Center for Transportation Research

FY 2009 - FY 2010 Report

Access ladder to a Wirtgen Rotomilling machine, which is used to grind old asphalt layers from pavement before resurfacing. Ground pavement is then reprocessed and recycled into Recycled Asphalt Pavement (RAP)

The Center for Transportation Research is a nationally recognized research institution, focusing on transportation research, education, and public service.

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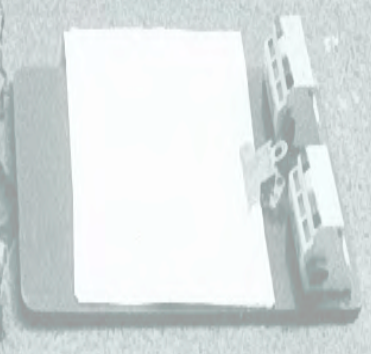
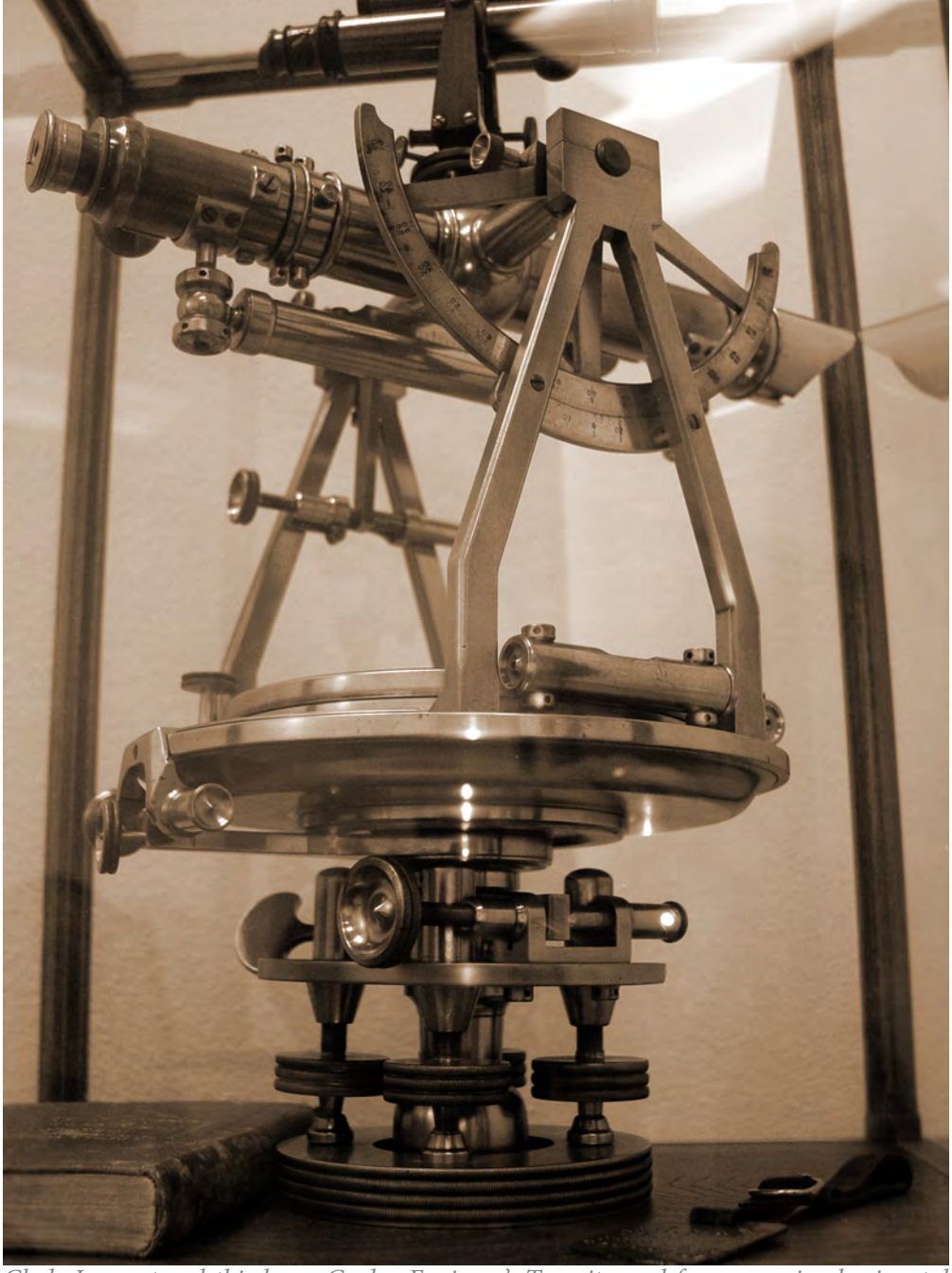




Clyde Lee restored this brass Gurley Engineer's Transit, used for measuring horizontal and vertical angles, and donated it to the Cockrell School of Engineering in 2003 to honor the centennial of the founding of the Department of Engineering at The University of Texas at Austin.

Since its inception, the Center for Transportation Research at The University of Texas at Austin has evolved into one of the nation's leading university-based transportation research facilities.

Directors' Report

A ROBUST TRANSPORTATION INFRASTRUCTURE lies at the heart of our state economy and our quality of life. The past two years have been crucial years for Texas transportation and its funding. The years that lie ahead present challenges. We must continue to serve the traveling public, working efficiently and with innovation to best utilize the funds that support transportation in our state.

Our purpose, first and foremost, is to foster the education of future transportation professionals. This is why the relationship between the center, the faculty, and the students is so important. This relationship is the real benefit of an academic research center. Technology transfer is built into the center's function, as student researchers carry the latest technology, applied to real-world transportation issues, directly into the profession. The successful blending of students, faculty, and professional researchers creates a dynamic environment with many research opportunities.

Transportation research is a team effort. Faculty, graduate students, and professional researchers from institutions as various as UT Arlington, Texas Transportation Institute, UT Tyler, UT El Paso, UT San Antonio, Texas Tech University, and the professionals at the Texas Department of Transportation (TxDOT) work together to guide Texas transportation into the future.

The center's relationship to TxDOT has matured greatly over the last 48 years. It began as a remote group that provided solutions to problems. But CTR now works much more directly with TxDOT providing real-time solutions. Historically, the center has done much work in the areas of bridges, pavement, and materials. In recent years, CTR has undertaken significant studies that support recognition of the critical role that freight transport plays in the national economy.

In the past, engineering studies were often multi-year in scope. In recent years, CTR has shown that it can be a resource to TxDOT senior management by performing a variety of strategic work that is delivered in studies of a year or less. This is evident in the 2030 I and 2030 II strategic initiatives and as we work in partnership on TxDOT's new Strategic Research Program. This program will allow us to look into the future to develop solutions that will meet future transportation challenges.

September 2008 brought a new dean to the Cockrell School of Engineering. Dr. Ben Streetman, a rigorous educator, administrator, and visionary leader, passed the torch to Dr. Gregory L. Fenves. Dean Fenves arrived at the Cockrell School from the University of California, Berkeley, where he had more than 20 years of experience. An internationally recognized structural engineer, Dean Fenves has taken a strong interest in our transportation research program and has attended our yearly symposiums to speak to our sponsors and encourage our mission.

New faculty and professional researchers working with CTR include Dan Seedah, Alejandra Cruz-Ross, and Mike Murphy, Jen Duthie, Soojun Ha, Boohyun Nam, Raissa Ferron, Fernanda Leite, and Talia McCray.

The center's move to 1616 Guadalupe in April 2010 has been a functional improvement. CTR is now within walking distance to both the Texas Capital and to TxDOT's main offices, yet still remains within walking distance to the main UT campus. We have expanded conference room facilities, with high-tech conference equipment. This expansion facilitates large meetings, where sponsors and researchers can come together for planning and updates on current projects. This relocation has been of great strategic benefit. The center is now larger, much more central, able to host visiting scholars and more students, plus house other research groups that bring synergy to our program.

In funding, CTR has continued to prosper. Most recent data covering FY2009 and FY2010 shows that, in FY2009, CTR recorded total awards of $ 11.4M. In FY2010, total funding rose to $13.3M.

The center and the University of Texas must protect their educational cooperative research program, which benefits the taxpayer in a variety of ways: lower costs, better jobs, better use of resources, better quality of life, improved safety, and better use of materials. The transportation professionals that come to train at UT Austin and stay to work in Texas provide the future traveling public with efficient and effective applications of the latest technology. TxDOT research projects bring the best of Texas together to conduct research that responds to society's changing transportation needs.

A close up of a spray-bar nozzle on a TxDOT skid trailer. Water is sprayed from the nozzle in front of the tire. The tire is then locked by the operator and the skid resistance, which is due to the pavement surface texture, is measured.

The last two years at CTR have been busy. The center has moved to a larger and more central location and the program has been enriched with the addition of new transportation faculty and staff.

About the Center

The Center for Transportation Research

is a nationally recognized research institution focusing on transportation research, education, and public service. Established in 1963 as the Center for Highway Research, its current and ongoing projects address virtually all aspects of transportation.

Its current mission remains to:

- Conduct industry-leading transportation research
- Provide educational opportunities for students
- Serve the public through research that responds to the transportation needs of Texas travelers

CTR administered 106 research projects and interagency contracts in FY 2009 and 111 research projects and interagency contracts in FY 2010, with a budget each year that exceeded $13 million. Approximately 80 faculty and 20 professional researchers performed research studies at CTR. Approximately 117 graduate and undergraduate students participated in the university transportation program.

CTR researchers work in collaboration with TxDOT, which remains CTR's major research partner. In addition to TxDOT, CTR works with other sponsors including the US-DOT, National Science Foundation (NSF), North Central Texas Council of Governments (NTCCOG), Capital Area Metropolitan Planning Organization (CAMPO), Capital Metropolitan Transit Authority, and the City of Austin.

