

TTI Creates New Methodology  
for Multimodal Assessment

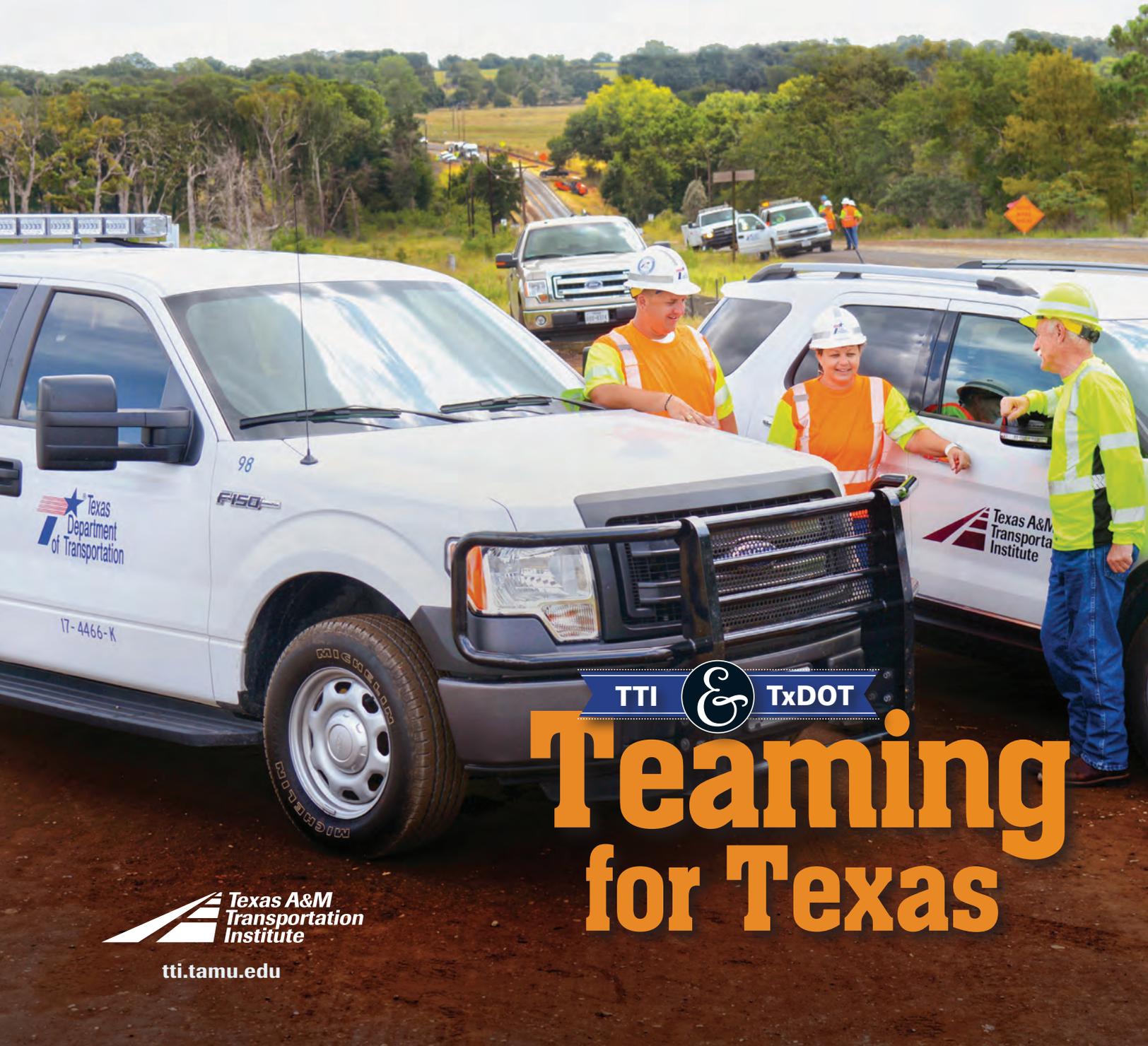
Seal Coats: Sharing Lessons  
Learned, Testing New Methods

Putting Research into Practice:  
Technology Transfer Supports  
Implementation

TEXAS TRANSPORTATION

VOL. 51 | NO. 3 | 2015

# Researcher



TTI



TxDOT

# Teaming for Texas



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# TEXAS TRANSPORTATION Researcher

VOL. 51 | NO. 3 | 2015

**ON THE COVER:** For nearly seven decades, the Texas A&M Transportation Institute and the Texas Department of Transportation have partnered to improve the Texas transportation system through innovative research initiatives.



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Dennis L. Christiansen, P.E.

**Editor**

Chris Pourteau

**Managing Editor**

Samantha Atchison

**Copy Editors**

Michelle Benoit

Kelly West

**Writers**

Samantha Atchison

Rick Davenport

Gabriella Medina

Terri Parker

Chris Pourteau

Chris Sasser

Kelly West

**Art Director**

John Henry

**Designers**

Vicky Nelson

Stacy Schnettler

**Photographer**

James Lyle

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*Texas Transportation Researcher* (ISSN 00404748) is a quarterly publication of TTI Communications, Texas A&M Transportation Institute, 3135 TAMU, College Station, Texas 77843-3135. Periodicals postage paid at College Station.

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TxDOT

# A Partnership of Vision, Expertise and Excellence for Texas

In 1948, the Texas Highway Department formed a unique relationship with the Agricultural and Mechanical College of Texas. Led by the department's vision for improving the Texas transportation system, Texas A&M's engineering faculty became the go-to problem solvers for Texans. Two years later, the Texas A&M Transportation Institute (TTI) was born.

The Texas Department of Transportation (TxDOT) has since formed similar partnerships with other university-based research programs around the state. From promoting safety and mobility to helping enable economic vitality, our Cooperative Research Program has become the intellectual engine for improving the Lone Star State's transportation system.

Research enables TxDOT to deliver necessary innovations to meet the immediate needs of Texans, and to understand the future potential of the transportation system. Ours is a time when convenience and customer service are expected — where just-in-time delivery can mean the difference between profitability or going out of business. And while facilitating economic prosperity is extremely important, many of those using the roadways are everyday travelers going to the store, commuting to work or picking up the kids at school. The system has to work for everyone.

Over the past seven decades, TxDOT and TTI have worked together on numerous initiatives to increase the safety and reliability of our transportation

system. In part, that's a tribute to the research excellence we've come to rely on from TTI. Whether it's testing roadside safety devices at TTI's Proving Ground, coming up with new, more cost-efficient pavement rehabilitation methods, or helping the department strategize to improve urban mobility, TTI provides essential support to our decision-making process. We've worked together to save billions of tax dollars through the implementation of new ideas. More importantly, we've saved Texans' lives.

The road ahead is equally challenging. While we may not know the exact challenges of tomorrow, we continue conducting research that can help us plan for them. Our university partners, including TTI, will be essential to that process in a couple of ways. They will, of course, continue to provide engineering expertise that advises the department on how to keep Texans safer, more mobile, and better able to compete in the global marketplace.

But they'll also do something that, really, only universities can do. While the essential function of our network

— getting people and goods where they need to go — will remain the same, how we perceive transportation itself will change as we become more reliant on technology along the roadways. By inspiring curiosity in young minds across all disciplines about these new technologies and their related markets, our university partners can help us apply our state's greatest resources — innovation, intelligence and industriousness — to maintain and further develop the most envied transportation system in the nation.

At nearly 70 years old, the TTI-TxDOT partnership stands strong. We've laid a solid foundation of teamwork and trust over time. And that positions us well to



work together to help Texas build a better future. ■

by LtGen J.F. Weber, USMC (Ret.)  
Executive Director,  
Texas Department of Transportation



TTI



TxDOT

WHERE *State*  
OF THE *Art*

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MEETS STATE OF THE  
*Practice*

Over the past 60 years, drivers have seen countless changes on Texas roadways — not only in how they're used by drivers but in how they're built and maintained. Yet one thing remains constant: the partnership between the Texas Department of Transportation (TxDOT) and the Texas A&M Transportation Institute (TTI).

