



Research Digest

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Research Digest

Item 1

Workshop on Design of Durable Concrete

UNIVERSITY OF TEXAS AT AUSTIN. CENTER FOR TRANSPORTATION RESEARCH (CTR)
CTR 4098-IMP-P1 • 2008

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Item 2

Design of Composite Steel Beams for Bridges

UNIVERSITY OF TEXAS AT AUSTIN. CENTER FOR TRANSPORTATION RESEARCH (CTR)
CTR 4811-1 • 2008

Current AASHTO bridge specifications require that composite beams have sufficient shear studs to fully yield the steel beam cross section in tension. The large number of studs required is independent of the loading on the bridge. It is recommended that partial composite design as used in building specifications be permitted. It is shown that 85% of the full composite strength can be achieved with 40% fewer studs.

The minimum stud spacing requirements in AASHTO were compared with the requirements in other design specifications. Additional research was recommended to evaluate the possibility of relaxing the current minimum requirement. It was shown that the current AASHTO fatigue requirements for stud design are conservative compared to the most recent research but no change is recommended.

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

http://www.utexas.edu/research/ctr/pdf_reports/0_4811_1.pdf

Item 3

Validating Mechanisms in Geosynthetic Reinforced Pavements

UNIVERSITY OF TEXAS AT AUSTIN. CENTER FOR TRANSPORTATION RESEARCH (CTR)
CTR 4829-1 • 2008

Base reinforcement results from the addition of a geosynthetic at the bottom of or within a base course to increase the structural or load-carrying capacity of a pavement system. While there is clear evidence that geosynthetic reinforcements can lead to improved pavement performance, the identification and quantification of the parameters that contribute to such improvement has remained, at best, unclear. In addition, pavement structures deteriorate under the combined effects of traffic loading and environmental conditions such as moisture changes. The effect of moisture changes can be particularly detrimental in many locations of Texas, which are characterized by the presence of expansive clays. Consequently, this research focused on the assessment of the effect of geosynthetics on the pavement structural section and on its resistance to environmental damage.

It is well documented that the use of geosynthetics for unbound base courses can lead to improved performance and reduced costs in pavement systems. However, appropriate selection of geosynthetics is compromised by the difficulty in associating their relative properties to pavement performance. Accordingly, important objectives of this research included: (i) determining the properties of geosynthesis that contribute to enhance the performance of pavement systems, and (ii) developing material specifications that incorporate the geosynthetic and soil properties that govern the pavement performance.

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Item 4

Mixture Design and Performance-Based Specifications for Cold Patching Mixtures

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

CTR 4872-2 • 2007

Cold patching asphalt mixtures constitute an essential element for the maintenance and rehabilitation of pavement infrastructure. Although this maintenance technique is both expensive and time consuming, it can minimize further damage and costly future repairs as well as increase user and vehicle safety. As a result, cold patching mixture performance is critical. Unfortunately, there is a lack of standard mixture design guidelines for homemade mixtures and performance-based mixture specifications for both homemade and containerized mixtures to ensure satisfactory field performance. This report presents a homemade mixture design for cold and wet weather areas by identifying the failure mechanisms of cold patching mixtures and analyzing the effects of gradation, aggregate shape, binder content and viscosity, curing time, temperature, and admixtures on the mixture workability and stability. Laboratory and accelerated pavement testing (APT) procedures are specifically defined for use with cold patching mixtures. Results from field evaluations are used as overall relative measures of field performance and as validation for those results obtained from laboratory and accelerated pavement tests. Furthermore, testing results, in conjunction with testing procedures developed as part of this project, are used to provide recommendations for performance-based specifications for homemade and containerized cold patching mixtures. Such recommendations provide interim guidelines for the rejection or approval of such mixtures. Overall, the protocols and testing procedures discussed in this report help ensure the material characteristics necessary for desired patch performance in the field, which in turn reduces the failure rate and makes cold patching a more cost-effective maintenance operation.

