

Research Digest

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In this Issue:

TxDOT Research Publications (August-September)

Table of Contents

Item 1.	Innovative Finance: Strategic Research Project (700-1)	1
Item 2.	An Integrated Approach to Managing the Finance, Maintenance, and Operation of Transportation Systems (701-1)....	1
Item 3.	Evaluation of Traffic Control Devices, Year 4 (1001-3)	2
Item 4.	MASH Test 3-21 on TL-3 Thrie Beam Transition Without Curb (1002-12-3)	2
Item 5.	Geosynthetic-Reinforced Unbound Base Courses: Quantification of the Reinforcement Benefits (4829-01-2)	3
Item 6.	Revised Overlay Design System (5123-03-P2)	3
Item 7.	Pretensioned Box Beams: Prestress Transfer and Shear Behavior (5831-3)	4
Item 8.	Use of Manufactured Sands for Concrete Pavement (6255-1)	5
Item 9.	Guidelines for Proportioning Class P Concrete Containing Manufactured Fine Aggregates & Mixture Proportioning Spreadsheet (6255-P3)	6
Item 10.	Effect of New Prestress Loss Estimates on Pretensioned Concrete Bridge Girder Design (6374-2)	6
Item 11.	TxDOT Administration Research Tasks Completed FY 2012 (6581-TI-4)	7
Item 12.	The Overlay Tester (OT): Comparison with Other Crack Test Methods and Recommendations for Surrogate Crack Tests (6607-2)	7
Item 13.	Characterization and Best Use of Recycled Asphalt Shingles in Hot-Mix Asphalt (6614-2)	8
Item 14.	Design and Construction Recommendations for Thin Overlays in Texas (6615-1)	8
Item 15.	Revision and Further Validation of Surface-Performance Graded Specification for Surface Treatment Binders (6616-1)	9
Item 16.	An AHP-based Approach to Prioritizing Resources for Highway Routine Maintenance (6623-2)	10
Item 17.	Prototype Mobile Luminance Measurement System and Level of Service for Evaluating Rural High-Speed Nighttime Delineation (6647-1)	10
Item 18.	Characterizing Fly Ash (6648-1)	11
Item 19.	Katy Freeway: An Evaluation of a Second-Generation Managed Lanes Project (6688-1)	12
Item 20.	Toward a BEST PRACTICE MODEL for Managed Lanes in Texas. Briefing Paper (6688-P1)	12
Item 21.	Managing the TDM Process: Developing MPO Institutional Capacity (6691-P2)	13
Item 22.	Best Practices for Flexible Pavement Structure Widening. Workshops (6748-P2)	13
Item 23.	Texas Highway Funding Options (6802-1)	14

Research Digest

Item 1

Innovative Finance: Strategic Research Project

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

TTI 700-1 • 2013

"This executive summary not only provides a list of possible out-of-the-box transportation revenue strategies, it also provides an overall framework in which to understand them. The authors intend to provide a holistic approach to examining how the state approaches how it funds and finances transportation infrastructure. These processes are part of an overall system with inputs, outputs, and institutional processes that ultimately govern how revenue is collected and allocated. This framework provides a guide to understanding the implications of current and innovative funding and financing strategies and will help Texas identify the preferred path for funding and financing our transportation network in the 21st century." --p.1

This report is available for free download (5 MB):

<http://tti.tamu.edu/documents/6-0700-1.pdf>

Item 2

An Integrated Approach to Managing the Finance, Maintenance, and Operation of Transportation Systems

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

CTR 701-1 • 2013

With the continued increase of demand on Texas highways, the consumption rate of our roads will accelerate due to the constrained funding for maintenance. Our highways represent a multi-billion dollar investment in our transportation system. Given the extent of the Texas highway network, ports, and the border it shares with Mexico, the state of our roads can affect the nation's economy if they are not properly maintained. Yet various studies have indicated that insufficient revenue is available to pay for the maintenance and rehabilitation (M&R) work required to keep the overall condition of the state-maintained highway system at the current target condition level. TxDOT must develop new and innovative ways to ensure that our highways fulfill their role in helping Texas maintain its economic competitiveness with a safe, reliable, and economical highway transportation system. To address these funding issues, this report proposes an integrated approach based on a tiered system of roadways in which the finance, maintenance, and operation of the system are considered simultaneously.