These two agencies work together to create a state transportation network that sets the standard for the nation. TTI research expertise helps advance TxDOT's state of the practice, most notably in the areas of traffic operations and roadway maintenance.



## Managing Our Lanes More Efficiently

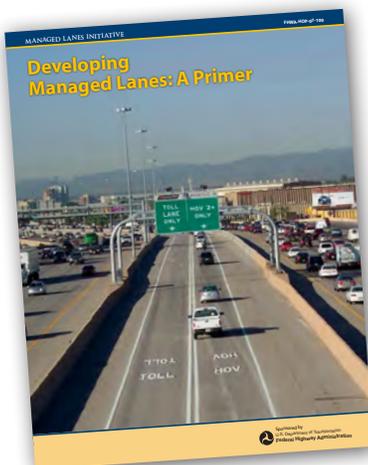
In 1979, Houston, Texas — recovering from a 30-year population boom — was running out of highway capacity. The result? Increasing traffic congestion. TTI researchers worked with the Texas State Department of Highways and Public Transportation (now TxDOT) and the agency that became the Metropolitan Transit Authority of Harris County (Houston METRO) to try something different.

“One of the approaches developed was to take a lane of off-peak traffic and assign it for bus-only use in the peak direction of travel on I-45 North,” says TTI Executive Associate Director Katie Turnbull. “A lot of people thought ‘this is interesting, but it isn’t going to work.’ But it did.”

The project was unique because it created the longest freeway contraflow lane at the time and operated during both peak times.

“This was a really innovative idea that spurred the high-occupancy vehicle [HOV] network you have today throughout the state as well as nationally. TTI was responsible for the technical work and helped maintain continuity across changes in both the Highway Department and Houston METRO,” says Turnbull.

In 2005, Beverly Kuhn, head of TTI’s System Reliability Division, and Ginger Goodin, director of TTI’s Transportation Policy Research Center, created *Developing Managed Lanes: A Primer* to help TxDOT make informed planning, design and operational decisions when considering managed-lanes facilities.



“TxDOT uses the handbook to help plan system changes that take into account how the existing HOV system has evolved over time into, for example, toll express lanes or high-occupancy toll lanes,” says Kuhn. “It was the first of its kind nationwide and really presented TxDOT as a national leader on the topic.”

## Building Our Roadways to Last Longer

Roadway maintenance is another area in which TTI has provided vital assistance to TxDOT in refining and improving departmental practices. Since 2010, Texas has seen another huge population boom, and as usual, more people mean more cars using Texas roadways. And that means a greater need for roadway maintenance.

Much of the interstate system was built over 60 years ago and built to last for 30 years. “A lot of it is worn out,” explains Tom Scullion, manager of TTI’s Flexible Pavements Program. “There’s growing interest in pavement rehabilitation and developing new materials and tools to address issues associated with pavement failure.”

For 25 years, TTI researchers have developed, tested and implemented advanced nondestructive testing technologies for TxDOT to use when diagnosing the cause of pavement failures and when selecting the optimal road repair and maintenance strategies.

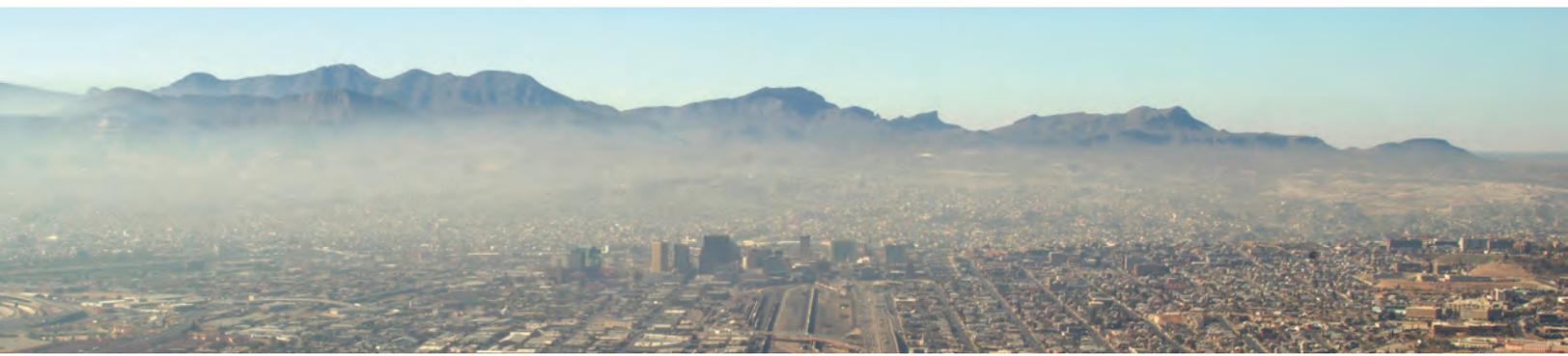
“We’ve been perfecting the application of ground-penetrating radar [GPR] and deflection technologies for pavement evaluation since 1990,” Scullion says. “TxDOT has implemented our recommendations and saved taxpayers a lot of money that otherwise would’ve been spent on more expensive maintenance techniques.”

Recently, TTI worked with TxDOT on a 7-mile stretch of I-20 to evaluate necessary roadway repairs. Using three existing technologies — GPR, core samples and rolling deflectometer — in a new approach pioneered by Scullion, TxDOT was able to reduce maintenance costs while achieving a better, longer-lasting pavement section.

“The I-20 project is a great example of how the TTI-TxDOT association works together,” says TxDOT Materials and Pavement Engineer Miles Garrison. “TTI’s use of the latest technology to determine the most cost-effective strategy for repairs and rehabilitation of the interstate has saved approximately \$1 million to date.” ■



For more information, contact **Katie Turnbull** at (979) 845-6005 or [k-turnbull@tti.tamu.edu](mailto:k-turnbull@tti.tamu.edu).



# TTI Creates New Methodology for Multimodal Assessment

## Helping El Paso Manage Growing Pains



The Office of the State Demographer projects Texas' population will rise from 25.2 million in 2010 to 33.9 million in 2030. That's a 35 percent increase in the state's population, and the growth isn't just happening in cities like Austin, Dallas or Houston — it's happening statewide.

In El Paso, commutes of 20 miles at peak travel times can take up to an hour. Local residents are spending more time in traffic, and their idling vehicles are adding to the region's air pollution. In fact, the U.S. Environmental Protection Agency (EPA) considers El Paso a non-attainment area, meaning the region fails to meet EPA's air-quality standards and risks losing federal funding until it does.

Researchers at the Texas A&M Transportation Institute's (TTI's) Center for International Intelligent Transportation

Research have come up with a new methodology to assist El Paso's metropolitan planning organization (MPO) in developing a multimodal plan for the region aimed at decreasing congestion and pollution by encouraging alternate modes of travel. Once proven in El Paso, the methodology could be used by the Texas Department of Transportation or other communities around the state.

"We're currently assessing how our transportation system needs to look in the future," explains Michael Medina, executive director of the El Paso MPO. "To do that, we need to know how people in the region use the different modes — pedestrian, bicycle, transit — as well as how they might feel about using those modes in the future."

The TTI team, led by Associate Research Engineer Alfredo Sanchez, collected baseline data related to how local residents currently use the biking, walking and transit modes. Researchers are looking at the level of service (LOS) provided by each of the three modes plus the automobile.



By relating the LOSs across modes, researchers can identify qualitative measurements for assessing each mode’s efficiency relative to the others.

“We’ve actually created a whole new methodology for doing this,” explains Sanchez. “The others that exist weren’t feasible for making comparisons across modes and didn’t allow for a complete, multimodal trip-based evaluation.”

In other words, if people rode their bikes to a bus stop and then rode the bus to another location from which they walked to their office, existing methodologies didn’t allow for rating the relative benefits each of those modes contributed to the overall trip.

