texite Research Digest

District 9 of the Institute of Transportation Engineers

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The Importance of Research…

to the Local Traffic Engineer…

by Paul Luedtke

What the local traffic engineer needs from the research community – three things. First, tools for the most basic everyday problems; second, materials that last longer; and third, truly advanced signal system hardware and software that makes it less labor intensive to maintain good equipment and good timing. The primary thing for researchers to remember is to stay in constant communication with local traffic engineers and always be mindful of the practical implications of what they are recommending.

Basic Tools: There is a need for a continuous compilation of a sort of toolbox of "how to's" and "why should I's" that address such questions as: What are the long term effects of installing speed humps in a city? What are the resulting implications of various speed hump policies? Where is a guardrail appropriate along a curb and gutter roadway? How do you design a grade separation in an urban environment? Which are better – loops or cameras? How do I set speed limits in an urban environment and still keep my job?

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to the Consulting Traffic Engineer…

Everything we do as consulting engineers is based on someone's research, and if we are really lucky, some of the work we are doing will be the basis for the work of future generations in traffic and transportation engineering. Research is the basis for the Manual on Uniform Traffic Control Devices, the ITE Manual, TRB and the underpinning of all the safety protocols that we observe.

Ted Abrahamson, Abrahamson & Associates, tells us that research is what he relies on to do his work whether it is in designing a project, writing a report or giving a deposition. He says, *"My library shelves contain over 400 lineal feet of textbooks, magazines, reports and other literature I use to not only find out about particular subject matter, but also to find out who is in agreement with whom . . . I have worked in most every state in the United States and five foreign countries so it is necessary for me to know who says what about certain subjects no matter where they actually work."*

When asked about research in his work, **Federico Mendoza, PE**, Brown & Gay Engineers, said the following: *"Research is probably at the heart of everything we do in terms of the tools we use as a result of research, whether*

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Check it out!

This edition of the TexITE Newsletter is a Research Digest featuring Texas-based research efforts and other transportation-related resources. We hope that it will serve as a valuable resource for you! But, we need your feedback – What can we do to make the Research Digest edition even better for next year? Send your comments and feedback to dena.jackson@rsandh.com.

Message from the International Director

by Jim Carvell

TRAFFIC SIGNAL OPERATION SELF-ASSESMENT
ITE, in cooperation with other agencies, is administering a self-assessment of traffic signal operations. Obviously, the assistance of the operating agencies is essential. The information collected will assist in communicating traffic signal needs to decision makers and make a case for increased funding. This will not be a report card of individual agencies and responses will be kept confidential. Many agencies may have already received information on this important initiative and I encourage those agencies to respond. If your agency has not received notice, go to http://ite.org/selfassesment for information.

ITE 2005 TECHNICAL CONFERENCE AND EXHIBIT
This conference will be held February 27–March 2, 2005 at the Flamingo Las Vegas Hotel • Las Vegas, NV. The theme of the conference is: *Mobility Now! Get Moving with Transportation Management and Operations*. This is the first of the mid-year conferences to be moved inland from Florida or California in a number of years. The 2005 conference will be held in San Antonio. Abstracts for consideration of papers are due September 30. See details at the ITE web site: http://ite.org/meetcon/.

ITE COUNCILS
ITE has eleven "area-of-practice" councils available for individual membership. These councils allow individual members to share their expertise in the development of practices, standards, reports, handbooks, and other materials that guide our profession. For specific information on ITE Councils, go to http://ite.org/councils/. Participation in these councils can be very rewarding as you come in contact with other professionals who share your interests and you contribute to the technical aspects of our profession.

PROFESSIONAL DEVELOPMENT PROGRAM COURSES ON CD-ROM Development of these four courses has been funded by contributions to

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Better Materials: One of the largest ongoing costs in both labor and materials is in replacing faded signs, worn out and missing thermoplastic and missing pavement markers. Anything the research community can develop to make any of these materials last longer or make installation faster would greatly reduce these costs and result in a more visible product to the public.

Better Signal System: A lot of discussion has been given to ITS in the past fifteen years but far too little of that has been focused on what local municipalities (and every citizen) use every day – a signal system. With the advances in hardware and communications we should be far further along than we are now in terms of using truly next generation signal control. A truly intelligent signal timing that gets away from the creative confinement institutionalized in rings and barriers and cycle split and offset. Surely we can come up with something better. We have the tools and we have the great minds, let's put forth an initiative that develops something truly remarkable.

Technical Committee Chair Message

by Rick Collins, P.E.

TxDOT has been considered a leader in research for many years. The annual research budget is just over $20 million dollars. While the research program is developed primarily by TxDOT employees and university researchers to address TxDOT needs, we would be interested in hearing ideas from TexITE members.

TxDOT is responsible for seeing that research projects that address the needs of the Department are selected and monitored by a panel of experts so that well documented results are obtained. Research project statements are prepared and/or reviewed by Technical Assistance Panels (TAPs) and recommendations for funding are made to the Research Management Committee (RMC) which then decides which projects will get funded. TxDOT places a large emphasis on implementing recommendations from research that will result in positive benefits (for example, reduced crashes, better materials or construction practices, or improved operations) for Texas.

TexITE can help to foster research and technology implementation exchange by staying tuned in through the Technical Committee. A research program schedule can be placed in a TexITE newsletter or on the TexITE website. Regular communication between the TxDOT Research and Technology Implementation Office addressing proposed, ongoing, and recently completed research can take place. TxDOT fosters research and information exchange by regular communication about research results with Department personnel. In addition, TxDOT has a $5 million annual program devoted specifically to implementation of research. The

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Legislation News

TEA-21 Reauthorization

Conference Committee members from the House and Senate have met several times during the months of June and July. Major discussions at this time have focused only on overall funding level. The current proposal from the Senate is $301 billion over six years in contract authority, with $289 billion in guaranteed funding. The House has submitted a counter-offer of $299 billion in contract authority over six years, with $284 billion in guaranteed funding. House leaders claim that this figure is the highest that will be approved by the President. Conferees were unable to come to an agreement, and in fact did not even vote on the overall funding level. They instructed staff to look at how key issues, such as rate of return, would be affected by each different funding level.

Congress will return September 7, 2004 after a six-week recess for the national presidential-nominating conventions and a district work period. The conferees will meet again in September to finalize a funding agreement. Once there is an agreed upon funding level the Conferees can begin working on other controversial, but important issues such as rate of return and MPO planning funds.

Before leaving Washington in July, both the House and Senate passed another short-term extension to TEA-21, which would extend most transportation programs through September 30, 2004. Primary apportioned highway formula programs are extended through September 24, 2004. The difference in deadlines is due to an attempt to get a selected group of high priority projects authorized before the end of Fiscal Year 2004.

This extension will give Conferees only three weeks to reach agreement and have a reauthorization bill passed and sent to the President before they adjourn for the campaign season. If an overall funding agreement cannot be reached quickly, look for key transportation leaders in Congress to begin drafting a long-term extension to TEA-21.

Specific provisions approved by the surface transportation authorization conference committee can be viewed at http://epw.senate.gov/. To keep up-to-date on progress made towards a reauthorization bill, visit http://www.dfwinfo.com/stayinformed.html

National News

Retroreflectivity – Federal Notice of Proposed MUTCD Revision

On July 30, 2004, the FHWA published a Notice of Proposed Amendments to the MUTCD regarding Sign Retroreflectivity. These amendments are designated as PROPOSED Revision No. 2 of the 2003 MUTCD. Please visit the MUTCD website (http://mutcd.fhwa.dot.gov) to view the Federal Register notice dated July 30, 2004, which describes the proposed changes and the reasons for them, and also to view the text of the proposed Revision No. 2 MUTCD changes. The MUTCD text references a supplemental document on maintaining sign retroreflectivity. This document is contained in an appendix to the Federal Register notice and can also be accessed at http://safety.fhwa.dot.gov/fourthlevel/sa03027.htm. The comment period for the proposed rule extends to October 28, 2004. FHWA has also posted some supplemental documents to the docket. These documents can be accessed at http://dms.dot.gov and searching for the docket number (15149). After the comment period closes, FHWA will evaluate the comments and determine how to proceed with a final rule.

Access Board Issues New Guidelines for Accessible Design

The U.S. Access Board has released new design guidelines that cover access for people with disabilities under the Americans with Disabilities Act (ADA) of 1990. The guidelines detail how accessibility is to be achieved in new construction and alterations; and provide specifications for various building elements and spaces, including entrances, ramps, parking, restrooms, and telephones, among others. The new design document updates the Board's ADA Accessibility Guidelines that were first published in 1991.

TechBrief – A Review of Signalized Intersections: Informational Guide

The Federal Highway Administration has released a TechBrief on its signalized intersection informational guide that will be published this fall. The Signalized Intersections: Informational Guide will provide methods for evaluating the safety and operations of signalized intersections and tools to remedy deficiencies. Copies of the TechBrief may be obtained from the FHWA Report Center by e-mail (report.center@ fhwa.dot.gov), fax (301-577-1421), phone (301-577-0818), or online (www.tfhrc.gov/safety/intersect.htm).

An Overview of Transit Signal Priority

ITS America has released an updated edition of "An Overview of Transit Signal Priority," an introductory guide to implementing transit signal priority. The guide addresses the issues, pitfalls, and potential solutions pertaining to transit signal priority implementation.

Texas Research Agency News

Texas Transportation Institute at Texas A&M University

Recent articles in Volume 40, Number 2 of the *Texas Transportation Researcher* include:

- The Back Road
- Focusing on Implementation
- TTI Council rides the rail
- TTI Advisory Council
- Transportation leaders selected for Hall of Honor induction
- Dallas High Five
- Exploding Roads
- HOT Challenges on Houston's HOV Lanes
- Bridging the Gap Between Box-Beam and Concrete Barriers
- Cars that go bump in the night… and day
- Smart Course for Smart Growth
- Stemming the tide
- Safety, reasonable access and mobility
- Workshops aimed at shrinking travel time, improving safety

Paul Krugler, who recently retired from TxDOT to serve as manager of research implementation for TTI, states, "TTI continues to focus on helping TxDOT and other agencies implement research results. The institute currently has 19 implementation projects with TxDOT, and TTI looks forward to assisting in many more projects. To help promote implementation activities, the institute established the manager of research implementation position. This position will assist researchers and sponsors in exploring new and innovative approaches to implementation."