This report is available for free download (830 KB):

<http://library.ctr.utexas.edu/ctr-publications/6-0701-1.pdf>

Research Digest

Item 3

Evaluation of Traffic Control Devices, Year 4

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

TTI 1001-3 • 2013

This project was established to provide a means of conducting small scale research activities on an as-needed basis so that the results could be available within months of starting the specific research. This report summarizes the research activities that were conducted between September 2011 and August 2012. The research included two primary activities and two secondary activities. The two primary activities were: (1) Rural Intersection Sign Reduction Evaluation, and (2) Update on Sequential Dynamic Curve Warning System Research. The two secondary activities were: (1) Development of Hurricane Evacuation Animation Maps for CRP, and (2) Mobile Pavement Marking Retroreflectivity Data Training.

CONTENTS

- Chapter 1. Overview
- Chapter 2. Rural Intersection Sign Reduction Evaluation
- Chapter 3. Update on Sequential Dynamic Curve Warning System Research
- Chapter 4. Additional Research Activities
- References

This report is available for free download (1.7 MB):

tti.tamu.edu/documents/9-1001-3.pdf

Item 4

MASH Test 3-21 on TL-3 Thrie Beam Transition Without Curb

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

TTI 1002-12-3 • 2013

This project evaluated the impact performance of a modified TxDOT thrie beam transition to rigid concrete barrier without a curb element below the transition rail. In a previous test described in TxDOT Research Report 0-4564, a thrie beam transition without curb failed to meet NCHRP Report 350 performance criteria. However, it could not be discerned whether the vehicle instability observed in that test was attributable to the missing curb or the rotation of the thrie beam transition rail into the sloped face of the concrete safety shape rail at the bridge end connection point...

This report is available for free download (8.7 MB):

<http://tti.tamu.edu/documents/9-1002-12-3.pdf>

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Item 5

Geosynthetic-Reinforced Unbound Base Courses: Quantification of the Reinforcement Benefits

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

CTR 4829-01-2 • 2013

As part of Research Project 0-4829, a new testing device was developed and a field monitoring program was initiated to evaluate the performance of geosynthetics used as reinforcement for unbound base courses. This implementation includes the use of the new testing device and procedures developed by the 0-4829 research project, which involves characterization of the confined stiffness in geosynthetic reinforcements. The project also provides continued monitoring of 32 experimental test sections constructed in FM2 and 6 test sections constructed in FM1644 for the purpose of correlating field performance with material characterization. The experimental component of this implementation project was accomplished by testing 11 different geosynthetic reinforcement products in the small pullout test. The field component of this implementation project involved conducting continued condition surveys, subsurface exploration, and weather data gathering in order to establish the threshold of the proposed confined stiffness parameter in the new specification based on the field performance.

This report is available for free download (27 MB):

<http://library.ctr.utexas.edu/ctr-publications/5-4829-01-2.pdf>

Item 6

Revised Overlay Design System

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

TTI 5123-03-P2 • 2013

This disc contains the revised Texas Asphalt Concrete Overlay Design and Analysis System (install using TxACOLSetup_08-19-13.msi).

This report is available for free download (44.9 MB):

<http://tti.tamu.edu/documents/5-5123-03-P2.zip>

Research Digest

Item 7

Pretensioned Box Beams: Prestress Transfer and Shear Behavior

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

CTR 5831-3 • 2013

Pretensioned concrete box beams have been used in highway bridges for more than half a century. Due to their geometry, they have often been used as a viable alternative to the classic I-shaped girders. Box beams are highly effective in cases where speed of construction is a priority. However, the detailing and design of box beams are more complicated than that of I-shaped girders. The flow of forces at the beam's end blocks must be understood in order to detail reinforcement adequately. The following were the objectives of this research study: (i) quantify the demands placed on box beam end blocks upon prestress transfer, (ii) characterize the demands placed on box beam end blocks upon the application of superimposed loads, (iii) evaluate the effects of alternative void geometries at skewed ends of box beams on curing temperatures, (iv) based on the knowledge gained in (i), (ii) and (iii), improve the box beam end blocks, (v) test the improved end block under worst case scenario demands at prestress transfer and under extreme loading conditions, and (vi) validate currently used shear strength design methodologies in their application to pretensioned box beams. In order to achieve these objectives, an experimental program was conducted. The experimental program included the load testing of ten 4B28 and five 5B40 box beams, for a total of twenty nine load tests. The influence of several factors that distinguish box beam behavior from the better-understood I-shaped girder behavior was studied. Additionally, the experimental program included the fabrication, instrumentation and early-age behavior study of five 5B40 box beams. The first three beams were used to assess the behavior of box beams fabricated with the current TxDOT standard details (from December 2006). The fourth beam incorporated modifications to the standard reinforcement details based on the observations made through the study of the first three 5B40 box beams. The last specimen corresponded to a new box beam cross section (5XB40) optimized to be used in a spread-box beams configuration.

