



CENTER FOR TRANSPORTATION RESEARCH
THE UNIVERSITY OF TEXAS AT AUSTIN

2008

ANNUAL REPORT



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FY 2008 ANNUAL REPORT

This report documents the Center for Transportation Research's (CTR) notable accomplishments during fiscal year 2008, which ran from September 1, 2007 through August 31, 2008. Also presented are the activities and results of the center's work, including events hosted and assets gained. In operation since 1963 at The University of Texas at Austin (UT), CTR's mission remains research, education, and public service. CTR works in cooperation with several other UT research centers to develop groundbreaking research. Those centers' accomplishments are described as well.

Directors Report

Fiscal year 2008 saw a number of challenges arise in the transportation sector, both nationally and in Texas. The rapid increase in fuel costs caused a decrease in gasoline consumption, thus directly impacting the funding for CTR's primary research sponsor, the Texas Department of Transportation (TxDOT). This same effect was felt across the country, in each state's department of transportation. To TxDOT's credit, the department maintained a focus on leading edge research. Further, two leading Texas university research centers pulled together to help TxDOT develop a statement of current transportation needs.

Some of the new opportunities that arose in the transportation sector include:

- TxDOT has modified the Technical Assistance Panel (TAP) procedures, in terms of both membership and

activity. Previously, TAP membership was restricted to the TAP appointees; now anyone can attend a TAP meeting. This inclusive approach should provide incentive for a wider range of faculty and professional researchers to get involved and contribute ideas and perspectives.

- In 2008, the Cockrell School of Engineering hired three new assistant professors who have expertise in fields applicable to transportation. In addition, the new dean of the Cockrell School of Engineering, Gregory L. Fenves, is a structural engineer. There is a new Associate Dean for Research, John G. Ekerdt. Lastly, the longstanding chairman of CAEE, Gerald Speitel, has become the Associate Dean of Academic Affairs, and Sharon Wood is the new appointed chair.
- SAFETEA-LU ends in FY2009, and new developments in transportation research funding will follow from the reauthorization of the Highway Trust Fund by state and federal legislative bodies. CTR will be following the debate and discussions surrounding reauthorization as they occur. As the newly elected president of the Council of University Transportation Centers (CUTC), CTR Director Dr. Randy Machemehl will be involved in the information provision to legislators as the re-authorization evolves. CTR's position in the transportation research community makes it an ideal source of information to legislative bodies and industry policymakers.
- TxDOT is reinventing itself to become a more responsive and innovative organization. Under the

new leadership of Executive Director Amadeo Saenz, TxDOT is seeking to remain efficient and effective in the face of dynamic changes to the transportation sector. The Transportation Commission also has a new chair, and the senior management team has been expanded to allow for more specific and responsive oversight. In addition, several administrative functions have been centralized, reducing the number of potentially duplicated efforts.

With CTR's efficient ratio of projects to staff and a robust schedule of projects, the center looks forward to a dynamic period of productivity and innovation.

Another achievement of FY 2008 is the continued success of student involvement in the research program. CTR actively recruits and retains graduate research assistants, who are a critical element of the program. CTR is producing the next generation of engineering professionals.

In particular, the TxDOT State Planning and Research (SPR) program is the cornerstone of CTR's research activities. Smaller program elements such as the Southwest University Transportation Centers (SWUTC) Program are also essential to program vitality.

The SWUTC program is part of a major national initiative designed to foster university-based, long-term research that encompasses all transportation modes, and to attract the nation's best students to the study of transportation. During FY 2008, 16 research professionals and 28 students participated in this program.

The SWUTC sponsors the Advanced Institute for Transportation Infrastructure Engineering and Management (AI), a program whose mission is to increase the number, quality, and diversity of professionals entering the transportation sector. During FY 2008, 22 graduate and undergraduate students participated in the AI program.

CTR's commitment to education is notable, as the per-person costs of supporting the education component are increasing faster than the contracted amounts. On average, more than 250 research personnel were supported each of the last 7 years. However, due to recent increases in student stipends, salaries, and—most significantly—tuition, the number of students supported decreased in FY 2008 as compared to the last 10 years, during which the number supported rose steadily.

FY 2007* CTR Research Staff

Faculty Participating in Program	50
Professional Researchers	15
Technical Staff	12
Graduate Researchers	102
Undergraduate Researchers	34
TOTAL	213

**Most recent figures available*

Year at a Glance

New Researchers Hired in FY 2008

Dr. Amit Bhasin, Assistant Professor. Dr. Bhasin's research is concentrated in the following areas: 1) characterizing physical and chemical properties of asphalt binders and aggregates including fillers, 2) developing models that relate fundamental material properties to the performance of asphalt mixtures, 3) evaluating the impact of additives on the performance of asphalt mixtures including additives used to produce energy efficient warm asphalt mixtures, and 5) developing comprehensive models for fatigue cracking and moisture sensitivity in asphalt mixtures.

Dr. Chadi El Mohtar, Assistant Professor. Research interests include pore fluid engineering, non-aqueous flow through porous media, earthquake engineering, liquefaction, soil improvement, laterally loaded drilled shaft piles, asphalt concrete behavior, and fatigue life.

Dr. Raissa Ferron, Assistant Professor. Dr. Ferron's areas of special interest include rheology, fiber-reinforced concrete, durability, quality-control methods, and self-consolidating concrete (SCC). Dr. Ferron starts in January 2009.

Active Projects

CTR had 106 active contracts during FY 2008, in the following categories:

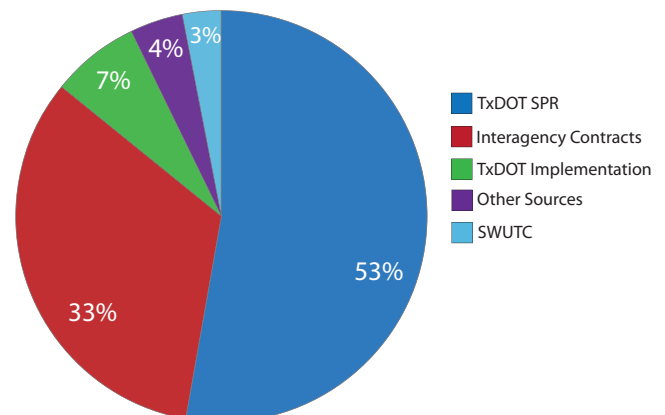
- TxDOT Research (48)
- TxDOT Implementation (11)
- SWUTC (12)
- TxDOT IACs (20)
- Other unique funding sources (15)

A complete list of CTR's active FY 2008 projects is included as Appendix A to this document. The Center maintains a list of the current fiscal year's active TxDOT projects on the Current Projects page in the Research section of the CTR Web site.