CTR's strength is in the synergy that is created by students, faculty, and professional researchers. Much of the success of the program is due to the efforts of its outstanding graduate students. Guided by full-time faculty members, these University of Texas students, seeking masters or doctoral degrees, perform much of the hands-on research.

In addition to its own staff researchers, the center taps an extraordinary reservoir of expertise in multiple disciplines by continuing to collaborate with affiliated research centers, including Ferguson Structural Engineering Laboratory, the International Center for Aggregates Research, the Center for Electromechanics, the Construction Industry Institute, the Construction Materials Research Group, and the Center for Research in Water Resources.

Collaboration with Texas A&M University and other University of Texas component institutions is also an important part of the CTR program. Faculty, graduate students, and professional researchers also work with other researchers from a variety of educational institutions that participate in the cooperative research program.

These positive, cooperative relationships benefit the state and beyond, providing quality transportation for Texas travelers and, through technology transfer, to transportation users throughout the world.

Faculty-Contributed Effort

CTR research is generally led by faculty whose academic salaries cover nine of each twelve months. Although, by job description, faculty often spend approximately half of their nine-month academic appointment supervising research, they cannot charge this time to research contracts. This means that faculty researchers typically contribute approximately half-time each nine-month academic year to the research program. If they spend three summer months conducting sponsored research, they actually devote about 62% of their annual effort to research. The contributed time is a significant benefit to research sponsors and is documented through a University Effort Certification System.

Center News

2030 Planning Meetings

CTR participated in the original TxDOT 2030 Needs Assessment, an assessment of pavement maintenance needs for TxDOT. In 2010, the team re-assembled to forecast the effects of future funding scenarios. Dr. C. Michael Walton is the leader-coordinator of the executive advisory committee. The CTR team is developing assessments of all pavement maintenance funding scenarios developed by the executive advisory committee. Meetings were held at the new CTR location in downtown Austin. The first document, *Texas Transportation Needs Report*, was published in 2009. The first report identified the gaps between the needs and available revenue for the Texas highway system. The second report, *Rough Ride Ahead*, has been sent for committee review. This report contains recommendations and possible solutions. The independent committee, a group of experienced and respected business leaders, is to provide an independent, authoritative assessment of the state's transportation infrastructure and mobility needs. Their charge is to forecast the needs of the four elements of the Texas transportation system—pavements, bridges, urban mobility, and rural connectivity—and analyze potential sources of revenues and the economic effects of under-investing in the system.

Peer State Review

At TxDOT's request, in 2010 a peer review was conducted of the TxDOT Maintenance Program and Maintenance Practices in order to assess these practices and identify potential areas for improvement. State DOT experts who attended the event included Steve Takigawa, Roy Rissky, Eric Pitts, Jim Carney, Jennifer Brandenburg, and David Bierschbach from California, Kansas, Georgia, Missouri, North Carolina, and Washington, respectively. The event was organized by Mike Murphy, Jorge Prozzi, Yetkin Yildirim, and Zhanmin Zhang of UT/CTR. The focus of the project was two workshops, one of which was conducted at CTR and the other at an Austin District Area Office. Agenda items included the maintenance planning process, how maintenance practices are conducted at the state and local levels, the four-year pavement management plan development, maintenance condition measurement and reporting, the TxDOT Pavement Management Information System, and funding allocations at state and local levels. The final event was a Road Rally that involved field evaluation by the peer states and TxDOT participants of pavement, roadside, and traffic marking maintenance conditions on more than 35 roadway sections. After each presentation or event, participants shared observations, areas for improvement, and recommendations. Lowell Choate, P.E., Maintenance Engineer, Austin District, and Terry McCoy, P.E., Area Engineer, North Austin Area Office, also coordinated a tour of the maintenance facilities and operations at the Area Office. The tour included a discussion of maintenance staffing and training requirements at TxDOT, the Area Office Lab facilities, and a display and demonstration of maintenance equipment including a roto-milling machine, bucket truck, chip spreader, and sand distributors. In addition, Jeff Seiders and Philip Hempel of the TxDOT Construction Division organized a pavement measurement equipment demonstration including a profiler-rut-bar van, skid system, ground penetrating radar van, and a falling weight deflectometer. The peer reviewers and participants provided feedback at each stage of the tour.

Metropolitan District Engineers

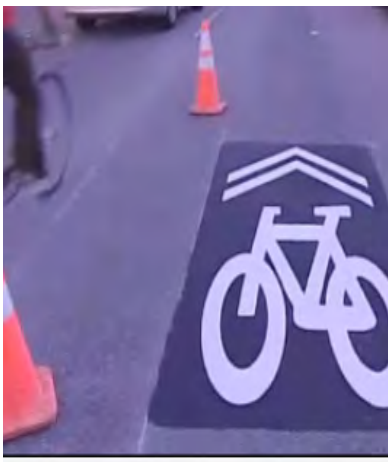
CTR hosted the 2010 meeting of the TxDOT Metropolitan District Engineers. This sub-group of TxDOT District Engineers (D.E.s) meets periodically to share their views of urban transport issues. CTR researchers presented ideas developed through five recent research efforts and interacted with the D.E.s and their colleagues.

Center News

Clyde Lee receives Pioneer Award The Transportation Research Board's "Traffic Simulation Pioneer Award" was presented January 2010 by committee chair Dr. Tom Rioux to Dr. Clyde Lee, Professor Emeritus of The University of Texas at Austin, for his pioneering efforts in traffic simulation starting with the TEXAS Model for Intersection Traffic in 1968. The award was presented at CTR. Dr. Clyde E. Lee began his faculty career at The University of Texas at Austin on February 9, 1959, as an Assistant Professor. He advanced to Associate Professor in August 1963, was appointed Professor in September 1967, and retired February 15, 1999. Dr. Lee was the founder of the Center for Highway Research in 1963 and served as the center's director until 1980, when it became the Center for Transportation Research (CTR). Lee's research activities include pioneering work in the development and application of highway weigh-in-motion systems, simulation of traffic control and vehicular flow at intersections, automated traffic data collection and analysis, and traffic monitoring for pavement and bridge research. In 1966, he was awarded United States Patent No. 32665584 entitled "Vehicle Weighing Scale with Overlapped Load Bearing Plates."

Sharrows Bike Project Picked for Innovations Award

The Women in Transportation Seminar awarded the 2009 Heart of Texas Chapter Innovative Transportation Solution Award and a 2010 WTS International Award to a bicycle safety study conducted by CTR in partnership with the City of Austin. The Shared Lane Bicycle study made use of thirteen 3x2 ft "sharrow" symbols of a bicycle in traffic lanes. Randy B. Machemehl, Director of CTR, was the principal investigator. Annick Beaudet, the Bicycle and Pedestrian Program Project Manager for the City of Austin's Department of Public Works, was the project manager.



The USDOT chose Austin as one of six cities across the country to try out the sharrows to determine whether drivers and cyclists can figure out on their own how they work. The Austin Public Works Department installed the sharrow symbols on selected roadways. City of Austin and CTR personnel installed video cameras in strategic areas around the sharrows to collect video on the sharrows' effectiveness and to study how the sharrows work, as part of the funded study for improving bicycle safety in Austin.

CTR Executive Advisory Committee

In 1999, the Center for Transportation Research Evaluation Committee's report recommended the creation of an advisory panel or committee of faculty members. After careful review of this recommendation, a CTR/Civil, Architectural & Environmental Engineering Executive Advisory Committee was established in the fall of 2000. The CTR/Civil, Architectural & Environmental Engineering Executive Advisory Committee meets regularly to assist the Director in maintaining an appropriate research strategy and administrative policies for the Center for Transportation Research. The current advisory board members are Clyde Lee, Kenneth Stokoe, David Maidment, Oguzhan Bayrak, David Fowler, Wayne Crew, Spyros Kinnas, and Sharon Wood. Agenda items for FY 2009 included GRA salary trends and impacts and non-faculty professional researcher and title progressions. Agenda items for FY 2010 included cost sharing, donated time, effort reporting, and strategic planning.

Center News

Road Hand Award

In the early days of the 20th century, anyone who helped build roads was called a road hand. Today's "Road Hands" are citizens who have given their time, energy, and vision to help improve transportation throughout the state. In bestowing this award, TxDOT recognizes its friends who have helped build one of the best transportation systems in the world. Professor C. Michael Walton is recognized for his involvement in shaping the state's future transportation plans. According to Amadeo Saenz, Jr., TxDOT Executive Director, Walton has played a decisive role in helping determine the fiscal requirements for the state's transportation goals by serving as chair of the agency's 2030 Committee. The 2030 report provides a comprehensive analysis of estimated needs, the anticipated costs to realize those needs, and the resulting benefits of highway construction and maintenance on urban and rural mobility and safety. The names of Road Hand award recipients are inscribed on the Road Hand Hall of Honor plaque, which hangs prominently in the foyer of the historic Dewitt C. Green Highway Building in Austin.

Engineering Education Research Center

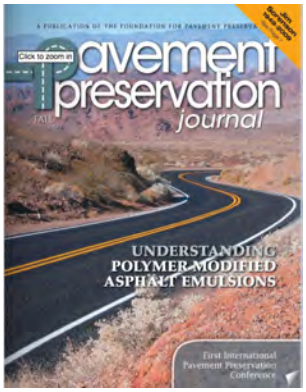
The Engineering Education Research Center is a joint collaboration between the UT Cockrell School of Engineering and the Cosmos Foundation. The Cosmos Foundation operates Harmony Science Academy (HSA), a tax-exempt, non-profit organization with 33 publicly funded charter schools in the State of Texas. Harmony Science Academy promotes academic excellence with special emphasis on achievement in math, science and college preparation. EERC was established in the belief that the programs may be mutually strengthened through affiliation and cooperation with each other. The 2010 I-SWEEEP (International Sustainable World Energy, Engineering, and Environment) Project Olympiad, a science fair for high school students, brought 470 top projects from 70 countries and 43 U.S. states to Houston, Texas, and students involved in EERC participated in the competition.

