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Focus on Research

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

Free Trade Pact Prompts TxDOT To Review Multimodal Potential

The growth in U.S.-Mexico trade over the past 5 years has been dramatic, with the traditional range of Mexican agriculture and mineral products now supplemented by electrical and automotive equipment produced at maquiladora sites in northern Mexico. The trade growth has been such that, today, Mexico is the third leading U.S. trading partner, behind Japan and Canada.

The key objective of Study 0-1319, *Multimodal Planning and the U.S.-Mexico Free Trade Agreement*, is to determine the different categories of multimodal centers that can be developed along the U.S.-Mexico border. These centers, which must offer competitive transportation costs and efficient levels of service, will facilitate trade and will protect the transportation infrastructure of Texas and the rest of the U.S.

As the volume of bilateral trade between the U.S. and Mexico increases, the need for an efficient transportation system to facilitate travel and the distribution of goods becomes more urgent. Without such a transport system, the amount of trade between the two countries will necessarily be limited. This study will contribute to the development of a framework within which regional and city plans can be studied and formulated.

To date, the researchers have installed a weigh-in-motion system and have begun collecting data. The experimental site for the study includes much of the Texas-Mexico border region.

The research findings, to be thoroughly documented in a series of reports, could prove extremely useful in TxDOT policy-making. In addition, the findings will be available to interested parties on both sides of the Texas-Mexico border. Among other things, the study will recommend center sites, with mode and configuration indicated (where appropriate) for both passenger and freight movement.

The project runs from September 1992 through August 1995.

Area 1 — Technical Panel Chairman: Manny Aguilera, P.E., El Paso District
Researchers: Robert Harrison, Dr. Clyde Lee, Chandler Stolp, and Dr. Leigh Boske, CTR

In This Issue

Optimum Shoulder Treatments Assessed

Single-vehicle run-off-the-road accidents are a problem on a number of Texas rural highways. This type of accident is most often caused by driver fatigue induced by long, straight stretches of highway. As a result, TxDOT has installed special shoulder treatments in areas where a significant number of such accidents have occurred.

Research Study 0-187 (Task 12),

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Texas Department of Transportation

Office of Research and Technology Transfer, in cooperation with the FHWA

Railroad Crossing Safety Investigated

Although significant progress has been made toward improving safety at railroad/highway grade crossings, the problem of unsafe crossings is by no means solved. For example, the most common strategy for improving safety at passive crossings has been the installation of active warning devices. However, based on the current funding level of $12 million per year for the installation of these devices in Texas, it would take approximately 70 years to signalize the 9,153 passive crossings in the state.

As a result, TxDOT, using accident data, has established a prioritizing system for identifying which crossing should be upgraded first. Presently, most of the crossings with high accident counts have been treated or improved. Unfortunately, identifying additional crossings that should be improved requires that TxDOT wait for accidents to occur.

The objective of Study 0-1343, *Revisions to the Texas Priority Index for Railroad-Highway Grade Crossings,* is to develop a revised priority index for ranking railroad-highway grade crossings in Texas. This new index will incorporate such engineering factors as sight distance, vehicle speeds, and obstruction, as well as such special factors as school bus routes, hazardous cargo routes, and short-line railroads.

This revised index will enable TxDOT engineers to identify and improve crossings that have the greatest potential safety benefits on a system-wide basis. Moreover, this index will ensure that limited safety funds are spent in the most cost-efficient manner.

The project runs from August 1993 to August 1994.

Area 3 — Technical Panel Chairman: Darin Kosmak, P.E., Traffic Operations Division
Researcher: Dan Fambro, P.E., TTI

Researchers To Examine Methods for Repairing Bridges Hit by Tall Trucks

In Texas, approximately one bridge per week is hit by a truck whose height exceeds the bridge's maximum clearance. Frequently, the impact damage is substantial enough to warrant removal and replacement of the bridge girders. In cases where prestressed girders have been impacted, the strands can, owing to a loss of the compression section, lose pretension force, even though the individual strands are neither frayed nor severed.

By examining the evaluation process relating to impact-damaged girders, Study 0-1370, *Repair of Impact-Damaged Prestressed Concrete Girders,* should lead to more reliable decisions regarding girder condition and need for repair (rather than replacement). Repair techniques that do not significantly alter the appearance of the bridge, or that do not introduce durability or maintenance problems, will be examined; such methods include the retensioning of strands in-place and the injecting of epoxy into cracked concrete. If impact-damaged girders can be repaired in-place rather than removed and replaced, then lane closure times can be reduced, saving both the state and motorists time and money. Because the project is lab oriented rather than field oriented, the CTR project team would like to acquire additional impact-damaged prestressed girders for their laboratory investigation.

The evaluation techniques developed could be used immediately in assessing damaged girders. It is expected that, upon completion of the study, TxDOT engineers will establish routine procedures for bridge damage assessment.

The project runs from September 1992 through August 1995.

Area 4 — Technical Panel Chairman: Robert Cochrane, P.E., Construction and Maintenance
Researchers: Drs. J. O. Jirsa, D. W. Fowler, and R. L. Carrasquillo, CTR

Optimum Shoulder Treatments Assessed

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Monitoring of Prevention of Single-Vehicle Run-off-the-Road Accidents, is evaluating the effectiveness of these shoulder treatments in Texas. As part of the evaluation process, the project team is collecting data on existing installations and comparing before-and-after accident data (such data for 1991 and 1992 have already been obtained and are being added to the existing data base). Design and construction data, as well as a questionnaire soliciting additional design, construction, and maintenance data, have been received from most districts. A proposed interim design guide is currently being prepared for review by the study technical committee.