Financial Data

The most recent available figures are for FY 2007 and include recorded expenditures of \$11,981,866 and total awards of \$14,973,605. The following chart depicts funding sources as percentages of the total amount contracted.

CTR Funding Sources
(preliminary estimates as of August 19, 2008)



Research Deliverables

As of August 31, 2008, CTR has published 35 reports and 33 products. The products category includes implementation-focused items such as handbooks, software, CD-ROMS, and user manuals. Preliminary studies submitted to the sponsor included 85 draft reports and 61 products. All CTR reports and some products are published online. These publications are listed on the CTR Reports Online page in the Research section of the CTR Web site.

Some examples of products include:

- Passenger Rail Sharing Freight Infrastructure Primer
- Incident Duration Prediction Models
- TxDOT Best Practices Model and Implementation Guide for Advance Planning Risk Analysis for Transportation Projects
- Containerization and Related Trends at Texas Deep Water Ports

Reports of Note

Impacts of Dray System along Ports, Intermodal Yards, and Border Ports of Entry (0-5684)

Research Team: Robert Harrison (RS), Jolanda Prozzi, Nathan Hutson, Jason West, John McCray

Dray operations form critical links in intermodal supply chains. The growth of international trade—much of it moved at some point by the dray industry—now requires planners to have a better understanding of the industry because most sea ports, major border cross-

ings, and distribution terminals are located in or near urban areas.

The research team measured the impacts of dray operations on Texas in terms of providing an estimate for total vehicle miles traveled, the emissions emitted, the congestion imposed, and the safety implications. The recent EPA model was used for emission calculations.

The impact of drayage operations on congestion was determined from a level of service (LOS) analysis at the Port of Houston. An LOS analysis was conducted on SH 225 and SH 146—critical freeways used by dray vehicles—that first determined baseline conditions and then altered the truck traffic volumes to illustrate the impact that drayage vehicles have on hourly flow rates and traffic density.

The research team proposed a number of initiatives that could be taken by terminals or government agencies to reduce the negative impact of drayage operations. Examples included the extension of gate hours at container terminals and the possibility of modernizing the dray fleet through air quality grants. Traffic impacts of drayage operations were only found to be substantial at particular bottlenecks, so initiatives to improve the performance of dray operations should be targeted at relieving pressure at these locations. This could be accomplished by shifting peak demand or by modernizing the dispatching system for dray vehicles through improved technology.

Investigation of Stormwater Quality Improvements Utilizing Permeable Pavement and/or the Porous Friction Course (0-5220)

Research Team: Michael Barrett (RS), Randy Charbeneau, Brandon Klenzendorf, Remi Candaele, Tina Stanard, and Yetkin Yildirim

Monitoring of runoff from a section of a highway overlain with Permeable Friction Course (PFC) indicates that, in addition to recognized safety benefits, PFC substantially reduces the concentration of many pollutants in stormwater runoff to the extent that the runoff complies with regional water quality standards. This may allow TxDOT to incorporate stormwater treatment into the pavement itself rather than purchasing additional right-of-way for construction of expensive stormwater treatment facilities. The research study followed two tracks: first, it documented water quality benefits associated with the use of PFC; and second, researchers performed permeability and porosity test-



ing of samples from existing installations. Knowledge of these hydraulic properties in both the horizontal and vertical directions will allow the development of a model and guidelines for the appropriate use of PFC and reduce the surface flow of runoff in sags and on multi-lane highways.

A cost comparison model was developed to evaluate the incremental cost of three stormwater treatment alternatives: (1) Vegetated filter strips, (2) Austin style sand filters, and (3) Permeable Friction Course. The model compares the breakeven cost of each alternative based upon project parameters such as road length. This will guide highway designers to the most cost effective option for complying with environmental regulations.



Above and left: Ph.D. students Brandon Klenzendorf and Brad Eck perform a field test of PFC permeability using a testing device developed by the project team. MS student Patrick Frazier records test results.

Extending Service Life of Large or Unusual Structures Affected by Premature Concrete Deterioration (0-5218)

Research Team: Kevin Folliard (RS), Maria Juenger, John Breen

Researchers investigated several key aspects of implementing technology to ensure long-term durability in new structures and to prolong the life of existing structures exhibiting distress due to alkali-silica reaction and delayed ettringite formation.

Included in this research:

- Evaluation, mitigation, and monitoring of sections of the San Antonio Y;
- Laboratory and exposure site evaluations of DEF to determine resultant stresses and requisite levels of restraint to control damage;
- Assessment of structures for ASR/DEF deterioration; and
- Treatment and monitoring of ASR/DEF affected structures with innovative techniques.

One of the most important products from this research was the development of a protocol for evaluating structures affected by ASR and/or DEF. This protocol is currently being used by TxDOT and others on various bridge structures. The protocol is a tool that provides guidance on how to conduct field and laboratory evaluations of field structures and cores extracted from such structures.

Substantial progress was also made in determining resultant stresses and requisite levels of restraint to con-

trol damage due to DEF, based primarily on Hoek cell testing, FRP-wrapped columns, odometers, and specimens internally reinforced with steel fibers.



Concrete column affected by delayed Ettringite formation

Influence of Verification Cores on Point Bearing Capacity of Drilled Shafts (0-5825)

Research Team: Fulvio Tonon (RS), Robert Gilbert, David Fowler, Heejung Youn, and Anay Raibagkar (with contractor Hugh Kelly)

During construction, cores taken at the bottom of drilled shafts are invaluable verification tools. However, the influence of verification cores on point bearing capacity is unknown. The research goal was to determine whether or not verification cores fill with concrete in dry conditions or under a slurry. The research

also sought to quantify the decrease in point-bearing capacity (if any) induced by verification cores both in degradable materials (e.g., Navarro, Taylor, Eagle Ford, and Del Rio formations/groups) and in materials less susceptible to slaking (e.g., Austin Chalk and Edwards formations). These less susceptible materials should provide TxDOT engineers and consultants with a meaningful reference point.

