

Focus on Research

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

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Research Area Titles

- Area A: "Administrative 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"

Texas A&M Study To Assist in Highway Operations Planning for Austin District

As Austin continues to grow, innovative approaches are required to accommodate traffic demands. Project 993, *Highway Planning and Operations for Austin District*, provides innovative support and access to advanced equipment and software in six areas:

- HOV planning assistance
- collection and analysis of freeway and highway operations data
- freeway planning (including surveillance and communication systems and corridor flow)
- regional thoroughfare planning coordination to accommodate future traffic
- assistance with planning projections (particularly design hour volumes that incorporate existing traffic, historical trend-line analysis, and design year projections)
- video imaging

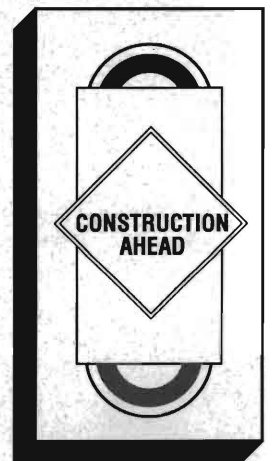
The researchers have developed *FREQ10* (a macroscopic freeway simulation program) models of Interstate 35 and will recommend possible ways to incorporate new freeway designs reflecting many HOV alternatives. The recommendations will be in the form of a guide to using the process on other freeway projects, rather than a detailed technical report. The models are currently being calibrated to reflect future growth.

The researchers have provided the district with several sets of video-based, computer-generated images showing before-and-after conditions of proposed construction to IH 35 and other state-maintained highways and streets in the Austin area. The graphic output comes in two formats, video tapes with animated traffic overlaying the image and 35 mm stills.

Currently, the researchers are also assisting in the development of a major transportation investment study for the Austin segment of IH 35. This assistance is limited to alternative comparisons.

District personnel have been very pleased with the results and the researchers' timely response to special requests.

This study takes findings from state and national HOV transportation modeling and other state-of-the-art research efforts and applies them to Texas situations. The project started in December 1989 and will end in August 1995.



Research and
Technology Transfer
Office, in cooperation
with the FHWA

Area 1 — PD: Glenn McVey, P.E., AUS
Researcher: Dr. Tim Lomax, TTI

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UTEP Study 0-1455

Researchers Assess ECS Device for Texas

The environmental conditioning system (ECS) is useful in determining moisture damage in pavements. Project 0-1455, *Evaluation of Environmental Conditioning System (ECS) for Predicting Moisture Damage Susceptibility of HMAC*, will evaluate this device under conditions found in Texas, compare its versatility with that of other current methods, define its weaknesses and strengths, de-

termine its cost effectiveness, and, finally, outline protocols for its use in the variety of climates found in the state.

The project team will pursue these objectives by testing (in the lab) HMAC mixtures typically used in Texas, and by comparing the reliability and accuracy of the device relative to existing methods and procedures.

The study findings will pro-

vide TxDOT with a reliable and cost-effective device for inspecting moisture damage in HMAC. The device can be implemented immediately upon the completion of this new project, which starts in September 1994 and ends in August 1996.

Area 2 — PD: Maghsoud Tahmoressi, P.E., MAT
Researchers: Drs. Rafael Pezo and Miguel Picornell, UTEP

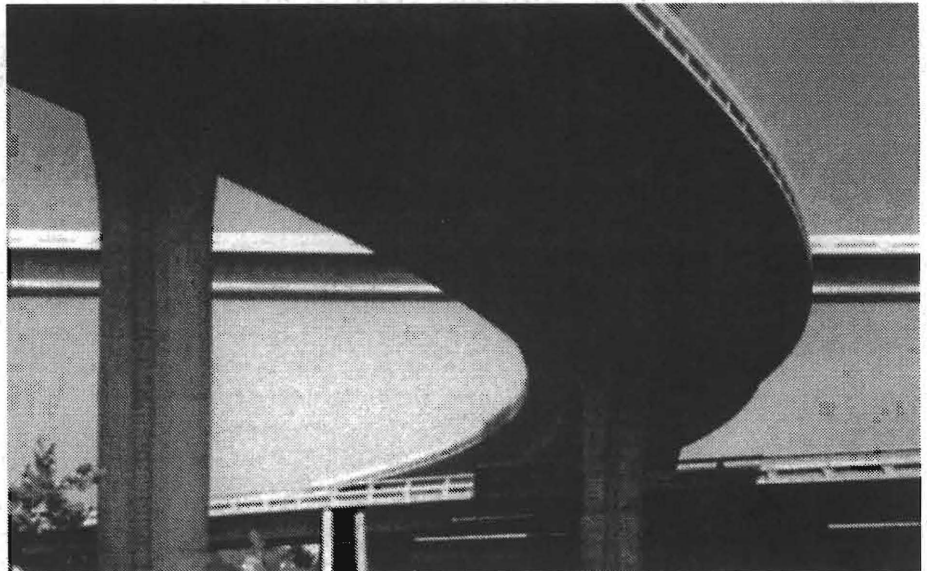
Current Corrosion Protection Measures Evaluated

