



Research Digest

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Research Digest

Item 1

Ramp Closure Strategies for Incident Management

*UNIVERSITY OF TEXAS AT AUSTIN. CENTER FOR TRANSPORTATION RESEARCH (CTR)
CTR 5422-1 • 2007*

Non-recurring congestion accounts for a significant portion of freeway delay experienced by motorists in both rural and urban areas. Because access to these facilities is controlled by onramps, these can play a major role in minimizing the impact that unexpected incidents have on system performance. This project considered both methodological and practical considerations in using ramp closure as an incident management strategy. Novel methods for predicting incident severity were developed using probabilistic analysis, as well as a two-phase model for recommending which ramps should be closed, and for how long. These models were designed to be integrated with operations at a traffic management center, where responsibility for ramp closure is likely to be located. Further, an overview of closure devices is provided, along with their comparative advantages and disadvantages.

Full-text PDF of this report is available for free download from
http://www.utexas.edu/research/ctr/pdf_reports/0_5422_1.pdf

Item 2

Interim Repair Guidelines for Longitudinal Cracking and Joint Separations

*UNIVERSITY OF TEXAS AT AUSTIN. CENTER FOR TRANSPORTATION RESEARCH (CTR)
CTR 5444-1 • 2007*

Interim Repair Guidelines for Longitudinal Cracking and Joint Separations

Full-text PDF of this report is available for free download from
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Item 3

Identifying Right-of-Way Requirements During the Project Development Process

UNIVERSITY OF TEXAS AT AUSTIN. CENTER FOR TRANSPORTATION RESEARCH (CTR)

CTR 5478-1 • 2007

The determination of right-of-way requirements during the project development process depends on many factors including proposed alignment, typical sections, access control, and accommodation for construction, drainage, clear zone, highway access maintenance, accessible pedestrian design, and environmental mitigation. Right-of-way, as a function of project development, is not isolated and independent of other functions. It will be highly advantageous to the project development team to have a method that can help incorporate and control, in a systematic and efficient way, the factors affecting the determination of right-of-way and other functional requirements. The Advance Planning Risk Analysis (APRA) was developed to meet exactly this need. Associated with a computer tool, the APRA is a method that, if used properly can: 1) help optimize the identification of project requirements during the project development process in all functions, including Planning and Programming, Preliminary Design, Environmental, ROW, Utilities, and Detailed Design; 2) help the project development team control and manage critical project issues during project development; 3) provide a platform for project participants to cooperate and coordinate project activities and responsibilities; 4) help reconcile participants' difference through discussions; 5) be a means for training new personnel; and 6) be used to anticipate project performance after a certain period of using time. This document reports in detail the entire process of developing the APRA method and its computer tool and the complete explanation of the method, how to use it, and its potential benefits.

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Item 4

Design of CrackScope (VCrack)

UNIVERSITY OF TEXAS AT AUSTIN. CENTER FOR TRANSPORTATION RESEARCH (CTR)

CTR 5708-1 • 2007

Full-text PDF of this report is available for free download from
http://www.utexas.edu/research/ctr/pdf_reports/0_5708_1.pdf



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Item 5

Correlation of Texas Cone Penetrometer Test Values and Shear Strength of Texas Soils: Technical Report

TEXAS DEPARTMENT OF TRANSPORTATION (TXDOT)

FHWA/TX-08/0-4862-1 • 2008

This report discusses the correlation of Texas Cone Penetrometer (TCP) test values and shear strength of Texas soils. Data collected over the past decade by the Texas Department of Transportation (TxDOT) from several parts of Texas were used to verify the current correlation between TCP blow count and the undrained shear strengths of clays with higher (CH) and low liquid limits (CL), sandy clay (SC) and Other soils. Over 4000 sets of data were used to verify the current TxDOT relationships for the entire state of Texas and three TxDOT districts from where most of the data were collected. Limited field studies were performed to verify the current TxDOT relationship with CH and CL soils. Based on the data available and statistical analyses, linear and nonlinear relationships between undrained shear strength of soil and TCP blow count have been developed. The statistical parameters including the probability distribution functions (PDF) for the undrained shear strength (S_u) and TCP blow count (N_{tcp}) based on the type of soil were determined. Analyses showed that the current TxDOT design relationships overestimated the undrained shear strength (S_u) and TCP blow count (N_{tcp}) was dependent on the depth for all types of soils investigated. The depth dependency also varied from location to location. The undrained shear strength versus TCP blow count relationships developed were also influenced by the locations.