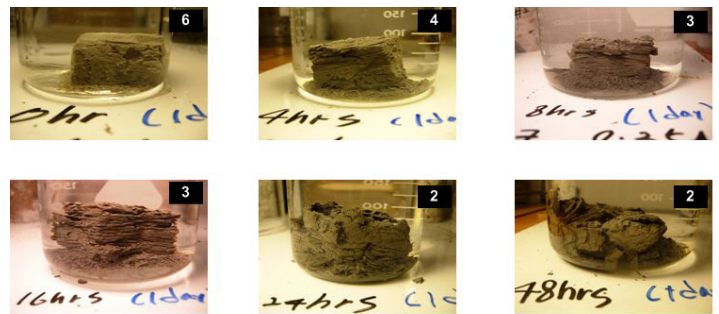


Acquisition of verification core

Lab tests in Task 2 provided the material properties of the degraded clay shales (Eagle Ford shale, Taylor Marl, Navarro shale, and Del Rio shale) subject to one cycle of air drying (ranging from 0 to 48 hours) and wetting. Task 3 provided the thickness of degraded zone, which was determined to be 5 inches thick for maximum air drying duration (48 hours). The thickness was estimated by full-scale condition tests and laboratory tests. Based on full-scale concrete filling tests, Task 4 provided the material properties for the material in the verification core hole. The filled-in materials were

found to be either solid concrete (under dry conditions) or sand-gravel mixture (under wet conditions).

Reduction factors to tip capacities were recommended based on numerical simulations that used results of Tasks 2 through 4. The reduction factors were obtained by comparing the tip capacity of the reference model to that of drilled shafts with verification cores under various conditions. The reduction factors were found to vary between 0.86 and 1.26, but mostly fall within 10% tip capacity of the reference model (with no verification core).



Example of Finding: Taylor Marl clay shale degrades significantly when the specimen is dried for more than 4 hours.

CTR Programs

Cooperative Research Program

The research conducted for the Texas Department of Transportation (TxDOT) remains the cornerstone of the CTR program; for any given year, CTR's TxDOT program comprises more than 70 projects, excluding interagency and other informal agreements. These investigations span all 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.

Southwest University Transportation Centers Program (SWUTC)

The Southwest University Transportation Center is one of 14 centers of excellence established by the U.S. Department of Transportation (USDOT). The program is a vehicle for both innovative research and student support.

As the following table shows, SWUTC research tends to have a social or economic focus. This emphasis is due to the USDOT mandate that these items not duplicate other research being conducted; most other research is in hard materials such as pavement. Also, the majority of SWUTC projects are initiated by UT's Civil Engineering faculty and by the School of Architecture and the LBJ School of Public Affairs.

SWUTC Reports Completed in FY 2008

A Scoping Study of the Impacts of Bioenergy and Alternative Fuels on the Southwest Region's Economy and Transportation Infrastructure, Leigh B. Boske and James T. Woodward, University of Texas at Austin, May 2008, 101 pp. (167271-1)

Simulating Land Use Impacts of Highway Development in the Texas Triangle—A Case Study of the Austin Metropolitan Region, Ming Zhang and Tian Haung, University of Texas at Austin, March 2008, 63 pp. (167266-1)

Microsimulation of Household and Firm Behaviors: Coupled Models of Land Use and Travel Demand in Austin, Texas, Saurabh Kumar and Kara M. Kockelman, University of Texas at Austin, December 2007, 147 pp. (167262-1)

Population Updating System Structures and Models Embedded Within the Comprehensive Econometric Microsimulator for Urban Systems (CEMUS), Naveen Eluru, Abdul Rawoof Pinjari, Jessica Y. Guo, Ipek N. Sener, Sivaramakrishnan Srinivasan, Rachel B. Copperman, and Chandra R. Bhat, University of Texas at Austin, October 2007, 44 pp. (167260-1)

Drayage Activity in Texas, Robert Harrison, Nathan Hutson, Jolanda Prozzi, Jason West, Juan Gonzalez and John McCray, University of Texas at Austin, October 2007, 86 pp. (0-5684-2)

Calibration of Pavement Response Models for the Mechanistic-Empirical Pavement Design Method, Rong Luo and Jorge A. Prozzi, University of Texas at Austin, September 2007, 85 pp. (167264-1)

Transportation Challenges and Issues Facing Rural Texas: A Methodology to Prioritize Rural Transportation Needs, Jolanda Prozzi and Robert Harrison, University of Texas at Austin, September 2007, 56 pp. (473700-00068-1)

Developing Appropriate Freight Performance Measures for Emerging Users, Mike Schofield and Robert Harrison, University of Texas at Austin, September 2007, 46 pp. (473700-00073-1)

Evaluating Mexican Truck Safety at the Texas/Mexico Border, Mike Schofield and Robert Harrison, University of Texas at Austin, September 2007, 26 pp. (473700-00071-1)

Comparing Microscopic Activity-Based and Traditional Models of Travel Demand: An Austin Area Case Study, Laura B. McWethy and Kara M. Kockelman, University of Texas at Austin, September 2007, 134 pp. (167862-1)

SWUTC is one of the very few funding sources that allow the researchers to generate the topics. Typically, the source of funds (i.e., the sponsor) presents a problem description and allocates funds to those research centers that indicate they can best provide a solution. SWUTC funds are used to fund the doctoral student program (all of CTR's UTC funds go to the doctoral program) and the candidates' work must be cutting edge, so UTC projects are usually quite innovative in nature.

Advanced Institute for Transportation Infrastructure Engineering and Management (AI)

The Advanced Institute is part of the SWUTC program. AI recruits, teaches, and mentors students entering the transportation field, with special emphasis placed on the quality and diversity of that professional pool. Its mission is to increase the number, quality, and diversity of professionals entering the transportation sector with its annual Undergraduate Summer Internship in Transportation. A high percentage of the Institute's undergraduate fellows continue their studies in transportation research. In FY2008, 28 students participated in AI, 6 of which were part of the Undergraduate Summer Internship in Transportation program. The other 22 students were graduate and undergraduate students participating during the academic year.