Southwest University Transportation Center (SWUTC) and Advanced Institute (AI)

Established in 1987, SWUTC is one of fourteen competitively selected centers of excellence established by the USDOT. CTR represents Region Six of the parent University Transportation Centers (UTC) program, a major national initiative designed to foster university-based, long-term research of all transportation modes, and to attract the nation's best students to study transportation. The program oversight is shared by the SWUTC consortium: The University of Texas at Austin, Texas A&M University, and Texas Southern University. SWUTC has conducted studies in sustainable transportation for mobility and economic strength, addressing NAFTA and Texas–Mexico border crossing issues. Its educational component, the Advanced Institute (AI) continues its mission to increase the number, quality, and diversity of professionals entering the transportation sector. In FY 2010, 20 graduate researchers participated in the AI program and received $200,000 in funding.

Texas Pavement Preservation Center

The center recently organized workshops throughout Texas on pavement preservation strategies. These workshops were organized jointly with the Rubber Pavements Association, Colas Solutions Inc., Foundation for Pavement Preservation, and TxDOT. The center also has been teaching its new micro-surfacing course throughout the state and has been contributing articles on Texas's experience in the area of pavement preservation to the *Pavement Preservation Journal*. Dr. Yetkin Yildirim serves as the technical editor for the research papers published in the journal.



Researcher Honors

Investment in transportation research has substantial payoffs for the traveling public. Every dollar invested yields $22 in direct dividends to Texas. CTR researchers have made substantial contributions and their efforts are recognized by their peers across the nation.

Researcher	Award
Kevin Folliard, Maria Juenger	*2010 Wason Medal* for Materials Research for a paper co-authored with three UT alumni (Dr. Kyle Riding, Assistant Professor at Kansas State University; Dr. Anton Schindler, Associate Professor at Auburn University; Dr. Jonathan Poole, CTL Group)
Richard Klingner	*2010 Wilbur C. Schoeller Award* from the Structural Engineers Association of Texas. Dr. Klingner was recognized for his teaching, research, and leadership of technical committees within ACI, TMS, and ASTM.
Randy Machemehl	*Innovative Projects Solutions Award* from Women in Transportation Seminar (WTS) and a 2010 WTS International Award for a bicycle safety study conducted by CTR in partnership with the City of Austin.
Kara Kockelman	*2010 Walter L. Huber Civil Engineering Research Prize* from the American Society of Civil Engineers (ASCE)
Chandra Bhat	*2010 Most Outstanding Faculty Award* for Civil Engineering from the Student Engineering Council
Ken Stokoe	*2010 H. Bolton Seed Medal* from the Geo-Institute of ASCE
Todd Helwig, Joe Yura	*2010 ASCE Moisseiff Award*
Ellen Rathje, Ken Stokoe	*2010 Hogentogler Award*
Chandra Bhat	*2010 S.S. Steinberg Award* from the Research and Education Division of the American Road & Transportation Builders Association
Kara Kockelman, Cara Wang	*2009 Young Researcher Award* from the Transportation Research Board's Committee on Statistical Methods (ABJ80)
Clyde Lee	*2010 Traffic Simulation Pioneer Award* from the Transportation Research Board Joint Subcommittee on Traffic Simulation

Researcher	Award
C. Michael Walton	*Road Hand Award* from TxDOT
Carl Haas (with Benjamin McKeever, Rich Greer, and Professor José Weissman)	*2009 D. Grant Mickle Award* from the National Research Council's Transportation Research Board
Maria Juenger	*2009 Walter P. Moore, Jr. Faculty Achievement Award* from the American Concrete Institute (ACI)
C. Michael Walton	Selected as chairman of the TxDOT's "2030 Committee" in 2009
James Jirsa	American Concrete Institute 2009 *Honorary Member* for "outstanding accomplishments in the research areas of design, behavior, and durability of concrete structures"
Lance Manuel (with student Patrick Ragan)	*2009 Best Journal Paper Award* from the American Society of Mechanical Engineer's Technical Committee on Wind Energy
Chandra Bhat	*2008 CCTexITE Student Chapter Advisor Award* from the Texas Institute of Transportation Engineers
Kara Kockelman	*2008 Woman of the Year* from the Texas Chapter of the WTS
Randy Machemehl	*2008 Wilbur S. Smith Award* from Transportation and Development Institute of the ASCE
Jorge Zornberg	*2008 Achievement Award* from the Mexican Chapter of the International Geosynthetics Society
Chandra Bhat	Received a 2008 Jefferson Science Fellowship

Library Report

The CTR Library is the official depository for the TxDOT research program. Publications generated by TxDOT-funded research at research centers statewide are available at the CTR Library. The library also acts as an archive for TxDOT materials.

Library at a Glance: FY 2010

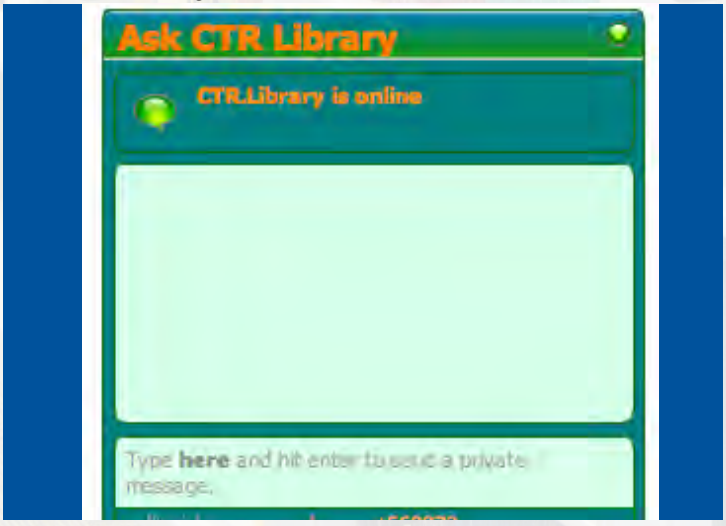
- Number of patron reference requests fulfilled: approximately 1,025 patrons were served.
- Number of items cataloged: nearly 750 new items were added to the web catalog.
- Website enhancements: more than 1,275 PDFs of TxDOT materials were added to the online catalog.

Library Moved to UTA Building

In April 2010, the CTR Library moved to the new location in the UTA Building. Library staff were responsible for preparing the library for the move by evaluating holdings and reorganizing the collection, as well as preparing a layout and floor plan for the new space. The goal was to create a more open and collaborative workspace. The library staff also established a library information center to display additional resources including TxDOT research, TRB materials, and state DOT announcements. Following the move, library outreach materials such as display materials and brochures were updated to reflect current information and library focus.

Developing Library Resources

The principal development in library resources has been in the area of digitization of CTR Library materials. Several projects were initiated. The staff worked closely with the Research and Technology Implementation Office of TxDOT to add more than 1,000 new PDFs in a retro-digitization project to include all TxDOT research. The library also launched an effort to digitize items in the TxDOT archive, making this unique collection available electronically through the online catalog. The archive section contains almost 1,300 items, and more than 300 documents in this project have been digitized.



The CTR Library has live chat support for patrons.

Developing Library Web Initiatives

Many enhancements have been added to the CTR Library web pages. Circulation functionality has been added to the catalog, so patrons are able to see if materials are currently available. Maps, architectural drawings, and periodical collections have been added to the catalog holdings. The *Research Digest*, a monthly newsletter that alerts TxDOT engineers to new publications in the CTR Library, was enhanced to include a table of contents so that patrons may quickly find resources. In July 2010, Kevyn Barnes was hired as a Library Assistant II. She has added several enhancements, including reorganizing the Library homepage and the FAQ page, as well as adding an online chat reference service via Meebo Messenger. She redesigned the catalog query page, results list, and detail pages for catalog items to improve usability and aesthetic appeal. Finally, several cataloging projects have been initiated to improve the functionality of catalog searches and to improve access to online materials.

Library Report

Developing Resource Networks

The Manager of Library Services, Louise Rosenzweig, has continued her involvement with the Western Transportation Knowledge Network (WTKN). This year, WTKN focused on data needs. Louise also participated as a member of the WTKN Strategic Plan Committee to develop strategic goals and objectives. Goals of the WTKN include sharing library resources and enabling participants to develop common principles, standards, and cooperative agreements. WTKN members are working to improve the transfer of information among member organizations. Louise will act as Chair of the WTKN in 2011.

Additionally, she is a member of the National Transportation Knowledge Network Digitization Committee, which works to promote digitization projects throughout the transportation community to make transportation resources available electronically to patrons.

Library staff continue to attend webinars, including the Transportation Librarians Roundtable (TLR), a monthly web conference series. The TLR's purpose is to provide transportation librarians with opportunities to learn more about issues of mutual concern and interest and also to have a new means of regular communication among members of that community. Staff have also attended webinars investigating new software and implementation of RDA (Resource, Description, and Access), a unified catalog standard designed for the digital world and for an expanding universe of metadata users.

Conference Participation

In April 2010, Louise attended an Arizona DOT teleconference, *Moving a Library: Best Practices,* where she shared experiences in planning and executing a building move. In June 2010, Louise attended the Special Libraries Association annual conference in New Orleans. She represented TxDOT and the CTR Library at several meetings of the Government Transportation Research Information Committee, Transportation Division meetings, WTKN meetings, and library related workshops.

On October 20-21, 2010, Louise and Kevyn represented CTR at the Associated General Contractors Trade Show in Austin. They staffed a booth highlighting research from the Center and they met other TxDOT, RTI, and TTI staff at the event. CTR reports, library brochures, and magnets, as well as university promotional materials, were available for patrons.

The CTR Library has worked with TxDOT to digitize items in the TxDOT archive, making this unique collection available electronically through the online catalog.