More information is available online at http://tti.tamu.edu/researcher/news letter.asp?vol=40&issue=2&article=0.

Center for Transportation Research at The University of Texas at Austin

Recently published research reports available on the CTR website:

- Enhancements to IGIDS to Import Data from GEOPAK Designs, Interface with PASSER II-90, Update the HCM Chapter 9 Procedures, and Update the Training Materials. Investigators: Thomas W. Rioux, Robert F. Inman, and Randy B. Machemehl
- Frontage Roads in Texas: Legal Issues, Operational Issues, and Land Use Distinctions. Investigators: M. Kockelman, Randy Machemehl, Aaron Overman, Marwan Madi, Jacob Sesker, Jenny Peterman, and Susan Handy
- Activity-Based Travel Demand Modeling for Metropolitan Areas in Texas: Software-related Processes and Mechanisms for the Activity-travel Pattern Generation Microsimulator. Investigators: Chandra R. Bhat, Jessica Guo, Sivaramakrishnan Srinivasan, Aruna Sivakumar
- Integration of Point-Based and Link-Based Incident Detection and Traffic Estimation. Investigators: Hani S. Mahmassani, Carl Haas, Haitham Logman, Hyun-Joon Shin.

Some research in progress includes the following: quiet pavements; a potential partnership with W. R. Meadows to increase the life of pavement by testing sealants with higher reflectivity; and a study to test object-sensing devices and software that steers cars out of danger.

More information is available online at www.utexas.edu/research/ctr.

Center for Transportation Training & Research at Texas Southern University

The Center for Transportation Training and Research focuses studies in the areas of sustainable transportation, intermodalism, and improved mobility and accessibility. Recent research and research in progress includes the following:

- An Analysis of Texas Speed Limit Laws. Principal Investigator: Ronald Goodwin and Sharon Boxill
- The Integration of GIS and Transportation Modeling: A State-of-the-Practice. Principal Investigator: Sharon A. Boxill
- An Assessment of Criteria for Transit-Friendly Decision Making. Principal Investigator: Thabo Moeng and Dr. Carol Lewis
- SH 225 Feasibility Study. Principal Investigator: Dr. Carol Lewis
- Public Transportation: Study for Ft. Bend County with The Goodmen Corporation. Principal Investigator: Dr. Carol Lewis
- "Case Study Analysis of Urban/Rural Area Toll Road Options." Principal Investigator: Dr. Carol Lewis
- 3-D Traffic Simulation Demonstration Lab. Principal Investigator: Sharon A. Boxill
- Organizational and Political Structures of Transit-Oriented Development. Principal Investigator: Dr. Carol Lewis
- Transportation Scholars Program. Principal Investigator: Khosro Godazi

Selected abstracts of CTTR research are available online at http://www.tsu.edu/academics/science/program/transportation/CTTR/projects.asp

University of Texas at Arlington

UTA's Department of Civil and Environmental Engineering (CEE) has partnered with the UTA School for Urban Public Affairs (SUPA) on a TxDOT project, "Developing a Comprehensive Pricing Evaluation Model for Managed Lanes." **Drs. Sia Ardekani**, **Shekhar Govind**, **Stephen P. Mattingly** and **Jim Williams** from the Department of CEE are participating in the project. This project involved conducting a stated preference survey in the Dallas-Fort Worth region and using this data to calibrate a new model. This new model analyzes current freeway demand levels to determine the optimal toll price for a high occupancy toll (HOT) lane based on different objectives. A UTA CEE Ph.D. student, **Auttawit Upayokin**, is working on this project and helping to write a paper that will be given at the 4th International Conference on Decision-Making in Urban and Civil Engineering.

For a second TxDOT project, UTA CEE Department has formed a partnership with SUPA; the project is titled, "Projected Changes in Transportation Demand and System Needs." **Drs. Mattingly and Williams** from the Department of CEE are participating in the project. This project considers the performance of all transportation modes in the State of Texas, especially from an operational capacity perspective. This research expects to identify the problem locations in the Texas transportation system that require improvement. Two UTA CEE Ph.D. students, **Isaradatta Rasmidatta** and **Phong Vo**, are working on this project and helped write two papers that have been submitted for presentation at the Transportation Research Board (TRB) 84th Annual Meeting.

In a third project, the UTA CEE Department has partnered with the University of California, Irvine (UCI) Institute of Transportation Studies (ITS) on a California Partners for Advanced Transit and Highways (PATH) Project, "Institutional Approaches for Interjurisdictional System Management." **Dr. Mattingly** is working with another Ph.D. student, **Saty Satyamurti**, on this project, which involves developing guidelines for crafting interjurisdictional agreements that pertain to system management. Oftentimes, system management strategies may fail because the interjurisdictional agreements are unclear or improperly structured to meet the system's needs. One paper from this project has been sent for presentation at the TRB 84th Annual Meeting.

Texas A&M University

Dr. Mark Burris is concentrating his research efforts on understanding traveler behavior, particularly the impact of pricing on travel behavior. Currently his research team is finishing a 2.5 year project on the High Occupancy/Toll lanes in Houston where one of their primary objectives is to optimize the use of those lanes through appropriate price and occupancy restrictions. To do this, one needs a thorough understanding of the values travelers place on different travel options and how/why they choose different travel behaviors. This project, funded through the Federal Highway Administration's Value Pricing Pilot Project program, in conjunction with the Houston district of TxDOT and Houston METRO, has provided an excellent opportunity to gain additional knowledge in this area.

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it is capacity analysis, safety evaluations, roadway design or signal systems. Of course, the research has already been done on most of the tools we use on a regular basis—but that just speaks for itself about the importance of research and the challenge to always continue it."

David Halloin, PE, Kimley Horn, said, *"Without research we would have no ground to stand on when it comes to supporting our decisions and engineering practices. Safety is the most important thing to come from research, and the most important thing to focus on as a professional engineer. It is the foundation of our practice and the decisions we make, not to mention that it lowers our liability if we follow the practices which are proven through research to be sound."*

Rick J. Staigle, PE, PTOE, Traffic Engineers, Inc, believes that research is important. *"Research allows new ideas to be explored and documented. Without research, the profession would not evolve and would become outdated . . . Research allowed us to go from fixed time 2-phase controls to where we are today . . . We evolve or we face extinction."*

TexITE and ITE play a vital role in research in terms of information exchange at annual meetings and chapter meetings, support of university and professional research programs, encouragement to students through student chapter programs and scholarship programs, and to practicing professionals through technical committees.

Research is the lifeblood of what we do and what those who come after us will do in the future.

Announcements

Upcoming Conferences

- September 22-24, 2004. 9th National Conference on Transportation Planning for Small and Medium-Sized Communities, Colorado Springs, Colorado
- September 26-29, 2004. 2nd National Conference on Accelerated Pavement Testing, Minneapolis, Minnesota
- October 18-22, 2004. 11th World Congress on ITS, Nagoya, Aichi Japan
- October 20-23, 2004. ASCE Civil Engineering Conference and Exposition '04, Baltimore, MD
- October 24-27, 2004. 16th National Rural Public and Intercity Bus Transportation Conference, Roanoke, Virginia
- October 26-27, 2004. Future Truck and Bus Safety Research Opportunities Conference, Washington, D.C.
- November 1-2, 2004. National Household Travel Survey Conference: Understanding Our Nation's Travel, Washington, D.C.
- November 16-17, 2004. 7th Marine Transportation System Research and Technology Coordination Conference, Washington, D.C.
- November 18-20, 2004. Conference for Research on Women's Transportation Issues, Chicago, Illinois
- December 1-3, 2004. Conference on Managing Travel for Planned Special Events, New Orleans, Louisiana

Get Certified!

The next Professional Traffic Operations Engineer™ (PTOE) examination dates and locations are as follows:

October 23, 2004	Chicago, IL
	Hartford, CT
	Minneapolis, MN
	Phoenix, AZ
	Toronto, ON
December 5, 2004	Jacksonville, FL
December 7, 2004	University Park, PA
January 8, 2005	Washington, DC

The *PTOE Certification Program Refresher Course* and a sample examination are available on the ITE website. The Refresher Course provides an overview of topics, key references, and a brief independent study guide by topic. The sample exam includes 50 multiple-choice questions representative of those on the Professional Traffic Operations Engineer Certification Examination. For more information on becoming a certified PTOE, visit ITE online at www.ite.org.

Attention Younger Members!

The ITE Consultants Council is sponsoring a scholarship program for young professionals in the transportation industry.

Winners of this scholarship will be provided $1,500 in travel assistance to attend the ITE 2005 Annual Meeting and Exhibit in Melbourne, Australia. The award includes $1,500 in travel assistance and recognition at the ITE 2005 Annual Meeting and Exhibit, in the ITE Consultants Council newsletter and in the ITE Journal. Applicants must be 35 years old or younger, must be members of ITE and must practice in a transportation-related discipline relevant to ITE.

For information on submitting an application and relevant materials, visit http://www.ite.org/councils/consultants.asp. All application materials are due no later than October 1, 2004 and can be submitted electronically. Winners will be announced no later than January 28, 2005.

Guidelines for Using Video Detection at Intersections and Interchanges

by James Bonneson, P.E., and Montasir Abbas (Reprinted from TTI Project Summary Report 4285-S)

Video imaging vehicle detection systems (VIVDSs) are becoming an increasingly common means of detecting traffic at intersections and interchanges in Texas. This interest stems from the recognition that video detection is often cheaper to install and maintain than inductive loop detectors at multi-lane intersections. It is also recognized that video detection is more readily adaptable to changing conditions at the intersection (e.g., lane reassignment, temporary lane closure for work zone activities). The benefits of VIVDSs have become more substantial as the technology matures, its initial cost drops, and experience with it grows.

It is estimated that about 10 percent of the intersections in Texas currently use VIVDSs. The collective experience with the operation of these intersections has generally been positive; however, this experience is limited to a short amount of time (relative to the life of such systems). Moreover, experience with the design and installation of a VIVDS for intersection control has been limited. This limitation is due to the fact that most intersection control applications have been "turnkey" arrangements with the product vendors. Further increases in VIVDS application will require greater participation by TxDOT engineers in the planning, design, operation, and installation stages.

What We Did . . .