“Our new methodology scores the modes on how efficient they are within the context of a person’s trip,” says Sanchez. “It’s sensitive to a region’s unique demographics and trip factors, like time of day, and uses performance measures of a given mode’s efficiency.”

TTI used easily accessible data to run its analysis, relying heavily on GIS information from existing agencies like Sun Metro (El Paso’s transit agency) and the City of El Paso Department of Transportation. Researchers also employed a travel-demand model that includes census and employment data from 2014

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**“TTI created this methodology for us to use here in El Paso, but with tweaking, it can be applied anywhere. With it, any local MPO could determine how to increase mobility for its citizens across travel modes.”**

*Michael Medina,  
Executive Director, El Paso MPO*

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and projections for 2030. They then created a framework for comparing the modes relative to one another.

“Part of what we’re doing is assessing what the El Paso MPO area has in the way of existing multimodal transportation facilities and where gaps occur between modes,” says Sanchez. “It’s those kinds of negative aspects of the current system that might influence users to choose to drive rather than use other travel modes.”

Although the project is ongoing, researchers have already determined that El Paso’s bicycle infrastructure requires

significant improvements to facilitate last-mile connectivity for local residents. Eventually, the MPO will use TTI’s research findings to analyze travel behaviors as the beginnings of a strategy to make alternate travel modes more appealing to El Pasoans.

TTI will ultimately provide the MPO with a framework for analyzing and prioritizing multimodal projects, which the MPO can then use to design a system that minimizes congestion and the pollution associated with it. Less pollution and healthier traveling choices, like biking and walking, could help improve citizens’ health. And that could mean fewer societal costs associated with conditions like respiratory disease, obesity and poor cardiovascular health.

“TTI created this methodology for us to use here in El Paso, but with tweaking, it can be applied anywhere,” says Medina. “With it, any local MPO could determine how to increase mobility for its citizens across travel modes.” ■



*For more information, contact **Alfredo Sanchez** at (915) 521-8111 or [a-sanchez@tti.tamu.edu](mailto:a-sanchez@tti.tamu.edu).*

# Seal Coats: Sharing Lessons Learned, Testing New Methods

## Training Courses Teach TxDOT Personnel Best Practices in Seal-Coat Projects

**The Texas Department of Transportation (TxDOT)** maintains more than 79,000 miles of farm-to-market, ranch-to-market, state, U.S. and interstate highways. That's more roadway than any other state. As resources are stretched thin, maintaining the roadways is a challenge. Seal coats — also known as chip seals — are simple, relatively inexpensive pavement surfaces that are highly effective if adequate care is taken in the planning and execution of the work.

Since 2007, the Texas A&M Transportation Institute (TTI) has provided TxDOT support with preparing, planning and teaching seal-coat training courses for its district personnel. The courses are based on a curriculum created from TxDOT's *Seal Coat and Surface Treatment Manual*.

"We have two one-day training classes we usually teach back to back," says TTI Research Engineer Cindy Estakhri, who manages TTI's Recyclable Materials Program. "One class is designed for inspectors [i.e., practitioners], and the other focuses on planning and design [intended for engineers]. Our classes are meant to supplement and enhance participant understanding of seal-coat projects while on the job."

The seal-coat training road show begins classes in the fall, when the weather cools off and the summer seal-coat season is complete. In a typical year, Estakhri — along with Jerry Peterson (director of TxDOT's Asphalt and Chemical Laboratory) and Joe Graff (retired deputy director of TxDOT's Maintenance Division) — travels around the state conducting a dozen or so classes a year that are usually filled with students.

"There are many factors affecting the success of a seal-coat project," explains Estakhri. "For example, the type of asphalt used may not be appropriate for the environment or the amounts of aggregate, and aggregate applied may not be appro-

priate for roadway conditions. Both of these scenarios can cause immediate problems, so it's helpful to have the experience of our instructors to explain how to do the job right the first time and avoid costly mistakes."

Currently, the courses are undergoing revisions that include updated photos, slides and a series of videos explaining equipment inspection.

"Seal coats are a very important part of TxDOT's preventive maintenance program," says TxDOT Director of the Pavement Preservation Branch Magdy Mikhail. "Seal coats are approximately \$2 per square yard versus \$7–10 for an asphalt overlay, so they provide a major cost value benefit for taxpayers. The seal-coat training courses ensure we give our personnel the tools they need to properly maintain our roadway system." ■



For more information,  
contact **Cindy Estakhri**  
at (979) 845-9551 or  
c-estakhri@tti.tamu.edu.

## Implementation of New Specification for Asphalt Binders in Seal Coats

**From the semi-arid northern plains** to the humid subtropical piney woods, Texas is a vast state with a sprawling network of roads spanning multiple climates. While the temperature and landscape variances add to the giant state's lore, they can also play havoc with roadway maintenance — namely the popular seal-coat surface treatment placed on 5,000 miles of roadways per year at a cost of approximately \$300 million.

“The performance of a seal-coat surface treatment depends on several factors, climate being one of them,” says TTI Research Engineer Amy Epps Martin. “Inadequate binder properties when first placed in hot weather or when the first cold temperatures arrive can result in premature bleeding and aggregate loss, respectively. This results in poor performance and a roadway that should last six to eight years needing additional maintenance much sooner.”

The Texas Department of Transportation has sponsored multiple research projects with the goal of developing and validating a surface performance-graded (SPG) specification toward improved selection of seal-coat binders. “The selection of seal-coat binders is currently based on experience and traditional specifications that aren't performance related and don't directly consider climate,” notes Epps Martin. “The validated SPG specification directly considers the multiple climate zones in Texas through performance-based properties measured with the same equipment currently utilized for asphalt binders in hot-mix and warm-mix asphalt mixtures.” This SPG specification will replace existing seal-coat binder specifications and selection tables for in-service performance.

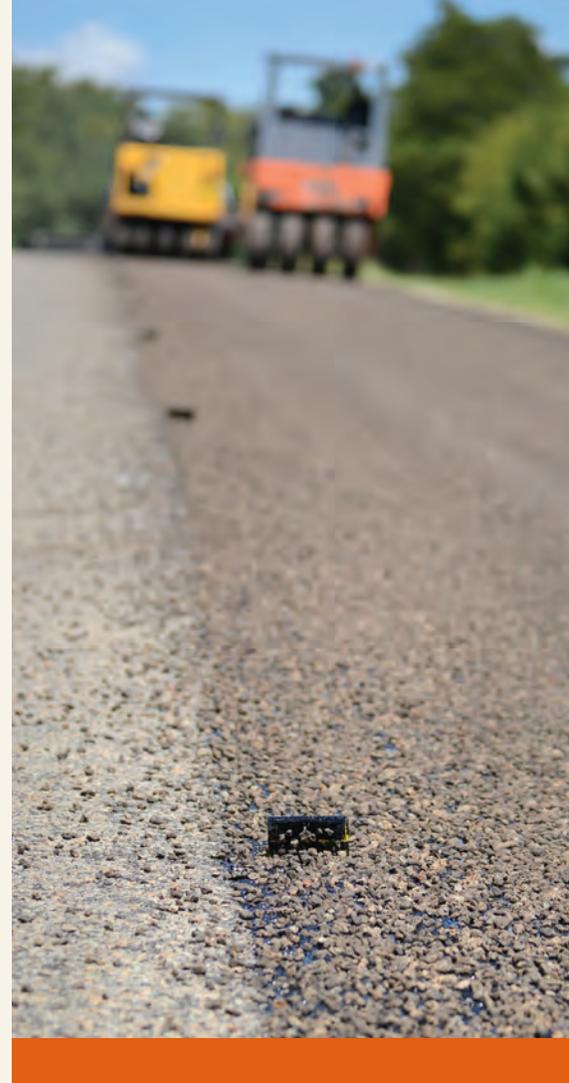
The Texas A&M Transportation Institute is working with TxDOT to implement the SPG specification in a four-year staged effort. In the future, a large seal-coat project in TxDOT's Corpus Christi District and a smaller one in the Paris District will serve as initial test beds for the new specification. After the first year of in-service performance, the research team will evaluate the results and revise the specification as necessary. The Abilene, Amarillo, Austin, Brownwood, Corpus Christi and Paris Districts are planning to implement the SPG specification in 2016.