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

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Item 5

Best Spall Repairs for Portland Cement Concrete Pavements for TxDOT Engineers/Inspection and Maintenance Supervisors

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

CTR 5110-01-P1 • 2008



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Item 6

Measuring Access to Public Transportation Services: Review of Customer-Oriented Transit Performance Measures and Methods of Transit Submarket Identification

*UNIVERSITY OF TEXAS AT AUSTIN. CENTER FOR TRANSPORTATION RESEARCH (CTR)
CTR 5178-1 • 2005*

This report synthesizes knowledge from existing literature relating to the interpretation and measurement of transit service quality from a customer-oriented perspective. The focus is on the evaluation of fixed-route transit systems. In addition, we review earlier studies that offer conceptual and operational ways of identifying different transit submarkets, their characteristics, and their varying activity and mobility needs. Our review suggests that existing transit service delivery measures are limited to their capabilities of reflecting the ease with which different population subgroups are able to participate in their desired activities using transit. Future effort in transit service delivery modeling needs to develop separate indices for different population subgroups for different trip purposes. There should also be a mechanism to consolidate these indices into successively more aggregate measures and ultimately into a single generalized measure that represents the overall service level for a region.

Full-text PDF of this report is available for free download from
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Item 7

State of the Practice: Permeable Friction Courses

*UNIVERSITY OF TEXAS AT AUSTIN. CENTER FOR TRANSPORTATION RESEARCH (CTR)
CTR 5220-1 • 2008*

Permeable Friction Courses (PFC) are open-graded bituminous mixtures placed over an impervious base. The interconnected air voids allow rainwater to drain into the pavement thus providing a safer driving surface in wet weather and a filter for highway runoff.

This report summarizes the current state of the practice related to the hydraulic properties, water quality benefits, and maintenance of PFC based on literature from around the world. Porous pavements reduce pollutant concentrations in the highway runoff during the functional service life of the pavement, which ultimately results in clogging of the pavement. This material accumulating in the pores was found to have high concentrations of pollutants, such as heavy metals. Pavement cleaning machines used in Europe to remove accumulated pollutants are described and usually found to maintain the function of the pavements. Existing research also includes measurements of hydraulic conductivity over time and from different pavements. In winter conditions, more maintenance is required for PFCs than for conventional pavements since the air voids change with ambient air temperature causing the PFC to freeze faster than conventional pavement. Other beneficial properties of PFCs, such as the friction coefficient and noise reduction ability, are also described.

This report also presents the results of a nationwide survey of DOTs conducted to document PFC use and maintenance in the U.S. The survey revealed minimal hydraulic testing, hydraulic design guidelines, and pavement maintenance by the DOTs. The cleaner stormwater runoff observed from PFC in several European studies has not been investigated by U.S. DOTs other than TxDOT.

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Item 8

Guidelines on Concrete Mixture Optimization in Varying Weather Conditions

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

CTR 5550-P1 • 2006

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Item 9

Non-Destructive Evaluation of Installed Soil Nails

TEXAS TECH UNIVERSITY (TECHMRT)

TechMRT 4484-1 • 2007

Recent forensic studies that investigated failure of several Texas Department of Transportation (TxDOT) soil nailed retaining walls revealed that incomplete grouting of soil nails was a very common problem. This finding has raised serious questions about the adequacy of QC/QA procedures currently used by TxDOT for verifying the integrity of installed soil nails. The research study described in this report attempted to address these concerns by: (a) developing of a non destructive test method to check the integrity of soil nails, (b) identifying the construction variables that have the most dominant influence on grout integrity and developing guidelines to control them. Sonic Echo method was selected, further refined and “customized” for non-destructive evaluation of soil nail grout columns. Optimum test parameter combination to be used with Sonic Echo testing was determined through several cycles of NDT testing that were conducted at an experimental soil wall that was specially built for this research. Among the various construction variables examined, grout rheology (or flowability) and tremie insertion length were found to be the most important parameters that influence integrity of soil