The objective of this project was to develop guidelines for planning, designing, installing, and maintaining a VIVDS at a new or existing intersection or interchange. This objective was achieved by conducting the following activities:

- Evaluating several VIVDS products with a focus on detection accuracy, system performance, and ease of set-up;
- developing guidelines describing when and how to use a VIVDS;
- and developing guidelines for detection design and detection layout.

The guidelines developed for this project address the use of VIVDSs to detect vehicle presence at a signalized intersection or interchange in Texas. The research does not explicitly address the use of a VIVDS to facilitate coordinated signal operation, beyond that needed to affect stop-line detection in support of such operation.

The manual (TTI Report 4285-2) was developed to help engineers determine when a VIVDS is appropriate, what functionality is needed, and how the detection components should be designed and operated. Information useful to signal technicians regarding VIVDS operations is presented in the handbook (TTI Report 4285-3).

What We Found . . .

Application Considerations

For signalized intersection applications, a VIVDS is most often used to provide vehicle presence detection in the vicinity of the stop line. The VIVDS cameras are mounted on the mast arm or on the mast-arm pole. A VIVDS is found to provide reliable presence detection when the detection zone is relatively long (approximately 40 ft or more). A VIVDS is sometimes used to provide advance detection on high-speed intersection approaches. However, some agencies are cautious about this use because of difficulties associated with the accurate detection of vehicles that are distant from the camera. Among those agencies that use a VIVDS for advance detection, the most conservative position is that it should not be used to monitor vehicle presence at distances more than 300 ft from the stop line. Experience with VIVDSs in Texas indicates that acceptable presence-mode operation is achieved at distances up to 500 ft.

A VIVDS is primarily used in situations where its high initial cost is offset by that associated with installing and maintaining inductive loop detectors. VIVDSs have been generally recognized as cost-effective, relative to alternative detection systems, in the following situations:

- when more than 12 stop-line detectors are needed at the intersection or interchange,
- when inductive loop life is short due to poor pavement or poor soil conditions,
- when extensive intersection reconstruction will last for one or more years,
- when the loop installation is physically impractical due to the presence of a bridge deck, railroad tracks, or underground utilities, and
- when the pavement in which the loop is placed will be reconstructed in less than three years or during overlay projects at large intersections where the cost of replacing all loops exceeds the cost of installing the VIVDS.

Design Considerations

Camera location is an important factor influencing detection accuracy. According to several VIVDS product manuals, an optimal

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New PASSER Program for Timing Signalized Arterials

by Nadeem A. Chaudhary, P.E., and Chi-Leung Chu (Reprinted from TTI Summary Report 4020-S)

Engineers working with the Texas Department of Transportation (TxDOT) and Texas cities, as well as consultants, use Progression Analysis and Signal System Evaluation Routine (PASSER) II for developing bandwidth-based signal timings for their signalized arterials. PASSER II was originally developed with TxDOT support more than 30 years ago. The optimization technology used in PASSER II is simple but efficient. In addition, it has proven to produce high-quality timings for signalized arterials. Furthermore, bandwidth-based timings are easily recognized and appreciated by motorists in Texas and many other parts of the United States.

PASSER II development, however, has not kept up with enhancements in Windows-based operating systems for personal computers. As a result, its use has declined in the last decade. During the same time, an easy-to-use Windows-based program, known as Synchro, grew in popularity. However, most TxDOT staff do not feel comfortable implementing timings developed by Synchro because the quality of signal timings produced by this program is not known. Traffic Network Study Tool (TRANSYT), version 7F, is another signal timing optimization program. It is popular in many states, excluding Texas.

TxDOT funded this two-year project to achieve two objectives. The first objective was to compare Synchro, TRANSYT 7F, and PASSER II-90 and to develop guidelines for selecting the right software for use in signal timing projects. Synchro and TRANSYT 7F develop timings to minimize a delay based objective function. PASSER II, on the other hand, optimizes timings to maximize arterial through progression. The second objective was to develop an enhanced version of PASSER II. These enhancements include a new Windows-based graphic user interface and improved optimization and analysis algorithms for arterials.

What We Did…

We divided the research and development work into two major tasks matching the two objectives. The following is a description of work performed under these tasks.

Task 1: Software Comparisons

For comparing the three programs, we used data from eight real arterials obtained from several agencies. Five of these arterials had five to six intersections. For each of these, we received one real volume scenario. In addition, we applied one reduction factor and one growth factor to obtain two additional volume scenarios for these five arterials. The other three arterials had 10, 12, and 14 intersections, respectively. For two of these three arterials, we received real volume data for two peak periods.

This data collection approach resulted in a total of 20 different scenarios. Using all scenarios for the five small arterials, we conducted a total of 65 optimization runs using the three programs. In order to ensure unbiased comparison of the three programs, we simulated the timings developed by each program using Corridor Simulation Model (CORSIM), a program developed and supported by the Federal Highway Administration. For each timing plan, we conducted 20 replications of simulation using CORSIM and averaged these results for comparison. In all, we conducted a total of 1,300 simulation runs using CORSIM.

These results identified the two best programs. Then, we used all five scenarios for the three large arterials to further analyze the performance of these two programs. During this stage of analysis, we performed more than 400 optimization and simulation runs.

Task 2: Enhancements to PASSER

In this task, we developed PASSER V, a new Windows-based program for timing signalized arterials. In PASSER V, we programmed the best features of the three programs analyzed in Task 1. These features include: a graphic user interface for easy data entry, bandwidth optimization algorithms, and a delay analysis and optimization algorithm that applies to all types of traffic conditions. We also compared the performance of this new PASSER program using 20 replications of CORSIM simulation for each case. In this comparison, we used all three programs used in Task 1. In addition, we used the base volume scenarios for all five small arterials.

What We Found…

Task 1: Software Comparisons

For optimizing arterial operations, both Synchro 4 and PASSER II-90 outperformed TRANSYT 7F. Although TRANSYT 7F's traffic model was more accurate for simulating traffic than the other two programs, it failed to produce progression bands, and its delay was higher than that of other programs. We also found that Synchro produced timings with the least delay, and PASSER II produced timings with larger progression bands, fewer stops, and the ability to move more traffic through the system. In addition, we found that a judicious selection of cycle length

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District Leadership

International Director:
Jim Carvell
Texas Transportation Institute
9441 LBJ Freeway, Suite 103
Dallas, TX 75243
Phone: (972) 994-0433
jim.carvell@texite.org

President:
John Friebele
223 S. Cherry St.
San Antonio, TX 78203
Phone: (210) 207-8291
john.friebele@texite.org

Vice President:
Connie Clark
Harris County, TX
Phone: (713) 755-4452
cclark@eng.hctx.net

Secretary/Treasurer:
Brian D. Van De Walle
Kimley-Horn and Associates, Inc.
11044 Research Boulevard, B-210
Austin, TX 78759
Phone: (512) 418-4500
brian.vandewalle@kimley-horn.com

Immediate Past President:
Jody Short
Lee Engineering
17440 Dallas Pkwy, Suite 204
Dallas, TX 75287
Phone: (972) 248-3006

2005 TexITE Winter Meeting

Feb 3-5, 2005
Waco Hilton / Waco Convention Center
Waco, Texas

Legibility Distances of Smaller Light-Emitting Diode (LED) Dynamic Message Signs (DMS) for Arterial Roadways

by Gerald L. Ullman, Brooke R. Ullman, Conrad L. Dudek, and Nada D. Trout

Dynamic message signs (DMS) provide transportation agencies a direct communication link to the motoring public. The amount of time that a motorist has to read a DMS depends primarily on the size of the characters used to create the message. Generally, the larger the character, the farther away the message can be read by motorists, and so the longer the amount of time they have to read the sign. Recently, the City of Dallas sponsored a study by the Texas Transportation Institute to determine daytime and nighttime legibility distances of 9-inch and 10.6-inch light-emitting diode (LED) DMS characters based on subject drivers who are representative of the actual driving population in the City of Dallas.

TTI researchers conducted legibility studies using Dallas residents driving an instrumented vehicle at the Dallas Fair Park parking lot. The legibility data from this study were combined with findings from a previous study of 18-inch DMS characters to develop a relationship between character height and 85th percentile legibility distance under both daytime and nighttime viewing conditions. Researchers converted these distances into the equivalent amount of time that a motorist would have available to read a message while approaching the DMS at various operating speeds, and converted these times into equivalent units of information that can effectively be displayed on a sign of that character size. Based on the results of that study, TTI researchers recommended the following:

- The City of Dallas should continue to utilize DMS with 12-inch high characters on its arterial roadways. This size character allows the display of 4-unit messages during the day on roadways with average operating speeds up to 40 mph. However, the messages should be limited to only 3 units of information at night.
- The City of Dallas should not use 9-inch DMSs on arterial roadways. Even on roadways with average operating speeds as low as 30 mph, the

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My, How Times Change!

Looking back through the Newsletter Archive, a few articles illustrated how times and ideas have changed. For example, this article appeared in the August 1986 TexITE Newsletter:

Phones Cut Accidents

Talking on the phone while driving may make you a better driver, a study recently published shows. Drivers who use cellular telephones have fewer accidents than those who don't, even though they drive twice as much, it says. The AT&T and Automobile Association of America study found: 7.4 percent of 305 cellular phone users surveyed had an accident in the last year, vs. 10.2 percent of 453 drivers in the control group. The accident rate for cellular phone users dropped after the phones were installed, from 8.2 percent to 6.6 percent annually. It may be because phone users feel less need to rush, says AT&T's Russ Glover. About 150, 000 drivers use cellular phones in 36 cities.

Managed Lanes – The Future of Freeways

by Beverly Kuhn and Ginger Goodin

What was once known as rush hour may now last up to six hours each day in Texas' most congested cities. But the idea of "managed lanes" is giving transportation planners another way to address the growing problem of traffic congestion.

Rising construction costs, land consumption, neighborhood impact and environmental issues are all factors that must be considered when examining transportation alternatives, particularly on our freeway systems. There is a growing realization that simply adding more general-purpose lanes to freeways is not always the answer to increasing mobility and travel efficiency. A viable and increasingly popular method for meeting urban mobility needs is the concept of managed lanes.

Managed lanes maintain free-flow travel speeds on the designated lanes by allowing only eligible use groups on those lanes through management strategies such as setting vehicle-occupancy levels, pricing, and vehicle types. These eligible user groups can vary by time of day or other factors, depending on available capacity of the facility, as well as the mobility needs of the community.

