

Focus on Research

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

CTR Study Developing Specifications for Large Diameter Anchor Bolts

The Texas Department of Transportation often uses large diameter anchor bolts to secure high mast lighting standards and overhead sign supports. Yet currently there are no specifications for tightening the nut to these large diameter bolts, an oversight that has led to problems. For example, an improperly tightened nut can reduce axial fatigue strength, which, in turn, can cause fatigue cracking problems in the supporting structure.

Research Project 0-1472, *Tightening Procedure for Large Diameter Anchor Bolts*, will develop (1) a method for installing high strength bolts, and (2) anchor bolt specifications for nut strength, overtapping, and lubrication. The research results will provide the state with safer and more reliable anchor bolt installations. An anchor bolt performing as the designer intended will yield both increased fatigue life and better structural performance.

To implement the study findings, the researchers will prepare a training video. They will also evaluate existing structures statewide and will present results to an AASHTO committee for adoption consideration. This project started in September 1994 and ends in August 1996.

Area 4 — PD: Jim Yang, P.E., DES

Researchers: Dr. Karl H. Frank and Dr. Joseph A. Yura, CTR

State Highway Operations Improvements in Urban Areas Focus of New TTI Study

While planning, design, construction, and maintenance activities consume the bulk of state transportation agency budgets, studies show that what highway travelers desire most are delay-free highway operations. Unfortunately, congestion delays are increasing dramatically in Texas' urban areas, requiring that the Texas Department of Transportation continue to seek ways of improving highway operations in order to provide state travelers with the highest practical level of service.

Much of this effort will require new and innovative ways of collecting data and controlling traffic. Research Project 0-1467, *Highway Operations Research and Implementation*, will assist TxDOT in this challenge by improving data collection in incident management, control strategies, and information systems. Overall, it will build on the operations improvements

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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"



Research and
Technology Transfer
Office, in cooperation
with the FHWA

Designs for Curb Inlets and Bridge Drains Assessed

Research Project 0-1409, *Hydraulic Characteristics of Recessed Curb Inlets and Bridge Drains* — Phase 2, will determine the capacity of two variations of a new type of curb inlet and of six types of bridge deck drains. The study, a continuation of Project 0-1267, will also undertake additional tests on bridge deck drains to evaluate the effects of downspout piping installed below bridge deck drains.

The overall objective of Study 0-1409 is to develop for the Texas Department of Transportation new

design criteria and procedures for constructing recessed curb inlets and bridge drains. Updating these criteria and procedures will provide more precise construction guidelines, thus eliminating the uncertainty that has led to the widespread practice of overestimating drain capacity for the various drains. Such guidelines will, in turn, reduce costs for these types of systems in bridge decks.

The form of the new design criteria and procedures will resemble that of other curb inlet and bridge

deck drain criteria used by TxDOT. The project got underway in September 1993 and ends in August 1995.

*Area 4 — PD: Jay Vose, P.E., DES
Researcher: Dr. Edward Holley,
CTR*

State Highway Operations Improvements Focus of Study

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already pioneered by TxDOT, which, in 1989, assumed national leadership in highway operations improvement when it undertook a five-year program of coordinated highway operations research. That effort yielded the *Texas Highway Operations Manual*, a set of guidelines adopted by other state agencies and used for internal training by the Federal Highway Administration.

While the research plan of Project 0-1467 targets incident management, control strategies, and information systems, the key focus is the implementation document — that is, a revised, user friendly *Texas Highway Operations Manual*. By separating project research documents from the project's implementation document, the researchers hope to make available to TxDOT personnel a practical, nontechnical field reference.

The findings of this study, which will be made available to the Traffic Operations Division and to urban districts, will improve highway operations (and capacity) by providing the agency with greater and more cost-effective control of highway systems. The project runs from September 1994 through August 1995.

*Area 3 — PD: Gary Trieisch, P.E., TRF
Researcher: Dr. Tom Urbanik,
P.E., TTI*

Project 0-1362

TTI Evaluating Use of Bonds for Financing Highway Investments

Transportation agencies frequently use bonds to fund new projects. Issued during lean economic times, these bonds offer attractive financial flexibility, since they are customarily paid back once the economy turns around. Project 0-1362, *Evaluation of Issuing Bonds in Order To Finance Highway Investments and of Other Special Issues in Highway Finance*, will analyze all aspects of bond financing and will evaluate special issues in highway finance. The research project hopes to go beyond a recent Strategic Highway Research Program (SHRP) report, which, while making numerous recommendations for changing transportation revenues in Texas, did not fully analyze the issue of bond financing.

This study has two objectives: (1) analyze all aspects of bond financing, and (2) evaluate special issues in highway finance, including selected recommendations of the SHRP report. Researchers will compare bond financing with such other types of financing as the current pay-

as-you-go method. They will also evaluate the effect of the financing method on present and future economic activity, present and future highway investment funding availability, and public perception of bond funding, as opposed to other forms of increasing funding (e.g., raising gasoline taxes). Finally, the researchers will analyze highway finance recommendations, including those contained in the SHRP report.

If the research shows that bond financing is a viable alternative for financing highway operations, then the implementation efforts should be minimal. The Division of Finance will advise the Administration on how best to mix current revenues and bond proceeds, providing TxDOT with a mechanism for financing valued projects across the state. The project started in September 1993 and ends in August 1995.

*Area A — PD: James Bass, BUD
Researcher: Dr. William
McFarland, TTI*

Study 0-1454 Seeks To Expedite Projects, Eliminate Traffic Delays

Because urban construction projects can create substantial traffic delays (and hence can increase user vehicle costs), the

construction between 12:00 a.m. and 6:00 a.m., a period of relatively light traffic.

