

TEXAS TRANSPORTATION

Researcher

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THE TRANSPORTATION SYSTEM

making it *work*
making it *safe*
making it *last*



Transportation is critical to quality of life... and often, its preservation.



University transportation research has made significant contributions toward improving all aspects of the transportation system. University-based research will continue to help ensure that the transportation system in Texas and the nation is safe, efficient and environmentally sound.

In 1948 the Cooperative Research Program formally created a relationship between the Texas Highway Department and Texas A&M College, establishing a partnership for the university to serve as a key research arm of the State. Two years later, the Texas A&M Board of Directors granted the Texas Transportation Institute (TTI) its original charter. Over the past 53 years, the Institute has been instrumental in helping ensure that Texas receives a high return on its investment in transportation research and education.

The partnership between TTI and the Texas Department of Transportation (TxDOT) continues to be strong. The Institute also has strong working relationships with federal, state and local agencies, private industry and the Texas A&M University System. Research continues to focus on finding better, safer, more efficient and environmentally compatible ways to plan, design, build, maintain, fund and operate all elements of the transportation system. TTI also provides valuable educational experiences to future transportation professionals.

In a little over five decades, TTI has established a sound record of applied research addressing critical transportation issues. Much of the early research at TTI focused on the development of roadside safety devices—breakaway signs, luminaire supports, crash cushions, and redesigned drainage structures. These applications are taken for granted now, but at the time they represented major breakthroughs in safety that have directly saved thousands of lives over the years.

Although safety continues to be an important focus of research activities, TTI's research program has broadened and expanded over the years to encompass all modes and disciplines. TTI is able to bring multidis-

ciplinary teams together to address the complex issues facing transportation today.

The Institute plays a key role in helping educate future generations of transportation professionals. Some 5,000 transportation professionals across the country received their education at Texas A&M University and obtained additional skills and experience working on TTI research projects.

With TTI conducting one-sixth of the country's university transportation research, the Institute operates five urban laboratories and nine state and national centers of research—administering approximately 540 projects a year for over 100 different sponsors. Findings from these projects are available to national and international transportation professionals via the Institute's web site.

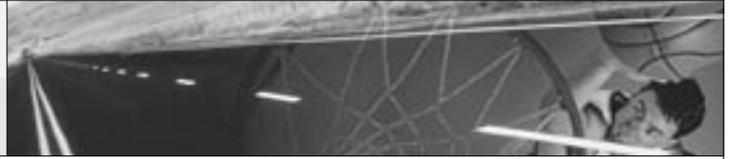
Saving thousands of lives, millions of dollars and billions of hours, TTI research has been implemented over the last half-century by agencies and groups across the state and the nation. This is largely due to the Institute's successful partnerships with government, industry and education. The value of TTI's research, and the benefit of university transportation research as a whole, is the focus of this *Researcher*. Three noted transportation professionals share their views of the importance of university transportation research (p. 3–5). Research projects selected by TxDOT as innovative and successfully implemented are noted (p. 6–7). The Institute's contributions to the National Cooperative Highway Research Program (NCHRP) and the Transit Cooperative Research Program (TCRP) are highlighted (p. 8).

The bottom line is every dollar spent on university transportation research in Texas brings an overall return on investment of 5-to-1—five dollars of benefit for every dollar spent on research. That is an estimated \$322 million dollar return over a three-year investment of \$54 million. Having conducted almost half of that research, TTI will continue to strive toward making all parts of the transportation system work, making it safe and making it last. **R**



Bob J. Reilly, Ph.D., P.E.

Director, Cooperative Research Programs
Transportation Research Board



UNIVERSITY RESEARCH:

COMPETITION MAKES IT STRONGER

Each year, hundreds of U.S. colleges and universities field men's basketball teams. At the end of the season, the best 65 are invited to the national championship tournament; the best team wins its last 6 games, and the other 64 end their season with a loss. This is a competitive system!

In its 40 years, the National Cooperative Highway Research Program (NCHRP) has awarded almost 1,000 contracts; about 35 percent have gone to educational institutions. More than 180 different colleges and universities have submitted almost 2,500 proposals to compete for NCHRP research contracts; more than 100 of these schools have never had one of their proposals selected for an NCHRP contract.

In its 10-year history, the Transit Cooperative Research Program (TCRP) has received 883 proposals from 452 different research agencies and has awarded 122 contracts. Some 90 universities have submitted a total of 196 TCRP proposals, but just 20 of these proposals from 14 schools have competed successfully for TCRP contracts.

The odds of winning an NCHRP or TCRP contract aren't quite as tough as the odds of winning the National Collegiate Athletic Association (NCAA) men's basketball championship, but our proposal-selection process is very competitive; it is the only way we have to ensure that the best are selected to do the work. Over the years, Texas Transportation Institute (TTI) has won 63 NCHRP con-

tracts (this is more than any other contractor) and 5 TCRP contracts (only one other contractor has won more). TTI has been very successful in competing for and conducting research, and it is worth thinking about why this is so.

There is no single strategy for winning proposals or conducting successful applied research; each project is

unique, and so is each Transportation Research Board (TRB) panel that selects the contractor and guides the research. Nevertheless, in celebration of the 40th anniversary of the NCHRP and the 10th anniversary of the TCRP, and in recognition of the part that universities play in the success of these two programs, I offer the adjacent half-serious list of the Top Ten Ways to Make Sure Your University Research Program is Competitive.

In sports, research or any other endeavor, strong and fair competition among toil-worn and tough players is the proven way to go. But competition isn't for everybody, so some universities seek and accept transportation research funding directly from Congress. Now there's an idea! While they are at it, they could save everybody a lot of time and

effort if they would just go ahead, forget about the NCAA tournament, and ask the U.S. Congress to designate their basketball team as the next national champion. But that could never happen; the principle of fair and open competition is too important, and sports fans, and maybe even some universities, would never stand by and let it be undermined. **R**

TOP TEN WAYS TO STAY COMPETITIVE

10. Whether or not there are gourmet restaurants near your campus, you should make sure that you find sponsors who will believe that eating Texas barbecue, a lump of cheese and a raw onion off a sheet of wrapping paper is fine dining.
9. Unless you can put as much creative energy into the research as you put into the proposal, make sure you don't propose.
8. If your reports are greeted by spontaneous outbursts of indifference, make sure that your findings and recommendations are as simple as possible, but no simpler.
7. Even if you are sure that engineers are the only ones who will ever read your reports, make sure to get the grammar, punctuation and spelling right.
6. Even if you have the kind of researchers about whom it can be said, "when they talk, people listen," make sure that you don't forget to listen to your customers.
5. Even if your sponsors are impressed by the ocean beaches and mountain skiing on your campus, make sure that your projects stay within budget.
4. Even if all of the buildings on your campus are more than 200 years old and covered with ivy, make sure that your projects are completed on time.
3. Even if all of your research results are published in international journals of theoretical physics, make sure that serious practitioners can read your reports.
2. Unless you want to study only what you think is interesting and pay for it with your own money, you better make sure that you go after your sponsor's objectives with everything you have.
1. Instead of dressing up your proposals with world-class, over-committed superstars, make sure that you form teams of good people who can work together.

Transportation Consultant
Former Federal Highway Administrator



UNIVERSITY TRANSPORTATION RESEARCH: A STRONG *BOTTOM LINE*

“At any hour that urban Americans are on the move, there is an anthem of gnashing teeth.” “Rail proponents are covetously eyeing the highway trust fund.” “The Senate Commerce Committee will hold hearings to consider a bill to fund the next five years for research and development of lightweight batteries, fuel cells and prototype electric runabouts for urban use.”