Like other transportation agencies nationwide, the Texas Department of Transportation (TxDOT) is looking to the managed lane operational approach to offer peak period free-flow travel to certain user groups, which might be high occupancy vehicles (HOV), trucks, toll-paying vehicles, transit, low-emitting vehicles, or some combination of these and other groups. However, little is known about the complexities of designing a practical, flexible, safe, and efficient facility that may have multiple operating strategies throughout the course of a day, week, year, or beyond.

Working in support of the research sponsors, TxDOT and the Federal Highway Administration, the Texas Transportation Institute (TTI), assisted by Texas Southern University, is examining how best to plan, design, and operate successful managed lanes. This multi-year project has a comprehensive research agenda looking at multiple topics within these three key thrust areas, including legislative issues, concept marketing, funding and financing, geometric design, traveler information and traffic control devices, interoperability, enforcement, incident management, evaluation and monitoring, interim and special use, and staffing and training needs.. With so many things to consider at all stages of a managed lanes project, getting started can be particularly challenging. With so many agencies and stakeholders involved, and with all of the ideas and strategies that are possible, the groundwork has to be in place before a successful project can become a reality.

TTI research results in several areas are key to laying that groundwork.

- Design Issues: Research addressing weaving (See TTI Research Report 4160-4) and geometric and design issues (See TTI Research Report 4160-10) provide recommendations on weaving distances for managed-lane cross-freeway maneuvers, spacing between freeway entrance/exit ramps and a managed lanes entrance/exit, and conditions under which designers should consider direct connect ramps for managed lanes.
- Legislation: Some of the results of the legislative research (See TTI Research Report 4160-8) were implemented in various forms in the 2003 legislative session in Texas to ensure that TxDOT has the authority to implement any potential managed lane strategy. Currently, Houston, Austin, and San Antonio are either implementing or expanding truck lane restrictions as a result of this legislation.
- Marketing: TxDOT is using the concept marketing brochures developed for the media and policymakers to communicate the objectives and advantages of managed lanes (See TTI Research Reports 4160-7, 4160-5-P1, and 4160-6-P2).
- Financing: New financing options made available in the 2003 legislative session in Texas broaden TxDOT's ability to finance projects.
- Traveler Information and Traffic Control: Providing information to users can be critical to success. Research on traveler information (TTI Research Report 4160-13) developed a conceptualized driver decision-making model to help TxDOT managed lane designers understand the type of information that drivers need in order to make informed decisions about whether or not to use the managed lane facility. Other research on traffic control devices (TTI Research Report 4160-16) gives recommendations for the consideration of traveler information needs in the early stages of planning to allow sufficient distance for conveying complex operating rules.

The research team has a website that serves as a growing resource for managed lanes information and interaction. In addition to links to project across the country, the website contains a quarterly newsletter and project reports and products as they become available. Researchers also maintain an electronic distribution list for

(Continued on page 21)

Research Information Sources

Ever wonder what the "state of the practice" is in your field of expertise? There are several Internet tools available to access transportation-related research. The following Internet sites can help you find information covering all aspects of transportation (e.g., planning, design, construction, pavements, etc.) contained in books, technical reports, conference proceedings, and journal articles.

TRIS Online

The **Transportation Research Information Service (TRIS)** sponsored by the Transportation Research Board and the US Department of Transportation offers public access to a database of almost half a million records.
TRIS Online includes full-text reports or links to publishers or suppliers of the original documents. You will find titles, publication dates, authors, abstracts, and document sources. Each year, over 20,000 new records are added to TRIS. The database includes international research as well as research sponsored by federal and state transportation agencies.

*Access **TRIS Online** at:* http://trisonline.bts.gov/sundev/search.cfm/

Center for Transportation Research
The University of Texas at Austin

The Center for Transportation Research (CTR) library is the official depository for the Texas Department of Transportation's Research library collection.
With over 28,000 volumes of transportation related materials, the library provides both electronic and print-based information. The library contains technical reports, abstracts, and Project Summary Reports from all universities participating in TxDOT's research program. Also available are TRB reports and circulars, NCHRP reports, and much more.

*Access the **CTR library** at:* http://library.ctr.utexas.edu/index.htm

National Transportation Library

Another library source is the US Department of Transportation's **National Transportation Library** (NTL). The NTL serves as a repository of electronic materials from public, academic and private organizations. The NTL also has a customized search engine that accesses reports and electronic documents maintained by the USDOT sites, as well as their state and local partners.

The NTL library staff is available to assist customers to find statistics, locate a report, or contact an expert. The library staff are available from 9:00 a.m. to 6:30 p.m. Eastern Time to answer telephone calls (1-800-853-1351). Email requests can be sent any time to Librarian@bts.gov or Answers@bts.gov. They will respond to a request within 24-48 hours.

*Access **NTL** at:* http://ntl.bts.gov/

TRB

The **Transportation Research Board (TRB)**, one of six major divisions of the National Research Council, promotes innovation and progress in transportation through sponsored research. TRB is supported by state transportation departments, the US Department of Transportation and other federal agencies, industry associations, as well as other organizations and individuals interested in the development of transportation. Many publications published by TRB are available electronically by accessing their website. From their homepage, you can browse TRB publications by topic or through a search engine. Earlier publications not available electronically through TRB can be obtained directly by contacting the CTR library.

TRB also sends out weekly an E-Newsletter. This is an e-mail update of topical transportation related information and research taking place in the US and internationally. You can be added to the mailing list for the E-Newsletter by going to TRB's homepage and clicking on

E-Newsletter shown on the left side of the page. Then follow their simple instructions to subscribe.

*Access **TRB** at:* http://www.trb.org

CALIFORNIA PATH

The **Caltrans PATH Database** provides access to the largest and most comprehensive collection of bibliographic information on Intelligent Transportation Systems (ITS). The Database is produced in cooperation with the California Dept. of Transportation and the California Partners for Advanced Transit and Highways (PATH) Program and made accessible on the Internet through a partnership with the Transportation Research Board. The Database contains references to all aspects of Intelligent Transportation Systems, ranging from historical materials dating back to the 1940s to topics of current and international research and applications. It reflects a wide coverage of information on ITS,

(Continued on page 21)

This Highway Will Crack

by CTR Editor Bruce Volbeda

A section of new pavement currently under construction on Texas Highway Loop 330 just southeast of Houston is going to crack, and it will do so because Jeong-Hee Nam wants it to.

Nam, a third-year Ph.D. student at the Center for Transportation Research, is studying the mechanical behavior of continuously reinforced concrete pavement (CRCP), the predominant pavement employed for heavy-use highways in Texas. Together with Dr. B. Frank McCullough, Dr. Seong-Min Kim, and Terry Dossey, Nam has devised a method to induce a crack in a real-world highway—one that is actively in use by the public—and measure the mechanical behavior of the pavement before, during, and after cracking.

While the crack will be only a hairline fracture 0.02 inches wide, unnoticeable to drivers at highway speeds, it will, however, yield important information about how pavement cracks, leading to design recommendations to improve future construction.

Laboratory testing is sometimes useful in this area, but scaled-down lab models can't compete with real-world conditions. "We believe our field tests will produce better data than is currently available," Nam explains.

How does one persuade a slab of heavily reinforced concrete to crack on cue, and then document the event?

First, special sensors—vibrating wire gauge, steel strain gauge, and "I-button" sensors—are placed around the area of the intended crack and concrete is poured over them. When the crack occurs, they'll be in place to record what happens.

The crack itself is produced by an innocuous looking device called – what else? – a "crack inducer." The inducer is a thin wood or metal strip pressed into the surface of still-wet concrete. When the inducer is removed, a narrow groove (of proprietary dimensions) remains in the surface, which leads the concrete to crack over time with the daily expansion and contraction caused by temperature changes in the environment and the curing process.

"It's a bit like cutting glass," Dossey explains. "A carefully placed groove in the surface of the concrete can produce a crack straight through the entire depth of the pavement."

As that crack develops, the research team's sensors will be there to witness it. A standard Campbell Scientific CR10X Data Logger will collect data from the sensors at periodic intervals over the course of a year. That data will capture temperature, moisture, expansion, and contraction changes in the concrete and its steel reinforcements to paint a detailed picture of the dynamics of CRCP over time.

Curiously, the goal of this research is not to eliminate cracking. "Cracks are natural," Nam explains. "Concrete is always in motion, even after it has hardened, due to environmental changes in temperature and the loads placed upon it." A hardened, reinforced structure such as a highway that is miles long will inevitably crack from the tensions that develop in the material.

Years ago, highway engineers sought to eliminate cracking by building pavement in sections separated by cushioned gaps that would absorb the expansion and shrinkage that is natural over the course of a highway's life. However, such "jointed pavements" often became rough and uneven over time as some sections of the pavement sank, and others rose.

Sometime in the late 1930s the Indiana Highway Department was attempting to create just such a jointed pavement, but inadvertently created the first continuously reinforced concrete pavement (CRCP), instead. Two decades later in the late 1950's, while working at the Texas State Department of Highways and Public Transportation (now TxDOT), Dr. McCullough expanded the CRCP concept and implemented it in Texas. This was the first time CRCP was used in Texas and it became the foundation for CRCP work around the world.

(Continued on page 21)

Jeong Hee Nam testing the Campbell Scientific CR10X Data Logger used to capture crack data.

Placement of Flexi-Probe in still-wet concrete.

What is Retroreflectivity?

by Gene Hawkins (Reprinted from the Texas Transportation Researcher)

All surfaces reflect light, but different types of surfaces reflect light in different ways. Figure 1 shows three different types of reflective surfaces. A diffuse reflector scatters light in all directions as shown in Figure 1a. A plain sheet of paper is an example of this type of surface. A specular reflector reflects light like a mirror. The angle of the reflected light is the same as the angle of the light hitting the surface. In Figure 1b, angle A equals angle B. Signs and markings are effective at night because they have been designed to reflect light from a vehicle's headlamps back to the driver. The technical term for this characteristic is "retroreflectivity"—because the light is reflected back toward the vehicle. There are several ways to make a device retroreflect ive, but it is commonly accomplished by embedding small glass beads in the pavement marking or sign, as shown in Figure 1c. This makes the device more visible at a much greater distance at night. But for drivers, it simply means that they can see signs and markings several hundred feet away at night, when almost everything else at that distance appears to be a black hole. There are, however, limitations on the performance of a retroreflector. The farther away a driver gets from the vehicle's headlamps, the less bright a sign or marking will appear. Figure 2 illustrates this concept. A sign will appear the brightest when it is oriented at a right angle to the light source and when the driver is as close as possible to the light source. The brightness of a sign or marking decreases as it is rotated off of a right angle, and as the driver moves further away from the light source.