Bridge deck deterioration is widespread in Texas. Scaling, cracking, and delamination of the concrete is usually accompanied by corrosion of the bridge deck reinforcement. Investigations discovered that some methods used for corrosion protection are ineffective and even harmful in some cases. TxDOT needs effective methods to protect bridge decks against corrosion.

The research team designed Study 0-1300, *Evaluations of Current Corrosion Protection Measures for Bridges*, to:

- identify methods for protecting bridges based on surveys of TxDOT districts and other states, and through laboratory and field tests that are carefully monitored for performance and for maintenance costs, and
- develop such implementation criteria as design provisions, material specifications, and construction procedures for use by bridge engineers and inspectors.

Researchers have completed the literature search, survey of current practice, and the development of a test procedure for surveying corrosion activity. They reported these tasks in *Field Evaluation of Bridge*



Corrosion Protection Measures, Research Report 1300-1. Currently, the research team is conducting an extensive lab test program comparing exposure and aging characteristics of over 150 different specimens representing 14 protection systems to make recommendations for future use in bridge construction. TxDOT district personnel have identified seven candidate projects to receive different protection systems to monitor the systems' performance in new bridge construction. Researchers are also monitoring the

corrosion activity in 13 existing structures exposed to deicing salts or seawater.

This research will yield guidelines, procedures, and specifications that will extend the service life of Texas' bridges, making them safer and less costly to maintain. Study 0-1300 started in September of 1991 and continues through August 1995.

Area 4 — PD: Dana Honganen, P.E., DES
Researcher: Dr. David Fowler, CTR

Fiberoptics Seen As Alternative for Traffic Signals

Replacing bulbs in roadway lamps and traffic signals is time-consuming and hazardous. Research Study 0-1464, *Fiberoptic Applications for Traffic Signal and Roadway Illumination Systems*, examines this safety issue by identifying alternative lighting systems (such as fiberoptics), and by preparing scale models of eligible systems to predict the cost-effectiveness of such alternative systems.

Fiberoptics transmit light. Unlike incandescent bulbs, the lighting source of a fiber optic cable may be remote. Theoretically, fiber optic traffic signals could have their lighting sources stored in the control box or similar housing away from traffic. Maintenance crews would not have to block an intersection to change light bulbs in a fiber optic system.

Intensity of illumination is the main drawback to fiberoptics right now — they aren't very bright. Fiberoptics, LEDs, fast-switching circuitry, and appropriate focusing equipment may be required to obtain the necessary light intensity. The size, number, and source of fiber optic cables will also determine the feasibility of using them in a roadway setting.

The selected fiber optic alternative will improve safety as well as possibly reduce system maintenance time. If the alternative system proves to be economically feasible, implementation will take place by gradually modifying older systems. The project gets underway in September 1994 and is scheduled to end in August 1996.

**Area 3 — PD: Karl Burkett, TRF
Researcher: Dr. Roger Walker, UTA**

Corrosion Protection for Post-Tension Tendons Focus of Study

A recent and highly controversial study alleges the existence of widespread problems in the corrosion protection of bridge cable-stay systems. Many of these problems are similar to those found in post-tensioned application — which is not surprising, given that the basic technologies, materials, and suppliers are often identical. Because some structures in Texas have experienced many of these problems, TxDOT seeks improved procedures that can ensure efficient, long-term corrosion protection.

Project 0-1264, *Corrosion Protection for Post-Tension Tendons and Cable-Stay Systems*, will examine the potential for corrosion in currently used post-tensioning systems. In addition, the project

will recommend improved:

- procedures for the use of lubricated tendons;
- methods for corrosion protection of post-tensioning for segmental construction; and
- corrosion protection methods for cable-stay systems.