Full-text PDF of this report is available for free download from

<http://tti.tamu.edu/documents/0-4862-1>

Item 6

Electronic Database Compiling Bridge Storm Design Parameters

TEXAS A&M UNIVERSITY KINGSVILLE

TAMUK 5516-1 • 2008

The extensive bridge damage caused by recent hurricanes on the Gulf of Mexico showed a need for a design method against wave forces. A literature review revealed that current guidelines offer limited help to bridge designers, since current information related to the design of bridge superstructures when subjected to the action of waves is inadequate. This document presents a compilation of available sources of information that contain information related to forces produced by waves acting on engineering structures such as sea walls, suspended walls, and bridge decks.

Full-text PDF of this report is available for free download from

<http://users.tamuk.edu/kfgfa00/Wave%20Loads.HTM>



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Item 7

Report Synthesis of Wave Load Design Methods for Coastal Bridges

TEXAS A&M UNIVERSITY KINGSVILLE

TAMUK 5516-2 • 2008

Several coastal bridges have been destroyed by historic and recent hurricanes. Currently no guidelines exist for the design of bridge superstructures when subjected to the action of waves. This document presents an introduction to weather and hurricanes, fundamental concepts of water waves, and a compilation of available sources of information that contain information related to forces produced by waves acting on engineering structures such as sea walls, suspended walls, and bridge decks. A section on the parameters most relevant to the design of bridge superstructures against hurricane waves is included in this document. This report provides a synthesis of data found in several historical databases and database maintained regularly by government organizations and research laboratories. A methodology to update the database is also presented. A plan of action to develop design methodology is also included and followed by a chapter on benefits of expanding this research beyond the synthesis stage. The document ends with a set of conclusions and recommendations.

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<http://users.tamuk.edu/kfgfa00/Wave%20Loads.HTM>

Item 8

Electronic Database Compiling Bridge Storm Design Parameters

TEXAS A&M UNIVERSITY KINGSVILLE

TAMUK 5516-P1 • 2008

Several coastal bridges have been destroyed by historic and recent hurricanes. Currently no guidelines exist for the design of bridge superstructures when subjected to the action of waves. Design parameters available for the design of bridge superstructures against storm wave forces are scattered and difficult to interpret. This document provides a synthesis of data found in several historical databases and databases maintained regularly by government organizations and research laboratories.

Full-text PDF of this report is available for free download from

<http://users.tamuk.edu/kfgfa00/Wave%20Loads.HTM>



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Item 9

Hamburg Wheel-Tracking Database Analysis

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 1707-7 • 2007

This report outlines statistical analyses done to investigate whether the Hamburg wheel-tracking device (HWTD) can be used to validate durability tests such as the magnesium sulfate soundness (MSS) and Micro-Deval tests. Researchers manipulated and merged the Hamburg test database and aggregate properties database of the Texas Department of Transportation (TxDOT) to provide the basis for statistical analysis. The qualitative visual examinations of plots of aggregate properties and Hamburg wheel-tracking device performance, based on soundness resistance, suggest that MSS and Micro-Deval tests do not correlate well with Hamburg test results. However, single variable correlations between aggregate properties and Hamburg test performance indicate that both soundness and Deval tests have weak correlation with Hamburg test performance in that appropriate trends could be observed with final Hamburg results (deformation or number of wheel passes). These findings suggest that aggregate durability has some influence on the performance of the bituminous mix in the Hamburg test. The effects of aggregate, binder grade, mix type, and additive on HWTD results were also evaluated. The HWTD test parameters investigated included rutting, slope of the rutting curve, and the area beneath the rutting curve at specific cycles. Based on the results of the analysis, it was observed that the dominant factors influencing Hamburg test performance are those that stiffen the mix, particularly stiffer performance grades (PG) and additives such as lime.

Full-text PDF of this report is available for free download from

<http://tti.tamu.edu/documents/0-1707-7.pdf>

Item 10

Inventory of Utilities-Summary Report

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 2110-01-4 • 2008

Each year, thousands of utilities are installed within the Texas Department of Transportation (TxDOT) right of way (ROW). This proliferation of utilities makes it increasingly difficult for TxDOT to manage its own transportation system effectively and allow for more utilities. Research Project 0-2110 developed a prototype geographic information system (GIS)-based platform for the inventory of utilities located within the TxDOT ROW.

Implementation projects 5-2110-01 and 5-2110-03 are the result of TxDOT's decision to implement the findings of Project 0-2110. Project 5-2110-01 focused on the implementation of the GIS-based utility inventory model, whereas Project 5-2110-03 focused on the implementation of the Internet-based utility installation notice review process (also known as the utility permitting process). This report summarizes the work completed in Project 5-2110-01.

Full-text PDF of this report is available for free download from

<http://tti.tamu.edu/documents/5-2110-01-4.pdf>



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Item 11

Development and Delivery of Access Management Training Materials and Workshops

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 4221-01-1 • 2008

This report documents the development and delivery of outreach materials and workshops explaining access management principles and demonstrating related benefits.