Texas Pavement Preservation Center (TPPC)

The Texas Pavement Preservation Center (TPPC), in joint collaboration with CTR and the Texas Transportation Institute (TTI) of Texas A&M University, promotes the use of pavement preservation strategies to provide the highest level of service to the traveling public at the lowest cost.

This year, TPPC launched a mentoring program for students enrolled at the Harmony Science Academy (HSA). The Cosmos Foundation operates HSA, which is an organization of charter schools in Texas that encourages academic focus on the science and math fields. This year, professors at The University of Texas at

Austin worked with HSA high school students, challenging them to explore practical problems to pavement preservation challenges.

As a part of efforts to encourage academic excellence, this year both TxDOT and the Cockrell School of Engineering at UT Austin took part in the International Sustainable World Engineering, Energy, and Environment (I-SWEEEP) Project Olympiad. The event took place May 2008, in Houston, Texas. The TxDOT presented awards and the Cockrell School of Engineering offered future scholarship grants to selected students who presented engineering projects. More than 800 students from around the globe attended the conference, which was hosted by the Cosmos Foundation.



Dr. Yetkin Yildirim presents an I-SWEEEP 2008 award

In October, the 2007 Pavement Preservation Seminar was held at the Austin Convention Center in conjunction with the 24th Annual AGC of Texas Trade & Equipment

Show. The seminar offered academic presentations on a variety of pavement preservation-related topics, including chip seals, characterization and selection of HMA mixes for thin asphalt overlays, and the history and future of pavement preservation.

Interagency Contracts (IAC)

Through an IAC, CTR develops implementations based on research performed. CTR researchers will likely have more opportunities to assist TxDOT through IACs. During FY 2008, the contracted amount for the 18 IACs exceeded \$4.1 million.

The Austin IAC

Through Austin IAC, CTR provides technical assistance and staff extension to the Austin District via a series of identified tasks. The contract has 11 major tasks, primarily related to support of design plan scheduling, evaluation of the District Right-of-Way (R/W) process, pavement maintenance and rehabilitation project selection, traffic operations, and evaluation and implementation of ITS strategies. The design plan scheduling tasks include customization of the CTR Project Development System (PDS) Wizard for the Austin District. The Wizard is used to create a preliminary design plan schedule in minutes rather than hours (as required if done manually through Primavera). The Austin PDS Wizard has been updated with a new process for managing the Historic Bridge review process. Additional design plan activities and processes are being reviewed with Central Design Office staff. CTR has provided valuable insights regarding the District R/W process, which provides opportunities for reducing the time needed to acquire an

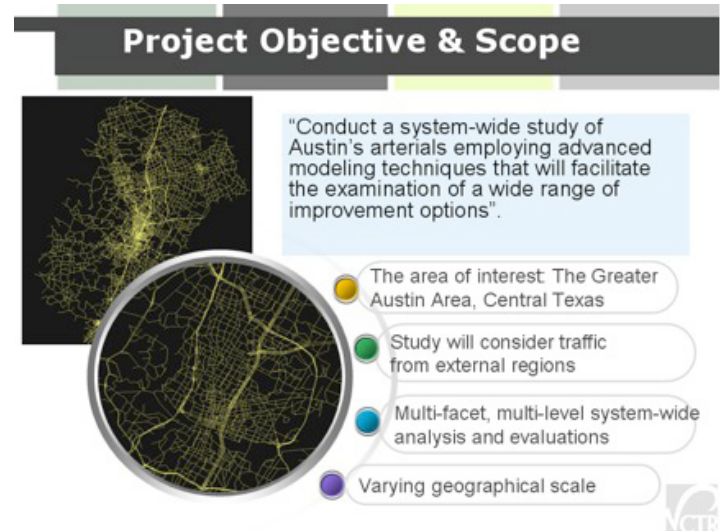
R/W parcel. The Pavement Preservation Maintenance Management system (PPMM) has been provided to the District Pavement Engineer and a plan for customizing PPMM for Austin applications has been developed. In addition, CTR will work with the Austin Maintenance Section to install pavement ice detection systems developed by CTR. Using ITS technology, the ice detection systems will transmit information about pavement icing conditions to the Austin ITS Monitoring Center and to Maintenance personnel in the field with laptops using specialized software and a mobile antennae.

System-level Analysis of Austin Arterials

This Austin IAC project focuses on employing cutting edge transportation modeling and simulation techniques to study central Texas arterial systems. As a result, a rigorous system-level analysis is possible, which permits the evaluation of a wide range of strategies to improve the congestion levels of central Texas. The sophisticated modeling allows for network-wide driver route-choice, and traffic and transit operational simulation, as well as precise dynamic traffic flow behavior. For the current year, new models are being calibrated that incorporate the entire bus route and schedule information for the region.

The Dallas IAC

CTR's Dallas IAC is one of the longest running partnerships between CTR and a TxDOT District and is responsible for providing technical assistance on a wide range of design, construction, and maintenance issues. The current IAC commenced on September 1, 2007 and will continue till August 31, 2010. It builds on our long



An example of an IAC's scope

experience of assisting the Dallas District with various technical analyses of construction-related mobility and economic impacts during the major reconstruction of US 75 corridor during the 1990s and the Dallas High Five project in the early 2000s. Through this IAC we have devised several innovative solutions to address complex mobility issues during reconstruction of major corridors in urban areas.

Our current IAC broadens the scope of our past work and consists of a wide range of activities to provide technical assistance to the Directors of Transportation Planning & Development, Construction, and Maintenance in Dallas. One such task consists of developing a comprehensive system to determine, track, and report the status of several hundred transportation projects in active project development phase. A typical TxDOT project spans several phases and can take as much as a decade from planning to construction. During this long process, the project evolves and its scope changes as the engineering plans mature. The CTR-devised system

consists of a model to first capture and then track the progress of different phases of the project development cycle through a critical-path method (CPM) schedule. The system uses off-the-shelf software with front-end customization. Since its successful development and implementation in the Dallas District, the system is being customized for statewide implementation.