Newsweek, January 9, 1967

“United Airlines is in bankruptcy, Amtrak is hanging on for dear life, highways are getting more congested but major projects are stalled, ports are trying to figure out how to for new security improvements, railroads cannot find the financing they need to maintain their systems, transit is struggling to keep up with increased volumes”

Eno News, January 2003

Transportation design, construction and maintenance firms are in urgent need of new blood—of the next generation of leaders in the vitally important business of providing mobility for America. Human resource needs are a common, continuing topic in transportation circles at all levels.

So how does all this relate to universities throughout the country? Some observations:

- ▶ America’s transportation challenges are complex, evolving, daunting. Descriptions of these from 1967, by 2003, have grown in every dimension, as shown in the quotes above. Imagine (but no one really can) our dire condition if we had not had major university-based breakthroughs in safety (crash barriers), traffic prediction and management programs, more durable pavements, longer lasting bridges, environmentally sensitive treatments for all construction—and much, much more.
- ▶ Yet all of these massive contributions would be for naught if it weren’t for the steady stream of trained persons providing leadership and broad talents to our transportation systems. And that, of course is much of what universities are all about. University transportation research programs always yield double “profit.” They feed both innovation and the vital human resources into our “thirsty for both” transportation systems.

Addressing continuing, urgent needs, university transportation support programs have been organized at both the state and national levels. Each of the 50 state departments of transportation sponsor research targeted to their unique needs. Decades ago visionary leaders crafted the National Cooperative Highway Research Program. Heavily oriented toward solving real, immediate problems, and leaning heavily on university resources, this program has produced some 500 reports and 300 syntheses of practice—all bearing on one or another of the challenges faced by our highway transportation systems.

Another national effort, the Strategic Highway Research Program, authorized by Congress in 1987, has contributed major advances in five “strategic” areas. These constitute a catalog of innovation now widely adopted across America. Again, massive contributions have come from leading university transportation research programs.

Using business terminology, there is compelling evidence that university transportation research programs have, and are continuing, to bring solid profits to the bottom line. ■



Paul E. Krugler, P.E.

Director, Research and Technology Implementation Office
Texas Department of Transportation



TEXAS COOPERATIVE RESEARCH PROGRAM *PAYS OFF*

Just why is transportation research important? This question should be asked, particularly in difficult economic times.

The answer lies in the impact transportation improvements have on our quality of life. Improved safety is the leading impact. Reducing accidents, injuries and fatalities dramatically improves our quality of life and must be our primary objective. Additionally, Texas and national economies rely heavily on the efficient and dependable movement of people and goods.

Research is where transportation professionals look for the new approaches and advanced technologies they need to make major improvements in the transportation system. Improving transportation today is largely a technology-driven endeavor. The work of transportation departments now involves sophisticated computer controls for traffic systems, stronger and more durable materials developed for the space program, the use of lasers and ground-penetrating radar for pavement testing, and mathematical models for forecasting future travel demands. Just as in private enterprise, creating new technologies and finding new applications for existing state-of-the-art technologies are the most effective ways to improve services. Therein is the role of research.

Direct comparison of private enterprise and the public sector helps clarify the importance of transportation research. In private technology-based enterprise, the cost of failing to develop and take advantage of new technologies frequently leads to loss in cost-effectiveness, product competitiveness and market share. Business failure is then a distinct possibility. The potential damage from a lack of cost-effectiveness is just as great in the public transportation sector, but the ultimate result is an on-going, unnecessarily high cost to taxpayers

or a reduction in services. Few will argue that taxpayers can afford inefficiency and lost opportunity costs that would be rejected by private sector stockholders.

The research program of the Texas Department of Transportation (TxDOT) has focused on solving challenges and improving transportation services for over 50 years. A strong and mutually beneficial relationship has been built with Texas public universities, who perform virtually all of TxDOT's research studies. The program has grown in size, reputation and value since its inception, and it is now widely recognized as a model program. The products of the program literally touch the lives of every traveler every day on the Texas transportation system.

To demonstrate the impact that research has on transportation in Texas, 21 technologies and methods produced by TxDOT's research program were recently analyzed to estimate expected benefits. These technologies were selected from over 200 products received from the research program between 1999 and 2001. The primary focus of the analysis was on reduction in the number of fatalities occurring on the transportation system, reduction in the number of accidents, and operational cost savings for the department. The conservative estimates resulting from this analysis are that 245 lives will be saved, over 24,000 accidents will not occur, and over \$322 million in costs will be saved over the next 10 years, from just these 21 foremost products of the program.

Research and a quality transportation system are closely linked, perhaps even inseparable. The TxDOT research program and its close relationship to our public universities are valuable assets to transportation professionals and taxpayers alike. **R**

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TTI TRANSPORTATION RESEARCH

In 1999, The Texas Department of Transportation (TxDOT) began annually recognizing Top Research Innovations and Findings from its cooperative research program. Since then, nearly half the projects selected as top innovations have been led by TTI. The following overviews of these projects illustrate the value of TTI research to TxDOT, the State of Texas and the nation.

SUPER 2 GEOMETRIC DESIGN GUIDANCE

Impact Over First Ten Years: \$150 million saved

Project No.: 0-4064

TTI Research Supervisor: Mark Wooldridge

TxDOT Project Director: Marty Smith

Benefits:

- Super 2 geometric design provides **improved highway safety and capacity** for two-lane rural highways with less than 4,200 average daily traffic (ADT).
- Use of Super 2 geometric design in lieu of converting a two-lane roadway to four lanes **saves approximately \$50 million** for a typical 25 mile section of rural highway. A conservative estimate is that the improved design criteria and guidelines will result in construction of at least one additional Super 2 section every three years.

TRUCK MONITORING AND WARNING SYSTEM FOR FREEWAY-TO-FREEWAY CONNECTIONS

Impact Over First Ten Years: 70 lives saved, 2,600 accidents prevented

Project No.: 7-2915

TTI Research Supervisor: Darrell Borchardt

TxDOT Project Directors: Robert Wright, Duane Hartmann and John Gaynor

Benefits:

- It is estimated that **70 lives will be saved and 2,600 accidents will be prevented** in Texas over 10 years as the truck monitoring and warning systems are installed at all problem freeway interchange ramps.
- User **savings of approximately 1 million person-hours**, over 10 years, will result from the reduced number of truck incidents at freeway interchanges.

IMPROVED GUIDELINES FOR FRONTAGE ROAD DRIVEWAY ACCESS LOCATIONS

Impact Over First Ten Years: 33 lives saved, 5,200 accidents prevented, \$230,000 saved

Project No.: 7-2927

TTI Research Supervisor: Russell Henk

TxDOT Project Directors: Clay Smith and Brien Hoher

Benefits:

- There will be a substantial reduction in the number of accidents occurring in the weave areas of urban frontage roads. Models show that the new standards will result in about **5,200 fewer accidents over the next 10 years**. When fully implemented, the driveway standards should result in 3,800 fewer accidents every year on Texas frontage roads.
- The new standards will also save lives. It is expected that there will be **33 less traffic fatalities** over the course of the first 10 years. At full implementation statewide, there should be 25 fewer vehicular fatalities every year.

GROUND PENETRATING RADAR TESTING OF PAVEMENTS

Impact Over First Ten Years: \$57 million saved

Project No.: 0-1702

TTI Research Supervisor: Tom Scullion

TxDOT Project Director: Carl Bertrand

Benefits:

- GPR **significantly reduces costs of multi-million dollar rehabilitation projects** when problems deep in the pavement structure are isolated and can be repaired individually.
- GPR data can be collected at highway speeds with **no disruption of traffic flow**.