Upon completion of the 3-year study, a final report will recommend optimum shoulder treatments for different highways and geographical areas in Texas. These recommendations will be included in department design procedures.

The project will continue through August 1995.

Area 3 — Technical Panel Chairman: Chris Hehr, P.E., Construction and Maintenance Division
Researcher: Dr. Kent Wray, P.E., Texas Tech

High-Strength Concrete Used in Houston Demo Project

Engineers are searching for ways to improve the performance of concrete as a bridge material. During the last 10 years or so, concrete having a compressive strength in excess of 8,000 psi has been successfully produced using conventional materials and production techniques. Many theoretical and parametric studies have also predicted significant design advantages and economic savings through the use of high-strength concrete in bridges.

The objective of Project 9-580, *Design and Construction of Extra-High Strength Concrete Bridges,* is to assist TxDOT engineers in the design and construction of the Louetta Road Overpass demonstration project in Houston. Such assistance includes designing a quality control program, conducting structural testing, monitoring performance, and performing various inspection and construction operations. The project will use concrete in the 8,000–12,000 psi range, along with 0.6-inch diameter prestressing strands.

Research results will be implemented immediately in the design and construction of the Louetta Road Overpass structures.

The benefits of extra-high-strength concrete combined with the 0.6-inch strands include increased durability, decreased permeability, and greater versatility in design (i.e., longer clear spans and greater flexibility in bent locations, column sizes, and spacing are allowed).

Test beams were cast by Texas Concrete Company in Victoria, Texas, during September of 1993. These beams, 44.5 feet (13.5m) long, have been transported to the Ferguson Structural Laboratory for testing. The demonstration site will be the proposed adjacent bridge structures at the Louetta Road Overpass in Houston. Construction should commence during the first half of 1994.

Research results will be implemented immediately in the design and construction of the Louetta Road Overpass structures. The knowledge gained through this demonstration project will be used in the design and construction of future extra-high-strength concrete bridges, not only in Texas but in other parts of the country as well.

This project runs from July 1993 through August 1995.

Area 4 — Technical Panel Chairman: Mary Lou Ralls, P.E., Design Division
Researchers: Drs. Ramón Carrasquillo and Ned Burns, CTR

Study To Provide Guidelines for Joint Sealant Selection

Joints relieve pavement distress by controlling the pavement's volumetric movements. To protect these joints from water and foreign material, pavement designers use joint sealants. Sealants have proven to be critical to the long-term performance of jointed concrete pavements. Because there are a wide variety of joint sealants available, designers require a framework within which to assess, compare, and select from among the numerous options, both with regards to initial cost and to performance effectiveness.

Research Project 0-1371, *Evaluation of Joint Sealants,* will characterize or develop appropriate materials models that account for age effects and climatic conditions. These materials models will, in turn, be used to develop performance-based prediction models. Methods for optimizing design factors for different climates will be developed to provide guidelines for comparing and selecting joint sealant types.

The study will develop guidelines for an improved and more reliable joint sealant selection and design process, one that should lead to longer lasting pavements and bridge decks in Texas. Field test sites will be selected later in the study.

This project started in September of 1993 and runs through August of 1995.

Area 2 — Technical Panel Chairman: Elias Rmeili, P.E., Design Division
Researchers: Dan Zollinger, P.E., and T. Tang, TTI

Research Area Titles

Area A: "Administration and Policy"

Area 1: "Planning, Economics, Environment, and Transit"

Area 2: "Materials, Construction, Maintenance, and Pavement Design"

Area 3: "Traffic Operations, Geometric Design, and Right-of-Way"

Area 4: "Structural Design"

Single-layer Pavement Ride Quality Addressed

Proposed TxDOT asphalt concrete pavement (ACP) specifications require that the ride quality be determined using a California-type profilograph, with applicable payment bonuses awarded or deductions imposed depending on resultant ride quality. Current plans allow this procedure only when the contractor is also responsible for placing or milling the layer beneath the one to be tested, since it is not known what ride quality can be achieved by placing only one relatively thin layer. One-layer jobs will continue to be evaluated using the relatively ineffective 10-foot straightedge criteria.

Project 0-1378, *Development of Ride Quality Specifications Criteria for ACP Overlays*, seeks to establish achievable ride quality for single-layer pavement placement contracts. In addition, it will address concerns regarding new profilograph specifications, including the apparent insensitivity to short-frequency ripples.

The findings of this research study should lead to a ride quality specification that is acceptable to the Associated General Contractors (AGC) and will benefit TxDOT and Texas motorists by encouraging contractors (through bonus payments) to produce high quality pavement overlays.

The results of this study will be used to develop modified ride quality specifications for TxDOT ACP contracts.

The Texas Department of Transporation plans to implement Study 0-1378 by publishing guidelines for anticipated increases in serviceability based on current roughness levels; (2) using levels of effort needed to achieve reasonable levels of ride quality to be determined by 0-1378; (3) certifying roughness measuring equipment and data analysis procedures using methods developed under the study; and (4) establishing a program for training and certifying TxDOT quality assurance personnel.

The results of this study will be used to develop modified ride quality specifications for TxDOT ACP contracts.

The project, which got underway in September 1993, will end in August of 1996.

Area 2 — Technical Panel Chairman: Rob Harris, P.E., Design Division
Researchers: E. G. Fernando and T. Scullion, P.E., TTI

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.*

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