CONTENTS

- Chapter 1. Introduction
- Chapter 2. Background
- Chapter 3. Experimental Program
- Chapter 4. Results and Analysis: Shear Performance of 4B28 Box Beams
- Chapter 5. Results and Analysis: Early-age Behavior of 5B40 Box Beams
- Chapter 6. Results and Analysis: Shear Performance of 5B40 Box Beams
- Chapter 7. Summary, Conclusions and Recommendations
- Appendices
- References

This report is available for free download (11.9 MB):

<http://library.ctr.utexas.edu/ctr-publications/0-5831-3.pdf>

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Item 8

Use of Manufactured Sands for Concrete Pavement

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

CTR 6255-1 • 2013

Manufactured fine aggregates are a product created when rocks are crushed using a mechanical crusher. With the depletion of sources of natural sands, the usage of manufactured fine aggregates has increased. Manufactured fine aggregates have properties that differ from natural sands; for this reason, the plastic and hardened properties of concrete produced using manufactured fine aggregates differ from the properties of concrete made with natural sands. The main concrete properties affected by the usage of manufactured fine aggregates are skid resistance, workability, and finishability. The aim of this research project was to investigate how manufactured fine aggregates could be used in concrete pavements without causing workability or skid related issues. To improve the workability of concrete made with manufactured fine aggregates, the use of the optimized mixture proportioning method developed by the International Center for Aggregate Research (ICAR) was investigated. Results obtained from this testing were used to make recommendations on how to optimize class P concrete mixtures made with any type and combination of aggregates.

CONTENTS

- Chapter 1. Introduction
- Chapter 2. Aggregates in Concrete Literature Review
- Chapter 3. Concrete Properties and Performance Literature Review
- Chapter 4. Material Properties
- Chapter 5. Non-Standard Micro-Deval Aggregate Testing
- Chapter 6. Evaluating the Shape of MFA
- Chapter 7. Proportioning PCC Containing MFAs
- Chapter 8. Preliminary Skid Testing
- Chapter 9. Field Testing for Skid Resistance
- Chapter 10. Evaluation of Hardened Concrete Properties
- Chapter 11. Evaluating the Effect of Mixture Proportions on Texture and Friction of PCC
- Chapter 12. Evaluating Diamond Grinding and Grooving for Friction
- Chapter 13. Analysis of Skid Data, Blending Recommendations, and Development of a Skid Prediction Model for Concrete Pavements
- Chapter 14. Summary and Conclusions
- References
- Appendix A: Skid Testing Results
- Appendix B: Texture and Friction Test Results
- Appendix C: Diamond Grinding and Grooving Test Results

This report is available for free download (4.3 MB):

<http://library.ctr.utexas.edu/ctr-publications/0-6255-1.pdf>

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Item 9

Guidelines for Proportioning Class P Concrete Containing Manufactured Fine Aggregates & Mixture Proportioning Spreadsheet

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

CTR 6255-P3 • [2013]

"This document provides guidance on using manufactured fine aggregates (MFAs) in class P concrete. The goal is to achieve the desired properties of concrete (workability, strength, and durability) while using MFAs and minimizing paste content. These guidelines present a method for proportioning concrete paving mixtures made with MFAs that allow desired concrete performance criteria to be achieved at the lowest cost and carbon footprint. The method described in this document is a modified version of the method presented by Fowler and Koehler (2007) and Fowler and McLeroy (2009)." --Guidelines, page 1.