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Item 10

Left-Turn Lane Design and Operation

TEXAS SOUTHERN UNIVERSITY (TSU)

TSU 5290-1 • 2008

This project examined important issues related to the design and operation of left-turn lanes. It developed an analytical model for determining the queue storage lengths of left-turn lanes at signalized intersections by considering both parts of left-turn queue: (1) the vehicles that arrive during the red phase (red-phase queue), and (2) the queue of vehicles carried over from previous cycles (leftover queue). The evaluation results indicated that the developed model considerably outperforms the existing methods by providing more accurate estimates of left-turn queue lengths. In addition, a decision making flowchart for installing multiple left-turn lanes was developed by combining the warrants in four categories: (1) capacity and volume based, (2) left-turn queue length based, (3) safety based, and (4) geometric condition based warrants. Furthermore, the safety benefits of extending the lengths of left-turn lanes were analyzed and the analysis results indicated that extending the length of left-turn lanes will significantly reduce the rear-end accident risk at intersections. Finally, this research investigated the left-turn bay taper length estimation and the impacts of signal phasing sequence on left-turn operation. It recommended using different sets of bay taper lengths for the intersections in the urban and non-urban areas and it suggested the way to select the proper signal phasing sequence for the intersections with left-turn lane overflow and/or blockage problems.

Item 11

Construction Details and Initial Performance of Two High-Performance Base Sections

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

TTI 4358-01-1 • 2008

Traditional Texas flexible bases specified under Item 247 perform well as long as they are kept dry. However, rapid and sudden failures can occur if water enters these bases. In Project 0-4358 draft specifications (proposed item 245) were developed for high-performance flexible base materials. These specifications tighten all existing specifications, place an upper limit of 10 percent on the amount of material passing the No. 200 sieve, and introduce new procedures to ensure that the base is not moisture susceptible.

In project 5-4358-01 two TxDOT pavements containing bases that met the proposed high-performance base specifications were constructed. No handling or segregation problems were encountered. The main concern found by the contractors was the use of nuclear density gauges for measuring density. Alternative methods were investigated. The initial field moduli were measured to be 60 ksi. The long-term benefits of these low-fines bases could not be demonstrated in this short project, since all the applicable sections are new and performing well.

However performance problems were encountered on a third section constructed on SH 43. In that case the design caused a “bath-tub” effect and water became trapped in the low fines base. Based on this experience a “day-lighting” requirement was placed in the Item 245 specification.

High-performance bases will cost more than traditional bases, and they are not needed in many areas of west Texas where rainfall is low. However, these bases will be economically viable in many areas of northeast Texas, especially with the escalating prices of traditional road building materials.

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Item 12

Development and Verification of a Down-Hole Penetrometer

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

TTI 4372-01-1 • 2008

Drilled shafts are increasingly used as foundations to support bridges and transportation structures in geomaterials such as soft-rocks and hard clay. Locating the bottom of the borehole during construction with the required strength is critical. Hence, developing a simple device that could be easily adapted/used with the drilling tool was an interest of this study. Determining the shear strength of the geomaterial in the borehole and at the bottom of the borehole can lead to better designs by identifying the various layers based on strength. In this study, Down-Hole Penetrometer (DHP) was designed, built and tested to determine its effectiveness in measuring the strength of soil/soft rock at the bottom of the borehole. DHP was calibrated in the laboratory by using springs with various stiffnesses and then field tested in clay shale, clay and silty clay in a total of six locations in the Houston and Dallas districts. The test results were used in developing the correlation between undrained shear strength of soil/soft rock and DHP deflection.