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*Amy Epps Martin,  
TTI Research Engineer*

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“The SPG specification is ready for implementation, and this effort will provide further validation with additional highway sections, corresponding climates and a wider variety of materials,” says TxDOT Deputy Director of the Construction Division Darren Hazlett. “It's been a long time coming, but we're hopeful this new specification will result in increased performance and reduced costs.” ■



*For more information,  
contact Amy Epps Martin  
at (979) 862-1750 or  
a-eppsmartin@tti.tamu.edu.*

# Troubleshooting Issues Before They're Problems

## TTI Partners with TxDOT on Seven Innovative Research Projects

In 2014, the Texas Department of Transportation (TxDOT) supplemented its Cooperative Research Program with an Innovative Projects program aimed at proactively addressing issues before they become problems. TxDOT's Research and Technology Implementation Office (RTI) is overseeing 13 forward-thinking research efforts aimed at creating a safer, more efficient Texas transportation system. The Texas A&M Transportation Institute (TTI) has been awarded contracts to work on seven of those projects.

"Our work with TTI is a collaborative effort that leverages the research expertise and unique facilities of the Institute in a proactive rather than reactive way," says RTI Director Dana Glover. "The Innovative Projects program will benefit Texans by exploring and evaluating state-of-the-art ideas and next-generation technologies. The program also will help us address the infrastructure needs of our growing population, which will continue to increase the number of vehicles on our roadways."



**1. The Truck Platooning Demonstration Project** is creating a first-of-its-kind, comprehensive freight platooning demonstration in Texas. Truck platoons offer the potential for faster, safer and more environmentally friendly freight movement. This three-phase project will conduct a feasibility planning study and proof-of-concept demonstration, develop the requirements for design, and develop a commercial truck platooning application in Texas.



**2. Automated and Connected Vehicle (AV/CV) Test Bed to Improve Transit, Bicycle and Pedestrian Safety** is evaluating AV/CV applications for enhancing transit, bicycle and pedestrian safety. Thus far, TTI has held meetings and workshops with modal stakeholders and conducted a technology scan to identify four near-term applications, three of which focus on collision avoidance with turning transit vehicles, straight-line travel, and fixed objects. A fourth application is addressing bike-rack-on-buses safety. The concept-of-operations plan, which includes recommendations for implementing these technologies, is currently under development.

**3. Connected Vehicle (CV) Wrong-Way (WW) Driving Detection and Mitigation Demonstration** is developing a concept of operations, functional requirements, and high-level system design to test applications that can detect and notify TxDOT and law enforcement about WW driving events. Researchers are also looking at how to alert the WW driver and nearby traveling public about such events. The project will include the demonstration and evaluation of a WW driving CV test bed in both a closed environment and at least one TxDOT district.



**4. Strategy- and Technology-Based Approaches to Freight Distribution** is examining innovative and automated freight distribution methods and technologies to provide TxDOT with recommendations on which approaches hold promise for streamlining operations and reducing costs for freight carriers in Texas. Currently under review are 57 strategies and technologies to improve productivity, convenience and safety of other transportation system users, and public/private financial and economic impacts. Researchers are creating a tool box that identifies the most effective combination of freight technologies and strategies to maximize benefits for specific freight-system needs and locations.



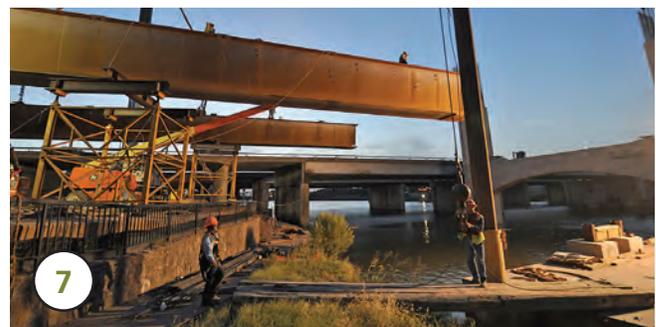
**5. Using Nondestructive Technologies to Ensure Specification Compliance for Pavements** is exploring new methods for testing pavement materials using nondestructive technologies. Such technologies allow for minimal traffic disruption and an increased level of testing coverage, and offer the potential for increased pavement life. Focus elements included in the project, if demonstrated feasible and implementable, would make the responsibility of assuring quality construction for flexible and rigid pavements more timely and reliable with minimal disruption to traffic.



**6. Piezoelectric-Based System for Harvesting Energy from Roadway Infrastructure** is a project to develop a Highway Sensing and Energy Conversion (HiSEC) module to be embedded in pavement structures. The module is designed to harness the high dynamic forces created by vehicles and use them to generate electric power. In addition, the HiSEC module will provide continuous monitoring of the roadway's conditions to help identify maintenance needs.



**7. Developing New Technologies to Improve Infrastructure Maintenance** is evaluating how emerging technologies can be used for more efficient and effective maintenance of highway infrastructure. Researchers are conducting proof-of-concept demonstrations in three highway infrastructure areas: safety and operations, bridges, and pavements. For example, adding sensors to existing infrastructure can give agencies responsible for maintaining it more timely data about needed repairs. Sensors can also improve the reliability of information provided by camera-based vehicle technologies to help keep vehicles on the road. ■



For more information, contact  
**Bill Stockton** at (979) 845-9947  
or [b-stockton@tti.tamu.edu](mailto:b-stockton@tti.tamu.edu).



*Armed with a new approach for saving lives on rural roadways, TxDOT has launched an extensive pavement-widening project.*

## The TTI-TxDOT Team Is Working to Increase Safety for Texans

**Improving transportation safety for Texans** is a goal long shared by the Texas Department of Transportation (TxDOT) and the Texas A&M Transportation Institute (TTI). In 2015, three projects are continuing that tradition of making the roadways in the Lone Star State safer for everyone.

### TTI Develops Assessment Methodology for Rural Texas

Armed with a new approach for saving lives on rural roadways, TxDOT has launched an extensive pavement-widening project using a risk assessment methodology developed by researchers at TTI.

Previously, roadway improvements were made solely based on crash frequency. TTI researchers have developed a new way to identify roadway features that indicate where crashes are likely to occur. The methodology has never been used before in Texas.

“This systemic approach will allow TxDOT to improve roadway safety proactively by identifying a particular roadway based on its risk factors that have potential for crashes,”

says TTI Crash Analysis Program Manager Troy Walden, principal investigator on Developing Methodology for Identifying, Evaluating and Prioritizing System Improvements. Wider pavement on rural roadways reduces the number of crashes and fatalities.

After a thorough examination of crashes on rural Texas highways from 2009 to 2013, researchers analyzed the numerous features of the roadways where the crashes occurred, including lane and shoulder width, the amount of truck traffic, and the degrees of curvature. Each factor was assigned points.

“By using this weighted method, TxDOT can add the details associated with each individual roadway and rank them,” Walden explains. “Once the roadways in question are compared to each other, TxDOT can prioritize its road-widening projects.”

Each TxDOT district has begun the ranking process using the new TTI methodology. Soon, those roadways will be prioritized for their pavement-widening needs, with work beginning next year. TxDOT plans to spend \$15.5 million a year to widen rural roadways through 2019.

“I see this as an opportunity for us to get ahead of the crashes, to prevent them from happening,” says Safety Engineer Darren McDaniel of TxDOT’s Traffic Operations. “This method allows us to compare risk factors of roadway characteristics that tell us where the best opportunity is for improving safety.”



TTI and TxDOT researched motorcyclists’ motivations for wearing protective gear.