Initiatives FY 2011

In the coming year, the CTR Library staff will focus on patron-user needs by continuing digitization efforts in the collection. The online catalog currently has nearly 8,000 full-text links. The staff will also work on catalog usability and will continue to investigate better functionality in the current software, while keeping abreast of recent developments in library software options. Kevyn will continue her work in implementing the RDA standards in the catalog.

Louise will act as the field supervisor for library graduate assistant Lara Hanneman's Capstone project: *Creation of the Center for Transportation Research Library Interactive Online Library Diagram*. This project will provide additional user enhancements to the CTR library web presence. Library graduate assistant Courtney Jeffries will create online tutorials to aid library patrons.

The staff will also focus on outreach and efforts to grow the archive section by encouraging departing TxDOT staff to donate their materials to the library, so the materials may be cataloged and become part of the library's permanent collection.

Symposium Highlights

2009 Symposium

CTR hosted its 2009 symposium in April at the J. J. Pickle Research Center campus. The theme was *Back to Basics.* Speakers addressed important research and topics facing the transportation industry, including 2030 pavement and bridge needs, TxDOT revenue and expenditure trends, vehicle operation costs, and concrete durability.

Gregory L. Fenves, Ph.D., the Dean of the Cockrell School of Engineering, welcomed the participants, and the Don Shelby award was awarded by Don Shelby's daughter, Lilas Kinch. The award went to Tammy Sims as the 2009 outstanding TxDOT Project Director. Ms. Sims was the Project Director for IPR 5-9035-01, *Pilot Implementation of a GIS System for PMIS.*

Randy B. Machemehl, CTR Director, and John Ekerdt, Associate Dean for Research at the Cockrell School of Engineering

CTR Director Randy B. Machemehl, Cockrell School of Engineering Dean Gregory L. Fenves, and TxDOT RTI Director Rick Collins.

2009 Symposium Speakers and Topics

2030/Pavement Needs
Mike Murphy, Ph.D., P.E.,
Center for Transportation Research

2030/Bridge Needs
Karl Frank, Ph.D., P.E.,
Ferguson Structural Engineering Laboratory

TxDOT Revenue/Expenditure Trends
Khali Persad, Ph.D., P.E.,
Center for Transportation Research

Alternative Fuel
Ron Matthews, Ph.D., Mechanical Engineering

Stormwater Quality
Michael Barrett, Ph.D., P.E., Center for Research in Water Resources

Concrete Durability
Kevin Folliard, Ph.D.,
Construction Materials Research Group

Symposium Highlights

2010 Symposium

CTR hosted its 2010 symposium in April 7 at the J.J. Pickle Campus. The theme was *Ideas @ Work*. Speaker topics focused on innovation, new ideas, better ways of doing things, and positive approaches to problems. The keynote speaker was Kyle Schneweis, Chief of Governmental Affairs for the Kansas Department of Transportation. In 2006 he managed KDOT's Long Range Plan. In 2008, he staffed Governor Sebelius's T-LINK Task Force, which studied the need to increase state transportation revenues. Schneweis spoke about these experiences and about the Kansas DOT Road Rally, where Kansas stakeholders traveled the roads and rated them for performance.

Dean Fenves welcomed the participants. Don Shelby presented the Mac Shelby Award to Brian Merrill as the year's outstanding TxDOT Project Director for Projects 0-4562, *Corrosion Resistance of Grouted Post-Tensioning Systems*, and 0-1405, *Durability Design of Post-Tensioning Sub-Structure Elements.*

UT Austin professor Jorge Prozzi demonstrates a research project to RTI Director Rick Collins and other symposium participants.

2010 Symposium Speakers and Topics

Kansas DOT Road Rally—Bringing the Public into the Performance Measure Process
Mike Murphy, Ph.D., P.E., Research Fellow, CTR, and Kyle Schneweis, P.E., Chief of Governmental Affairs, Kansas DOT

TxDOT's Structural Engineering Research Program at Ferguson Laboratory
Oguzhan Bayrak, Ph.D., Director, FSEL, Associate Professor, Cockrell School of Engineering

Multi-scale Approach to Evaluate Fatigue Cracking in New Generation Asphalt Mixtures
Amit Bhasin, Ph.D., Assistant Professor, Cockrell School of Engineering

History and New Developments of the Rolling Dynamic Deflectometer (RDD)
Kenneth H. Stokoe, Ph.D., P.E., Professor, Cockrell School of Engineering

Identification of Factors that Impact the Right-of-Way Acquisitions Scheduling
Carlos Caldas, Ph.D., Associate Professor, Cockrell School of Engineering

Spreader hoppers for salt and/or sand, which are mounted on the back of a dump truck and filled with materials. The mechanism at the bottom spreads the sand on the roadway during icy or snowy weather. These can be used to spread sand or chemicals on pavement surfaces that are "bleeding," a term used to describe when asphalt is oozing to the surface of the pavement.

As an educational organization, CTR links research to transportation education in ways that no other Texas educational institution can match, preparing hundreds of students for positions in government, academia, and private industry.

Research Strengths

In a word, CTR is about innovation. For 48 years, we have provided innovative and pragmatic solutions to our state's transportation challenges. Here are some of our research strengths.

Environmental

- Characterization and control of sources of hazardous air pollutants (HAPs) and volatile organic compounds (VOCs), urban air quality and pollution prevention, environmental and industrial reaction engineering
- Mitigation of urban, agricultural, and construction site stormwater runoff; statistical analysis of water quality data; groundwater hydrology, subsurface contaminant fate and transport of hazardous and radioactive wastes, groundwater pollution, dose and risk assessment, multiphase flow, and mathematical modeling; in-situ bioremediation highway runoff; treatment and management of sludges and solid wastes
- Alternative fuels, emissions, engine modeling

Concrete

- Behavior, analysis, and design of reinforced and pre-stressed concrete structures, earthquake engineering, evaluation of structures in distress, use of fiber reinforced polymers for corrosion repair and strengthening of reinforced concrete, high-performance concrete
- Polymer concrete, corrosion protection of concrete, bonded concrete overlays, repair of concrete, concrete sealers, FRP wraps for concrete protection, materials database for highway materials, monomers for sealing cracks in concrete, use of micro fines for producing concrete, test methods and mitigation methods for alkali-silica reaction in concrete, effect of aggregate characteristics on concrete properties, frictional resistance of seal coat pavements, protective coatings for reinforcing steel in concrete, use of recycled materials in concrete
- Fracture analysis or mechanics, structural steel, materials fatigue
- Design of reinforced concrete structures subjected to severe loading and exposure conditions, concrete structure, performance of reinforced concrete systems, repair and strengthening of structures, seismic response of reinforced concrete structures
- Hydration chemistry of portland cement and its constituent phases, the development of microstructure in portland cement, concrete durability, blended cements, chemical deterioration processes in concrete

Bridges

- Composite materials, disaster studies, earthquake engineering, mechanical engineering, structural analysis, structural design, offshore structures, composite materials
- Aesthetics of short and medium span bridges, durability design criteria for post-tensioned concrete, and structural concrete detailing procedures
- Dynamic response of structures to blast and earthquake loads, with particular focus on the potential for progressive collapse, models and analyses of trapezoidal box girder bridges during construction, the behavior of synthetic-fiber rope in mooring applications
- Noncomposite steel girder bridges, bridge monitoring systems, truck permitting procedures through finite analysis, reinforced concrete bridges

High Tech

- 3D sensing and modeling for construction automation
- Electronic data interchange, computer integrated construction, and pre-project planning
- Hydrologic modeling, use of geographic information systems in hydrology
- Wind engineering, structural reliability, dynamics and random vibration, earthquake engineering, probabilistic seismic hazard analysis
- Soil mechanics, soil reinforcement and improvement, environmental geotechnics, geosynthetics, numerical and physical (centrifuge) modeling of geotechnical and geoenvironmental systems

Planning

- University-industry-government collaboration in technology
- Urban planning, children's travel behavior and health, nonmotorized transportation planning and safety, relationship between urban planning and public health
- Facility forensics, contract claims analysis, constructability, value engineering, decision analysis and risk management, project work process integration and automation, innovative IT applications for project execution

Pavement

- Deflection testing of pavements, performance assessment, spectral analysis, soils, flexible pavements and subgrades, non-destructive testing, resonant column/torsional shear (RCTS) equipment, dynamic soil properties, Rolling Dynamic Deflectometer (RDD)
- New imaging technology for automated pavement surface distress inspection
- Wayside noise testing according to ISO standard, On Board Sound Intensity testing using a specialized test vehicle, materials testing in the lab or in situ using an impedance tube according to ISO standards, analysis of noise impact avoidance/mitigation using the FHWA's TNM noise modeling program, non-conventional barrier/absorptive material design and analysis
- Rigid and flexible pavement performance, database design and analysis, traffic characteristics, environmental conditions, and truck configurations affecting pavement, traffic data analysis for pavement management

Research Programs

TxDOT Cooperative Research

The research conducted for TxDOT remains the cornerstone of the CTR program. For any given year, our TxDOT program comprises more than 65 projects, excluding interagency and other informal agreements. These investigations span all four of the agency's research areas and range from traditional subjects like pavements to the newer areas of intelligent transportation systems (ITS), air quality, and rail planning. CTR Deputy Director Robert Harrison directs the activities of the professional research staff.

As TxDOT's program continues to undergo change, CTR remains committed to producing work of the highest quality for the citizens of Texas. Better pavements, stronger and more economical bridges, less traffic congestion, and demand-based solutions to urban passenger and freight movements create real, measurable, financial benefits. Safety programs alone have repaid the investment in the total research program many times over. While meeting our educational objectives by training tomorrow's transportation professionals, valuable benefits also accrue to those living and working in Texas. When appropriate, CTR partners with other universities, including UT Arlington, UT El Paso, Texas Tech University, UT San Antonio, UT Tyler, and Texas A&M. As we continue cooperative research with TxDOT, we intend to build on a clear foundation of mutual success and achievement. CTR will continue to explore how best to work with TxDOT and other state agencies to provide to the citizens of Texas cost-effective products of quality.

