

Research Digest

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TxDOT Research Publications (June-July)

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Item 1

MASH TL-3 testing and evaluation of the TxDOT T131RC bridge rail transition

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

TTI 1002-12-4 • 2013

This project designed and crash tested a transition design for the Texas Department of Transportation (TxDOT) T131RC Bridge Rail that would meet the strength and safety performance criteria for Test Level 3 of American Association of State Highway Official's (AASHTO) Manual for Assessing Safety Hardware (MASH).

The TxDOT T131RC Bridge Rail Transition contained and redirected the 1100C vehicle. The vehicle did not penetrate, underride, or override the installation. Maximum dynamic rail deflection was 7.4 inches. No detached elements, fragments, or other debris were present to penetrate or to show potential for penetrating the occupant compartment, or to present hazard to others. Maximum occupant compartment deformation was 2.5 inches in the left door at occupant hip height. The 1100C vehicle remained upright during and after the collision event. Occupant risk factors were within the limits specified in MASH. The 1100C crossed the exit box within the limits specified in MASH.

The TxDOT T131RC Bridge Rail Transition contained and redirected the 2270P vehicle. The vehicle did not penetrate, underride, or override the installation. Maximum dynamic deflection during the test was 8.4 inches. No detached elements, fragments, or other debris were present to penetrate or to show potential for penetrating the occupant compartment, or to present hazard to others. Maximum occupant compartment deformation was 0.25 inch in the left door at occupant hip height. The 2270P vehicle remained upright during and after the collision event. Occupant risk factors were within the limits specified in MASH. The 2270P vehicle crossed the exit box within the limits specified in MASH. The TxDOT T131RC Bridge Rail Transition performed acceptably as a MASH TL-3 transition.

This report is available for free download (14 MB):

<http://tti.tamu.edu/documents/9-1002-12-4.pdf>

Item 2

TPAD Data Analysis Software and User Manual

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

TTI 6005-P3 • 2013

"The TPAD is a continuous pavement deflection testing device enhanced with several additional survey features. Since the device is designed for total acceptance of pavements, we have combined the deflection testing with Ground Penetrating Radar (GPR), digital video and GPS technologies; the final system will be suitable for testing both new pavements in a quality assurance capacity and those scheduled for rehabilitation to determine suitable strategies. This user's manual describes the data processing system and uses the data collected on a 2012 survey of US 287 in the Wichita Falls District for illustrative purposes. The executable load module for this software and the associated data from US 287 are supplied with this manual. The TPADScan data acquisition software developed by TTI to collect TPAD raw data is run on one laptop computer. After each field test, TPADScan will create four files..." --Summary

This report is available for free download (34.9 MB):

<http://tti.tamu.edu/documents/0-6005-P3.zip>

Item 3

Implementation of Centrifuge Testing for Swelling Properties of Highly Plastic Clays

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

CTR 6048-01-1 • 2013

A novel centrifuge-testing device was developed for characterization of expansive soils, which are the source of major pavement design and maintenance problems across the state. Specifically, testing protocols were developed for use of a small centrifuge device to provide direct measurement of the vertical swelling of clays. In this test, soil samples are subjected to water infiltration during a comparatively short testing period. The centrifuge approach is well suited for pavement design because it provides not only one data point for a single normal stress but the entire relationship between vertical strains and vertical stresses. This feature represents a significant advantage over conventional swelling tests, which are prohibitively long; in addition, each conventional test provides the vertical strain for one vertical stress. Consequently, this approach is particularly well suited for use with the Potential Vertical Raise (PVR) approach. The objective of this project is to quantify the benefits and implement the new centrifuge technology for characterization of expansive clays in Texas. This research team will achieve this objective by implementing the laboratory procedure developed as part of Research Project 0-6048 using multiple clay sources, developing a spreadsheet with swelling curves (vertical strain versus normal stress) for relevant high-plasticity clays in Texas, incorporating the use of swelling curves obtained using centrifuge technology into the PVR methodology, and developing training material that includes examples of practical problems for calculation of the PVR using actual swelling curves and actual subgrade profiles.