## Gearing Up for Motorcycle Safety

In Texas, there are two types of motorcyclists — those that will wear helmets and those that won’t. However, when it comes to convincing riders to wear protective gear each time they ride, TTI researchers think some minds can be changed.

“We know that protective gear — like padded jackets and riding pants, eyewear, gloves, and boots — go a long way in reducing severe injuries,” says Mike Manser, TTI Human Factors Program manager, who’s studying how motorcyclists make those decisions. “But why motorcyclists decide to wear gear or not is something we don’t fully understand.”

Funded by TxDOT, the study began with a survey asking motorcyclists about the equipment they do wear and why they choose to wear it. From the results, TTI and TxDOT produced a tip card that focuses on the advantages of wearing safety gear. Now, researchers are reviewing the results of an online survey that was taken by 1,600 motorcyclists across the country. The final goal is an outreach campaign designed to convince riders that they should wear protective clothing each time they ride.

“Based on their answers, we will develop a campaign that shows the advantages of wearing safety equipment and motivates riders to change their habits. TxDOT has always



The anonymous attitude and awareness survey is one of the ways in which TTI works with TxDOT to refine its highway safety program.

been very concerned about motorcycle safety, and like me, they know that the more riders who wear gear, the better,” Manser says.

## Attitude and Awareness Surveys for Texas Motorists

How often do Texans drive after drinking alcohol? How often do they drive over the speed limit? Do Texans know that everyone riding in a vehicle is required to buckle up?

Since 2010, those have been among the questions answered each year by at least 2,000 respondents in a traffic safety survey commissioned by TxDOT and distributed and analyzed by TTI.

“The anonymous survey is one of the ways in which TTI works with TxDOT to refine its highway safety program,” explains Katie Womack, manager of the Behavioral Research Group in TTI’s Center for Transportation Safety. “It’s a valuable tool designed to measure and track Texans’ attitudes and awareness of traffic safety programs, proposed policy changes, current laws, and behaviors related to issues such as impaired driving, distracted driving, safety belt use and others.”

Ten of the 25 survey questions are performance metrics specified by the National Highway Traffic Safety Administration, ten are traffic safety related and of specific interest to TxDOT, and five are designed to obtain background and demographic information. The 2015 Traffic Safety Attitude and Awareness Survey was conducted during the summer and is currently being analyzed. The final report will be released in 2016. ■



For more information, contact **Robert Wunderlich** at (979) 845-2095 or [r-wunderlich@tti.tamu.edu](mailto:r-wunderlich@tti.tamu.edu).

# INTERAGENCY COOPERATION: *Working Together for Texans*

## Relieving Traffic Congestion, Facilitating Evacuations for Houston

Thanks in part to a decades-long relationship developed and strengthened through an interagency agreement (IAC) between the Texas Department of Transportation's (TxDOT's) Houston District and Texas A&M Transportation Institute (TTI) researchers, 1,000 miles of Houston roadways are monitored by a low-cost traffic data collection system. The system collects the average speeds and travel times of motorists using an anonymous wireless address matching (AWAM) system, invented by TTI researchers, to facilitate traffic flow in Houston and the surrounding region.

The monitoring system anonymously reads Bluetooth® and Wi-Fi enabled wireless devices such as cell phones and vehicle navigation systems as vehicles pass AWAM antennas strategically placed along the roadside. The data is transmitted in real time to transportation and emergency management centers, like Houston's TranStar, to determine how long it takes to traverse designated roadway segments and to help identify when and where congestion is forming. TranStar personnel can use the data provided to, for example, reroute traffic to avoid congestion before it ever occurs.

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**"I believe the success of AWAM was made possible because of the working agreement we had in place with TxDOT."**

*Tony Voigt,  
TTI Research Engineer*

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AWAM was first implemented on I-45 between Houston and Dallas following the evacuation gridlock caused by the threat of Hurricane Rita in 2005. Motorists sat for hours in traffic jams along evaluation routes. With AWAM, TranStar personnel can monitor the congestion along I-45 and determine, for example, if and when contraflow lane reversals should be implemented. Based on the successful deployment



on I-45, the TxDOT Houston District has recently updated its travel-time monitoring system to include a majority of AWAM-based sensors.

"I believe the success of AWAM was made possible because of the working agreement we had in place with TxDOT," says TTI Research Engineer Tony Voigt, program manager for the Institute's Houston Research and Implementation Office. "The existing agreement offered a method to deploy and refine AWAM to solve a particular problem identified by TxDOT. Ultimately, in addition to evacuation monitoring, it also made sense to implement AWAM in support of other needs, like daily travel-time monitoring and incident management."

AWAM has been used by TranStar since 2010, providing accurate and low-cost data for its traveler information system.

"As a result of the cost savings we realized by using AWAM, we've been able to apply resources to monitor travel times in areas we were not able to consider before," explains TxDOT's David Fink, Houston TranStar transportation operations engineer. ■



*For more information, contact  
**Tony Voigt** at (713) 613-9208  
or [t-voigt@tti.tamu.edu](mailto:t-voigt@tti.tamu.edu).*

## Advanced Traveler Information, Communication Strategies for Central Texas

Like TTI's effort in Houston, the Institute's work in support of TxDOT's I-35 Expansion Project in the Waco District is a prime example of how important interagency agreements are for Texans, especially considering the goals outlined by TxDOT for this particular project.

### "The collaboration with TTI on the I-35 corridor reconstruction program has been invaluable to the Waco District."

*Bobby Littlefield,  
TxDOT District Engineer*

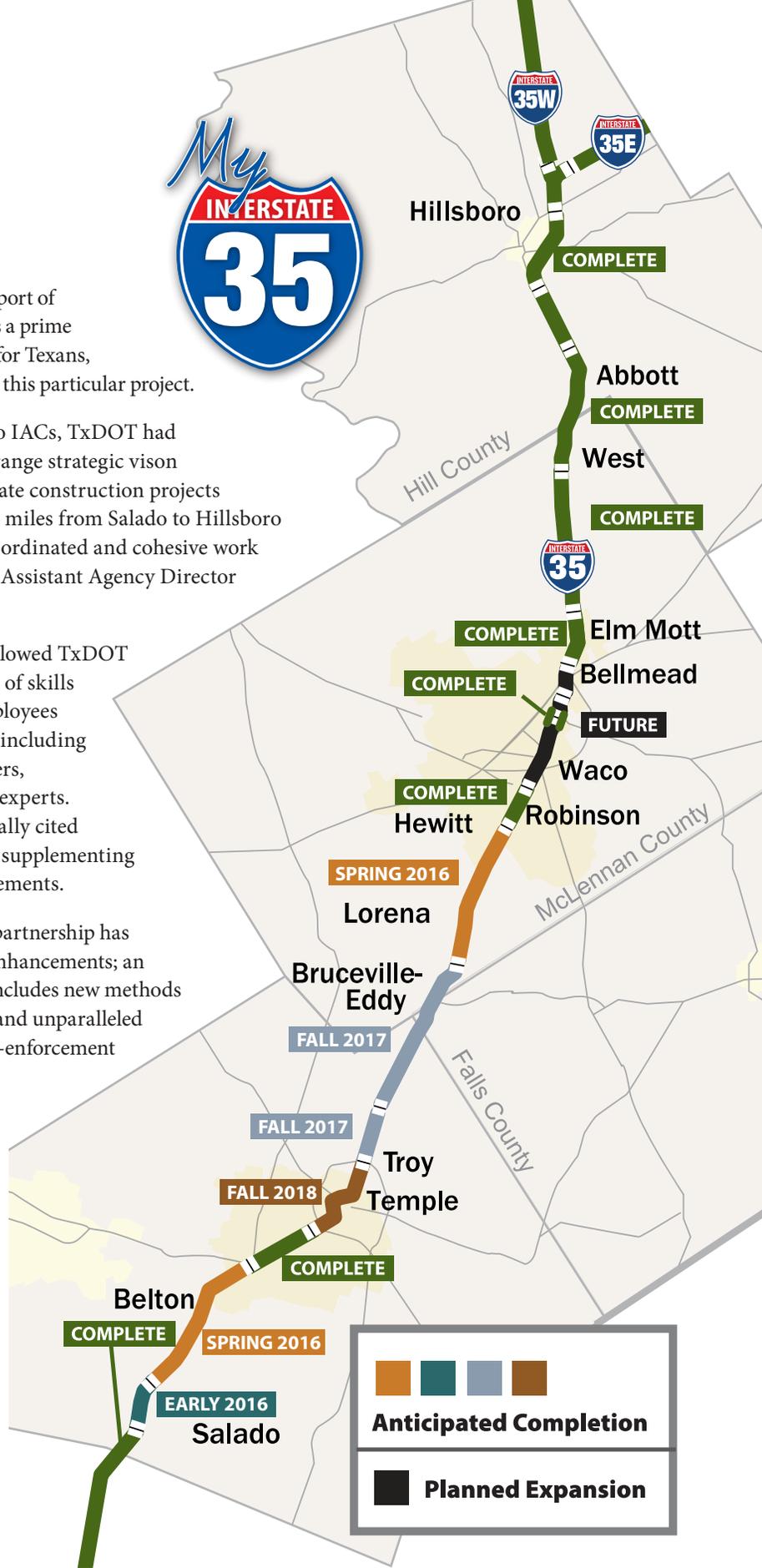
having TTI personnel and their expertise as a way of supplementing the agency's own staff as a major benefit of such agreements.