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Item 13

Evaluation of Chevron Markings on Freeway-to-Freeway Connector Ramps in Texas

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

TTI 4813-2 • 2008

This report presents an evaluation of the use of converging chevron pavement markings in an attempt to reduce speeds on freeway-to-freeway connector ramps. In this project, a converging chevron marking was designed and implemented on a freeway-to-freeway connector ramp in El Paso, Texas. Speed measurements were conducted at the project site in three study periods: before the implementation of chevron markings, early-after the implementation, and late after the implementation of chevron markings. Speed measurements were taken upstream of the curve, at the start of the curve, and in the middle of the curve of the connector ramp. A detailed before-after analysis of the speed data was conducted by vehicle classification, light conditions, and location along the curve. From the analysis results, it was found that chevron markings appeared to reduce speeds where the markings were in place, though the reduction in the average speeds varied based on vehicle class and curve location. Maximum reduction was observed at the upstream location of the curve with about a 4 mile per hour (mph) reduction observed for heavy trucks.

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Item 14

Hurricane Evacuation Traffic Operation

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

TTI 4962-1 • 2008

This research, using focus groups and surveys of individuals who had experienced hurricane evacuations in Texas, assessed various hurricane evacuation traffic signs and pavement markings for developing guidelines. This report contains the process and findings from that effort. Other specific issues addressed include the following:

- best means of operating traffic signals during mass evacuation,
- identification of data needs for an after-action review of evacuation traffic operations,
- intelligent transportation system's role in evacuations,
- methods of reducing field staffing requirements during evacuations, and
- applicability of Houston's Beltway 8 East as an evacuation route.

This research also produced tri-fold brochures intended to communicate to the public regarding where and how new contraflow routes will operate during hurricane evacuations. Finally, the report includes findings from traffic simulation computer modeling of various critical locations throughout Texas' evacuation contraflow routes.

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

<http://tti.tamu.edu/documents/0-4962-1.pdf>

Item 15

Improving Lab Compaction Methods for Roadway Base Materials

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

TTI 5135-2 • 2008

The Texas Department of Transportation (TxDOT) employs the impact hammer method of sample compaction for laboratory preparation of road base and subgrade materials for testing. Experience has shown that this method may not adequately represent the true field performance of the materials. This report describes results investigating how different lab compaction methods influence the laboratory characterization of the materials. As compared to Tex-113-E, Modified compaction improved the performance of a Grade 2 Texas base, but not the Grade 1 material tested. Vibratory compaction resulted in improved performance for both bases tested. Unfortunately, efforts to study the soil of fabric to investigate what lab technique best mimics the field structure were unsuccessful. However, future work in this project will utilize four additional Texas base materials, including field sections, in efforts to validate the preliminary findings described in this report.

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

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Item 16

Crash Testing and Evaluation of F-Shape Barriers on Slopes

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

TTI 5210-3 • 2008

The TxDOT Roadway Design Manual currently suggests that concrete barrier not be placed on slopes steeper than 10H: 1V. This suggestion has limited the placement of concrete barriers to narrow, flat, paved medians of at the edge of the shoulder.

Based on the results of full-scale crash testing, researchers determined that TxDOT's cast-in-place permanent F-shape barrier and the precast free-standing X-bolt F-shape barrier are suitable for placement on roadside and median foreslopes of 6H: 1V or less. Additionally, these barriers are suitable to be placed at any lateral offset from the roadway edge, and for any width of depressed V-ditch median as long as the barrier is placed at its center. Further, similar or better performance would be expected for barrier placement on more gentle (e.g., 8H: 1V) slopes.

Increasing the maximum slope on which median barriers can be placed will allow many installations to be placed further from the travelway, which in turn will most likely lead to a reduction in barrier impact and severity.