Institute for Transportation Infrastructure Engineering and Management

The Advanced Institute continues its mission to increase the number, quality, and diversity of professionals entering the transportation sector. The institute is part of a national program that recruits, teaches, and mentors students entering the transportation field, with emphasis placed on the quality and diversity of that professional pool. Established in 1990 in the Department of Civil Engineering, Architectural, and Environmental Engineering (CAEE) at The University of Texas at Austin and funded by the USDOT, the institute is part of the Southwest Region University Transportation Center (SWUTC) established by USDOT. The program is overseen by C. Michael Walton.

The institute recognizes that the planning, design, and management of the transportation infrastructure represents challenges that cut across traditional civil engineering disciplines. Accordingly, the institute is multimodal in scope and cross-disciplinary in perspective, addressing not only the broader aspects of infrastructure planning and management, but also its technical engineering requirements. The academic program in the Advanced Institute builds on established strengths in civil engineering and in other university disciplines, including operations research, community and regional planning, computer science, and public affairs. Institute graduates contribute to the transportation sector through employment in government agencies, nonprofit organizations, and firms engaged in providing services to transportation agencies, as well as through further advanced study in transportation.

Research Programs

Southwest University Transportation Center Program

Established in 1987, the Southwest University Transportation Center program (SWUTC) is one of fourteen competitively selected centers of excellence established by the USDOT. The center represents Region Six of the parent University Transportation Centers (UTC) program, which is a major national initiative designed to foster university-based, long-term research that encompasses all transportation modes. The program attracts the nation's best students to the study of transportation.

SWUTC administers the UTC program for Arkansas, Louisiana, New Mexico, Oklahoma, and Texas. Program oversight is shared by the SWUTC consortium consisting of The University of Texas at Austin, Texas A&M University, and Texas Southern University. The University of Texas at Austin research program component of Region Six SWUTC is directed by Randy B. Machemehl. Dock Burke directs the Texas A&M University component. The Advanced Institute educational component is directed by C. Michael Walton. The Region Six SWUTC program focuses on the region's special transportation challenges.

SWUTC has conducted studies in sustainable transportation for mobility and economic strength, with projects associated with NAFTA and Texas-Mexico border crossing transportation issues.

Texas Pavement Preservation Center

A joint collaboration between CTR of the University of Texas at Austin and the Texas Transportation Institute (TTI) of Texas A&M University, TPPC promotes the use of pavement preservation strategies to provide the highest level of service to the traveling public at the lowest cost. The program serves a broad range of needs for TxDOT, industry, and agencies within the highway community.

TPPC has been developing pertinent classroom instruction, workshops, and instructional videos designed to teach TxDOT engineers, municipalities, counties, and private firms how to put new techniques in pavement preservation into practice. Yetkin Yildirim serves as the director of the TPPC. He also oversees the Superpave and Asphalt Research Program.

Strategic Research program

CTR, TTI, and The Center for Multidisciplinary Research in Transportation (TechMRT) at Texas Tech University, have developed a Strategic Research Program (SRP) to prepare TxDOT for transportation challenges likely to be faced in the next 10 to 30 years. The program complements the technical research program by addressing longer-term and broader transportation issues that the State Legislature and TxDOT Administration foresee affecting the efficiency and viability of the statewide transportation system. For the first year of the program, seven research briefs are being developed. An external committee provides oversight for the SRP program.

Student Awards

Student researchers are the backbone of our research program. Each year they receive awards based upon their work in the field of transportation.

Student	Award
Xiaokun Wang	2009 Young Researcher Award from the Transportation Research Board's Committee on Statistical Methods (ABJ80)
Bharath Rajagopalan	2009 C.V. Wootan Memorial Award for the best MS thesis
Jason Lemp	2009 SWUTC Dr. William J. Harris Outstanding Ph.D Student Award from Southwest Region University Transportation Center (SWUTC)
Katherine Kortum	Represented CTR at the 2010 Eno Transportation Foundation's Leadership Development Conference
Lauren Gardner	2010 Helene M. Overly Memorial Scholarship, awarded by the Heart of Texas Chapter of Women's Transportation Seminar (WTS)
Katherine Kortum	2010 Elaine Dezenski President's Legacy Scholarship, awarded by the Heart of Texas Chapter of Women's Transportation Seminar (WTS)
Jose Aguiar Moya	Represented CTR at the 2010 IRF Road Scholar Program
Katherine Kortum, Lily Aung	$1000 scholarship through ITS Texas at the ITS Texas 2009 Annual Meeting
Migdalia Carrion Alers, Lauren Gardner, Beatriz Rutzen	2009-2010 Eisenhower Graduate Transportation Fellowships, awarded by the Universities and Grants Programs of the National Highway Institute, Federal Highway Administration
Charlotte Whitehead, Bin "Brenda" Zhou, Jennifer Duthie	2009 scholarships from the Women's Transportation Seminar's (WTS) Heart of Texas Chapter
Abdul Rawoof Pinjari	2008 C.V. Wootan Memorial Award for best Ph.D dissertation in the transportation policy and planning area, awarded by the Council of University Transportation Centers.
Jennifer Duthie	2009 TRB Fred Burggraf Award from the Transportation Research Board

Student	Award
Naveen Eluru	2008 SWUTC Dr. Robert Herman Award to the Most Outstanding Student
Rachel Copperman	2008 SWUTC Dr. William J. Harris Outstanding Ph.D Student Award, awarded by the Southwest Region University Transportation Center
Jeffrey LaMondia	2009 Eno Transportation Foundation's Leadership Development Conference
Ipek Sener	2008 Helene M. Overly Memorial Scholarship, awarded by the Heart of Texas Chapter of Women's Transportation Seminar (WTS)
Naveen Eluru	Participant in 2009 IRF Executive Leadership Program
Beth Porterfield	$1000 scholarship through ITS Texas at the ITS Texas 2008 Annual Meeting
Eleni Pappas	2009 Outstanding Student Award, awarded by the Texas Institute of Transportation Engineers
Ian Hlavacek	2009 Young Member of the Year Award from the Houston area section of TexITE.
Stephen Boyles, Lauren Gardner, Jeffrey LaMondia, Jason Lemp	2008-2009 Eisenhower Graduate Transportation Fellowships, awarded by the Universities and Grants Programs of the National Highway Institute, Federal Highway Administration

UTC Publications

The Southwest Region University Transportation Center (SWUTC) produces research reports on a variety of transportation studies. The following is a selected list of publications.

Project	Title
167276	Future Travel Demand and its Implications for Transportation Infrastructure Investments in the Texas Triangle, Ming Zhang and Binbin Chen, UT Austin, March 2009, 50 pp. (167276-1)
167263	Private Sector's Role in Public School Facility Planning, Jennifer Bennett and Tracy McMillan, UT Austin, April 2009, 85 pp. (167263-1)
167866	Design-Build Agreements: A Case Study Review of the Included Handover Requirements, Jolanda Prozzi, Alejandro Perez-Ordonez, and Jorge A. Prozzi, UT Austin, April 2009, 66 pp. (167866-1)
167272	Microsimulation of Household and Firm Behaviors: Anticipation of Greenhouse Gas Emissions for Austin, Texas, Sumala Tirumalachetty and Kara M. Kockelman, UT Austin, May 2009, 129 pp. (167272-1)
169201	Analysis of Texas Biofuel Supply Chains Originating in the United States and Brazil, Leigh B. Boske and James T. Woodward, UT Austin, May 2009, 94 pp. (169201-1)
167861	The U.S.-Brazil-China Trade and Transportation Triangle: Implications for the Southwest Region, Leigh B. Boske, and John C. Cuttino, UT Austin, March 2009, 130 pp. (167861-1)
476660-00063	Vehicle and Driver Scheduling for Public Transit, Kristen Torrance, Ashley R. Haire and Randy B. Machemehl, UT Austin, August 2009, 44 pp. (476660-00063-1)
169203	A Methodology for Incorporating Fuel Price Impacts into Short-term Transit Ridership Forecasts, Ashley R. Haire and Randy B. Machemehl, UT Austin, August 2009, 147 pp. (169203-1)
167867	Multimodal Network Models for Robust Transportation Systems, Jennifer Duthie, Erin Ferguson, Avinash Unnikrishnan, and S. Travis Waller, UT Austin, October 2009, 67 pp. (167867-1)
169202	Evolution of the Household Vehicle Fleet: Anticipating Fleet Composition, Plug-In Hybrid Electric Vehicle (PHEV) Adoption and Greenhouse Gas (GHG) Emissions in Austin, Texas, Sashank Musti and Kara M. Kockelman, UT Austin, December 2009, 165 pp. (169202-1)
169207	Trip Internalization and Mixed-Use Development: A Case Study of Austin Texas, Ming Zhang, Alexander Kone, Shaun Tooley, and Ryan Ramphul, UT Austin, December 2009, 123 pp. (169207-1)
167275	Quantifying Travel Time Variability in Transportation Networks, Stephen D. Boyles, Avinash Voruganti, and S. Travis Waller, UT Austin, March 2010, 39 pp. (167275-1)
161021	Impacts of Pending Federal Greenhouse Gas Legislation on the Texas Transportation Sector, Leigh B. Boske and James T. Woodward, UT Austin, May 2010, 55 pp. (161021-1)
476660-00074	Examining the Role of Trip Length in Commuter Decisions to Use Public Transportation, Yao Yu and Randy Machemehl, UT Austin, June 2010, 45 pp. (476660-00074-1)
476660-00073	Predicting the Incremental Effects on Transit Ridership Due to Bus-On-Shoulder Operations, Eleni Pappas and Randy Machemehl, UT Austin, August 2010, 87 pp. (476660-00073-1)
476660-00064	A Road Pricing Methodology for Infrastructure Cost Recovery, Alison J. Conway and C. Michael Walton, UT Austin, August 2010, 296 pp. (476660-00064-1)
473700-00074	State Commercial Vehicle Security Enforcement: Operations, Technologies, and Barriers, Alison J. Conway and C. Michael Walton, UT Austin, August 2010, 66 pp. (473700-00074-1)
476660-00067	A Comprehensive Examination of Heavy Vehicle Emissions Factors, Melissa Thompson, Avinash Unnikrishnan, Alison J. Conway, and C. Michael Walton, UT Austin, August 2010, 143 pp. (476660-00067-1)
169200	Examining the Influence of Tolls on Commute Departure and Route Choice Behavior in the Chicago Region, Naveen Eluru, Rajesh Paleti, and Chandra R. Bhat, UT Austin, August 2010, 39 pp. (169200-1)
161026	Network Methods for Project Selection Based on Optimizing Environmental Impact, Erin M. Ferguson, Jennifer Duthie, and S. Travis Waller, UT Austin, August 2010, 149 pp. (161026-1)