GENERIC CRASHWORTHY WORK ZONE TRAFFIC CONTROL DEVICES

Impact Over First Ten Years: 70 lives saved, 8,000 accidents prevented, \$23.5 million saved

Project No.: 0-1792

TTI Research Supervisor: Roger Bligh

TxDOT Project Director: Greg Brinkmeyer

Benefits:

- Generic work zone traffic control devices are non-proprietary and cost-effective, which saves TxDOT approximately \$75-100 per barricade and \$100-150 per sign support. The **estimated annual savings to TxDOT is \$2,350,000**.
- Barricades and temporary sign supports now comply with NCHRP Report 350 crash testing standards. They are estimated to **reduce the number of work zone related traffic deaths by 7 each year**.
- A **savings in motorist delays of approximately 3.2 million person-hours** is anticipated over 10 years, based on reduced traffic congestion in work zones.

TRANSPORTATION RESEARCH

GUIDELINES FOR HIGH OCCUPANCY/TOLL (HOT) LANES IN TEXAS

Impact Over First Ten Years: Congestion reduced in metropolitan areas

Project No.: 7-4915

TTI Research Supervisor: Bill Stockton

TxDOT Project Director: Carol Rawson

Benefits:

- The major benefit is that properly implemented HOT lanes help **manage congestion** on the general purpose lanes.
- Since the inception of the HOT lane concept in 1998, the total benefits to road users from reduced delays on the Katy and Northwest Freeways are valued at approximately \$600,000. However, with added HOT lanes being incorporated in the future reconstruction of the Katy and LBJ Freeways, **the value of user delay benefits is projected to be \$80 million over 10 years.**

EROSION FUNCTION APPARATUS AND SCOUR DESIGN METHOD

Impact Over First Ten Years: \$1.625 million saved

Project No.: 7-2937

TTI Research Supervisor: Jean-Louis Briaud

TxDOT Project Director: Tony Schneider

Benefits:

- Erosion rate versus shear stress is directly determined, thereby improving the quality of data made available to bridge designers.
- **The risk of bridge failure due to scour is further reduced.**
- The SRICOS method will yield fiscal benefits in design because shallower foundations can be justified in some cases. A conservative estimate is that the research will **save in excess of \$160,000 per year** in design staff and construction costs.

GUIDELINES FOR PERFORMING TRAFFIC SIGNAL WARRANT ANALYSIS

Impact Over First Ten Years: Improves the warranting process for traffic signal analysis

Project No.: 7-3991

TTI Research Supervisors: Paul Carlson and Gene Hawkins

TxDOT Project Director: Dan Mauphin

Benefits:

- Provides a set of comprehensive, uniform guidelines for conducting traffic signal warrant analyses.
- Based on these guidelines, the warranting process provides reliable, consistent results that offer a clear indication of whether the conditions justify further consideration of a traffic signal.

MODEL BORDER CROSSING DESIGN

Impact Over First Ten Years: Texas economic and international benefits

Project No.: 5-9014

TTI Research Supervisor: Bill Stockton

TxDOT Project Director: Edward Wueste

Benefits:

- Approximately 70 percent of the 3 to 4 million trucks crossing the Texas-Mexico border each year can be pre-cleared. **Total processing time will be reduced from hours to less than 15 minutes for pre-cleared trucks.**
- Savings to motorists, specifically truckers, are significant. Assume 70% of 3 million trucks save only 30 minutes each, which equates to 1.05 million truck hours. The value of truck time is \$25 to \$35 per hour. Costs to deliver goods by trucks will be reduced by at least \$25 million per year.
- **Possible savings to the U.S. economy range from \$30 million to \$60 million per year.**

WINDOWS VERSION OF MODULUS/FPS19

Impact Over First Ten Years: Provides more reliable pavement designs

Project No.: 0-1869

TTI Research Supervisor: Tom Scullion

TxDOT Project Director: Mark McDaniel

Benefits:

- TxDOT's annual rehab budget is in excess of \$300 million. This software program allows the adequate design of rehabilitation alternatives.
- Improved pavement modeling capabilities provide more reliable pavement designs.

TTI plays integral role in national transportation research

The National Cooperative Highway Research Program turns 41 this year, and the Transit Cooperative Research Program celebrates its 10th birthday.

The National Cooperative Highway Research Program (NCHRP) began in 1962 through the combined efforts of the American Association of State Highway and Transportation Officials (AASHTO), the Federal Highway Administration (FHWA) and the Transportation Research Board (TRB). For 41 years, this program has provided a structure for the identification of research needs and the competitive selection of public and private sector organizations to conduct the projects. NCHRP, which is administered by TRB, has a long history of providing problem-oriented research that can be directly transferred into practice.

Texas Transportation Institute (TTI) has been an integral part of NCHRP research since the program began. The Institute has been selected to conduct more projects than any other public or private contractor. In some cases, TTI teams with other universities and private firms to ensure the best mix of skills to address specific problems. Many of the NCHRP projects completed by the Institute represent landmark research.

For example, in the early 1980s NCHRP Project 22-2(4) produced Report 230, "Recommended Procedures for Safety Performance Evaluation of Highway Appurtenances," which became the generally accepted guide for developing and evaluating highway safety hardware. Almost a decade later, TTI performed an update to that document, NCHRP Report 350, which is now the accepted national standard for testing the safety of highway features.



A 3/4-ton pickup crash test at the TTI Proving Grounds during testing for Report 350.

TTI's national pavements research has also remained in the forefront—with a wide range of topics ranging from pavement design and management systems, recycled pavements, rehabilitation and construction strategies to aggregates, heavy loads and nondestructive testing. Currently, TTI is beginning groundbreaking work on the surface energy of aggregate particles (Project 9-37) and on development of a reflective cracking model (Project 1-41).

Although younger than NCHRP, the Transit Cooperative Research Program (TCRP) has been instrumental in addressing critical needs in public transportation. TTI has successfully competed for TCRP projects, often teaming with other public and private organizations.

"TCRP projects are of great value to transit agencies throughout the country," notes Linda Watson, general manager of the Corpus Christi Regional Transportation Authority, current TTI Council member, and past chair of the TCRP Oversight and Project Selection (TOPS) committee. "The research TTI and others are doing addresses critical issues facing public transportation. The results provide clear direction for improving the safe and efficient operation of transit services, while enhancing passenger comfort and convenience." **R**

EXAMPLES OF TCRP PROJECTS COMPLETED BY TTI:

- ▶ *Guidelines for the Location and Design of Bus Stops.* TCRP Report 19. 1996.
- ▶ *Passenger-Information Systems.* TCRP Report 45. 1999.
- ▶ *A Handbook of Proven Marketing Strategies for Public Transit.* TCRP Report 50. 1999.

New detection-control system saves lives

Drivers approaching a high-speed rural intersection with a green signal that suddenly changes to yellow have a split second to make an important decision: Is it safer to decrease speed quickly and stop, or continue driving through the intersection? This period is referred to as the “dilemma zone,” and a wrong decision may result in a fatality or major injury.

Researchers at the Texas Transportation Institute (TTI) recently completed work on a project sponsored by the Texas Department of Transportation (TxDOT) that sought to develop a new detection-control system (D-CS) designed specifically for rural, high-speed signalized intersections. The new D-CS is expected to improve safety at high-speed rural signalized intersections by reducing red-light violations and sudden stops by up to 70 percent.