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

<http://tti.tamu.edu/documents/0-5210-3.pdf>

Item 17

Studies to Improve Temporary Traffic Control at Urban Freeway Interchanges and Pavement Marking Material Selection in Work Zones

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

TTI 5238-2 • 2008

This report describes the methodology and results of analyses performed to develop guidelines on (1) how to improve temporary traffic control at work zones in and near urban freeway interchanges, and (2) selecting appropriate pavement marking materials in work zones. Laboratory studies conducted using laptop computers and the Texas Transportation Institute (TTI) Driving Simulator indicate that continuing to use guide signs that no longer align directly over travel lanes (as often occurs during interchange reconstruction or widening) will degrade drivers' abilities to properly choose lanes and negotiate through the interchange area. The use of temporary work zone diagrammatic signing and/or pavement marking symbols to denote route destinations for the various lanes will help offset this degradation. Other findings from the laboratory studies are discussed in the report.

Monte Carlo simulation was used to model the interrelationships and variability of estimates of pavement marking material service life, project phase duration for which the marking is intended to provide service, and cost of the marking material in determining which pavement marking material would provide the lowest total expected cost for a particular work zone roadway condition. Matrices were generated of recommended pavement marking materials as a function of expected project phase duration and Annual Average Daily Traffic AADT. Additional matrices provided allow practitioners to adopt more liberal or conservative assumptions of the input variables when selecting a marking material.

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Research Digest

Item 18

Engineering Design Data Management - Practices and Framework Development

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

TTI 5246-1 • 2008

During the project development process, districts produce enormous amounts of engineering data in a variety of data formats with varying levels of accuracy and resolution on several types of storage media. Examples include aerial photography and topographic information, drawings at various levels of development, survey data, right of way and utility maps, and traffic counts. These data are a valuable asset, and the Texas Department of Transportation (TxDOT) has begun to implement strategies to ensure the usability and integrity of the data. However, the amount of data that districts produce and receive is growing steadily, which makes it increasingly difficult to manage the data effectively. Although district personnel have a wealth of data at their disposal, frequent lack of data integrity, accessibility, quality control, or plain awareness makes it unnecessarily difficult to put the data to good use. These inefficiencies result in redundant data collection efforts and contribute to project delays.

This report summarizes research conducted to evaluate and document current engineering design data management practices at TxDOT. The report also describes a prototype engineering data management framework to assist divisions and districts in their effort to manage engineering data effectively. The focus of the report is on data types, spatial and temporal data attributes, and associated documentation used during the design phase of typical highway improvement projects. The report summarizes procedures, practices, and systems TxDOT and other government agencies use for managing engineering design data; describes an integrated geographic information system (GIS)-based data model for engineering design data that complies with TxDOT data architecture requirements; and documents the results of tests completed on the engineering design data model by using offline and online testing environments.

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Item 19

Evaluation and Recommended Improvements for Mix Design of Permeable Friction Courses

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

TTI 5262-3 • 2008

This project focuses on the improvement of the mix design and the development of guidelines for construction and maintenance of permeable friction courses (PFC). The study started with an information search documented in Technical Report 0-5262-1 that summarizes information from a worldwide literature review and Texas Department of Transportation (TxDOT) district interviews focused on performance, maintenance, and construction of PFC. The information gathered was used to define an experimental design directed to evaluate four main aspects of PFC mix design: volumetrics, functionality (or drainability), durability, and aging. These aspects were evaluated for mixtures fabricated with both TxDOT asphalt types: PG-76-22 and asphalt rubber.

Dimensional analysis and calculation of the theoretical maximum specific gravity of the mixture were recommended for evaluating total air voids (AV) content and water accessible AV content. The computation of water accessible AV was suggested for future application in design and performance evaluations. In addition, the density specification was modified (from 78-82 percent to 76-80 percent) to ensure adequate drainability. Field evaluation of drainability during construction was recommended to ensure adequate initial functionality properties in terms of permeability. For durability, the draindown test and the Cantabro loss test (conducted in both dry and wet conditions) were recommended. In addition, density requirements for field compaction were suggested to improve the control of functionality and durability.

Technical Report 0-5262-2 constitutes the second interim report and documents construction and maintenance guidelines for PFC.