Another important contribution of the Dallas IAC to TxDOT is the development of a sophisticated and automated database system to manage routine maintenance contracts (RMC). This system allows various management levels to plan and forecast budget projections, manage letting schedules, monitor contract time, and perform general RMC reporting functions. Coupled with the Pavement Performance and Maintenance Management (PPMM) system, this database is now providing much needed support to TxDOT in determining the maintenance and rehabilitation (M&R) strategies for various roadway sections and managing the maintenance budget in a more effective manner.

In addition, CTR is assisting the District in the construction of a large bridge/interchange project between President George Bush Turnpike (PGBT) and I-30 in Dallas by developing a 3D object-oriented model. The CAD model consists of objects for each significant construction element of the PGBT bridge and the interchange with I-30 and is capable of linking with a critical-path method schedule for easy evaluation of various phases of construction and their impacts on workzone mobility. In addition, this system provides a visual method of communicating the impacts of various constructability issues to regional stakeholders.

Transportation Planning and Research

A subsidiary of the TxDOT Cooperative Research Program, this program conducts research for TxDOT specifically in the areas of transportation planning, borders, ports, economic issues, and container shipping. Administered by CTR Deputy Director Rob Harrison, the program has recently addressed NAFTA trade corridors and inland ports, Texas-Mexico border trade issues, and the major markets served by the Texas gulf ports.

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 2008

- **Number of patron reference requests fulfilled:** Approximately 1,750 patrons were served.
- **Number of items cataloged:** Nearly 700 new items were added to the web catalog.
- **Web site enhancements:** Over 1000 PDFs of TxDOT materials were added to our web catalog.

Developing Resource Networks

The Manager of Library Services Louise Rosenzweig has continued her involvement this year with the Western Transportation Knowledge Network (WTKN). This year, WTKN members worked to establish guiding principles, by-laws, inter-Library loan guidelines,

and a WTKN website located at <http://wtkn.org/>. Goals of the WTKN are to share library resources and enable participants to develop common principles, standards, and cooperative agreements. Members are working to improve the transfer of information among member organizations.

In April, Louise Rosenzweig participated in a panel discussion on working in a special library. The UT student chapter of the Special Libraries Association hosted the discussion. This was a great opportunity to share the CTR mission of providing educational opportunities to students. In June, Louise attended the Special Libraries Association annual conference in Seattle. 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.

Additionally, library staff attended the annual Transportation Research Board conference in Washington D.C. in January. TxDOT and CTR were represented at events and meetings, and library staff participated in the Library and Information Science for Transportation (LIST) committee meetings and workshops.

Conference Participation

In October, CTR library staff participated in the Second Annual Pavement Preservation Seminar, sponsored by the Pavement Preservation Center. This seminar was held in conjunction with the 24th Annual Associated General Contractors (AGC) of Texas Trade and Equipment show. CTR pavement related research reports by Dr. Yetkin Yildirim and library brochures were on

display at the Austin Convention Center. Dr. Yildirim invited speakers from around the globe, including the Netherlands, Turkey, Penn State University, TTI, Texas Tech University, FHWA, and TxDOT. This was a great opportunity to promote the research of CTR and TxDOT as well as the services of the library.

The CTR Library staff also participated in Texas Motor Transportation Association (TMTA) Fleet Maintenance Council Fall Seminar in Kerrville, Texas. CTR research reports, library brochures and magnets were on display for this conference. The library provided supporting research on trucking in Texas. This outreach effort was another opportunity to reach a new audience to promote the CTR library and research.

Special Projects

Library staff worked on several special projects in the past year. Their goal was to make CTR research reports more accessible to library patrons. Library staff completed a digitization project in which older CTR/TxDOT research reports were scanned and digitized. Staff posted 976 PDFs for these older reports this year.

The Library Manager began a new project of sending CTR reports to the McKinney library for cataloging and inclusion into the UT Library catalog. This allows research materials to be available to a wider audience, as well as increase availability the UT community and inter-library loan community. About 520 reports were sent to the McKinney library in the past year.

Webinars

In 2008, there was an increase in the number of collaborative Internet webinars offered in the field of transportation librarianship. CTR Library staff participated in a number of sessions.

In October, the Transportation Librarians Roundtable (TLR), a monthly web conference series, an initiative of the National Transportation Library (NTL), co-sponsored by the American Association of State Highway and Transportation Officials (AASHTO), Transportation Research Board, and the Special Libraries Association's Transportation Division was launched. 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. Library staff participated in several Roundtable discussions.

In February, the Transportation Research Board sponsored *Fast Lanes on the Transportation Information Superhighway* webinar that explored techniques and tips on how to search on the Internet for transportation-related information.

TxDOT Construction Division Customer Service Excellence Award

On July 18, Louise Rosenzweig, CTR Manager Library Services, was presented a customer service award in appreciation and recognition for outstanding customer service, leadership, attitude, technical skills in literary research, and accuracy in library services.

Initiatives FY 2009

In the coming year, the library is looking forward to April DeRome joining the staff. Her skills in digital library development will be utilized to bring enhancements to the catalog and Web site. Staff will investigate ways to bring Web 2.0 networking enhancements to library patrons. A project is planned to digitize older TxDOT materials in the archive to make the libraries collection available to patrons electronically.

The CTR Library will continue to expand its participation in transportation knowledge networks to stay in the forefront of transportation information services.

Awards and Recognition

Faculty and Researcher Awards

Dr. Chandra Bhat received the CCTexITE Student Chapter Advisor Award for 2008. This award recognizes the outstanding faculty advisor of a student chapter of the Texas Institute of Transportation Engineers (TexITE). Dr. Bhat was also selected to represent The University of Texas at Austin for the 2008 Jefferson Science Fellows program. Further, he received the Wilbur S. Smith Distinguished Transportation Educator Award from the Institute of Transportation Engineers for his "outstanding contribution to the transportation profession by relating academic studies to the actual practice of transportation." Along with co-authors Dr. Jessica Guo, and Ph.D. student Rachel Copperman, Dr. Bhat received the 2007 Pyke Johnson Award from the Transportation Research Board (TRB) for their outstanding paper in transportation systems planning and the environment.

Dr. James Jirsa was named an American Concrete Institute Honorary Member for his outstanding accomplishments in the research areas of design, behavior, and durability of concrete structures including repair and strengthening of structures, and for his leadership in improving the institute's international relationships.