“What we are trying to do is prevent the light changing from yellow to red when vehicles are approaching the intersection,” says Jim Bonneson, TTI project supervisor and program manager. “The dilemma zone can be a problem if a driver misjudges the light and has to stop suddenly or ends up in the intersection after the red. We’re trying to prevent all these events from happening and have a safe termination of green.”

The new system involves an interface of three components: (1) the vehicle detection system, (2) the D-CS control strategy and (3) the traffic control system.

(1) The vehicle detection system consists of detector loops installed in each lane of the roadway approximately 1,000 feet away from the intersection. When the drivers travel over the loop, a signal is sent to the detection-control system located in the controller cabinet.

(2) After receiving the signal, the D-CS records the vehicle size, speed and lane number. This information is processed and the system determines whether to end the green before the driver enters the dilemma zone or to wait until the vehicle clears it.

(3) The traffic control system either ends the green or holds the green depending on input from the D-CS.

The optimal time to end the green is when there are no vehicles on either approach. After the computer waits 30 to 40 seconds and does not detect this condition, it is likely that traffic volumes are too high to find the optimal time. Traditional traffic controllers provide green through a pre-programmed maximum time (max out) and present yellow when this occurs, thus leaving drivers in the dilemma zone.

“The new detection-control system is an improvement because it adds a second stage,” says Bonneson. “After the D-CS waits the 30 to 40 seconds and has not found an empty approach, it will relax the standards by accepting



TTI researchers Jim Bonneson and Rick Parker inspect a detection-control system.

one car (but never a truck) per lane per approach in the dilemma zone. We found this condition to be still safer than a max out because, at most, only one car is caught in the dilemma zone.”

Other benefits of the new D-CS, relative to traditional advance detection schemes, include:

- reduced design and installation costs,
- reduced maintenance costs due to system simplicity and speed sensitivity,
- minimum stops and delays for trucks,
- minimum overall traffic delay,
- annual benefits to Texas motorists in terms of reduced potential for crashes, fatalities and injuries,
- dollar benefits from reduced potential for crashes in the amount of \$55,000 per intersection per year, and
- benefit-to-cost ratio of approximately 15:1 relative to the cost of installing one detection-control system per year.

“We are in the process of installing eight of the new D-CS systems in locations throughout Texas,” says Bonneson. “We are very pleased that TxDOT liked the D-CS concept and are willing to invest in its implementation.” **R**

RELATED MATERIALS: Research Report 4022-2, *Intelligent Detection-Control System for Rural Intersections*

FOR MORE INFORMATION

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Guidebook for safer rural roads

Take a trip down a lonely rural road in Texas and you may find yourself traveling some of the most picturesque miles you have ever seen. Any one of the nearly 50,000 miles of low-volume, rural, two-lane roads provides opportunities to view wildlife, scenic vistas and diverse landscapes. But the average driver may not know that cruising along a rural road may be more dangerous than driving in congested urban areas.

Over 62 percent of Texas highways are rural two-lane roads with fewer than 2,000 cars on a typical day. Although these roads carry less than 8 percent of the total vehicle miles on state-maintained highways, they account for approximately 11 percent of the total on-system vehicle crashes. Speeds tend to be higher on rural roads than in urban settings, and the crashes are more severe.

To combat higher crash rates and the severity of crashes in rural areas, Lynn Passmore, district engineer for the Texas Department of Transportation's (TxDOT) Brownwood District, and Danny Brown, area engineer in TxDOT's Childress District, worked with the Texas Transportation Institute (TTI) to find effective, low-cost methods to increase rural safety and save lives. Kay Fitzpatrick, research engineer at TTI, was the project's principal investigator and is the lead author of a guidebook to address safety treatments for high-crash locations on rural two-lane highways in Texas.

The "Treatments for Crashes on Rural Two-Lane Highways in Texas" guidebook provides transportation practitioners with:

- documentation of crash characteristics for rural roads in Texas;
- identification of low-cost safety treatments used on highways and at intersections, along with their known effectiveness; and
- presentation of experiences with selected treatments, including whether the treatment could be considered elsewhere.

"We hope the report presents a user-friendly document that is easy for a TxDOT engineer to use to identify treatments that could address some of the different



Typical two-lane rural roadway in Texas.

rural issues," Fitzpatrick says. "We created a chapter that looks at treatments on highway segments and a chapter that looks at treatments on intersections."

Additional chapters in the guidebook focus on conducting a crash study in Texas and providing several case studies of actual treatment scenarios that have an emphasis on pictures and figures to demonstrate safety treatments that were installed.

"We feel like we've already seen significant increases in safety as a result of this project," says Brown. "The guidebook addresses many of the most significant crash areas for rural situations. TxDOT may not be able to put in a divided four-lane or grade-separated interchange, but using the guidebook we can come up with low-cost alternatives for designers, area engineers or maintenance personnel."

In order to keep the rural safety treatment guidebook flexible and updated, Fitzpatrick says the book will be published in a 3-ring binder.

"We suggested the 3-ring binder approach so users can insert new pages or articles if they find something they can use later," Fitzpatrick says. "The binder keeps everything in one location."

TxDOT estimates indicate that use of the guidebook could return \$1 million in crash savings statewide if each district treated only one intersection and one roadway segment each year in a more effective manner.

"The intent of this document is to improve safety and to save lives," Brown says. "We need to do whatever we can to get the safety message out and to encourage the consideration of safety in the day-to-day operations and in the allocation of resources." **R**

The reports for **Project 0-4048** have not been published.



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Rural highway sign placement

Driver's who are unfamiliar with rural roads often depend on highway guide signs to help them find their way. In fact, the Texas Department of Transportation (TxDOT) is responsible for placing and maintaining an estimated eight to ten million signs across the state. TxDOT sign personnel have traditionally relied upon the Texas Manual of Uniform Traffic Control Devices (MUTCD) for guidance in placing signs. The sign guidelines in the MUTCD are general and, due to the multitude of situations that can exist on a roadway, leave considerable room for variation in actual field application.

In an eight-year research project evaluating drivers' information needs for guide signs on rural highways, Texas Transportation Institute (TTI) researchers and TxDOT staff identified the need for a document prepared specifically for sign crews. This led to the development of the TxDOT Sign Crew Field Book.

"We determined that we needed a new document oriented specifically to field personnel and designed to help them deal with issues regarding sign placement," says Gene Hawkins, project supervisor and division head of the Operations and Design Division at TTI. "One of the challenges we faced was that the TxDOT's sign placement information in the MUTCD and standard sheets were developed for use in the design process rather than for use in the field on a daily basis."

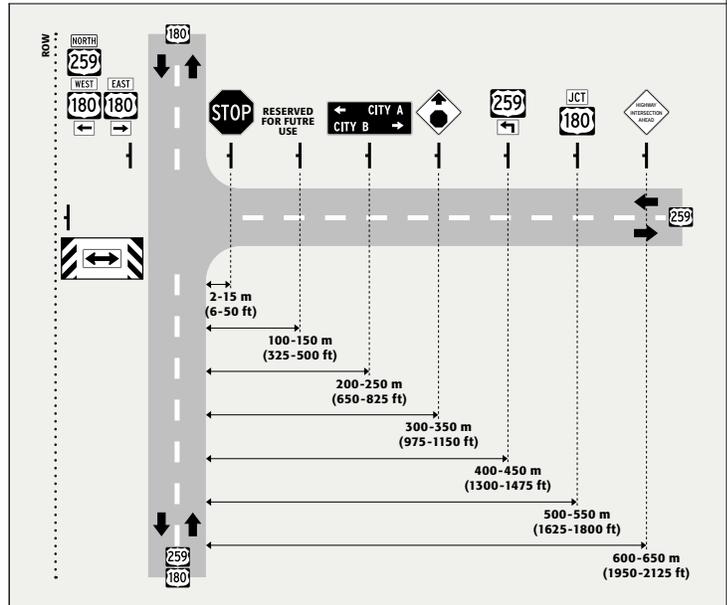
The eight chapters of the Sign Crew Field Book implement the research findings by providing field crews with information on sign placement, barrier reflectors and delineation. Content includes:

- the field placement of regulatory, warning and guide signs;
- location and placement of object markers, delineators and barrier reflectors; and
- location and installation of mailboxes.