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

<http://tti.tamu.edu/documents/0-5262-3.pdf>

Item 20

Public Transportation Solutions for Regional Travel: Technical Report

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

TTI 5345-1 • 2008

Constant growth in rural areas and extensive suburban development have contributed to increasingly more people needing seamless and adequate public transportation to and from nearby cities. Coordinating existing services or determining the need for expanded services tends to require new paradigm thinking for those interested in servicing growing potential markets in interregional travel markets. Added to the travel pressures in these growing regions is the call from funding agencies and planners to better integrate medical and other human service transportation with more traditional public transportation service. Increasingly, Texans are commuting from outlying communities to jobs, universities, and for other trip purposes to nearby urban and suburban areas. The current separation of urban and rural public transportation services means that Texans who travel between jurisdictions- from rural or suburban communities to cities or the reverse- often find public transportation a difficult or unviable mode of transportation. The need for regional public transportation is likely to grow, not diminish. This report documents the research performed regarding public transportation coordination practices and transit travel demand estimation, and summarizes the tools and guidelines developed as products of the research project.

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Research Digest

Item 21

A Guidebook for Effective Use of Archived Operations Data at Transportation Management Centers
TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)
TTI 5485-P1 • 2008

This draft guidebook provides methodologies and procedures for using archived operations data collected at Texas Transportation Management Centers (TMCs). The guidebook provides an overview of existing ITS deployment and data management at Texas TMCs. The guidebook describes how historical data can be used to: (a) identify incident hot spots with incident data archives, (b) predict incident durations based on incident characteristics, (c) estimate incident impacts and predict incident-induced congestion clearance time using combined historical and real-time traffic data, and (d) calculate performance measures for performance reporting. This draft guidebook is a product of research results in Year 1 of project 0-5485. Case studies and examples using the methodologies and procedures provided in this guidebook will be completed and appended to the guidebook as part of the research effort in Year 2 of this project.

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Item 22

Enhancements to PIA System for Real-Time Control at Isolated Traffic Signals: Technical Report
TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)
TTI 5507-1 • 2008

The objective of this research project was to enhance and test the platoon identification and accommodation (PIA) system developed by 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. To achieve project objectives, TTI researchers added a software classifier to replace the hardware classifier needed by the original system, added a new module for communication with TS-2 cabinets via serial ports on enhanced bus interface units, extended the system to provide platoon identification and accommodation on both arterial directions, and added real-time performance measurement and adaptive features.

Implementation of these enhancements required TTI researchers to re-engineer the original system software. The enhanced system was tested in the lab using cabinet-in-the-loop simulations and then field-tested at two locations in Texas. This report documents the work conducted by TTI researchers in this project.

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Item 23

Dual Mode Vehicle and Infrastructure Alternatives Analysis

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

TTI 5827-1 • 2008

The United States has a transportation challenge that requires addressing four issues simultaneously: traffic congestion, environmental pollution, safety, and energy security. A potential solution to these transportation challenges is the concept of an electrified guideway infrastructure providing energy in real time to automated vehicles. This project surveyed existing electrified advanced transportation concepts and selected five systems for evaluation of their technology readiness. None of the systems evaluated were judged ready for commercialization, but potential benefits of the technology warrant further development. Stakeholder interviews and a survey of collaboration mechanisms identified organizational and research paths that would enable accelerated development of a system capable of handling personal vehicles, public transit, and driverless freight movement on a common 21st century infrastructure.

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Item 24

Mix Design Procedure for Crumb Rubber Modified Hot Mix Asphalt

TEXAS DEPARTMENT OF TRANSPORTATION (TXDOT)

TX 4821-1 • 2005

To improve the performance of hot-mix asphalt concrete at high temperatures, crumb-rubber is typically used. Although hot-mix asphalt concrete consisting of crumb-rubber has been successfully placed and have performed well over the years, the laboratory design and preparation of specimens are sometimes problematic. The current mix design procedure (Tex-232-F) is cumbersome and requires preparing a large number of laboratory specimens to carry out an appropriate mix design. The purpose of this research project is to identify the problems with and provide solutions to the current procedure. In addition, the mix design procedure using Superpave Gyratory Compactor is also included in this report.