Since the I-35 project began in 2010, the TxDOT-TTI partnership has developed and deployed advanced, work zone safety enhancements; an intelligent transportation system infrastructure that includes new methods and capabilities for distributing traveler information; and unparalleled coordination between the various contractors and law-enforcement agencies involved in the effort.

"The collaboration with TTI on the I-35 corridor reconstruction program has been invaluable to the Waco District," says District Engineer Bobby Littlefield. "TTI brings technical expertise combined with a willingness to reach out to travelers and communities along the corridor to provide information and coordination, which has resulted in improved mobility and safety enhancements. It has proven to be a good partnership and provides a model for similar major corridor projects in other parts of the state." ■

"Working under two IACs, TxDOT had a remarkable, long-range strategic vision for turning 17 separate construction projects covering almost 100 miles from Salado to Hillsboro into one modern, coordinated and cohesive work zone," explains TTI Assistant Agency Director Christopher Poe.

Poe says the IACs allowed TxDOT to use a broad range of skills from numerous employees across the Institute, including professional engineers, planners and safety experts. TxDOT has specifically cited



For more information, contact **Chris Poe** at (972) 994-2206 or c-poe@tti.tamu.edu.

**NEW TxDOT traffic safety PROJECTS**

**SAFETY FIRST**

A significant portion of the projects conducted by the Center for Transportation Safety (CTS) are part of the Texas Highway Safety Performance Plan, which is funded by the National Highway Traffic Safety Administration through the Texas Department of Transportation (TxDOT). More than 300 traffic safety grants are awarded each year to state, local and non-profit agencies across Texas.

All of the projects are designed to help reduce the number of motor vehicle crashes, injuries and fatalities by addressing problem areas specific to Texas.

Here are some of the projects being conducted by CTS:

- Motorcycle Safety:** The lack of safety gear worn by motorcyclists — helmets and protective clothing — is a contributing factor on the high rate of Texas motorcycle injuries. Researchers with CTS are developing a motorcycle safety equipment use campaign devoted to providing education and awareness about helmeting and using safety gear. Researchers will also develop an outreach program after determining why some motorcyclists choose not to use safety equipment and what messages might change their minds.
- Impaired Driving:** Headed up by CTS, the Statewide Impaired Driving Task Force was formed in 2012 to provide a comprehensive strategy for preventing and reducing impaired driving behavior. Members of the task force include researchers, prosecutors, judges and law enforcement officers. Together, the members are developing an impaired driving plan for the state. The task force needs more data on impaired driving incidents and other drug court-measures program.
- Data-Driven Approaches to Crime and Traffic Safety (DACS):** All parts of a multi-year project that have law enforcement officers reduce crime rates in their community by targeting areas that have a high traffic crash rate. CTS researchers are assisting the Texas Department of Public Safety. The center is analyzing crash data on the entire roadway system to identify high-crash segments that have the highest number of crashes, who crashes are happening, and at what time of year there are.
- Observation Surveys:** CTS conducted Texas' first observational survey to track mobile device use among drivers in 2013. The survey showed that 15.2 percent of drivers were talking on their cell phones at any given time. This year's survey, which was completed in September, showed cell phone use decreased to 9 percent. However, researchers determined the use of texting drivers remained the same for both years. Since 1986, researchers with the Texas A&M Transportation Institute have conducted surveys.

**Texans behind the wheel: Driving distracted**



**ENERGY-SECTOR BRIEF**  
Barbara D. Davis, President Asset Management

**14-01: TxDOT/TTI Joint Effort to Address Roadway Damage Resulting from Energy Development**

**Background:** The Texas Department of Transportation (TxDOT) and Texas Transportation Institute (TTI) are working together to address roadway damage caused by energy development. This includes the impact of heavy machinery, increased traffic, and the need for improved road design and construction techniques. The project aims to reduce the cost of roadway damage and improve the safety and durability of roads in energy-producing areas.

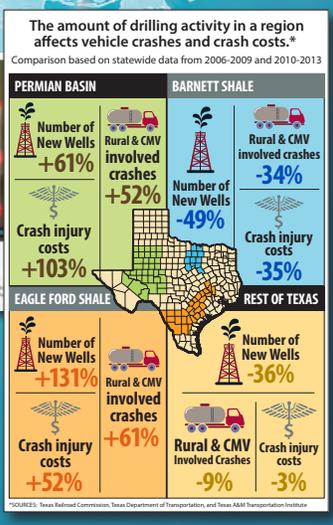
**Introduction:** The Texas Department of Transportation (TxDOT) and Texas Transportation Institute (TTI) are working together to address roadway damage caused by energy development. This includes the impact of heavy machinery, increased traffic, and the need for improved road design and construction techniques. The project aims to reduce the cost of roadway damage and improve the safety and durability of roads in energy-producing areas.

**While the energy sector is being a dynamic partner in the state's economic growth, it also presents a significant challenge to the transportation system. Heavy machinery, increased traffic, and the need for improved road design and construction techniques are all factors that contribute to roadway damage. The Texas Department of Transportation (TxDOT) and Texas Transportation Institute (TTI) are working together to address this challenge through a joint effort to improve road design and construction techniques. This includes the use of advanced materials, improved construction methods, and the implementation of new technologies. The goal is to reduce the cost of roadway damage and improve the safety and durability of roads in energy-producing areas.**

**TxDOT/TTI Joint Effort:** The Texas Department of Transportation (TxDOT) and Texas Transportation Institute (TTI) are working together to address roadway damage caused by energy development. This includes the impact of heavy machinery, increased traffic, and the need for improved road design and construction techniques. The project aims to reduce the cost of roadway damage and improve the safety and durability of roads in energy-producing areas.

**Assessing the Effectiveness of Wrong-Way Driving Countermeasures**

**Connected Transportation Is Just up the Road**



# Putting Research into Practice: Technology Transfer Supports Implementation

**A robust technology transfer (T2) program** helps get cutting-edge research into the hands of practitioners who just need to know what to do and how to do it — without the methodology behind the findings.

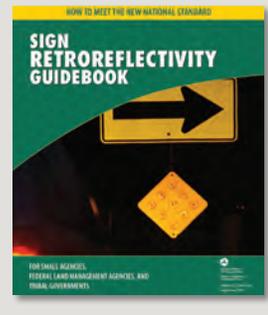
In order to improve and transform the transportation system, those making decisions about exactly what improvements are necessary must receive clear and concise information to use it efficiently. A technical research report, while a vital component of any research project, is usually not the ideal channel for informing practitioners. For example, while methodology is vitally important to future research efforts on a topic, technical findings often need translation into shorter, more active and visually appealing instructions. And these days, agencies responsible for improving our transportation system must also share their efforts with policy makers and the public through a variety of electronic media. Any T2 program must excel at both translation and distribution if it's to be successful.