The field book does not supercede the MUTCD, but it does provide additional guidance with respect to standards, recommended practices or other requirements established by TxDOT documents. The field book relies heavily on the use of figures and tables to convey information to field crews, increasing the usability of the document.

"One of the crucial findings in the research on this project was the need to provide drivers with more advance information at intersections," says Hawkins. "Moving signs farther away from the intersections on the approach addresses this concern." The figure on the right illustrates the typical recommended sign placement distances on the intersection approach.

While TTI researchers were responsible for preparing the initial material for the field book based on the preliminary recommendations of the research, a panel of TxDOT and Federal Highway Administration (FHWA) staff provided extremely valuable input in the development and review



Sign placement on high-speed intersection approach.

of the field book. The field book is a tremendous example of TxDOT, FHWA and TTI staff working together to implement research findings.

Since its initial publication, approximately 2,500 copies of the Sign Crew Field Book have been widely distributed to TxDOT maintenance sections and can be found in almost every sign truck in the state. Area and district offices are also using the field book when designing the sign portion of highway plans. TxDOT is saving an estimated \$475,000 each year through increased efficiency of department sign crews.

"The field book has been very well accepted," says Greg Brinkmeyer, the project director and engineer of policy and standards at TxDOT Traffic Operations Division. "Our administration has supported the concept and has referenced it as the primary source for information concerning the placement of signs and roadway delineation. We are currently updating the manual to include additional information for our field folks to use." **R**

The Sign Crew Field Book is available from the TxDOT Traffic Operations Division. Contact **Jeanne Black** at (512) 416-3134 to order a copy of the field book.

RELATED MATERIALS: Project Summary Report 1373-S, The TxDOT Sign Crew Field Book; Report 1373-1, Evaluation of Rural Guide Signing: First Year Report; Report 1373-2, Evaluation of Rural Guide Signing: Second Year Activities and Preliminary Recommendations

FOR MORE INFORMATION

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TTI Researchers: (L-R, standing) Gene Hawkins (RS), Ivan Lorenz, Paul Carlson



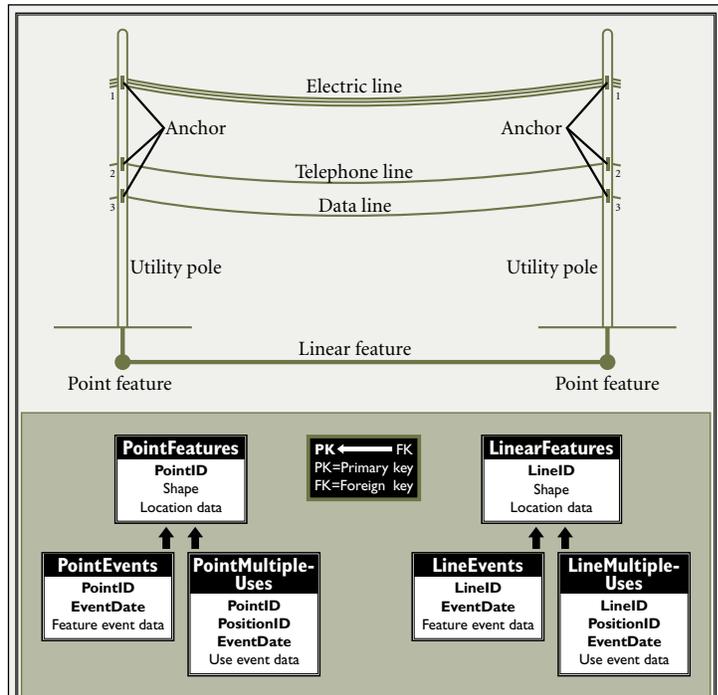
Research improves right-of-way management

According to statistics from the United States Census Bureau, the population of Texas increased by about 20 percent from 1990 to 2000. With population growth trends expected to continue, so will telecommunications and the number of utilities installed each year. For the Texas Department of Transportation (TxDOT), that means more right-of-way (ROW) management and planning to accommodate the ensuing demands on the state's highway system.

Effective management of the growing number of utilities in their ROW is essential for TxDOT, not only so it can allow an appropriate quantity and placement of utilities, but also so the state can deliver and manage its transportation system in a timely and efficient manner. Researchers at the Texas Transportation Institute (TTI) recently completed a research project that provides a major advancement for the management of utilities located within TxDOT right-of-way. There were two main products of the research: (1) a geographic information system (GIS)-based model for the inventory of utilities located within TxDOT ROW; (2) a GIS/Internet-based prototype system for automating the utility permitting process at TxDOT.

According to Cesar Quiroga, project supervisor and TTI associate research engineer, having utility data that are consistent and detailed is crucial to the development and success of a statewide GIS-based system of utilities. As part of the project, the researchers evaluated several sources of utility data, including notices of proposed utility installation (as utility permit applications are called at TxDOT), utility inventory maps, joint use agreements, subsurface utility engineering (SUE) deliverables and utility company databases.

"By and large, the installation notices are the main source of utility data that TxDOT officials see, as they handle roughly 10,000 requests a year," says Quiroga. "We figured that by improving the installation notice process, the department could have a mechanism with which to help maintain the inventory of utilities and keep it up to date."



Cross-section of utility data collected using the GIS-based utility data inventory model.

The new Internet-based procedure is expected to improve the management of installation notices at TxDOT by:

- enhancing the current process with automated steps,
- managing and consolidating all data associated with the process,
- allowing map and data distribution through online data and file uploading, and
- providing online access to all documentation.

The other product of this project was the development of a GIS-based model for the inventory of utilities. The model shows the location of utility facilities located within the TxDOT ROW and associated attribute data such as ownership, purpose, size, type, positional accuracy and quality level indicators and other pertinent characteristics.

"This new system will help us keep an accurate count of the utilities that are on our system and their approximate locations," says Jesse Cooper, TxDOT project advisor and section director in ROW division. "As we have projects, we will be able to better estimate the relocation costs and any other impacts on the highway facility."

A phased implementation of the research products is currently under development, first at a sample of TxDOT districts and then statewide. **R**

RELATED MATERIALS: *Research Report 2110-1, A Data Platform for Managing Utilities along Highway Corridors*, *Research Report 2110-2, A Data Platform for Managing Utilities along Highway Corridors: User Manual*



FOR MORE INFORMATION

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Safe and efficient shipping

Joint research creates a guidebook for inland port developers

It's 2 A.M. Do you know where your shipment is?

As manufacturing expands globally, businesses want to reduce shipping costs by limiting the number of distribution nodes serving national, regional or metropolitan markets. Concerns over congestion on our nation's highways, increasing pollution and hazardous materials moving through major metropolitan areas also emphasize the need for minimizing shipping. Inland ports are a promising solution, and the Texas Department of Transportation (TxDOT) plays an important role in planning for and facilitating such developments.