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Item 25

Special Specification for Deep Soil Mixing

UNIVERSITY OF TEXAS AT ARLINGTON (UTA)

UTA 5179-P1 • 2008

Produce elements of soil-binder mix from the mechanical mixing of in-situ soil with chemical binder slurry to provide support for embankments and earth structures.

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Research Digest

Item 26

Design of Deep Soil Mixing Columns for Mitigation of Heave

UNIVERSITY OF TEXAS AT ARLINGTON (UTA)

UTA 5179-P2 • 2008

The present design of Deep Soil Mixing (DSM) columns in expansive soils is based on the heave prediction model originally proposed by Fredlund and Rahardjo (1993) and later revised by Rao et al. (1998). This model was evaluated as a part of the TxDOT Research Project 0-5179.

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Item 27

Plans and Section Views of DSM Treated Sections

UNIVERSITY OF TEXAS AT ARLINGTON (UTA)

UTA 5179-P3 • 2008

The following provides various details of DSM column designs and configurations used in the TxDOT research project.

This Product presents the following plans and drawings:

Figure 1: Bore Log Information of Test Site 1 (Low PI Site)

Figure 2: Bore Log Information of Test Site 2 (High PI Site)

Figure 3: Plan View of DSM Column Layout of Test Site 1

Figure 4: Plan View of DSM Column Layout of Test Site 2

Figure 5: Sectional Details of DSM Columns at Test Site 1

Figure 6: Sectional Details of DSM Columns at Test Site 2

Figure 7: Details of Anchor Rod/Plate and Geogrid Connections to the DSM Column (Detail A)

Figure 8: Typical Perspective View of the DSM Treatment Test Section

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Research Digest

Item 28

Vibration Reduction and Control for Traffic Cameras: Technical Report

UNIVERSITY OF TEXAS AT ARLINGTON (UTA)

UTA 5251-2 • 2008

This project developed two low-cost, high-effective image stabilization devices and algorithms to correct images transmitted from closed circuit television (CCTV) cameras to traffic management centers. The stabilization devices eliminate the requirements of high stiffness and strength for the camera poles so that lighter poles can be used. This report provides information regarding the project outcomes.

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| <input type="checkbox"/> _3 | CTR 4829-1 | <input type="checkbox"/> _17 | TTI 5238-2 |
| <input type="checkbox"/> _4 | CTR 4872-2 | <input type="checkbox"/> _18 | TTI 5246-1 |
| <input type="checkbox"/> _5 | CTR 5110-01-P1 | <input type="checkbox"/> _19 | TTI 5262-3 |
| <input type="checkbox"/> _6 | CTR 5178-1 | <input type="checkbox"/> _20 | TTI 5345-1 |
| <input type="checkbox"/> _7 | CTR 5220-1 | <input type="checkbox"/> _21 | TTI 5485-P1 |
| <input type="checkbox"/> _8 | CTR 5550-P1 | <input type="checkbox"/> _22 | TTI 5507-1 |
| <input type="checkbox"/> _9 | TechMRT 4484-1 | <input type="checkbox"/> _23 | TTI 5827-1 |
| <input type="checkbox"/> _10 | TSU 5290-1 | <input type="checkbox"/> _24 | TX 4821-1 |
| <input type="checkbox"/> _11 | TTI 4358-01-1 | <input type="checkbox"/> _25 | UTA 5179-P1 |
| <input type="checkbox"/> _12 | TTI 4372-01-1 | <input type="checkbox"/> _26 | UTA 5179-P2 |
| <input type="checkbox"/> _13 | TTI 4813-2 | <input type="checkbox"/> _27 | UTA 5179-P3 |
| <input type="checkbox"/> _14 | TTI 4962-1 | <input type="checkbox"/> _28 | UTA 5251-2 |

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