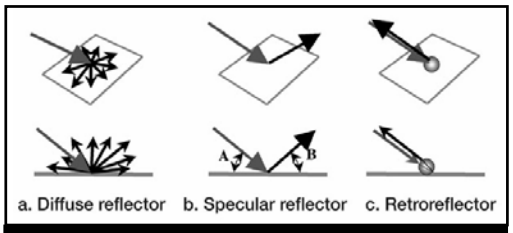


Figure 1. Three difference types of reflective surfaces.

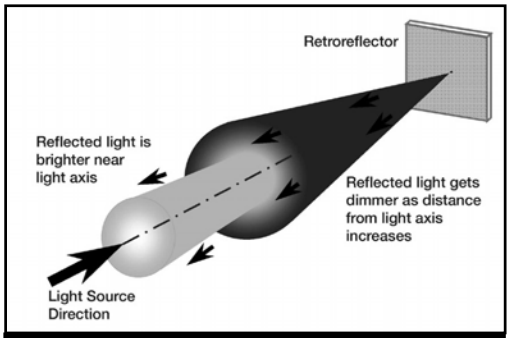


Figure 2. This illustration shows the farther away a driver gets from the vehicle's headlamps, the less bright a sign or marking will appear.

Note: On July 30, 2004, the FHWA published a Notice of Proposed Amendments (NPA) to the MUTCD regarding Sign Retroreflectivity. These amendments are designated as PROPOSED Revision No. 2 of the 2003 MUTCD. Please visit the MUTCD website (http://mutcd.fhwa. dot.gov) to view the Federal Register notice dated July 30, 2004, which describes the proposed changes and the reasons for them, and also to view the text of the proposed Revision No. 2 MUTCD changes. The MUTCD text references a supplemental document on maintaining sign retroreflectivity. This document is contained in an appendix to the Federal Register notice and can also be accessed at http://safety.fhwa.dot. gov/fourthlevel/sa03027.htm. The comment period for the proposed rule extends to October 28, 2004. FHWA has also posted some supplemental documents to the docket. These documents can be accessed at http://dms.dot.gov and searching for the docket number (15149). After the comment period closes, FHWA will evaluate the comments and determine how to proceed with a final rule.

Saving Money for Texas

by Terry Dossey

CTR Research Supervisor Dr. B. Frank McCullough, along with co-Principal Investigator Terry Dossey, Researcher Seong-Min Kim, and graduate students Shantala Ramaiah and Jeong-Hee Nam were recently chosen by the Texas Department of Transportation (TxDOT) for a TxDOT Top Innovations Award.

The award was based on their work on TxDOT-sponsored CTR research project 0-1700, "Improving Portland Cement Concrete Pavements."

Each fall, TxDOT selects Top Research Innovations and Findings for the past year based on anticipated or already realized dividends to the department and the state. These dividends may be in terms of saved lives, more efficient operations, improved services, and/or financial savings. Products from the research program may include devices, machines, tools, materials, manuals, and software, while others are less tangible concepts, knowledge, or advice. These products affect virtually every area of TxDOT operations.

Portland Cement Concrete roads are used on highways with high traffic volumes and large trucks due to their load carrying capacity and durability. Unfortunately, concrete pavements constructed during high temperatures and moisture conditions lead to temperature and moisture loss levels in the pavement that produce excessive spalling. Spalling can be so severe that major rehabilitation is required in less than ten years on pavements designed for 30 years. In cases like these, the cost to the public can be large as illustrated by two cases in Houston where a bonded concrete overlay was required on a section of BW-8 with a cost over $6 million, and an asphalt overlay on SH-6 with a price tag over $2 million. Traffic delay and other user costs due to the premature rehabilitation would add more to the total cost.

Engineers have known for some time the detrimental effects of high temperatures and excessive moisture

(Continued on page 21)

Message from the President

by John Friebele, P.E., PTOE (M)

TexITE's 50th Anniversary meeting in Austin was an opportunity for us to celebrate our past, the persons and the achievements that have brought us to where we are today. I hope that those who were not able to be there will have the opportunity to view the DVD of past recollections and see the CD presentation of the highlights of our first 50 years. And … if you have the opportunity, please let **Jason Crawford** and **Barbra Leftwich** know what a tremendous job they did leading the effort to produce these important memories or our organization. I'd also like to thank the Austin Local Arrangements Committee headed by **Brian Van De Walle** who arranged a most accommodating venue for our meeting. A number of persons worked to make this a milestone event and I appreciate all of your efforts. I was personally gratified at the large turnout for this milestone event and the 400 attendees at this event had the opportunity to visit with some of the folks who have led TexITE in the past.

However, the past is the past in that we can't rest on the achievements we've accomplished to this point. Our organization has the opportunity to be one of the more influential organizations to develop and implement transportation policy in the State of Texas. This is due to our members – those professionals who occupy positions in both the public, private and academic sectors who have achieved state and nation-wide stature as transportation professionals and leaders.

The future, from my perspective, is bright, but it will require continued efforts by the coming generations of transportation professionals. They're out there; I've seen them and am constantly hearing from and about them and I'm personally glad I'm far enough along to not have to compete with them. These younger people that are now adopting our profession as their own will be the ones to develop and implement transportation policy in the State. And, in so doing, will make the next 50 years of TexITE as remarkable in growth and activity as we have experienced during the first 50 years.

What TexITE Means to…

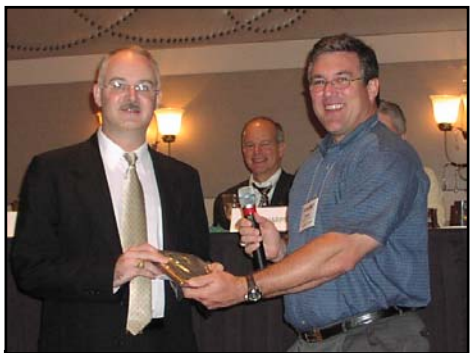
Richard Peterson -- "TexITE is a very rare opportunity for anyone in or close to the great state of Texas. It affords the opportunity to meet old codgers – such as myself – whom I affectionately call old mossbacks. As you know, moss normally grows on the shady side of a tree. And some of my favorite mossbacks are members of District 9."

Marilyn Hansen -- "TexITE is an opportunity to meet a lot of people in the business whom I could not call on otherwise [because of the distance]. It is a great opportunity to make contacts. TexITE is like an extended family."

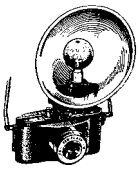
Richard Peterson and Marilyn Hansen

TexITE 50th Anniversary Logo Winner

TexITE recently sponsored a competition for a special 50th Anniversary Logo. The winning design was submitted by **Mark Sherron** of the Houston office of Wilbur Smith Associates. Mark's design (shown above) was featured throughout the Summer 2004 TexITE Meeting in Austin. For his efforts, Mark won a $50 prize and tons of prestige.



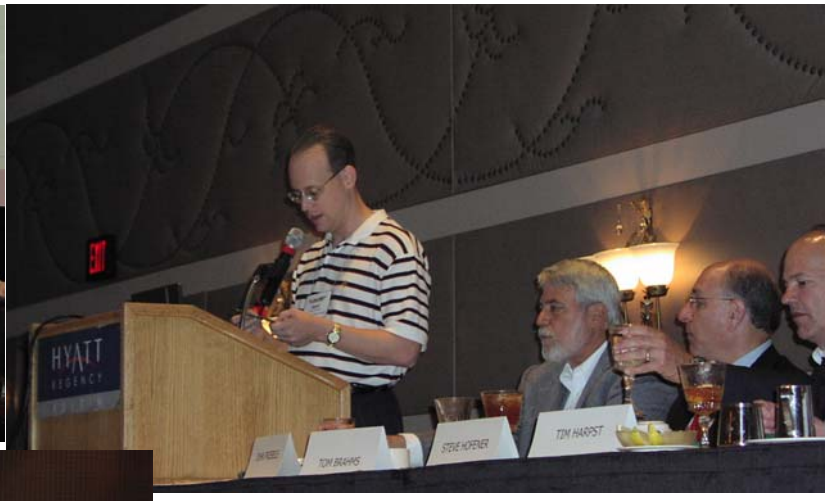
Mark Sherron (left) accepting his award from Brian Van De Walle (right)



The professional photographs taken at the 50th Anniversary Meeting in Austin are posted and available for purchase online at www.collages.net. Click on "View an Event", then enter User ID: TexITE, Password: 3355. Enter your e-mail address to view available photos. All other photos are posted on the TexITE website at www.texite.org.

Highlights from the Summer Meeting

Austin, Texas



Student News

Texas A&M University

Recent student dissertations and theses include the following:

- **Hanseon Cho**, Ph.D., December 2003, "Preemption Strategy for Traffic Signals at Intersections near Highway-Railroad Grade Crossings," Advisor: Dr. Laurence R. Rilett.
- **Kimberly Mastako**, Ph.D., December 2003, "Choice Set as an Indicator for Choice Behavior When Lanes are Managed with Value Pricing," Advisor: Dr. Laurence R. Rilett.
- **Grant Schultz**, Ph.D., December 2003, "Developing a Methodology to Account for Commercial Motor Vehicles Using Microscopic Traffic Simulation Models," Advisor: Dr. Laurence R. Rilett.
- **Karun K. Konduru**, M.S., December 2003, "Long Run Changes in Driver Behavior Due To Variable Tolls," Advisor: Dr. Mark Burris.
- **Zongzhong Tian**, Ph.D., May 2004, "Development & Evaluation of Operational Strategies for Providing an Integrated Diamond Interchange-Ramp Metering Control System." Advisor: Dr. Carroll Messer.
- **Jacqueline Jenkins**, Ph.D., August 2004, "Modeling the Intersection Between Passenger Cars and Trucks," Advisor: Dr. Laurence R. Rilett.
- **Lelitha Vanajakshi**, Ph.D., August 2004, "Estimation & Prediction of Travel Time from Loop Detector Data for Intelligent Transportation Systems Applications," Advisor: Dr. Laurence R. Rilett.
- **Justice Appiah**, M.S., August 2004, "An Examination of Factors Affecting High Occupancy/Toll Lane Demand," Advisor: Dr. Mark Burris.
- **Kwaku Obeng-Boampong**, M.S., August 2004, "Evaluation of Nighttime versus Daytime Red-Light Running with an Advanced Warning for End of Green Phase System," Advisor: Dr. Carroll Messer.
- **Anuj Sharma**, M.S., August 2004, "Development of Traffic Responsive Control Factors & Thresholds Using Artificial Neural Network," Advisor: Dr. Carroll Messer.
- **Tyrell Thompson**, M.S., August 2004, "Evaluation of Rumble Strips at Stop-Controlled Intersections in Texas," Advisor: Dr. Mark Burris.
- **Jonathon Tydlacka**, M.S., August 2004, "A Microsimulation Analysis of Highway Intersections near Highway-Railroad Grade Crossings," Advisor: Dr. Laurence R. Rilett.