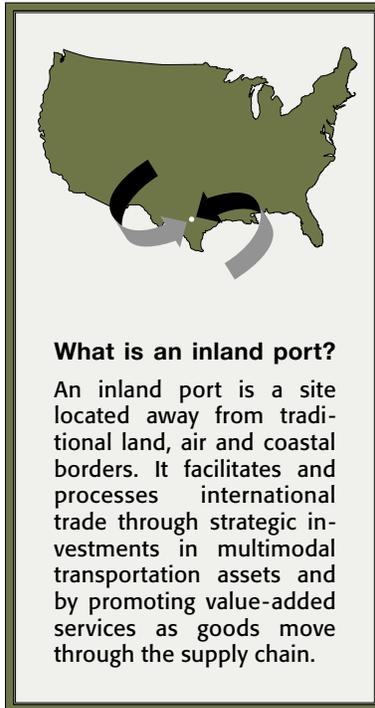
Texas Transportation Institute (TTI) partnered with the Center for Transportation Research (CTR) at The University of Texas to create a guide that facilitates interaction between developers of inland ports and TxDOT.

The three transportation modes of highway, rail and air typically come together at an inland port, making it a hub for market distribution.

"Historically, it's been difficult to define exactly what an inland port is," notes Russell Henk, the TTI associate research engineer on the project. "By creating a multiphased definition, we were able to more accurately profile the status of an inland port facility." Researchers first looked at various facilities internationally, in the U.S. and in Texas (Kelly Air Force Base and Alliance Texas) to characterize the developmental phases a facility goes through. The research team was then able to propose a new definition, modeled after a typical business cycle, for defining an inland port.

"Inland ports minimize shipping over our highways because they serve as a one-stop shop for production and distribution. In addition to lower shipping costs, there are societal benefits as well. As inland ports become more prevalent, there will be less congestion on our highways and reduced pollution in our cities," says Project Director Andrew Griffith of TxDOT.

As both production center and primary distribution node, inland ports also improve responsiveness to 'just in time' requests, reduce warehousing costs and provide cheaper products to market.



What is an inland port?

An inland port is a site located away from traditional land, air and coastal borders. It facilitates and processes international trade through strategic investments in multimodal transportation assets and by promoting value-added services as goods move through the supply chain.

"As globalization of trade lengthens supply chains across the world, security has become an important issue in the post-9/11 environment. Secure inland ports are candidates for ensuring that imports meet the more stringent conditions currently being developed," explains Rob Harrison of CTR, the project's research supervisor.

Working together on this project, CTR and TTI researchers created an inland port classification system that provides recommendations for how and when developers should interact with TxDOT. The guide steps them through the many-tiered planning process that includes state, local and federal agencies. By specifically identifying what information is needed at each stage of port development—as well as how TxDOT planners are likely

to respond to developer requests—the entire process can be expedited.

The guide focuses on providing highway infrastructure to the inland port. TxDOT can use criteria identified by researchers to gauge the inland port's impact on the highway network. Because TxDOT is streamlining the state's Unified Transportation Program (UTP) funding categories (used in planning transportation development projects), coordinating work on the inland port project with the larger UTP-TTI project team was vital to creating a useful guide.

"With all of us working closely across university and project lines," says Henk, "TTI and CTR have produced a set of criteria that will encourage a smooth planning and development process for years to come." And that translates into public-private partnerships that save taxpayer dollars while creating a more efficient, cohesive and safer transportation system. **R**

RELATED MATERIALS: Contact Center for Transportation Research at (512) 232-3100 for **Research Report 4083-1, The Identification and Classification of Inland Ports.**

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Exploding roads

Research recommendations will help prevent sulfate heave

When the wrong chemical reactions occur beneath new pavements, the soils can swell, causing the pavement to heave. Sulfate-induced heave, as it is called, has presented challenges to pavement designers and departments of transportation (DOTs) around the world over the past 20 years. It occurs when lime or cement is used to stabilize subgrade soils that bear sulfate/sulfide minerals. The ensuing reactions sometimes result in the formation of minerals that occupy more space than the original soil constituents. Thus, after the pavement is placed, the soil beneath it undergoes an increase in volume, and heave takes place—as if a minor explosion has occurred under the pavement. The damage can be expensive and sometimes catastrophic.

How can DOTs most effectively and efficiently predict which roads are likely to experience this? And what is the best way to prevent it from happening? To find the answers to these questions, the Texas Department of Transportation (TxDOT) is sponsoring a Texas Transportation Institute (TTI) project to develop new guidelines and test procedures for stabilizing sulfate soils.

With the first phase of the project complete, researchers have already recommended a new laboratory test procedure and two rapid field test procedures for measuring the sulfate content of soils. “We’ve seen that these sulfate problems occur in small localized areas in Texas,” says Pat Harris, TTI research supervisor for the project. “Sometimes we’ll see only one or two heaves in a project that is several miles long, and the potential problem areas need to be quickly and easily identified and fixed before or during construction.”

The two rapid field test procedures recommended—the new conductivity and colorimetry test methods—are being implemented. TxDOT will supply all 25 of its districts with test kits. These tests can be performed in approximately 3–30 minutes compared to an estimated eight labor hours over a three-day period using conventional methods.

“We’ll be able to make on-the-job determinations of sulfate content during construction activities with



(top left) Heave from swelling of underlying soils; (top right) Testing soil samples using conductivity equipment; (bottom) Conductivity and colorimetry equipment.

timely results for both the contractor and the department,” says Bob Boykin, the TxDOT-Dallas field construction engineer who is project director of the project. “In fact, when sampling a one-mile section of roadway with highly variable soil conditions at 100-foot intervals, we’re estimating the new test procedures will save approximately 400 labor hours, and the results will be available several weeks sooner.”

The department is also in the preliminary stages of adopting the new laboratory standard test, the ion chromatography technique. Although the initial cost of the equipment is substantial, when compared to traditional methods this test is more accurate and repeatable, requires less time, does not expose personnel to toxic chemicals, brings less interference from other constituents in the soil and is not as sensitive to individual operator biases.

The Dallas District is just one of a number of TxDOT districts where pockets of sulfate soils have sometimes frustrated maintenance and rehabilitation efforts. According to Boykin, elimination of the sulfate-induced heave problems there could result in an estimated annual savings of \$10.5 million. “The first phase of this study was a resounding success, and we’re now making significant progress in the second phase of the project toward determining the allowable sulfate limits in a soil and toward finding an alternative stabilizing agent to lime.” **R**

The reports for **Project 0-4240** have not been published.



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New look for asphalt aging device

For years asphalt researchers have searched for better ways to simulate the asphalt aging process. Established laboratory methods are cumbersome, time consuming and potentially dangerous—yet the tests are necessary to predict the performance of asphalt under real world conditions. The time-tested, standard methods for simulating asphalt hot-mix aging are the rolling thin-film oven test (RTFOT) and the thin-film oven test (TFOT). Based on research conducted at the Texas Transportation Institute (TTI) for the Texas Department of Transportation (TxDOT), a single new apparatus and procedure may take their place—at twice the testing speed and half the cost.

The new stirred air-flow test (SAFT) demonstrates significant advancements in asphalt aging research. Whereas the RTFOT and TFOT tests required a lengthy amount of time to properly age samples, SAFT expedites the process by using asphalt air blowing. The blowing air oxidizes the crude oil products in the asphalt and ages the samples at a faster rate. The SAFT method also solves the problem asphalt researchers have encountered attempting to test polymer-modified binders (used in modern roadways), which the RTFOT and TFOT tests wouldn't accommodate.