Dr. Kara Kockelman received the 2008 Woman of the Year Award from the Women's Transportation Seminar's (WTS) Heart of Texas Chapter. This award honors a leader in the field of transportation who has advanced the reputation and credibility of women in the field.

Dr. Randy Machemehl received the 2008 Wilbur S. Smith Award from the Transportation and Development Institute of the American Society of Civil Engineers for his contributions to transportation engineering as a teacher, researcher, and research administrator.

Dr. Lance Manuel and Patrick Ragan (2007 MS graduate) received a Best Journal Paper Award from the American Society of Mechanical Engineer's Technical Committee on Wind Energy for their paper, "Statistical Extrapolation Methods for Estimating Wind Turbine Extreme Loads" (Journal of Solar Energy Engineering, Transactions of the ASME, Vol 130, August 2008).

Dr. C. Michael Walton was elected chairman of the Texas Department of Transportation's "2030 Committee."

Dr. Jorge G. Zornberg received the Achievement Award from the Mexican Chapter of the International Geosynthetics Society.



UT Professor Dr. Kara Kockelman (L) receives the Women's Transportation Seminar (WTS) Woman of the Year 2008 Award from WTS Recognitions Chair, Ashley McLain (R), of Cox/McLain Environmental Consulting

CTR Symposium Highlights

CTR hosted its annual symposium on April 2, 2008. There were more than 160 participants. The theme of this year's symposium was "Moving Texas Forward."



These distinguished speakers formed a keynote panel discussion, entitled Partnering for Progress, moderated by Dr. C. Michael Walton, Professor at UT's Cockrell School of Engineering:

- Neil J. Pedersen, Administrator, Maryland State Highway Administration
- Wes Lum, Chief, National Liaison, Division of Research and Innovation, Caltrans
- Michael Morris, Director of Transportation, North Central Texas Council of Governments (NCTCOG)
- T. Peter Ruane, President and CEO, American Road and Transportation Builders Association (ARTBA)

The Mac Shelby Award for outstanding TxDOT Project Director was presented to Janie Temple, Analysis Branch Manager in the Traffic Analysis Section of TxDOT's Transportation Planning and Programming Division. The M. D. "Mac" Shelby Award is presented annually by CTR to honor a TxDOT Research Project Director who has provided exceptional leadership. Recipients of the award demonstrate leadership, technical expertise, ability to address special challenges, and dedication to research. Mac Shelby's son, Don, presents

the award at CTR's Symposium each year. Ms. Temple received the award based on her work with Project 0-5667, *Analysis and Guidelines for Establishing Unified Urban Land-Use and Transportation Planning Framework and Procedures*.



Don Shelby presents the Mac Shelby award to Project Director Janie Temple

Breakout Session Topics

- *Preserving Pavement Assets: Pay Now or Pay Later?* presented by Dr. Zhanmin Zhang, UT's Cockrell School of Engineering
- *3D/4D Modeling on the President George Bush Turnpike-IH30 Interchange* presented by Dr. William O'Brien, UT's Cockrell School of Engineering and Brian Barth, Director of Transportation Plan-

ning & Development for TxDOT's Dallas District

- *Fracture Critical Bridges: Are They Really Critical?* presented by Dr. Karl Frank, UT's Cockrell School of Engineering
- *Saving Money through Rigorous Research: The Case of Right-of-Way Cost Estimation* presented by Dr. Kara Kockelman, UT's Cockrell School of Engineering
- *Infrastructure Planning in Mexico* presented by Nathan Hutson, CTR
- *Creating an ITS Vision for Your District* presented by Dr. Zhong Wang, CTR



*TTI's "Doc" Burke and CTR Director
Randy B. Machemehl*

Affiliated Research Centers

Center for Electromechanics (CEM)

UT's Center for Electromechanics is one of the world's leading university-based research centers developing new concepts and technologies for the generation, storage, and use of electric and mechanical power. FY 2008

saw the following accomplishments for CEM:

- Commissioned the first plug-in hybrid bus with hydrogen fuel cell range extender that is licensed to operate in the State of Texas. Under a USDOT program, completed eight months of vehicle performance evaluation. Concurrently developed modeling techniques to accurately predict hybrid bus performance on varied routes and operation conditions.
- Developed and published simulation approaches to compare flywheels, batteries, and ultracapacitors as energy storage with both fuel cells and hydrogen internal combustion engines on actual bus routes
- Demonstrated performance and reliability of active suspension systems on military vehicles
- In collaboration with The Gas Technology Institute, installation of the first hydrogen vehicle refueling station in Texas has begun. The zero-emission bus and hydrogen fueling station at the University's J.J. Pickle Research Campus will be the foundation for an 'early-adopter' program for assessing newly-commercialized hydrogen vehicles and fueling systems.

Center for Research in Water Resources (CRWR)

CRWR serves as the central focus for environmental and water resources research at the university and works with CTR and TxDOT to analyze such issues as they pertain to transportation.

During FY 2008, CRWR researchers participated in three active projects funded by TxDOT.

Drs. Joseph Malina, Randall Charbeneau, and Michael Barrett participated in the following active projects.

- 0-4875: *Minimum Longitudinal Grade at Zero Cross Slope in Superelevation Transition*
- 0-5492: *Hydraulic Performance of Bridge Rails and Traffic Barriers*
- 0-5220: *Investigation of Stormwater Quality Improvements Utilizing Permeable Pavement and/or the Porous Friction Course (PFC)*

The fiscal year also saw the CRWR publication of this transportation-related research paper:

- Online Report 08-3: *Stormwater Quality Benefits of a Permeable Friction Course*, Christina E. Stanard, M.S.E., Michael E. Barrett, Ph.D., Randall J. Charbeneau, Ph.D. May 2008

CRWR and the Environmental Systems Research Institute, Inc. (ESRI) have established a consortium for developing and implementing new Geographic Information System (GIS) capabilities in water resources. The consortium is headed by Dr. David R. Maidment, Director of CRWR, and supported by software development staff at ESRI. Each year since 1994, CRWR presented a GIS Hydro PreConference Seminar at the ESRI User Conference, most recently on August 3, 2008.