Congratulations to the following M.Eng. graduates: December 2003 – **Kit Black**, **Michael Hofener**; May 2004 – **George Balarezo**, **Luanne Lane**, **Carissa Mardiros**, **Timothy Wolff**, **Chad Zorn**; August 2004 – **Leslie Dean Stengele**.

Texas A&M University graduate **Jacqueline Jenkins, Ph.D., P.Eng.** accepted an Assistant Professor position at the University of British Columbia in the Department of Civil Engineering. Dr. Jenkins will be teaching graduate-level classes in Traffic Flow Theory and Transportation Systems Analysis, and a senior-level class in Transportation Planning and Analysis.

The Texas A&M ITE Student Chapter has a new Faculty Advisor, **Dr. Yunlong Zhang**. Dr. Zhang is from Mississippi State Univ., where he was a faculty member in transportation engineering and was the faculty advisor for their ITE student chapter. Dr. Zhang just started at A&M, and they are excited that he is jumping in with both feet and volunteering for this important task.

University of Texas at Austin

UT graduate **Dr. Michael Hunter** accepted an Assistant Professor position at Georgia Tech in the School of Civil and Environmental Engineering. Dr. Hunter is teaching undergraduate highway design, senior-level traffic engineering design, and a graduate-level signals course. Dr. Hunter is pleased about his appointment at one of the nation's top research universities. The match was a good one; due to a recent retirement, Georgia Tech was looking for someone with expertise in signals, an area in which Hunter has been making significant research contributions.

University of Texas at Arlington

Recent student dissertations and theses include the following:

- **David A. Faria**, Ph.D., December 2003, "A Framework to Transform Real-Time GPS Data from Transit Vehicles to Determine Current Speed-Flow Characteristics of Arterials," Advisor: Dr. Shekhar Govind
- **Aruna Bhaskara Lakshmi Birakayala**, M.S., December 2003, "Investigating the Affects of Access Road Intersections on Freeway Congestion," Advisor: Dr. Shekhar Govind
- **Yatinkumar Kalyansinh Rathod**, M.S., December 2003, "User Equilibrium Model for Toll Pricing Strategies," Advisor: Dr. Shekhar Govind
- **Jignesh P. Thakkar**, M.S., December 2003, "A Functional Analysis of Autonomous Dial-A-Ride Operations," Advisor: Dr. Shekhar Govind
- **Mohan Prasant Kumar Atluri**, M.S., May 2004, "Using GPS Equipped Vehicles to Estimate the Travel Time in a Network," Advisor: Dr. Shekhar Govind
- **Pranesh Amarneth Tarikere**, M.S., May 2004, "Financial Feasibility of Maglev System in Texas," Advisor: Dr. Shekhar Govind

- **Manoj Muralidharan**, M.S., August 2004, "Risk Assessment Using GIS," Advisor: Dr. Shekhar Govind

The Chapter welcomes its new Faculty Advisor, **Dr. Stephen Mattingly.**

Student Chapter Contacts

Texas A&M University
Dr. Yunlong Zhang
CE/TTI Room 301G
3136 TAMU
College Station, Texas 77843-3136
yzhang@civil.tamu.edu

Texas Southern University
Dr. Carol Lewis
School of Technology
3110 Cleburne Avenue
Houston, TX 76019
Phone: (713) 313-7925
lewis_ca@tsu.edu

University of Texas at Arlington
Dr. Stephen P. Mattingly
Box 19308
Arlington, TX 76019-0308
Phone: (817) 272-2859
mattingly@ce.uta.edu

University of Texas at Austin
Dr. Chandra Bhat
CVEN Department, ECJ 6.810
Austin, TX 78712
Phone: (512) 475-8744
bhat@mail.utexas.edu

University of Texas at El Paso
Dr. Yi-Chang Chiu
500 West University Avenue
El Paso, TX 79968
Phone: (915) 747-6918
chiu@utep.edu

People News

Brazos Valley Section

Melisa Finley of the Texas Transportation Institute (TTI) was chosen as TexITE's 2004 Younger Member of the Year. Congratulations Melisa!

2004 Younger Member of the Year – Melisa D. Finley

After 35 years of teaching at Texas A&M University, **Dr. Carroll Messer** is retiring. Dr. Messer joined the faculty as an Assistant Professor in 1969. He also served as Head of the Transportation Systems Division of TTI for 5 years, and as Program Manager of the Traffic Operations Program for 12 years. Under Dr. Messer's leadership, that Program was instrumental in developing the PASSER family of traffic signal optimization programs.

Texas A&M University is pleased to announce that **Dominique Lord** (from TTI) and **Yunlong Zhong** (from Mississippi State University) were hired as new Assistant professors within the Department of Civil Engineering. In addition, **Gene Hawkins** (from TTI) was hired as an Associate Professor.

TTI Assistant Research Engineer **Montasir Abbas** will be teaching a senior-level Urban Traffic Facilities class at Texas A&M University this fall as a Visiting Assistant Professor.

Kay Fitzpatrick and **Tim Wolff** of TTI were awarded Best Paper in July 2004 for, "Left-Turn Lane Installation Guidelines," originally presented at the 2003 TRB Urban Street Symposium.

The following people from TTI presented at the ITE 2004 Annual Meeting and Exhibit in Lake Buena Vista, Florida in August: **Sue Chrysler, Montasir Abbas, Srinivasa Sunkari, Brooke Ullman, Kay Fitzpatrick, & Marcus Brewer**

Capital Area Section

D. Lance Hartland, PE, AICP has joined WHM Transportation Engineering as a Project Manager. Lance's specialties include traffic operations and design, transportation planning, land development processes, and roadway design. Lance brings with him 16 years of experience in the transportation engineering and planning field.

Heidi Ross, P.E., PTOE and **Rashed Islam, P.E., PTOE** both of WHM Transportation Engineering, recently passed the Professional Traffic Operations Engineer examination offered through ITE. They join a select group of qualified professionals with demonstrated expertise in the field of traffic operations engineering.

Sharon Barta, PE has accepted a research engineer position with the TxDOT Research and Technology Transfer Office.

Dr. Bugao Xu, UT Associate Professor and Research Scientist at the Center for Transportation Research, recently was chosen by TxDOT for a Top Innovations Award. Dr. Xu and his team were awarded for their work on TxDOT-sponsored CTR research project, 7-4975, "Implementation of an Automated Pavement Surface Distress Rating System for Asphaltic and Concrete Pavements."

Dr. Manuel Trevino, a newly minted Ph.D. researcher at the Center for Transportation Research, recently appeared as an extra in a major motion picture, The Alamo, which was filmed just outside Austin. "The Alamo," starring Dennis Quaid, Billy Bob Thornton, Jason Patric – and Dr. Manuel Trevino as "a townsperson!" – opened in theaters nationwide in December 2003. As a staff researcher at the Center for Transportation Research at UT, Dr. Trevino is working primarily on two TxDOT-sponsored projects concerning the rehabilitation of asphalt pavements.

Dr. Manuel Trevino on the set of The Alamo *just outside of Austin*

Prof. Chandra R. Bhat, an Associate Professor of Civil Engineering at UT Austin, was recently awarded the 2004 Walter L. Huber Civil Engineering Research Prize by ASCE in recognition of his contributions to "innovative methods in transportation systems analysis and modeling." This prestigious and highly coveted prize is awarded for "notable achievements in research related to Civil Engineering". The award will be presented at the ASCE National Convention in Baltimore in October 2004.

Greater Dallas Section

Elizabeth Ramirez of the City of Dallas was selected as TexITE's 2004 Transportation Engineer of the Year. Congratulations Beth!

2004 Transportation Engineer of the Year – Elizabeth A. Ramirez

Jack Hatchell, Life Member, was recently elected chair of the Regional Transportation Council of the North Central Texas Council of Governments (NCTCOG). Jack is immediate Past President of the NCTCOG Executive Board. He is serving in his eighteenth year as a Collin County Commissioner. Prior to his service with the county, Jack was a member of the Plano City Council for ten years, three of which he served as Mayor Pro Tem. A practicing transportation engineer for 40 plus years, Jack is owner of Jack Hatchell & Associates.

Area News

RS&H has been selected for the following projects:

- RS&H was selected by Wachovia Bank to provide full service design, permitting and construction administration services on 25 to 30 new branches per year in Houston, extending over a 5 year period.
- RS&H was selected as the new on-call General Consultant for the Waco Regional Airport. This is a three to five year assignment that includes all engineering, architecture and planning for the airport during that time.
- TxDOT Waco District selected RS&H to provide design services for widening Loop 363 between 5th Street and US 190/SH 36 (1st Street) to a six-lane divided freeway with one-way, three-lane frontage roads. The project also includes intersection/interchange improvements at 1st Street.

PBS&J has been selected for the following projects:

- PBS&J will lead the IH35/LP 363S Interchange design project for TxDOT Waco District. This $44 million project will involve freeway, traffic control, and drainage design as well as seven overpasses, including three railroad grade separations.
- The North Texas Tollway Authority recently selected PBS&J to design a new southbound mainlane along the Dallas North Tollway (DNT). This project is Phase 2 of the DNT Expansion Feasibility Study completed by PBS&J last year.
- PBS&J is providing design services in Allen, Texas for widening Bethany Drive between Malone Road and FM 2551 to a 4-lane divided roadway. The City has mitigated right-of-way acquisition and plans to be under construction within the first quarter of 2005.
- TxDOT Tyler District chose PBS&J to provide right-of-way and land acquisition services for the widening of US 175 in Henderson County. PBS&J is responsible for real estate appraisal, negotiations, relocations, closings, eminent domain, and property management.