Full-text PDF of this report is available for free download from

<http://tti.tamu.edu/documents/5-4221-01-1.pdf>

Item 12

Heavy-duty Flexible Bases: Field Performance and Draft Specifications

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 4358-4 • 2007

In Year 3 the laboratory test protocols for measuring the resilient modulus and permanent deformation properties of granular bases were further developed. A repeatability study was conducted, and studies were also made on the influence of sample size. A comparison was made with samples molded to the recommended dimensions (6 inches by 12 inches high) to the standard Texas Department of Transportation (TxDOT) size, 6 by 8 inch. Using a high-quality base material from Spicewood Springs, it was found statistically that the resilient modulus values were not affected by using a smaller sample size.

Experimental test sections were also constructed with three premium bases that meet the proposed Item 245 specification. Preliminary laboratory test results are presented on these bases together with details of the test section construction. The Tube Suction Test continues to be a good test to identify good base materials; it clearly distinguished between the Item 245 and Item 247 materials. No clear distinction could be made with other tests such as resilient modulus.

Numerous problems were encountered with running the low-fines bases through the traditional strength testing. We found problems with both the compaction and testing. A new vibratory compaction system was built, and it will be evaluated in Year 4 of this project.

Full-text PDF of this report is available for free download from

<http://tti.tamu.edu/documents/0-4358-4.pdf>



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Item 13

Pilot Implementation of the Overlay Tester and Double-Blade Saw

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 4467-01-1 • 2008

Past experience and recent field performance data has shown that several of TxDOT's widely used asphalt mixtures are rut resistant but increasingly prone to cracking. Under Research Project 0-4467 the Overlay Tester (OT) was successfully demonstrated as a simple performance-related test to identify the crack resistance of asphalt mixtures. This implementation project focused on developing specifications for the OT, purchasing three units, and conducting shakedown tests on the new units. Within lab testing at the Texas Transportation Institute produced very consistent results. However, variability problems were encountered in the initial Round-Robin tests between the labs. An investigation was conducted to identify the source of the differences. Several factors were identified and these are described in this report. Recommendations were made to modify the test protocol and it is highly recommended that a second Round-Robin test be conducted to evaluate the repeatability and reproducibility of the overlay tester.

Additionally, specifications for double-bladed saws were developed and three saws were purchased and delivered to Districts labs. The samples cut with these saws meet the required operational tolerances. However, it was recommended that calibration may be required on mixtures made with extremely hard rock, such as river gravels.

The results obtained with both the new overlay testers and double bladed saws are presented in this report. The specifications for each device are given in the Appendices.

Full-text PDF of this report is available for free download from

<http://tti.tamu.edu/documents/5-4467-01-1.pdf>

Item 14

Tests to Identify Poor Quality Coarse Limestone Aggregates and Acceptable Limits for Such Aggregates in Bituminous Mixes

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 4523-2 • 2007

Over the last few years the Texas Department of Transportation has expressed concern about mineralogical segregation (variation) of coarse aggregates used in bituminous mixes; problems are associated with variation in the quality of aggregates taken from a quarry/gravel pit. The primary objective of this project was to examine the effects of poor quality coarse limestone aggregate on hotmix asphalt performance and to determine how much of the poor quality limestone can be used before adversely affecting performance. A Type C aggregate composed of a high quality limestone from one quarry was blended with soft and absorptive limestone aggregates from two other quarries in different proportions using a PG 64-22 asphalt binder. The individual aggregates were run through Los Angeles abrasion, Micro-Deval, magnesium sulfate soundness, specific gravity, and absorption tests. Molded bituminous samples were tested with the Hamburg wheel tracker, dynamic modulus, and the overlay tester. In order to obtain less than 10 percent marginal Texas coarse limestone aggregate, the Micro-Deval loss should not exceed 20 percent, and the magnesium sulfate soundness percent loss should not exceed 15. The introduction of marginal coarse limestone aggregate will lower the reflection cracking life of the bituminous mix, so a maximum of 10 percent marginal (soft and absorptive) coarse limestone aggregate is recommended.

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<http://tti.tamu.edu/documents/0-4523-2.pdf>



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Item 15

Field Evaluations and Guidelines for Rubblization in Texas

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 4687-2 • 2007

Rubblization is a unique means of rehabilitating concrete pavements by in-place conversion of the old concrete pavement into usable base. Rubblization employs machinery that will break apart the concrete in place and leave pieces small enough that reflective cracking problems are significantly reduced or ideally eliminated. This report builds upon the previously published report 4687-1. This report presents a summary of several field investigations performed to evaluate projects' suitability for rubblization projects. Based on these experiences, this report presents a non-invasive field test procedure to evaluate projects, recommended thickness design procedures for rubblization projects, and a construction specification for conducting rubblization in Texas. Full-text PDF of this report is available for free download from