CONTENTS

- Guidelines for Proportioning Class P Concrete Containing Manufactured Fine Aggregates [guidelines.pdf]
- Mixture Proportioning Worksheet For Proportioning Class P Concrete containing MFA [Mixture Proportioning Spreadsheet.xlsx]
- Read Me.txt

This report is available for free download (861 KB):

<http://library.ctr.utexas.edu/ctr-publications/0-6255-p3.zip>

Item 10

Effect of New Prestress Loss Estimates on Pretensioned Concrete Bridge Girder Design

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

CTR 6374-2 • 2013

In 2008, TxDOT initiated Project 0-6374 to investigate prestress losses in pretensioned concrete girders. The prestress loss estimates in the AASHTO LRFD Bridge Design Specifications had been recalibrated in 2005 to be more accurate for "high-strength [conventional] concrete." Greater accuracy implies less conservatism, the result of which may be flexural cracking of beams under service loads. Project 0-6374 was therefore funded to provide an experimental evaluation and an engineering recommendation of whether implementation of the new prestress loss estimates (currently outlined in AASHTO LRFD 2012) is appropriate for TxDOT. The primary objectives of TxDOT Project 0-6374 were: (1) to assess the conservatism and accuracy of the current prestress loss provisions, (2) to identify the benefits and weaknesses of using the AASHTO LRFD 2004 and 2012 prestress loss provisions, and (3) to make recommendations to simplify the prestress loss provisions of AASHTO LRFD 2012. These objectives were accomplished through (1) the fabrication, conditioning, and testing of 30 field-representative girders, (2) the assembly and analysis of a prestress loss database, (3) a parametric study of the design implications of the various prestress loss provisions. The database evaluation, coupled with the experimental results, revealed that use of the AASHTO LRFD 2012 prestress loss provisions resulted in underestimation of the prestress loss in nearly half of all cases. With this in mind, new prestress loss provisions were developed through simplification and recalibration of the method outlined in AASHTO LRFD 2012. The TxDOT Project 0-6374 prestress loss provisions were found to be simpler, more conservative, and more precise than the current methods outlined within the AASHTO LRFD Bridge Design Specifications.

This report is available for free download (11.9 MB):

<http://library.ctr.utexas.edu/ctr-publications/0-6374-2.pdf>

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Item 11

TxDOT Administration Research Tasks Completed FY 2012

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

TTI 6581-TI-4 • 2013

This report briefly describes the fiscal Year 2012 Work Orders 22 and 24 conducted by the Texas A&M Transportation Institute (TTI) for the Texas Department of Transportation (TxDOT). Work Order 22 was a request to "conduct an analysis of the corridor traffic operations impacts of allowing trucks to use a concurrent-flow high-occupancy vehicle (HOV) lane." (p.1) Work Order 24 builds on the 2011 TxDOT Research Project 0-6498 "Texas Energy Developments and TxDOT Right-of-Way."

CONTENTS

- Work Order 22: Assessing High-Level Corridor Impacts of Trucks Using HOV Lanes
- Work Order 24: Estimation of Additional Investment Needed to Support Energy Industry Activity in Texas

This report is available for free download (236 KB):

<http://tti.tamu.edu/documents/0-6581-TI-4.pdf>

Item 12

The Overlay Tester (OT): Comparison with Other Crack Test Methods and Recommendations for Surrogate Crack Tests

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

TTI 6607-2 • 2013

Presently, one of the principal performance concerns of hot-mix asphalt (HMA) pavements is premature cracking, particularly of HMA surfacing mixes. Regrettably, however, while many USA transportation agencies have implemented design-level tests to measure the rutting potential of HMA mixes; there is hardly any standardized national design-level test for measuring and characterizing the HMA cracking resistance potential. Currently, the Texas Department of Transportation (TxDOT) uses the Overlay Tester (OT) to routinely evaluate the cracking susceptibility of HMA mixes in the laboratory. While the OT effectively simulates the reflective cracking mechanism of opening and closing of joints and/or cracks, repeatability and variability in the test results have been major areas of concern. As an effort towards addressing these repeatability/variability issues, this laboratory study was undertaken, namely to: 1) conduct a comprehensive sensitivity evaluation of the OT test procedure so as to improve its repeatability and minimize variability in the OT test results; 2) recommend updates and modifications to the Tex-248-F specification including development of OT calibration and service maintenance manuals; 3) explore other alternative OT data analysis methods; 4) comparatively evaluate and explore other crack test methods (both in monotonic and dynamic loading modes) that could serve as supplementary and/or surrogate tests to the OT test method; and 5) develop new crack test procedures, specifications, and technical implementation recommendations. As documented in this report, the scope of work to accomplish these objectives included evaluating the following crack test methods: 1) the standard repeated (OTR, Tex-248-F) and monotonic loading OT test (OTM); 2) the monotonic (IDT) and repeated loading indirect-tension (R-IDT) test; 3) the monotonic (SCB) and repeated loading semi-circular bending (R-SCB) test; 4) the disk-shaped compaction tension test (DSCTT); and 5) the monotonic (DT) and repeated loading direct-tension (R-DT) tests.