All projects will be managed by personnel from PBS&J's Dallas office.

Section News

Participation with local Sections is a great opportunity to interact with fellow transportation professionals. Each Section has a website with contact information if you are interested in becoming a member of your local Section.

Brazos Valley

The Brazos Valley Section is planning to host an Aggie Football Weekend this fall. Details to be forthcoming. Please check at http://www.texite.org/bv/ for updates.

Capital Area

The Capital Area Section is looking for meeting locations. If you would like to volunteer your office for a meeting, please contact **Roy Mynier** at clmynier@pbsj.com.

Future meeting dates are as follows:
Oct. 1 – Trans-Texas Corridor
Dec. 3 – Christmas Business Meeting.

Please check at http://www.texite.org /austin/index.php for additional information.

South Texas

http://www.texite.org/southtexas/

Greater Dallas

The Greater Dallas Section meets on the second Thursday of each month. Please check at http://www.texite.org /dallas/maindallas.htm for information on upcoming meetings.

Greater Fort Worth

The Fort Worth Section meets on the third Thursday of each month at Joe T. Garcia's in Fort Worth for a noon-hour meeting providing a buffet-style lunch, conversation, networking, and a technical presentation.

Upcoming meetings are as follows:

- September 16 – "Incident Management in the Fort Worth District," Grover Schetter, TxDOT Fort Worth District Courtesy Patrol
- October 21 – "Aerial Photo-Surveys," Natalie Bettger, NCTCOG
- November 18 – Speaker to be announced
- December 16 – Speaker to be announced

http://www.texite.org/fortworth/ mainfortworth.htm

Greater Houston

The Houston section meets on the second Wednesday of each month at 11:30 AM at the Holiday Inn, 7787 Katy Freeway. Check at http://www.texite.org/houston/ mainhouston.htm for updates.

The annual Houston Section Shrimp Boil will be held on Saturday, October 9 at Bear Creek Park. We'd like to extend a special invitation to the Brazos Valley Section to come and join us (don't worry – the Aggie football game is away this day!).

Section Presidents

Brazos Valley Section
Michael Parks
Brazos Valley Council of Governments
Phone: (979) 775-4244
mparks@bvcog.org

Capital Area Section
Roy Mynier
PBS&J
Austin, TX
Phone: (512) 327-6840
cllmynier@pbsj.com

Greater Dallas Section
Mark Titus
City of Dallas
Dallas, TX 75201
Phone: (214) 670-3123
mtitus@pbw.ci.dallas.tx.us

South Texas Section
Robert Murillo
City of Laredo
Phone: (210) 795-2550
rmurillo@ci.laredo.tx.us

Greater Forth-Worth Section
Chris Hoff
Carter & Burgess, Inc.
Arlington, TX
Phone: (817) 735-6056
HoffCM@c-b.com

Greater Houston Section
Robert DeShurley
Siemens
Houston, TX
Phone: (713) 939-6694
robert.deshurley@itssiemens.com

Legibility Distances…
(Continued from page 9)

legibility distance provided by 9-inch characters allows for no more than one unit of information to be displayed at night. This is insufficient for essentially all types of messages that the City of Dallas desires to display.

- The City of Dallas should also not use 10.6-inch character DMS on arterial roadways. Although this size character would provide adequate legibility and viewing time to accommodate 3- and 4-unit messages during daylight conditions on most roadways, only 2 units of information could effectively be displayed on a sign of that character size during nighttime conditions. Very few of the typical messages of interest to the City of Dallas can be effectively reduced to that size.

For additional details, the full report (as titled above) is available from the Texas Transportation Institute (http://tti.tamu.edu/product/).

Video Detection
(Continued from page 7)

location is one that provides a stable, unobstructed view of each traffic lane on the intersection approach. Moreover, the view must include the stop line and extend back along the approach for a distance equal to that needed for the desired detection layout.

The VIVDS product manuals indicate that detection accuracy will improve as camera height increases within the range of 20 to 40 ft. This height improves the camera's view of each approach traffic lane by minimizing the adverse effects of occlusion.

Calibration of the camera field of view is based on a one-time adjustment to the camera pitch angle and the lens focal length. According to several VIVDS product manuals, an optimal field of view is one that has the stop line parallel to the bottom edge of the view and in the bottom one-half of this view. The optimal view also includes all approach traffic lanes. The focal length would be adjusted such that the approach width, as measured at the stop line, equates to 90 to 100 percent of the horizontal width of the view. Finally, the view must exclude the horizon.

Operation Issues

Detection zone layout is an important factor influencing the performance of the intersection. Guidance provided by several VIVDS product manuals indicates that there are several factors to consider, including:

- location relative to the stop line, zone location relative to the stop line,
- the number of VIVDS detectors used to constitute the detection zone,
- whether to link the detectors using Boolean logic functions,
- whether to have the detector monitor travel only in a specified direction, and
- whether the detector's call is delayed.

The actual detectors provided by the VIVDS product would be placed in the zones such that the area is fully monitored.

Unlike that of inductive loops, the performance of a VIVDS is adversely affected by camera motion, daily changes in light level, and seasonal changes in the sun's position. In recognition of these factors, at least one VIVDS manual encourages an initial check of the detector layout and operation during the morning, evening, and at night to verify the operation is as intended. Periodic checks at specified time intervals (e.g., every six months) are beneficial.

The Researchers Recommend . . .

A life-cycle cost analysis comparing a four-camera VIVDS and an inductive loop system indicated that a VIVDS is more cost-effective than a loop system under certain conditions. These conditions relate to the number of inductive loops needed at the intersection and the expected life of these loops.

In general, a four-camera VIVDS is cost-effective at intersections requiring 12 or more stopline loop detectors, regardless of loop life. However, in areas where the average loop life is only four years, a VIVDS is found to be cost-effective when only five loops are needed. Researchers developed minimum camera height guidelines to reduce occlusion. The minimum heights vary from 20 to 50 ft, depending on the width of the approach and camera offset. The minimum height for a camera mounted in the center of the approach is 20 ft. Larger minimums are needed as the camera is moved left or right from this central position. Field measurements of detection accuracy indicate that intersection approaches served by cameras that exceed the minimum height have significantly fewer unneeded or missed calls.

Researchers also developed minimum camera height guidelines to maintain acceptable detection accuracy. This minimum height is required when the VIVDS is used to monitor sections of the approach that are well in advance of the stop line. The minimum height needed for advance detection ranges from 24 to 36 ft, depending on the distance between the camera and stop line and on the approach speed limit. The higher distances are needed for higher speeds or greater distances.

Field measurements indicate that increasing camera height tends to improve accuracy, provided that there is no camera motion. However, camera heights of 34 ft or more may be associated with an above-average detection error rate unless the camera is mounted on a stable pole.

Researchers developed guidelines for designing stop-line-only detection and stop-line plus advance detection using VIVDSs. These guidelines describe the recommended number of detection zones as well as their location and length. The guidelines for stopline-only detection are based on the use of a long detection zone and a 0.0-s controller passage time. The guidelines for stop-line plus advance detection are based on a 1.0-s passage time and two advance detectors. Both simulation and field data indicate that the use of these guidelines can reduce delay and improve intersection operation.

Note: This research is documented in TTI Report 4285-1, *Video Detection for Intersection and Interchange Control*. Related reports include: TTI Report 4285-2, *Intersection Video Detection Manual*, and TTI Report 4285-3, *Intersection Video Detection Field Handbook*. To obtain copies, visit the on-line catalog at http://tti.tamu.edu or contact Dolores Hott at (979) 845-4853 or d-hott@tamu.edu.

Newsletter Articles

To submit a research article or project summary for future newsletter publication, please send information to dena.jackson@rsandh.com.

Research Information Sources
(Continued from page 11)

including monographs, journal articles, conference papers, technical reports, theses, web sites, and selected media coverage. The Database currently contains over 28,500 records with abstracts. Full bibliographic information is provided, and URLs are included are included for those documents which are available full-text.

*Access **PATH** at*: http://www.dcdata.com/path/path.htm

Managed Lanes
(Continued from page 10)

communicating with people interested in managed lanes projects. For more information on the emerging research results on this project or to join the distribution list, contact Beverly Kuhn (979-862-3558, b-kuhn@tamu.edu) or Ginger Goodin (512-467-0946, g-goodin@tamu.edu) or visit the project website at http://managed-lanes.tamu.edu.

This Highway Will Crack
(Continued from page 12)

The key to CRCP is that concrete is poured in a continuous ribbon over networks of reinforcing steel. Instead of inserting joints in the pavement, engineers design the structure to crack on its own at strategic intervals so as to absorb the inevitable shrinkage and expansion that pavements experience. This method not only reduces the cost of construction, but improves road surface smoothness, as well, and has become standard procedure throughout the U.S.

Not all cracks are created equal, however. If a crack is too narrow, it won't relieve enough stress and anchor cracks will form; too wide, and moisture will penetrate to rust the steel. If cracks are too close together, a "punchout" may result—the concrete pavement version of the familiar pothole.

Intentional cracking of CRCP can be managed by modifying certain variables such as the percentage of steel to concrete, the thickness of the pavement, and by designing the mix of materials that make up the pavement. "We want to be able to control these variables under various conditions to optimize the placement and size of pavement cracks," says Dossey.

While few drivers develop a fondness of cracked concrete, Texas drivers at least can feel reassured that some hairline fractures are helping researchers create better roads for the future.

Saving Money for Texas *(Continued from page 13)*

loss, but have not been able to adequately monitor them. The Thermochron (temperature) and Hygrochron probes (moisture) developed under this study provide engineers a cost effective way to extensively monitor the pavement during construction, potentially saving millions of dollars over the years as well as keeping the goodwill of the traveling public.

The Thermochron buttons are $8 each, which allows economical monitoring of temperature in new construction, possibly replacing the conventional maturity meter at lower cost and with higher security (buttons are embedded in pavement and store data internally). In addition, the researchers have used Thermochrons to measure minimum temperatures at various depths over two winters. This data indicates that mid depth temperatures in thick pavements are not as low as expected, which means steel designs can be optimized by region at considerable savings.