Installing an On-Board Sound Intensity (OBSI) frame to the wheel hub of a noise test vehicle. The frame suspends two precision microphones 3" from the pavement and 4" from the tire sidewall while the vehicle collects data at 60 mph. The OBSI gear is used to measure noise at the pavement/tire contact point and thereby evaluate the acoustic performance of the pavement. OBSI affords a directional measurement of noise. The measurements are unaffected by traffic and reflective barriers at the roadside, which allows testing at any time of the day in urban areas.

The Center for Transportation Research has been providing transportation solutions for 48 years in partnership with its sponsors.

Selected Interagency Contracts

The Dallas IAC

The Dallas IAC is a multifaceted program of innovative technical services provided during the planning, design, construction, and maintenance phases of projects. These services range from construction schedule monitoring to pavement forensic studies to economic impact analysis. In addition, new systems and models have been developed under the IAC including a lane closure guidance system, a traffic impacts model, a project development scheduling (PDS) system, 4D/CAD model, and a constructability lessons learned system. Many of these CTR innovations have successfully evolved to become statewide programs. The program is headed by Nabeel Khwaja.

Network Modeling Center

This center's mission is to provide quantitative technical input on system-level impacts of a wide range of transportation planning decisions, including roadway improvements, emissions reduction strategies, and transit operations/ridership programs. In collaboration with other governmental agencies in the central Texas region, the center will augment the four-step process (trip generation, distribution, mode split, and traffic assignment) with network-level dynamic traffic representation. This new center creates an opportunity for cross-sharing of expertise and training among the numerous governments, agencies, and organizations involved in Texas transportation planning. The program is managed by Jen Duthie.

Intercity Passenger & High-Speed Rail

This project was initiated in response to a presidential and federal initiative undertaken by many states to review their rail policies. The program is overseen by C. Michael Walton and Jolanda Prozzi. The first task of the project was to create an extensive bibliography and set of technical reports on Texas, US, and international experiences of passenger and high-speed rail. The final task was a complete revision and update to the Texas Rail Plan. This document was approved by the Texas Transportation Commission in 2010 and is available on the TxDOT Website as the *Texas State Rail Plan.* www.txdot.gov/public_involvement/rail_plan/default.htm

Mega-Region Freight Issues in Texas

This project studies the network of interconnected cities, such as the Texas Triangle, to understand how to apply the mega-region concepts to problems such as modal congestion, development disparity, and air pollution that metropolitan areas or cities cannot solve individually. The goal is to apply mega-region theory in a way that will complement TxDOT planning, especially at the state transportation level, to promote economic growth, federal support, and private sector investment. This initiative will allow Texas to compete with other states using mega-regional planning for large-scale systems, green infrastructure, and economic development. The project is managed by Robert Harrison.

Laredo Border Master Plan

This study will help to prepare a master plan that covers all points of entry (POEs) and infrastructure related to transit that crosses the Texas border. Tasks include studying capacity and levels of congestion on roadways or rail tracks and its impact on other modes of transport of goods and passengers. The project's goal is to design an inclusive stakeholder agency involvement process, increase understanding among those stakeholders, and implement a plan to prioritize POE projects to ensure coordination on POE and supporting transportation infrastructure needs. The project is managed by Jolanda Prozzi.

The Austin IAC

The Austin IAC provides technical assistance to TxDOT's Austin District with a series of identified tasks, serving in many respects as a staff extension. The eight tasks on the contract primarily relate to construction management and traffic operations. Construction-related tasks include workload analysis improving workload analysis and construction scheduling and estimating. Traffic operations tasks include evaluation of ITS strategies and miscellaneous traffic studies. The program is managed by Khali Persad.

Affiliates

Ferguson Structural Engineering Lab

The Ferguson Structural Engineering Lab (FSEL) is one of the largest and most active structural engineering facilities in the world. The lab contains a wide range of loading equipment, enabling large-scale studies of structural behavior. It is managed by a team of distinguished faculty with a rotating directorship. Researchers at FSEL are finding cost-effective ways to renew or rehabilitate the nation's bridges. Using state-of-the-art equipment, bridges and other special-purpose structures are tested under stresses such as earthquakes. The laboratory has expanded its experimental facilities to help improve the durability of the civil infrastructure, study the response of structures under fire, blast, and impact loads, and develop new capabilities in nondestructive testing. New design approaches, materials, and computational techniques are used to meet engineering challenges.

Practical laboratory experience is an important component of the graduate program in structural engineering at The University of Texas at Austin. Research assistants at FSEL perform experimental research and study structural behavior by observing specimen response under the guidance of faculty advisors. FSEL sponsors many part-time graduate research assistants each year.

Construction Materials Research Group and the Concrete Durability Center

These research groups are dedicated to advancing the state of the art in construction materials technology and concrete durability through research and development. Funded projects encompass a wide range of concrete materials design, analysis, and testing. The lab's researchers are leaders in research studies in concrete durability, use of aggregates in concrete, virtual testing/proportioning of concrete mixtures, and concrete repair. Research at CMRG has developed a smart polymer concrete that responds "intelligently" to stimuli such as strain and temperature. Other projects include evaluating mitigation strategies for internal expansion mechanisms in concrete, investigating methods to control shrinkage cracking in concrete bridge decks, and proportioning concrete mixtures with an emphasis on high micro fines contents. Research studies also focus on integrating realistic aggregate properties at the NIST-developed Virtual Cement and Concrete Testing Laboratory, and developing a more practical method for measuring the workability of concrete, especially low slump concretes.

Community and Regional Planning

The Community and Regional Planning (CRP) group is housed within the School of Architecture. The CRP program studies the growth and development of cities and regions, including topics related to city planning methods, theory, law, and finance. Researchers at CRP have performed work recently on transportation social equity, accessibility, and health care planning.

Center for Water Resources (CRWR)

The Center for Water Resources (CRWR) is a regional center for water-related research, education, planning, and design. CRWR serves as the central focus for environmental and water resources research at the university, performing studies in advanced research, education, design, and planning in water resources and waste management. Research is focused on Texas but includes issues of national and international interest, serving as a regional center for water-related research, education, planning, and practical design, sharing experience and providing support to graduate students of the university by involving them in applied research. CRWR and the Environmental Systems Research Institute, Inc. (ESRI) established a consortium for developing and implementing new Geographic Information System (GIS) capabilities in water resources.

Affiliates

Construction Industry Institute

Construction Industry Institute (CII) has a strong position as a national forum for construction industry research. Research remains its primary function. CII is a consortium of leading owners and contractors who have joined together to find better ways of planning and executing capital construction programs. Its mission is to improve the cost effectiveness of the capital facility project life cycle, from pre-project planning through completion and commissioning. By collaborating on important industry issues and by providing guidance on best practices discovered through research, CII members are collectively an industry forum for the engineer-procure-construct process.

LBJ School of Public Affairs

The LBJ School has worked in partnership with CTR on a number of funded research studies on topics such as the movement of goods, ports, terminals, and multimodal and intermodal facilities. Researchers at CTR and the LBJ School have undertaken additional, significant studies that support recognition of the critical role that freight transport plays in the national economy.

Center for Electromechanics (CEM)

CEM is a world-class center for modeling, analyzing, designing, and fabricating advanced electrical power generation and distribution systems. The center staff includes researchers recognized as world leaders in the development of advanced energy storage and power generation rotating machines for both intermittent and continuous duty applications. The CEM research staff interacts with industry on the time-scale industry needs, using a wide range of models of interaction with companies and government agencies to respond to changing needs. The center engages in both fundamental and applied research in the areas of electromagnetics, electromechanical devices, power electronics, and advanced materials, developing leading-edge concepts and technology for generation, storage and use of electric and mechanical energy.

International Center for Aggregates Research

The International Center for Aggregates Research (ICAR) serves the industry as a forum for research and discussion, where aggregates stakeholders can seek answers to industry concerns. In addition, the center provides the industry with the knowledge to put the latest aggregates technology into practice. ICAR is the voice of the aggregates industry in the research community and serves as a facilitator for determining the most effective use of aggregates in design, specification, and construction. Its mission is enhanced by the participation of state DOT and federal agency representatives in formulating the research program. An advisory board of directors, representing the industry, UT Austin, and Texas A&M, provides guidance for the program. ICAR's research efforts are directed by seven task forces, consisting of representatives from industry, academia, government, and professional organizations.

The Center for Transportation and Electricity Convergence (CTEC)

The Center for Transportation and Electricity Convergence (CTEC) is a National Science Foundation Industry/University Cooperative Research Center started in 2010. Dr. S. Travis Waller from UT Austin's Transportation Engineering program is the center director and more than 20 faculty members from both UT Austin and Texas A&M are involved in the effort. CTEC takes a unique systems approach to the study of a future where plug-in electric vehicles (PEVs) are widespread. Researchers consider the technical aspects of PEV deployment along with a variety of socioeconomic, commercial, environmental, regulatory, planning and industrial factors, which need to be understood and carefully coordinated in order to maximize the opportunity for economic and societal benefit brought about by these vehicles.