**While methodology is vitally important to future research efforts on a topic, technical findings often need translation into shorter, more active and visually appealing instructions.**

The Texas A&M Transportation (TTI) Communications Program works with the Texas Department of Transportation (TxDOT) Research and Technology Implementation Office to produce user-friendly T2 products that mirror the department's federally sponsored research program findings. Creative teams of engineering experts and TTI communications professionals work together to develop a wide range of educational products, including project summaries, the research program's quarterly newsletter, executive summaries, professional industry technical articles, guidebooks, online training modules, workshop materials, project web pages, and project video summary reports hosted and maintained on TxDOT's YouTube channel.

"Our communications services can help a researcher repackage their findings in a user-friendly way that the practitioner in the field can readily understand and put into practice," says Kelly West, who manages the implementation and research support projects for TTI Communications. "Sometimes a talented artist can turn two solid pages of text into one infographic that communicates the message at a glance." ■

## TTI Developing Training for Nighttime Sign Inspectors



As part of a current T2 project for TxDOT, TTI Communications videographers, editors and artists will team with researchers

to create training materials and conduct training throughout Texas for nighttime sign inspections. The training will emphasize practices compliant with minimum sign retroreflectivity requirements as specified in the *Texas Manual on Uniform Traffic Control Devices*.

"Video demonstrations of the inspection techniques will be extremely helpful to us in the classroom portion of this training," says Paul Carlson, head of TTI's Operations and Design Division and principal investigator on the project. "Putting together the right team of experts is necessary for developing an effective implementation product." ■



For more information, contact **Kelly West** at (979) 845-8867 or [k-west@tti.tamu.edu](mailto:k-west@tti.tamu.edu).

# TTI ADVISORY COUNCIL

## *Advancing the Vision*

The Texas A&M Transportation Institute (TTI) Advisory Council is comprised of a small group of high-level transportation professionals from across Texas and every sector of the transportation world. The council, which meets annually, offers a tremendous service to the Institute by advising on transportation issues and trends and supporting TTI's research programs and initiatives. TTI profiles several council members in each issue of *Researcher*. ■



**James Crites**

Executive Vice President,  
DFW Airport,  
Dallas, Texas

*Crites*

James Crites is executive vice president of the Operations Division at Dallas/Fort Worth International Airport. In this capacity, he oversees operations, energy and transportation management, asset management, the department of public safety, planning, and environmental affairs. He previously served as director of planning and marketing research for the airport and provided leadership for facilities development and new business opportunities. He has also held several key management positions at American Airlines, Inc.

Crites serves as vice chairman of the Transportation Research Board (TRB) Executive Committee and on the TRB Standing Committee on Airfield and Airspace Capacity and Delay. He is chairman of The University of Texas at Arlington College of Engineering Advisory Board and is a member of the Radio Technical Commission for Aeronautics NextGen Advisory Committee. ■



**Thomas Lambert**

CEO, Houston METRO,  
Houston, Texas

*Lambert*

Thomas Lambert serves as president and CEO of the Metropolitan Transit Authority of Harris County (Houston METRO). In this role, he oversees the management and operations of transit services for the nation's fourth largest city. He previously served as executive vice president, as well as senior vice president, chief administrative officer and chief of police, during his 36 years with the agency. He has also served as a senior police officer with the Austin Police Department.

Lambert serves on the American Public Transportation Association board and the Transportation Policy Council of the Houston-Galveston Area Council. He is a former chairman of the Intelligent Transportation Society of America Board of Directors and the Houston TranStar Leadership Team. He also previously served on the U.S. Department of Transportation Intelligent Transportation Systems Advisory Council. ■



**Robert Spillar**

Transportation  
Director,  
City of Austin,  
Austin, Texas

*Spillar*

As transportation director for the City of Austin, Robert Spillar is responsible for the city's multimodal transportation portfolio, including rail planning, traffic engineering and operations, parking enterprise, right-of-way permitting, and special events management. He has developed numerous regional partnerships to improve transportation system conditions not just in Austin but across Central Texas through projects such as the Ben White/Loop 1 interchange, improvements to the Oak Hill "Y," and the revamping of parking operations. Other major accomplishments include launch of the city's Urban Rail Program and deployment of the Austin Strategic Mobility Plan.

Formerly, Spillar served as vice president for Parsons Brinckerhoff and director of traffic management for the City of Seattle. He has served as a scoutmaster for the Boy Scouts of America. ■

## Carlson Receives Eldon J. Yoder Memorial Award



Carlson

**T**TI Senior Research Engineer Paul Carlson was recently awarded the Transportation Research Board Eldon J. Yoder Memorial Award.

The award was presented during the 11th International Conference on Low-Volume Roads in Pittsburgh, Penn., held July 12–15. Carlson won the award for the research paper “Can Traffic Signs Be Too Bright on Low-Volume Roads?” The research investigated a concern that signs along rural highways can be so bright that they cause reduced legibility and/or glare to the point of being a safety concern.

The Eldon J. Yoder Memorial Award was established in 1987 to recognize the most outstanding paper on a topic related to low-volume roads. It is presented every four years to an author or authors whose paper appears in the *Proceedings of the International Conference on Low-Volume Roads*. ■

## TTI Employees Recognized for Patents

**A** fifth U.S. patent has been granted related to TTI’s Freight Shuttle System, a low-cost and low-emission alternative to moving freight. The patent for a Guideway Switching Mechanism was granted for a new design switch to be used in the Freight Shuttle, which is currently in the prototype stage, according to TTI Assistant



John Sharp, chancellor of The Texas A&M University System; Gene Buth, TTI senior research engineer; Akram Abu-Odeh, TTI research scientist; Roger Bligh, TTI research engineer; Lance Bullard, TTI research engineer; Michael Young, Texas A&M University president; Dean Alberson, TTI research engineer; Brett Cornwell, A&M System technology commercialization associate vice chancellor for commercialization.

Agency Director Steve Roop, who invented the mechanism. TTI’s newest patents were recognized at The Texas A&M University System Technology Commercialization Patent and Innovation Awards Luncheon May 8.

TTI’s John Mander and co-inventor Stefan Hurlbaeus were recognized for their Traffic Signal Supporting Structures and Methods device, designed to increase the lifespan of traffic signals, which are susceptible to stress fractures caused by wind. The device stabilizes traffic signals and can be part of a new system or retrofitted for existing signals. The Institute’s Gene Buth, Akram Abu-Odeh, Dean Alberson, Roger Bligh and Lance Bullard were honored for their Tension Guardrail Terminal. This all-steel tangent end terminal, the SoftStop®, is for use with W-beam guardrail systems and is MASH Test Level 3 compliant as a redirective, gating end terminal. Others recognized for their inventions included Alan Palazzolo and Randall Tucker (Texas A&M Engineering Experiment Station Mechanical Engineering) for their TTI invention, Shaft-less Energy Storage Flywheel. ■

## Stevens Honored with National Young Engineer of the Year Award

**T**TI Research Engineer Charles Stevens has been named the 2015 Young Engineer of the Year by the National Society of Professional Engineers (NSPE). Stevens accepted the award in Seattle, Wash., on July 17. According to NSPE, “the Young Engineer of the Year Award recognizes young members who have made outstanding contributions to the engineering profession and their communities during the early years of their careers.”

Stevens received civil engineering degrees from Texas A&M University and began his career as a student worker at TTI. After seven years in private practice as a consultant, Stevens returned to TTI in March 2014.