In a similar manner, the Hygrochron buttons store humidity readings, which can be used in fresh concrete to indicate how effective the curing is under any condition. If contractors had ready access to information of this sort, additional measures could be taken during high evaporation periods to avoid strength loss or differential shrinkage conditions that lead to spalling.

As a rough estimate of possible statewide savings, the Texas Rigid Pavement Database was examined to determine what percentage of concrete roads fail due to poor temperature or moisture control during construction. The analysis determined that roughly 8.7% fail to reach design life due to close cracking (possible temperature problems) and 7.2% from spalling (possible uncontrolled moisture loss), with some overlap between the two (i.e. some pavements experience both problems). Since 2.5 million cubic yards of paving concrete are used in Texas annually at an estimated cost of $137 million, the failure rates account for about $20 million in replacement cost, allowing for the overlap. If these pavements average a 20% reduction in design life, then the savings from correcting the problem might be as much as $4 million/yr.

Technical Committee Chair Message
(continued from page 2)

research program is a cooperative program with the public universities in Texas. We work very closely with them throughout the entire process, including the development of research project statements. Obviously, their main role is to conduct the research and to prepare reports detailing what they did and outlining conclusions and recommendations. They may also deliver other products as part of the project. For example, a four-page color project summary report describing the research is prepared for each project. In addition, guide books ready for implementation for TxDOT may be prepared as part of the project.

TxDOT primarily conducts applied research – in other words, research projects address specific problem areas that TxDOT is dealing with. Through the TAP and RMC process, the highest priority projects are funded.

In the specific area of traffic engineering related research, we need to continue to explore ways to make the transportation system safer for all users, to reduce congestion, and to improve the efficiency of the system. Some examples of recently completed traffic operations or planning related research projects include:

Project 0-4260: Advanced Warning for End-of-Green Phase for High Speed Traffic Signals. This two-year project developed a system called Advanced Warning for End-of-Green System (AWEGS) to provide advance warning to motorists of the end-of-green signal phase. AWEGS provides warning to high speed vehicles by flashing beacons five to six seconds before the onset of yellow on a "Be Prepared To Stop" sign located on the approach to the intersection.

Project 0-4238: Smart Growth Texas Style. In this project, the researchers developed a Primer on smart growth techniques that could be employed by transportation planners at the local level and in TxDOT districts. Specifically, the Primer provides background, concepts, examples, and other states' experiences with smart growth as it relates to transportation. Four workshops were conducted around the state in which TxDOT, Metropolitan Planning Organizations (MPOs), and local technical staffs were introduced to the concepts of smart growth.

TexITE members use state or national research either directly or use research results indirectly in that many standards and guidelines have been developed and/or modified as a result of research findings. It is my hope that the Technical Committee of TexITE will serve as a good forum to exchange information about research and new technologies.

New PASSER Program
(Continued from page 8)

results in PASSER II timings with delays comparable to or lower than those of Synchro. Further analysis of Synchro and PASSER II revealed that Synchro's ability to produce two-way arterial progression degrades for large arterials. We also found that Synchro has a tendency to estimate lower delays than PASSER II for the same timing plan.

Task 2: Enhancements to PASSER
Because of its Windows-based graphic user interface, PASSER V is more flexible and much easier to use than previous versions of PASSER programs. By comparing PASSER V optimization algorithms with other programs, we found that PASSER V produces:

- timings with better progression bands than PASSER II when the same green splits are used, as well as higher productivity than the other programs; and
- timings with delays similar to those of Synchro and lower delay than TRANSYT 7F.

In addition, PASSER V also provides a capability similar to PASSER III for timing signalized diamond interchanges, and a new planning/ operations model to analyze the space issue for four-phase diamond interchanges. The other programs either do not have these features, or their capabilities to analyze/optimize diamond interchange operations are limited.

The Researchers Recommend…
Among the existing programs compared in this project, both Synchro and PASSER II produced good timings. For timing arterials,PASSER V provides the best features of these two programs and TRANSYT 7F. Therefore, we recommend PASSER V for all future arterial signal timing projects. PASSER V is as easy to use as Synchro and provides additional features not provided by the other programs. These additional features include models for optimizing and analyzing Texas diamond operations.

We recommend that the program be released to agencies outside TxDOT upon approval from the project panel.

Note: This research is documented in TTI Report 4020-1, *Software for Timing Signalized Arterials.* To obtain copies, visit the on-line catalog at http://tti.tamu.edu or contact Dolores Hott at (979) 845-4853 or d-hott@tamu.edu.

Tell us what you think!

What can we do to make the Research Digest edition even better for next year? Send your comments to dena.jackson@rsandh.com

Report from the International Director *(Continued from page 2)*

the ITE Professional Development Program Fund (to which TexITE has been a contributor). They provide an excellent opportunity for section meeting programs or training in firms or agencies. In addition to the course materials, an instructor's guide is provided on the CD. Each disk sells for $75.00, but I have copies and will be glad to lend them to interested parties. The courses available at this time include: Traffic Signal Clearance Intervals; MUTCD 2000 and 2003 Revisions; Engineering Intersections to Reduce Red-Light Running; and Managing High Technology Projects in Transportation. Other courses to be available by the end of the year are: Managing High Tech Projects; Trip Generation Fundamentals; Trip Generation Advanced Concepts; Introduction to Systems Engineering

ON-LINE LEARNING
ITE, with its partner in education, DeakinPrime USA, offers affordable, convenient learning opportunities for transportation professionals that can be accessed from office or home computers. http://ite.org/education/ OLGcatalog.pdf

MEGA ISSUES
At its spring meeting in California, the ITE International Board brainstormed critical issues facing our profession in the coming years. From over 50 issues suggested, the board identified five "Mega Issues" for specific exploration: Workforce Development; Safety; Operations; Designing for All Users; and Public Image/ Relations. Each of these issues will be addressed in detail by the board and staff over the next few months. In Orlando, the board employed a process called "Knowledge Based" decision making (What do we **know**, what do we **think**, what do we **feel**, what do we **do**?) on the issue of Workforce Development. I will report more on this at a later date.

As always, feel free to contact me on any ITE issue. It is a pleasure to serve as your representative to the ITE International Board of Direction.

Jim Carvell
jcarvell@tamu.edu

Job Postings

Jefferson Parrish, Louisiana
Traffic Engineer II (Traffic Division Head*)*

Under the administrative direction of the Director of Engineering, performs administrative, managerial, and engineering work of considerable difficulty in acting as division head of the Traffic Engineering Division. Employee is directly responsible for the overall operations of the division, and for the overall supervision of professional and non-professional engineers preparing geometric plans of roadway improvements, new roadways and traffic signal installations. Performs related work as required. Although under administrative direction, employee performs his/her duties independently, but is answerable to the Director of Engineering.

Minimum acceptable qualification requirements include: Graduation from an accredited college or university with a Bachelor of Science degree in Civil, Electrical or Mechanical Engineering, plus registration with the Louisiana State Board of Registration for Professional Engineers and Land Surveyors; plus a minimum of 10 years of post Professional Engineer Registration work experience, of which 6 years shall have been in active practice in the field of Transportation or Traffic Engineering, with 3 of those years being supervisory/management experience. Eligibility for the grade of Member in the Institute of Transportation Engineers can substitute for the 3 years of supervisory/management experience. If Engineer-Professional registration is in another state, must obtain Louisiana Registration within 6 months of employment.

Professional Services Directory

To submit job postings or list your firm in the Professional Services Directory, please contact dena.jackson@rsandh.com.

NEWSLETTER STAFF

Newsletter Editor:
Emily Braswell
Reynolds, Smith & Hills, Inc.
11011 Richmond Avenue, Suite 700
Houston, Texas 77042
Phone: (713) 914-4413
emily.braswell@texite.org

Newsletter Assistant Editor:
Michelle D. Jozwiak
Reynolds, Smith & Hills, Inc.
11011 Richmond Avenue, Suite 700
Houston, Texas 77042
Phone: (713) 914-4426
michelle.jozwiak@rsandh.com

Newsletter Assistant Editor:
Dena D. Jackson
Reynolds, Smith & Hills, Inc.
11011 Richmond Avenue, Suite 700
Houston, Texas 77042
Phone: (713) 914-4420
dena.jackson@rsandh.com

Roster Manager:
Susan Langdon
Street Smarts
Phone: (972) 771-6518
susanl@streetsmarts.us

COMMITTEE CHAIRS

Past Presidents: Robert W. Jenkins
Turner Collie & Braden, Inc.
1200 Summit Avenue, Suite 600
Fort Worth, TX 76102-4409
Phone: (817) 332-8977
jenkinsr@tcbftw.com

The Profession: George Human
City of Richardson
P.O. Box 830309
Richardson, TX 78083-0309
Phone: (972) 238-4243
george_human@cor.gov

Technical & Consultants: Larry Cervenka
Parsons Brinckerhoff Quade & Douglas
Mesquite, Texas
Phone: (214) 819-5964
cervenka@pbworld.com

Transit: Kevin R. St. Jacques
Wilbur Smith Associates
4925 Greenville Avenue, Suite 915
Dallas, TX 75206
Phone: (214) 890-4460
kstjacques@wilbursmith.com

Awards: James C. Cline
City of Irving
P.O. Box 152288
Irving, TX 77015-2288
Phone: (972) 721-2646
jcline@ci.irving.tx.us

Highway Products: Dale E. Thomson
Consolidated Traffic Controls, Inc.
P.O. Box 151837
Arlington, TX 76015
Phone: (817) 265-4321
dethomson@aol.com

Legislative: William R. Stockton
Texas Transportation Institute
7715 Chevy Chase Drive, Suite 4160
Austin, TX 78752
Phone (512) 467-0946
bill.stockton@tamu.edu

Membership: Bill Thorpe
City of San Antonio Public Works
223 South Cherry Street
San Antonio, TX 78203
Phone (210) 207-6906

Younger Members: Jason A. Crawford
Texas Transportation Institute
Arlington, TX
Phone: (817) 462-0534
jcrawford@tamu.edu

Future Engineers: Melisa D. Finley
Texas Transportation Institute
Texas A&M University System
3135 TAMU
College Station, TX 77843-3135
Phone: (979) 845-7596
m-finley@tamu.edu

texite

%: Reynolds, Smith & Hills, Inc.
11011 Richmond Ave, Suite 700
Houston, Texas 77042

Bulk Mail Stamp