According to Charles Glover, program manager for Pavement Materials Chemistry in TTI's Materials and Pavements Division, improved safety is also an important aspect of using the SAFT apparatus and procedure.

"The RTFOT asphalt aging test involves handling a lot of very hot glass containing hot-mix asphalt samples," Glover says. "There's always a danger of dropping these bottles or breaking them while they're being handled. And there are a lot of problems cleaning the bottles, which have narrow necks."

To fully cleanse the bottles for the older tests, researchers use high-temperature ovens to bake residual asphalt samples to ash. The ovens are expensive and consume valuable bench space in the laboratories, as does the RTFOT and TFOT equipment. The simple-to-use SAFT apparatus takes a fraction of the bench space and eliminates the aggravations and dangers associated with handling glass bottles.

"The new instrument is faster and far less labor-intensive than the RTFOT," says Gerald Peterson, SAFT's TxDOT project director and the asphalt laboratory engineer in TxDOT's Construction Division. "While the time savings may seem small on one test, the man hours saved on the several thousand tests we perform every year become pretty significant."

Researchers expect the SAFT to cut in half the time spent aging hot-mix asphalt samples, which translates to research hours being spent more efficiently.

Glover also says he expects that once implemented, the new apparatus will cost half that of conventional asphalt aging devices.

"Our apparatus handles the same amount of material in half the time and costs significantly less, probably half as



The Stirred Air-Flow Test apparatus (above) vs. conventional test methods.

METHOD	TIME
Stirred Air-Flow Test (SAFT)	35 min.
Rolling Thin-Film Oven Test (RTFOT)	85 min.
Thin-Film Oven Test (TFOT)	5 hours

much," Glover says. "That's a savings of several thousand dollars for each lab."

Labs using the SAFT apparatus and procedures could dispense with messy, dangerous bottles, expensive ashing ovens and time-consuming testing methods, while reaping meaningful cost savings and more research space on the laboratory bench.

"Our project management committee awarded TTI the project because they offered us the most promising ideas for a new test," Peterson says. "National implementation would give us more accurate and more efficient binder testing across the entire industry, not simply in one state or agency."

Glover's research team is now exploring options to manufacture the SAFT apparatus with a number of labs and manufacturing firms across the country. The new apparatus could be ready for implementation at TxDOT in about a year. **R**

The reports for **Project 0-1742** have not been published.

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Dick Davison, Jerry Peterson (Project
Director); (back row, L-R)
Charles Glover (RS), Nikolai Vassiliev



TTI Advisory Council Meeting

The TTI Advisory Council met in Austin on February 13, 2003. The Council heard updates on research projects and program initiatives, discussed critical transportation issues facing Texas and provided guidance on potential future research efforts.

Texas State Senator Steve Ogden, chair of the Infrastructure Development and Security Committee, was the keynote luncheon speaker. Senator Ogden, who authored the bill creating the Center for Transportation Safety at TTI, highlighted some of the transportation issues facing the Texas Legislature this session. In addition to improving unsafe stretches of roadway, increasing law enforcement and improving driver training, Ogden pointed to the need for continued safety research to better define, track and address highway crashes and fatalities.

A discussion of transportation issues led by Council Chair Arnold Oliver identified a number of potential areas for new research. Transporta-



(front row, L-R) Bob Jones, Linda Watson, Larry Heil, Kris Heckman, Rollin Bredenberg, Dianna Nobel;

(back row, L-R) Margaret Lonero, Donald Aviles, Thomas Kornegay, Michael Behrens, Arnold Oliver, Mark Stiles, Lawrence Olsen, David Laney, Gary Trietsch, and Paul Krugler.

tion funding strategies, homeland security, transportation safety, transit ridership and traffic congestion were identified as some of the priority issues. Members shared ideas on highway, port, air, rail and transit security; the need for partnerships to resolve institutional barriers to improved security, and potential technologies that can enhance the safety of all modes.

The comments and suggestions from Council members will be used to help formulate new initiatives at TTI. Former chair of the Council, Larry Heil, pointed out, "The progress in the dialogue of this group has been phenomenal. The group is headed toward continued success." ■

TTI and College of Architecture sign Memorandum of Agreement

TTI and the Texas A&M University College of Architecture signed a memorandum of agreement (MOA) on February 26, 2003. The MOA formalizes the strong working relationship that has developed between TTI and the college. The MOA encourages research collaborations, provides college faculty with opportunities for joint research appointments and offers TTI researchers opportunities for adjunct teaching appointments. It also supports ongoing student involvement in transportation research projects.

Representatives from TTI, the College of Architecture, Texas A&M University, and the Texas A&M University System attended the signing



(L-R) Jerry Gaston, the Texas A&M University System; David B. Prior, Texas A&M University; Thomas Regan, College of Architecture; Herbert Richardson, TTI.

luncheon. The MOA was signed by Herbert H. Richardson, TTI; J. Thomas Regan, College of Architecture; David B. Prior, Texas A&M University; and

Jerry Gaston, the Texas A&M University System. ■

TTI teams up with TxDOT, DPS and Senator Steve Ogden to urge driver safety during the holidays

TTI was a catalyst in bringing together law enforcement, transportation and legislative officials to send a united message during the recent holiday season. TTI worked to help promote what the Texas Department of Transportation (TxDOT), the Department of Public Safety (DPS) and State Senator Steve Ogden (R-Bryan) had to say: Don't drink and drive, don't speed, and don't forget to buckle up.

Ogden, a long-time transportation safety advocate, shared the latest safety belt use statistics from TTI's Center for Transportation Safety (CTS) to bring new evidence to an old message.

Seat belt usage among drivers and front seat passengers in 10 major Texas cities increased from 82 percent to 84 percent during a Thanksgiving holiday awareness and enforcement effort by TxDOT and DPS. The



TTI Center for Transportation Safety Director Dave Willis and State Senator Steve Ogden.

survey, conducted by CTS, reported that seat belt use increased fairly dramatically in three of the 10 cities studied (Corpus Christi, El Paso and Lubbock) during the holiday period, giving a boost to the 10-city average, but was essentially stable in seven cities. In those cities—Arlington, Austin, Dallas, Fort Worth, Garland, Houston and San Antonio—belt use is near or better than 80 percent, exceeding the national average of 75 percent.

Belt use statewide in Texas registered at 81 percent this past summer, reflecting a five-percentage-point improvement over 2001.

"Our goal is to protect the innocent from the intentional and unintentional acts of others so that we can exercise our freedom and enjoy our friends and our families without the tragedy of a fatal automobile accident," Ogden says.

Texas leads the nation in traffic fatalities, with more than 3,500 people dying in crashes each year. With projects like this one, TTI's Center for Transportation Safety is working to reduce that number. ■

For more information on CTS, contact **Dave Willis** at (979) 862-6707 or d-willis@tamu.edu. The web site for CTS is <http://cts.tamu.edu/>.

TTI's deputy director earns national honor

Dennis L. Christiansen, deputy director of TTI, is the 2002 recipient of the American Road & Transportation Builders Association's (ARTBA) S.S. Steinberg Award. ARTBA, which was founded in 1902, represents the U.S. transportation construction industry before Congress, the White House, news media and general public.



Created in honor of S.S. Steinberg, the founding president of ARTBA's Research & Education Division (RED), this award recognizes an individual who has made remarkable contribu-

tions to transportation education. It was presented January 13 during the division's annual meeting at the Transportation Research Board in Washington, D.C.