This report is available for free download (2.1 MB):

<http://library.ctr.utexas.edu/ctr-publications/5-6048-01-1.pdf>

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Item 4

Balanced RAP/RAS Mix Design and Performance Evaluation System for Project-Specific Service Conditions

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

TTI 6092-3 • 2013

The use of reclaimed asphalt pavement (RAP) and recycled asphalt shingles (RAS) can significantly reduce the increasing cost of hot-mix asphalt paving, conserve energy, and protect the environment. However, the premature cracking problem has been a serious concern. This report presents the latest work on RAP/RAS mix design and performance analysis including field performance of a variety of RAP/RAS test sections around Texas, and the proposed RAP/RAS mix design and performance evaluation system for project-specific service conditions.

RAP/RAS mixes can have better or similar performance than virgin mixes if they are well designed with balancing both rutting/moisture damage and cracking requirements. Cracking performance of RAP/RAS mixes is influenced by many factors, such as traffic, climate, existing pavement conditions for asphalt overlays, and pavement structure and layer thickness. It is obvious that a single cracking requirement does not apply to all asphalt overlay applications. Instead, a project-specific service conditions based mix design system should be developed. Based on the relationship between Overlay Test (OT) cycles and fracture properties (A and n) established under this study, a balanced RAP/RAS mix design and performance evaluation system for project-specific service conditions is proposed, and it includes a balanced mix design procedure and a performance evaluation system in which the Hamburg wheel tracking test and associated criteria are used to control rutting/moisture damage and the OT, and the required OT cycles determined from S-TxACOL cracking prediction with consideration of climate, traffic, pavement structure and existing pavement conditions. Additionally, the impacts of soft binder on engineering properties of RAP/RAS mixes in terms of dynamic modulus, HWTT rut depth, and OT cycles are investigated. The test results clearly indicated that the use of soft and modified asphalt binder (i.e., PG xx-28, PG xx-34) can effectively improve cracking resistance of RAP/RAS mixes without sacrificing much rutting/moisture damage resistance. Dynamic modulus is not a good indicator as cracking resistance of RAP/RAS mixes. Researchers highly recommend that the proposed RAP/RAS mix design and performance evaluation system for project-specific service conditions be implemented statewide.

CONTENTS

- Chapter 1. Introduction
- Chapter 2. Field Performance of RAP/RAS Test Sections
- Chapter 3. Balanced RAP/RAS Mix Design and Performance Evaluation System for Project-Specific Service Conditions
- Chapter 4. Approaches for Improving Cracking Resistance of RAP/RAS Mixes
- Chapter 5. Summary and Conclusions
- References
- Appendix A. Rap Quality, Processing, and Construction Draft Specification
- Appendix B. Balanced Mix Design Procedure for HMA Mixes Using High Rap
- Appendix C. Pavement Type Selection Guidelines for the Use of High RAP Mixes
- Appendix D. Guidelines for the Use of High RAP in HMA Mixes

This report is available for free download (5.4 MB):

<http://tti.tamu.edu/documents/0-6092-3.pdf>

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Item 5

New Generation HMA Mix Designs: Accelerated Pavement Testing of a Type C Mix with the ALF Machine

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

TTI 6132-2 • 2013

Recent changes to the Texas hot-mix asphalt (HMA) mix-design procedures, such as the adaption of the higher-stiffer performance-grade asphalt-binder grades and the Hamburg test, have ensured that the mixes that are routinely used on Texas highways are not prone to rutting. However, performance concerns have been raised with these HMA mixes, which are now drier, more difficult to compact, and more susceptible to premature cracking. This is particularly problematic with the dense-graded mixes (Type C and D) that are widely used throughout the state of Texas. Several new ideas have been under consideration to either: (a) modify the existing HMA mix-design criteria and/or include new and simpler cracking test procedures, or (b) develop new generation HMA mix-design methods that will optimize HMA field performance, particularly with respect to cracking.