<http://tti.tamu.edu/documents/0-4687-2.pdf>

Item 16

Non-Vital Advance Rail Preemption of Signalized Intersections near Highway-Rail Grade Crossings: Technical Report

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 4746-3 • 2007

The Texas Department of Transportation (TxDOT) primarily uses simultaneous preemption of traffic signals near highway-rail grade crossings to clear queued vehicles prior to the arrival of a train at the crossing. At some intersections, 20 seconds of advanced warning may not be sufficient to allow the traffic signal to clear pedestrians using the normal clearance intervals between phases. The research developed an alternative method (nonvital advance preemption) of ensuring adequate pedestrian clearance in the presence of an approaching train without interfering with the normal preemption sequence at the intersection or installing costly additional track circuitry needed to provide advance preemption. Two strategies were investigated to ensure pedestrian clearance time. The first utilizes a lower-level preemption sequence to guarantee full pedestrian clearance to a terminating phase before the traffic signal starts the preemption sequence. The second strategy uses the pedestrian-omit feature to prevent the controller from activating the pedestrian interval if there is not sufficient time in advance of the start of the preemption sequence to provide full pedestrian clearance.

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Item 17

Truck Instrumentation for Dynamic Load Measurement

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 4863-1 • 2007

The Texas Department of Transportation (TxDOT) is implementing a ride specification that uses profile data collected with inertial profilers for acceptance testing of the finished surface. This specification is based primarily on ride quality criteria. The objective of the present project is to establish whether gaps exist in the current specification that permit frequency components of surface profile to pass that are potentially detrimental to pavement life based on the induced dynamic loading. To carry out this objective, the work plan includes tests to measure surface profiles and vehicle dynamic loads on in-service pavement sections. This interim report documents the research efforts conducted to provide an instrumented tractor-semitrailer combination for measurement of dynamic loads and a high-speed inertial profiler for measurement of surface profiles. These test vehicles were used in this project to collect data for evaluating TxDOT's Item 585 ride specification.

Full-text PDF of this report is available for free download from

<http://tti.tamu.edu/documents/0-4863-1.pdf>

Item 18

Specification Framework for Communication Utilities and Estimation of Utility Adjustment Costs

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 4998-3 • 2007

Report 0-4998-1, "A Unit Cost and Construction Specification Framework for Utility Installations," described a prototype framework of construction specifications and corresponding unit cost work items for utility installations at TxDOT and recommendations on how to implement that framework in Texas. That report focused on water and sanitary sewer installations. Report 0-4998-2, "Construction Specification Requirements for Water and Sanitary Sewer Installations," provided a detailed description of the corresponding specification requirements for water and sanitary sewer utility installations that could be used to prepare the construction specifications.

This report is a follow up to the 0-4998-1 and 0-4998-2 reports. It describes a prototype framework of specification requirements and corresponding unit cost work items for communication utilities. The requirements for each specification include a summary table outlining the main characteristics of the proposed specification and provide a listing of bid items, subsidiary items, and units of measurement, followed by a list of specification requirements. This report also summarizes a methodology to develop utility adjustment cost estimates during the early stages of the project development process and a procedure for estimating the uncertainty and likelihood of exceedance of those estimates. The need for that methodology became apparent after realizing the limitations of traditional approaches that simply estimate utility adjustment costs as percentages of the highway construction costs without providing a measure of uncertainty for those estimates.

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Item 19

Assesing the Ability of Fog Seals to Seal Pavements, to Rejuvenate in Situ Binder, and to Retard Binder Oxidation

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 5091-3 • 2007

This work was conducted for the purpose of assessing the effectiveness of fog seal treatments as an aid to highway maintenance managers in making sound decisions for fog seal treatments. Replicate cores of both treated and untreated highway and general aviation pavement sections were analyzed. Whole cores were assessed by water permeability and by susceptibility to permanent deformation. Replicate cores were sawed into one-quarter inch slices which were individually analyzed for total air voids, binder content, oxidative aging and rheology, and for the presence of fog seal material. The fog seal materials used in this project were emulsions of asphalt materials and coal tar type materials. Results showed that if the fog seal is penetrating into the pavement, it is not doing so to a detectable level, the permeability of the pavement is not significantly reduced, and APA test did not show any softening of the pavements by the treatments. Additionally, 1) differences between untreated and treated pavement slices generally seem more likely due to original binder variability with depth than to the fog seal treatments, although coal-tar treatments appear to harden the top layer; 2) effects of the fog seal treatments on oxidative aging were not observed; 3) previous work, that the aging rates of asphalt binders are decreased by very low accessible air voids is supported. In summary, the effects of fog seals on pavement durability appear to be minimal, with respect to binder rejuvenation or sealing. Cosmetic effects or protecting against shelling or raveling remain as possible benefits, although they were not assessed by this project. In response to this work, engineers should reassess the cost-benefit balance of fog seal treatments.