The results could be of use in future bridge designs and in the construction of prestressed tendons (especially in segmental construction) and cable stays. Lab tests on large-scale models are currently taking place. The project started in September 1990 and continues through August 1994.

Area 4 — PD: Lisa Powell, P.E., DES

Researchers: Drs. John Breen and Karl Frank, CTR

Congestion Pricing May Lead To Reduced Urban Congestion

In Project 0-1321, *Use of Congestion Pricing for Reducing Urban Congestion*, the researchers will develop methods for determining road pricing for use in urban congestion control, air quality enhancement, and revenue generation. Additionally, the project seeks to develop a road pricing implementation strategy that complements both traffic management systems and IVHS in Texas.

Specific project objectives include:

- examining the feasibility and effectiveness of road pricing as a way of reducing congestion,
- analyzing past methods of road pricing,
- examining technologies and policies that can be effective in Texas,
- developing procedures to de-

termine "optimal" pricing, and

- identifying selected candidate locations for possible implementation.

The results will allow further development and implementation of a potentially effective tool for reducing urban congestion, improving flow conditions in urban networks, reducing user delay, and generating additional revenue for facility operation and maintenance. Equally important, the findings will better enable the state to comply with the 1990 Clean Air Act. This project got underway in February 1992 and ends in August 1994.

**Area A — PD: Jack Foster, TPP
Researchers: Drs. Hani S. Mahmassani and C. Michael Walton, CTR**

TxDOT Seeks Enhanced Environmental Awareness

Faced with the dual demands of cost-effectively maintaining the state's highways and demonstrating a level of environmental sensitivity, the Texas Department of Transportation seeks a more proactive approach to those environmental issues affecting highway maintenance. Research Study 7-1933, *Environmental Concerns in Maintenance: A Proactive Initiative*, will assist the department in this effort by:

- preparing an environmental impact study (EIS) on the Vegeta-

tion Management Program's pesticide operations, and by

- identifying and prioritizing, for environmental assessment, all other maintenance practices and materials used by TxDOT.

The study results — to be presented as an EIS — will allow TxDOT to proactively manage environmental issues affecting maintenance. Overall, TxDOT, through this study, will more effectively preserve highway vegetation aesthetics, protect the capital investment, minimize adverse effects on natural resources and wild-

life habitats, demonstrate a concern for our cultural heritage, and project a positive public image. Most importantly, the results obtained from this study will enhance TxDOT's efforts to incorporate environmental concerns into the planning and operation phases of maintenance. The project got underway in August 1991 and will continue through December 1994.

*Area 1 — PD: Roy Smith, CMD
Researcher: Dr. Wayne G. McCully, TTI*

Cost Allocation Study To Determine User Equity

The *Cost Allocation Procedure Enhancement* study (7-1919) provides TxDOT with a basis for distributing the cost of providing highways fairly among highway users. It also develops pricing strategies to generate revenues to recover road costs. The principal objective of 7-1919 is to determine whether each vehicle or class of vehicles contributes fairly to the cost of providing operating systems. Traditionally, equity is used as the fairness criterion. The researchers consider equity to occur when each vehicle group's percentage of total assigned costs is equal to that group's percentage of total contributed revenues.

The methodology refined in this study involves:

- designation of vehicle classes and fleet estimation
- revenue estimation and allocation
- cost estimation and allocation
- revenue/cost comparison

The recently released report 1919-2F/1910-3F summarizes the 1992 analysis of cost responsibility, including estimates for 1993 and 1994. Based on the analysis, combination trucks pay about 50 percent of their assigned costs; buses pay about 27 percent; passenger cars pay about 118 percent; and pickups pay about 175 percent. A value greater than 100 percent means that the vehicle class is contributing more in user taxes

and fees than its responsible costs. A value less than 100 percent means a vehicle class is not paying enough. The results represent the most accurate estimates to date.

Study 7-1919 and its TTI companion study, 7-1910, have important policy implications. Among other things, the results provide TxDOT with appropriate information to address inquiries as to the potential impact of various vehicle user tax changes. This project, which began in March 1992, is a continuing project.

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Researchers: Dr. C Michael Walton and Mark Euritt, 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.

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