In this study, two HMA mix-design methods, namely the traditional Texas gyratory (TG) and the proposed balanced mix design (BMD) were comparatively evaluated in the laboratory and then validated in the field using accelerated pavement testing (APT) with the accelerated loading facility in Louisiana. A typical Texas dense-graded Type C mix, designed using both the TG (herein called the Control) and the BMD (herein called the Modified) methods, was utilized. This report provides a detailed documentation of the laboratory and field APT test results of the Type C mix, both the Control and Modified designs, respectively. Compared to the traditional TG method, the study findings indicated that the proposed BMD method yields a richer HMA mix design with higher asphalt-binder content and superior crack resistance and constructability (workability and compactability) properties, respectively.

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

<http://tti.tamu.edu/documents/0-6132-2.pdf>

Research Digest

Item 6

New Generation Mix-Designs: Laboratory-Field Testing and Modifications to Texas HMA Mix-Design Procedures

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

TTI 6132-3 • 2013

Recent changes to the Texas hot mix asphalt (HMA) mix-design procedures such as adaption of the higher-stiffer PG asphalt-binder grades and the Hamburg test have ensured that the mixes that are routinely used on the Texas highways are not prone to rutting. However, performance concerns have been raised with these HMA mixes that are now drier, more difficult to compact, and more susceptible to premature cracking. This is particularly problematic with the dense-graded mixes (Type C and D) that are widely used throughout the state of Texas. Therefore, there has been a great need to either: (1) modify the existing Texas HMA mix-design criteria and/or to include new simpler cracking test procedures; or (2) develop new mix-design methods that will optimize HMA field performance, particularly with respect to cracking. As a means toward addressing these issues, this report provides documentation of a 4-year research study that included the following major tasks: a) comparative evaluation of the Texas gyratory and balanced mix design (BMD) methods; b) development and evaluation of numerous HMA mix-designs including RAP and RAS mixes, c) extensive laboratory test including Hamburg rutting and Overlay Tester crack evaluations; d) accelerated pavement testing and performance evaluation; e) field testing and performance monitoring of in-service highway test sections. Based on the study findings and as documented herein, recommendations for updates and modifications to the Texas HMA mix-design methods were made. Additionally, new guidelines and specifications were also developed for new generation HMA mix-design procedures. Overall, the BMD method that is rutting-cracking performance based exhibited superiority over the traditional Texas gyratory mix-design method, particularly in terms of HMA mix constructability and cracking performance.

This report is available for free download (9.6 MB):

<http://tti.tamu.edu/documents/0-6132-3.pdf>

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Item 7

Strength and Serviceability Design of Reinforced Concrete Inverted-T Beams

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

CTR 6416-1 • 2013

Significant diagonal cracking in reinforced concrete inverted-T straddle bent caps has been reported throughout the State of Texas. Many of the distressed structures were recently constructed and have generally been in service for less than two decades. The unique nature of the problem prompted a closer look into the design and behavior of such structural components. An experimental study was conducted in which 33 reinforced concrete inverted-T beam specimens were tested. The effects of the following variables were evaluated: ledge depth and length, quantity of web reinforcement, number of point loads, member depth, and a/d ratio. A strut-and-tie design method proposed by TxDOT Project 0-5253, initially calibrated for compression-chord loaded deep beams, was investigated. It was concluded that the strut-and-tie method was a simpler and accurate design method and was recommended for use in inverted-T beam design. A recommendation was also made on the amount of minimum web reinforcement needed for strength and serviceability considerations. A simple service-load check was proposed for the purpose of limiting diagonal cracking under service loads. Lastly, a chart was created to aid in the distress evaluation of a diagonally-cracked inverted-T bent cap in the field.

CONTENTS

- Introduction
- Background of Inverted-T Straddle Bent Caps
- Experimental Program
- Experimental Results
- Analysis of Results
- In-Service Inverted-T Bridge Bents
- Design Recommendations
- Summary and Conclusions
- References
- Appendix A. Design Example

This report is available for free download (9.1 MB):

<http://library.ctr.utexas.edu/ctr-publications/0-6416-1.pdf>

Item 8

Treatments for Clays in Aggregates Used to Produce Cement Concrete, Bituminous Materials, and Chip Seals

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

TTI 6444-1 • 2013

The clay contamination of coarse and fine aggregates and its effects on pavement performance of portland cement concrete, bituminous mixes and chip seals is a major concern for Texas Department of Transportation. We proposed (i) to determine what type and concentration of clay mineral will result in poor pavement performance, (ii) to identify a quick field test method to detect the presence of deleterious clay minerals in the stockpile, and (iii) suggest remedial techniques to make the clay contaminated aggregates acceptable for use.