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<http://tti.tamu.edu/documents/0-5091-3.pdf>

Item 20

Ramp Reversal Projects: Guidelines for Successful Implementation

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 5105-P2 • 2007

Many urban freeways in Texas experience congested traffic conditions during peak periods. Freeway system expansion is very expensive and time-consuming. Consequently, alternatives other than construction of new facilities are desired. The Texas Department of Transportation has been implementing comparatively inexpensive methods to improve existing freeways such as grade-separated (I.E., braided) ramps and modified ramp configurations via X-ramp interchanges and ramp reversals.

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Research Digest

Item 21

Checklist for Accommodating Pedestrians in Temporary Traffic Control Areas

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 5237-P1 • 2007

The need to provide improved consistency and quality of pedestrian traffic control devices has become more important with the implementation of the Americans with Disabilities Act of 1990 (ADA), which was passed to eliminate barriers to employment, transportation, public accommodations, public services, and telecommunications. The ADA requires that pedestrians with physical and/or mental disabilities be accommodated not only in completed facilities, but also during times of construction. The Texas Department of Transportation sponsored a project to investigate methods for accommodating pedestrians in work zones that meet the evolving requirements being developed as a result of the ADA. This checklist document was developed to assist in considering pedestrians within the public right-of-way. Advice on pedestrians is contained in several locations- this document groups the advice to reflect the different stages of a project. The four stages used within the checklist are:

Stage 1: Feasibility

Stage 2: Project Assessment

Stage 3: Temporary Traffic Control Plan Development

Stage 4: Construction In-Field Review

The checklist provides topics and issues to be considered within each stage. It also provides examples or discussion for these topics. After the user gains familiarity with the checklists, the examples and discussions are not needed. Therefore, the Appendix provides a summary of the key topics to consider when using the checklist.

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Item 22

Guidelines on Construction and Maintenance of Porous Friction Courses in Texas

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 5262-2 • 2008

Porous or permeable friction courses (PFC) are hot mix asphalt mixtures placed at the surface of a pavement structure in a thin layer to produce several benefits for the traveling public in terms of safety, economy, and the environment. It is a sacrificial wearing course consisting of an aggregate with relatively uniform grading and little or no fines and mineral filler and it is designed to have a high air void content compared to dense-graded mixtures.

This document presents construction and maintenance guidelines for PFC which is based on a compilation of information from:

-published literature;

-interviews with engineers and inspectors of TxDOT districts with experience in the construction of PFCs; and

-onsite field observations during the construction of 10 PFC projects around the state.

Construction guidelines are presented on mixture production, storage and transportation, surface preparation,

mixture placement, compaction and joint construction, and mixture acceptance.

Since most of the PFCs constructed in Texas have performed very well to date, there is little experience regarding maintenance of PFCs. Based on information from the literature, guidelines are presented on

corrective maintenance, surface maintenance, winter maintenance, and rehabilitation.

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Research Digest

Item 23

Managed Lane Strategies Feasible for Freeway Ramp Applications

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 5284-2 • 2008

Current funding constraints and difficulty in gaining environmental and public approval for large-scale construction projects has forced the Texas Department of Transportation (TxDOT) to continue considering alternative solutions to roadway widening to mitigate congestion. One area for potentially improving freeway performance is ramp locations. Current ramp treatments only address point demand. Applying managed lanes operational strategies to ramps could maximize existing capacity, manage demand, offer choices, improve safety, and generate revenue. This project investigates the application of these demand management strategies to mainlane ramps and managed lane ramp operations during the peak period; i.e., "managed ramps." Such strategies could include peak-period use of both mainlane or managed lanes entrance and exit ramps by user group, possibly influencing mode choice, enhancing mobility, improving safety in a freeway corridor, and helping ensure the integrity and free-flow operations of a managed lanes facility. This research: (1) investigated under what conditions should managed ramps be considered for both mainlanes and managed lanes based on relevant factors including target users in the corridor, congestion level, ramp spacing/density, ramp volumes, accident history, etc.; (2) assessed the impacts and benefits of managed ramps; and (3) developed general guidelines and best practices for operating and enforcing managed ramps.