Construction Industry Institute (CII)

CII is a research consortium based at UT Austin whose mission is to enhance the business effectiveness and

sustainability of the capital facility life cycle through research. FY 2008 developments included:

- A year-long celebration of CII's 25th anniversary, highlighted by its popular Annual Conference in August. That conference, with its theme of "Shaping the Future: Leveraging 25 Years of Industry Leadership," featured new research and outstanding speakers from industry and academia.
- Membership has grown to a record 116 and represents the leading organizations from the owner, contractor, supplier, and government sectors as well as several international companies.
- The CII Executive Leadership Program, a three-week program conducted in association with UT's McCombs School of Business and designed to help nurture and prepare the leaders of tomorrow, held its third annual session in Austin and is now being recognized as one of the best programs of its kind in the nation.

Construction Materials Research Group (CMRG)

CMRG seeks to integrate education for civil engineers with advancement in construction materials technology.

Located at the J.J. Pickle Research Center, CMRG annually works with graduate students in the pursuit of research to advance construction materials technology and concrete durability. Projects funded by TxDOT in 2008 included:

- *Sulfate Resistance of Concrete Exposed to External Sulfate Attack* (0-4889)

- *Extending Service Life of Large or Unusual Structures Affected by Premature Concrete Deterioration (0-5218)*
- *Influence of Verification Cores on Point Bearing Capacity of Drilled Shafts (0-5825)*
- *Durability Evaluation of Post-Tensioned Concrete Beam Specimens after Long-Term Aggressive Exposure Testing (0-4562-2)*

Ferguson Structural Engineering Lab (FSEL)

The Phil M. Ferguson Structural Engineering Research Laboratory (FSEL), the largest facility of its kind in the world, continues to pursue its mission: to conduct research for improving the analysis, design, and construction of buildings, bridges, and special structures.

During FY 2008, researchers at FSEL participated in 15 active TxDOT-funded projects. Topics included evaluating the redundancy of steel bridges, fatigue life of traffic structures, design for safe and economical construction, extending service life of large structures, corrosion resistance, and prediction models for the behavior of concrete over time. Recently published reports include:

- *The Effects of Liquid Nitrogen on Concrete Properties (0-5111-1)*
- *Prediction Model For Concrete Behavior (0-4563-1)*
- *Design Considerations for MSE Retaining Walls Constructed in Confined Spaces (0-5506-1)*
- *Effects of Increasing the Allowable Compressive Stress at Release of Prestressed Concrete Girders (0-5197-1)*



FSEL researchers measure humidity in concrete mixtures. Picture from report 0-5111-1.

For the coming FY 2009, Dr. Oguzhan Bayrak will become FSEL's new director.

Appendix A: FY 2008 Funding Sources

TxDOT Research Projects

Project Title	Project Number (if applicable)
1. TxDOT TAP Agreement	0-1755-CT08
2. Corrosion Resistance of Grouted Post-Tensioning Systems	0-4562
3. Minimum Longitudinal Grade at Zero Cross Slope in Superelevation Transition	0-4875
4. Sulfate Resistance of Concrete Exposed to External Sulfate Attack	0-4889
5. Noise Level Adjustments for Highway Pavements in TxDOT	0-5185
6. Continuing Research on Allowable Design Release Stresses for Prestressed Concrete Beams	0-5197
7. Extending Service Life of Large or Unusual Structures Affected by Premature Concrete Deterioration	0-5218
8. Investigation of Stormwater Quality Improvements Utilizing Permeable Pavement and/or the Porous Friction Course (PFC)	0-5220
9. D-Region Strength and Serviceability Design	0-5253
10. Development of Simple Bridge Deck Details at Expansion Joints	0-5367
11. Rehabilitation Procedures for Longitudinal Cracks and Joints Separation in Concrete Pavement	0-5444
12. Project Level Performance Database for Rigid Pavements in Texas	0-5445
13. Hydraulic Performance of Bridge Rails and Traffic Barriers	0-5492
14. Tracking the Performance of HMA Mixtures in Texas	0-5496
15. Development of a Flexible Pavements Database	0-5513
16. Beneficial Use of Scrap Tire Bales in Highway Projects	0-5517
17. Horizontal Cracking in Concrete Pavements	0-5549
18. Curved Plate Girder Design for Safe and Economical Construction	0-5574
19. Analysis and Guidelines for Establishing Unified Urban Land-Use and Transportation System Planning Framework and Procedures	0-5667
20. Comprehensive Planning and Design Guidelines for Incorporating a Bus Rapid Transit Scenario to the Analysis of Texas Highway Corridors	0-5668
21. Impacts of Dray system Along Ports, Intermodal Yards and Border Ports of Entry	0-5684
22. Utilizing the Data Collected at Traffic Management Centers for Planning Purposes Through Non-Traditional Sources and Improved Equipment	0-5686
23. Cross-Frame and Diaphragm Layout and Connection Details	0-5701

Project Title	Project Number (if applicable)
24. Impact of Overhang Construction on Girder Design	0-5706
25. Improving Capabilities of Automated Distress Rating	0-5708
26. Synthesis Study of Programs Used to Reduce the Need for Inspection Personnel	0-5799
27. Development of Application Guide and Specifications for Geotextiles in Soil and Base	0-5812
28. Correlation of Shallow, Low Blow Count Texas Cone Penetrometer Values and Shear Strength for Texas Soils	0-5824
29. Influence of Verification Cores on Point Bearing Capacity of Drilled Shafts	0-5825
30. Best Practices for Concrete Curb and Gutter	0-5830
31. Bursting and Shear Behavior of Prestressed Concrete Beams With End Blocks	0-5831
32. Develop Mechanistic/Empirical Design for CRCP	0-5832
33. Arterial Intelligent Transportation Systems-Infrastructure Elements and Traveler Information Requirements	0-5865
34. Quantifying the Transportation Network Effects on Investment Risk Measures for Toll Feasibility Analysis - TTI Lead	0-5881
35. Feasibility of Speed Harmonization and Peak Period Shoulder Use to Manage Urban Freeway Congestion	0-5913
36. Development of Potential Policies and Incentives to Encourage Movement of Containerized Freight on Texas Inland Waterways - TTI Lead	0-5937
37. Emerging Trade Corridors and Texas Transportation Planning	0-5973
38. Estimating Texas Motor Vehicle Operating Costs	0-5974
39. Evaluating Mexican Transportation Planning Processes and Implications for Texas Transportation Assets	0-5985
40. Planning and Financing Tools for Rural/Small Urban Area Projects	0-6034
41. Alternatives to Asphalt Concrete Pavement Subbase for Concrete Pavement	0-6037
42. Estimated and Actual Usage of Toll Facilities	0-6044
43. Laboratory Evaluation of Influence of Operational Tolerance (Acceptance Criterion) on Performance of HMA	0-6045
44. Soil Testing Using Centrifuge Technology	0-6048
45. Reporting, Publications, and Information Services in Support of Research	0-9803-08
46. Coordination of Administrative Services of TxDOT's Program	0-9903-08
47. Investigation of the Fatigue Life of Steel Base Plate to Pole Connections for Traffic Structures	9-1526
48. Methods of Evaluating the Redundancy of Steel Bridges	