This report is available for free download (15 MB):

<http://tti.tamu.edu/documents/0-6444-1.pdf>

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Item 9

Pullout Resistance of Mechanically Stabilized Reinforcements in Backfills Typically Used in Texas. Volume 2, Test Reports for MSE Reinforcements in Type B (Sandy) Backfill

TEXAS TECH UNIVERSITY. CENTER FOR MULTIDISCIPLINARY RESEARCH IN TRANSPORTATION (TECHMRT)
TechMRT 6493-1 v.2 • 2013

This report documents findings from a three-year research study that examined the pullout resistance of inextensible MSE reinforcements in backfills typically used in Texas. The study involved an extensive laboratory test program in which a total of 687 pullout tests were completed. These tests were conducted using a large scale pullout test system that consisted of a test box with dimensions of 12ft x 12ft x 4ft and capability to simulate overburden pressures equivalent to 40 feet of fill. Tests were conducted on ribbed strip reinforcements, welded steel grid reinforcements, and a limited number of smooth bars embedded in two types of backfill, designated as Type A (gravelly) and Type B (sandy) select backfill as per TxDOT specifications. A subset of strip and grid reinforcements in each backfill type was instrumented with strain gages to provide further insight into mechanisms that control pullout resistance. The research design evaluated pullout resistance factors for both strip and grid reinforcements for a variety of independent variables including overburden pressure, reinforcement length, skew or splay angle, grid wire size, and grid geometry including both transverse and longitudinal wire spacing. Appropriate statistical analyses were used to interpret the data within the context of published AASHTO design guidance for inextensible MSE reinforcements. This volume, Volume 2, presents pullout test reports from a total of 367 pullout tests completed on MSE reinforcements embedded in TxDOT Type B backfill, and accompanying strain gage test reports. Volume 1 summarizes the research findings, and Volume 3 presents test reports for reinforcements in Type A backfill.

CONTENTS

- Appendix F: MSE Reinforcements Pullout Test Reports: Ribbed Strips in Type B Backfill
- Appendix G: MSE Reinforcement Pullout Test Reports: Ribbed Strips in Type B Backfill -- Under-Compacted
- Appendix H: MSE Reinforcement Pullout Test Reports: Welded Steel Grids in Type B Backfill
- Appendix I: MSE Reinforcement Pullout Test Reports: Smooth Bars in Type B Backfill
- Appendix J: MSE Reinforcement Pullout Test Strain Gage Reports: Ribbed Strips in Type B Backfill
- Appendix K: MSE Reinforcement Pullout Test Strain Gage Reports: Welded Steel Grids in Type B Backfill

This report is available for free download (43 MB):

http://www.depts.ttu.edu/techmrtweb/Reports/Complete%20Reports/0-6493-1_Vol2.pdf

Research Digest

Item 10

Pullout Resistance of Mechanically Stabilized Reinforcements in Backfills Typically Used in Texas. Volume 3, Test Reports for MSE Reinforcements in Type A (Gravelly) Backfill

TEXAS TECH UNIVERSITY. CENTER FOR MULTIDISCIPLINARY RESEARCH IN TRANSPORTATION (TECHMRT)
TechMRT 6493-1 v.3 • 2013

This report documents findings from a three-year research study that examined the pullout resistance of inextensible MSE reinforcements in backfills typically used in Texas. The study involved an extensive laboratory test program in which a total of 687 pullout tests were completed. These tests were conducted using a large scale pullout test system that consisted of a test box with dimensions of 12ft x 12ft x 4ft and capability to simulate overburden pressures equivalent to 40 feet of fill. Tests were conducted on ribbed strip reinforcements, welded steel grid reinforcements, and a limited number of smooth bars embedded in two types of backfill, designated as Type A (gravelly) and Type B (sandy) select backfill as per TxDOT specifications. A subset of strip and grid reinforcements in each backfill type was instrumented with strain gages to provide further insight into mechanisms that control pullout resistance. The research design evaluated pullout resistance factors for both strip and grid reinforcements for a variety of independent variables including overburden pressure, reinforcement length, skew or splay angle, grid wire size, and grid geometry including both transverse and longitudinal wire spacing. Appropriate statistical analyses were used to interpret the data within the context of published AASHTO design guidance for inextensible MSE reinforcements. This volume, Volume 3, presents pullout test reports from a total of 320 pullout tests completed on MSE reinforcements embedded in TxDOT Type A backfill, and accompanying strain gage test reports. Volume 1 summarizes the research findings, and Volume 2 presents test reports for reinforcements in Type B backfill.