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<http://tti.tamu.edu/documents/0-5284-2.pdf>

Item 24

Guidelines for Applying Managed Lane Strategies to Ramps

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 5284-P1 • 2007

Current funding constraints and difficulty in gaining environmental and public approval for large-scale construction projects has forced the Texas Department of Transportation (TxDOT) to continue considering alternative solutions to roadway widening to mitigate congestion. One area for potentially improving freeway performance is ramp locations. Current ramp treatments only address point demand. Applying managed lane operational strategies to ramps could maximize existing capacity, manage demand, offer choices, improve safety, and generate revenue. This project will investigate the application of these demand management strategies to mainlane ramps and managed lane ramp operations during the peak period: i.e., "managed ramps." Such strategies could include peak-period use of both mainlane or managed lanes entrance and exit ramps by user group, possibly influencing mode choice, enhancing mobility, improving safety in a freeway corridor, and helping ensure the integrity and free-flow operations of a managed lanes facility. This document provides guidance on identifying when to consider managed ramps based on relevant factors including target users in the corridor, congestion level, ramp spacing/density, ramp volumes, accident history, etc.

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Research Digest

Item 25

Integration and Consolidation of Border Freight Transportation Data for Planning Applications and Characterization of NAFTA Truck Loads for Aiding in Transportation Infrastructure Management: First Year

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 5339-1 • 2007

The quantity of truck transportation handled in Texas increased dramatically in the 1990s especially after the full implementation of the North American Free Trade Agreement (NAFTA). Accurate information on truck volumes and truck characteristics is critical to the transportation planning and transportation operation activities performed by the Texas Department of Transportation (TxDOT) and other agencies responsible for the freeway and roadway system in the state of Texas. Information for freight transportation planning, in particular truck-related data, is expensive and difficult to collect, but various agencies located at the Texas-Mexico border already gather information that is used for operation or statistical purposes.

This report covering first-year activities identifies planning information needs, determines data that are being collected by various federal, state, and local agencies, and proposes an integrated truck-related information system that could be used for planning purposes. Second-year activities will involve collecting and analyzing loading characteristics of heavy vehicles associated with cross border trade required for determining infrastructure impacts.

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<http://tti.tamu.edu/documents/0-5339-1.pdf>

Item 26

Enhancements to PASSER V Signal Timing Optimization Program

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 5424-1 • 2008

The Texas Department of Transportation (TxDOT) and many other agencies in the U.S. prefer to time their traffic signals to maximize through progression for arterial traffic. Because of this need, the PASSER series of traffic signal timing optimization software has become an important asset to these agencies. Recent access management analysis of several arterial roadways in Texas required the comparison of alternatives with different signal spacing, inevitably leaving some intersections unsignalized. Since all the members of the PASSER software family cannot presently analyze unsignalized intersections, it was necessary to use the Synchro traffic optimization tool for analysis. However, as the Synchro tool is not designed to provide arterial progression, questions were raised about the usability of the results, since TxDOT would inevitably time signals along an arterial to achieve progressed flow.

The objective of this project is to enhance PASSER V to provide the capability to analyze the impacts of unsignalized intersections, including driveways, located on signalized arterials. In projects including traffic management improvements or access management improvements, different intersections are signalized or unsignalized to achieve various operational or safety improvement objectives. With the additional feature to analyze unsignalized intersections, PASSER V users are able to make side-by-side comparisons between alternatives for these projects.

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<http://tti.tamu.edu/documents/0-5424-1.pdf>



Research Digest

Item 27

Managed Lane Strategies Feasible for Freeway Ramp Applications

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 5446-2 • 2008

This report describes research activities regarding the comprehension of the signs and pavement markings for toll roads and managed lanes. Texas Transportation Institute researchers conducted seven focus groups, which explored driver understanding of toll road route markers, open road tolling payment options, pavement marking symbols, and preferential lane pavement markings in four Texas cities. Researchers also reviewed the ongoing development of revisions to the toll road chapter for the Texas Manual of Uniform Traffic Control Devices.

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<http://tti.tamu.edu/documents/0-5446-2.pdf>

Item 28

PIA System Installation and User Guide

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 5507-P2 • 2008

This research project enhanced a platoon identification and accommodation (PIA) system developed by the Texas Transportation Institute (TTI) researchers in an earlier research project. The PIA system consists of off-the-shelf hardware and custom software for providing intelligent control at isolated traffic signals. This document contains detailed information required for installing and operating the enhanced version of the PIA system developed in TxDOT Project 0-5507. This document begins by providing a brief description of the PIA system, what it does, and where it could be installed. Then, the document provides detailed information about various system components, the approximated cost of each off-the-shelf hardware component and where to acquire it. Then, the document provides detailed instructions on how to install and configure needed software components, including the PIA software. Appendices provide additional information needed to configure communication links with traffic signal cabinets.