Active Projects

Project	Title	RMC*	RS
0-4562	Corrosion Resistance of Grouted Post-Tensioning Systems	5	John Breen
0-5220	Investigation of Stormwater Quality Improvements Utilizing Permeable Pavement and/or the Porous Friction Course (PFC)	2	Michael Barrett
0-5549	Horizontal Cracking in Concrete Pavements	1	Joint with TechMRT and University of North Texas. Seongcheol Choi
0-5701	Cross-Frame and Diaphragm Layout and Connection Details	5	Michael Engelhardt
0-5831	Bursting and Shear Behavior of Prestressed Concrete Beams With End Blocks	5	Oguzhan Bayrak
0-5832	Develop Mechanistic/Empirical Design for CRCP	1	Joint with TechMRT and TTI. Seongcheol Choi
0-5836	Performance of Permeable Friction Course (PFC) Pavements Over Time	1	Joint with TTI. Jorge A Prozzi
0-5893	Laboratory Evaluation of Constructability Issues with Surface Treatment Binders	1	Joint with TechMRT, Jorge A Prozzi
0-5974	Estimating Texas Motor Vehicle Operating Costs	2	Robert Harrison
0-6005	Developing a Testing Device for Total Pavements Acceptance	1	Kenneth Stokoe
0-6094	Mitigation Methods for Temporary Concrete Traffic Barrier Effects on Flood Water Flows	5	Joint with UTSA, Michael Barrett
0-6095	Longer Combination Vehicles and Road Trains for Texas?	2	C. Michael Walton
0-6147	Bacteria Levels in Discharge from Road Right-of-Ways	2	Michael Barrett
0-6190	Use of Dowel Bars at Longitudinal Construction Joints	1	Joint with TechMRT, Seongcheol Choi
0-6235	Sketch Planning Techniques to Assess Regional Air Quality Impacts of Congestion Mitigation Strategies	2	Kara Kockelman
0-6255	Use of Manufactured Sands for Concrete Paving	1	David Fowler
0-6268	Acquisition, Uses and Funding Options for Abandoned Rail Corridors	2	Joint with TTI, Lisa Loftus-Otway and Nathan Hutson
0-6274	Project Level Performance Database for Rigid Pavements in Texas, Phase II	1	Joint with TechMRT, Zhanmin Zhang
0-6275	Continued Development and Analysis of the Flexible Pavements Databases	1	Jorge Prozzi
0-6297	Freight Planning Factors Impacting Texas Commodity Flows	2	C. Michael Walton
0-6306	Shear Strengthening of Large Reinforced Concrete Elements Using Carbon Fiber Reinforced Polymer (CFRP) Sheets	5	James Jirsa
0-6326	Rational Use of Terminal Anchorages in Portland Cement Concrete Pavement	1	Joint with TechMRT and UTEP, Seongcheol Choi
0-6332	Development of Predictive Model for Bridge Deck Cracking and Strength Development	5	Kevin Folliard
0-6348	Controlling Cracking in Prestressed Concrete Panels and Optimizing Bridge Deck Reinforcing Steel	5	Richard Klingner
0-6357	Monitoring of Experimental Sections Using a Pavement Database	1	Jorge Prozzi
0-6374	Effects of New Prestress Loss Predictions on TxDOT Bridges	5	Oguzhan Bayrak
0-6388	Synthesis Study on Innovative Contract Techniques for Routine and Preventive Maintenance Contracts	1	Cindy Menches
0-6395-CT	Modeling Revenue for Use in Developing Reasonable Expectations of Revenue for Long Range Plan Development	2	Robert Harrison
0-6412	Equipment Replacement Optimization	2	Joint with UT Tyler, Randy Machemehl

Active Projects

Project	Title	RMC*	RS
0-6414	Development of Guidelines for Implementation of Roundabouts in Texas	4	S. Travis Waller
0-6416	Shear Cracking in Inverted-T Straddle Bents	5	Oguzhan Bayrak
0-6435	CAM Mix Design with Local Materials in Texas	1	Jorge Prozzi
0-6487	Development of a Performance Measurement Based Methodology to Objectively Compare operational Improvements with Capacity Additions	2	Kara Kockelman
0-6491	Non-Destructive Evaluation of In-Service Concrete Structures Affected by Alkali-Silica Reaction (ASR) or Delayed Ettringite Formation (DEF)	5	Kevin Folliard
0-6495	TxDOT and Electric Power Transmission Lines	2	TechMRT, Robert Harrison
0-6513	Impacts of Energy Developments on the Texas Transportation System	2	Jolanda Prozzi
0-6538	Planning Tools to Assess the Real Estate Leveraging Potential for Roadways and Transit	2	Joint with TTI, Ming Zhang
0-6544	Appraisal of Available Analytical Tools to Assess Environmental Justice Impacts of Toll Road Projects	2	Jolanda Prozzi
0-6564	Improved Cross Frame Details	5	Todd Helwig
0-6568	Use of Flashing Yellow Operations to Improve Safety at Signals with Protected-Permissive Left Turn (PPLT) Operations	4	Joint study with TSU, Khali Persad
0-6576	Safety Implications of Using Active Traffic Strategies on TxDOT Freeways	4	Travis Waller
0-6581-CT	TxDOT Administration Research	2	Khali Persad
0-6590	Material Selection for Concrete Overlays	1	David Fowler
0-6591	Developing a Fundamental Understanding of the Chemistry of Warm Mix Additives	1	Amit Bhasin
0-6592	Economic Impacts of ARRA Funding on TxDOT Projects	2	Robert Harrison
0-6603	Long-Term Performance of Drilled Shaft Retaining Walls	5	Robert Gilbert
0-6655-CT	System Operation and Preservation Optimization	P	Robert Harrison
0-6661	TxDOT Strategic Research Program	P	Khali Persad
5-4322-01	Implementation of a Network-Level Pavement Structural Condition Index Based on Falling Weight Deflectometer Data	1	Mike Murphy
5-4563-01	Development of Training Module for Concrete Works	1	Kevin Folliard
5-4829-01	Pilot Implementation to Quantify the Benefits of Using Geosynthetics for Unbound Base Courses	1	Jorge Zornberg
5-5178-03	Measuring Access to Transit Service in Rural Transit Systems	2	Chandra Bhat
5-5253-01	Strut-and-Tie Model Design Examples for Bridges	5	Oguzhan Bayrak
5-5444-01	Pilot Implementation of Pavement Repair Guidelines for Longitudinal Cracks and Joints	1	David Fowler
5-5517-01	Validate Item 132 Draft Specification Using Tire Bales	2	Jorge Zornberg
5-5574-01	Implementation of Straight and Curved Steel Girder Erection Design Tools	5	Todd Helwig
5-5667-01	Implementation of Accessible Land Use Modeling Tool for Texas Applications	2	Kara Kockelman
5-9035-01	Pilot Implementation of a Web-based GIS System to Provide Information for Pavement Maintenance Decision-Making	1	Zhanmin Zhang
9-9012-01	Implementing Primavera 6	2	Nabeel Khwaja

*RMC: *The four research areas of TxDOT research are RMC 1, Construction and Maintenance; RMC 2, Planning and Environment; RMC 4, Safety and Operations; and RMC 5, Structures and Hydraulics.*

Selected Deliverables

Report	Title	Date
0-6095-1	Potential Use of Longer Combination Vehicles in Texas: First Year Report	7/9/2010
0-6388-1	Synthesis of Innovative Contracting Strategies for Routine and Preventive Maintenance Contracts	6/30/2010
0-5706-1	Impact of Overhang Construction on Girder Design	6/30/2010
5-9029-01-1	Implementation of the Use of Higher Micro-Fines in Concrete Pavements Final Report	6/23/2010
0-5973-2	Emerging Trade Corridors and Texas Transportation Planning	6/17/2010
0-5513-2	Project Report on the Development of the Texas Flexible Pavement Database	6/7/2010
0-5974-1	Estimating Texas Motor Vehicle Operating Costs	5/14/2010
5-4124-01-2	Field Test and Finite Element of I 345 Bridge in Dallas	5/14/2010
5-1523-03-1	Implementation of Electronic Appraisal System	5/10/2010
0-5985-1	An Evaluation of Mexican Transportation Planning, Finance and Implementation Processes	4/14/2010
0-6395-CT-1	Evaluation of TxDOT's J.A.C.K. Model for Revenue and Expenditure Projections	4/14/2010
0-6210-2	Tour-Based Model Development for TxDOT: Evaluation and Transition Steps	4/6/2010
0-5517-1	Mechanical Properties of Tire Bales for Highway Applications	4/6/2010
0-6044-1	Actual versus Forecasted Toll Usage: A Case Study Review	3/16/2010
5-5106-01-1	Pilot Implementation of New Test Procedures for Curing in Concrete Pavements	3/15/2010
0-6581-CT-1	Special Studies for TxDOT Administration in FY 2009	2/22/2010
0-6210-1	Tour-Based Model Development for TxDOT: Implementation Steps for the Tour-based Model Design Option and the Data Needs	2/16/2010
0-5913-1	Speed Harmonization and Peak-period Shoulder Use to Manage Urban Freeway Congestion	1/27/2010
0-5197-01-1	Aggregate Distribution Investigation in Box Beams Fabricated with Self-Consolidating Concrete	1/27/2010
0-5445-3	Evaluation of MEPDG with TxDOT Rigid Pavement Database	1/5/2010
0-5865-1	Arterial Intelligent Transportation Systems – Infrastructure Elements and Traveler Information Requirements	12/21/2009