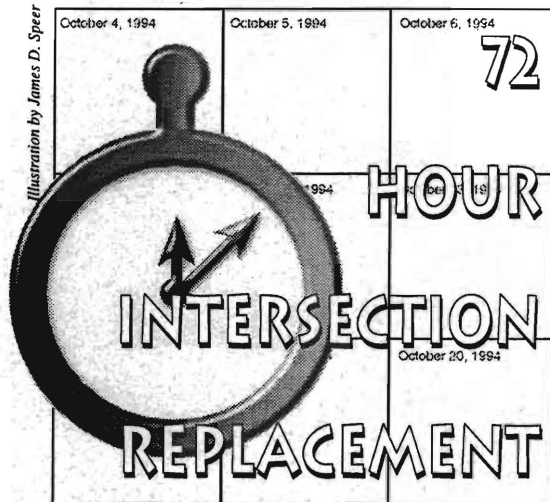
The researchers will achieve this objective (1) by identifying, developing, and refining techniques for expediting urban highway intersection reconstruction; and (2) by identifying appropriate concrete pavement construction phasings that allow for a more rapid reopening of the roadway.

By reducing the time required to reconstruct intersections, the project findings should decrease time delays, decrease construction-related accidents, and, overall, should reduce construction costs. To

demonstrate their expediting method's real-world utility, the researchers will employ the techniques developed in this project to expedite an actual urban reconstruction project. The project runs from September 1994 through August 1995.

Area 2 — PD: Pat Henry, P.E., HOU
Researchers: Drs. Dan Zollinger, P.E., TTI, and Zaher Khatib, P.E., Prairie View A&M

Texas Department of Transportation seeks innovative ways of expediting such construction. Project 0-1454, *Seventy-Two-Hour Urban Highway Intersection Replacement*, will develop for TxDOT a method of reconstructing a given intersection within 72 hours. An important aspect of this method — one that should prove effective in eliminating massive delays caused by daytime construction — will be the scheduling of most



New Guidelines for Drainable Bases Subject of UTEP Project

Presently there are no uniform guidelines in the placement of drainable bases. As a consequence, many design engineers have questioned the continued use of such a base for pavements. Thus, an evaluation and a guide are necessary to validate the advantages of using drainable base material for pavement construction in Texas.

Project 0-1456, *Evaluation and Guidelines for Drainable Bases*, will

- assess the drainage properties;
- ensure production and construction of truly drainable bases;
- determine problems in construction;

- estimate economic advantages; and
- develop guidelines for construction.

The increased understanding of drainable bases obtained in this project will allow TxDOT to construct longer lasting pavements.

To implement study findings, the researcher will develop for TxDOT a design and construction manual. This project got underway in September 1994 and will end in August 1995.

Area 2 — PD: Mark Schluter, P.E., FTW

Researchers: Dr. Miguel Picornell and Dr. Soheil Nazarian, UTEP

Joint Study Focusing on Air Quality

Traffic assignment results are necessary for estimating emission inventories for the larger metropolitan (nonattainment) areas in Texas. In undertaking these emissions analyses, the Texas Department of Transportation would greatly benefit from an improved method for developing 24-hour capacity restraint assignments. Research Project 0-1357, *Improving Assignment Results for Air Quality Analyses*, will provide such an improved method by:

- validating the improvements in the 24-hour assignment results;
- measuring the impact of the time-of-day modeling approach on mobile source emissions;
- reviewing the time-of-day modeling techniques and making recommendations for further progress; and
- reviewing the model application process.

For the four nonattainment areas in Texas, emissions analyses will likely play a key role in determining improvements that can be made. The researcher expects that the time-of-day model results will also prove useful for corridor analyses, design, and project development. This research project runs from September 1993 through August 1995.

Area 1 — PD: Zack Graham, TPP

Researcher: J. D. Benson, CTR/UTEP

CTR Looking at State Transit System Financing Alternatives

Public transit systems have been criticized in recent years for their reliance on tax money to cover capital and operating expenses. In response, the Texas Department of Transportation is evaluating alternative methods of financing public tran-

ancing schemes on the structure and operation of transit systems; and

- developing recommendations for transit financing alternatives.

The study will guide efforts to improve the revenue base of the transit industry. Overall, the findings should lead to more efficient use of public funds, as well as to better planning of future financing needs.

The project researcher reports that the study will need experimental sites. Those willing to participate should have a recent review of financing alternatives, detailed records of revenue sources, and information on the influence revenue sources have had on system structure and operations. The implemen-

tation of findings and recommendations will be available at project completion. This project started in September 1993 and ends in August 1995.

Area 1 — PD: Karen Dunlap, PTN

Researcher: Mark Euritt, CTR

Study to Improve Skid Resistance

Currently, TxDOT uses pavement skid history data in rating the skid performance of aggregates. However, recent research has determined that the basic principles of this rating system are inaccurate: Although it relies on actual field data, the system has not been proven in monitored test sections.

This problem is addressed in Research Project 0-1459, *Use of Pavement Skid History as the Basis for TxDOT Skid Reduction*, the objective of which is to develop and improve design procedures for achieving proper skid resistance on pavements. The end-result should be a method for designing better skid-resistant pavements.

Once the research team downloads the procedure into a computer system, pavement designers will be able to access skid resistance data relating to all aggregates used in the study. This project runs from September 1994 to August 1997.

Area 2 — PD: Caroline Herrera, P.E., MAT
Researcher: Dr. P. Jayawickrama, Texas Tech University



Illustration by James D. Speer

sit. Project 0-1356, *Impacts of Current Financing Methods on Transit Systems and Evaluation of Alternative Financing Schemes*, will assist TxDOT in this effort by:

- identifying and evaluating alternative transit financing schemes;
- evaluating the impacts of fi-

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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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