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Research Digest

Item 29

Regional Public Transportation Coordination in Texas

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 5542-1 • 2008

Chapter 461 of the Texas State Transportation Code focuses on maximizing the benefits of the state's investment in public transportation through the coordination of services. In 2005, the Texas Transportation Commission, under the leadership of Commissioner Hope Andrade, established the Regional Planning and Public Transportation Study Group. The mission of the Study Group was to review current public transportation planning and programming practices within metropolitan, suburban, and rural areas and to enhance service delivery, customer satisfaction, efficiency and effectiveness. TxDOT sponsored project 0-5542 to support the Study Group and twenty-four regional efforts to develop regional coordinated human service public transportation plans. This report and compact disc (CD) presents the major elements of the on-going planning and implementation process being conducted by twenty-four planning regions and TxDOT. The three primary project objectives included:

1. A website and information clearinghouse for coordinated public transit-human services transportation plans
<http://www.regionalserviceplanning.org>
2. Facilitating regional coordination plan development efforts
3. Providing technical and information resource services to the planning regions.

The accompanying CD contains the project website and all of its contents as of August 2007. The combined report and CD serve to archive this two year effort.

Full-text PDF of this report is available for free download from

<http://tti.tamu.edu/documents/0-5542-1.pdf>



Research Digest

Item 30

Measures, Methods, and Application of a Mobility Monitoring Process for Small to Medium-Sized Communities

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 5571-1 • 2007

Many TxDOT districts struggle with congestion issues in growing small to medium-sized communities (SMSCs). Congestion in these communities is often highest along state highways that also serve major local travel functions. The objective of this one-year research project was to develop and test a framework for congestion monitoring in SMSCs, including economical (low-cost) monitoring techniques and the normal range of improvements for SMSCs. This report summarizes the activities and results for this one-year project. Researchers developed a six-step framework for performing on-going mobility monitoring in SMSCs. The framework was applied in two pilot study locations- one in a small-sized community (less than 50,000 population with no metropolitan planning organization [MPO] presence), and another in a medium-sized community (greater than 100,000 population with a MPO presence). Researchers collected travel time data using test vehicles instrumented with global positioning system (GPS) equipment, pneumatic tube traffic volume data, and performed videologs of the 14 (total) corridors. Researchers performed a stopped delay study at one location. Researchers developed methods to effectively communicate mobility monitoring results to both technical and non-technical audiences. A survey of SMSCs was performed to obtain a better understanding of congestion definitions, monitoring activities, and when, where, and why congestion occurs in SMSCs. Researchers developed numerous outreach materials including a guidebook entitled *Guidebook for Mobility Monitoring in Small to Medium-Sized Communities: A How-To Guide* for technical audiences, a companion (smaller) document for non-technical audiences, tri-fold brochure for the general public, one-page overview of the framework, interactive CD with PowerPoint presentations to technical and non-technical audiences and an interactive case study, and preliminary workshop lesson plans. The result documented in this research report, and the associated outreach materials will be useful for TxDOT staff in small to medium-sized communities as well as TxDOT's partnering agencies, including MPOs, municipalities, and counties.

Full-text PDF of this report is available for free download from

<http://tti.tamu.edu/documents/0-5571-1.pdf>



Research Digest

Item 31

Communications Trends and their Impact on TxDOT ITS Deployments

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 5586-1 • 2008

The Advanced Traffic Management System (ATMS) from the Texas Department of Transportation (TxDOT) has been used in multiple Intelligent Transportation System (ITS) deployments across the state. ATMS utilizes a physical communications infrastructure that provides connections to field devices, provides video streams, and enables information flow to other centers, the media and/or the public. Several trends have an impact on the design and operation of this physical infrastructure, including:

- Development of the next generation software interfaces for ATMS
- Development of a core technology architecture for TxDOT,
- Communication of industry trends, and
- Needs of information providers.

This project documented the current state of ATMS deployments, analyzed the impacts of the above trends, and developed a conceptual model for an ATMS network architecture to be used in future ITS deployments. This architecture is discussed in terms of services, security, and areas of responsibility.

Full-text PDF of this report is available for free download from

<http://tti.tamu.edu/documents/0-5586-1.pdf>



Research Digest

Item 32

Thin HMA Overlays in Texas: Mix Design and Laboratory Material Property Characterization

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 5598-1 • 2008

In this interim report, various cold-laid and hot-mix asphalt (HMA) mixes were designed and/or evaluated based on the balanced mix-design concept and the Texas Department of Transportation (TxDOT) crack attenuated mix (CAM) special specification (SS) 3109 specification for their potential application as very thin overlay mixes. The research methodology incorporated extensive laboratory testing and field experiments including the Hamburg, overlay, and ground penetration radar.