TxDOT Implementation

Project Title	Project Number (if applicable)
1. Complete Implementation of Electronic Appraisal System	5-1523-03
2. Construction and Evaluation of Post-Tensioned Prestressed Concrete Pavement	5-4035-01
3. Bridge Strengthening Through the Use of Post-Installed Shear Connectors	5-4124-01
4. Implementation of the Right of Way and Utility Adjustment Duration Planning Tool	5-4617-01
5. Pilot Implementation to Quantify the Benefits of Using Geosynthetics for Unbound Base Courses	
6. Implementation of Ice Detection Equipment for Pavements and Bridge Decks	5-4834-01
7. Pilot Implementation of New Test Procedures for Curing in Concrete Pavements	5-5106-01
8. Measuring Access to Transit Service	5-5178-01
9. Implementation of the Use of Higher Micro-Fines in Concrete Pavements	5-9029-01
10. Pilot Implementation of a Web-Based GIS System to Provide Information for Pavement Maintenance Decision-Making	5-9035-01
11. Reporting, Publications, and Information Services in Support of Implementation	5-9803-08

Interagency Contracts

Project Title	Project Number (if applicable)
1. Forensic Evaluations of Concrete Pavement	06-0173
2. Rolling Dynamic Deflectometer (RDD) Testing in Houston, Texas	08-701
3. Austin Arterial Technical Assistance and Modeling	14-8XXIA003
4. FY07-09 Technical Assistance to the Austin District	14-8XXIA004
5. Technical Services to the Dallas District of Texas Department of Transportation for FY 2008-10	18-7XXIA004
6. Rolling Dynamic Deflectometer (RDD)/Stationary Dynamic Deflectometer (SDD) Support	46-08PIA023
7. Technical Support and Training Services for the Texas Department of Transportation Construction Division	46-7CSIA001
8. Perform Geological Studies & Tests 08	4608MIA002
9. Flexible Pavement Branch 08	4608MIA005
10. Bending Stiffness Test for Geogrid	4608MIA007
11. Information Systems Support for Load Zone Analyses and Pavement Data Collection Request Management	4608PIA021
12. RDD 08	4608PIA023
13. Traffic Materials Testing Support	467MTIA003
14. Technical Support for Rigid Pavements and Concrete Materials Branch	467MTIA004
15. Programming for Laboratory Equipment and Further Development of the Laboratory Information Management System	467MTIA008
16. Tasks for Field Survey and Evaluation of Premature Deteriorated Concrete Bridges	467MTIA009
17. Evaluation of Long-Term Durability of Concrete	467MTIA011
18. Tx Pavement Preservation Center	475XXIA003
19. TxDOT Needs Assessment IAC	75-8XXIA-004
20. TxDOT Needs Assessment	75-8XXIA004

SWUTC

Project Title	Project Number (if applicable)
1. Analysis of Children's After-school Activity and Travel Patterns	167270
2. A Scoping Study of the Impacts of Bioenergy and Alternative Fuels on the Southwest Region's Economy and Transportation Infrastructure	167271
3. Microsimulation for Coupled Models of Travel & Location Choice: Applications to Green House Emissions	167272
4. Development of a Transferable Public Transportation Ridership Forecasting Methodology and Tool	167273
5. Towards an Integrated Robust Highway Design Approach	167274
6. Quantifying Travel Time Variability in Transportation Networks	167275
7. Future Travel Demand and It's Implications for Transportation Infrastructure Investments in the Texas Triangle	167276
8. Develop A System to Support Preparation of Life-Cycle Budget Needs for Highways	167277
9. Technology Support	167278
10. Advanced Institute for Transportation Infrastructure Engineering and Management	USDOT 473700-00061
11. Monitoring U.S. Safety Rules for Mexican Trucks	USDOT 473700-00067
12. Evaluating Mexican Truck Safety at the Texas/Mexico Border	USDOT 473700-00071

Unique Projects

Project Title	Project Number (if applicable)
1. Cosmos Foundation	
2. Land Use Model Development, Activity Model Review and Program Administration	
3. Bus Use of Freeway Shoulders	08-658
4. Improving Our Understanding of How Highway Congestion and Pricing Affect Travel Demand	173047A
5. ARA Subcontract No. 18227-UT-00	18227-UT-00
6. Evaluation of Long Term Behavior of Pavement layered Materials by means of Accelerated Pavement	26827048
7. Jennifer Duthie Eisenhower Graduate Fellowship FY08	DDEGRD07X00412
8. Rachel Copperman Eisenhower Graduate Fellowship FY08	DDEGRD07X00413
9. Lauren Gardner Eisenhower Graduate Fellowship FY08	DDEGRD07X00426
10. Jason Lemp Eisenhower Graduate Fellowship	DDEGRD07X00429
11. Bin Zhou Eisenhower Graduate Fellowship	DDEGRD07X00440
12. Allison J. Conway Eisenhower Graduate Fellowship FY08	DDEGRD07X00441
13. Stephen Boyles Eisenhower Graduate Fellowship FY08	DDEGRD07X00442
14. Jeffrey LaMondia Eisenhower Graduate Fellowship FY08	DDEGRD07X00459
15. Buses Using Freeway Shoulders in Central Texas (Capital Metro Study)	UTA08-658