Christiansen, a professional engineer, has been a member of the TTI staff for 31 years. As deputy director, he is responsible for research in the areas of transportation operations, planning and economics. He has specialized in multi-modal research with an emphasis on identifying cost-effective approaches for addressing urban mobility concerns. He is an internationally recognized expert in the planning, design, operation and evaluation of high occupancy vehicle lanes, a common feature in large urban areas across the nation.

Christiansen serves on the ARTBA Board of Directors and is immediate past president of ARTBA's RED. He is

currently president of the Council of University Transportation Centers. In 1996, Christiansen served as international president of the International Institute of Transportation Engineers.

Colleagues say they value, honor and appreciate Christiansen's service and leadership in transportation. "Dennis' leadership has had and continues to have a national impact that has brought distinction not only to him but to TTI, as well," said TTI Director Herbert H. Richardson. During his career, Christiansen has received many professional awards, including the Transportation Research Board's Fred Burgraff Award. He was also named the Transportation Engineer of the Year by the Texas Section of the Institute of Transportation Engineers in 1989. ■

Gene Buth receives Stonex Award

Gene Buth, division head of Safety and Structural Systems of TTI, is the 2002 recipient of the Transportation Research Board's (TRB) Kenneth A. Stonex Award.



This award was created in honor of Kenneth A. Stonex, the General Motors engineer who pioneered highway

safety in the 1940s and 50s. It recognizes an individual who has made remarkable contributions to transportation safety. The award was presented January 15 during the TRB annual meeting in Washington, D.C.

The citation on the award reads: "In recognition of more than three decades of service and achievement in advancing state-of-the-art in roadside safety; for his pioneering research in bridge rail design & analysis methods; for his role in the development and testing of innovative roadside safety devices including the ET-2000 guardrail end terminal;

for his education and mentoring two generations of transportation safety professionals; and for his staunch dedication and commitment to promoting roadside safety. His invaluable contributions have prevented untold numbers of injuries and fatalities, and made highways safer for us all."

Buth, a professional engineer, has been a member of the TTI staff for 39 years. As division head, he is responsible for research in the areas of transportation safety and structural systems. ■

Tucker will serve as chair of TRB's LIST Committee

Sandy Tucker, manager of TTI's Library and Information Services group, was recently appointed to be the new chair of the TRB Committee A5017, Library and Information Services for Transportation (LIST).



The committee's mission is to provide leadership for the transportation community in efforts to gather, organize and disseminate information, utilizing technology and fostering technological innovation for the improvement of transportation systems worldwide. Tucker was the chair of the panel for Project 20-32 of the National Cooperative Highway Research Program, "Development of a Comprehensive Thesaurus for Transportation Research." She also is a past chair of the Transportation Division of Special Libraries Association. ■

TTI and Bush School sponsor seminar

In conjunction with the George Bush School of Policy and Government at Texas A&M University, TTI sponsored a seminar presentation given by Graham Hill, the lead staff person in writing the reauthorization of TEA-21. Hill is the counsel for the House Highways and Transit Subcommittee of the House Transportation and Infrastructure Committee of the United States House of Representatives. With close to 100 students, faculty and researchers attending, Hill spoke on the processes and challenges of getting transportation legislation through the U.S. House and Senate. He also highlighted the



key issues facing reauthorization of TEA-21 this session. Graham met with representatives of TTI and the Texas Department of Transportation for the balance of the day to discuss issues associated with transportation research programs. ■

Landphair to chair Landscape and Environmental Design Committee

TTI Research Scientist Harlow Landphair has been appointed chair of the Transportation Research Board's (TRB) Landscape



and Environmental Design Committee (A2A05). Landphair is head of TTI's Environmental Management Program and has served on the Board of Directors of the International Erosion Control Association's South Central Chapter.

TRB's Landscape and Environmental Design Committee is concerned with design parameters that relate to the protection, conservation, restoration and enhancement of the natural environment and man-made elements of transportation systems and their surroundings. ■

John Carter visits TTI

John Carter, State Representative for the 31st District in Texas, recently visited TTI to discuss the benefits of establishing a proposed National Mobility Institute at TTI. This nation spends in excess of \$35 billion annually on transportation improvements, yet congestion continues to increase at an estimated rate of 5 percent. Investing a small portion of the national transportation budget will enable our nation to better understand the problem, effectively measure it and look for innovative solutions.

TTI's Urban Mobility Study is already used in virtually every discussion of congestion and what to do about it. Findings from this research have been part of the deliberations of national, state and local policy boards, commissions and blue ribbon panels.



Through the work proposed by a new National Mobility Institute, expanded research will allow national, state and local transportation leaders to make fiscally sound decisions to help slow the growth of congestion and increase mobility. ■

TTI Employee Award Winners

Awards for outstanding employee performance were presented at the Institute's annual meeting on December 4. The following TTI employees received administrative awards:

Administrative Professional Staff Award—Beth Roach; Administrative Support Staff Award—Jody Paschall; Administrative Technical Support Award—Brian Long; Administrative Technical Support Award—Gary Sinton; Division Administrative Support Award—Helen Olivarez; Charles J. "Jack" Keese Career Achievement for Administrative/Technical Support Award—Anna Jo Mitchell

Trinity award winners are presented below. ■

Trinity Industries and TTI present employee awards



(front row, L-R) Trinity Industries Vice President Rodney Boyd; Trinity Senior Researcher Award—Edward Seymour; Trinity Researcher Award—William Frawley; Trinity Division Technical Support Award—Rebecca Haug; Trinity New Researcher Award—Timothy Gates; TTI Director Herbert Richardson

(back row, L-R) Trinity Researcher Award—Thomas Freeman; Trinity Division Technical Support Award—Robert Kocman; Trinity/Charley V. Wootan Career Achievement for Research Award—George Dresser; Trinity Researcher Award—Larry Rilett

THE BACK ROAD



In challenging economic times, near-term solutions for the state's fiscal and policy problems tend to become the focus. That's understandable, and we certainly support our elected officials' efforts to find solutions that will keep Texas on the right path. We all know that a safe, well-managed and efficient transportation system is key to supporting economic growth.

Texans worry about the quality of the air, the safety of their families on the highway and their ability to get to work or recreation easily and without undue delays.

For that reason, now is a good time to consider how research has improved transportation in Texas. The benefits gained from the state's investment are quantifiable. Over the past 50 years, researchers at TTI and other Texas universities have worked closely with TxDOT and the United States Department of Transportation, as well as with private companies, to find solutions to a wide range of transportation problems. In this issue, you'll learn about just a few of the projects that have repaid their cost many times over in terms of lives and dollars saved.

In fact, using a conservative estimate and analyzing the effect of only 21 projects from its university research program, TxDOT estimates that 245 lives will be saved, over 24,000 accidents will not occur, and over \$322 million in costs will be saved over the next 10 years. The overall return-on-investment is 5:1: five dollars of direct benefit to Texans for every dollar invested in university research. Universities compete for these research dollars, so sponsors are ensured of getting the highest quality research product at the best price, which is essential in this challenging financial environment.

While the financial returns are impressive, it's important to remember that what really matters is how research improves the overall quality and safety of the transportation system. Every advance in pavements, rural road safety, urban traffic management or water or rail transportation, when implemented effectively and efficiently, means that our transportation system is more secure and that Texans can continue to have confidence in the quality of that system.

Inside this issue of the *Researcher* you'll find some specific examples of these savings from a range of innovative, leading edge and highly practical research projects. If any of the stories is of particular interest, I hope you'll get in touch with the researchers for additional details. Thanks for your interest in TTI and your continued support for transportation research.

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