including the incorporation of improved laser scanning technologies. Field testing is scheduled for the configuration of sensors developed and/or selected.

Integration of all the different pavement distress measurement operations into one data collection system requires the development of an electrical bus and various interface modules. The design of the bus system must consider not only existing technologies used by TxDOT, but other technologies that may be adopted as well. The list of surface measurement and data acquisition equipment that could be expected to interface with the real-time bus system includes acoustic sensors, lasers, video, accelerometers, ground-penetrating radar, global positioning devices, inclinometers, temperature systems, and gyroscopes or inertial reference measuring instruments.

When completed, this project will provide a faster and more accurate method of obtaining various distress information for the state's PES database and for project-specific applications. By using only one vehicle for obtaining several different distress measurements, the department can realize savings in manpower, time, and money.

The department plans to implement the real-time bus in the ten SIometer/rut bar vans. Such implementation will provide an expanded capability for pavement management and project data collection activities. The greatest overall benefit to TxDOT will be the ability to collect a variety of pavement surface distress data in only one pass. This project got underway in September 1993 and will terminate in August 1995.

Area 2 — PD: Carl Bertrand, P.E., DES
Researcher: Dr. Roger S. Walker, UTA

Texas Department of Transportation

Research and Technology Transfer Office, in cooperation with the FHWA

Project Measuring and Monitoring Urban Mobility in Texas

In planning for improvements that increase urban highway capacity, TxDOT must monitor the congestion levels in the state's large urban areas. To assess the congestion problem adequately, state transportation planners must also compare the Texas situation with that of other large metropolitan areas throughout the country. In this way, TxDOT can identify nationwide mobility trends and, at the same time, gauge the performance of our state's urban highway network relative to those of other metropolitan areas. Such information is essential in determining overall transportation trends and in prioritizing allocations meant to increase the state's urban mobility.

Assisting TxDOT in this challenge is Project 0-1131, *Measuring and Monitoring Urban Mobility in Texas*. This ten-year study, undertaken by the Texas Transportation Institute, has been measuring and monitoring urban mobility in urbanized areas throughout the U.S. In addition, it has been analyzing the congestion levels of recently completed urban construction projects to determine the effectiveness of such construction. (That is, has it increased capacity and rates of travel?) What this project — and TxDOT — hope to achieve is a reversal of the trend toward increased traffic congestion that has characterized urban areas in Texas since the early 1980s.

Among other tasks, Project 0-1131 has developed a peak-period congestion index, continues to update and expand mobility indicators to include the 25 largest U.S. metropolitan areas, and has developed an areawide transit and roadway mobility index.

The project findings yield more effective, consistent, and up-to-date measurements of urban mobility. Such measurements, in turn, are used to assess the benefits of major transportation improvement. For example, conventional wisdom suggests that the significant street, highway, and transit construction projects currently underway in major Texas cities will be effective in slowing, and possibly reversing, the traffic congestion growth trend. Quantifying the relative mobility levels of these projects as they are completed will test this axiom, determining whether these major improvement projects do in fact increase overall capacity. This long -term project began in September 1987 and will run through August 1997.

Area 1 — PD: Deborah Morris, P.E., TPP
Researcher: Dr. Tim Lomax, TTI

CTR Study Testing Notched Ends of Prestressed Concrete Box Beams

Prestressed concrete box beams being used in a bridge project in Houston have shown signs of cracking at the notched ends (aka dapped ends) during fabrication. This unexpected development raises the question of whether a similar problem could occur in any beam having a voided cross section and dapped ends.

In an effort to answer these and other structural design questions, Project 0-1479, *Testing Notched Ends of Prestressed Concrete Box Beams*, is assisting TxDOT's Design Division to perform a static load test on a bridge beam that has notched-end details and cracking similar to that found in the box beams used in Houston. Loads will be applied to the beam to induce the kind of reaction at the end that would occur if a load large enough to cause flexural failure were placed at the midspan of the beam. The researchers will also assist with the development of new notched-end details.

Most significant to TxDOT, Project 0-1479 will determine the ultimate strength of the notched-end detail in members having voided cross sections. Because notched-end cracking can threaten the structural integrity of a bridge, the results will be implemented immediately. Thus, the researchers will redesign for TxDOT any prestressed concrete box beam exhibiting notched-end detail problems. This project started in July 1994 and will end in August 1994.

Area 4 — PD: Jeffery C. Cotham, P.E., DES
Researchers: Drs. Michael E. Kreger and John E. Breen, CTR

Focus on Research

The purpose of ***Focus on Research*** *is to update engineers and technicians on items of interest in active upcoming projects. The contents of the various articles do not necessarily reflect the official views of the FHWA or TxDOT.*

Contact Kathleen M. Jones (512) 465-7947, Research and Technology Transfer Office, P.O. Box 5080, Austin, TX 78763-5080, for more detailed information.

This paper contains 50% post-consumer recycled fiber.

Texas Department of Transportation
Office of Research and Technology Transfer
P.O. Box 5080
Austin, TX 78763-5080

This issue prepared by the Center for Transportation Research of The University of Texas at Austin