Report	Title	Date
0-5549-2	Horizontal Cracking Mechanism in CRCP	9/11/2009
0-5668-1	Guidelines for Incorporating a Bus Rapid Transit Scenario into the Analysis of Texas Highway Corridors	8/26/2009
0-5492-2	Feasibility Report and Plan of Action for Development of a New, Hydraulically Efficient Bridge Rail	8/12/2009
0-6034-1	Financing Tools for Rural and Small Urban Area Projects	8/12/2009
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0-5444-2	Assessment and Rehabilitation Methods for Longitudinal Cracks and Joint Separations in Concrete Pavement	7/31/2009
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0-6048-1	Characterization of the Swelling Properties of Highly Plastic Clays using Centrifuge Technology	6/15/2009
0-5830-1	Optimized Design of Concrete Curb Under Off Tracking Loads	6/10/2009
0-5496-1	Developing a Sustainable Flexible Pavement Database in Texas	6/3/2009
9-5498-2	The Tensile Capacity of Welded Shear Studs	5/15/2009
0-5492-1	Hydraulic Performance of Bridge Rails	5/13/2009
5-4124-01-1	Implementation Project: Strengthening of a Bridge near Hondo, Texas using Post-Installed Shear Connectors	5/11/2009
0-5755-1	The Effects of On-Street Parking on Cyclist Route Choice and the Operational Behavior of Cyclists and Motorists	5/8/2009
5-9026-01-1	Pilot Implementation of Optimized Aggregate Gradation for Concrete Paving	4/29/2009
0-5253-1	Strength and Serviceability Design of Reinforced Concrete Deep Beams	4/29/2009
0-5207-1	Effects of Texas Flyash on Air-Entrainment in Concrete: Comprehensive Report	4/16/2009
0-4893-2	Concrete Pavement Overlays and Failure Mechanisms	4/15/2009

Selected Deliverables

Report	Title	Date
5-5178-01-1	DRT Accessibility Tool: Summary Report	4/15/2009
0-5708-2	Improved Pavement Distress Rating System	3/23/2009
0-5513-1	First Year Progress Report on the Development of the Texas Flexible Pavement Database	3/11/2009
0-5824-1	Improved Correlation Between Texas Cone Penetrometer Blow Count and Undrained Shear Strength of Soft Clays	3/9/2009
0-5197-4	Allowable Compressive Stress at Prestress Transfer	3/9/2009
0-5197-3	Effects of Increasing the Allowable Compressive Stress at Release on the Shear Strength of Prestressed Concrete Girders	3/3/2009
0-5367-1	Recommendations for the Use of Precast Deck Panels at Expansion Joints	2/27/2009
0-5367-1	Recommendations for the Use of Precast Deck Panels at Expansion Joints	2/27/2009
0-5686-1	Archiving, Sharing, and Quantifying Reliability of Traffic Data	2/24/2009
0-5445-S	Project Level Performance Database for Rigid Pavements in Texas: A Summary	2/20/2009
0-5667-1	An Examination of Land Use Models, Emphasizing UrbanSim, TELUM, and Suitability Analysis	2/20/2009
0-5538-1	An Analysis of the Value of Texas Seaports in an Environment of Increasing Global Trade	2/20/2009
0-5824-2	Characterization of Undrained Shear Strength Profiles for Soft Clays at Six Sites in Texas	2/13/2009
0-5799-1	Synthesis of Workload Reduction Strategies for Construction Inspection	1/29/2009
0-5482-1	A Report on Concrete Pavement Overlays Over Existing Asphalt Pavement Structures	1/29/2009
0-5482-2	Development of the Thickness Design for Concrete Pavement Overlays Over Existing Asphalt Pavement Structures	1/21/2009
0-5445-2	Analysis of Continuously Reinforced Concrete Pavement Behavior Using Information in The Rigid Pavement Database	1/12/2009
0-5253-S	Design of Deep Beams	12/17/2008
0-5546-1	Protecting Rail Corridors Against Encroachment	12/15/2008
0-4893-4	Debonding in Bonded Concrete Overlays over Continuously Reinforced Concrete Pavements	12/15/2008

Report	Title	Date
5-4617-01-1	Findings on Determining Durations of Right-of-Way Acquisition and Utility Adjustment on Highway Projects	12/3/2008
5-5110-01-1	Implementing Best Concrete Pavement Spall Repairs	11/24/2008
7-2941-5	Comprehensive Report on the Long-Term Behavior of High Performance Concrete Bridges in Texas	10/30/2008
5-4958-01-1	Summary of Implementation of an Artificial Lighting System for Automated Visual Distress Rating System	9/30/2008
0-1401-1	Bending Fatigue Response of Grouted Stay Cables	9/29/2008
0-5492-P3	Design Guidelines and Rating Curves for Hydraulic Performance of Bridge Rails and Traffic Barriers	9/29/2008
0-4875-1	Highway Drainage at Superelevation Transitions	9/19/2008
Products		
0-6388-P1	Synthesis of Innovative Contracting Strategies Used for Routine and Preventive Maintenance Contracts	7/7/2010
0-6395-CT-P2	Communications Materials on Methods of Development of Revenue and Cost Estimates to Non-Technical Audiences	3/26/2010
0-5913-P1	Guidance for Feasibility Analysis of Candidate Sites	3/22/2010
0-5538-P1	Guide to the Economic Value of Texas Ports	9/9/2009
0-5668-P1	Bus Rapid Transit (BRT) Application Guidebook	8/26/2009
0-6034-P1	Financing Tools and Partnerships for Rural and Semi-Urban Transportation Projects	8/12/2009
0-6034-P2	Decision Tool for Financing and Developing RSUA Projects	8/12/2009
0-6395-CT-P3	In-Depth Analysis of the JACK Model	7/30/2009
0-5799-P1	TxDOT Synthesis of the Top 5 Recommended Construction Inspection Workload Reduction Strategies	4/29/2009
0-5546-P1	Protecting Rail Corridors from Encroachment: Options to Reduce or Mitigate Against Encroachment/ Incompatible Use	12/15/2008
0-5492-P1	Design Guidelines and Rating Curves for hydraulic Performance of Bridge Rails and Traffic Barriers	9/29/2008
0-4893-P7	Design Worksheet for Bonded Concrete Overlay BCO	9/16/2008

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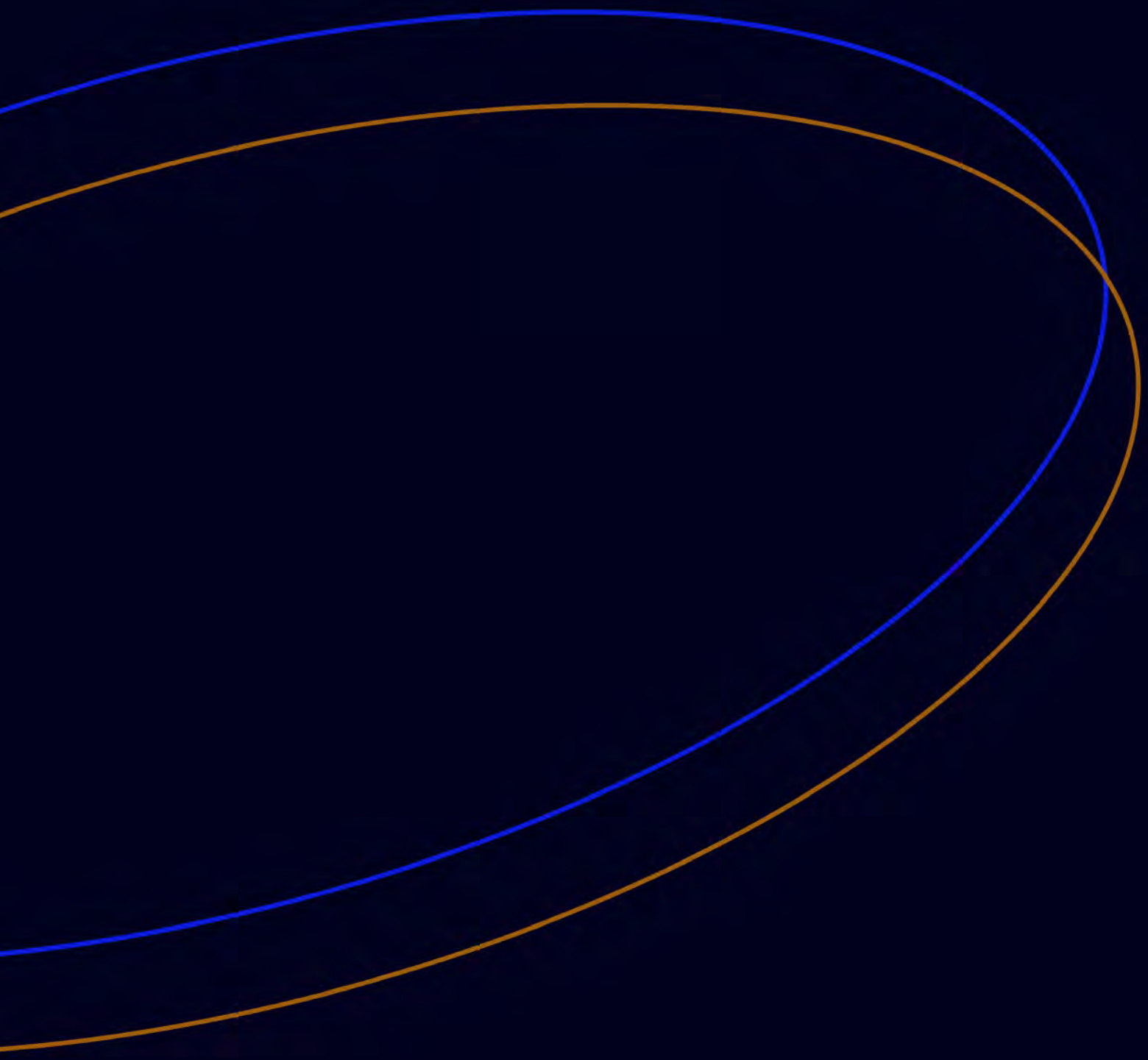

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