CONTENTS

- Appendix L: MSE Reinforcement Pullout Test Reports: Ribbed Strips in Type A Backfill
- Appendix M: MSE Reinforcement Pullout Test Reports: Welded Steel Grids in Type A Backfill
- Appendix N: MSE Reinforcement Pullout Test Reports: Smooth Bars in Type A Backfill
- Appendix O: MSE Reinforcement Pullout Test Strain Gage Reports: Ribbed Strips in Type A Backfill
- Appendix P: MSE Reinforcement Pullout Test Strain Gage Reports: Welded Steel Grids in Type A Backfill

This report is available for free download (33.2 MB):

http://www.depts.ttu.edu/techmrtweb/Reports/Complete%20Reports/0-6493-1_Vol3.pdf

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Item 11

Hydraulic Performance of Staggered-Barrel Culverts for Stream Crossings

TEXAS TECH UNIVERSITY. CENTER FOR MULTIDISCIPLINARY RESEARCH IN TRANSPORTATION (TECHMRT)
TechMRT 6549-1 • 2013

Literature interpretation, laboratory experimentation, and data analysis was used to infer guidelines to assist in assessing multiple barrel staggered-systems that mimic natural stream behavior to facilitate solids migration, yet still provide the sufficient clear-water hydraulic capacity to meet their transportation infrastructure drainage needs. A database developed from literature data pertaining to solids transport was developed along with a screening tool for estimating solids transport. The laboratory study examined staggered barrel and conventional culverts both in-line with the stream axis and skew to that axis to develop tools to predict culvert performance. Experiments showed culvert open area was correlated with solids transport while culvert shape was not. Staggered systems showed some advantage in skew-settings performing slightly better than anticipated based on in-line studies. Stage-conveyance plots showed that our largest open area systems to have a curve closest to the approach section stage-conveyance until submergence; a finding supportive of matching the approach section conveyance and the culvert system conveyance to maintain solids continuity through the system. Examples illustrating the screening tool on selected experiments are presented, as are suggestions for future study.

CONTENTS

- 1. Introduction
- 2. Literature Review
- 3. Screening Tool
- 4. Physical Model
- 5. Results and Interpretation
- 6. Guidelines and Summary
- 7. Appendix-I Texas Tech Experiment Database

This report is available for free download (57.6 MB):

<http://www.depts.ttu.edu/techmrtweb/Reports/Complete%20Reports/0-6549-1.pdf>

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Item 12

Impact of changes in profile measurement technology on QA testing of pavement smoothness: technical report

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

TTI 6610-1 • 2013

This project aims to establish the impact of recent changes in profiling technology on TxDOT's implementation of the Department's Item 585 and SP247-011 ride specifications. Of particular importance to this research is verification of the ride statistics and defect locations determined from profile measurements with the traditional single-point and newer wide-footprint lasers. This verification would require ground truth measurements to establish benchmarks that may be used to identify where changes are required in the existing ride specifications and determine what these changes should be. Additionally, the project needs to evaluate the bump criteria in the existing Item 585 ride specification to establish an improved methodology that engineers can use to objectively determine the need for corrections based on measured surface profiles to fix defects that diminish road-user perception of ride quality. To meet the research objectives, TxDOT divided the project into two phases. Phase I focuses on addressing the impact of new sensor technology on the Department's current ride specifications, while Phase II focuses on investigating relationships between the existing bump criteria and bump panel ratings. This report documents the research work conducted in Phase I. Based on findings from comparisons between international roughness indices determined from inertial and reference profile measurements, the report provides recommendations on using inertial profilers with different lasers for quality assurance testing of pavement smoothness.