This report is available for free download (7.8 MB):

<http://tti.tamu.edu/documents/0-6607-2.pdf>

Item 13

Characterization and Best Use of Recycled Asphalt Shingles in Hot-Mix Asphalt

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)
TTI 6614-2 • 2013

Recycled asphalt shingles (RAS) often containing more than 20 percent asphalt binder has become another black gold in the asphalt industry. There are two basic types of RAS scraps in the market: tear-off asphalt shingles (TOAS) and manufacture waste asphalt shingles (MWAS). Both TOAS and MWAS have been used in hot-mix asphalt (HMA) paving in Texas. Since RAS is very stiff lots of concerns have been raised on using RAS in HMA. The researchers conducted a comprehensive investigation on HMA mixes containing RAS, including RAS binder characterization and blending charts for virgin/RAS binders, impact of RAS content on optimum asphalt content (OAC) and engineering properties of RAS mixes, and approaches for improving cracking resistance of RAS mixes. Furthermore, a variety of RTAS field test sections were constructed to validate the approaches for improving cracking resistance of RAS mixes. Additionally, this report discusses the environmental and economic benefits of using RAS in HMA.

This report is available for free download (4.6 MB):
<http://tti.tamu.edu/documents/0-6614-2.pdf>

Item 14

Design and Construction Recommendations for Thin Overlays in Texas

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)
TTI 6615-1 • 2013

"Thin HMA overlays, laid at 1.0 inch or thinner, are cost-effective surface maintenance options. The primary focus of this research was to develop specifications for three such mixes: fine dense-graded mix (fine DGM), fine-graded stone matrix asphalt (fine SMA), and fine-graded permeable friction course (fine PFC). A number of slurry overlay systems were also evaluated, but to a lesser extent. Draft specifications for the three mix types were first developed based on the results of a literature/information search and a field investigation of 11 existing projects. The specifications included minimum material quality levels, laboratory performance criteria, and construction recommendations. To evaluate the design recommendations, extensive laboratory testing was performed on each of the three thin overlay mixes with five different aggregates. Of the 15 mixes attempted, 12 had acceptable designs in terms of the specified performance tests. For the most part, the draft specifications appeared to function well with minor alterations recommended. Testing also included two supplementary studies on the effects of screening type in fine SMA and the effects of recycled materials on both the fine SMA and fine PFC."

This report is available for free download (17.8 MB):
<http://tti.tamu.edu/documents/0-6615-1.pdf>

Research Digest

Item 15

Revision and Further Validation of Surface-Performance Graded Specification for Surface Treatment Binders

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

TTI 6616-1 • 2013

The design and selection of surface treatment binders in service is currently based on specifications that include tests of emulsion residues or hot-applied asphalt cements at standard temperatures that do not cover the entire range of in service temperatures, measure properties that are not performance-related, and do not consider representative aging conditions for the critical first year. Current specifications for these binders consider properties of the material during both construction and in service, and a wide range of materials can be utilized to meet the current specified properties. A surface performance-graded (SPG) specification for the evaluation and selection of chip seal binders which addressed these shortcomings was developed as part of previous Texas Department of Transportation (TxDOT) and National Cooperative Highway Research Program (NCHRP) research projects. In the current study, the SPG specification was revised and further validated. This was accomplished by standardizing the emulsion residue recovery method through the evaluation of two warm oven methods, exploring the exclusive use of the dynamic shear rheometer (DSR) for determining performance-related properties, and further field validating the thresholds for these properties. The laboratory and field results were used to revise the SPG specification for surface treatment binders in service. Moreover, the results obtained from the multiple stress creep recovery and DSR frequency sweep tests were compared with field performance to evaluate additional criteria for the specification. This study is limited to producing a revised SPG specification for performance-related properties that address aggregate retention and bleeding in service. The effects of construction and quality control processes are beyond the scope of this study sponsored by TxDOT, and additional specifications are needed for use in conjunction with the SPG specification to address these issues and ensure adequate performance.