“I was excited to win the award at the state level but am still in a state of disbelief to have received the national honor,” Stevens said. “It is an honor to know that your application went up against those of the best young engineers across the country and you came out on top.” ■





## TTI Field Trip Introduces Students to Engineering Careers

**O**n May 8, about 40 sixth graders from College Station's Oakwood Intermediate School

were introduced to the world of transportation engineering at TTI as part of the College Station Independent School District's Advancement Via Individual Determination (AVID) program. AVID prepares children who may not be thinking about higher education for college, introducing them to professions they probably know little about. The program recruits kids who are "in the middle" academically and have shown an ability to succeed.

Six TTI transportation engineers presented the students with information about various parts of their programs, including crash testing, distracted driving, traffic control devices, bicycle safety and the environmental aspects of transportation.

"I want to show the students that engineering can be fun and can apply to everyday life," says TTI Research Engineer Melisa Finley, who's organized AVID field trips to TTI since 2010. "You can't develop a passion for something unless you know something about it." ■

## Henk Receives NSC's 2015 Teen Driving Safety Leadership Award



Henk

**T**he National Safety Council (NSC) recently awarded Russell Henk, program manager for TTI's Youth Transportation Safety Program, the organization's 2015 Teen Driving Safety Leadership Award. Henk won the award for his "long-term commitment to reducing teen crashes through developing, nurturing and growing" Teens in the Driver Seat® (TDS), the TTI program Henk founded more than a decade ago. Each year, NSC bestows awards on individuals and organizations that have proven they're making a real difference in improving driving habits among teens.

"We know those efforts save lives and prevent injuries on our nation's roadways," says Kelly Nantel, vice president of communications and advocacy for NSC. "The research component of TDS — that is, being able to measure its effectiveness with teens over time — was vitally important to Mr. Henk's receiving this award. That kind of measurement is imperative in our ongoing efforts to curb teen driver crashes and save lives."

"Receiving this award is both humbling and thrilling," says Henk. "It's a great tribute that I must share with the entire TDS team, with whom I am so blessed to work. Validation of our collective accomplishments by such a well-respected organization on a national stage is pretty incredible, but knowing we've saved lives is the most rewarding aspect of all." ■

## Traffic Safety Conference Examines New Ways to Save Lives

**T**he 2015 Traffic Safety Conference — sponsored by TTI and the Texas Department of Transportation June 8–10 in Corpus Christi — brought together experts, stakeholders and transportation professionals for the seventh year in a row to highlight the need for increased awareness regarding transportation safety.

This year's conference included 55 speakers from 20 organizations, and breakout sessions addressed numerous issues, including technology and its role in transportation safety, driver behaviors, truck and motorcycle safety, impaired driving, protection for vulnerable users (e.g., older drivers, pedestrians and children), and current efforts to link crash and trauma data to improve safety.

"This is where great minds with a passion for safety come to share ideas and experiences, all for the goal of making Texans safer," said TTI Executive Associate Director Bill Stockton as he welcomed attendees to the conference. Stockton moderated the opening session and said the range of subjects at this year's conference was broader than ever because the expertise and disciplines of the participants were broader than ever.

"Our goal should be to leave here with fresh ideas and be better able to accomplish our individual missions," Stockton told participants. ■

*For more information about TTI News, contact Rick Davenport at (979) 862-3763 or r-davenport@tti.tamu.edu.*

TEXAS A&M TRANSPORTATION INSTITUTE  
**PUBLICATIONS**

A full catalog of TTI publications and other products is online at <http://tti.tamu.edu/> publications. You can find the publications by searching for either the title or publication number listed here. Most of these publications are available as free downloads in portable document format (PDF).

Printed, bound versions of these reports are also available through the URL above.

**RESEARCH VIDEOS**

Access the research topics listed below via the URLs shown.

*TTI Creates New Methodology for Multimodal Assessment:*

<https://vimeo.com/134130572>

*Researching Critical Solutions to Critical Border Issues:*

<https://vimeo.com/130477644>

*TTI Enhances Its Proving Ground with New Research Facilities:*

<https://vimeo.com/131557369>

*Assessing the Effectiveness of Wrong-Way Driving Countermeasures:*

<https://vimeo.com/127093778>

*Connected Cars, Smarter Roads, Safer Texas:*

<https://vimeo.com/97270483>

*TTI's Air Quality Program:*

<https://vimeo.com/123978706>



**TECHNICAL REPORTS**

*Crash Test and MASH TL-3 Evaluation of the TxDOT Short Radius Guardrail*, by Akram Abu-Odeh, **0-6711-1**, April 14, 2015.

*Evaluation of Design and Construction Issues of Thin HMA Overlays*, by Bryan Wilson, **0-6742-1**, April 16, 2015.

*Evaluation of Existing SmartPhone Applications and Data Needs for Travel Survey*, by Yan Huang, **0-6767-1**, May 27, 2015.

*Improved Business Driveway Delineation in Urban Work Zones*, by LuAnn Theiss, **0-6781-1**, April 22, 2015.

*Improved Trip Generation Data for Texas Using Workplace and Special Generator Surveys*, by Ed Hard, **0-6760-1**, May 18, 2015.

*Managing the TDM Process: Developing MPO Institutional Capacity — Technical Report*, by Karen Lorenzini, **0-6691-1**, April 7, 2015.

*Project Consistency with Transportation Plans and Air Quality Conformity Workshops: Technical Report*, by Reza Farzaneh, **5-6758-01-1**, April 29, 2015.

*Reducing Lane and Shoulder Width to Permit an Additional Lane on a Freeway: Technical Report*, by Karen Dixon, **0-6811-1**, May 21, 2015.

*Spread Prestressed Concrete Slab Beam Bridges*, by Mary Beth Hueste, **0-6722-1**, May 8, 2015.

*Structural Assessment of "D" Regions Affected by Premature Concrete Deterioration: Technical Report*, by John Mander, **0-5997-2**, April 10, 2015.

**PROJECT SUMMARY REPORTS AND PRODUCTS**

*Binder Utilization Maps*, by Amy Epps Martin, **5-6616-01-P5**, April 28, 2015.

*Draft Specifications for Micro-milling*, by Tom Scullion, **0-6742-P2**, April 16, 2015.

*Equipment Replacement/Retention Decision Making*, by Fan Wei, **0-6693-S**, September 4, 2015.

*Guidelines for Analyzing the Capacity of D-Regions with Premature Concrete Deterioration of ASR/DEF*, by John Mander, **0-5997-P2**, April 22, 2015.

*Improved Nighttime Work Zone Channelization in Confined Urban Projects*, by LuAnn Theiss, **0-6781-S**, April 10, 2015.

*Improved Trip Generation Data for Texas Using Workplace and Special Generator Surveys*, by Ed Hard, **0-6760-S**, April 21, 2015.

*Improved Trip Generation Data for Texas Using Workplace and Special Generator Surveys: Workshop Materials*, by Ed Hard, **0-6760-P2**, May 4, 2015.

*Project Consistency with Transportation Plans and Air Quality Conformity Workshops: Materials*, by Reza Farzaneh, **5-6758-01-P5**, April 8, 2015.

*Reducing Lane and Shoulder Width to Permit an Additional Lane on a Freeway*, by Karen Dixon, **0-6811-S**, May 22, 2015.

*Seal Coat Binder Performance Specifications: Technical Briefing Presentation, Task 1*, by Amy Epps Martin, **5-6616-01-P1**, April 28, 2015.

*Short Radius MASH TL-3 Guardrail Treatment*, by Akram Abu-Odeh, **0-6711-S**, April 7, 2015.

*SPG Specification for 2015 Implementation*, by Amy Epps Martin, **5-6616-01-P4**, April 28, 2015.

*Spread Prestressed Concrete Slab Beam Bridges*, by Mary Beth Hueste, **0-6722-S**, April 7, 2015.

*Texas Trip Generation Manual*, by Ed Hard, **0-6760-P1**, May 4, 2015.

*Thin Overlay Guidelines: Project Selection, Design, and Construction*, by John Mander, **0-6742-P1**, April 22, 2015.