This report is available for free download (5.5 MB):

<http://tti.tamu.edu/documents/0-6610-1.pdf>

Item 13

Guidelines for Freeway Lighting Curfews

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

TTI 6645-1 • 2013

Roadway lighting is provided on selected highways to improve the visibility of the nighttime environment. Roadway lighting is typically warranted on the basis of the daily traffic volume. However, in the early morning hours, the traffic volumes may be so low as to diminish the need for roadway lighting. At present, the lighting infrastructure in place on Texas Department of Transportation (TxDOT) highways is not well suited to being dimmed. As a result, turning off roadway lighting during early morning hours is the only option. This concept is known as a lighting curfew for purposes of this research project. The lighting curfew section of the TxDOT 2003 Illumination Manual does not provide specific guidelines or criteria for implementing lighting curfews. Although lighting curfews are of interest around the country, no state has developed guidelines for lighting curfews, nor are there national guidelines at this time. The most significant potential benefits of lighting curfews include reduced power consumption and reduced light pollution. This project focused upon developing guidelines for implementing lighting curfews on urban freeways, which have the potential to impact TxDOT's ability to manage its lighting infrastructure in an advantageous manner. The guidelines developed through this project identify threshold criteria under which freeway main lane lighting can be turned off. The guidelines also identify conditions or exceptions under which lighting curfews should be suspended, modified, canceled, or not used at all (such as periods of inclement weather or during a major late-night event).

This report is available for free download (888 KB):

<http://tti.tamu.edu/documents/0-6645-1.pdf>

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Item 14

Texas Flexible Pavements and Overlays: Calibration Plans for M-E Models and Related Software

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

TTI 6658-P4 • 2013

This five-year project was initiated to collect materials and pavement performance data on a minimum of 100 highway test sections around the State of Texas, incorporating flexible pavements and overlays. Besides being used to calibrate and validate mechanistic-empirical (M-E) design models, the data collected will also serve as an ongoing reference data source and/or diagnostic tool for TxDOT engineers and other transportation professionals. Towards this goal, this interim report provides a documentation of the comprehensive work plans and strategies that were developed to calibrate and validate the M-E models and the associated software. As a minimum, the calibration and validation plans covers the following M-E models and associated software: The FPS, The TxACOL, The TxM-E, The M-E PDG. As discussed in this interim report, these strategic work plans were devised on the premise that data for calibrating and validating these M-E models/software will predominantly come from the Project 0-6658 MS Access Data Storage System (DSS). Accordingly, the DSS is also discussed in this interim report. Demonstration examples of the software (FPS, TxACOL, and M-E PDG) runs are also included in the report.

CONTENTS

- Chapter 1. Introduction
- Chapter 2. Calibration and Validation Plans
- Chapter 3. The Project 0-6658 Data Storage System
- Chapter 4. The FPS and Associated Software
- Chapter 5. The TxACOL and associated Software
- Chapter 6. The TxM-E and Associated Software
- Chapter 7. The M-E PDG and Associated Software
- Chapter 8. M-E. Model Comparisons Relative to Field and Laboratory Data
- Chapter 9. Summary and Recommendations
- References
- Appendixes A-E
- Data CD

This report is available for free download (8 MB PDF; see detail notes for link to CD-ROM contents):

<http://tti.tamu.edu/documents/0-6658-P4.pdf>

Item 15

Managing Operating Cost for Rural and Small Urban Transit Systems: Workshop Materials

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

TTI 6694-P2 • 2013

This CD-ROM includes instructor and participant workshop materials (notes, presentation slides, guide, and evaluation form) for a workshop that prepared by Texas A&M Transportation Institute and the Texas Department of Transportation. "The purpose of the workshop is to provide rural and small urban transit managers and staff with tools to analyze, track, predict, and manage operational costs. The workshop will have a beginning and ending general session, and will provide six sessions in specific operating cost areas including: Staff: Managing Shifts, Managing Costs; Maintenance: Vehicle Replacement Plans and State of Good Repair; Contracting for Transit Services; Future Trends and Forward Thinking Approaches; Buying Fuel and Managing Consumption; Minimizing No-Shows and Late Cancellations. The workshop is a 6-hour format including breaks and lunch." --Instructor Notes