While exhibiting fairly satisfactory field performance, laboratory results indicated that the cold-laid maintenance mixes are potentially susceptible to moisture damage (stripping). In general, their laboratory performance under the wet Hamburg test and the overlay test was very poor. Their excellent laboratory performance under dry Hamburg testing at ambient temperature suggest that these cold-laid mixes are good for application in dry areas, but they may not perform well under wet conditions or if water infiltrates into the mix. More research is recommended with these mixes. With the HMA mixes, promising laboratory results have been obtained with fine-graded (3/8 inch nominal maximum aggregate size) mixes; predominantly composed of Type F rock and screenings and an asphalt-binder content of over 7 percent. Based on the TxDOT CAM SS 3109 specification, high quality clean Class A aggregates, such as granite, exhibited superior laboratory performance and are recommended. However, acceptable laboratory designs were also obtained with good quality sandstone and limestone materials. As described in this report, the initial field performance of these mixes has been very good and this will be further validated in Year 2 of this study. Draft specifications and guidelines for very thin HMA overlays will be submitted at a later stage after conducting field performance monitoring and evaluations of selected demonstration/implementation projects.

Full-text PDF of this report is available for free download from

<http://tti.tamu.edu/documents/0-5598-1.pdf>



Research Digest

Item 33

Effectiveness of the "Teens in the Driver Seat Program" in Texas

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 5657-1 • 2008

The goal of this research project was to assess the effectiveness of the Teens in the Driver Seat (TDS) Program in Texas. The first peer-to-peer driver education and awareness program for teens in the United States, the TDS program, was deployed at approximately 60 schools in Texas during the course of the 2006-2007 school year. Targeted at fighting the number one killer of teens in America, the program uses peer influence in a positive way by helping teens increase awareness of the most common risks teens face while driving- namely, 1) driving at night; 2) distractions (primarily in the form of other teen passengers and cell phones/texting); 3) speeding; 4) not wearing a seat belt; and 5) alcohol use.

Attitudinal surveys, field studies, focus groups, and the TDS Program website statistics were some of the means used to assess the impact of the program. Analyses indicate awareness of the common risks (other than "drinking and driving", which is already very high) has improved 40 to 200+ percent, while field studies indicate seat belt use is an average of 11 percent higher and cell phone use/texting is 30 percent lower at "program schools" as compared to a control group of schools at which the program has never been deployed. Website traffic for www.t-driver.com has increased over 1,500 percent in the past 18 months, with a current average of 20,000 hits per month and an average duration of time spent at the site having doubled this year to a current level of 8 minutes. Personal interviews indicate the program is popular with teens, and they feel the peer-to-peer approach is productive and serves a number of beneficial purposes for them.

Full-text PDF of this report is available for free download from

<http://tti.tamu.edu/documents/0-5657-1.pdf>

Item 34

Short Sea Shipping Initiatives and the Impacts on the Texas Transportation System: Technical Report

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 5695-1 • 2007

This report examines the potential effects of short sea shipping (SSS) development on the Texas transportation system. The project region includes Texas, Mexico, and Central America. In the international arena, the most likely prospects are for containerized shipments using small container ships. In the domestic arena, the most likely prospects are for coastwise shipments using modified offshore service vessels of articulated tug/barges. Only three Texas ports handle containers consistently (Houston accounts for 95% of the total), and three more handle containers sporadically. Other ports could potentially offer a limited container service but will most likely require equipment and infrastructure upgrades to be competitive. The report identifies several triggers, which – if they were to occur – could abruptly change the level of SSS activities in the region. Even with a doubling of current SSS volumes, the effects on the Texas highway and rail systems will most likely be insignificant, with the possible exceptions of Freeport and Brownsville.

Full-text PDF of this report is available for free download from

<http://tti.tamu.edu/documents/0-5695-1.pdf>



Research Digest

Item 35

Improving Ride Quality of Portland Cement Concrete Pavement: Final Report

UNIVERSITY OF TEXAS AT ARLINGTON (UTA)

UTA 4385-1 • 2007

The construction of smooth and durable pavements is a major objective in construction projects. The administration at TxDOT has asked that ride quality be stressed on all construction projects. TxDOT has focused on ride quality specifications and has revised them several times in the recent past. These specifications call for remedial action well after the concrete has hardened and it becomes necessary to grind the concrete, which leaves a permanent scar for the life of the pavement. If poor ride quality could be detected before the concrete reaches its initial set, a better product at less cost could potentially be achieved. The objective of this research is to determine if early detection of inadequate ride or smoothness in PCC pavements can be determined and if so, identify the appropriate correction procedures needed before the concrete has hardened.

Full-text PDF of this report is available for free download from

<http://ranger.uta.edu/~walker/Reports/FINAL%200-4835-1.pdf>

Item 36

Pilot Implementation of Bump Detection Profiler

UNIVERSITY OF TEXAS AT ARLINGTON (UTA)

UTA 4385-01-1 • 2007

During TxDOT Project 0-4385, a sliding profiler device was developed that has the capability to be attached to a concrete paver for determining the location of bumps on fresh concrete. This device has potential to provide TxDOT and contractors an early identification of defects in newly poured concrete. Contractors could even fix the defects while concrete is still fresh. During Project 5-4385-01, this device was implemented on several construction projects. This report describes the implementation of this device.

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