This report is available for free download (4.7 MB):

<http://tti.tamu.edu/documents/0-6616-1.pdf>

Research Digest

Item 16

An AHP-based Approach to Prioritizing Resources for Highway Routine Maintenance

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

CTR 6623-2 • 2013

The Texas Department of Transportation has been experiencing maintenance budget fluctuations recently. The budget shortage has a negative impact on the agency's maintenance strategies and results in the undesirable deterioration of highway conditions, increasing the risk for both road users and the agency. This project aims to develop a methodology to minimize the impact of budget fluctuation by quantifying the risk of not performing a maintenance activity and identifying the priority of maintenance activities based on the quantified risk. With the help of maintenance experts from TxDOT, 4 maintenance objectives and 16 maintenance function groups were identified and a hierarchy structure was developed based on the objectives and function groups. Four pilot districts were selected to represent the different demographic and climatic regions in Texas and maintenance experts were selected from the four districts to participate in the workshop. The overall relative weights of the 16 maintenance function groups were determined based on the individual evaluator's judgments using the Analytical Hierarchy Process. To determine whether the 4 pilot districts varied in assigning relative importance to the 4 defined objectives and priority to the 16 maintenance groups, statistical analyses were conducted with the 4 sets of values, 1 for each of the 4 pilot districts, using Kruskal-Wallis test. Lastly, a web-based prototype system was developed to assist users in generating the list of maintenance projects under budget constraints. Exposure factors, ADT, and truck volume were applied in the system to factor in the impact of traffic on the maintenance strategy. Users of this system can choose to use the weights and parameter values from the pilot district that they think is most comparable to their own district, or use the state average values that have proved to be applicable to all the districts in Texas.

This report is available for free download (2.2 MB):

<http://library.ctr.utexas.edu/ctr-publications/0-6623-2.pdf>

Item 17

Prototype Mobile Luminance Measurement System and Level of Service for Evaluating Rural High-Speed Nighttime Delineation

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

TTI 6647-1 • 2013

Transportation agencies routinely travel their extensive roadway networks conducting subjective roadway assessments of traffic control devices both day and night. Retroreflectivity is a good tool for product testing but can provide false positives for traffic control devices based on the approach geometry. This research project developed an objective nighttime assessment method for traffic devices that could be tied back to a form of level of service. The project also correlated luminance data with level of service. Researchers recommend the use the precise and approximate measurement methods in conjunction with nighttime inspections and retroreflectivity measurements to assess the accuracy and repeatability versus time.

This report is available for free download (2.8 MB):

<http://tti.tamu.edu/documents/0-6647-1.pdf>

Research Digest

Item 18

Characterizing Fly Ash

UNIVERSITY OF TEXAS AT AUSTIN. CENTER FOR TRANSPORTATION RESEARCH (CTR)
CTR 6648-1 • 2013

Although fly ash can and typically does impart [major technical benefits, including reduced heat of hydration, reduced permeability, and improved resistance to alkali-silica reaction (ASR), sulfate attack, and delayed ettringite formation (DEF)] to concrete, several technical and practical issues must still be addressed. First, all fly ashes are not created equally. The chemical / mineralogical / physical properties can vary significantly from one source to another, based on differences in fuel sources (coal), combustion conditions, and cooling regimes. Furthermore, the fly ash industry is quite dynamic and is rapidly changing due to recently imposed environmental regulations. As such, fly ash produced from a given power plant may be considerably different than fly ash produced from the same plant just a few years ago. Therefore, it is becoming increasingly important to be able to characterize fly ash in a way that best predicts how it will perform in concrete, and this is the primary focus of this project.

This report is available for free download (4 MB):

<http://library.ctr.utexas.edu/ctr-publications/0-6648-1.pdf>

Research Digest

Item 19

Katy Freeway: An Evaluation of a Second-Generation Managed Lanes Project

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

TTI 6688-1 • 2013

The Katy Freeway Managed Lanes (KML) represents the first operational, multilane managed facility in Texas and provides an opportunity to benefit from the lessons learned from the project. This study evaluated multiple aspects of KML and the critical areas of project development, design, and operation. One sample finding is that travel time savings are approximately 5 minutes in the morning and 14 minutes in the afternoon in the peak directions, and the travel time advantage over the general-purpose lanes has increased as volumes have grown. Continual monitoring and adjustment of operating aspects of new managed lanes is required post-opening, especially during the ramp-up period in which drivers make travel adjustments to use the facility. The operating partners for the KML have continuously monitored the performance of the lanes since opening and have made adjustments in toll rates, lane configuration at the tolling zones, and access operations at the western terminus. These adjustments are critical to ensuring that the performance standards for the lanes are maintained.