This report is available for free download (23.1 MB):

<http://tti.tamu.edu/documents/0-6694-P2.zip>

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Item 16

Development of a Statewide Motorcycle Safety Plan for Texas: Technical Report

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

TTI 6712-1 • 2013

The objective of this research project was to develop a statewide plan to reduce motorcycle crashes and injuries in the state of Texas. The project included a review of published literature on current and proposed countermeasures for reducing the incidence and/or severity of motorcycle-involved crashes and related injuries, a review of existing and emerging Intelligent Transportation System (ITS) and other advanced technologies for motorcycles and other vehicles, an analysis of Texas motorcycle crash and injury data, and a statewide survey of Texas motorcycle riders that explored the demographics, riding histories, training and licensing status, use of protective gear, crash involvement, and attitudes toward various motorcycle safety countermeasures. These data collection activities culminated in a list of potential motorcycle crash and injury countermeasures; these countermeasures were then evaluated and prioritized in a workshop attended by motorcycle safety experts and advocates.

CONTENTS

- Chapter 1. Introduction
- Chapter 2. Literature Review
- Chapter 3. Synthesis of ITS Technologies
- Chapter 4. Motorcycle Crash Data Analysis
- Chapter 5. Statewide Rider Survey
- Chapter 6. Crash Countermeasures Evaluation
- Chapter 7. Conclusions
- References
- Bibliography
- Appendix A. List of Crash Countermeasure Implementation Workshop Participants
- Appendix B. Workshop Participant Materials

This report is available for free download (1.4 MB):

<http://tti.tamu.edu/documents/0-6712-1.pdf>

Item 17

Texas Motorcycle Crash Countermeasure Workshop

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

TTI 6712-P1 • 2013

This CD-ROM contains administrative information (key goals, invitation to attend, and attendance list) regarding a one-day motorcycle countermeasure workshop on Thursday, January 24, 2013 that was targeted at TxDOT, TxDPS, and others with expertise or specialized knowledge with measures to reduce crashes and injuries involving motorcyclists. "[This] workshop will help to shape a new strategic direction for the use of motorcycles and the safety of motorcyclists over the next five years in the State. The plan targets several possible areas for action: Motorcycle/rider conspicuity, Motorist awareness of motorcycles, Licensing, Training and Education, Impaired riding, Speeding, Personal protective gear, Roadway / Infrastructure, Legislation and regulations, Law enforcement, Program management, Program evaluation and data, Motorcycle and vehicle technologies/ITS. The materials summarize the literature on countermeasures to improve motorcycle safety. When reviewing each countermeasure, please consider their effectiveness in preventing motorcycle crashes, and their effectiveness in reducing the severity of injuries to a crash-involved rider..."

This report is available for free download (254 KB):

<http://tti.tamu.edu/documents/0-6712-P1.zip>

Research Digest

Item 18

Texas Strategic Action Plan for Motorcycles 2013 - 2018

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

TTI 6712-P2 • 2013

"The Texas Strategic Action Plan for Motorcycles: 2013-2018 provides an integrated approach to identify implementable strategies and action steps to make the road environment and infrastructure safer for motorcyclists and other powered two- and three-wheelers in the State of Texas... The five-year plan includes detailed strategies and action steps to reduce the number of motorcycle fatalities, injuries, and crashes on Texas roadways. It provides guidance to TxDOT and key stakeholders involved with improving motorcycle safety, including the Texas Department of Public Safety - Motorcycle/ATV Safety Unit (DPS-MSU), the Texas Education Agency (TEA), the Texas Department of State Health Services (DSHS), the Texas Motorcycle Safety Coalition (TMSC), law enforcement, local agencies, motorcycle clubs/groups, motorcyclists, and dealers." --p.1

This report is available for free download (952 KB):