CONTENTS

- Introduction
- Background and History of Katy Freeway Managed Lanes
- Congestion and Travel Time
- Safety
- Enforcement
- Maintenance
- Tolling and Pricing
- Access Design
- Lane Separation
- Operational Policy
- Public Attitudes and Perceptions
- Project Delivery Mechanism
- Findings and Lessons Learned
- References

This report is available for free download (6.7 MB):

<http://tti.tamu.edu/documents/0-6688-1.pdf>

Item 20

Toward a BEST PRACTICE MODEL for Managed Lanes in Texas. Briefing Paper

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

TTI 6688-P1 • 2013

"Project 0-6688, Katy Freeway: An Evaluation of a Second-Generation Managed Lanes Project, represents a comprehensive evaluation of the KML. Researchers created a framework for evaluating the KML that yields best-practice recommendations comprising 10 distinct operational areas: congestion and travel time, safety, enforcement, maintenance, toll and pricing, access design, lane separation, operational policy, public attitudes and perceptions, and project delivery. This white paper provides a history and operational description; a summary of each of the operational areas listed above; findings and conclusions for the KML as a step toward establishing best practices for managed lanes in Texas" --p.6

This report is available for free download (2.8 MB):

<http://tti.tamu.edu/documents/0-6688-P1.pdf>

Research Digest

Item 21

Managing the TDM Process: Developing MPO Institutional Capacity

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

TTI 6691-P2 • 2013

This ZIP file includes "Managing the Travel Model Process: Small and Medium-Sized MPOs" workshop instructor and participant materials. "Emphasis of this course is on small and medium-sized MPOs, but much of the content is pertinent to all MPOs... Research of MPOs nationwide, as well as here in Texas, has demonstrated that travel modeling is one of the aspects that MPO directors find most complicated for applying and supporting their Metropolitan Transportation Plan.... The course materials are intended to be useful take-away references that MPOs can continue to reference after the course. The course approach thus includes lecture, discussion and small-group activities, a participant handbook, and all of these materials are provided in digital format, as well, so that the MPOs can copy, adapt, and use these materials for their own work and process." --Introduction

CONTENTS

- Course Presentation [.pptx]
- Instructor Guide [.pdf]
- Participant Handbook [.pdf]
- Napkin Calculations for Consultants [.xls]
- Evaluation [.docx]

This report is available for free download (51 MB ZIP folder):

<http://tti.tamu.edu/documents/0-6691-P2.zip>

Item 22

Best Practices for Flexible Pavement Structure Widening. Workshops

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

CTR 6748-P2 • 2013

"This document presents a summary of the two half-day workshops/webinars that took place at CTR July 2, 2013. The workshops constitute Product 2 (P2) of the research project and correspond to Task 3. The purpose of the workshops was to obtain expert opinions from TxDOT personnel, contractors, and construction equipment and materials manufacturers with experience in pavement widening projects. For logistical and practical reasons both workshops were conducted on the same day." --Introduction, p.1

CONTENTS

- Introduction
- Workshop Webinar 1: Contractors and Suppliers Experience
- Workshop Webinar 2: TxDOT Experience
- Workshop Presentations and Materials
- Summary and Conclusions

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Research Digest

Item 23

Texas Highway Funding Options

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

CTR 6802-1 • 2013

This study was designed to provide strategic information on highway funding options and alternatives in preparation for the 2013 Texas Legislative Session. The contents evolved during the research team's two-semester interaction with senior TxDOT staff, led by Mr. Phil Wilson, Executive Director. Three workshops narrowed the scope to the four finance issue briefs on the following subjects: energy sector infrastructure financing in selected U.S states, weight distance charges, electric vehicle fees, and toll road availability payments. Each brief follows this structure: executive summary, purpose, key points, lessons learned, relevance to Texas, and appendices.

CONTENTS

- Energy Sector Infrastructure Financing
- Availability Payment Public Private Partnerships
- Electric Vehicle Fees
- Weight Distance Charges: State Experiences

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