<http://tti.tamu.edu/documents/0-6712-P2.pdf>

Item 19

Toll Roads, Toll Rates, and Driver Behavior. Executive Report

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

TTI 6737-1 • 2013

State and federal research has examined toll roads and attempted to identify methods to make toll roads a more attractive option for drivers. Researchers examined various views of toll road transactions and concluded: +Truckers and trucking companies view toll roads significantly differently than the average passenger car driver. Travel time savings and avoiding congestion are generally less important than the actual cost of the tolls and their inability to pass those costs to their customers. +Drivers require more information on toll roads: where they are located, how/where to access them, how to pay for the toll transaction, how much time will they save by taking a toll road versus a free alternative, who operates a given toll road, etc. +Raising toll rates actually increases revenue while lowering toll rates will increase traffic volumes at the expense of toll revenues.

This report is available for free download (341 KB):

<http://tti.tamu.edu/documents/0-6737-1.pdf>

Research Digest

Item 20

Best Practices for Using RAP and RAS in HMA and WMA

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

TTI 6738-P1 • 2013

[Project researchers] collaborating with TxDOT and TxAPA organized a RAP/RAS best practice workshop held at the TxAPA headquarter in Buda, Texas, on Jan. 8, 2013. This product includes a summary as well as PDFs of 5 workshop presentations.

CONTENTS

- Product (P1) from Project 0-6738: Performance Studies and Future Directions for Mixes Containing RAP and RAS [PDF]
- Balanced RAP/RAS Mix Design and Performance Evaluation for Project- Specific Service Conditions / Fujie Zhou [PDF]
- Performance Studies and Future Directions for Mixes Containing RAP and RAS (and WMA) / Robert Lee [PDF]
- RAP & RAS Mix Design and QC Issues / Maghsoud Tahmoressi, PaveTex [PDF]
- RAP & RAS Production and Construction / Chuck Fuller, Ramming Paving [PDF]
- RAP / RAS Workshop / David Morton, APAC-Texas [PDF]

This report is available for free download (14.7 MB):

<http://tti.tamu.edu/documents/0-6738-P1.zip>

Item 21

Evaluation of the Texas Tier System for Seal Coat Binder Specification

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

TTI 6798-1 • 2013

The Texas Department of Transportation (TxDOT) instituted a change in their seal coat binder specification in 2010 which allowed districts to select multiple binders within specified traffic levels or tiers for the purpose of allowing contractors to bid the work with the most economical binder available to them. Known as the tier system, it is estimated that this approach has saved TxDOT over \$33 million in the 2.5 years that it has been used. While this savings is substantial, it was recognized that refinements to the tier system were needed to address specific performance problems. This research project was initiated to poll TxDOT district personnel, contractors, and chip seal binder suppliers to ascertain how the tier system was working, what modifications could be made to improve performance, and what other issues needed to be addressed. Although the tier system is generally working as intended, there are opportunities for improvement. These include an expanded education effort for all levels of TxDOT personnel involved in chip seal construction, changing traffic requirements to reflect cumulative and truck characteristics, keeping the tier system for district wide chip seal programs, updating the current chip seal manual, developing standards for pavement preparation ahead of sealing, allowing more flexibility for selecting binders for individual projects, developing generic chip seal binder specifications, removing aggregate requirements from the current tier system, initiate research into the development of a good winter binder, and initiate research into the development and application of seal coat test methods.

This report is available for free download (637 KB):

<http://tti.tamu.edu/documents/0-6798-1.pdf>

Research Digest

Item 22

Price Adjustment Clauses: Report

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

TTI 6799-1 • 2013

Price adjustment mechanisms exist to account for fluctuations in commodity or labor prices and have been used for highway construction in 47 states. They are useful in stabilizing bid prices in times of economic uncertainty and preventing defaults on contracts. This study examined the feasibility of establishing price adjustment practices on highway construction contracts in Texas. Researchers found that there is not a consensus among TxDOT districts or contractors about using price adjustment clauses (PACs), but those who favor such would use them for longer term, higher value projects if they were to be instituted. Because there is not a clear agreement at this time among contractors and among TxDOT personnel interviewed, implementation of PACs on construction projects cannot be recommended.

This report is available for free download (4.2 MB):

<http://tti.tamu.edu/documents/0-6799-1.pdf>